

**GTHT - 001**

**BUREAU OF LAND  
MANAGEMENT  
(BLM)**

1 of 2



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED  
TAKE PRIDE IN AMERICA

2012 OCT 18 P 12:50

In Reply Refer To:

NMNM034790  
3200 (L0310)

OCT 16 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 3452

AMEC Environment and Infrastructure  
c/o Mr. David Janney  
8519 Jefferson, NE  
Albuquerque, NM 87113

Dear Mr. Janney:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is returning the enclosed unapproved Geothermal Drilling Permits (GDPs) for the 42-18 and 54-12 injection wells.

On September 18, 2012, you informed BLM staff that Cyrq Energy was reevaluating the proposed 54-12 injection well and requested that the BLM suspend further review of this GDP. The LCDO has not received further direction on whether to proceed, so we are returning this GDP unsigned so you may secure the confidential information until you are ready to resubmit or dispose of this application.

On April 25, 2012, the LCDO requested (Certified Receipt 7006 0100 0004 5388 7885) additional information necessary to complete the 42-18 GDP submittal. As of this letter, the LCDO has not received the requested information. Therefore, the 42-18 GDP is returned to you for completion or disposal.

Please remember that you may submit new GDPs for these or other locations if necessary. All GDP submissions must meet the relevant requirements of 43 CFR 3261.10-.22 (copy enclosed).



If you have any immediate questions, you may contact me at (575) 525-4300. After November 13, 2012, please direct questions to Patrick Moran at (575) 525-4337 or [pmoran@blm.gov](mailto:pmoran@blm.gov).

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

3 Enclosures:

- 1 – GDP 54-12 (3 cpys)
- 2 – GDP 42-18 (3 cpys)
- 3 – 43 CFR 3261.10-12

cc:

Ben Barker  
✓ Carl Chavez  
Randy Dade  
Charles Jackson



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OOD

In Reply Refer To:

NMNM 034790  
3260 (L0310)

2012 SEP 28 P 12:38

SEP 26 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 4046

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

### **REVISED WRITTEN ORDER(S) OF THE BLM AUTHORIZED OFFICER**

On September 17, 2012, the Bureau of Land Management (BLM), Las Cruces District Office (LCDO) issued a Written Order (WO) to Cyrq Energy, Inc. This WO related to the removal or isolation of drilling fluids in reserve pits associated with three completed wells (63-7, 47-7 and 53-7) located on geothermal lease NMNM 034790 in section 7, T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM. At the request of Cyrq Energy's designated agent, the LCDO reviewed water chemistry data provided by Cyrq Energy on September 21, 2012. Based on this review, the LCDO has determined that it is appropriate to revise the previous WO. This revised WO shall supersede and replace the original September 17, 2012, WO.

Provided that there are no new actions which may potentially change the chemistry of water in the reserve pits, the following corrective actions in the September 17, 2012 WO are no longer required:

1. Remove all remaining drilling fluids from the reserve pits at the 63-7, 47-7 and 53-7 well sites and dispose of these fluids in a manner consistent with the applicable State of New Mexico laws, regulations and permit conditions;

or

2. Apply protective netting over the reserve pits at the 63-7, 47-7 and 53-7 well sites until these pits are reclaimed. Acceptable netting will consist of mesh ¼-inch or smaller installed at the ground surface over the pits. Netting must completely cover the pit surface area and be maintained so as to remain taut and suspended above the pit surface.

In lieu of these previous requirements, and under the regulatory authority in 43 CFR 3200.4(h) and 3250.13(c), the LCDO is hereby issuing the following revised WO to Cyrq Energy, Inc.:

The unused reserve pits associated with the 63-7, 47-7 and 53-7 wells shall be backfilled and fully reclaimed in accordance with applicable State of New Mexico regulations and permit requirements as soon as the pits are sufficiently dry for reclamation. This will permanently correct any potential hazards to migratory birds

Federal regulations (43 CFR 3200.4(h)) require geothermal operators to comply with instructions from the BLM authorized officer. Failure to meet the requirements of this WO will result in the issuance of a written Incident of Noncompliance following the procedures in 43 CFR 3277.12. The LCDO continues to reserve the option not to take further action on pending geothermal drilling permits for the proposed 54-12 and 42-18 wells until it is demonstrated that adequate migratory bird protection measures are being applied at existing and inactive drilling sites.

#### Appeal Procedures

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted,  
and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

1 Enclosure

cc:

Mr. David Janney  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OGD

In Reply Refer To:

NMNM 034790  
3260 (L0310)

2012 SEP 20 A 11:39

SEP 17 2012

CERTIFIED--RETURN RECEIPT REQUESTED

7006 0100 0001 5594 3162

Cyrq Energy  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has received (July 30, 2012) and reviewed your "resubmittal" of the May 31, 2012 sundry notice for the 47-7 well. The LCDO was previously unable to act on this sundry notice due to pending legal proceedings, which have now been resolved.

In your cover letter, you state that this submission is in response to our May 15, 2012 letter (Certified Receipt 7006 0100 0004 5388 8141) regarding the Incident on Noncompliance (INC) issued for the 47-7 well on February 6, 2012 (Certified Receipt 7006 0810 0003 4674 1119). The LCDO's May 15 letter did not require or request a response from Cyrq Energy; rather it was sent to reiterate that Cyrq had not appealed the INC within the regulatory timeframe, and that the LCDO cannot rescind the current INC until the well 47-7 is either reconstructed to conform to the approved GDP, or plugged and abandoned in accordance with applicable State of New Mexico standards.

The LCDO's May 15, 2012 letter did not state that the BLM would rescind the INC for the 47-7 well if that well passed a mechanical integrity test (MIT). If Cyrq Energy needs to complete an MIT for the 47-7 well, the BLM can authorize this action in a sundry notice; however, successful completion of an MIT will not result in the BLM rescinding the INC. This INC is the file record that the 47-7 well was not completed as specified in the approved Geothermal Drilling Permit (GDP).

Before the LCDO can approve the proposed sundry notice, several corrections and some additional information is necessary:

1. All three copies of the sundry notice must be signed in ink.
2. Remove item 12 from section 16.

3. Identify/specify the weighted fluid mentioned in item 1 of section 15.
4. Provide the technical justification for deviating from the MIT (Casing Integrity and Cement bond) test pressures and hold times specified in the conditions of approval in the 47-7 GDP. Otherwise, the MIT will have to meet these standards to be considered successful.
5. In the event of MIT failure, specify the criteria the operator will use for determining whether to repair the well, plug and abandon the well, or convert to a monitoring well.
6. Specify the types of geophysical logs to be run in this test (item 5 in section 15).

Should Cyrq Energy decide to proceed with the proposed MIT, you will be required to arrange for a qualified BLM Petroleum Engineering Technician to observe the test.

Please provide the required information within 30 days of your receipt of this letter, or the LCDO will return all copies of your July 30, 2012 sundry notice unsigned. You may contact Michael Smith at (575) 525-4421 or [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov), if you have additional questions.

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

1 Enclosure:  
1 - Form 3260-3

cc:

Mr. Frank Lupo  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OCD

2012 SEP 20 A 11:38

In Reply Refer To:  
NMNM 034790  
3260 (L0310)

SEP 17 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 3155

Cyrq Energy Inc.  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

### WRITTEN ORDER(S) OF THE BLM AUTHORIZED OFFICER

On August 28, 2012, the Bureau of Land Management (BLM), Las Cruces District Office (LCDO) approved a sundry notice to authorize the emergency transfer of drilling fluids from the active Geothermal Drilling Permit (GDP) site called the 63-7 well to two unused reserve pits at previously drilled wells, referred to as the 47-7 and 53-7 wells. This sundry notice outlined specific wildlife monitoring procedures, and was subject to Conditions of Approval (COA's) to protect migratory birds from coming into contact with drilling fluids stored in the 63-7, 47-7 and 53-7 reserve pits.

On August 30, 2012, LCDO staff was informed that the drilling rig on the 63-7 well site was being released, which ended the authorizations granted under the August 28, 2012 sundry notice (see COA #4). On September 11, 2012, LCDO staff was verbally informed by Cyrq Energy Inc.'s, designated agent that drilling fluids transferred from the 63-7 well remain in all three reserve pits, even though the authorizing sundry notice is expired.

Under the regulatory authority in 43 CFR 3200.4(h) and 3250.13(c), the LCDO is hereby issuing the following Written Order (WO) to Cyrq Energy Inc:

1. Remove all remaining drilling fluids from the reserve pits at the 63-7, 47-7 and 53-7 well sites and dispose of these fluids in a manner consistent with the applicable State of New Mexico laws, regulations and permit conditions;

or

2. Apply protective netting over the reserve pits at the 63-7, 47-7 and 53-7 well sites until these pits are reclaimed. Acceptable netting will consist of mesh 1/4-inch or smaller installed at the ground surface over the pits. Netting must completely cover the pit surface area and be maintained so as to remain taut and suspended above the pit surface.

Federal regulations (43 CFR 3200.4(h)) require geothermal operators to comply with instructions from the BLM authorized officer. Please complete either of the above remediation measures within 2 weeks of your receipt of this WO. Failure to meet the requirements of this WO will result in the issuance of a written Incident of Noncompliance (INC) following the procedures in 43 CFR 3277.12. Please be aware that the LCDO will take no further action on pending GDP's for the proposed 54-12 and 42-18 wells until Cyrq Energy Inc., has met the requirements of this WO.

#### Appeal Procedures

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

#### Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.

  
Bill Childress  
District Manager

1 Enclosure

cc:

Mr. David Janney  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson





# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OCD  
2012 SEP 14 A 10:44

In Reply Refer To:

NMNM 034790  
3260 (L0310)

SEP 12 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 3124

### DECISION

AMEC, Inc.	:	
c/o Mr: David Janney	:	Lease: NMNM 034790
8519 Jefferson Street NE	:	
Albuquerque, NM 87113	:	

#### Geothermal Sundry Notices Approved: Wells 45-7 and 55-7

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the fifth sundry notice for the Geothermal Drilling Permit (GDP) for the well 55-7 (approved May 17, 2010) and the fifth sundry notice for the GDP for the well 45-7 (approved October 1, 2008). Both were received June 15, 2012. These sundry notices are approved subject to the conditions defined in 43 CFR §3260.11 and the attached Conditions of Approval (COA's).


If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.

*FOR*   
David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

2 Enclosures:

- 1 – Approved Sundry Notice 45-7 and 55-7
- 2 – Form 1842-1

cc:

Mr. Ben Barker  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OCD

2012 SEP -6 P 12:42

In Reply Refer To:

NMNM 034790  
3260 (L0310)

SEP 4 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 3964

AMEC, Inc.  
c/o Mr. David Janney  
8519 Jefferson Street NE  
Albuquerque, NM 87113

Lease: NMNM 034790

Dear Mr. Janney:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is writing in response to recent complications encountered while drilling the 63-7 injection well. As you are aware, these problems developed as a consequence of an undersized reserve pit developed for the drilling rig. The original operations plan for the 63-7 Geothermal Drilling Permit (GDP) specified a 200-foot by 60-foot by 15-foot pit, and the pit constructed on site was smaller (approximately 150 feet by 60 feet by 12 feet).

To avoid future complications with your operation, we advise that you estimate the appropriate volume of the reserve pit for the drilling rig currently on site for the upcoming 54-7 and 42-18 wells. If you determine that resizing the proposed pit is necessary, please submit a written modification to the operations plan for the 54-7 GDP (a sundry notice is not required to amend an unapproved GDP (43 CFR 3261.17(a))) and coordinate with the relevant State agencies.

54-12  
CSC  
9/7/12

If you determine that no change in proposed pit dimensions is necessary, then no further action is required. We are informing you, however, that the LCDO will not provide any further verbal approval of changes to the approved GDPs unless we determine that it conclusively meets the requirements of 43 CFR 3261.21. Problems created by an operator's substandard design or insufficient planning, generally do not fall into the categories considered in 43 CFR 3261.21.

In addition, you are reminded that the GDPs for the proposed 42-18 and 54-12 injection wells are still incomplete. You were advised by letter (Certified Receipt 7006 0100 0004 5388 7885) of

the additional information required to meet the regulatory requirements outlined in 43 CFR 3261.11-.13. At your earliest convenience, please send the following information for the proposed 54-12 and 42-18 injection wells:

1. Submit a complete operations plan meeting all of the requirements of 43 CFR 3261.12(a) for the 42-18 only.
2. Submit plats certified by a licensed surveyor showing the surveyed well surface location and distances from the nearest section or tract lines (43 CFR 3261.12(a)) for the 42-18 only.
3. Provide additional detail regarding drilling mud composition (gel-polymer content, bentonite content, and any additives) and MSDS for drilling mud components (43 CFR 3261.13(b)(14)).
4. Provide a description of the logs that you will run (43 CFR 3261.13(b)(6)) for both wells.
5. For any proposed flow and injection tests, provide complete flow diagrams showing the movement of water between tanks, reserve pits, wells and proposed discharge/injection points. Specify if formation fluids will be stored in any open pits, tanks or reservoirs, and show location of pumps and flash separators (43 CFR 3261.13(b)(14)). Note: you may also request authorization for flow and injection tests after well completion by submitting a sundry notice.
6. Specify mitigations to prevent wildlife and migratory birds from entering the reserve pit for the 42-18 well until pit reclamation is completed.

If you have any questions, please contact Michael Smith at (575) 525-4421 or at [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov).

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:

- Mr. Ben Barker
- ✓ Mr. Carl Chavez
- Mr. Randy Dade
- Mr. Charles Jackson



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

In Reply Refer To:

NMNM 034790  
3260 (L0310)

AUG 29 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0001 5594 3919

### DECISION

AMEC, Inc.  
c/o Mr. David Janney  
8519 Jefferson Street NE  
Albuquerque, NM 87113

:  
:  
:  
:

Lease: NMNM 034790

### Geothermal Sundry Notice Approved: Well 63-7

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the third sundry notice (received August 22, 2012) for the Geothermal Drilling Permit (GDP) for the well 63-7 (approved May 17, 2012). This sundry is approved subject to the attached Conditions of Approval (COA's).

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

2012 AUG 31 P 12:24  
RECEIVED OODP

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

2 Enclosures:

- 1 – Copy of Approved Sundry Notice
- 2 – Form 1842-1

cc:

Cyrq Energy, Inc.  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson

## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Tuesday, August 28, 2012 3:54 PM  
**To:** 'Smith, Michael A'; Dade, Randy, EMNRD; Phillips, Haddy L., OSE; Shapard, Craig, EMNRD  
**Cc:** VonGonten, Glenn, EMNRD; Shapard, Craig, EMNRD; Brooks, David K., EMNRD; Sanchez, Daniel J., EMNRD  
**Subject:** RE: LDG 63-7

Mike:

Hi. Los Lobos does not have enough containment or evaporation ponds to dispose of the produced fluids and they were proposing to inject them back into the reservoir via a G-103 Sundry Notice.

The OCD informed Los Lobos that any wells being drilled, under construction and/or development that produce fluids tainted with mud cuttings, etc. cannot be re-injected back into the well being constructed. Geothermal disposal wells seated in a suitable formation, if found, other than the geothermal reservoir could handle the produced fluids, and disposal wells have not been discussed until now that they are seeking to re-inject produced fluids back into the well. Los Lobos is attempting to sample the drill fluids to make a case for re-injection, they would have to meet the WQCC standards before injection, and as we know there are constituents that exceed WQCC standards already. Background has not been determined for the project. They must use fresh water supply wells that have been developed to produce fresh formation water.

Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
E-mail: [CarlJ.Chavez@State.NM.US](mailto:CarlJ.Chavez@State.NM.US)  
Website: <http://www.emnrd.state.nm.us/ocd/>  
"Why Not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward With the Rest of the Nation?" To see how, please go to: "Pollution Prevention & Waste Minimization" at <http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>

---

**From:** Smith, Michael A [mailto:michaelsmith@blm.gov]  
**Sent:** Tuesday, August 28, 2012 2:52 PM  
**To:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD; Phillips, Haddy L., OSE; Shapard, Craig, EMNRD  
**Subject:** FW: LDG 63-7

An update – I have been in communication with Mr. Janney and he said the vacuum truck (mentioned below) is the method being used to transfer water between the 53-7 (not 54-7) and 63-7 pits. To me, this seems like a pretty expensive way to shuffle water around - MS (575-525-4421).

---

**From:** Smith, Michael A  
**Sent:** Tuesday, August 28, 2012 12:37 PM  
**To:** 'Chavez, Carl J, EMNRD'  
**Cc:** Shapard, Craig, EMNRD; [Randy.Dade@state.nm.us](mailto:Randy.Dade@state.nm.us); [haddy.phillips@state.nm.us](mailto:haddy.phillips@state.nm.us)  
**Subject:** RE: LDG 63-7

Carl:

Thanks for the updates on this issue. LDG did submit a sundry for the proposed mud-shuffling between the pits (copy attached). Since this is on private surface, BLM's main concern with this proposal is going to be compliance with the Migratory Bird Treaty Act, hence the wildlife protection measures.

I visited the site last Friday (August 24, 2012). They had fenced the 54-7 and 47-7 pits and set up the propane cannons, but they had not set up any hose or pipe for mud transfer. A vacuum truck (Overley's VT Services) drove up to the 54-7 pit and began sucking out water. I asked the operator about what he was doing, and he said the was transferring water to "steel tanks" at the 63-7 drill site. He did not have an explanation as to why this was necessary, and I did not see where he ultimately took the water.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)

---

**From:** Chavez, Carl J, EMNRD [<mailto:CarlJ.Chavez@state.nm.us>]  
**Sent:** Tuesday, August 28, 2012 10:35 AM  
**To:** Smith, Michael A; Phillips, Haddy L., OSE  
**Cc:** Shapard, Craig, EMNRD  
**Subject:** FW: LDG 63-7

*FYI.*

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
E-mail: [CarlJ.Chavez@State.NM.US](mailto:CarlJ.Chavez@State.NM.US)

Website: <http://www.emnrd.state.nm.us/ocd/>

"Why Not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward With the Rest of the Nation?" To see how, please go to: "Pollution Prevention & Waste Minimization" at <http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Tuesday, August 28, 2012 10:34 AM  
**To:** 'Janney, David'; Shapard, Craig, EMNRD  
**Cc:** VonGonten, Glenn, EMNRD; Dade, Randy, EMNRD; Sanchez, Daniel J., EMNRD; Brooks, David K., EMNRD; Shapard, Craig, EMNRD  
**Subject:** RE: LDG 63-7

David:

See OCD responses in red italics below. Thank you.



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: December 31, 2013

6. Lease Serial No.

Federal NM34790

7. Surface Manager:  BLM  FS  
 Other Private

8. Unit Agreement Name  
NA

9. Well No.  
LDG 63-7

10. Permit No.

11. Field or Area  
Lightning Dock

12. Sec., T., R., B. & M.  
SE 1/4, NE 1/4, SW 1/4, NE 1/4 Sec. 7, T. 25S, R. 19W, NMB&M

13. County

Hidalgo

14. State

NM

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
Drilled to a total depth of 3,373 feet and being completed

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator  
136 S. Main Street, Ste. 600 Salt Lake City, UT 84101

4. Location of Well or Facility  
1722 feet from the North line and 1420 feet from the East line of Sec. 7, T. 25S, R. 19W

5. Type of Work
- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Change Plans                         | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input type="checkbox"/> Abandon              |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input checked="" type="checkbox"/> Other     |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

The GDP for this well was submitted to BLM on May 1, 2012 and it was approved on May 17, 2012. The well is currently being cleaned out and logged and will be completed according to the procedures describe in Drilling Handbook submitted with the GDP. Lightning Dock considers this to be an emergency situation based on the threat of potential reserve pit overflow to the ground surface and/or resultant potential property damage.

This sundry notice is submitted in order to allow, as necessary, drilling cuttings and well completion fluids to be placed into the reserve pit located at LDG 53-7 (approximately 900 feet to the west) and/or into the reserve pit located at LDG 47-7 (approximately 2,800 feet to the southwest). Each of these pits currently contains dry drilling cuttings. The bird deterrent/wildlife protection measures outlined in the current Plan of Operations submitted and approved by BLM for the LDG 63-7 will be employed on each of the pits that receive fluids. These measures will include:

Each pit will be completely fenced with appropriate wire fencing to height of at least four feet; While fluid is in the pit, mylar bird deterrent ribbon will be in place above the pit; A bird deterrent cannon will be deployed and utilized; and Inspections will be conducted on an hourly basis for free board height and wildlife protection.

The total volume of completion fluids placed into the other pits will be less than 1,200 barrels. The fluids will be re-injected into the 63-7 as soon as possible.

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed David Janssen, PC Title Agent for Lightning Dock Geothermal HI-01, LLC Date 08/21/2012

(This space for Federal Use)

Approved by [Signature] Title ADM-MR Date 8/28/12

Conditions of Approval, if any:  
See attached

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

**Third Sundry Notice Conditions of Approval**  
**NMNM034790 Well 63-7**  
**Received: August 22, 2012**

1. The operator shall comply with all State of New Mexico rules, regulations and permit conditions regarding the disposal and storage of solid wastes.
2. The operator shall maintain written logs of the hourly inspections of the pits. Inspections shall be conducted during daylight hours. These inspections shall include measurements of freeboard height and observations of the presence or absence of wildlife activity at the pits. At least one time-stamped photo displaying general conditions at the pit shall be taken during each inspection. Copies of the previous week's inspection reports and photos shall be delivered to the LCDO by close of business (4:30 p.m.) each Friday.
3. In the event the operator discovers dead or living wildlife or migratory birds within any of the three reserve pits (i.e. 63-7, 47-7 or 53-7 pits), the operator shall immediately stop pumping or transferring drilling mud, fluids and cuttings to the pit and contact the LCDO for further instructions on wildlife protection.
4. This sundry notice shall expire when the drilling rig on the 63-7 is demobilized, mobilized to a new drill site, or placed on standby.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
E-mail: [CarlJ.Chavez@State.NM.US](mailto:CarlJ.Chavez@State.NM.US)  
Website: <http://www.emnrd.state.nm.us/ocd/>

“Why Not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward With the Rest of the Nation?” To see how, please go to: “Pollution Prevention & Waste Minimization” at <http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>

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**From:** Janney, David [<mailto:david.janney@amec.com>]  
**Sent:** Tuesday, August 28, 2012 9:56 AM  
**To:** Chavez, Carl J, EMNRD; Shapard, Craig, EMNRD  
**Cc:** VonGonten, Glenn, EMNRD; Dade, Randy, EMNRD; Sanchez, Daniel J., EMNRD  
**Subject:** RE: LDG 63-7

Good morning:

Thank you very much.

Can you please provide an update on the status of the previous sundry to re-inject the drilling fluid/formation water into the 63-7?

*Under no circumstances shall Los Lobos re-inject any well drilling/completion fluids into a well, unless you have proposed treatment of the produced fluids and muds to the OCD for approval. In addition, any produced fluids from any well under drilling, construction and/or completion must handle produced fluids as a waste product. Therefore, a G-103 Sundry for waste products may not be appropriate. OCD has provided path forward for disposition of waste under the OCD GTHT-001 discharge permit (contains waste handling provisions) to address the G-103 submittal for transfer of waste to pits at another location for temporary storage of drill cuttings and produced fluids. Los Lobos will need to seek approval from the OCD District Office (DO) to treat the wastes before any injection could allowed back into a fresh aquifer system. In addition, Los Lobos was directed to the OCD DO for beneficial reuse of drilling mud for drilling at another well location, etc.*

Can you please provide an update on the 45-7/55-7 testing?

*The OCD review and final response to the G-112s and 104s is pending resolution of AmeriCulture concerns associated with the OCD's review of the aforementioned forms, etc. AmeriCulture is preparing a reply to the Los Lobos 8/23 letter (letter). OCD is awaiting the AmeriCulture response in order to make a final determination of the concerns of AmeriCulture and the OCD after review of the Los Lobos letter.*

Did you receive the G-101/G-102 package for the LDG 54-12?

*No, not yet.*

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113

505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

---

**From:** Chavez, Carl J, EMNRD [<mailto:CarlJ.Chavez@state.nm.us>]  
**Sent:** Tuesday, August 28, 2012 7:41 AM  
**To:** Janney, David; Shapard, Craig, EMNRD  
**Cc:** Dade, Randy, EMNRD; VonGonten, Glenn, EMNRD; Shapard, Craig, EMNRD; Sanchez, Daniel J., EMNRD  
**Subject:** RE: LDG 63-7

See attachment.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
E-mail: [CarlJ.Chavez@State.NM.US](mailto:CarlJ.Chavez@State.NM.US)

Website: <http://www.emnrd.state.nm.us/ocd/>

“Why Not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward With the Rest of the Nation?” To see how, please go to: “Pollution Prevention & Waste Minimization” at <http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>

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**From:** Chavez, Carl J, EMNRD  
**Sent:** Tuesday, August 28, 2012 7:40 AM  
**To:** 'Janney, David'; Shapard, Craig, EMNRD  
**Cc:** Dade, Randy, EMNRD; VonGonten, Glenn, EMNRD; Shapard, Craig, EMNRD; Sanchez, Daniel J., EMNRD  
**Subject:** RE: LDG 63-7

Mr. Janney:

Please find the approved G-103 attached.

Please be advised that any references to the Environmental Handbook that you refer to shall not be regarded by the New Mexico Oil Conservation Division to be substitute for the geothermal and environmental regulations.

Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
E-mail: [CarlJ.Chavez@State.NM.US](mailto:CarlJ.Chavez@State.NM.US)

Website: <http://www.emnrd.state.nm.us/ocd/>

“Why Not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward With the Rest of the Nation?” To see how, please go to: “Pollution Prevention & Waste Minimization” at <http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>

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**From:** Janney, David [<mailto:david.janney@amec.com>]  
**Sent:** Friday, August 24, 2012 4:54 PM  
**To:** Shapard, Craig, EMNRD; Chavez, Carl J, EMNRD

**Cc:** Dade, Randy, EMNRD; VonGonten, Glenn, EMNRD

**Subject:** LDG 63-7

Good Afternoon:

Please find attached a Sundry Notice for the use of fresh water to conduct the injection tests for the LDG 63-7. This is the rig injection test that is described in the drilling handbook submitted with the G 101.

The source of the water is Los Lobos' fresh drinking water well, 14-7. This water meets the requirements of NMAC 20.6.2.3105 A. Please feel free to contact me with questions.

The hard copy has been submitted to you via FedEx.

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113  
505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

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# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OGD

2012 AUG 22 P 12:44

In Reply Refer To:

NMNM 034790  
3260 (L0310)

AUG 21 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7005 1820 0003 3590 9990

### DECISION

Michelle Henrie  
P.O. Box 7035  
Albuquerque, NM 87194

NMNM 034790

### Sundry Notice Rejected

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your second sundry notice (received by e-mail on August 13, 2012) for the Geothermal Drilling Permit (GDP) for the well 63-7 (approved May 17, 2012). This sundry is being rejected because you have informed BLM staff (August 15, 2012) that the change in intermediate (13<sup>3</sup>/<sub>4</sub>-inches) casing length proposed in the sundry notice had been completed prior to receiving approval (43 CFR 3260.17(b)).

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted,  
and
- 4) Whether the public interest favors granting the stay.



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

2 Enclosures:

1 – Form 1842-1

2 – Sundry Notice (3 cys)

cc:

Ben Barker

✓ Carl Chavez

Randy Dade

Charles Jackson



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

In Reply Refer To:

NMNM034790  
3200 (L0310)

RECEIVED OCD

2012 AUG 13 P 12:38

AUG 9 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7005 1820 0003 3590 9884

AMEC Environment and Infrastructure, Inc.  
c/o Mr. David Janney  
8519 Jefferson NE  
Albuquerque, NM 87113

Dear Mr. Janney:

On July 11, 2012 the Bureau of Land Management (BLM), Las Cruces District Office (LCDO) received your response to our June 29, 2012 (Certified Receipt 7005 1820 0003 3590 8685) request for additional information. This request was made so the LCDO could complete review of the recently (June 15, 2012) submitted sundry notices for the Geothermal Drilling Permit (GDP) associated with wells 45-7 and 55-7 located in the SE<sup>1</sup>/<sub>4</sub>, section 7, T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM.

We appreciate your efforts to provide the needed information for the LCDO to fully evaluate this proposal. However, some aspects of the original request were not sufficiently addressed for a complete evaluation by the agency. Therefore, the LCDO is taking this opportunity to elaborate on the needed information:

1. In the June 29, 2012 letter, LCDO requested that AMEC provide information on the proposed goals of the test, and specifically requested information on the "well properties, aquifer parameters, etc." that will be measured. The July 11, 2012 response was not specific enough to determine exactly what is being measured by the proposed test. It mentioned the test being required to "size the power plant," but did not explain what specific parameters (i.e., discharge rates, water temperatures, etc.) need to be measured for plant design or to develop the predictive engineering models you mentioned. Your response also mentioned plans to measure levels in adjacent water wells, which was not discussed in the original sundry notice. Please provide the location of the wells to be monitored and elaborate on the monitoring procedures and goals.

Our request for this information is necessary so the BLM hydrologist may verify that the proposed test will meet the described data needs and the LCDO may document that the testing will not constitute waste of geothermal resources (43 CFR 3260.11(c)).



2. The LCDO also requested (June 29, 2012) that Cyrq Energy provide information on the depth, geologic structure, and ground water flow direction in the inferred re-injection zone at the 45-7 well. Your response (July 11, 2012) apparently defines the injection zone as corresponding with the zone of highest permeability at 2,100-2,200 feet depth, but did not provide information on the structure at this depth. Please specify the nature of the geologic structure in this inferred injection zone. Specifically, if it is associated with the inferred fault, provide the strike and true of this fault at the injection zone.

Your response also stated that the inferred injection zone is separated from the unconfined aquifer by several hundred feet of low-permeability rock. The lithology log submitted with the well completion report (BLM Form 3260-4) for the 45-7 well does not readily identify this low permeability layer. Please specify the location and nature of this low-permeability layer in the stratigraphic column for the 45-7 well.

3. A final issue that has arisen is the appropriateness of utilizing the proposed wells in the production-injection test. The 45-7 well is designated as a production well in the approved GDP, and is completed at a shallower depth than the planned injection wells. Cyrq's drilling contractor is presently completing the 63-7 well, which is one of three designated injection wells. It would therefore seem appropriate to delay the test until the 63-7 well is completed, and utilize that well as the point of injection and the 45-7 well as the point of production. This would appear to be more consistent with the planned uses of the two wells, but the LCDO would like to provide Cyrq Energy with this opportunity to explain why the proposed test would be representative of final system operations.

Please submit the required information within 60 days of your receipt of this letter. Otherwise, the LCDO will close the case file on these sundry notices without further notification to AMEC Inc., or Cyrq Energy. Please remember that you cannot start the described operations until the LCDO approves the sundry notice (43 CFR 3261.22). If you have any questions, please contact Michael Smith at (575) 525-4421 or [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov).

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Ben Barker  
Mr. Charles Jackson

## Chavez, Carl J, EMNRD

---

**From:** Smith, Michael A <michaelsmith@blm.gov>  
**Sent:** Tuesday, July 24, 2012 4:13 PM  
**To:** david.janney@amec.com  
**Cc:** Dade, Randy, EMNRD; Phillips, Haddy L., OSE; Chavez, Carl J, EMNRD  
**Subject:** First Federal sundry notice for the 63-07 well has been approved  
**Attachments:** 63-7\_NMNM34790\_01SN\_Approved.pdf

Mr. Janney:

Attached please find a scan of the approved Federal Sundry Notice for the 63-07 well you originally submitted yesterday. A signed original will be mailed to Cyrq Energy Inc. with a cc to you at AVEN. You may contact me if you have any additional questions.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

24, 10:36 A.M.

*Dea*

FORM APPROVED  
OMB NO. 1004-0132  
Expires: December 31, 2013

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

6. Lease Serial No. Federal NM34790	
7. Surface Manager: <input type="checkbox"/> BLM <input type="checkbox"/> FS <input checked="" type="checkbox"/> Other Private	
8. Unit Agreement Name NA	
9. Well No. LDG 63-7	10. Permit No.
11. Field or Area Lightning Dock Geothermal	
12. Sec., T., R., B. & M. SE1/4, NE 1/4, SW 1/4, NE 1/4, Sec. 7, T. 25S, R. 19W, NMB&M	
13. County Hidalgo	
14. State NM	
1a. Well Type: <input type="checkbox"/> Production <input checked="" type="checkbox"/> Injection <input type="checkbox"/> Heat Exchange <input type="checkbox"/> Observation <input type="checkbox"/> Other	
1b. Well Status: Other: not drilled	
2. Name of Lessee/Operator Lightning Dock Geothermal HI-01, LLC	
3. Address of Lessee/Operator 136 S. Main Street, Ste. 600 Salt Lake City, UT 84101	
4. Location of Well or Facility 1722 feet from the North line and 1420 feet from the East line of Sec. 7, T. 25S, R. 19W	

5. Type of Work

<input checked="" type="checkbox"/> Change Plans	<input type="checkbox"/> Convert to Injection	<input type="checkbox"/> Pull or Alter Casing
<input type="checkbox"/> Site and Road Construction	<input type="checkbox"/> Fracture Test	<input type="checkbox"/> Multiple Complete
<input type="checkbox"/> Construct New Production Facilities	<input type="checkbox"/> Shoot or Acidize	<input type="checkbox"/> Abandon
<input type="checkbox"/> Alter Existing Production Facilities	<input type="checkbox"/> Repair Well	<input type="checkbox"/> Other

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

This well has not been drilled. The GDP for this well was submitted to BLM on May 1, 2012 and it was approved on May 17, 2012. The casing schedule in the approved GDP is as follows:

20 inch - 94# - welded - 3/8" wall to 150'  
13.375 inch - 54.5# - BT&C - J-55 to 1500'  
9.625 inch - 36# - BT&C - K-55 liner to 3400'

This sundry notice is submitted in order to add another surface casing to further stabilize the well bore in the shallow alluvium and provide an adequate riser pipe for recirculating drilling mud to the reserve pit. ThermaSource, the drilling company, has requested this additional surface casing based on its inspection of site conditions. LDG proposes to install 30" casing in a 36" well bore to a depth of 35'. The 30" casing will be a single piece set to 35' with 2' of stick-up. It will be 118# casing with a 3/8" inch wall thickness. The casing will be cemented into place using a 6 sack Portland Type I mix with aggregate <1" in diameter which will be run with excess to the surface. The exact cement quantity used will be reported on the well completion report filed for this well.

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed *David W. Jensen, PE* Title Agent for Lightning Dock Geothermal HI-01, LLC Date 07/23/2012  
(This space for Federal use)

Approved by *Paul W. Lee* Title Assist DM-me Date 7/24/12  
Conditions of Approval, if any:

## Chavez, Carl J, EMNRD

---

**From:** Janney, David <david.janney@amec.com>  
**Sent:** Monday, July 23, 2012 1:34 PM  
**To:** Dade, Randy, EMNRD; Chavez, Carl J, EMNRD; Shapard, Craig, EMNRD  
**Cc:** Phillips, Haddy L., OSE; Rappuhn, Doug H., OSE  
**Subject:** FW: Sundry Notice for addition of 30" surface casing to LDG 63-7  
**Attachments:** LDG 63-7 Rev2 Casing Change Sundry Notice.PDF

Good afternoon:

Please find attached the Sundry Notice submitted to BLM today for the addition to the well design of a 30" surface casing to a depth of 35'.

I will forward to you the approved version of this document as soon as possible.

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113  
505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: December 31, 2013

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

6. Lease Serial No. Federal NM34790	
7. Surface Manager: <input type="checkbox"/> BLM <input type="checkbox"/> FS <input checked="" type="checkbox"/> Other Private	
8. Unit Agreement Name NA	
9. Well No. LDG 63-7	10. Permit No.
11. Field or Area Lightning Dock Geothermal	
12. Sec., T., R., B. & M. SE 1/4, NE 1/4, SW 1/4, NE 1/4, Sec. 7, T. 25S, R. 19W, NMB&M	
13. County Hidalgo	
14. State NM	

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
Other: not drilled

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator  
136 S. Main Street, Ste. 600 Salt Lake City, UT 84101

4. Location of Well or Facility  
1722 feet from the North line and 1420 feet from the East line of Sec. 7, T. 25S, R. 19W

5. Type of Work
- |   |   |   |
|---|---|---|
| <input checked="" type="checkbox"/> Change Plans              | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input type="checkbox"/> Abandon              |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input type="checkbox"/> Other                |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

This well has not been drilled. The GDP for this well was submitted to BLM on May 1, 2012 and it was approved on May 17, 2012. The casing schedule in the approved GDP is as follows:

- 20 inch - 94# - welded - 3/8" wall to 150'
- 13.375 inch - 54.5# - BT&C - J-55 to 1500'
- 9.625 inch - 36# - BT&C - K-55 liner to 3400'

This sundry notice is submitted in order to add another surface casing to further stabilize the well bore in the shallow alluvium and provide an adequate riser pipe for recirculating drilling mud to the reserve pit. Thermasource, the drilling company, has requested this additional surface casing based on its inspection of site conditions. LDG proposes to install 30" casing in a 36" well bore to a depth of 35'. The 30" casing will be a single piece set to 35' with 2' of stick-up. It will be 118# casing with a 3/8" inch wall thickness. The casing will be cemented into place using a 6 sack Portland Type I mix with aggregate <1" in diameter which will be run with excess to the surface. The exact cement quantity used will be reported on the well completion report filed for this well.

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed David W. Jensen, PG Title Agent for Lightning Dock Geothermal HI-01, LLC Date 07/23/2012

(This space for Federal use)

Approved by \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_  
Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

## Chavez, Carl J, EMNRD

---

**From:** Janney, David <david.janney@amec.com>  
**Sent:** Monday, July 23, 2012 11:14 AM  
**To:** Smith, Michael A  
**Cc:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD; Phillips, Haddy L., OSE  
**Subject:** RE: Sundry Notice for addition of 30" surface casing to LDG 63-7

Mr. Smith:

Yes thank you. I can get the revision back to you today in a pdf via email and put the originals into FedEx today.

I have spoke with Randy Dade and he will be satisfied with the approved BLM sundry.

OSE does not have any regulations regarding surface casing, I have had this discussion with Dour Rappuhn in the past. This will be included in the Well Report and Record that we file with them.

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113  
505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

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**From:** Smith, Michael A [<mailto:michaelsmith@blm.gov>]  
**Sent:** Monday, July 23, 2012 10:58 AM  
**To:** Janney, David  
**Cc:** Chavez, Carl J, EMNRD ([carlj.chavez@state.nm.us](mailto:carlj.chavez@state.nm.us)); [haddy.phillips@state.nm.us](mailto:haddy.phillips@state.nm.us)  
**Subject:** RE: Sundry Notice for addition of 30" surface casing to LDG 63-7

Mr. Janney:

Could you please specify the following details in this sundry notice (i.e. include them on a revised submission of form 3260-3):

1. What type/grade cement will be used for the 30" conductor casing (Portland I/II?)
2. What type of connects will be used for the 30" casing (welded, BT&C, or single-length pipe?)
3. Specify grade/wall thickness of the 30' casing

Please remember that Federal COA#25 still applies to this GDP (set 13 3/8" casing at least 50' into volcanic tuff). This COA was not included in section 15 of the Federal SN. Depending on the stratigraphy, this may require extending the casing below the 1500' specified in the Federal GDP and NM G-112 COA #2 (this should not create an issue, because the G-112 COA #2 states "...set to a minimum depth of 1500',...").

Also, if you have not already done so, please contact the relevant state regulators to see if a modification to NM permits is required. I will be in the office all day today if you have questions, but in the field all day tomorrow.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)

---

**From:** Janney, David [<mailto:david.janney@amec.com>]  
**Sent:** Monday, July 23, 2012 8:22 AM  
**To:** Smith, Michael A  
**Cc:** Michael Hayter; Nick Goodman  
**Subject:** Sundry Notice for addition of 30" surface casing to LDG 63-7

Good morning Mr. Smith:

Please find attached a pdf of the sundry notice that was sent to you via FedEx priority delivery on Friday. It should arrive in your office before 1030 this morning. Thank you for your understanding about this additional casing and willingness to walk it through the process. We would greatly appreciate a verbal approval for this when it is possible. Please feel free to contact me with any questions you may have.

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113  
505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

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## Chavez, Carl J, EMNRD

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**From:** Janney, David <david.janney@amec.com>  
**Sent:** Friday, July 13, 2012 10:27 AM  
**To:** Chavez, Carl J, EMNRD; Phillips, Haddy L., OSE  
**Cc:** Michelle Henrie  
**Subject:** FW: Response to BLM's questions regarding the 45-7 and 55-7 testing  
**Attachments:** Final-45-7 55-7 BLM Sundry-Response to Request for Additional Information.pdf

Greetings:

Please find attached for your records our response to a letter that we received from BLM regarding the proposed 55-7/45-7 flow/injection testing program.

Please feel free to contact me with any questions you may have.

Regards,

David W. Janney, PG  
Senior Geologist  
AMEC Environment and Infrastructure  
8519 Jefferson, NE  
Albuquerque, NM 87113  
505.821.1801 off  
505.821.7371 fax  
505.449.8457 cell

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Mr. David L. Wallace  
Assistant District Manager  
Bureau of Land Management  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4300

July 11, 2012

**RE: NMNM 034790, 3200 (L0310); Response to BLM request for information to clarify Sundry Notices submitted for GDPs associated with wells 45-7 and 55-7, dated 6/13/2012**

Dear Mr. Wallace:

We received your correspondence dated 6/29/2012 which was sent to Mr. Jeff Cotter of AMEC, designated agent for permits for Lightning Dock Geothermal HI-01, LLC (LDG). Your letter requested additional information so that your staff could properly review the adequacy of Sundry Notices (SN) dated 6/13/2012 which you received on 6/15/2012.

Thank you for your initial review. The following is provided to you in response to the seven (7) questions enumerated in the body of your letter.

1. BLM – “Specify the bird protection measures mentioned in section 15 (Proposed Operations).”

LDG - The SN for 55-7 states that LDG would “Deploy bird protection measures on centralized pond; Employ other bird deterrents, according to Plan of Operations, while water in the centralized pond is greater than 100 degrees F.” Please find in Attachment 1, the bird protection protocols developed in conjunction with BLM biologist Jack Barnitz in 2011, for operations at LDG. These protocols were initially developed for geothermal fluids flowed into the centralized pond and were later adapted to cover mud and fluids in the reserve pit while drilling as described in Attachment 1. As such, they were incorporated by attachment into the Plan of Operations recently submitted with the LDG 63-7 Geothermal Drilling Permit Application. The protocols will be followed and adhered to during the flow test operations proposed in the SN for well 55-7, as applicable when water in the centralized pond is greater than 100 degrees F.

2. BLM – “The operating plans for the 45-7 and 55-7 wells did not specify ‘other bird deterrents’ for use in the centralized pond when water is above 100 degrees F. Please elaborate on the proposed protection measures.”

LDG – The reference to the operating plans in the SN was meant to include the protocols outlined in Attachment 1. The “other bird deterrent” measures outlined in Attachment 1 provide the information you require.

3. BLM – “Specify the pump and equipment that will be used to re-inject formation fluid into the 45-7 well. Also specify whether portable surge tanks will be necessary between the centralized pond and the 45-7 well.”

LDG – Injection fluid will be pumped from the centralized holding pond to the 45-7 well head using a rented diesel pump and piping. We expect to use a pump similar to the Rain for Rent DV-200c, for which specifications are described in the Rain for Rent information sheet in Attached 2 of this document. The piping will be standard grooved end industrial aluminum piping with Victaulic couplings. The piping diameter will depend upon the capacity of the pump used to inject the produced fluids into 45-7. The wellhead pressure will be maintained below 40 pounds per square inch (psi) until the well moves to vacuum. This should provide a safety margin of more than 100 psi below the down-hole pressure demonstrated from the Formation Integrity Test that was performed on 1/23/11. Once the well is on vacuum, the wellhead pressure should be below 2 psi. Based on past experience, a surge tank will not be required.

4. BLM – “Estimated loss from flash evaporation is approximately 2.1 million gallons (Mgal); specify where the flash evaporation will occur (i.e., will a flash chamber/tank be placed between the 55-7 well and the reserve pit, or will flash loss occur at the outlet of the 8 – 12 inch pipe?”

LDG – The flow line from 55-7 will be run into the bottom of centralized holding pond. The flow line will be placed on the bottom of the pond with vent holes facing up. The flash will occur at this point. The use of a separate flash chamber is not planned. The well will be produced slowly until there is approximately 5 to 10 feet of head above the vent holes, this will reduce the rate of evaporation due to flashing and reduce the total evaporation to below the 2.1 Mgal estimate. The well, therefore, can be produced and the head of pond water will minimize the velocity and flash vaporization of the well fluid. Steam will be vented to the atmosphere and evaporation will occur. The rate of evaporation will depend upon atmospheric conditions and the actual residence time of the fluid in the pond.

5. BLM – “Describe the purpose and goals of the proposed test (i.e., what well properties, aquifer parameters, etc., are being measured)?”

LDG – This proposed test is a “closed loop” test that allows LDG to evaluate the overall capacity of the geothermal resource. This test will provide some of the data our engineers require to size the power plant, i.e., is it a 10 MW plant or a 20 MW plant? To meet project timeframes, long-lead items like the power plant need to be designed and equipment ordered soon so that the power plant can begin producing power by

December 2013. Prior to the test, pressure transducers will be placed in a number of surrounding wells to establish baseline water elevations before during and following the test. Water elevations will also be recorded manually during the test. The water levels and their variations with time and production will be used to develop predictive engineering models of the geothermal resource to design the optimum power plant capacity.

6. BLM – “Describe, using the best available geologic information, the final disposition of the re-injected formation fluid. Specify the depth, geologic structure, and ground water flow direction in the inferred re-injection zone.”

LDG – Well logs in 45-7 show the greatest interval of permeability to be in a fractured volcanoclastic formation at a depth of 2,100-2,200 feet. This is the production zone of 45-7, which is known through pressure interference testing to be in hydraulic communication with the production zone of well 55-7. These production and injection zones are several hundreds of feet deeper than any known unconfined groundwater flow in the area. Unconfined groundwater flow occurs in the unconsolidated alluvium, typically within 100-600 feet of the surface. This test is expected to re-circulate produced geothermal fluid from the geothermal reservoir back into its formation of origin without interacting with unconfined groundwater in the relatively shallow alluvium. The general direction of unconfined groundwater flow within the alluvium is estimated to be toward the northwest. Fluid flow direction in the inferred re-injection zone may also be to the northwest but there is also expected to be a vertical flow component within the bedrock geothermal reservoir. The inferred injection zone is separated from the unconfined groundwater above by several hundred feet of low-permeability rock. There is some natural leakage (vertical flow) of geothermal fluid to the near-surface where it is carried northwest by the shallow groundwater with which it mixes. The small area within which commercial geothermal temperatures are found indicates that there is no widespread lateral flow in the geothermal reservoir analogous to the movement of shallow unconfined groundwater within the alluvium.

7. BLM – “Provide calculations and specify assumptions used to estimate flash loss, evaporation loss and injection rate for the 45-7 well.”

LDG – The flash calculation is based on the equation expressing conservation of energy in an adiabatic change of state, which is a good assumption for stable geothermal well flow and also happens to be “conservative” in the sense of calculating an upper limit to the degree of boiling that can occur.

For liquid water at 308° F (as measured down-hole in 55-7) enthalpy  $h(\text{liq})=278.1$  BTU/lbm

For atmospheric flash at 4,100 ft mean sea level (i.e., at atmospheric pressure= 13.5 psi)  $h(\text{liq})=175.9$  BTU/lbm,  $h(\text{vap})=1149$  BTU/lbm and  $T(\text{sat})=208$ ° F.

For a boiling fraction (flash) of X, the conservation equation is:

$$H(\text{liq}@308^\circ\text{F}) = Xh(\text{vap}@208^\circ\text{F}) + (1-X)h(\text{liq}@208^\circ\text{F})$$

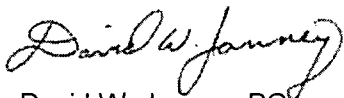
Solving for X, we have  $X = (278.1-175.9)/(1149-175.9) = 102.2/973.1 = 0.110 = 11\%$

This calculation assumes that no heat is lost to the wellbore, maximizing the energy of the flashing liquid, and that the flash occurs instantaneously to atmospheric pressure. The flash fraction will be reduced by heat transfer from the water to the wellbore and formation during production and by flashing at a higher-than-atmospheric pressure in a submerged flow line.

The responses presented above are expected to answer your questions. If there are additional questions, perhaps a phone conversation could be utilized to provide a faster response. We could then follow the conversation up by providing additional written information. LDG will not start the operations described in the SN until the BLM approves the SNs.

Thank you very much for your assistance in the development of this important energy project. Should you have questions regarding the responses, please do not hesitate to contact me by email at [david.janney@amec.com](mailto:david.janney@amec.com) or by phone at (505) 821-1801.

Respectfully submitted,



David W. Janney, PG  
Agent for Lightning Dock Geothermal HI-01, LLC

**Cc:** Michael Smith – BLM LCDO  
Carl Chavez – NMOCD  
Charles Jackson – NMOSE  
Michael Hayter – LDG  
Michelle Henrie – Attorney for LDG

#### **ATTACHMENTS**

Attachment 1 – Migratory Bird Protection on Reserve Drilling Pits for Lightning Dock Geothermal HI-01, LLC, Hidalgo County, New Mexico  
Attachment 2 – Rain for Rent Pump Specifications



# Cyrq

**Lightning Dock**  
geothermal

## **Migratory Bird Protection on Reserve Drilling Pits for Lightning Dock Geothermal HI-01, LLC, Hidalgo County, New Mexico**

Cyrq wishes to avoid any harm to migratory birds and is therefore proposing to utilize the same methods of bird deterrence that were implemented in the past on the centralized collection pond adjacent to well TFD 55-7. These methods were developed following a conversation between Cyrq and BLM biologist Jack Barnitz. These methods will be utilized while drilling or while water or drilling mud above 100° F is present in the reserve drilling pit. The methods of deterrence will include the following:

- Continuous human presence with vigilant deterrence while drilling;
- Gas operated scare cannon;
- Bird repellent ribbon; and
- Habitat modification as necessary.

Human presence is the most effective way of deterring birds and other animals from utilizing a specific area. Cyrq proposes to patrol the perimeter of the pond on a 24-hour basis. The patrolling individual will employ the use of a shotgun loaded with blank ammunition. If birds are observed in the immediate area of the pond, the observer will discharge the shotgun. The human presence and the “bang” of the shotgun will each act as a deterrent and help prevent habituation by causing positive reinforcement to the other methods of deterrence. At night, the patrolling individual will carry a highly luminescent spotlight and will flash this light across the pond to reflect from the Mylar ribbon which will act as a deterrent to migrating birds that fly at night and seek a resting area.

To reinforce the effect of the human presence Cyrq will also utilize an L.P. gas operated portable scare cannon. Scare cannons produce “bangs” by igniting propane in a metal tube. They can be set to operate at various time intervals and produce a noise equivalent to that of a small military cannon and somewhat louder than a twelve gauge shotgun. The sudden loud bang of the cannon is capable of scaring birds away from the area. However, without reinforcement the birds may soon habituate to the noise. The human patrol will provide the necessary reinforcement. Gas cannons can be effective if the frequency of the explosions is varied and the cannon is moved every second or third day. Cyrq proposes to deploy one cannon set to fire at variable short and prolonged intervals. The cannon will be relocated around the reserve pit every two to three days. An onsite observer will adjust the location and interval in order to produce the desired results.

Mylar bird repellent ribbon can also be an effective deterrent. Repellent ribbon is holographic Mylar tape that creates an optical, audible and physical discomfort zone for birds. When deployed in the area of treatment, a breeze causes flashing reflective images and a metallic rattle. Reflecting tape has been used successfully to deter birds from grain fields. Cyrq proposes to place two perpendicular wires across the entire length and width of the holding pond. Three-foot lengths of repellent ribbon will be attached to the wires at irregular intervals in order to provide coverage over the entire pond. This distribution of ribbon should be sufficient to catch sunlight and wind to allow maximum effectiveness of the ribbon. The tape will be deployed

just prior to the discharge of water into the pit. Cyrq proposes to install a system to retract the ribbons when not needed, to avoid habituation and to facilitate maintenance.

Habitat modification is practiced at many airports and airbases around the world. In addition to all the above-described methods of deterrence, Cyrq proposes to trim back any existing salt cedar/tamarisk that is currently within about 30 feet of the proposed pits. Cyrq believes this will reduce perching opportunities for birds that may reside or migrate across the vicinity of the pond. Reduction of vegetation has proven successful in discouraging bird use of a particular area.

Well drilling is done using a closed loop system. The reserve pit is primarily used to collect cuttings, but water will accumulate on the top due to normal use and drilling. It may be necessary to dump mud into the pit for several different reasons such as: mud property adjustments, well is producing during drilling, or to spot a mud pill. The reserve pit is also used to collect fluids during completions, rig testing, and flow-back. Cyrq does not expect to see mud temperatures above 150° Fahrenheit (F) in the pits and on average, the temperature of mud or pit fluid will be less than 100° F. The average body temperature of avian species is approximately 105° F and exposure to high water temperature will cause severe burns and death. Cyrq will keep a log of water temperature and provide that record to any overseeing agency that wishes a copy. When the surface cools to 100° deterrence activities will cease. Water temperature of the pond will be taken at the surface and various depths while the pond contains water. Any noted avian mortality will be recorded and provided to the BLM as well as other responsible Agencies requesting this information.

Bentonite based drilling mud has been in use for many years and has not been proven to be hazardous to birds through dermal contact or incidental ingestion. In many areas, avian geophagy is well documented and is a benefit to the birds. Drilling mud will be a clay-based bentonite mud with powdered bentonite added as needed to maintain adequate viscosity for good hole cleaning and adding bentonite/sawdust pills and Polyvis (PHPA) to sweep hole as needed. Mud may also be thinned with Desco CF as needed. Additives such as PAC may also be used for fluid loss control, and TORKease/Walnut may be used to reduce torque and drag and pH will be maintained between 9.0 and 9.5 with Soda Ash. A complete list of the potential mud components is presented below and the Material Safety Data Sheets for the mud components are included in Attachment B of the Drilling Handbook.

Estimated Product Usage for the LDG 42-18, LDG 53-7 and LDG 63-7 wells

<b>Product/Additive</b>	<b>Unit Size</b>	<b>Estimated Units/Well</b>
Bentonite/Gel	100#	500
Soda Ash	50#	30
Sawdust	2.5 cu ft	180
PrimaSeal	40#	25
Polyvis	5 gal	45
XCD	25#	60
PAC Polymer	50#	15
TORKease	5 gal	36
Walnut	50#	30
Desco CF	25#	10
Sodium Bicarbonate	50#	7
Mix 2/Micro C	25#	20
Calcium Carbonate	50#	20

These product usages are estimates only for the base drilling fluids additives to be used for one of the proposed wells. Actual usages will be determined by the need to control specific mud properties, to promote stable hole conditions, the type and severity of any encountered lost circulation, and the actual drilling time.

Although no single system of deterrence is always completely successful in discouraging bird use of a particular area, based on previous experience, Cyrq is confident that the combination of methods described above will prove successful in preventing most birds from attempting to utilize the reserve pits.



## Model DV-200c

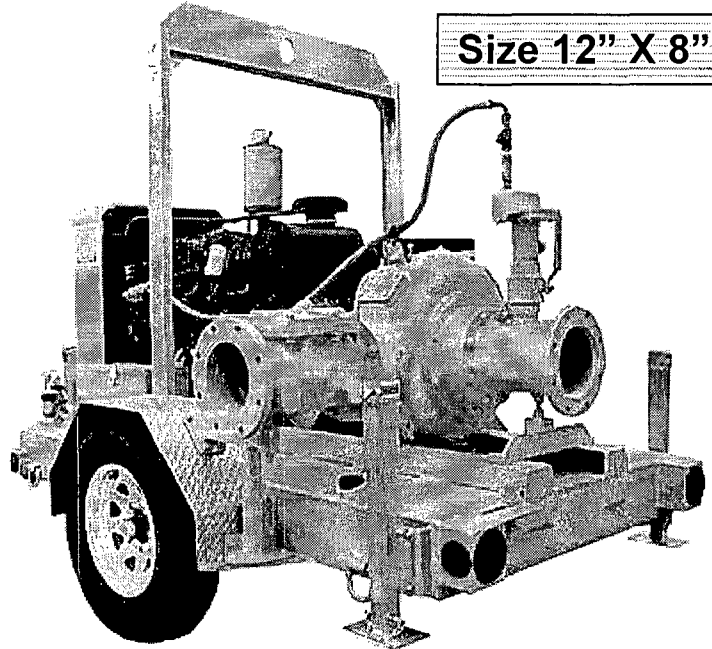
**Size 12" X 8"**

### Standard Features

- Hot Dip Galvanized Trailers and Skids
  - Radiator Enclosure
  - Battery Box
  - Wheels
- Zinc Plated Jacks
- Emissions Certified Engines
  - Perkins and John Deere
- DOT LED lights
- Electric Brakes with Safety breakaway
- Locking Battery Box

### Pump Features

- Solids-handling capabilities to 3.375" diameter maximum
- Continuous self-priming
- Runs dry unattended
- Suction lift up to 28 ft.
- Skid- or trailer-mounted
- Auto-start-capable control panel

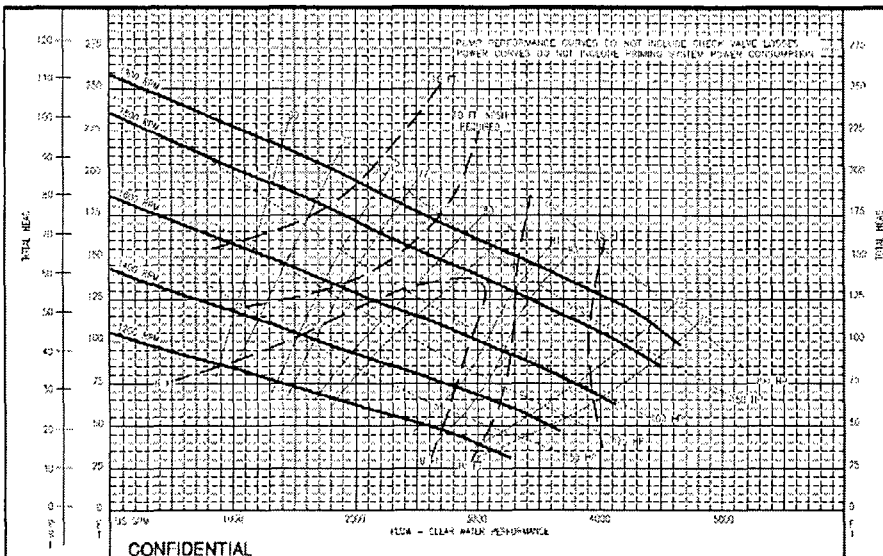


### Technical

- SAE-mounted
- 12 volt, electric start with control panel
- Skid- or trailer-mounted with optional lifting bale
- 24-hour minimum capacity fuel tank
- Compressor/Venturi automatic priming system
- Electric drive option available
- Sound attenuated option available

### Material Specifications

- Standard Build – ASTM A48 CLASS 30 Gray Iron volute Enclosed 2 vane non-clog impeller and replaceable wear rings
- Pump Shaft  
LaSalle 1144 stress proof steel
- Mechanical Seal  
Tungsten carbide vs. silicon carbide mating faces  
Oil-bath lubrication for dry running
- Suction / discharge flanges ANSI 150# FF



**Rain for Rent**  
 P.O. Box 2248  
 Bakersfield CA 93303  
 800-742-7246  
 661-393-1542  
 FAX 661-393-1542  
 www.rainforrent.com  
 info@rainforrent.com

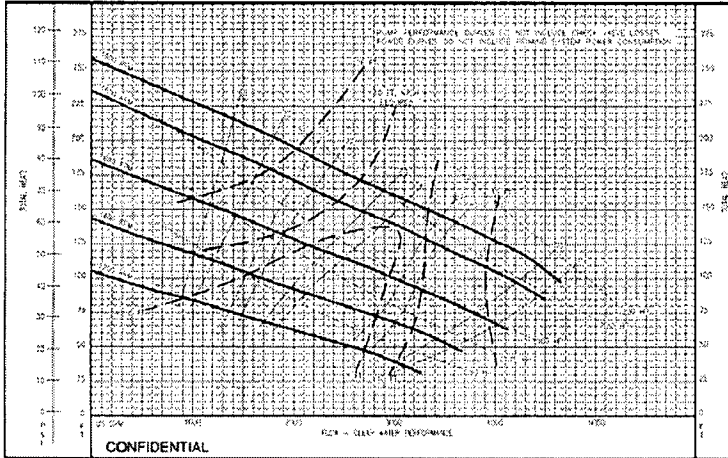
Rain for Rent is a registered trademark of Western Oilfields Supply Company. Features and Specifications are subject to change without notice.





## DV-200c Technical Specifications

### Production Curve



### Performance Specs

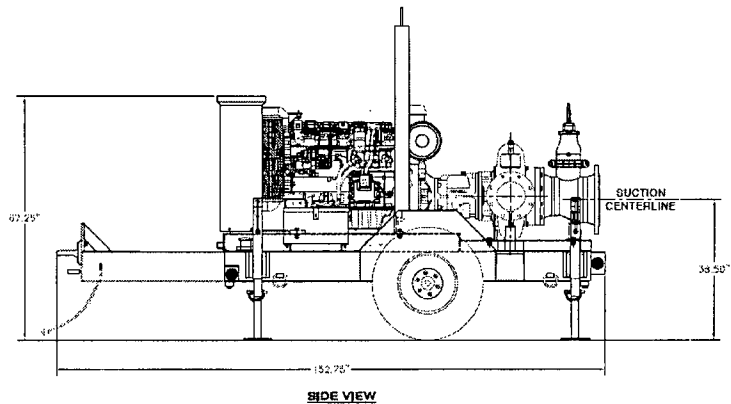
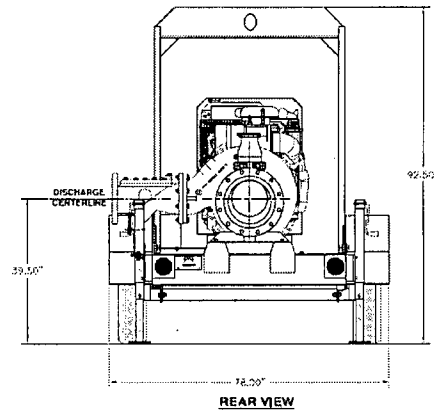
#### 2 VANE NON-CLOG IMPELLER

Minimum Operating Speed:	1400 RPM
Maximum Operating Speed:	1900 RPM
Maximum Head:	260 FT
Maximum Flow:	4600 GPM
Fuel Consumption:	Perkins 1106D-E60TA
	(4000 GPM @ 125' TDH) 8.5 GPH @ 1900 RPM

### Design Details

<b>Pump Designation:</b>	DV-200C
<b>Pump Description:</b>	Centrifugal end suction pump, single stage, volute type, 2 vane non-clog impeller
<b>Solid Handling Size:</b>	Up to 3.375 inches (45mm)
<b>Operating Temperature</b>	MIN: -4°F (-20°C) - MAX: +212°F (+100°C)

### Dimensions



Rain for Rent  
 P.O. Box 2248  
 Bakersfield CA 93303  
 800-742-7246  
 661-399-9124  
 FAX 661-393-1542  
 www.rainforrent.com  
 info@rainforrent.com

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# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3200 (L0310)

JUN 29 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7005 1820 0003 3590 8658

AMEC Environment and Infrastructure, Inc.  
c/o Mr. Jeff Cotter  
8519 Jefferson NE  
Albuquerque, NM 87113

Dear Mr. Cotter:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has reviewed your recently (June 15, 2012) submitted sundry notices for the Geothermal Drilling Permit (GDP) associated with wells 45-7 and 55-7 located in:

T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM  
sec. 7, SE¼.

Our review has determined that additional information is needed to finish processing these sundry notices. At your earliest convenience, please submit the following information. Review of these sundry notices will be suspended until the additional information is received (43 CFR 3261.20(f)).

1. Specify the bird protection measures mentioned in section 15 (Proposed Operations).
2. The operating plans for the 45-7 and the 55-7 wells did not specify "other bird deterrents" for use in the centralized pond when water is above 100°F. Please elaborate on the proposed protection measures.
3. Specify the pump and equipment that will be used to re-inject formation fluid into the 45-7 well. Also specify whether portable surge tanks will be necessary between the centralized pond and the 45-7 well.
4. Estimated loss from flash evaporation is approximately 2.1 million gallons; specify where the flash evaporation will occur (i.e., will a flash chamber/tank be placed between the 55-7 well and the reserve pit, or will flash loss occur at the outlet of the 8 – 12-inch pipe)

2012 JUL -2 P 12:55  
RECEIVED OGD

5. Describe the purpose and goals of the proposed test (i.e., what well properties, aquifer parameters, etc., are being measured).
6. Describe, using the best available geologic information, the final disposition of the re-injected formation fluid. Specify the depth, geologic structure, and ground water flow direction in the inferred re-injection zone.
7. Provide calculations and specify assumptions used to estimate flash loss, evaporation loss and injection rate for the 45-7 well.

We request that you submit the required information within 60 days of your receipt of this letter. Otherwise, the LCDO will close the case file on these sundry notices without further notification to AMEC Inc., or Cyrq Energy. Please remember that you cannot start the described operations until the LCDO approves the sundry notice (43 CFR 3261.22).

If you have any questions, please contact Michael Smith at (575) 525-4421.

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Ben Barker



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OCS

2012 MAY 29 A-10-53

In Reply Refer To:

NMNM 034790  
3260 (L0310)

MAY 23 2012

CERTIFIED--RETURN RECEIPT REQUESTED

7006 0100 0004 5388 8196

### DECISION

Lightning Dock Geothermal H1-01 LLC :  
c/o Mr. Ben Barker :  
136 S. Main Street, Suite 600 :  
Salt Lake City, UT 84101 :

Lease: NMNM 034790

#### Geothermal Drilling Permit Approved: Well 63-7

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your Geothermal Drilling Permit (GDP) and accompanying Drilling Plan and Operations Plan for the proposed well 63-07 on the subject Federal geothermal lease. This permit is approved subject to the standards defined in 43 CFR §3260.11 and the enclosed Conditions of Approval (COA) developed for your proposal (43 CFR §3260.12). This project is currently bonded with the BLM (Bond Number NMB000512).

If you contend that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the

appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

4 Enclosures:

- 1 - 43 CFR §3260.11
- 2 - Conditions of Approval
- 3 - Form 1842-1
- 4 - Form 3260-4

cc:

- ✓ Mr. Carl Chavez
- Mr. Randy Dade
- Mr. Charles Jackson
- Mr. David Janney



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3200 (L0310)

RECEIVED OCD

2012 MAY 17 A 10:36

MAY 15 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0004 5388 8141

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 S. Main Street  
Suite 600  
Salt Lake City, UT 84101

Dear Mr. Barker:

On February 6, 2012, Cyrq Energy, Inc., received an Incident of Noncompliance (INC) (Certified Receipt 7006 0810 0003 4674 1119) related to unapproved alterations of the permitted well 47-07. This INC clearly described appeal procedures and included the required Form 1842-1 (Information on Taking Appeals to the Interior Board of Land Appeals). As Cyrq Energy, Inc., did not file an appeal within the regulatory 30-day period, they have waived their rights to administrative appeal of the subject INC.

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is taking this opportunity to inform Cyrq Energy, Inc., that the well 47-07 remains non-compliant with the approved geothermal drilling permit (GDP). The LCDO cannot rescind the current INC until the well 47-07 is either reconstructed to conform to the approved GDP, or plugged and abandoned in accordance with applicable State of New Mexico standards.

Should Cyrq Energy, Inc., submit a new sundry notice for the 47-07 well, the LCDO will, if necessary, require additional well testing to verify that this well can be operated safely and without waste of geothermal resources (43 CFR 3262.14). Such testing could include a mechanical integrity test. Please be aware that the BLM may order the abandonment of a well which is determined to be mechanically unsound or unnecessary for lease operations (43 CFR 3263.14).

In the recent past (January, 2012) Cyrq Energy, Inc., has requested certification from the LCDO that Geothermal Lease NMNM 34790 is in good standing. Please be aware that the LCDO cannot issue such certifications as long as the well 47-07 remains non-compliant. Under these

circumstances, future requests for certification that Lease NMNM 34790 is in good standing will be dismissed by the LCDO without notification to Cyrq Energy, Inc.

You are reminded that the INC received on February 6, 2012, is the second INC recorded against Cyrq Energy in approximately 5 months; the previous INC (Certified Receipt 7004 1350 0002 8394 3234) having been received on October 7, 2011. Federal regulations at 43 CFR 3200.4 require all geothermal lessees and operators to comply with applicable laws, regulations, operational orders, lease terms and conditions, conditions of approval and other instructions from the BLM. The BLM can also initiate proceedings to cancel a geothermal lease for violating the requirements of 43 CFR 3200.4 (43 CFR 3213.17). Future decisions by Cyrq Energy, Inc., to execute unauthorized changes to approved geothermal drilling permits, or otherwise conduct unauthorized operations, may result in the cancellation of Lease NMNM 34790.

You are encouraged to communicate with BLM staff who will try to help you remain in compliance with your approved GDPs and applicable laws, regulations and orders. Please direct any questions to Michael Smith at (575) 525-4421.

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:

Mr. Frank Lupo  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson

## Chavez, Carl J, EMNRD

---

**From:** Smith, Michael A <michaelsmith@blm.gov>  
**Sent:** Friday, May 04, 2012 12:48 PM  
**To:** Jackson, Charles L., OSE; Chavez, Carl J, EMNRD; Dade, Randy, EMNRD; Phillips, Haddy L., OSE  
**Subject:** Update RE: Federal GDP for Cyrq Energy's 63-7 well

BLM's evaluation of the subject permit is complete except for the Wildlife analysis. Our wildlife staff will not be able to review the permit until May 17, 2012, so that's the soonest it will be approved by BLM. I have informed Dave Janney of the situation.

BLM will be requiring the following modifications to the well casing:

- The first string of casing (20") will extend to 150' below surface. Prior to drilling below the 20" casing, an annular preventer or rotating head shall be installed and tested to 50 psig.
- The second string of casing (13 3/8") will be set at least 50' feet into the tuff (at 1500-1600' depth).

Copies of the complete conditions of approval will be sent to both OCD and OSE once this GDP is approved. Let me know if you have any questions.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)





# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3200 (L0310)

APR 26 2012

CERTIFIED--RETURN RECEIPT REQUESTED

7006 0100 0004 5388 7892

Cyrq Energy, Inc.  
c/o Mr. Michael Hayter  
136 S. Main Street  
Suite 600  
Salt Lake City, UT 84101

2012 APR 30 P 12:50  
RECEIVED 005

The Bureau of Land Management, Las Cruces District Office (LCDO) is writing to request direction regarding the release of information marked "confidential" or "proprietary" to relevant State agencies.

Unique among LCDO applicants, Cyrq Energy has been marking every page of recently submitted Geothermal Drilling Permits (GDP's) as "confidential". The LCDO, on the advice of the Federal Solicitor's Office, is therefore requesting written instruction regarding the release of pending and/or approved GDP's marked "confidential" and/or "proprietary" to the New Mexico Oil Conservation Division (OCD) and the Office of the State Engineer (OSE). In your response, please provide instruction on the release of other Federal applications (Notices of Intent, Sundry Notices, Commercial Use Permits, etc.) your company believes to be "confidential" and/or "proprietary".

Until we receive written authorization for release from Cyrq Energy, the LCDO will continue to treat these documents as confidential within the requirements of 43 CFR 3266.10. Please direct any questions to Michael Smith at (575) 525-4421 or [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov).

Sincerely,

David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3200 (L0310)

APR 25 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0004 5388 7885

AMEC Environment and Infrastructure  
c/o Mr. David Janney  
8519 Jefferson, NE  
Albuquerque, NM 87113

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the three geothermal drilling permits (GDP's) received by this office on April 11, 2012. This review has determined that additional information is needed to meet applicable regulatory requirements (43 CFR 3261.11) and to evaluate the possible effects of the proposed action (43 CFR 3261.12(i) and 43 CFR 3262.13(b)(14)). At your earliest possible convenience, please send the following information for each of the three GDP applications submitted (proposed Wells 42-18, 54-12 and 63-07):

1. The GDP's for Wells 54-12 and 63-07 specifies injection wells, while the drilling program specifies exploration wells. Define the type of well in the drilling program to match the designation in the GDP.
2. Submit a complete operations plan meeting all of the requirements of 43 CFR 3261.12(a) for all three wells.
3. Submit plats certified by a licensed surveyor showing the surveyed well surface location and distances from the nearest section or tract lines for all three wells (43 CFR 3261.12(a)).
4. Provide additional detail regarding drilling mud composition (gel-polymer content, bentonite content, and any additives) and Material Safety Data Sheets for drilling mud components (43 CFR 3261.13(b)(14)).
5. Provide a description of the logs that you will run (43 CFR 3261.13(b)(6)).

2012 APR 30 P 1:09  
RECEIVED OGD

2012 APR 30 P 1:00  
RECEIVED OGD

6. Specify the expected depth and thickness of fresh water zones, anticipated reservoir temperature and pressure, and the anticipated temperature gradient in the area (43 CFR 3261.13(b)(8, 10, 11).
7. For the proposed flow and injection tests, provide complete flow diagrams showing the movement of water between tanks, reserve pits, wells and proposed discharge/injection points. Specify if formation fluids will be stored in any open pits, tanks or reservoirs, and show location of pumps and flash separators (43 CFR 3261.13(b)(14)).
8. Specify mitigations to prevent wildlife and migratory birds from entering reserve pits until pit reclamation is completed. Otherwise, provide data demonstrating that drilling fluids and reservoir fluids will not present a physical or chemical hazard to wildlife and migratory birds (43 CFR 3261.13(b)(14)).

The BLM is taking this opportunity to point out that Class "G" cement with 40 percent silica flour is specified in all three drilling plans, and the BLM will not consider changes to cement formulation after the GDP's are approved.

Please direct any questions to Michael Smith at (575) 525-4421 or at [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov) (note new e-mail address).

Sincerely,



David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:

Mr. Ben Barker  
✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson

## Chavez, Carl J, EMNRD

---

**From:** Smith, Michael A [michaelsmith@blm.gov]  
**Sent:** Thursday, April 26, 2012 9:13 AM  
**To:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD; Jackson, Charles L., OSE; Phillips, Haddy L., OSE  
**Subject:** Update on Cyrq Energy's 3 permits for injection wells  
**Attachments:** Review\_42-18\_54-12\_63-07.pdf

I finished my review of the three pending injection wells at the Lightning Dock Geothermal site, and sent (e-mail & certified mail) the attached letter to David Janney and Ben Barker. They primarily need to provide BLM additional information required under the Federal regulations.

BLM's Petroleum Engineer (Rich Estabrook) has reviewed the casing program and we will be requiring changes to the casing design. We will require the second string of casing (13.375" diameter) to be set at least 50' feet into the tuff around 1500-1600' and will require a full BOP (annular plus double rams). The 20" string will also be lengthened and fitted with an annular preventer to reduce the risk of blow-out in the event of circulation loss in the shallow geothermal reservoir. Capuano Engineering & AMEC are aware of this, but I don't know if they told Cyrq. Capuano Engineering agreed to provide BLM with a fracture gradient so we can estimate an appropriate depth to set the 20" string.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)

Initials/Date SURNAME 4/25/2012  
Initials/Date [Signature] 4/25/2012  
Initials/Date 4-25-2012 JS  
Initials/Date [Signature] 4/25/12  
Initials/Date \_\_\_\_\_

NMNM034790  
3200 (L0310)

APR 25 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0100 0004 5388 7885

AMEC Environment and Infrastructure  
c/o Mr. David Janney  
8519 Jefferson, NE  
Albuquerque, NM 87113

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the three geothermal drilling permits (GDP's) received by this office on April 11, 2012. This review has determined that additional information is needed to meet applicable regulatory requirements (43 CFR 3261.11) and to evaluate the possible effects of the proposed action (43 CFR 3261.12(i) and 43 CFR 3262.13(b)(14)). At your earliest possible convenience, please send the following information for each of the three GDP applications submitted (proposed Wells 42-18, 54-12 and 63-07):

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4. Provide additional detail regarding drilling mud composition (gel-polymer content, bentonite content, and any additives) and Material Safety Data Sheets for drilling mud components (43 CFR 3261.13(b)(14)).
5. Provide a description of the logs that you will run (43 CFR 3261.13(b)(6)).

6. Specify the expected depth and thickness of fresh water zones, anticipated reservoir temperature and pressure, and the anticipated temperature gradient in the area (43 CFR 3261.13(b)(8, 10, 11).
7. For the proposed flow and injection tests, provide complete flow diagrams showing the movement of water between tanks, reserve pits, wells and proposed discharge/injection points. Specify if formation fluids will be stored in any open pits, tanks or reservoirs, and show location of pumps and flash separators (43 CFR 3261.13(b)(14)).
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The BLM is taking this opportunity to point out that Class "G" cement with 40 percent silica flour is specified in all three drilling plans, and the BLM will not consider changes to cement formulation after the GDP's are approved.

Please direct any questions to Michael Smith at (575) 525-4421 or at [michaelsmith@blm.gov](mailto:michaelsmith@blm.gov) (note new e-mail address).

Sincerely,

D L WALLACE  
D L WALLACE

David L. Wallace  
Assistant District Manager  
Division of Multi-Resources

cc:  
See attached list

cc:

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 S. Main Street  
Suite 600  
Salt Lake City, UT 84101

Mr. Carl Chavez  
New Mexico Energy, Minerals  
and Natural Resources Department  
Oil Conservation Division  
1220 S. Saint Francis Drive  
Santa Fe, NM 87505

Mr. Randy Dade  
New Mexico Energy, Minerals  
and Natural Resources Department  
Oil Conservation Division District 2  
1301 W. Grand Avenue  
Artesia, NM 88210

Mr. Charles Jackson  
Office of the State Engineer – District 3  
P.O. Box 844  
Deming, NM 88031

L0310:MSmith:cp:4/25/2012:x4375:AMEC.GDPReview.AdditionalInfoReq



United States Department of the Interior



BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OCD

2012 MAR 19 A 10:38

In Reply Refer To:

NMNM 034790  
3260 (L0310)

MAR 16 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7004 1350 0002 8394 3456

DECISION

Lightning Dock Geothermal H1-01 LLC :  
c/o Mr. Ben Barker : NMNM 034790  
136 South Main Street :  
Suite 600 :  
Salt Lake City, UT 84101-1684 :

Sundry Notice Approved

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your fourth sundry notice, received March 2, 2012, for the Geothermal Drilling Permit (GDP) for the well 45-7 (approved October 1, 2008). This sundry is approved subject to the general standards defined in 43 CFR §3260.11.

Bill Childress  
District Manager

1 Enclosure:  
1 - Approved Sundry

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade

2012 MAR 16 10:38 AM  
3260 (L0310)  
034790



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: December 31, 2013

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
Shut-in

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator  
136 S. Main Street, Ste. 600 Salt Lake City, UT 84101

4. Location of Well or Facility  
2360 feet from the South line and 2278 feet from the West line

5. Type of Work
- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Change Plans                         | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input type="checkbox"/> Abandon              |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input checked="" type="checkbox"/> Other     |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

Move on location and rig-up pump pull rig  
Pull Pump for reconditioning  
Rig-down and move off pump pull rig  
Move on and rig-up drilling rig  
Clean out well  
Rig-up geophysical loggers and log well  
Rig-down loggers  
Run slotted liner  
Close master valve, rig-down and move off location

Please see the attached LDG 45-7 Cleanout & Completion Program by Capuano Engineering Consultants for the details of this program.

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2012 MAR -2 PM 1:45  
LAS CRUCES NMA 6800

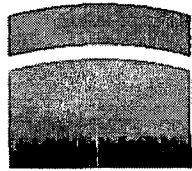
16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed David W. Janner, P.G. Title Agent for Lightning Dock Geothermal HI-01, LLC Date Feb 29, 2012

(This space for Federal use)  
Approved by Bill Abel Title District Manager Date 3/9/2012  
Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.



**Cyrq**

---

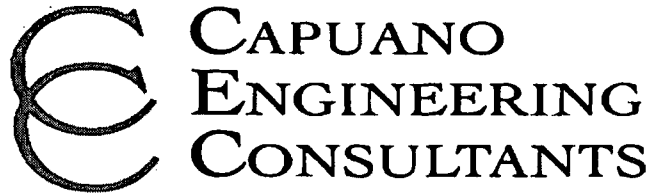
**Lightning Dock**  
geothermal

**LDG 45-7**  
**Cleanout &**  
**Completion Program**

**Designed and Prepared By:**

**E** CAPUANO  
ENGINEERING  
CONSULTANTS

Cyrq – Lightning Dock Geothermal  
 Pump Removal and Cleanout Program  
 45-7



3883 Airway Drive  
 Suite 210  
 Santa Rosa, CA 95403  
 TELEPHONE: (707) 575-8740

<b>Drilling Program</b>	
Operating Company	Lightning Dock Geothermal HI-01, LLC
Field	Lightning Dock
Well	45-7
Location	Hidalgo County, NM
Well Type	Production Well
Drilling Engineer	Louis Capuano III
Date of Issue	February 29, 2012

		<b>Signature</b>	<b>Date</b>
Prepared	Louis Capuano III		
	Drilling Engineer	Capuano Engineering Consultants	
Accepted	Michael Hayter		
	Project Management	Cyrq Energy	

**Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7**

**Table of Contents**

**Section:**

- A. General Well Information**
- B. Pump Removal Program**
- C. Cleanout and Liner Program**
- D. BOP Wellhead Diagram**

Cyrq – Lightning Dock Geothermal  
 Pump Removal and Cleanout Program  
 45-7

**Section A: General Well Information**

Well Information Table	
Lightning Dock Geothermal HI-01, LLC	45-7
Location	Section: 7, Township: 25S, Range: 19W County: Hidalgo County State: NM
Elevation	GL: 4202' KB: 13'
Final Total Depth	2900' MD
Surface UTM Coordinates	32° 8'39.89" N, 108°50'16.15" W
Bottom Hole Target	64.4'S and 1.9' E of surface location
Target Zone:	Volcanic Tuff

Section	Maximum Depth of Section		Casing
	OH	MD	
36"	48'	48'	30", 139 ppf, J-55 Welded Line Pipe
26"	411'	411'	20", 94 ppf, J-55, BTC Casing
17-1/2"	1680'	1679'	13-3/8", 54.5 ppf, K-55, BTC Casing
12-1/4"	2900'	2899'	9-5/8", 36 ppf, K-55, BTC Slotted Liner w/ TOL at 1600'

Wellhead Information	
Flange Size	Pressure Test (psi)
13-3/8" SOW x ANSI 12", 400 Series	1000

**Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7**

**Overview:**

LDG 45-7 is a pumped production well. The well was drilled from Dec 2010 to Feb 2011. However, the completion was delayed by logging and wellbore problems. The object of this operation is to complete the original plan for the well. The bottom hole section from 1680' to TD at 2900' is open hole completion. There is a 12" line shaft pump installed in the wellbore to 960'. The pump has three different strings of pipe that are (starting with the inner most shaft) the drive shaft, the lubricator string and the pump casing. This workover operation will begin with the removal of the line shaft pump. Once the pump is removed a BOP stack including a master valve will be placed on the wellhead. The BOP will be tested before proceeding into the wellbore. The well will then be cleaned out to a total depth of 2900'. Once clean out has occurred the well will be logged for fracture identification. After logging the rig will complete the well with a slotted 9-5/8" liner. The liner will be set on bottom with a liner adapter on top.

**Safety, Hazards and Special Considerations:**

**Section B: Pump Removal Program**

During the removal of the pump cool water must be flowed down the backside of the wellbore in order to keep the well killed. If no water is kept flowing down the annular space, the well will become active and want to flow.

It is essential to handle the pump motor, bearings, seals and bells with the up most care. These pieces of equipment are very fragile and can be damaged easily.

The lubrication string will be filled with oil. This oil needs to be collected and contained. Standard clamps, rings, hoses and storage containers should be utilized to prevent contamination. Be aware when breaking the connection that the string will be full of oil.

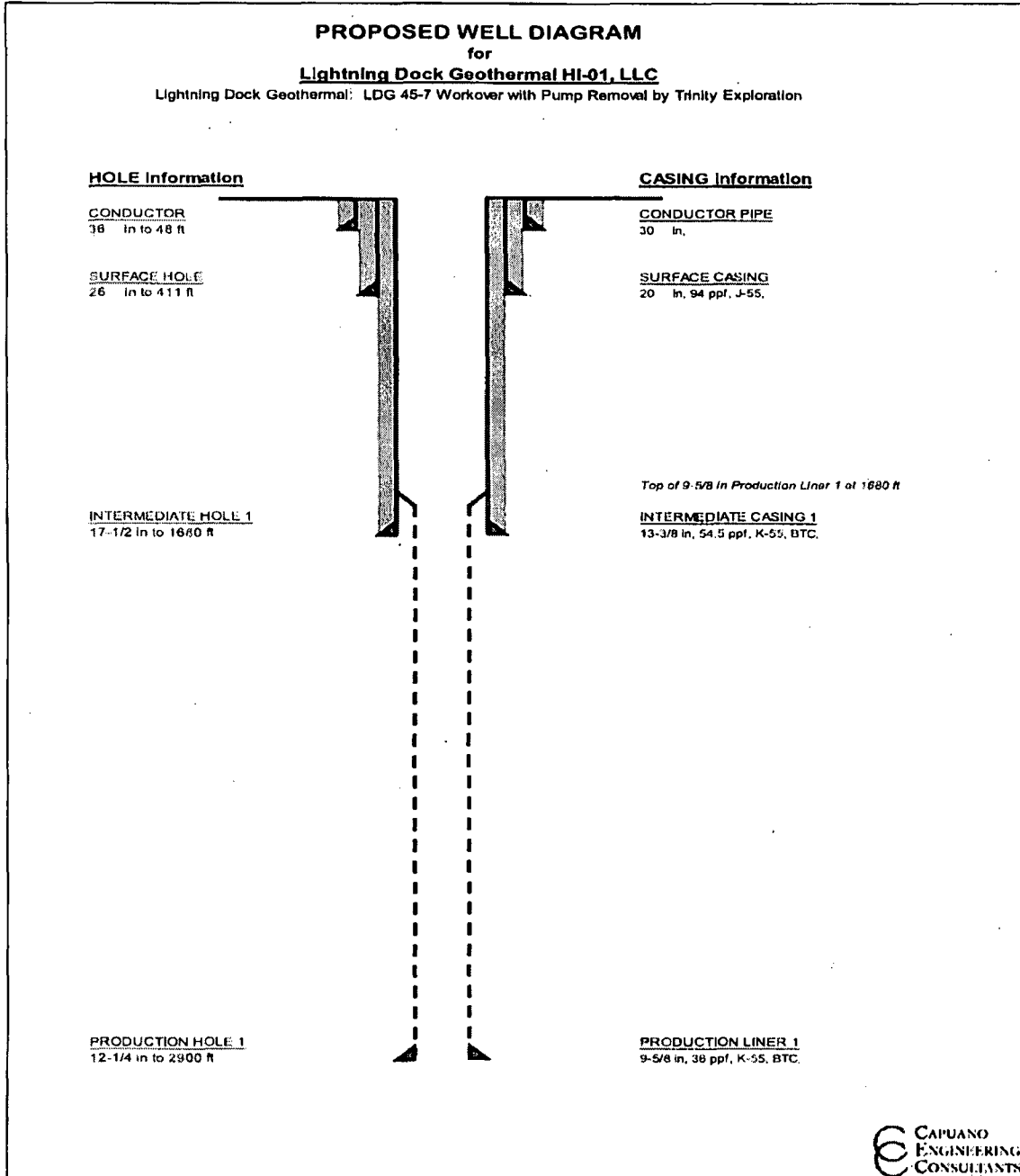
**Section C: Cleanout of 12-1/4" Hole and Placement of 9-5/8" Slotted Liner Program**

The original 12-1/4" hole section was not completed with any type of slotted or perforated casing. The potential of a bridge to exist in the wellbore is very high and as the well is flowed more often the potential of future bridges grows every day. So a clean out run to bottom is needed to ensure that the hole is in gage and the wellbore is clean.

The rig will encounter lost circulation and should expect to handle the problem with aerated water. At no time will mud be used during the clean out of the hole. Mud will plug the producing formation and could permanently damage the well. Aerated water should be used as the drilling fluid.

**Cyrq – Lightning Dock Geothermal  
 Pump Removal and Cleanout Program  
 45-7**

**Wellbore Schematic**



Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7

**Section B: Pump Removal Program**

**12-1/4" Hole Section to 4000' MD / 3406' TVD (9-5/8" Slotted Liner):**

**Safety / Hazards Considerations in This Section:**

During the removal of the pump cool water must be allowed to flow down the backside of the wellbore in order to keep the well killed. If no water is kept flowing down the annular space, the well will become active and want to flow.

It is essential to handle the pump motor, bearings, seals and bells with the up most care. These pieces of equipment are very fragile and can be damaged easily.

The lubrication string will be filled with oil. This oil needs to be collected and contained. Standard clamps, rings, hoses and storage containers should be utilized to prevent contamination. Be aware when breaking the connection that the string will be full of oil.

**Program:**

1. Rig up pump pulling unit on location and over the 45-7 pump head.
2. Remove pump motor and set aside.
  - 2.1. Secure shaft with dog collar.
3. Use power tongs to unscrew pump casing and shafts.
  - 3.1. Cut off strapped 1/4" tubing and try to save on spool.
  - 3.2. Keep drive shaft inside of lubrication string and lubrication string inside of the pump casing.
    - Keep all shafts within each other and stack joints.
  - 3.3. Continue to remove pump until Bells are at surface.
  - 3.4. Lay down bells and housing.
4. Rig down pump pulling unit.
5. Carefully stack and haul off pump equipment for refurbishing.
6. At all times continue to flow cool water down the wellbore.



Cyrq – Lightning Dock Geothermal  
 Pump Removal and Cleanout Program  
 45-7

**Section C: Cleanout of 12-1/4" Hole and Placement of 9-5/8" Slotted Liner**

**Safety / Hazards Considerations in This Section:**

The original 12-1/4" hole section was not completed with any type of slotted or perforated casing. The potential of a bridge to exist in the wellbore is very high and as the well is flowed more often the potential of future bridges grows every day. So a clean out run to bottom is needed to ensure that the hole is in gage and the wellbore is clean.

The rig will encounter lost circulation and should expect to handle the problem with aerated water. At no time will mud be used during the clean out of the hole. Mud will plug the producing formation and could permanently damage the well. Aerated water should be used as the drilling fluid.

Bit & Hydraulics Program		Mud Program	
Bit Type	12-1/4" Tri-cone	Mud Weight	8.3
Nozzles	3 x 26	Mud Type	Water
IADC Code	5-1-7 to 6-1-7	Funnel Vis	< 40
RPM	75 – 100 RPM	YP	< 20
Pump Rate	300 – 600 gpm	PH	7
Expected Formations	Tuff, Limestone and Sandstone	Filtrate	< 5
		Solids	< 2% by Volume
12-1/4" Cleanout BHA	12-1/4" Bit, 1 x 6-3/4" DC, 12-1/4" String Stabilizer, 6 x 6-3/4" DC, Jar, 2 x 6-3/4" DC, XO, 10 x 4" HWDP		

**Drilling:**

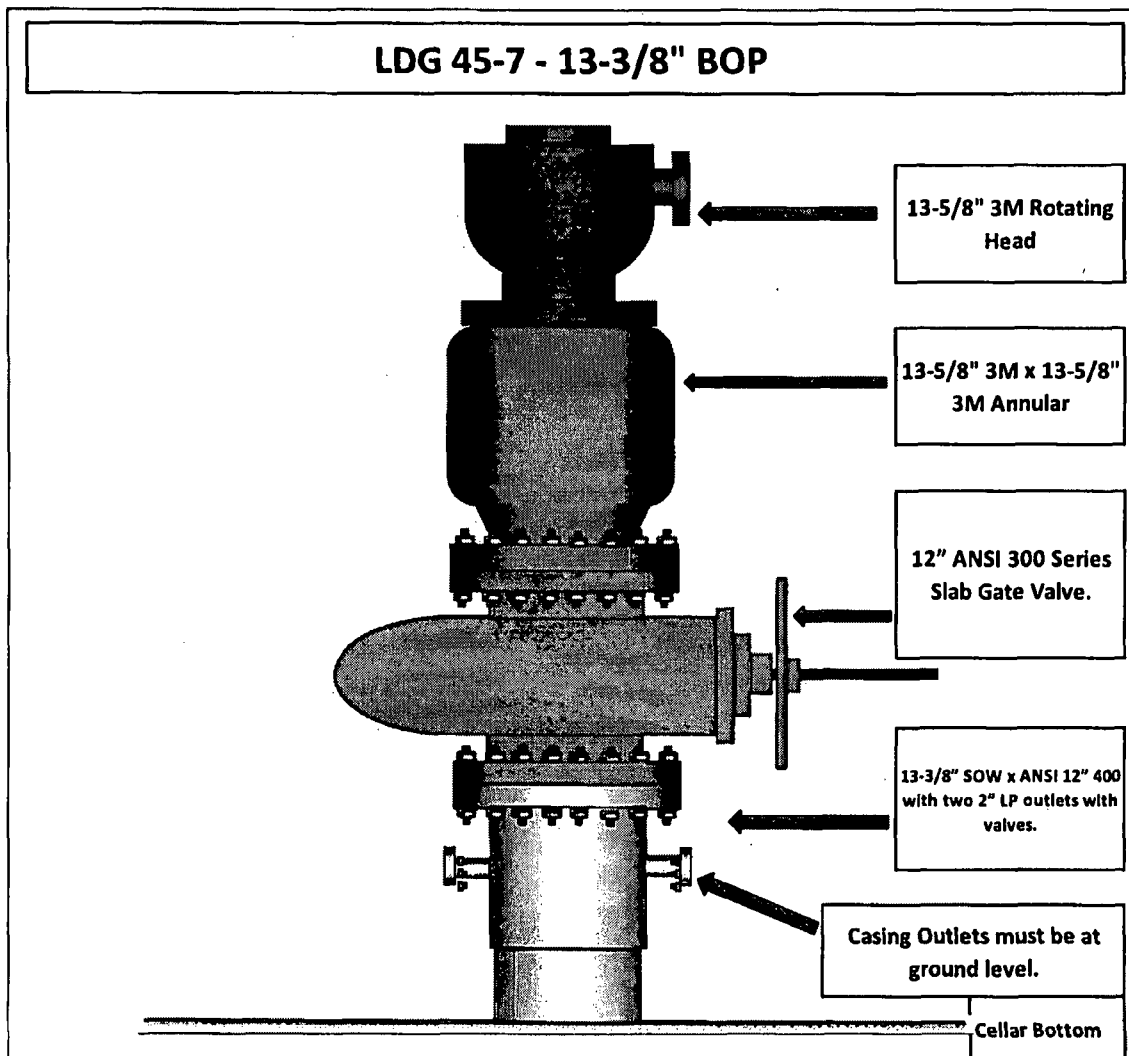
1. Rig up drilling rig over 45-7.
2. Nipple up BOP stack as follows:
  - 2.1. 12" 300 Series Master Valve.
  - 2.2. 12" 300 Series x 12" 900 Series Spool.
  - 2.3. 12" 900 Series Pipe Rams
  - 2.4. 12" 900 Series Flow Tee.
  - 2.5. 12" 900 Series Rotating Head
3. Function test BOPs.

**Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7**

4. Build Blooie Line and muffler system.
5. Hook up aerated drilling system.
6. Test Master Valve and Choke System.
7. Make up 12-1/4" Conventional BHA and run to the 1<sup>st</sup> joint of drill pipe.
8. Space out tool joint and test Pipe Rams and Casing.
9. Continue to RIH to the shoe of the 13-3/8" casing at 1680'.
10. Trip in to the well to 2900'.
  - 10.1. Cleanout and ream any tight sections or bridges that are encountered.
  - 10.2. Make all connections off bottom and never let the pipe sit on bottom without circulation and rotation.
  - 10.3. Continue to use clean water as a drilling fluid.
  - 10.4. Use aerated fluid for cuttings carrying capacity.
11. Once at 2900' pull out of the hole.
12. Rig up loggers and log the well.
  - 12.1. The loggers should be running a FMI log, Pressure/Temperature and possibly gamma or sonic.
13. Rig down loggers.
14. Trip back to bottom with assembly to ensure that the hole is still in gage.
15. Pull out of the hole.
16. Run approximately 1300' of 9-5/8", 36 ppf, K-55, BTC perforated liner on a 13-3/8" x 9-5/8" liner adapter.
  - 16.1. Plan liner for an 80' liner lap with blank casing.
    - The bottom 4 joints and the top 3 joints should be blank.
    - The rest of the liner is slotted.
  - 16.2. Adjust the amount of perforated liner based on the final TD.
  - 16.3. Equip liner with a drillable guide shoe.
  - 16.4. Weld the bottom four joints of casing.
  - 16.5. Run liner in the hole on 4" drill pipe.
  - 16.6. Tag bottom and pick up 3'.
  - 16.7. Set liner adapter, release running tool and pull out of the hole.
17. Close Master Valve and Rig Down.

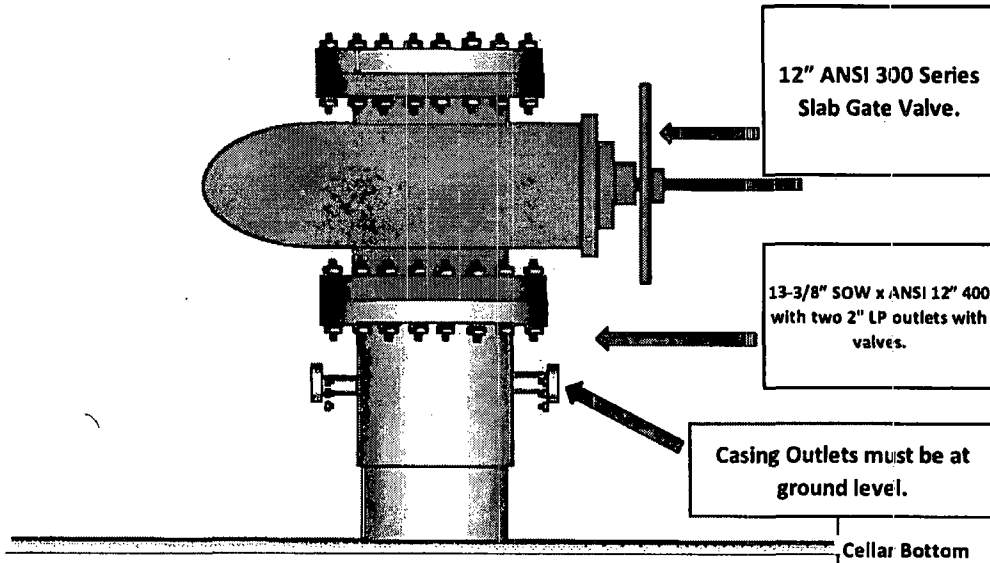
Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7

**Section D: BOP Wellhead Diagrams**



Cyrq – Lightning Dock Geothermal  
Pump Removal and Cleanout Program  
45-7

LDG - 45-7 -Final Wellhead





# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OCD

2012 FEB 27 A 11:31

In Reply Refer To:

NMNM 034790  
3200 (L0310)

FEB 23 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 1232

Cyrq Energy, Inc.  
c/o Mr. Michael Hayter  
136 S. Main Street  
Suite 600  
Salt Lake City, UT 84101

Dear Mr. Hayter:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has received your letter dated January 30, 2012. In this letter, you propose that Lightning Dock Geothermal H1-01 LLC (LDG) assume bonding liability (plugging and abandonment) for eight geothermal wells located on split-estate (Private Surface/Federal Minerals) in section 7, T. 25 S., R. 19 W. These wells are likely capable of geothermal production, but none have been permitted with the BLM.

The LCDO will require the following information before a final decision will be made regarding your proposal.

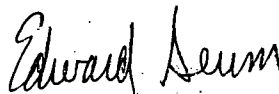
1. An estimate of the total bonding costs to plug and abandon (to New Mexico Office of State Engineer standards) these eight wells. Please provide this cost estimate with all documentation used to determine plugging and abandonment costs so LCDO staff can determine if the estimate is sufficient.
2. A plan to plug and abandon the remaining wells on site. LCDO records indicate a minimum of 22 wells (not including wells 45-7, 47-7, 53-7, and 55-7) are present in section 7, T. 25 S., R. 19 W., of which six are verified as plugged and abandoned. Therefore, the LCDO will require plugging and abandonment, or assumption of bonding liability, for these wells. The remaining wells correspond to wells 0, 8, 13, 17, 21, 24, 28, and 29 in Exhibit A in your letter. (Note: the status of well 28 is unknown because BLM staff was unable to access this well).

The inventory of wells in your letter includes well number 22 in Exhibit A. LCDO records indicate this well is abandoned and LDG will have to receive an approved Geothermal Drilling Permit (GDP) prior to re-entry into this well. The LCDO cannot release any current bond funds until an appropriate replacement bond has been submitted and accepted.

In your letter, you mention that these wells are needed for monitoring purposes. Please be aware that LDG will need to obtain an approved GDP from the LCDO prior to deepening, emplacing a new pump, injecting into, or abandoning any of the subject wells.

Please direct any questions to Michael Smith at (575) 525-4421.

Sincerely,



Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

1 Enclosure:

1 - BLM Form 3260-2

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade  
Mr. Charles Jackson  
Mr. Dale Burgett



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OCD

2012 FEB -9 A 10:14

In Reply Refer To:

NMNM 034790  
3260 (L0310)

FEB 6 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 1119

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

### INCIDENT OF NONCOMPLIANCE

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is issuing an Incident of Noncompliance (INC) for Cyrq Energy's geothermal operation located in the NE $\frac{1}{4}$ SW $\frac{1}{4}$  of section 7, T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM. Federal regulations (43 CFR 3265.12(a)) require the BLM to issue an INC for geothermal drilling operations that do not comply with permit terms and conditions, applicable regulations, or other requirements defined in 43 CFR 3200.4.

Cyrq Energy Inc. is in violation of 43 CFR 3261.17(b) which states:

"To amend an approved operations plan or drilling permit, submit a completed and signed Sundry Notice describing your proposed change. Do not start any amended operations until after BLM approves your drilling permit or Sundry Notice."

On January 27, 2012, Cyrq Energy, Inc., staff (Ben Barker) informed LCDO staff (Michael Smith) that an authorized production well currently under construction, known as well 47-07, was completed without any 20-inch casing. The approved Geothermal Drilling Permit (GDP) requires 400 feet of 20-inch surface casing. Although Lightning Dock Geothermal H1-01 LLC (a subsidiary of Cyrq Energy, Inc.) submitted a sundry notice to the LCDO (January 11, 2012), this sundry only specified shortening the 20-inch casing. This sundry was rejected (January 24, 2012) by the LCDO primarily because it was determined to be inadequate for groundwater protection.

**Corrective Action:** Please complete one of the following remedial actions:

1. Submit a detailed plan (as a new sundry notice) describing how well 47-07 will be remediated to achieve the same level of groundwater protection and operational safety specified in the approved GDP. This sundry will have to be reviewed and accepted by the BLM before remedial modifications to well 47-07 may commence. If acceptable protection cannot be demonstrated, the LCDO will reject the sundry and may order plugging and abandonment of well 47-07.
2. Alternatively, Cyrq Energy may immediately plug and abandon well 47-07 to New Mexico Office of State Engineer's standards, and submit a Final Abandonment Notice to the LCDO when plugging and abandonment is completed.

Please complete one of the above corrective actions within 30 days of receipt of this letter. If the noncompliance continues, the BLM will take one or more of the following actions prescribed in 43 CFR 3265.12:

1. Enter your lease, and correct any deficiencies at your expense
2. Collect all or part of your bond
3. Direct modification or shutdown of your operations
4. Take other enforcement action under 43 CFR 3213

#### Appeal Procedures

If you contend that this decision is erroneous and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.



Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

2 Enclosures:

1 – Form 1842-1

2 – Form 3260-3

cc:

Mr. Frank Lupo

✓ Mr. Carl Chavez

Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3260 (L0310)

RECEIVED OCD  
2017 JAN 26 P 1:00

JAN 24 2012

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 0945

### DECISION

Lightning Dock Geothermal H1-01 LLC :  
c/o Mr. Ben Barker :  
136 South Main Street, Suite 600 :  
Salt Lake city, UT 84101 :

NMNM 034790

#### Sundry Notice Rejected

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your first sundry notice (received January 11, 2012) for the Geothermal Drilling Permit (GDP) for the well 47-7 (approved October 1, 2008). This sundry is rejected because the proposed reduced length of 20-inch diameter surface casing (40 feet instead of the approved 400 feet) would not provide adequate protection of ground water resources, and may not provide adequate pressure control prior to setting production casing.

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

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- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

1 Enclosure

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3260 (L0310)

DEC 19 2011

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 0686

Mr. Dale Burgett  
29 Rose Lane  
Animas, NM 88020

Dear Mr. Burgett:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is in receipt of your November 29, 2011 request to return your cash bond (NM03680003) for the subject geothermal lease. The LCDO review of your request and present site conditions has determined that additional information is required before the BLM can make a final determination regarding this bond.

Your proposal to plug and abandon seven wells to standards prescribed by the New Mexico Office of State Engineer (OSE) did not specify which wells you are proposing to plug in return for your bond. Please provide the LCDO with a written inventory of the wells you are proposing to close, and reference these wells using the well numbers on the enclosed map.

BLM records indicate that wells 9, 26, and 27 on the enclosed map have previously been plugged and abandoned. Field observations by BLM staff indicate that wells 14, 15, 19, and 22 are also plugged. Although the BLM has a copy of the notification of abandonment to OSE for well 0, field observations determined that the bore of this well is still open. There is an active BLM permit for well 20, and the status of wells 18 and 28 are currently unknown to the BLM. Therefore, between eight and ten of the known wells on lease NMNM 034790 would remain open after you plug and abandon the proposed seven wells. Before your bond would be released, the LCDO will need to know how the liability to plug and abandon the remaining wells will be covered.

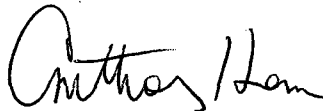
In your letter, you state that the current lessee has indicated interest in assuming liability for plugging unused wells on the leasehold. The LCDO has not received written notification from the current lessee stating they are willing to assume such liability. If a third-party does offer to

2011 DEC 23  
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assume bonding liability for the lease wells, the LCDO cannot release your bond until the final liability amount is determined and the new bond has been accepted by the BLM.

Please contact Michael Smith, Geologist at (575) 525-4421, if you have any questions.

Sincerely,



*For:*

Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

1 Enclosure

cc:

✓ Carl Chavez  
Randy Dade  
New Mexico Office of the State Engineer



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



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2011 DEC -9 P 1:18

In Reply Refer To:

NMNM 034790  
3260 (L0310)

DEC 7 2011

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 0358

### DECISION

Lightning Dock Geothermal H1-01, LLC  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101-1684

NMNM 034790

### Sundry Notice Approved

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your third sundry notice, received November 3, 2011, for the Geothermal Drilling Permit (GDP) for the Well 45-7 (approved October 1, 2008). This sundry is approved subject to the general standards defined in 43 CFR §3260.11 and the enclosed conditions of approval (COAs).

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

2 Enclosures

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade

**CONDITIONS OF APPROVAL (43 CFR 3200.4(f))**

**NMNM 034790 WELL #45-7**

**APPROVED: NOVEMBER 30, 2011**

1. The operator shall follow all procedures outlined in the sundry notice, including bird protection measures, except when otherwise specified in these conditions of approval. Prior to initiating any changes to the approved operations, including any modifications to Well #45-7, the operator shall submit a complete sundry notice (BLM Form 3260-3) describing the proposed changes to the Las Cruces District Office (LCDO). The lessee shall not begin any changes to the operation or operational procedures until the LCDO has approved the sundry notice (43 CFR §3275.10).
2. This sundry notice will expire one (1) year from the date of approval.





# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

In Reply Refer To:

NMNM 034790  
3260 (L0310)

RECEIVED OCD

2011 NOV 17 P 10:40

NOV 10 2011

CERTIFIED MAIL -- RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 0174

### DECISION

Lightning Dock Geothermal H1-01 LLC  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

### Sundry Notices Approved

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the first and second sundry notices for the Geothermal Drilling Permit (GDP) for the Well 53-7 (approved September 30, 2008). Both sundries are approved subject to the general standards defined in 43 CFR §3260.11, and one sundry is approved subject to the enclosed Conditions of Approval (43 CFR §3260.12).

If you contend that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

3 Enclosures

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



In Reply Refer To:

NMNM 034790  
3260 (L0310)

NOV 9 2011

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 0810 0003 4674 0143

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

2011 NOV 14 P 12:53  
RECEIVED OGD

### INCIDENT OF NONCOMPLIANCE RESCINDED

On October 7, 2011, Cyrq Energy, Inc., received (Certified Receipt 7004 1350 0002 8394 3234) an incident of noncompliance (INC) for their geothermal operation located in section 7, T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM. This INC was issued due to noncompliance with 43 CFR 3264.10 which states:

**“What must I submit to BLM after I complete a well?**

You must submit a Geothermal Well Completion Report, Form 3260-4, within 30 days after you complete a well. Your report must include the following:

- (a) A complete, chronological well history;
- (b) A copy of all logs;
- (c) Copies of all directional surveys; and
- (d) Copies of all mechanical, flow, reservoir, and other test data.”

On November 3, 2011, Cyrq Energy, Inc., completed the required corrective action by submitting a completed Form 3206-4 for Well #45-7. Therefore, the subject INC is rescinded effective this date.

Bill Childress  
District Manager

cc:

Mr. Frank Lupo  
✓ Mr. Carl Chavez  
Mr. Randy Dade

## Chavez, Carl J, EMNRD

---

**From:** Smith, Michael A [michaelsmith@blm.gov]  
**Sent:** Monday, November 07, 2011 10:47 AM  
**To:** Ben Barker  
**Cc:** Estabrook, Richard M; Dade, Randy, EMNRD; Chavez, Carl J, EMNRD  
**Subject:** RE: sundries, Estabrook email and 45-7

Mr. Barker:

After reviewing your verbal request and recent sundry for deepening well 53-07 by 1000' (from 3500' to 4500'), the Las Cruces BLM is issuing a verbal authorization to proceed (43 CFR 3261.21(C)) subject to the following stipulations:

1. If make-up water from well 55-7 is used, then the operator must implement the agreed-upon bird protection measures in any tanks, basins, reserve pits etc. You did not mention if OCD has approved the use of formation water as make-up for drilling, so please continue to work with them on this issue as you need OCD approval prior to performing this action.
2. This approval does not authorize the placement or transfer of a pump to well 45-7, that will be reviewed and approved in a separate sundry.
3. For filing purposes, the well will be considered completed on the day the rig is released. The 30-day clock to file 3206-4 begins then.

These stipulations will be applied as conditions of approval to the signed sundry notice. I am scheduled to meet the District Manager tomorrow (Nov. 7) to discuss this sundry, and the sundry for the modified casing shoe placement/BOP test. Regarding the third sundry you submitted on Nov. 3, 2011; because this is not described in the original development plan, there will have to be a BLM review (i.e. Determination of NEPA Adequacy). This is scheduled for next Monday (November 14, 2011). Do not proceed with installing a pump on 45-7 until this sundry notice is approved. Please inform Boart-Longyear of this situation.

I also reviewed the well completion report for 45-7 you had submitted on Nov. 3 and I have recommended that the District Manager rescind the Incident of Noncompliance.

One last thing, according to my records, LDG H1-01 LLC has not filed daily drilling reports for the period for Oct 31 to Nov. 6 (inclusive). Please get the daily drilling records up to date with this office by Thursday Nov. 10, 2011 or the BLM will have to submit an Incident of Noncompliance. If you are still having problems with your server, you may fax the reports to me at 575-525-4412.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[michaelsmith@blm.gov](mailto:michaelsmith@blm.gov)

---

**From:** Ben Barker [<mailto:Ben.Barker@cyrgenergy.com>]  
**Sent:** Monday, November 07, 2011 2:34 AM

**To:** Smith, Michael A

**Subject:** sundries, Estabrook email and 45-7

Good morning Mr. Smith,

After careful study of the cuttings and temperatures, we decided last night that we should test the carbonate rocks in LDG 53-7 with one more bit after all. I called Randy Dade who gave us verbal approval to go to 4000 ft pending action on the sundry. We are now running in the hole and will wait for your go-ahead. I tried to send a copy to Richard Estabrook of the email to Randy Dade, but it was rejected by Rich's email server twice. I think he received the 3260-3 I sent last week, but I'm not sure. If you would like for me do anything to help get material to Rich, please advise. I may head back to CA tonight and I'm willing to go to Ukiah if that would be helpful.

When we spoke about 45-7 not being complete I mentioned several factors, including

1. Incomplete logging as called for in the drilling plan, due to multiple logging tool failures and a possible wellbore obstruction,
2. Incomplete testing, as described in the drilling plan and the January 2011 sundry, and
3. As a result of (1) and (2), we have insufficient information to conclude whether the well should be drilled to the permitted depth and whether a slotted liner is needed for production. Slotted liners have a lead time of weeks for delivery, so it is normal to release the drilling rig and use a smaller rig for completion at a later date.
4. None of the permits for 45-7 expire until 2012.

We have been actively pursuing the logging of 45-7 since we released the Barbour rig. There is a shortage of wireline tools for geothermal wells and the distance to the Animas location makes it unattractive for many vendors. This weekend we had another logging company with geothermal experience try to enter 45-7 and they were unable to get tools to bottom. We cannot tell whether the wellbore is really obstructed or merely irregular in one spot. Either way, we are ready to bring in another rig to prepare the wellbore for logging and testing. We are contracting with Boart Longyear to bring a service rig from Phoenix to move our pump from 55 to 45. That rig will also allow us to probe the wellbore for obstructions. They are holding the rig for us while you review our sundry notice.

Please do not hesitate to call on me if I can answer any questions or be of help.

Thanks,  
Ben

VP Resource Management  
Lightning Dock Geothermal HI-01, LLC  
Kearns Building, Suite 600  
136 South Main Street  
Salt Lake City, UT 84101-1684  
801-875-4203 office  
801-616-6193 mobile1  
707-508-9963 mobile2  
801-374-3314 fax



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OCD

2011 OCT 11 P 11:43

In Reply Refer To:

NMNM034790  
3200 (L0310)

OCT 7 2011

~~CERTIFIED--RETURN RECEIPT REQUESTED~~

7004 1350 0002 8394 3302

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 S. Main Street  
Suite 600  
Salt Lake City, UT 84101

Dear Mr. Barker:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has received your five letters dated September 28, 2011. Thank you for the first letter informing us of your company's name change, and the LCDO had previously received the Notice of Appeal of the BLM Revised Written Orders of August 25, 2011, which you sent in your second letter.

In the third letter, Cyrq Energy requests an exemption from submitting additional sundry notices and production and well testing reports for well 55-07. Please be aware that, in general, local BLM offices cannot grant exemptions or waivers of regulatory requirements, and your request must be respectfully declined. A sundry notice is required when a geothermal operator needs to amend or change an existing operating plan or drilling permit (43 CFR 3261.17). If you are unsure if your planned activities would require a sundry notice, please do not hesitate to contact LCDO staff for clarification.

It is suggested that you review the regulations cited in the third letter (43 CFR 3261.22 and 43 CFR 3264.11(b)). These regulations only allow the BLM to issue an exemption for activities the BLM determines to be routine (well surveys, clean-outs, maintenance, etc.). They do not allow the BLM to grant an exemption from data reporting requirements under 43 CFR 3253.10 and 43 CFR 3264.11(a).

In your fourth letter, you assert that it is unnecessary to submit the previously requested (Certified Receipt 7006 2150 0004 4494 6644) well completion report (BLM Form 3260-4) for well 45-07 until you have completed a reservoir test for this well. Cyrq Energy, Inc., also informed the LCDO that the test cannot commence until a permit approval is received from the New Mexico Oil Conservation Division (NMOCD), but did not provide a date as to when this is expected to occur. Well 45-07 is authorized to a depth of 3,400 feet, but Cyrq Energy voluntarily ceased drilling at 2,900 feet. It is not stated in your letter that drilling would continue

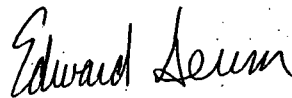
beyond this depth. Therefore, because you have not stated plans to deepen the well and the drilling rig vacated the site sometime between February 9, 2011 and April 1, 2011, this well is considered complete and a Well Completion report must be filed to meet the requirements of 43 CFR 3264.10. Please remember that if subsequent modification to a completed well is necessary, this can be readily authorized through a geothermal sundry notice.

Cyrq Energy submitted a sundry notice to complete a "24 hour or less" airlift test on well 45-07, which was approved by the LCDO District Manager on January 31, 2011. LCDO staff has been verbally informed by your consultant, Del Fortner (September 12, 2011), that Cyrq Energy is considering transferring the pumping system from well 55-07 to well 45-07. The approved Geothermal Drilling Permit (GDP) for well 45-07 does not include information regarding well equipment and operations, such as motor size, impeller placement, timing and duration of testing, management of produced water, and safety measures. Prior to initiating this pump transfer and any subsequent testing, Cyrq Energy, Inc., must submit a new sundry notice correcting these deficiencies in the GDP for well 45-07. Transferring the pump prior to receiving approval of a sundry notice will result in the issuance of an Incident of Noncompliance (INC).

In the fifth letter, Cyrq Energy asserts that well 55-07 is capable of producing in "commercial quantities" and that your analysis "resulted in a conclusion that pay back from connecting this well to the planned geothermal plant will occur in less than one year." You conclude this letter with a request that the LCDO provide written concurrence that well 55-07 can produce in "commercial quantities." Because the feasibility study and economic analysis upon which you base this assertion has not been provided to the LCDO, we cannot verify the accuracy or veracity of your claims. Therefore, your request for written confirmation of the assertions in this letter is respectfully declined.

You may direct any questions to Michael Smith at (575) 525-4421.

Sincerely,



Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

cc:

Frank Lupo  
✓ Carl Chavez  
Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OGD

In Reply Refer To:

NMNM 034790  
3260 (L0310)

2011 OCT -7 P 11:30

OCT 4 2011

CERTIFIED--RETURN RECEIPT REQUESTED  
7004 1350 0002 8394 3234

Cyrq Energy, Inc.  
c/o Mr. Ben Barker  
136 South Main Street  
Suite 600  
Salt Lake City, UT 84101

### INCIDENT OF NONCOMPLIANCE

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) is issuing an Incident of Noncompliance (INC) for Cyrq Energy's geothermal operation located in section 7 of T. 25 S., R. 19 W., NMPM, in Hidalgo County, New Mexico. Federal regulations (43 CFR 3265.12(a)) require the BLM to issue an INC for geothermal drilling operations that do not comply with permit terms and conditions, applicable regulations, or other requirements defined in 43 CFR 3200.4.

1. Cyrq Energy Inc., is in violation of 43 CFR 3264.10 which states:

#### **What must I submit to BLM after I complete a well?**

You must submit a Geothermal Well Completion Report, Form 3260-4, within 30 days after you complete a well. Your report must include the following:

- (a) A complete, chronological well history;
- (b) A copy of all logs;
- (c) Copies of all directional surveys; and
- (d) Copies of all mechanical, flow, reservoir, and other test data.

On August 1, 2011, Cyrq Energy Inc. (then d.b.a. Lightning Dock Geothermal H1-01 LLC) received a certified letter from this office (Certified Receipt 7006 2150 0004 4494 6644). In this letter, Cyrq Energy Inc., was informed that Geothermal Well Completion reports had not been submitted for either Well #45-7 or Well #55-7. This letter also stated that the completed form and reports for both wells must be submitted to the LCDO within 30 days. On September 12, 2011, BLM staff verbally informed your consultant (Del Fortner) that the deadline to submit the



completed Geothermal Well Completion Reports would be extended to September 16, 2011. On September 15, 2011, the LCDO received a completed Form 3260-4 for Well #55-7, but did not receive a well completion report for Well # 45-7.

**Corrective Action:** Please submit a completed Form 3260-4 for Well #45-7. Include copies of all surveys, test and logs required by 43 CFR 3264.210.

Please complete the above corrective action within thirty (30) days of receipt and the BLM will promptly rescind this INC in writing. If the noncompliance continues, the BLM will take one or more of the following actions prescribed in 43 CFR 3265.12:

1. Enter your lease, and correct any deficiencies at your expense
2. Collect all or part of your bond
3. Direct modification or shutdown of your operations
4. Take other enforcement action under 43 CFR 3213

#### Appeal Procedures

If you contend that this decision is erroneous and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

3 Enclosures:

- 1 – Form 1842-1
- 2 – Form 3260-4
- 3 – 43 CFR 3264.10

cc:

Mr. Frank Lupo  
✓ Mr. Carl Chavez  
Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED 001A

2011 JUL 21 A 11:54

In Reply Refer To

NMNM034790  
3200 (L0310)

JUL 20 2011

CERTIFIED--RETURN RECEIPT REQUESTED  
7006 2150 0004 4494 6644

Lightning Dock Geothermal H1-01 LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Suite 375  
Provo, UT 84604

Dear Mr. Barker:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of the most recent (June 24, 2011) sundry notice for the Geothermal Drilling Permit (GDP) for well 55-7 located in the NW $\frac{1}{4}$ , SE $\frac{1}{4}$  of section 7, T. 25 S., R. 19 W., Hidalgo County, New Mexico, NMPM. All three copies of the sundry notice are being returned unsigned (unapproved) because they do not provide sufficient information to describe proposed operations at this well.

Please understand that the BLM, LCDO cannot grant the indefinite "blanket approval" for undefined and unspecified activities which you request in Item 16 of the sundry notice. If you choose, you may resubmit the returned sundry notice with an addendum providing the required information outlined below.

1. For the specific tests mentioned (interference, tracer, etc.), describe the equipment necessary to complete these tests, and any well improvements needed for the tests. For tests involving well discharge, include procedures to meet applicable requirements under 43 CFR 3262.11 (i.e., in addition to storing fluids in tanks or pits).
2. Provide projected dates when the proposed testing will begin, and specify the expected duration of testing. Also include the projected date of test completion.

BLM staff determined that this information is needed during a pre-submittal review of this sundry notice requested by Lightning Dock Geothermal H1-01 LLC (LDG) on May 24, 2011. The BLM also informed LDG staff (Michael Hayter) in an e-mail sent on June 3, 2011, that the above information is needed to complete the sundry notice.

LDG has informed the BLM, LCDO that the pumping system currently installed on the 55-7 well is needed for future reservoir testing and electricity production. LDG has not, however, provided information to demonstrate that the 55-7 well will be used for reasonable and appropriate reservoir testing in the foreseeable future. Furthermore, LDG has not provided reservoir, flow testing, or other data which would demonstrate that the 55-7 well would support the profitable production of electricity. Without this data, the assertion that the well is "ready for connection to a power plant" (Item 16 of returned sundry notice) can only be considered speculation. Until the BLM receives and reviews all necessary and relevant information, there is no justification for the pumping system to remain installed on well 55-7.

The BLM, LCDO is taking this opportunity to remind you of regulatory requirements defined at 43 CFR § 3264.10 which states:

**§ 3264.10 What must I submit to BLM after I complete a well? You must submit a Geothermal Well Completion Report, Form 3260-4, within 30 days after you complete a well. Your report must include the following:**

- (a) A complete, chronological well history;
- (b) A copy of all logs;
- (c) Copies of all directional surveys; and
- (d) Copies of all mechanical, flow, reservoir, and other test data.

Our records indicate that LDG has not submitted completed Forms 3260-4 for either the 55-7 well, or the 45-7 well drilled in December 2010. This office previously requested (Certified Receipt No. 7006 0810 0000 8915 2456) that your company complete and submit Form 3260-4 for the 55-7 well. LDG submitted (June 27, 2011) a chronological history and directional survey for the 55-7 well, but has not included the results of recent (2010) mechanical, flow or reservoir tests, or any downhole surveys. As of this letter, the BLM has not received any of the above information for the 45-7 well.

Please submit the completed Form 3260-4 and accompanying data required by 43 CFR 3264.10(a-d) for both the 45-7 and 55-7 wells within 30 days of receipt of this letter. LDG shall include the results of the 2010 cleanout and pump test mentioned in Item 16 of the June 24, 2011 sundry notice for well 55-7; which LDG claims demonstrates this well's "commercial value." If LDG does not submit the complete Form 3260-4, with all required information and data within 30 days of receipt of this letter, the BLM will be compelled to issue an Incident of Noncompliance as prescribed under 43 CFR 3254.11.

Please direct any questions to Michael Smith, Geologist, at (575) 525-4421.

Sincerely,



Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

5 Enclosures

cc:

Mr. Frank R. Lupo

✓ Mr. Carl Chavez

Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OOD

In Reply Refer To:

NMNM 034790  
3200 (L0310)

2011 MAR -3 P 1:25

MAR 1 2011

CERTIFIED -- RETURN RECEIPT REQUESTED  
7006 0810 0000 8915 2456

Lightning Dock Geothermal H1-01 LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Suite 375  
Provo, UT 84604

Dear Mr. Barker:

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your recently submitted (February 23, 2011) supplemental information to the second sundry notice for the Geothermal Drilling Permit (GDP) for Well 55-7 located in the NW $\frac{1}{4}$ , SE $\frac{1}{4}$ , sec. 7, T. 25 S., R. 19 W., NMPM, Hidalgo County, New Mexico. Your response indicates that you may not fully understand the information requirements necessary for the LCDO to process your sundry notice, and would benefit from assistance in interpreting current Federal geothermal regulations (43 CFR Part 3200).

In your response, you assert that:

“Your letter leads LDG to believe your office desires well 55-7 to be plugged and abandoned and that BLM does not recognize the value of this well as a well capable of producing in commercial quantities.”

Our letter does not require that Lightning Dock Geothermal H1-01 LLC plug and abandon this well and submit a Final Abandonment Notice (FAN). The request is for an estimate of the costs to plug and abandon the well in the event Raser Technologies defaults on its obligations and the United States is left with the responsibility of closing out Well 55-7. The LCDO may determine if an adjustment to the bond is necessary based on these costs (43 CFR 3214.14(a)(4)). The LCDO cannot comment on your assertion that Well 55-7 is “... a well capable of producing in commercial quantities” as you have not: a) described the potential use for this well, or b) provided data from your recent (2010) pumping test from this well.

Regarding your interpretation of 43 CFR 3207.10(b), we suggest you carefully review 43 CFR 3207.10 and 3207.11 for the necessary requirements to extend a geothermal lease beyond the primary term. For copies of current Federal regulations, please refer to <http://www.gpo.gov/fdsys>.

In your letter of February 23, 2011, you state that Lightning Dock Geothermal H1-01 LLC only seeks approval of operations granted under 43 CFR 3260, while well uses can only be reviewed and authorized by the BLM under 43 CFR 3270. We remind you that Lightning Dock Geothermal H1-01 LLC has already submitted a utilization plan (February 26, 2008) and this plan does not include use of Well 55-7. Therefore, a sundry notice describing the proposed use of Well 55-7 and specifying when these uses will begin must be submitted to correct your utilization plan and the GDP for Well 55-7.

Complicating our evaluation of your January 7, 2011 sundry notice and February 23, 2011 supplemental information is the contradictory explanation of your proposed utilization of Well 55-7. On the second page of your letter, you state that your intentions are to leave Well 55-7 in its current configuration to be used to test and monitor resources. This contradicts your sundry notice of January 7, 2011, in which you state that the well will be connected to the planned power plant. Please specify whether the intended use of Well 55-7 is for testing or for production. You may change the use of a geothermal well by submitting a sundry notice following procedures in 43 CFR 3261.22.

Your quotation of Federal regulations at 43 CFR 3214.14(a)(4) is inaccurate. The regulation does not state "Our inspection of the property determines that the bond is too low to cover estimated reclamation cost." Rather it states "We determine that the bond amount will not cover the estimated reclamation cost." Reclamation activities that require Federal bonding include plugging and abandoning wells (43 CFR 3214.14(b)). As you are aware, Lightning Dock Geothermal H1-01 LLC currently has a \$45,000 bond filed with the BLM. This is much less than the \$100,000 cost of removing the pump system from Well 55-7, which you provided in your sundry notice of January 7, 2011. Your contention that 43 CFR 3261.18(a)(1) allows for Lightning Dock Geothermal H1-01 LLC to bond all Statewide operations for \$50,000 ignores the fact that this regulation states that \$50,000 is the minimum bond required for a State-wide bond. 43 CFR 3214.14 clearly grants the BLM authority to raise bond amounts above this minimum and to consider the cost of well plugging in estimating bond amounts.

Your letter indicates that you do not understand all of the circumstances under which a geothermal bond can be adjusted by the BLM. The LCDO suggests that you carefully review bonding regulations at 43 CFR 3214.14(a)(4).

The above discussion should clarify the information requirements necessary to finish processing your second sundry notice for Well 55-7. The LCDO is therefore reiterating its request for additional information and providing additional details to our request.

1. The specific use(s) for Well 55-7.
  - a. If Well 55-7 is to be used for production, specify the proposed use for this well (i.e., direct use, surge power, etc.) so that the BLM may update your GDP and utilization plan.
  - b. If Well 55-7 is to be used for testing, describe the specific tests to be performed (pumping, interference, etc.) and explain why the previously authorized pump test is insufficient. If your tests do not involve pumping of the well, then explain in detail why it is necessary to keep the motor and pump installed in the well.
2. For item #1 above (utilization or testing), please provide specific dates when the proposed actions (production or testing) will begin, and specific timeframes in which these activities will occur.
3. As stated in our response to your January 7, 2011 sundry notice (Certified No. 7006 2760 0005 1422 8961) please describe the specific action that will be taken to prevent unauthorized operations and specify details of the maintenance and monitoring programs.
4. Provide an itemized cost estimate for a third-party contractor to remove and dispose of the pump and motor and to abandon Well 55-7 to New Mexico Office of State Engineer's (OSE) standards. Please note that this is not a request or an order to plug and abandon Well 55-7. Rather, it is necessary information for meeting bonding requirements under 43 CFR 3214.14.

Please provide the additional information, required above within 30 days of receipt of this letter. If you do not provide the necessary information within this period, the LCDO will return your second sundry notice unsigned.

In conclusion, we remind you of Federal regulations at 43 CFR 3264.10 which states:

**§ 3264.10 What must I submit to BLM after I complete a well?** You must submit a Geothermal Well Completion Report, Form 3260-4, within 30 days after you complete a well.

Your report must include the following:

- (a) A complete, chronological well history;
- (b) A copy of all logs;
- (c) Copies of all directional surveys; and
- (d) Copies of all mechanical, flow, reservoir, and other test data.

Our records indicate you have not completed this regulatory requirement for your recent work on Well 55-7. Submission of the completed Form 3260-4 is also required by COA number 18 in the



GDP for Well 55-7. Therefore, please submit the completed Form 3260-4 and accompanying data, including the results of your flow tests, within 30 days of receipt of this letter. You may direct questions to Michael Smith at (575) 525-4421.

Sincerely,

Handwritten signature of Edward Seum in black ink.

Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

cc:

Frank R. Lupo

✓ Carl Chavez

Randy Dade



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

In Reply Refer To:

NMNM 34790  
3251 (L0310)

RECEIVED OCD  
2011 MAR -1 P. 12:37

FEB 23 2011

CERTIFIED -- RETURN RECEIPT REQUESTED  
7006 2760 0005 1422 9111

Lightning Dock Geothermal H1-01 LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Provo, UT 84604

Dear Mr. Barker:

On February 9, 2011, staff from the Bureau of Land Management (BLM), Las Cruces District Office (LCDO) completed an inspection of your Notice of Intent area in secs. 4, 9, 19, 20, and 21, T. 25 S., R. 19 W.; and sec. 33, T. 24 S., R. 19 W., NMPM, Hidalgo County, New Mexico.

This inspection did not identify any unresolved or outstanding reclamation issues associated with your MT survey of December 2010. Therefore, the LCDO will be returning your reclamation bond of \$8,000.00. You will receive your refunded bond in a separate mailing.

If you have any questions, please contact Michael Smith at (575) 525-4421.

Sincerely,

Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

cc:  
✓ Mr. Carl Chavez  
Mr. Randy Dade

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

6. Lease Serial No. NM 34790	
7. Surface Manager: <input type="checkbox"/> BLM <input type="checkbox"/> FS <input checked="" type="checkbox"/> Other Private	
8. Unit Agreement Name N/A	
9. Well No. LDG 45-7	10. Permit No. 08
11. Field or Area Wildcat	
12. Sec., T., R., B. & M. Sec.7, T25S, R19W NMBM	
13. County Hidalgo	
14. State NM	

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
New Well

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator  
5152 N. Edgwood Drive, Suite 200  
Provo, Utah 84604

4. Location of Well or Facility  
2360.0 ft north of the South Line and 2278.3 ft east the West line of Sec.7, T25S, R19W NMBM

5. Type of Work
- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Change Plans                         | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input type="checkbox"/> Abandon              |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input checked="" type="checkbox"/> Other     |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

The approved plan of operations in the GDP for well LDG 45-7 includes as its penultimate step:

"Rig up for well tests 24 hour and long testing per geologic staff directions."

Aside from grammatical deficiencies, the step omits the words "and run" after "Rig up." This Sundry Notice is to provide additional detail about what comprises "24 hour and long testing" in this geothermal operation.

Well LDG 45-7 is presently drilling ahead at 2740 ft with a rate of penetration of only 8 ft/hr. No returns of cuttings have been observed for over 24 hours. The geologic staff believes the well may have passed through a significant change in formation and the engineering staff believes it would be prudent to evaluate the hole completed so far. Testing is needed to determine whether to continue drilling to the permitted TD of 3400 ft, whether a costly liner must be installed, and whether the well has the earmarks of commercial viability. Events are driven to some extent by the results as testing proceeds, so what follows is the expected sequence, but some adjustments may be needed as we proceed. We request in advance the latitude to exercise prudent engineering judgment for safe and efficient operation.

[Please see attached follow sheet for balance of description.]

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed B. J. Barber Title Vice President, Resource Management Date 01/28/2011

(This space for Federal use)

Approved by Bill Ehler Title Director, Mining Date 1/31/2011  
Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

## GENERAL INSTRUCTIONS

This form must be used for applications for well work, road, site and facilities construction and other miscellaneous activities performed on Federally leased lands which are related to operations performed under an approved Plan of Operation.

## SPECIFIC INSTRUCTIONS

Item 1b: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, St=shut-in, WS=water supply, OB=observation, O=other (explain).

Item 15: The latest well conditions (hole size, casing, cement, perforations, producing and injecting zones, etc.) along with all proposed additions/changes must be shown. When completing this section, list existing well program first, followed by the proposed program, and separate by a sufficient space to clearly distinguish the two programs. Current well conditions may be either listed in this section or may be shown by attaching a copy of the latest completion report on the subject well.

Item 16: Attach all pertinent engineering plans and specifications.

Completed Operations: Thirty days after completion of all operations other than construction activities, approved under this permit, a completion report must be submitted in duplicate, to the BLM. The completion report must include a copy of the approved Geothermal Sundry Notice with an attached report detailing all important activities performed and the completion and abandonment procedures undertaken. Copies of all records of the operations must accompany the report if not previously submitted.

## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

**AUTHORITY:** 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

**PRINCIPAL PURPOSE:** The BLM uses this information to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

**ROUTINE USES:** (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal; and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to process the application. If all the information is not provided, the application may be rejected.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to evaluate your proposed and/or completed subsequent well operations on Federal geothermal leases.

The BLM will use this information to report subsequent operations once work is completed, and, when you request it, to approve subsequent operations.

Response to this request is mandatory for the specific types of activities specified in the geothermal operations regulations at 43 CFR 3260.

The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0132), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington D.C. 20240.

Continuation of Item 15.

1. Drilling will stop once logging and test equipment schedules are certain, expected this weekend ( 1/28-30). The bit and tools will be withdrawn from the hole to allow access by temperature and geophysical logging tools. Some of the logs may be run near the end of the test, depending on availability and temperatures.
2. The logs now contemplated are Halliburton's caliper, Dual Induction Laterolog, Micro-Spherically Focused Log, neutron porosity, Gamma, Temperature, Sonic Array and Spectral Density. We may run additional temperature and pressure logs to validate the conditions for the more expensive tools to be run.
3. When the logs are complete a string of pipe will be run in to 1000' +/-, to stimulate flow with injected air (an "air lift"). Pressure and temperature tools may be lowered into the well to measure those parameters below the air injection point.
4. The air lift test will run 24 hours or less, per the GDP/POO. The data will provide a preliminary indication of well productivity. Fluid samples will be collected to determine whether formation fluids are being produced or only drilling fluids. Produced fluids will be collected in tanks.
5. Following the air lift test the rig will rerun a drilling assembly to check hole conditions and clean out fill.
6. While the hole is being cleaned and evaluated the water samples will be analyzed. The chemistry and the flow data from the air lift may indicate any of several courses of action: (a) complete the well immediately, (b) resume drilling, or (c) conduct a longer and more definitive flow test. Alternative (c) is the "long test" referred to in the GDP/POO.
7. If alternative (b) is selected drilling will resume and the testing step in the GDP/POO will be repeated at final depth.
8. If alternative (c) is selected the rig will install air lift and/or pumping equipment. NMOCD approval will be obtained to convey production water in excess of tank capacity directly to the irrigation field. The operator shall provide the BLM a copy of the written NMOCD approval to convey water to the irrigation field on the same day they receive this approval. Water produced during testing shall be discharged directly to the irrigation field **only**. Flow testing and the installation of air lift and/or pumping equipment for alternative "c" shall proceed only as long as necessary to determine if drilling should continue and shall not exceed the established NMOSE permit limits for this well (up to ten days of flow testing).



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OOD

2011 FEB 16 P 12:41

In Reply Refer To:

NMNM 034790  
3260 (L0310)

FEB 11 2011

CERTIFIED -- RETURN RECEIPT REQUESTED  
7006 0810 0000 8915 2104

### DECISION

Lightning Dock Geothermal H1-01 LLC	:	
c/o Mr. Ben Barker	:	NMNM 034790
5152 North Edgewood Drive	:	
Provo, UT 84604	:	

### Sundry Notice Approved

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your second sundry notice, received January 28, 2011, for the Geothermal Drilling Permit (GDP) for the Well 45-7 (approved October 1, 2008). This sundry is approved subject to the general standards defined in 43 CFR §3260.11.

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

2 Enclosures:

- 1 – Approved Geothermal Drilling Permit
- 2 – Form 1842-1

cc:

- ✓ Mr. Carl Chavez
- Mr. Randy Dade

## Chavez, Carl J, EMNRD

---

**From:** mikesmit@blm.gov  
**Sent:** Thursday, February 10, 2011 7:20 AM  
**To:** Chavez, Carl J, EMNRD  
**Subject:** Re: FW: Turner report 11A0692  
**Attachments:** pic10474.jpg

Thanks Carl. I was at the 45-7 site yesterday; they are rigged up for the airlift test, but were not doing any pumping or discharge from the well (or the 55-7 well). In case you're not aware, I was informed that they want to do the airlift test to determine if they can produce from the current depth (2900' +/-) or need to drill the additional 700'.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
Mike\_Smith@blm.gov

"Chavez, Carl J,  
EMNRD"  
<CarlJ.Chavez@state.nm.us> To  
"Mike\_Smith@blm.gov"  
<Mike\_Smith@blm.gov>  
02/09/2011 04:53 PM cc  
Subject  
FW: Turner report 11A0692

FYI.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention and Waste Minimization Guidance is under "About Us- Environmental Bureau"  
<http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental>)

From: Chavez, Carl J, EMNRD  
Sent: Wednesday, February 09, 2011 4:54 PM  
To: 'Jamie Robinson'



Cc: Del Fortner (External); Ben Barker; Roger Bowers (External); VonGonten, Glenn, EMNRD  
Subject: RE: Turner report 11A0692

Ms. Robinson, Ben Barker, et al.:

First, the OCD has reviewed the credentials of the Turner Laboratories, Inc. submitted at the request of the OCD from Ms. Nancy Turner on February 8, 2011. The OCD was looking for laboratory associations, affiliations, etc. that the lab meets some type of national standard(s). The OCD received the following: 1) a proficiency certificate from a corporation presented to the laboratory that was not received from a Governmental agency, i.e., EPA; 2) Environmental Laboratory License from the Arizona Department of Health Services; and 3) certification of the test analytes and methods used by the laboratory. While the lab may be acceptable, the OCD notices that there was no Laboratory QA/QC Summary Sheets that accompanied the analytical data to verify the accuracy of the laboratory's lab equipment capabilities. Environmental laboratories know that QA/QC data sheets must accompany environmental data to satisfy the Data Quality Objectives of the State.

Second, the OCD reviewed the data absent the radiochemistry that is named "DRAFT: LDG 45-7" in both the preliminary submittal by Ben Barker and in Raser's most recent submittal by Jamie Robinson. The OCD notices that Fluorides and pH are significantly elevated to be of concern and forms a basis for the OCD permit and G-101 approval conditions. A point of confusion in New Mexico's State Environmental Regulations may be cleanup of ground water to the water quality standards or background, whichever is greater. In this case, the question is does the state allow discharges to the environment greater of the aforementioned. Since this is not remediation, this is not the case. In fact, Raser will need to perform rigorous testing even after OCD has reviewed the proper form documentation of its field work in order to verify that water quality is adequate without treatment, which was a major issue of contention during the hearings associated with the permit application.

Third, Raser is aware of the OCD discharge permit (GTHT-1) conditions for installation of temporary and permanent pits for well testing required under the permit, but has now proposed to discharge to the farm field that the OCD had temporarily allowed a lesser volume of well test water from Well 55-07 to be discharged based on water quality information that the OCD reviewed for approving that discharge into a farm field during the growing season.

One reason in addition to water quality that the OCD requires pits for this project is due to the tremendous volumes of fluids that would be brought to surface during initial well testing of every well that is drilled and for future well testing if the project ever reaches authorization to produce from each well. The demonstration required and record keeping of all information is a major task that will eventually need to be proven to the OCD before it can authorize any well for production and/or injection. The volumes of fluids involved and the clear language of the permit to NOT allow any discharge to "waters of the state" i.e., creeks, arroyos, etc. without an NPDES Discharge Permit from the EPA (Region 6 Office) should also point out why the OCD was able to approve the discharge permit application in the first place without any treatment, etc. of water before final disposition. The sampling and frequency requirements are also specified in the discharge permit for proving that once the facility is in operation that it meets WQ Standards through rigorous testing requirement to prove that no treatment is needed.

Consequently, the OCD hereby disapproves Raser's request to discharge effluent from any project wells into the farm field on location. The OCD could work with Raser if it wishes to construct a properly designed pit that may handle the fluid volumes from testing of all wells drilled at the facility if it is feasible.

Thank you for the opportunity to consider your request. The OCD hopes that Raser will follow its approved discharge permit requirements that forms the basis for approval of the project in the first place.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

From: Jamie Robinson [mailto:Jamie.Robinson@rasertech.com]  
Sent: Monday, February 07, 2011 4:50 PM  
To: Chavez, Carl J, EMNRD

Cc: Del Fortner (External); Ben Barker; Roger Bowers (External)  
Subject: FW: Turner report 11A0692

Hi Carl,

Here is the final analysis report for 45-7 from the lab. We expect radiochemistry to be in by the end of the week. If you have any questions please feel free to contact me,

Sincerely,

Jamie

Jamie Robinson  
Geologist  
Raser Technologies, Inc.  
5152 N. Edgewood Drive, Provo UT. 84604  
Office: 801.765.1200  
Cell: 801.717.5563

From: Terri Garcia [mailto:tgarcia@turnerlabs.com]  
Sent: Monday, February 07, 2011 3:22 PM  
To: Jamie Robinson  
Subject: Turner report 11A0692

Hello Jamie,

Attached is the last draft report for this work order. All of the Turner Laboratories analyses have been reviewed and validated. The only addition to this report will be that of the radiochemistry from Radiation Safety, which I believe Dawn told you would be available at the end of this week.

Please feel free to contact me if you have any questions or if I can be of further assistance to you in any way.

Sincerely,

Terri Garcia  
tgarcia@turnerlabs.com  
Technical Director  
Turner Laboratories, Inc.  
Tucson, Arizona  
520.882.5880  
(Embedded image moved to file: pic10474.jpg) cid:image001.jpg@01CAD6F8.71D10E40



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OGD

2011 JAN 31 P 12:39

In Reply Refer To:

NMNM 034790  
3260 (L0310)

JAN 28 2011

CERTIFIED -- RETURN RECEIPT REQUESTED  
7006 0810 0000 8915 1909

### DECISION

Lightning Dock Geothermal H1-01 LLC :  
c/o Mr. Ben Barker : NMNM 034790  
5152 North Edgewood Drive :  
Provo, UT 84604 :

### Sundry Notice Approved

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your first sundry notice for the Geothermal Drilling Permit for Well 45-7 (approved October 1, 2008). This sundry is approved subject to the general standards defined in 43 CFR §3260.11.

If you contend that this decision is incorrect and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

2 Enclosures

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade



# United States Department of the Interior

## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm



RECEIVED OCD

2011 JAN 20 P 12:38

In Reply Refer To:

NMNM 034790  
3200 (L0310)

JAN 18 2011

CERTIFIED -- RETURN RECEIPT REQUESTED

7006 2760 0005 1422 8961

Lightning Dock Geothermal H1-01 LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Suite 375  
Provo, UT 84604

Dear Mr. Barker;

The Bureau of Land Management (BLM), Las Cruces District Office (LCDO) has completed review of your recently submitted (January 7, 2011) second sundry notice for the Geothermal Drilling Permit (GDP) for Well 55-7 located in the NW $\frac{1}{4}$ ; SE $\frac{1}{4}$ ; sec. 7; T: 25 S., R: 19 W., NMPM, Hidalgo County, New Mexico. Our review has determined that additional information is needed to finish processing this sundry notice.

In your second sundry notice, you state as your intentions to "maintain well in its present condition until it is connected to the power plant." The original GDP for Well 55-7, approved on May 21, 2010, did not specify that this well would be connected to the planned geothermal plant. Connection to the planned power plant is not specified in your first sundry approved on May 28, 2010 either. Therefore, the LCDO requires additional information on your plans to use this well in your pending operations. Please provide the following information.

1. The specific use(s) for Well 55-7.
2. The date (month and year) when Well 55-7 will be connected to the plant.
3. The second sundry notice requests that step 37 of the original GDP Plan of Operations be replaced with "secure well from unauthorized operation and implement industry-standard maintenance and monitoring programs." Please describe the specific action that will be taken to prevent unauthorized operations and specify details of the maintenance and monitoring programs.

Currently, Lightning Dock Geothermal H1-01 LLC has not been bonded for the abandonment and closures of Well 55-7, thus your current bond must be adjusted to reflect this reclamation

cost (43 CFR 3214.14(a)(4)). As part of your response, please provide an itemized cost estimate for a third-party contractor to remove and dispose of the pump and motor and to abandon Well 55-7 to New Mexico Office of State Engineer's (OSE) standards. This cost estimate will be reviewed for approval by the LCDO and adjusted if necessary. You will be required to supplement your current bond (NMB000512), if necessary, before the LCDO can approve your second sundry notice.

Please remember that prior to using Well 55-7, or any of your planned wells, to test your planned utilization facility you must submit a new sundry notice describing the testing schedule and the quantity of Federal geothermal resources you expect to be delivered to the facility during the testing. Do not start delivering Federal geothermal resources to the facility until the BLM approves the sundry notice for utilization facility testing (43 CFR 3271.14(b)). Prior to initiating any commercial uses at the Federal Geothermal Lease NMNM 034790, Lightning Dock Geothermal H1-01 LLC must obtain an approved commercial use permit meeting the requirements of 43 CFR 3274.11.

Please provide the supplement to your sundry, or submit a new sundry with the required information, within 30 days of receipt of this letter. If you have any questions, please contact Michael Smith at (575) 525-4421.

Sincerely,



Edward Seum  
Supervisory Multi-Resources Specialist  
Division of Multi-Resources

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess  
Las Cruces, NM 88005-3371



RECEIVED OCD  
2010 DEC 20 P 12:50

DEC 15 2010

IN REPLY TO:

**Case Number:** NMNM034790

**Certified Mail No:** 7006 2760 0005 1422 3546  
Return Receipt Requested

Lightning Dock Geothermal LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Suite 375  
Provo, UT 84604

## WRITTEN ORDER(S) OF THE BLM AUTHORIZED OFFICER

On December 8, 2010, staff from the Las Cruces District Office (LCDO) of the Bureau of Land Management (BLM) visited the geothermal drilling permit (GDP) site for well number 55-7 in the NW¼ SE¼ section 7, T. 25 S., R. 19 W., NMPM, Hidalgo County, New Mexico, located on geothermal lease NMNM034790. During this site visit, Raser Technologies staff (Mr. Ben Barker) informed BLM staff that the well testing authorized under the current GDP is completed, and that a monitoring and data logging system is installed in well 55-7 to monitor the elevation of the potentiometric surface. BLM staff was also informed the Raser Technologies Inc. wants to keep well 55-7 open for an indefinite period of time for possible monitoring or production purposes.

One of your consultants (Del Fortner) had previously informed (September 16, 2010) the LCDO by e-mail that the monitoring equipment described above would be used for a pump-seal test. However, Raser Technologies Inc. has not disclosed their intentions to keep this apparatus in the Federal well 55-7 after this test, and to convert this well to monitoring purposes. Current Federal regulations regarding geothermal well operations state the following:

**43 CFR § 3261.22 How do I get approval for subsequent well operations?** Send BLM a Sundry Notice describing your proposed operation. For some routine work, such as cleanouts, surveys, or general maintenance (see § 3264.11(b)), we may waive the Sundry Notice requirement. Contact your local BLM office to ask about waivers for subsequent well operations. Unless you receive a waiver, you must submit a Sundry Notice. Do not start your operations until we grant a waiver or approve the Sundry Notice.

As you have altered the use of well 55-7 from temporary resource testing to monitoring and began data collection operations without receiving a waiver or submitting a sundry notice, you are currently in non-compliance with 43 CFR 3261.22.

Under the regulatory authority in 43 CFR 3200.4(h) and 3250.13(c), the Las Cruces District Office (LCDO) of the Bureau of Land Management (BLM) is hereby issuing the following written orders to Raser Technologies Inc:

1. Submit a completed sundry notice (BLM form 3260-3, copy enclosed) to the BLM Las Cruces District Office no later than 4:30 p.m. on **January 7, 2011**. Please note this date supersedes the deadline established in the GDP Conditions of Approval (COA). Include the following information in the sundry:
  - A detailed diagram of the monitoring system, including data collection and transmission equipment and structures.
  - An inventory of the equipment in use for well monitoring.
  - A detailed explanation of the types of data to be collected.
  - A detailed description of the types of well tests or parameter monitoring to be completed (i.e. potentiometric surface monitoring, permeability or transmissivity determinations, etc.).
  - A reasonable, defined and unambiguous duration of monitoring. At the end of this monitoring period, if the sundry is approved, the LCDO will determine whether or the Federal well 55-7 should be abandoned (43 CFR 3263.14).
2. Remove the pump and motor from the well 55-7 by January 7, 2011. Because we were informed on December 8, 2010 that the well tests authorized under the current GDP are complete, and that Raser Technologies wants to use the Federal well 55-7 for monitoring, there is no need for keeping a pump on this well. Describe in your sundry notice how the wellhead will be secured against future trespass after the pump is removed.

The LCDO will evaluate your sundry and may require additional information if necessary. Please be aware that if the LCDO can approve the new sundry notice, it will likely require a supplement to your current reclamation bond (NMB000512) to cover the cost of future abandonment of the previously closed federal well 55-7. Additional bond monies may be required depending on the activities described in your sundry notice.

As an alternative to the above orders, you may permanently plug and abandon the Federal well 55-7 by February 8, 2011, as required in COA #19 of the GDP for well 55-7. Well plugging and abandonment must meet all relevant requirements and standards of the New Mexico State Engineer's Office and other State Agencies, and will require submission of a Final Abandonment Notice (FAN) to the Las Cruces BLM prior to initiating well closure (43 CFR 3263.10). If you decide to abandon this well, please submit an FAN to the LCDO by 4:30 pm on January 7, 2011.

Federal regulations (43 CFR 3200.4(h)) require geothermal operators to comply with instructions from the BLM authorized officer. BLM decisions issued under 43 CFR part 3200 are immediately effective unless a stay is granted in accordance with 4.21(b) of title 43 CFR (43 CFR 3200.5(b)). Failure to submit the complete sundry notice by January 7, 2010 will result in the issuance of a written Incident of Noncompliance (INC) following the procedures in 43 CFR 3277.12.

#### Appeal Procedures

If you contend that this decision is erroneous and that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.



If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager  
Las Cruces District Office

cc:

Carl Chavez  
New Mexico Energy, Minerals and Natural Resources Department  
Oil Conservation Division  
1220 S. Saint Francis Drive  
Santa Fe, NM 87505

Randy Dade  
New Mexico Energy, Minerals and Natural Resources Department  
Oil Conservation Division District 2  
1301 W. Grand Avenue  
Artesia, NM 88210

Enclosure: Form 1842-1  
Form 3260-3

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

INFORMATION ON TAKING APPEALS TO THE INTERIOR BOARD OF LAND APPEALS

DO NOT APPEAL UNLESS

1. This decision is adverse to you,
- AND
2. You believe it is incorrect

IF YOU APPEAL, THE FOLLOWING PROCEDURES MUST BE FOLLOWED

- A person who wishes to appeal to the Interior Board of Land Appeals must file in the office of the officer who made the decision (not the Interior Board of Land Appeals) a notice that he wishes to appeal. A person served with the decision being appealed must transmit the *Notice of Appeal* in time for it to be filed in the office where it is required to be filed within 30 days after the date of service. If a decision is published in the FEDERAL REGISTER, a person not served with the decision must transmit a *Notice of Appeal* in time for it to be filed within 30 days after the date of publication (43 CFR 4.411 and 4.413).
- 1. NOTICE OF APPEAL.....**
- 2. WHERE TO FILE**
- NOTICE OF APPEAL..... U.S. Department of the Interior  
Bureau of Land Management  
1800 Marquess Street  
Las Cruces, NM 88005
- WITH COPY TO SOLICITOR... Office of the Solicitor  
U.S. Department of the Interior, Santa Fe Unit  
1100 Old Santa Fe Trail  
Santa Fe, NM 87505
- 3. STATEMENT OF REASONS**
- Within 30 days after filing the *Notice of Appeal*, file a complete statement of the reasons why you are appealing. This must be filed with the United States Department of the Interior, Office of Hearings and Appeals, Interior Board of Land Appeals, 801 N. Quincy Street, MS 300-QC, Arlington, Virginia 22203. If you fully stated your reasons for appealing when filing the *Notice of Appeal*, no additional statement is necessary (43 CFR 4.412 and 4.413).
- WITH COPY TO SOLICITOR..... Office of the Solicitor  
U.S. Department of the Interior, Santa Fe Unit AND U.S. Department of the Interior  
1100 Old Santa Fe Trail Bureau of Land Management  
Santa Fe, NM 87505 1800 Marquess Street  
Las Cruces, NM 88005
- 4. ADVERSE PARTIES.....** Within 15 days after each document is filed, each adverse party named in the decision and the Regional Solicitor or Field Solicitor having jurisdiction over the State in which the appeal arose must be served with a copy of: (a) the *Notice of Appeal*, (b) the Statement of Reasons, and (c) any other documents filed (43 CFR 4.413).
- 5. PROOF OF SERVICE.....** Within 15 days after any document is served on an adverse party, file proof of that service with the United States Department of the Interior, Office of Hearings and Appeals, Interior Board of Land Appeals, 801 N. Quincy Street, MS 300-QC, Arlington, Virginia 22203. This may consist of a certified or registered mail "Return Receipt Card" signed by the adverse party (43 CFR 4.401(c)).
- 6. REQUEST FOR STAY.....** Except where program-specific regulations place this decision in full force and effect or provide for an automatic stay, the decision becomes effective upon the expiration of the time allowed for filing an appeal unless a petition for a stay is timely filed together with a *Notice of Appeal* (43 CFR 4.21). If you wish to file a petition for a stay of the effectiveness of this decision during the time that your appeal is being reviewed by the Interior Board of Land Appeals, the petition for a stay must accompany your *Notice of Appeal* (43 CFR 4.21 or 43 CFR 2801.10 or 43 CFR 2881.10). A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the *Notice of Appeal* and Petition for a Stay **must** also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.
- Standards for Obtaining a Stay.** Except as otherwise provided by law or other pertinent regulations, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards: (1) the relative harm to the parties if the stay is granted or denied, (2) the likelihood of the appellant's success on the merits, (3) the likelihood of immediate and irreparable harm if the stay is not granted, and (4) whether the public interest favors granting the stay.

Unless these procedures are followed, your appeal will be subject to dismissal (43 CFR 4.402). Be certain that all communications are identified by serial number of the case being appealed.

**NOTE:** A document is not filed until it is actually received in the proper office (43 CFR 4.401(a)). See 43 CFR Part 4, Subpart B for general rules relating to procedures and practice involving appeals.

**43 CFR SUBPART 1821--GENERAL INFORMATION**

Sec. 1821.10 Where are BLM offices located? (a) In addition to the Headquarters Office in Washington, D.C. and seven national level support and service centers, BLM operates 12 State Offices each having several subsidiary offices called Field Offices. The addresses of the State Offices can be found in the most recent edition of 43 CFR 1821.10. The State Office geographical areas of jurisdiction are as follows:

**STATE OFFICES AND AREAS OF JURISDICTION:**

Alaska State Office ----- Alaska  
Arizona State Office ----- Arizona  
California State Office ----- California  
Colorado State Office ----- Colorado  
Eastern States Office ----- Arkansas, Iowa, Louisiana, Minnesota, Missouri  
and, all States east of the Mississippi River  
Idaho State Office ----- Idaho  
Montana State Office ----- Montana, North Dakota and South Dakota  
Nevada State Office ----- Nevada  
New Mexico State Office ---- New Mexico, Kansas, Oklahoma and Texas  
Oregon State Office ----- Oregon and Washington  
Utah State Office ----- Utah  
Wyoming State Office ----- Wyoming and Nebraska

(b) A list of the names, addresses, and geographical areas of jurisdiction of all Field Offices of the Bureau of Land Management can be obtained at the above addresses or any office of the Bureau of Land Management, including the Washington Office, Bureau of Land Management, 1849 C Street, NW, Washington, DC 20240.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

**GEOHERMAL SUNDRY NOTICE**

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:

2. Name of Lessee/Operator

3. Address of Lessee/Operator

4. Location of Well or Facility

6. Lease Serial No.

7. Surface Manager:  BLM  FS  
 Other

8. Unit Agreement Name

9. Well No.

10. Permit No.

11. Field or Area

12. Sec., T., R., B. & M.

13. County

14. State

5. Type of Work

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Change Plans                         | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input type="checkbox"/> Abandon              |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input type="checkbox"/> Other                |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

(This space for Federal use)

Approved by \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

## GENERAL INSTRUCTIONS

This form must be used for applications for well work, road, site and facilities construction and other miscellaneous activities performed on Federally leased lands which are related to operations performed under an approved Plan of Operation.

## SPECIFIC INSTRUCTIONS

Item 1b: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (explain).

Item 15: The latest well conditions (hole size, casing, cement, perforations, producing and injecting zones, etc.) along with all proposed additions/changes must be shown. When completing this section, list existing well program first, followed by the proposed program, and separate by a sufficient space to clearly distinguish the two programs. Current well conditions may be either listed in this section or may be shown by attaching a copy of the latest completion report on the subject well.

Item 16: Attach all pertinent engineering plans and specifications.

Completed Operations: Thirty days after completion of all operations other than construction activities, approved under this permit, a completion report must be submitted in duplicate, to the BLM. The completion report must include a copy of the approved Geothermal Sundry Notice with an attached report detailing all important activities performed and the completion and abandonment procedures undertaken. Copies of all records of the operations must accompany the report if not previously submitted.

## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application. AUTHORITY: 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

PRINCIPAL PURPOSE: The BLM uses this information to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

ROUTINE USES: (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal; and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

EFFECT OF NOT PROVIDING INFORMATION: Disclosure of the information is required to process the application. If all the information is not provided, the application may be rejected.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to evaluate your proposed and/or completed subsequent well operations on Federal geothermal leases.

The BLM will use this information to report subsequent operations once work is completed, and, when you request it, to approve subsequent operations.

Response to this request is mandatory for the specific types of activities specified in the geothermal operations regulations at 43 CFR 3260.

The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0132), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington D.C. 20240.

## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Tuesday, December 07, 2010 11:01 AM  
**To:** 'Mike\_Smith@blm.gov'  
**Subject:** FW: Information re 55-07

FYI.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

-----Original Message-----

From: Ben Barker [mailto:Ben.Barker@rasertech.com]  
Sent: Tuesday, December 07, 2010 7:12 AM  
To: Chavez, Carl J, EMNRD; Dade, Randy, EMNRD  
Cc: VonGonten, Glenn, EMNRD; Del Fortner (External)  
Subject: RE: Information re 55-07

Thank you, Carl. I have distributed copies and Del Fortner will be at the site tomorrow before rig-up begins to review the conditions you cited, as well as BLM's, with the drilling contractor and the rest of the team. If your travel restrictions have eased we would be pleased to have you join us.

Best regards,  
Ben

VP Resource Management  
Raser Technologies  
5152 N. Edgewood Drive  
Provo, UT 84604  
801-765-1200 office  
801-850-5904 direct  
801-857-5301 mobile1  
707-508-9963 mobile2

-----Original Message-----

From: Chavez, Carl J, EMNRD [mailto:CarlJ.Chavez@state.nm.us]  
Sent: Tuesday, December 07, 2010 6:20 AM  
To: Dade, Randy, EMNRD  
Cc: VonGonten, Glenn, EMNRD; Del Fortner (External); Ben Barker  
Subject: FW: Information re 55-07

FYI.

To review OCD conditions for drilling Well 45-07, please go to:  
<http://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=pCJC0813635742> (See G-101s thumbnail).

Thanks.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
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E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

-----Original Message-----

From: Mike\_Smith@blm.gov [mailto:Mike\_Smith@blm.gov]  
Sent: Monday, December 06, 2010 4:35 PM  
To: Del Fortner  
Cc: 'Ben Barker'; 'Michael Hayter'; William\_Childress@blm.gov; Edward\_Seum@nm.blm.gov; Chavez, Carl J, EMNRD  
Subject: Re: Information re 55-07

Del:

Thank you very much for the update and for your efforts to fill in the information gap. The main issue is that BLM was not informed of the start-up of the interference test and thus did not perform inspections of activities during the test.

We were expecting the new sundry notice prior to the initiation of the interference test - there was a lot of discussion about that over the past two months. The point of the new sundry notice (to my understanding) was to modify the bird-protection stipulations required in the GDP and WO. During my phone conversation with Mr. Barker on Nov. 8, 2010, we discussed that changes to bird protection measure would not be necessary if there was no discharge to the reserve pit. But unfortunately, I did not receive any notification (e-mail) that Raser Tech would proceed with the interference test on the premise they would only discharge to the irrigation field and not to the reserve pit (to be fair, I don't recall specifically asking for this either). So was the new sundry notice necessary? - I can't answer that because we're not able to verify what activities occurred during the interference test.

We appreciate Raser Technologies Inc's. attempts to assure the BLM that there were no discharges outside of the irrigated field or unauthorized diversions of the geothermal resource. Unfortunately, this self-reporting from the proponent cannot be accepted in the project record without an independent verification by BLM. If any future concerns develop regarding activities since BLM's last inspection (Oct. 18, 2010), I will have to answer that I was not able to confirm what did or did not happen during the interference test.

I will be in Hidalgo County on Wednesday December 8 because I have a previously scheduled field review of an exploratory drilling project, and I will try to make it down for the drilling of the 45-07 production well. I can't guarantee an exact time because I don't know how long this other meeting will take, but will make all efforts to be at the 45-07 site at 1300.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
Mike\_Smith@blm.gov

"Del Fortner"  
<delfortner@char  
ter.net>  
To  
<Mike\_Smith@blm.gov>  
12/04/2010 11:35 AM  
cc  
"Ben Barker"

<Ben.Barker@rasertech.com>,  
"Michael Hayter"  
<Michael.Hayter@rasertech.com>,  
<rbageo@sbcglobal.net>  
Subject  
Information re 55-07

Mike, attached is information for you regarding activities at 55-07 since your conversation with Ben on or about 11/7. It appears that Raser followed the GDP but did not use the pit for cooling the produced water. So you require additional information? Regards, Del

Del Fortner  
775.530.8803

From: Ben Barker [mailto:Ben.Barker@rasertech.com]  
Sent: Friday, December 03, 2010 10:39 PM  
To: Del Fortner; Michael Hayter  
Cc: Roger Bowers (External)  
Subject: RE: BLM notified re drilling of 45-07

Del,

After hearing Mike's concern about discharges I asked Jim Rosser to remove any connection or hose to the pond. He had that done and we persuaded Dale not to fill the pit with fresh water. Please reassure Mike that we respect his trust and have behaved ourselves so that he could inspect at any time. The pit is dry, unless there was a rain shower I missed.

We plan to shut off the pump in 55-7 tomorrow morning and record pressure transient data. We can declare the test complete when we remove the flow line next week.

Thanks,  
Ben

-----Original Message-----

From: Del Fortner [mailto:delfortner@charter.net]  
Sent: Fri 12/3/2010 5:26 PM  
To: Michael Hayter; Ben Barker  
Cc: Roger Bowers (External)  
Subject: BLM notified re drilling of 45-07

I spoke with Mike Smith regarding 45-07 and provided him with the 5-day notice. He said the phone call was acceptable but asked me to send him an email this evening to follow-up. I will send this shortly. In addition, according to the GDP, I contacted Glen Garnand and Rich Estabrook. I also called Carl Chavez (OCD) and left a message. I did not call OSE as I noticed that Mike Hayter is working with them and probably is giving them the heads-up.

Mike Smith brought up 55-07. He asked me what was going on at the 55-07 location and how the interference test was coming along. If someone can draft a status on 55-07, please do so and send it to me. I will forward it to Mike Smith. He reminded me that they require a 30-day notice upon completion of activities at 55-07.



Regards, Del

Confidentiality Notice: This e-mail, including all attachments is for the sole use of the intended recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure or distribution is prohibited unless specifically provided under the New Mexico Inspection of Public Records Act. If you are not the intended recipient, please contact the sender and destroy all copies of this message. -- This email has been scanned by the Sybari - Antigen Email System.

## Chavez, Carl J, EMNRD

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Mike\_Smith@blm.gov

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<delfortner@char  
ter.net> To  
<Mike\_Smith@blm.gov>  
12/04/2010 11:35 AM cc  
"Ben Barker"  
<Ben.Barker@rasertech.com>,  
"Michael Hayter"  
<Michael.Hayter@rasertech.com>,  
<rbageo@sbcglobal.net>  
Subject  
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Regards, Del

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**GEOHERMAL DRILLING PERMIT**

RECEIVED 00D

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operation.

7. Lease Serial No. 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 51-07 | 11. Permit No.

12. Field or Area

13. Sec., T., R., B. & M. NW4NW4NE4, Sec. 7, T25S, R19W, NMBM

14. County Hidalgo

15. State NM

16. Approx. Starting Date 07/15/2010

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: New Well

2. Name of Lessee/Operator Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator 5152 North Edgewood Drive, Suite 200, Provo, Utah 84604

4. Location of Well  
At surface  
At proposed prod. Zone

5. Distance from Proposed Location to Nearest Property or Lease Line 169.2 FNL and 2406.9 FEL

6. Distance from Proposed Location to Nearest Well or Previously Applied for Well Location on this Lease.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400'

20. Elevations:  Estimated  Final  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (conductor)	3/8" wall		PEBFM	GL	40'	496 sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 sacks
12.25"	9.625" liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM 108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23. [Signature] Vice President, Resource Management 06/17/2010  
Signed Title Date

(This space for Federal use)

Approved by [Signature] Title District Manager Date 10/20/2010  
Conditions of Approval, if any: See attached COAT

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

## GENERAL INSTRUCTIONS

This form must be submitted for any application to drill for, test, extract, produce, dispose and/or utilize the actual geothermal resources on Federally leased land or lands covered by a unit or cooperative agreement.

## SPECIFIC INSTRUCTIONS

Item 1C: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (explain).

Item 7: Number the wells using the Modified Kettleman Well Numbering System (see below).

Item 15: Show the surface location coordinates from the nearest section corner or tract lines and if the well is to be directionally drilled, the proposed zone coordinates (top and bottom) from the surface location.

Item 19: Indicate reference datum from which measurement was made (see item 20).

Item 20: If the reference datum shown is not the graded mat, also show the measurement from the mat surface (e.g., mat-to-derrick floor (DF) measurement, mat-to-rotary table (RT) measurement, mat-to-kelly bushing (KB) measurement, etc.)

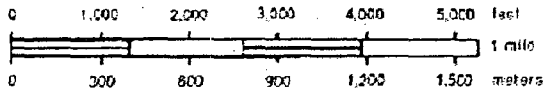
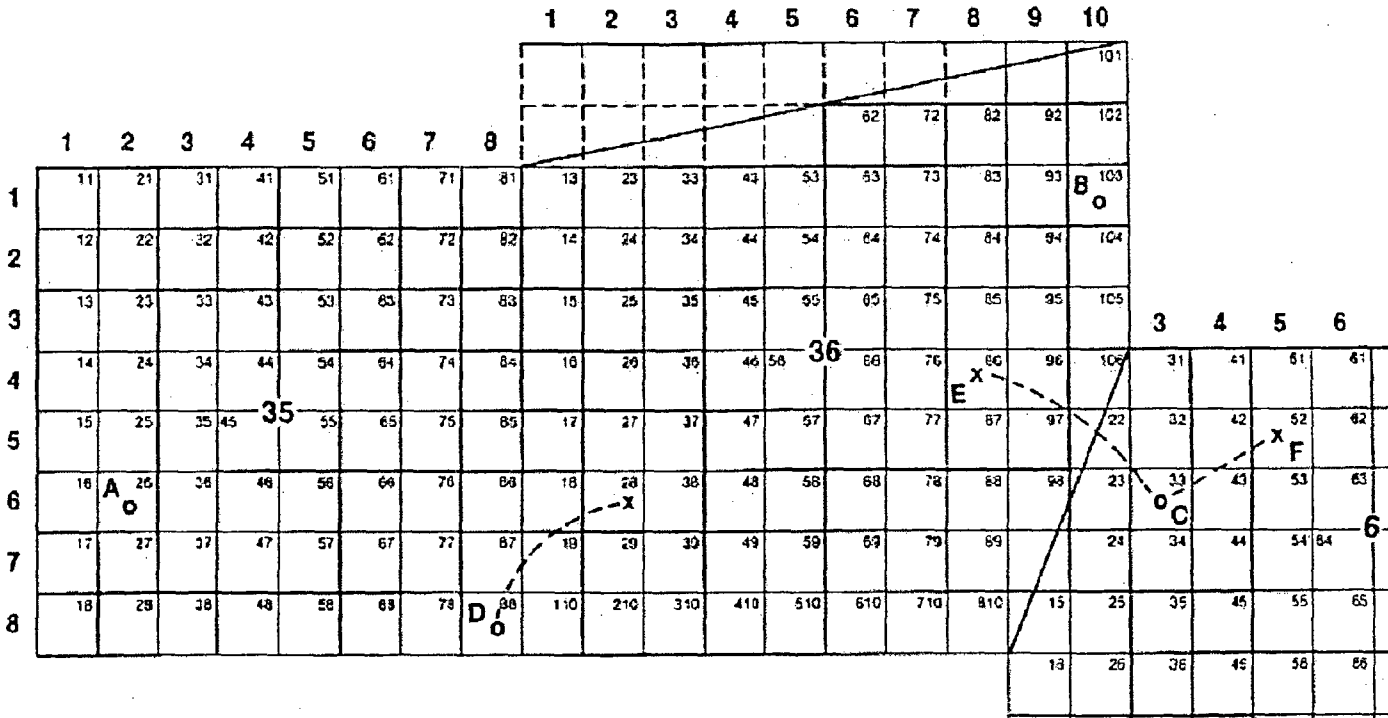
Item 21: For subsequent well work the latest well conditions along with all proposed additions and changes must be shown. To show current well conditions, either fill out this item or attach the latest completion report on the subject well.

Item 22: Summarize other pertinent existing data such as producing and injecting zones, type, size, density of perforations and perforated intervals, etc., in addition to the proposed work. Indicate reasons for changes undertaken.

### PROCEDURE FOR NUMBERING GEOTHERMAL WELLS USING THE MODIFIED KETLEMAN WELL NUMBERING SYSTEM

1. Subdivide the sections where the wells are to be located into 10-acre (660 feet x 660 feet) subdivisions. Number each horizontal and vertical subdivision starting in the northwest corner of each section with 1.1 and increasing to the east and south. A regular 640-acre section contains 64 subdivisions numbered from 11 to 88 (vertical digit first followed by the horizontal digit).
2. Number the first vertical well with the number of the 10-acre subdivision in which it is located followed by the section number. (See examples "A", "B", and "C", below.) If the first well is directionally drilled, number it with the subdivision number of its surface location, followed by the subdivision number in which the bottom of the completion interval lies and that section number (if different from the surface section number), and followed by the surface section number. (See Example "D".)
3. Subsequent wells drilled from the same 10-acre surface location are numbered in the manner described above with an A, B, C, etc., added following the surface subdivision number. (See Examples "E" and "F".)
4. For sections with irregular boundaries, align a 10-acre grid pattern North-South, running through the westernmost section point or line and East-West running through the northernmost section point or line. Number wells according to the 10-acre grid, subdividing as far as possible to the east and south.

Example A 26-35      Example D Directional 88(28-36)-35  
 Example B 103-36      Example E Directional 33A(86-36)-6  
 Example C 33-6          Example F Directional 33B(52)-6



## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

**AUTHORITY:** 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

**PRINCIPAL PURPOSE:** The BLM uses this information to evaluate the technical, safety, and environmental factors involved with geothermal resources on Federal geothermal leases.

**ROUTINE USES:** (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal; and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to process the application. If all information is not provided, the application may be rejected.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to allow us to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

The BLM will use this information to analyze and approve operations.

Response to this request is mandatory only if you want to initiate drilling operations on a geothermal lease.

The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0132), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington D.C. 20240.

# Lightning Dock Area of Review Animas Valley, NM

**Map Scale:** 1:50,000  
**Map Date:** 10/2011  
**Map Author:** [Redacted]  
**Map Title:** Lightning Dock Area of Review Animas Valley, NM  
**Map Purpose:** To provide a visual representation of the Lightning Dock Area of Review in the Animas Valley, NM, showing the locations of existing and proposed wells, monitoring wells, and other features. The map is intended for informational purposes only and does not constitute a guarantee of accuracy or completeness. The information is based on the best available data at the time of the map's creation. The map is subject to change without notice. The map is provided as a service to the public and is not intended for use in legal proceedings or other official matters. The map is the property of the Bureau of Land Management and is loaned to the user. The user agrees to return the map in good condition and to not make any copies or modifications to the map. The user also agrees to hold the Bureau of Land Management harmless from any claims, damages, or liabilities that may arise from the use of the map. The map is provided on the condition that the user will not use it for any purpose other than the one for which it was intended. The map is provided as a service to the public and is not intended for use in legal proceedings or other official matters. The map is the property of the Bureau of Land Management and is loaned to the user. The user agrees to return the map in good condition and to not make any copies or modifications to the map. The user also agrees to hold the Bureau of Land Management harmless from any claims, damages, or liabilities that may arise from the use of the map. The map is provided on the condition that the user will not use it for any purpose other than the one for which it was intended.

## Wells

Number	Description
0	Injection Well - Federal
1	Production Well - Federal
2	Monitoring Well - Federal
3	Abandoned Well - Federal
4	Well No. 1 - State - Abipet
5	Well No. 2 - State - Abipet
6	Well No. 3 - State - Abipet
7	Well No. 4 - State - Abipet
8	Well No. 5 - State - Abipet
9	Well No. 6 - State - Abipet
10	Well No. 7 - State - Abipet
11	Well No. 8 - State - Abipet
12	Well No. 9 - State - Abipet
13	Well No. 10 - State - Abipet
14	Well No. 11 - State - Abipet
15	Well No. 12 - State - Abipet
16	Well No. 13 - State - Abipet
17	Well No. 14 - State - Abipet
18	Well No. 15 - State - Abipet
19	Well No. 16 - State - Abipet
20	Well No. 17 - State - Abipet
21	Well No. 18 - State - Abipet
22	Well No. 19 - State - Abipet
23	Well No. 20 - State - Abipet
24	Well No. 21 - State - Abipet
25	Well No. 22 - State - Abipet
26	Well No. 23 - State - Abipet
27	Well No. 24 - State - Abipet
28	Well No. 25 - State - Abipet
29	Well No. 26 - State - Abipet
30	Well No. 27 - State - Abipet
31	Well No. 28 - State - Abipet
32	Well No. 29 - State - Abipet
33	Well No. 30 - State - Abipet
34	Well No. 31 - State - Abipet
35	Well No. 32 - State - Abipet
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94	Well No. 91 - State - Abipet
95	Well No. 92 - State - Abipet
96	Well No. 93 - State - Abipet
97	Well No. 94 - State - Abipet
98	Well No. 95 - State - Abipet
99	Well No. 96 - State - Abipet
100	Well No. 97 - State - Abipet

**Proposed Wells**

- Injection Well (No. 100) - Federal
- Production Well (No. 101) - Federal
- Monitoring Well (No. 102) - Federal
- Abandoned Well (No. 103) - Federal
- Well No. 104 - State - Abipet
- Well No. 105 - State - Abipet
- Well No. 106 - State - Abipet
- Well No. 107 - State - Abipet
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- Well No. 147 - State - Abipet
- Well No. 148 - State - Abipet
- Well No. 149 - State - Abipet
- Well No. 150 - State - Abipet

**Proposed Monitoring Wells**

- Monitoring Well (No. 151) - Federal
- Monitoring Well (No. 152) - Federal
- Monitoring Well (No. 153) - Federal
- Monitoring Well (No. 154) - Federal
- Monitoring Well (No. 155) - Federal
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- Monitoring Well (No. 200) - Federal

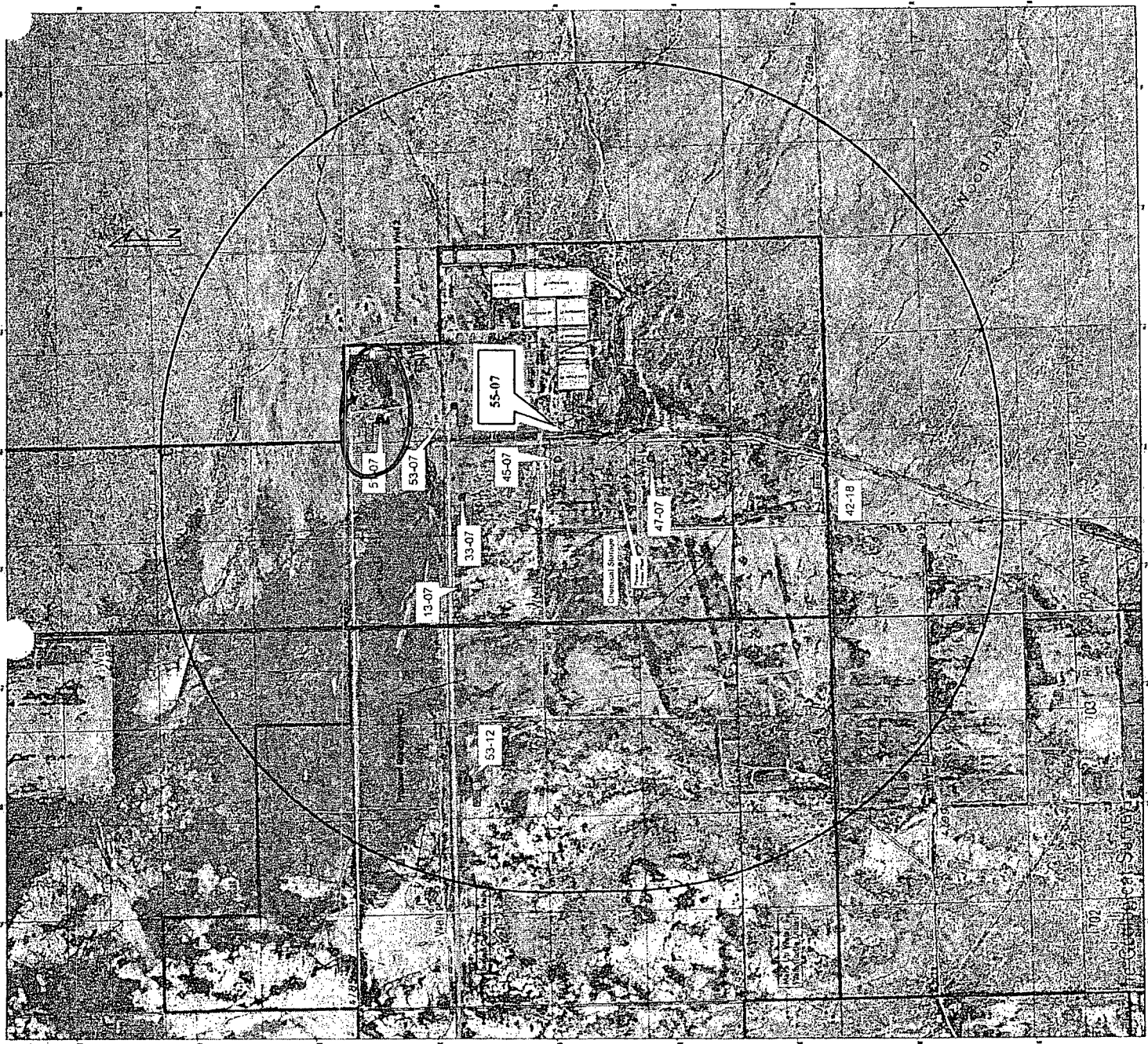
**Proposed Power Plant**

- Power Plant (No. 201) - Federal
- Power Plant (No. 202) - Federal
- Power Plant (No. 203) - Federal
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- Power Plant (No. 206) - Federal
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- Power Plant (No. 237) - Federal
- Power Plant (No. 238) - Federal
- Power Plant (No. 239) - Federal
- Power Plant (No. 240) - Federal

**Other Features**

- Geothermal Lease
- Bureau of Land Management
- Private Land
- State Land
- County of Santa Fe
- County of Sandoval
- County of Valencia
- County of Dona Ana
- County of Grant
- County of Lincoln
- County of Mora
- County of Otero
- County of Quay
- County of Rio Arriba
- County of San Juan
- County of San Miguel
- County of Socorro
- County of Taos
- County of Torrance
- County of Yuma

**Scale:** 0 0.1 0.2 0.3 0.4 Miles  
 0 0.25 0.5 0.75 KM





**CONDITIONS OF APPROVAL**  
**NMNM034790 WELL 51-07 (approved Oct. 20, 2010)**

1. The following information shall be posted at a conspicuous location at the well:

**Operator Name:**

**Lease No.:**

**Well Name & No.:**

**County:**

**Location:**

2. The operator shall follow all procedures outlined in the approved operations and drilling plan and addendums. Any variations in the approved operations and drilling plan shall be incorporated by written amendment (sundry notice: BLM form 3260-3) to the approved GDP and shall be subject to approval by the Las Cruces District Office (LCDO). The operator shall permit the LCDO sufficient time to evaluate any environmental effects of the amendment prior to initiating the revised activities (43 CFR §3261.17).

3. The operator shall be responsible for the protection from damage of all identified cultural resources within the area which may be affected by their actions. In addition, the operator shall be liable for all damage or injury to the identified cultural resources caused by their actions. The operator shall immediately notify the Agency Official if any damage occurs to any cultural resource and immediately halt work in the area in which damage has occurred until approval to proceed has been granted by the Agency Official after consultation with the BLM Archeologist.

4. If previously undiscovered heritage resources (historic or prehistoric) are exposed or disturbed as a result of operations authorized under this contract, the operator shall leave such discoveries intact, cease operations in the area so affected, and immediately notify the Las Cruces Field Office. The operator shall not proceed until they are notified by the BLM in writing that all provisions or recovery of heritage resources are met.

5. Pursuant to the Native American Grave Protection and Repatriation Act (NAGPRA) 25 USC 3002(d); 43 CFR Part 10.4, if any human remains, funerary objects, sacred objects, or objects of possible cultural significance are discovered during the course of ground disturbing activity, the operator will immediately cease activity in the area of the discovery and will make a reasonable effort to protect the remains and objects. The operator will provide immediate telephone notification of the discovery to the Las Cruces Field Office, and will follow up with written confirmation to the authorized officer. The operator will not resume the activity that resulted in the discovery until the authorized officer gives written approval. Approval to resume the activity, if otherwise lawful, will be given thirty (30) days after certification by the Agency Official of the operator's written confirmation of the discovery, or at any time that a written binding agreement is executed between the BLM and the affiliated tribes adopting a recovery plan for the remains and objects.

6. To prevent the spread of noxious weeds, the operator shall clean all earth-moving and hauling equipment prior to its initial move-in to the area. This cleaning shall remove all soil, seeds, vegetative matter, or other debris that could contain or hold seeds or plant parts. The operator shall employ power-wash or high pressure cleaning or whatever cleaning methods are necessary to ensure that equipment is free of noxious weed sources. Equipment shall be considered free of soil, seed and plant debris when a visual inspection does not detect such material. The operator shall contact the Las Cruces District Office at least five (5) working days prior to mobilizing equipment and vehicles to arrange for an inspection to assure

compliance. The operator and BLM inspector will arrange to meet at a mutually accessible location outside of the public lands for the inspection. Any equipment that does pass such an inspection shall not be utilized until it has been cleaned by the operator and inspected again by the LCDO. If any equipment subsequently operates outside the project area, the operator shall contact the Las Cruces District Office at least five (5) working days prior to re-mobilization on the public land and arrange for a new inspection.

7. Operator shall utilize water trucks for onsite dust control as necessary.

8. Operator shall provide the LCDO with a minimum five (5) days notice prior to beginning operations in order to schedule inspections over the period of operations. The operator shall inform BLM of both drilling and well-test completion and schedule a final inspection no more than three (3) days after operations are completed.

9. In the event water analysis exceeds applicable State of New Mexico standards and Oil Conservation Division (OCD) requirements, all pump testing and discharge/irrigation activities shall cease until the operator has met the requirements of the OCD conditions of approval for water quality. Prior to restarting operations, the operator shall obtain written acknowledgement from OCD that State standards and requirements have been met and provide a copy to the LCDO.

10. To minimize visual impacts and disorientation of birds and bats during night operations, drill rig and testing facility lights shall be limited to those required to safely conduct operations. All lights shall be shielded and/or directed in a manner which focuses direct light to the immediate work area.

11. The reserve pits shall be constructed and fenced in a manner consistent with applicable best management practices outlined in BLM *Surface Operating Standards and Guidelines for Oil and Gas Exploration* (the "Gold Book"), fourth edition, 2007 (p. 16-17).

12. Operator shall complete pre-construction survey for listed species and for burrowing owl nests. Survey for and avoid Giffith's saltbrush and night-blooming cereus within the area of operations. The survey will be completed by a BLM qualified biologist and all results shall be presented in writing to BLM prior to initiating operations.

13. The reserve pit shall be covered with a safe grating or approved floating devices ("bird balls") sufficient to prevent migratory birds from accessing the pits. Nets shall not be installed as this tends to trap birds and bats. Reserve pits shall be monitored to minimize entrapment of small mammals, reptiles and amphibians

14. A minimum of two feet of freeboard shall be maintained in the reserve pit. If a synthetic liner is required in the reserve pits by OCD, it shall have a permeability of  $< 10^{-7}$  cm/sec and be composed of materials compatible with pit temperatures and contents.

15. All equipment shall be kept in safe operating order and free of any oil, fuel or fluid leaks. Impermeable liners (25 mm HDPE or equivalent) shall be placed under likely spill sources.

Any soils, water or materials contaminated by fuels, lubricants or engine fluids shall be immediately cleaned, isolated in appropriate containers and disposed of at approved waste-receiving facilities.

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

**Overview**

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

**Borehole Design**

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

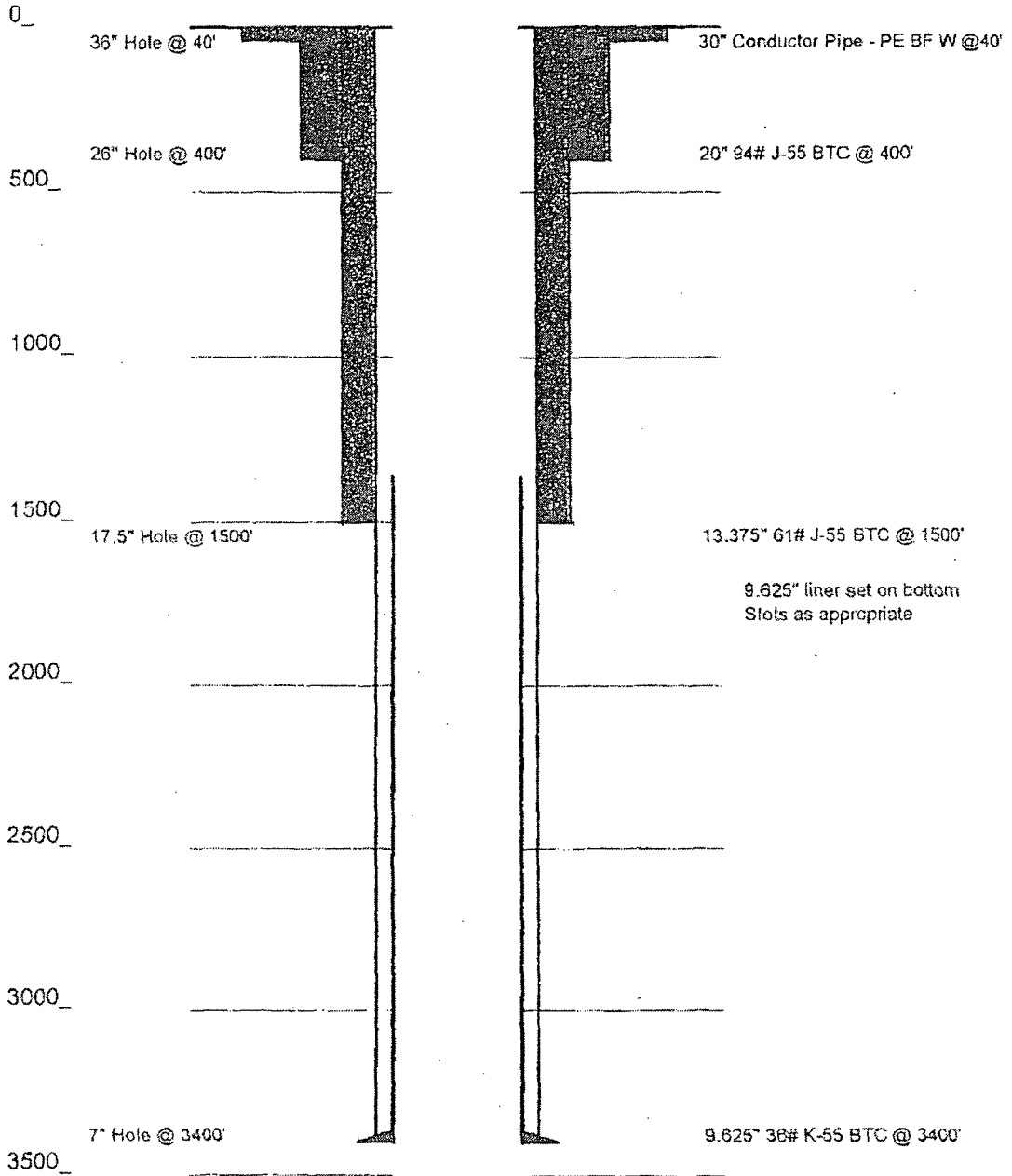
If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A



# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures
  - a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
    - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
    - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
    - iii. [Equal to] 2,000 psi.
  - b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
    - i. Drilling mud temperature.
    - ii. Drilling mud pit level.
    - iii. Drilling mud pump volume.
    - iv. Drilling mud weight.
    - v. Drilling rate.
    - vi. Hydrogen sulfide gas volume.
  - c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.
- Using Mud as the Drilling Fluid
  - a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:
  - i. Check the accumulator pressure.
  - ii. Check pressure of the emergency backup system.
  - iii. Check hydraulic fluid level in the accumulator.
  - iv. Check air pressure to support system.
  - v. Record all of the above in IADC log book and well ledger.
- b. Every trip, but not twice within a 24 hour period:
  - i. Function test pipe rams (when inside shoe).
  - ii. Function test blind rams (when inside shoe).
  - iii. Operate all Kelly cocks.
  - iv. Check Drill pipe safety valve.
  - v. Function test HCR valve.
  - vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.
- c. Every 7 days (1 week) actuate the following:
  - i. Annular preventer.
  - ii. All gate valves in the choke and kill system.
  - iii. Inside BOP.
  - iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.



## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2010 JUN 21 AM 9:47

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

**GEOHERMAL DRILLING PERMIT**

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operation.

7. Lease Serial No. 849017

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 53-12 11. Permit No.

12. Field or Area

13. Sec., T., R., B. & M. NW4SW4NE4, Sec. 12, T25S, R20W, NMBM

14. County Hidalgo

15. State NM

16. Approx. Starting Date 07/15/2010

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: New Well

2. Name of Lessee/Operator Lightning Dock Geothermal HI-01, LLC

3. Address of Lessee/Operator 5152 North Edgewood Drive, Suite 200, Provo, Utah 84604

4. Location of Well  
At surface  
At proposed prod. Zone

5. Distance from Proposed Location to Nearest Property or Lease Line 1574.8 FNL & 3350 FWL

6. Distance from Proposed Location to Nearest Well or Previously Applied for Well Location on this Lease.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400'

20. Elevations:  Estimated  Final  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (conductor)	3/8" wall		PEBFM	GL	40'	496 sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500"	913 sacks
12.25"	9.625" liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM 108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23. B. J. Baker Vice President, Resource Management 06/17/2010  
Signed Title Date

(This space for Federal use)  
Approved by Bill Child Title District Manager Date 10/20/2010  
Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

## GENERAL INSTRUCTIONS

This form must be submitted for any application to drill for, test, extract, produce, dispose and/or utilize the actual geothermal resources on Federally leased land or lands covered by a unit or cooperative agreement.

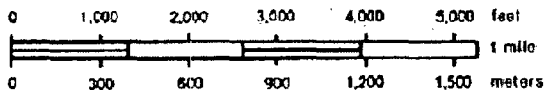
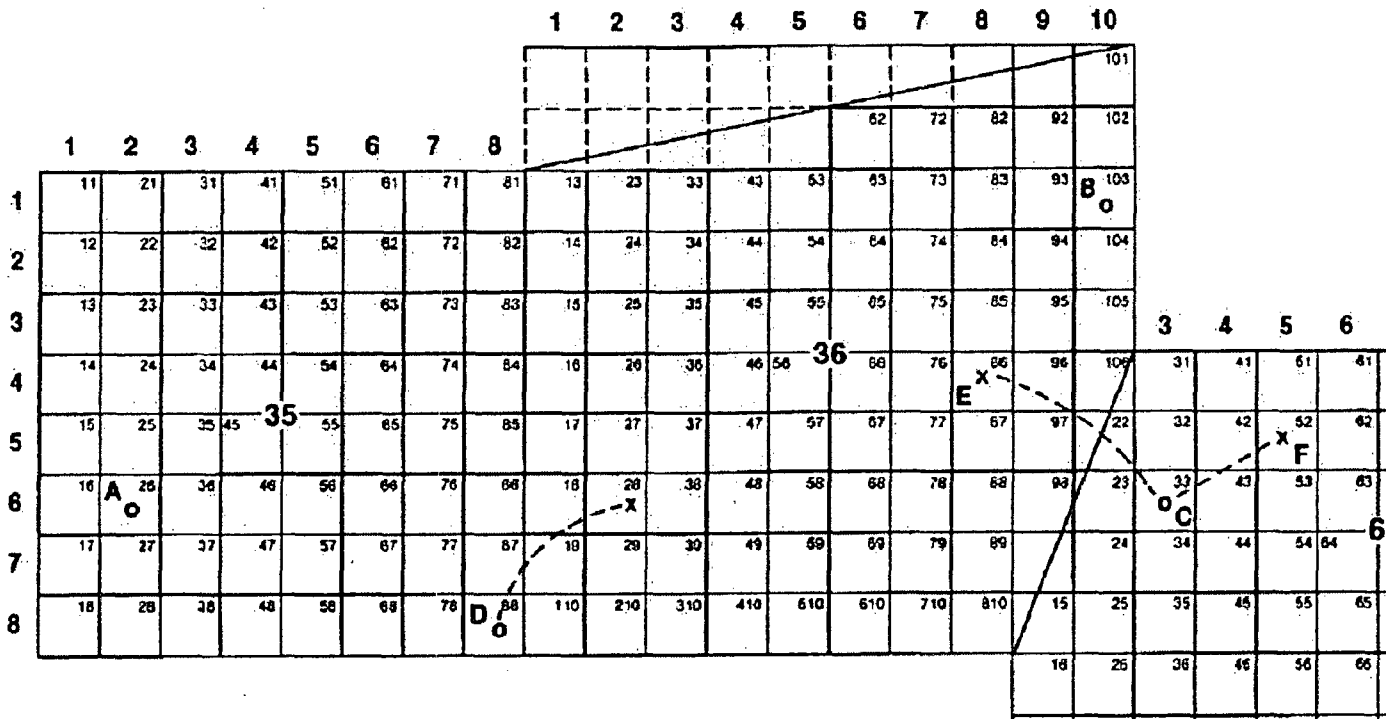
## SPECIFIC INSTRUCTIONS

- Item 1C: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (*explain*).
- Item 7: Number the wells using the Modified Kettleman Well Numbering System (*see below*).
- Item 15: Show the surface location coordinates from the nearest section corner or tract lines and if the well is to be directionally drilled, the proposed zone coordinates (*top and bottom*) from the surface location.
- Item 19: Indicate reference datum from which measurement was made (*see item 20*).
- Item 20: If the reference datum shown is not the graded mat, also show the measurement from the mat surface (*e.g., mat-to-derrick floor (DF) measurement, mat-to-rotary table (RT) measurement, mat-to-kelly bushing (KB) measurement, etc.*)
- Item 21: For subsequent well work the latest well conditions along with all proposed additions and changes must be shown. To show current well conditions, either fill out this item or attach the latest completion report on the subject well.
- Item 22: Summarize other pertinent existing data such as producing and injecting zones, type, size, density of perforations and perforated intervals, etc., in addition to the proposed work. Indicate reasons for changes undertaken.

### PROCEDURE FOR NUMBERING GEOTHERMAL WELLS USING THE MODIFIED KETTLEMAN WELL NUMBERING SYSTEM

1. Subdivide the sections where the wells are to be located into 10-acre (660 feet x 660 feet) subdivisions. Number each horizontal and vertical subdivision starting in the northwest corner of each section with 1.1 and increasing to the east and south. A regular 640-acre section contains 64 subdivisions numbered from 11 to 88 (*vertical digit first followed by the horizontal digit*).
2. Number the first vertical well with the number of the 10-acre subdivision in which it is located followed by the section number. (*See examples "A", "B", and "C", below.*) If the first well is directionally drilled, number it with the subdivision number of its surface location, followed by the subdivision number in which the bottom of the completion interval lies and that section number (*if different from the surface section number*), and followed by the surface section number. (*See Example "D".*)
3. Subsequent wells drilled from the same 10-acre surface location are numbered in the manner described above with an A, B, C, etc., added following the surface subdivision number. (*See Examples "E" and "F".*)
4. For sections with irregular boundaries, align a 10-acre grid pattern North-South, running through the westernmost section point or line and East-West running through the northernmost section point or line. Number wells according to the 10-acre grid, subdividing as far as possible to the east and south.

Example A    26-35            Example D Directional 88(28-36)-35  
 Example B    103-36            Example E Directional 33A(86-36)-6  
 Example C    33-6                Example F Directional 33B(52)-6



## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

**AUTHORITY:** 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

**PRINCIPAL PURPOSE:** The BLM uses this information to evaluate the technical, safety, and environmental factors involved with geothermal resources on Federal geothermal leases.

**ROUTINE USES:** (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal; and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to process the application. If all information is not provided, the application may be rejected.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to allow us to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

The BLM will use this information to analyze and approve operations.

Response to this request is mandatory only if you want to initiate drilling operations on a geothermal lease.

The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0132), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington D.C. 20240.

**CONDITIONS OF APPROVAL**  
**NMNM034790 WELL 53-12 (approved Oct. 20, 2010)**

1. The following information shall be posted at a conspicuous location at the well:

<b>Operator Name:</b>	<b>Lease No.:</b>
<b>Well Name &amp; No.:</b>	<b>County:</b>
<b>Location:</b>	

2. The operator shall follow all procedures outlined in the approved operations and drilling plan and addendums. Any variations in the approved operations and drilling plan shall be incorporated by written amendment (sundry notice: BLM form 3260-3) to the approved GDP and shall be subject to approval by the Las Cruces District Office (LCDO). The operator shall permit the LCDO sufficient time to evaluate any environmental effects of the amendment prior to initiating the revised activities (43 CFR §3261.17).

3. The operator shall be responsible for the protection from damage of all identified cultural resources within the area which may be affected by their actions. In addition, the operator shall be liable for all damage or injury to the identified cultural resources caused by their actions. The operator shall immediately notify the Agency Official if any damage occurs to any cultural resource and immediately halt work in the area in which damage has occurred until approval to proceed has been granted by the Agency Official after consultation with the BLM Archeologist.

4. If previously undiscovered heritage resources (historic or prehistoric) are exposed or disturbed as a result of operations authorized under this contract, the operator shall leave such discoveries intact, cease operations in the area so affected, and immediately notify the Las Cruces Field Office. The operator shall not proceed until they are notified by the BLM in writing that all provisions or recovery of heritage resources are met.

5. Pursuant to the Native American Grave Protection and Repatriation Act (NAGPRA) 25 USC 3002(d); 43 CFR Part 10.4, if any human remains, funerary objects, sacred objects, or objects of possible cultural significance are discovered during the course of ground disturbing activity, the operator will immediately cease activity in the area of the discovery and will make a reasonable effort to protect the remains and objects. The operator will provide immediate telephone notification of the discovery to the Las Cruces Field Office, and will follow up with written confirmation to the authorized officer. The operator will not resume the activity that resulted in the discovery until the authorized officer gives written approval. Approval to resume the activity, if otherwise lawful, will be given thirty (30) days after certification by the Agency Official of the operator's written confirmation of the discovery, or at any time that a written binding agreement is executed between the BLM and the affiliated tribes adopting a recovery plan for the remains and objects.

6. To prevent the spread of noxious weeds, the operator shall clean all earth-moving and hauling equipment prior to its initial move-in to the area. This cleaning shall remove all soil, seeds, vegetative matter, or other debris that could contain or hold seeds or plant parts. The operator shall employ power-wash or high pressure cleaning or whatever cleaning methods are necessary to ensure that equipment is free of noxious weed sources. Equipment shall be considered free of soil, seed and plant debris when a visual inspection does not detect such material. The operator shall contact the Las Cruces District Office at least five (5) working days prior to mobilizing equipment and vehicles to arrange for an inspection to assure

compliance. The operator and BLM inspector will arrange to meet at a mutually accessible location outside of the public lands for the inspection. Any equipment that does pass such an inspection shall not be utilized until it has been cleaned by the operator and inspected again by the LCDO. If any equipment subsequently operates outside the project area, the operator shall contact the Las Cruces District Office at least five (5) working days prior to re-mobilization on the public land and arrange for a new inspection.

7. Operator shall utilize water trucks for onsite dust control as necessary.

8. Operator shall provide the LCDO with a minimum five (5) days notice prior to beginning operations in order to schedule inspections over the period of operations. The operator shall inform BLM of both drilling and well-test completion and schedule a final inspection no more than three (3) days after operations are completed.

9. In the event water analysis exceeds applicable State of New Mexico standards and Oil Conservation Division (OCD) requirements, all pump testing and discharge/irrigation activities shall cease until the operator has met the requirements of the OCD conditions of approval for water quality. Prior to restarting operations, the operator shall obtain written acknowledgement from OCD that State standards and requirements have been met and provide a copy to the LCDO.

10. To minimize visual impacts and disorientation of birds and bats during night operations, drill rig and testing facility lights shall be limited to those required to safely conduct operations. All lights shall be shielded and/or directed in a manner which focuses direct light to the immediate work area.

11. The reserve pits shall be constructed and fenced in a manner consistent with applicable best management practices outlined in BLM *Surface Operating Standards and Guidelines for Oil and Gas Exploration* (the "Gold Book"), fourth edition, 2007 (p. 16-17).

12. Operator shall complete pre-construction survey for listed species and for burrowing owl nests. Survey for and avoid Giffith's saltbrush and night-blooming cereus within the area of operations. The survey will be completed by a BLM qualified biologist and all results shall be presented in writing to BLM prior to initiating operations.

13. The reserve pit shall be covered with a safe grating or approved floating devices ("bird balls") sufficient to prevent migratory birds from accessing the pits. Nets shall not be installed as this tends to trap birds and bats. Reserve pits shall be monitored to minimize entrapment of small mammals, reptiles and amphibians

14. A minimum of two feet of freeboard shall be maintained in the reserve pit. If a synthetic liner is required in the reserve pits by OCD, it shall have a permeability of  $< 10^{-7}$  cm/sec and be composed of materials compatible with pit temperatures and contents.

15. All equipment shall be kept in safe operating order and free of any oil, fuel or fluid leaks. Impermeable liners (25 mm HDPE or equivalent) shall be placed under likely spill sources.

Any soils, water or materials contaminated by fuels, lubricants or engine fluids shall be immediately cleaned, isolated in appropriate containers and disposed of at approved waste-receiving facilities.



# Lighting Dock Area of Review Animas Valley, NM

Animas Valley, NM is a geothermal resource area located in the northern portion of the Animas Valley, approximately 10 miles north of the town of Lordsburg, New Mexico. The area is bounded by the Animas Mountains to the north and the Animas Valley to the south. The Animas Valley is a geothermal resource area that has been identified as a potential source of geothermal energy. The Animas Valley is a geothermal resource area that has been identified as a potential source of geothermal energy. The Animas Valley is a geothermal resource area that has been identified as a potential source of geothermal energy.

- 1. Well - Description
- 2. High-Pressure Heating - Federal
- 3. Experimental Well - Federal
- 4. Abandoned Well - Federal
- 5. Abandoned Well - Federal
- 6. Well No. 1 - State - Brought
- 7. Well No. 2 - State - Brought
- 8. Well No. 3 - State - Brought
- 9. Well No. 4 - State - Brought
- 10. Well No. 5 - State - Brought
- 11. Well No. 6 - State - Brought
- 12. Well No. 7 - State - Brought
- 13. Well No. 8 - State - Brought
- 14. Well No. 9 - State - Brought
- 15. Well No. 10 - State - Brought
- 16. Well No. 11 - State - Brought
- 17. Well No. 12 - State - Brought
- 18. Well No. 13 - State - Brought
- 19. Well No. 14 - State - Brought
- 20. Well No. 15 - State - Brought
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- 98. Well No. 93 - State - Brought
- 99. Well No. 94 - State - Brought
- 100. Well No. 95 - State - Brought
- 101. Well No. 96 - State - Brought
- 102. Well No. 97 - State - Brought
- 103. Well No. 98 - State - Brought
- 104. Well No. 99 - State - Brought
- 105. Well No. 100 - State - Brought

**Proposed Wells**

- Well No. 50 - 100'
- Well No. 250 - 100'
- Well No. 1000 - 100'

**Proposed Monitoring Wells**

- Well No. 100 - 100'
- Well No. 250 - 100'
- Well No. 1000 - 100'

**Project Area 1 Mile Buffer (Geothermal Lease)**

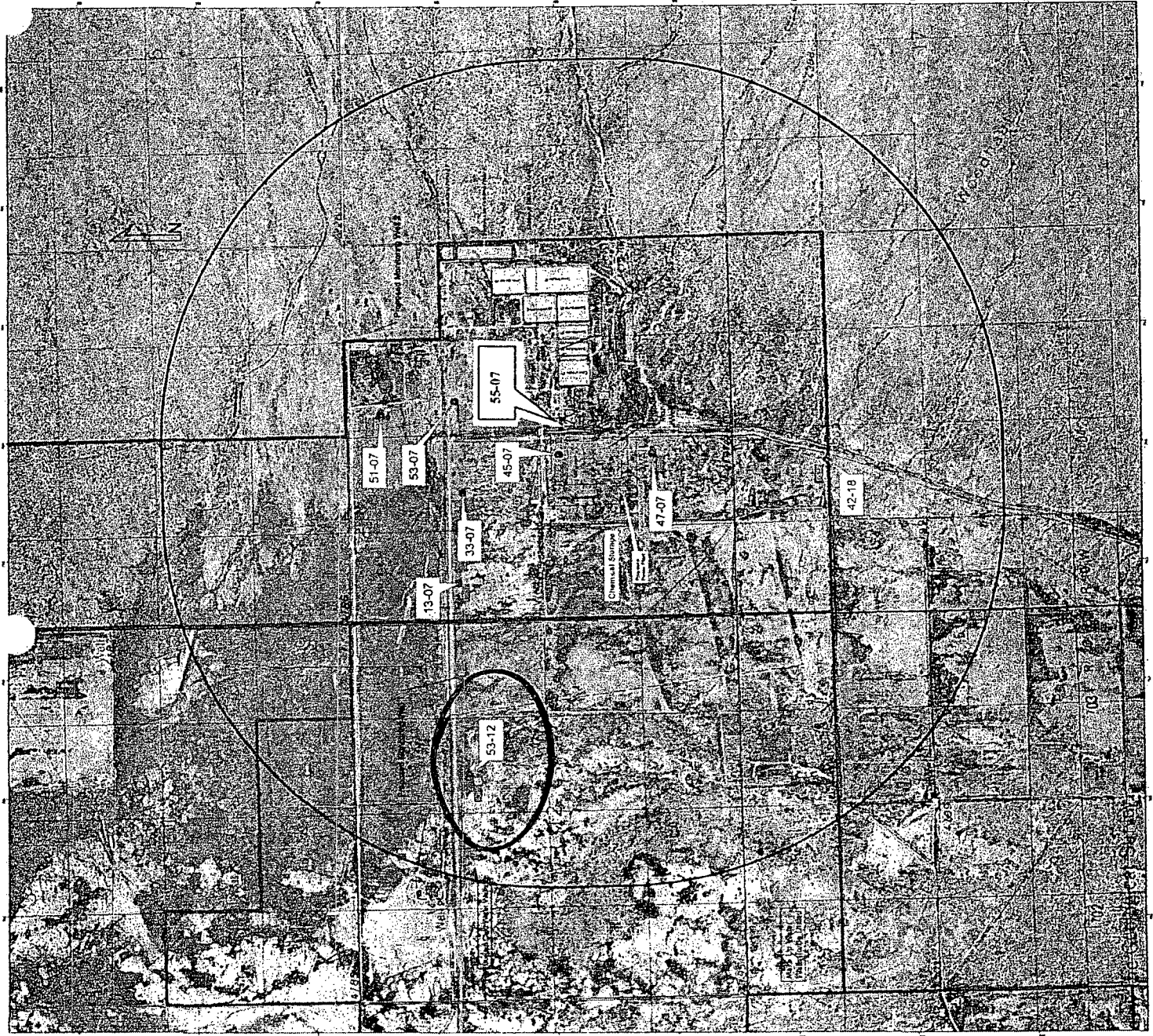
- Geothermal Lease
- Proposed Power Plant
- Building Footprints
- Roads/Federal Geothermal Leases
- Bureau of Land Management
- Private
- State

**Scale**

0 0.1 0.2 0.3 0.4 Miles

0 0.25 0.5 0.75 Km

Coordinate System: UTM Zone 12 N UTM



Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

**Overview**

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

**Borehole Design**

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

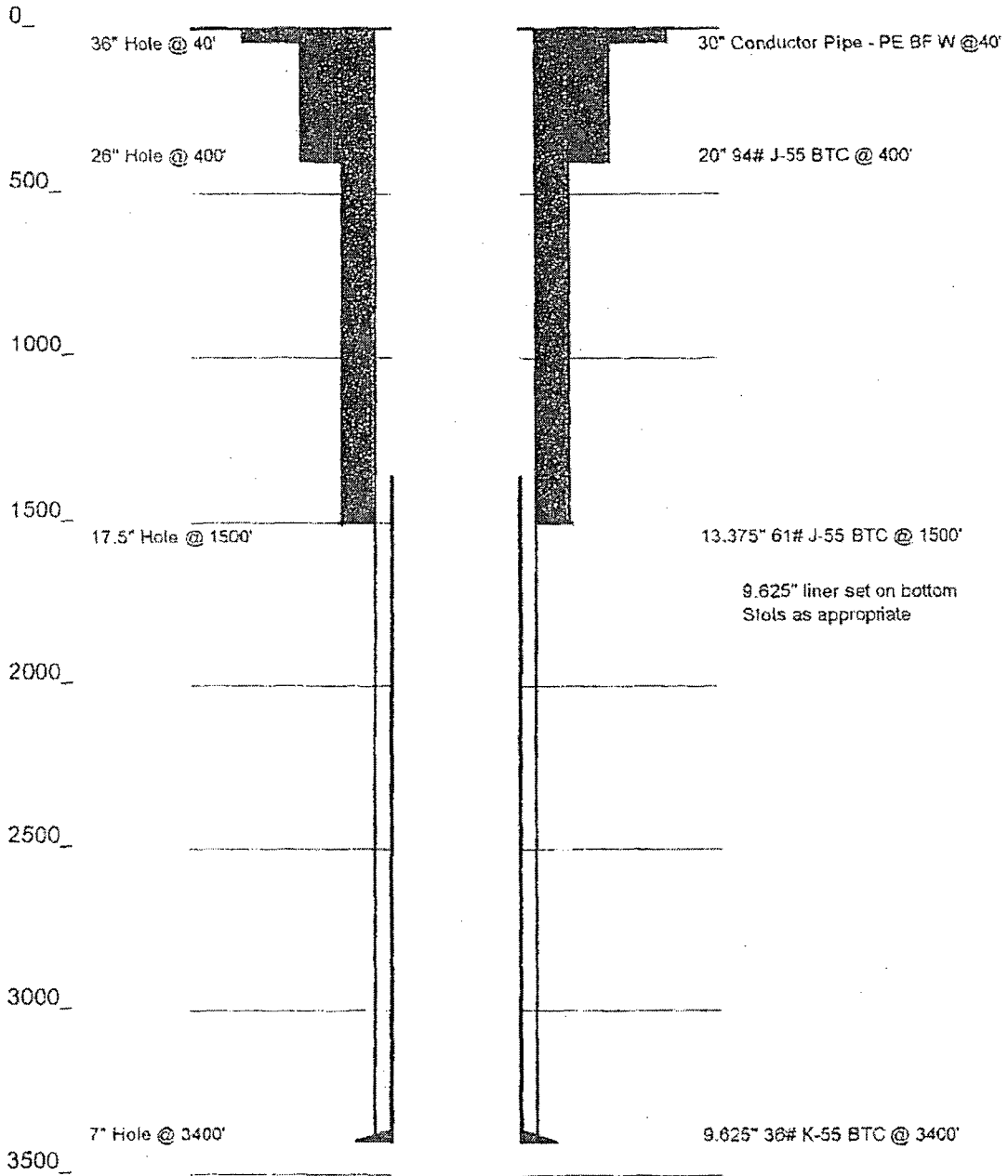
If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0\_

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500\_

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000\_

1500\_

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000\_

2500\_

3000\_

3500\_

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures
  - a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
    - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
    - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
    - iii. [Equal to] 2,000 psi.
  - b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
    - i. Drilling mud temperature.
    - ii. Drilling mud pit level.
    - iii. Drilling mud pump volume.
    - iv. Drilling mud weight.
    - v. Drilling rate.
    - vi. Hydrogen sulfide gas volume.
  - c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.
- Using Mud as the Drilling Fluid
  - a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.



- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure.
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventors, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
- BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.



## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Wednesday, October 27, 2010 8:52 AM  
**To:** 'Mike\_Smith@blm.gov'  
**Cc:** VonGonten, Glenn, EMNRD; Michael Hayter; Dade, Randy, EMNRD  
**Subject:** RE: OCD G-101s and 102s for Class V Geothermal Injection Wells 51-07 and 53-12

Mike:

Good morning.

Raser Technologies needs to confirm that their most recent submitted State G-101s and 102s on file with the OCD reflect the correct locations before OCD processes their forms for these wells.

Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

-----Original Message-----

From: Mike\_Smith@blm.gov [mailto:Mike\_Smith@blm.gov]  
Sent: Wednesday, October 27, 2010 8:36 AM  
To: Chavez, Carl J, EMNRD  
Cc: VonGonten, Glenn, EMNRD; Michael Hayter; Dade, Randy, EMNRD  
Subject: Re: OCD G-101s and 102s for Class V Geothermal Injection Wells 51-07 and 53-12

Carl:

The 2 enclosures sent to Raser Tech with the BLM decision were copies of the approved GDP's with Conditions of Approval (COAs) and BLM form 1842-1 (Appeals to the IBLA). OCD should have received copies of the approved GDP's and I apologize for the oversight. I have dropped copies in the mail to OCD in Santa Fe (Randy - let me know if I need to send copies to the Artesia Office too). I won't burden you with the form 1842-1 because only the permittee has standing to appeal the COA's.

In regards to these Federal GDP's (51-07 and 53-12). These as being the two injection wells that Raser had relocated in place of injection wells 62-18 and 82-18 - please reference the attached map:

(See attached file: 51-07 & 53-12\_BASE\_MAPv1.jpg)

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
Mike\_Smith@blm.gov

PS I did go to the OCD website you linked in your e-mail. I was able to download the image files, but they were corrupted and I could not get the complete files. This may be an issue with our server, but you may want to check the OCD site too.

"Chavez, Carl J,  
EMNRD"  
<CarlJ.Chavez@state.nm.us> To  
"Michael Hayter"  
<Michael.Hayter@rasertech.com>  
10/26/2010 06:58 AM cc  
"VonGonten, Glenn, EMNRD"  
<Glenn.VonGonten@state.nm.us>,  
"Dade, Randy, EMNRD"  
<Randy.Dade@state.nm.us>  
Subject  
OCD G-101s and 102s for Class V  
Geothermal Injection Wells 51-07  
and 53-12

(Embedded image moved to file: pic02011.gif)

Mike:

Good morning. The New Mexico Oil Conservation Division (OCD) is in receipt (see attachment) of the Bureau of Land Management's (BLM) GDP permit approval of the above subject wells. OCD notices that the enclosures referenced in the approval letter above are missing from the copy I received in the mail.

The OCD is prepared to process the OCD G-101s and G-102s for the subject wells; however, in most recent correspondence you mentioned that the well locations may have been changed? Consequently, I am requesting confirmation that the locations have indeed changed from the previous locations identified in G-101s and G102 Forms currently on file with the OCD. I recommend that you review the G Forms for Wells 51-07 and 53-12 (Class V Geothermal Injection Wells) to make sure the locations are correct at <http://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=pCJC0813635742>

If the locations have changed, and the current forms on file with the OCD do not reflect the correct locations of the wells, you will need to resubmit G-101s and G-102s for the wells at your earliest convenience. If you confirm that the locations are correct, the OCD will process the G-Forms today.

Please contact me if you have questions. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

File: OCD Online "GTHT-1 "General Correspondence"

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[attachment "BLM GDP Approvals 51-07 and 53-12 10-21-10.pdf" deleted by Mike Smith/LCFO/NM/BLM/DOI]

NMNM34790: Proposed wellfield configuration (no wells drilled as of June 2010)

Legend:

- Production GDP approved 2008
- Injection GDP approved 2008
- Injection GDP approved 2008
- ✕ Injection GDP approved 2008  
Closed 2010 (will not be drilled)
- ▲ Injection GDP pending  
(awaiting approval)



## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Tuesday, October 26, 2010 6:59 AM  
**To:** 'Michael Hayter'  
**Cc:** VonGonten, Glenn, EMNRD; Dade, Randy, EMNRD  
**Subject:** OCD G-101s and 102s for Class V Geothermal Injection Wells 51-07 and 53-12  
**Attachments:** BLM GDP Approvals 51-07 and 53-12 10-21-10.pdf

Mike:

Good morning. The New Mexico Oil Conservation Division (OCD) is in receipt (see attachment) of the Bureau of Land Management's (BLM) GDP permit approval of the above subject wells. OCD notices that the enclosures referenced in the approval letter above are missing from the copy I received in the mail.

The OCD is prepared to process the OCD G-101s and G-102s for the subject wells; however, in most recent correspondence you mentioned that the well locations may have been changed? Consequently, I am requesting confirmation that the locations have indeed changed from the previous locations identified in G-101s and G102 Forms currently on file with the OCD. I recommend that you review the G Forms for Wells 51-07 and 53-12 (Class V Geothermal Injection Wells) to make sure the locations are correct at <http://ocdimage.emnrd.state.nm.us/imaging/AEOrderFileView.aspx?appNo=pCJC0813635742>.

If the locations have changed, and the current forms on file with the OCD do not reflect the correct locations of the wells, you will need to resubmit G-101s and G-102s for the wells at your earliest convenience. If you confirm that the locations are correct, the OCD will process the G-Forms today.

Please contact me if you have questions. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: [CarlJ.Chavez@state.nm.us](mailto:CarlJ.Chavez@state.nm.us)  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

File: OCD Online "GTHT-1 "General Correspondence"



# United States Department of the Interior



## BUREAU OF LAND MANAGEMENT

Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OCD  
2010 OCT 25 P 1:10  
TAKE PRIDE IN AMERICA

In Reply Refer To:  
NMNM 034790  
3260 (L0310)

OCT 21 2010

### DECISION

Lightning Dock Geothermal LLC :  
c/o Mr. Ben Barker :  
5152 North Edgewood Drive :  
Provo, UT 84604 :

### Geothermal Permits to Drill Approved

The Bureau of Land Management (BLM) Las Cruces District Office (LCDO) has completed review of your Geothermal Drilling Permits (GDP) and accompanying Drilling Plans and Operations Plans for the 51-07 and 53-12 injection wells at the Lightning Dock Geothermal Lease (NMNM034790). This permit is approved subject to the general standards defined in 43 CFR §3260.11 and the Conditions of Approval (COA) attached to each approved permit (43 CFR §3260.12). This project is currently bonded with the BLM (Bond Number NMB000512).

If you contend that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

Standards for Obtaining a Stay

Except as otherwise provided by law or other pertinent regulation, a petition for a stay of a decision pending appeal shall show sufficient justification based on the following standards:

- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade

3 Enclosures:

- 1 – Form 1842-1
- 2 – Form 3260-4
- 3 – 43 CFR §3260.11



# United States Department of the Interior



BUREAU OF LAND MANAGEMENT  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, New Mexico 88005  
www.blm.gov/nm

RECEIVED OOD

In Reply Refer To: 2010 JUL 20 P 1:08  
NMNM 034790  
3200 (L0310)

JUL 13 2010

CERTIFIED -- RETURN RECEIPT REQUESTED  
7004 1350 0002 8394 4996

Lightning Dock Geothermal LLC  
c/o Mr. Ben Barker  
5152 North Edgewood Drive  
Suite 375  
Provo, UT 84604

## **CONFIRMATION OF VERBAL ORDER(S) OF THE BLM AUTHORIZED OFFICER**

Under the regulatory authorization granted in 43 CFR 3200.4(g) and 3260.12(e), the Bureau of Land Management (BLM) Las Cruces District Office (LCDO) issued verbal orders by telephone to Ben Barker of Lightning Dock Geothermal LLC on July 12, 2010. These orders relate to the geothermal drilling permit (GDP) for Well Number 55-7, NW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 7, T. 25 S., R. 19 W., NMPM, Hidalgo County, New Mexico, located on Geothermal Lease NMNM034790:

1. If any volume of water from Well 55-7 is discharged into the reserve pit, migratory bird protection in the form of safe grating or approved floating devices ("bird balls") sufficient to prevent birds from accessing the pit must be used.
2. The operating plan for Well 55-7 did not specify other sources of water would be discharged into the reserve pit for Well 55-7. Use of the reserve pit for Well 55-7 shall be limited to discharge from Well 55-7 (exempting natural precipitation into the pit).

The purpose of these orders is to prevent unnecessary impacts on land and wildlife resources and to clarify operating procedures that are consistent with the approved drilling and operations plan for the Well 55-7 GDP.

Federal regulations (43 CFR 3200.4(g)) require geothermal operators to comply with verbal orders from the BLM that are confirmed in writing. BLM decisions or approvals issued under 43 CFR part 3200, including verbal orders confirmed in writing, are immediately effective unless a stay is granted in accordance with 4.21(b) of title 43 CFR (43 CFR 3200.5(b)).

You may submit a written request for a variance from all or selected requirements of 43 CFR 3200.4., including this order. All such requests for variance must meet the requirements of 43 CFR 3256.10 (copy enclosed).



### Appeal Procedures

If you contend that you are adversely affected by this decision, you may appeal this decision directly to the Interior Board of Land Appeals, Office of the Secretary, in accordance with the regulations contained in 43 CFR, Part 4 and the enclosed Form 1842-1. If an appeal is taken, your notice of appeal must be filed in this office (at the above address) within 30 days from receipt of this decision. The appellant has the burden of showing that the decision appealed from is in error.

If you decide to file a petition (pursuant to regulation 43 CFR 4.21 (58 FR 4939, January 19, 1993) (request) for a stay (suspension) of the effectiveness of this decision during the time that your appeal is being reviewed by the Board, the petition for a stay must accompany your notice of appeal. A petition for a stay is required to show sufficient justification based on the standards listed below. Copies of the notice of appeal and petition for a stay must also be submitted to each party named in this decision and to the Interior Board of Land Appeals and to the appropriate Office of the Solicitor (see 43 CFR 4.413) at the same time the original documents are filed with this office. If you request a stay, you have the burden of proof to demonstrate that a stay should be granted.

### Standards for Obtaining a Stay

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- 1) The relative harm to the parties if the stay is granted or denied,
- 2) The likelihood of the appellant's success on the merits,
- 3) The likelihood of immediate and irreparable harm if the stay is not granted, and
- 4) Whether the public interest favors granting the stay.



Bill Childress  
District Manager

2 Enclosures

cc:

✓ Mr. Carl Chavez  
Mr. Randy Dade

## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Friday, July 16, 2010 3:52 PM  
**To:** 'Ben Barker'  
**Cc:** VonGonten, Glenn, EMNRD; 'Mike\_Smith@blm.gov'  
**Subject:** FW: FW: GTHT-001 Water Quality Concerns & Discharge into Unlined Pit  
**Attachments:** pic08217.gif

Ben:

Please find below Mr. Smith's understanding of the situation. You can also read the OCD's conclusion(s). Please find below the paragraph from BLM that requires a Sundry Notice from Raser to move forward.

In summary, BLM would not have any issues with OCD's conclusion regarding the State's "Fresh Water Stations" guidance, provided it is understood that this determination does not relieve or exonerate Raser from requirements under Federal regulations, permits and orders. As of now, those orders require that only water from well 55-7 be used in the reserve pit and that they provide bird protection (bird balls or grating) when water from 55-7 is discharged to the reserve pit. If Raser Tech will submit a request for a variance or a sundry notice, we would certainly consider their proposal and try to find a practical solution that meets the proponents needs while protecting the resource in question. As of now, however, I have not received a sundry or request for variance from them.

Please contact Mike Smith to resolve BLM issues or if you have questions. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

-----Original Message-----

**From:** Mike\_Smith@blm.gov [mailto:Mike\_Smith@blm.gov]  
**Sent:** Friday, July 16, 2010 3:42 PM  
**To:** Chavez, Carl J, EMNRD  
**Cc:** William\_Childress@blm.gov; Edward\_Seum@nm.blm.gov; Jay\_Spielman@blm.gov  
**Subject:** Re: FW: GTHT-001 Water Quality Concerns & Discharge into Unlined Pit

Carl:

I have read Mr. Barker's July 15, 2010 memorandum to OCD. I notice he makes reference to using the offsite (domestic) water for mixing drilling fluids, cleanup and replenishing drill tanks. I really don't see how this is relevant because the drill rig left the site three weeks ago (June 21, 2010). As I reported to you on July 13, the water from this offsite source was running through the trailer tanks set up for the pump test and into the reserve pit.

Please let me explain what Mr. Barker has told BLM because it's not in his memorandum: From my understanding, the whole point of using this new water source is to devise an alternate bird protection strategy. The offsite water will be used to cool water from well 55-7 in order to make it safe for migratory birds. Raser wishes to pursue this new strategy because Mr. Barker told me they are having trouble getting the bird-balls delivered in a timely fashion, and wishes to avoid the expense associated with their purchase (he claims they were misled on the price by an unnamed consultant).

The Federal Environmental Analysis (EA) for this project determined that grating or use of floating bird-balls is the preferred mitigation for keeping migratory birds from utilizing reserve pits during drilling and testing. The Federal EA was approved on September 30, 2008 so this is not a new requirement. We required this mitigation measure as COA #14 when the GDP for 55-7 was approved on May 21, 2010. It was not until June 15, 2010 that the cost and delivery issues associated with bird-balls was brought to BLM's attention.

Now, if there needs to be a change to the Federal GDP, the way to do it is to submit a sundry notice. Several "trial balloons" have been informally proposed - such as floating grates and temperature monitoring, but no sundry notice has been provided to the BLM for review. In my conversations with Raser's staff (Ben, Jim and Mike) I explained they need to submit a sundry notice because 1) they are bringing in water from a different source than the permitted well (55-7) for a purpose they did not describe in the GDP, and 2) they want to avoid using bird-balls as required in COA #14. I told them the sundry notice will need to identify the water sources, justify the threshold temperature for bird protection, and describe methods for monitoring and averaging water temperatures in the reserve pit.

In summary, BLM would not have any issues with OCD's conclusion regarding the State's "Fresh Water Stations" guidance, provided it is understood that this determination does not relieve or exonerate Raser from requirements under Federal regulations, permits and orders. As of now, those orders require that only water from well 55-7 be used in the reserve pit and that they provide bird protection (bird balls or grating) when water from 55-7 is discharged to the reserve pit. If Raser Tech will submit a request for a variance or a sundry notice, we would certainly consider their proposal and try to find a practical solution that meets the proponents needs while protecting the resource in question. As of now, however, I have not received a sundry or request for variance from them.

Please keep in mind that the issues the BLM needs resolved are meeting bird protection requirements and accurately documenting operation procedures.

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
Mike\_Smith@blm.gov

"Chavez, Carl J,  
EMNRD"  
<CarlJ.Chavez@state.nm.us> To  
<Mike\_Smith@blm.gov>  
cc  
07/16/2010 10:44 AM "Phillips, Haddy L., OSE"  
<haddy.phillips@state.nm.us>,  
"VonGonten, Glenn, EMNRD"  
<Glenn.VonGonten@state.nm.us>,  
"Dade, Randy, EMNRD"  
<Randy.Dade@state.nm.us>  
Subject  
FW: GTHT-001 Water Quality Concerns  
& Discharge into Unlined Pit

(Embedded image moved to file: pic08217.gif)

Mike:

Good morning. I met with my Supervisor (Glenn von Gonten) to discuss Mr. Barker's response letter (letter) to the OCD inquiry based on the recent BLM inspection, and subsequent amendment to the BLM GDP (referenced in Mr. Barker's letter) which appears to have shut-in the use of the unlined pit?

Based on the OCD's review of Mr. Barker's response to the OCD's inquiry with supporting water quality information from the area (historic and most recent) and fresh water well in question, and the basis for the water use, the OCD feels that the operator should be allowed to use the fresh water as it is within the project area and will likely meet the background criteria for the Well 55-7 well work. In addition, Raser will also be instructed to collect a confirmation ground water sample from the fresh water source next week, which should confirm what the OCD has been aware of from a couple of public meetings and putting together the monitoring program under the discharge permit for the operator. Please find attached a "Fresh Water Station" document that was issued shortly after the OCD Pit Rule Regulation was enacted, which exempts fresh water stations from OCD regulations if it meets certain criteria.

However, the OCD would like to know if BLM has any concerns about the OCD conclusion in this matter that the operator should be allowed to use the water for the well work? The OCD wants to make sure the agencies are communicating. Please let me know so I can issue a final reply to the operator. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: [CarlJ.Chavez@state.nm.us](mailto:CarlJ.Chavez@state.nm.us)  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

From: Ben Barker [<mailto:Ben.Barker@rasertech.com>]  
Sent: Friday, July 16, 2010 4:05 AM  
To: Chavez, Carl J, EMNRD  
Cc: VonGonten, Glenn, EMNRD; Jackson, Charles L., OSE; Mike\_Smith@blm.gov  
Subject: RE: GTHT-001 Water Quality Concerns & Discharge into Unlined Pit

Carl,

Attached is a memorandum that addresses your questions on operations at TFD 55-7. It clarifies our use of domestic water at the site for drilling and process operations. The second attachment is a collection of photos that may be of interest to you and Genn, since you haven't been to the site yet.

Comparing the pipeline in photos 5 with the others (e.g., photos 3 and 7) gives a visual indication of the relative flow potential of the two water sources on the site. Please do not hesitate to let me know if I can provide further information.

Thank you,  
Ben

VP Resource Management  
Raser Technologies  
5152 N. Edgewood Drive  
Provo, UT 84604  
801-765-1200 office  
801-850-5904 direct  
707-508-9963 mobile

From: Chavez, Carl J, EMNRD [<mailto:CarlJ.Chavez@state.nm.us>]  
Sent: Tuesday, July 13, 2010 4:40 PM  
To: Ben Barker

Cc: VonGonten, Glenn, EMNRD  
Subject: GTHT-001 Water Quality Concerns & Discharge into Unlined Pit

Ben:

Good afternoon.

Could you please identify the source(s) of the water stream(s) that is currently being discharged into the unlined pit and/or is planned to be mixed with the Well 55-7 ground water? Also, Raser will need to test any extraneous water source(s) that may be mixed with the effluent from Well 55-7 and discharged into the unlined pit to make sure water quality standards are met. Regardless, OCD's approval with conditions does not provide for extraneous sources of effluent to be mixed with the ground water from Well 55-7.

Please clarify the above. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau 1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: CarlJ.Chavez@state.nm.us  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

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[attachment "LDG Domestic WQ.pdf" deleted by Mike Smith/LCFO/NM/BLM/DOI] [attachment "Lightning Dock Geothermal Photo Update July 15.pdf" deleted by Mike Smith/LCFO/NM/BLM/DOI] [attachment "PitRuleFAQFreshWaterStations20080812.pdf" deleted by Mike Smith/LCFO/NM/BLM/DOI]



July 15, 2010

Mr. Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Dr.  
Santa Fe, New Mexico 87505

RE: GTHT-001 Water Quality Concerns & Discharge into Unlined Pit

Dear Mr. Chavez:

Thank you for your note of July 13 and for the opportunity to respond to your concern about the sources and quality of water in the unlined pit at well TFD 55-7. Raser intends to, and believes it has, conformed to the letter and intent of the several permits associated with this project. Nevertheless, I see in this case that I could have done better at describing industry-standard practice rather than assuming a common understanding. Please accept my apology for the inconvenience resulting from that oversight.

The water in the unlined pit at well TFD 55-7 is from the same sources as all of our well site water and as the samples whose analysis you relied on in approving our discharge to the pit. Those sources are well 55-7 itself and the well site domestic water supply we use to mix drilling fluids. The analyses I will discuss shortly show that the domestic water is of better quality than the produced fluid from TFD 55-7, and appears to meet 26.2.3103 NMAC standards for drinking water. Therefore, Raser believes that commingling produced water from TFD 55-7 and domestic water from the well site tap is environmentally beneficial and deserving of your continued approval.

The use of a local water source for makeup water, cleaning, etc. around drilling operations is such universal practice that I neglected to describe it in our G-103. Step 4 of the approved Operations and Drilling Plan reads: "Mix non-toxic gel-lime mud and fill hole." While the Proposed Operations and Drilling Plan did not identify in writing the source of the water for this operation, the need to fill the hole implied a source of water other than well 55-7. We pointed out to the various State and Federal inspectors who visited the site the fresh water source we intended to use, and that is the only source we have used.

The samples taken on June 8, 2010 from well TFD 55-7 met the 26.2.3103 NMAC standards for drinking water except for Fluoride and Total Dissolved Solids. Further sampling and analysis followed on June 29. These samples were analyzed for F and TDS, plus chloride, sulfate and alkalinity. We included samples from the well site domestic source, as well as a Lordsburg hotel. We note that the well site water source had less than  $\frac{1}{4}$  the Fluoride and  $\frac{1}{2}$  the TDS of the Lordsburg municipal sample.

The values for the well site source are listed in the table below in the column headed "LD domestic, 236040-162." In all cases the values are below the limits established by 26.2.3103 NMAC. Since the well water from TFD 55-7 meets the standard for all other analyses, we expect 236040-162 does also. I have directed our personnel in the field to include a sample from the well site source in our next full sample suite, scheduled for next week, and will further expedite that analysis upon your request.

We inquired into the source of the well site domestic water and were informed that several water wells on the Rosette, Inc. property are connected to a storage tank. This acts as a reservoir from which water is distributed to the various residences and greenhouses on the property. I was told by a former owner of Lightning Dock Geothermal that the NMOCD sampled and analyzed water in 1986 from several Rosette sources. Raser provided to OCD on June 17, 2010 an aqueous chemistry data base. The water sample identified as OCD-5 is described as "Burgett Fresh Water Well." The former LDG owner stated his opinion that OCD-5 is typical of the wells supplying the Rosette domestic system. The data for OCD-5 are displayed in the table at the end of this letter. None of values exceed the 26.2.3103 NMAC standard.

In considering the mixing of water from well TFD 55-7 with well site domestic water it may be helpful to know the proportions involved. For Raser's purposes the volume of water from the domestic tap is inconsequential and incidental to its use in maintaining our process equipment in good order. Based on the volume of drilling fluids mixed, the time spent replenishing rig tanks following lost circulation and the cleanup of equipment, we estimate well TFD 55-7 has produced more than 90% of the fluid to date. That fraction will increase to completely overwhelm the domestic water contribution in a few days as we send water to the irrigation system.

We completed construction today of the piping described in Step 35 of the approved Operations and Drilling Plan. We were able to eliminate the transfer pump described therein and will use gravity to deliver water directly from the tanks to the field. Step 35 contemplates delivery either directly or via the pit, but as you know, BLM have amended their GDP conditions to prevent us from using the pit. We are complying with that order, of course, and will eventually seek relief. In the meantime, NMOSE inspected and accepted the water meter installation today and we expect to begin direct delivery tomorrow afternoon.

Although the amount of water from the well site domestic tap is immaterial to the test, it is of great benefit to be able to use it for maintaining the process equipment, for cooling instrumentation and so forth. To isolate the water from the two sources would require the services of a vacuum truck at a cost of more than \$2000 per day. Since the domestic water is of better quality than the well water, this seems counterproductive as well as uneconomic.

We respectfully request your continued approval of water discharge to the irrigation system and to the unlined pit, amending your prior approval to include water from well TFD 55-7 and such incidental water from the well site domestic tap as may be needed for the operation of the test described in Step 36 of the approved Operations and Drilling Plan.

Thank you for your consideration.

Very truly yours,

Raser Technologies

A handwritten signature in black ink that reads "Benjamin J. Barker". The signature is written in a cursive, flowing style.

Benjamin J. Barker

VP Resource Management



### Comparison of Water Analyses With 26.2.3103 NMAC Standard

	<i>Analysis</i>	<i>Standard</i>	<i>LD domestic 236040-162*</i>	<i>OCD-5 (1986)</i>	<i>TFD 55-7 (2010)</i>
<b>A</b>					
1	Arsenic (As)	0.1 mg/l		<0.005 mg/l	0.021 mg/l
2	Barium (Ba)	1 mg/l		<0.1 mg/l	0.278 mg/l
3	Cadmium (Cd)	0.01 mg/l		<0.1 mg/l	<0.005 mg/l
4	Chromium (Cr)	0.05 mg/l		<0.1 mg/l	<0.001 mg/l
5	Cyanide (CN)	0.2 mg/l			<0.015 mg/l
6	Fluoride (F)	1.6 mg/l	1.05	0.98 mg/l	11.6 mg/l
7	Lead (Pb)	0.05 mg/l		<0.1 mg/l	0.042 mg/l
8	Total Mercury (Hg)	0.002 mg/l			<0.0002 mg/l
9	Nitrate (NO <sub>3</sub> as N)	10 mg/l			<0.5 mg/l
10	Selenium (Se)	0.05 mg/l		<0.1 mg/l	<0.02 mg/l
11	Silver (Ag)	0.05 mg/l		<0.1 mg/l	<0.005 mg/l
12	Uranium (U)	0.03 mg/l			<0.03 mg/l
13	Radioactivity: Radium (Ra 226-228)	30 pCi/l			<1 pCi/l
14	Benzene	0.01 mg/l			<0.001 mg/l
15	Polychlorinated biphenyls (PCB's)	0.001 mg/l			<0.0005 mg/l
16	Toluene	0.75 mg/l			<0.001 mg/l
17	Carbon Tetrachloride	0.01 mg/l			<0.001 mg/l
18	1,2-dichloroethane (EDC)	0.01 mg/l			<0.001 mg/l
19	1,1-dichloroethylene (1,1- DCE)	0.005 mg/l			<0.001 mg/l
20	1,1,2,2-tetrachloroethylene (PCE)	0.02 mg/l			<0.001 mg/l
21	1,1,2-trichloroethylene (TCE)	0.1 mg/l			<0.001 mg/l
22	ethylbenze	0.75 mg/l			<0.001 mg/l
23	total xylenes	0.62 mg/l			<0.001 mg/l
24	methylene chloride	0.1 mg/l			<0.005 mg/l

## Comparison of Water Analyses With 26.2.3103 NMAC Standard

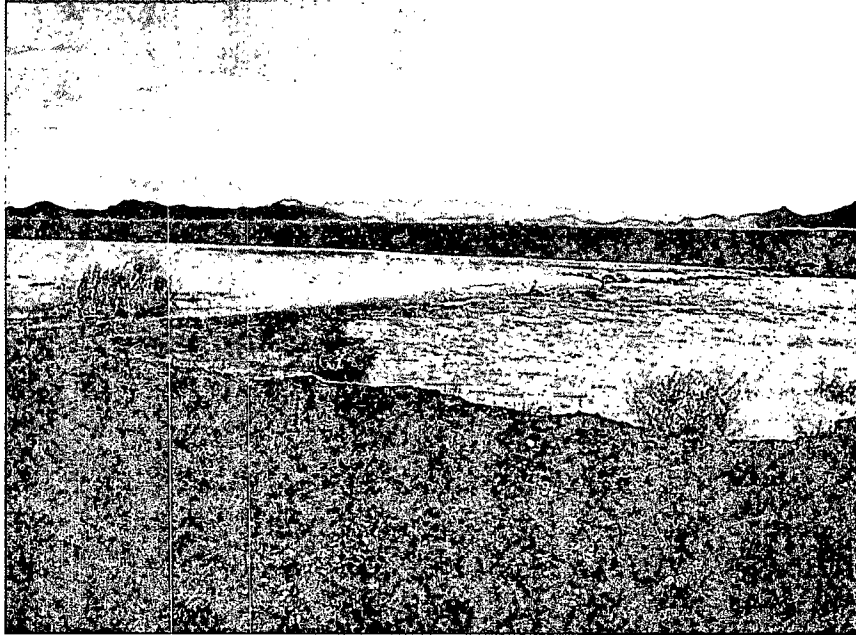
(continued)

	<i>Analysis</i>	<i>Standard</i>	<i>LD domestic 236040-162*</i>	<i>OCD-5 (1986)</i>	<i>TFD 55-7 (2010)</i>
<b>A</b>	<b>Continued</b>				
25	chloroform	0.1 mg/l			<0.001 mg/l
26	1,1-dichloroethane	0.025 mg/l			<0.001 mg/l
27	ethylene dibromide (EDB)	0.0001 mg/l			<0.001 mg/l
28	1,1,1-trichloroethane	0.06 mg/l			<0.001 mg/l
29	1,1,2-trichloroethane	0.01 mg/l			<0.001 mg/l
30	1,1,2,2-tetrachloroethane	0.01 mg/l			<0.001 mg/l
31	vinyl chloride	0.001 mg/l			<0.001 mg/l
32	PAH's: total naphthalene + monomethylnaphthalenes	0.03 mg/l			<0.005 mg/l
33	benzo-a-pyrene	0.0007 mg/l			<0.000183 mg/l
<b>B</b>					
1	Chloride (Cl)	250 mg/l	33.7	18.6 mg/l	80 mg/l
2	Copper (Cu)	1 mg/l		<0.1 mg/l	0.052 mg/l
3	Iron (Fe)	1 mg/l		<0.1 mg/l	0.018 mg/l
4	Manganese (Mn)	0.2 mg/l		<0.05 mg/l	0.008 mg/l
5	Phenols	0.005 mg/l			<0.00458 mg/l
6	Sulfate (SO4)	600 mg/l	122	80.5 mg/l	500 mg/l
7	Total Dissolved Solids (TDS)	1000 mg/l	410	310 mg/l	1440 mg/l
8	Zinc (Zn)	10 mg/l		<0.1 mg/l	0.131 mg/l
9	pH	6-9	7.8		8.69
<b>C</b>					
1	Aluminum (Al)	5 mg/l		<0.1 mg/l	<0.05 mg/l
2	Boron (B)	0.75 mg/l		<0.1 mg/l	0.465 mg/l
3	Cobalt (Co)	0.05 mg/l		<0.1 mg/l	<0.005 mg/l
4	Molybdenum (Mo)	1 mg/l		<0.1 mg/l	0.046 mg/l
5	Nickel (Ni)	0.2 mg/l		<0.1 mg/l	<0.005 mg/l

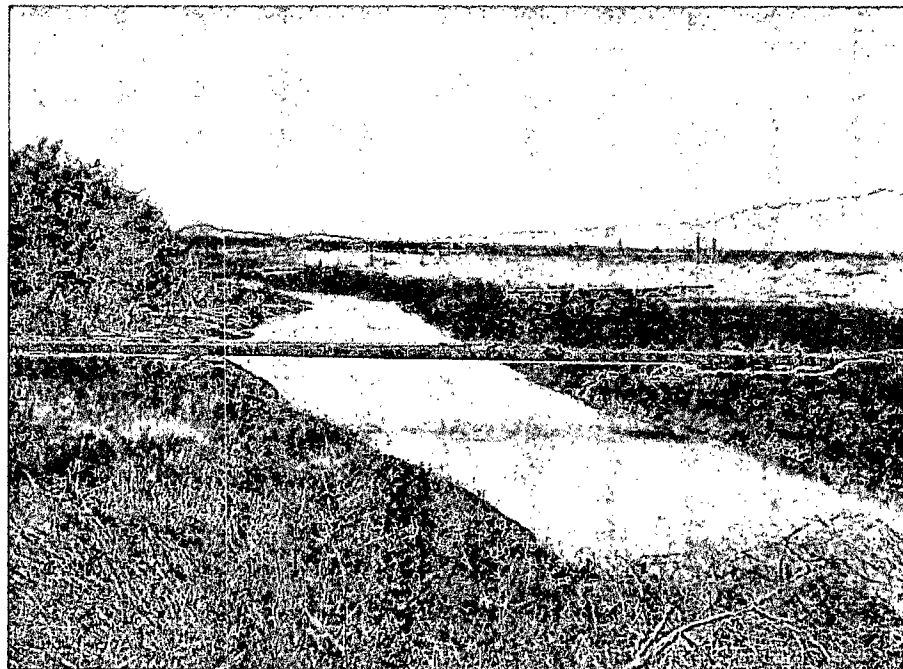
\* sample identifier used by TraceAnalysis laboratory. Values reported are from the 29June2010 report transmitted with our 30June2010 letter, except pH which is a field measurement by Raser personnel .

Lightning Dock Geothermal Photo Update

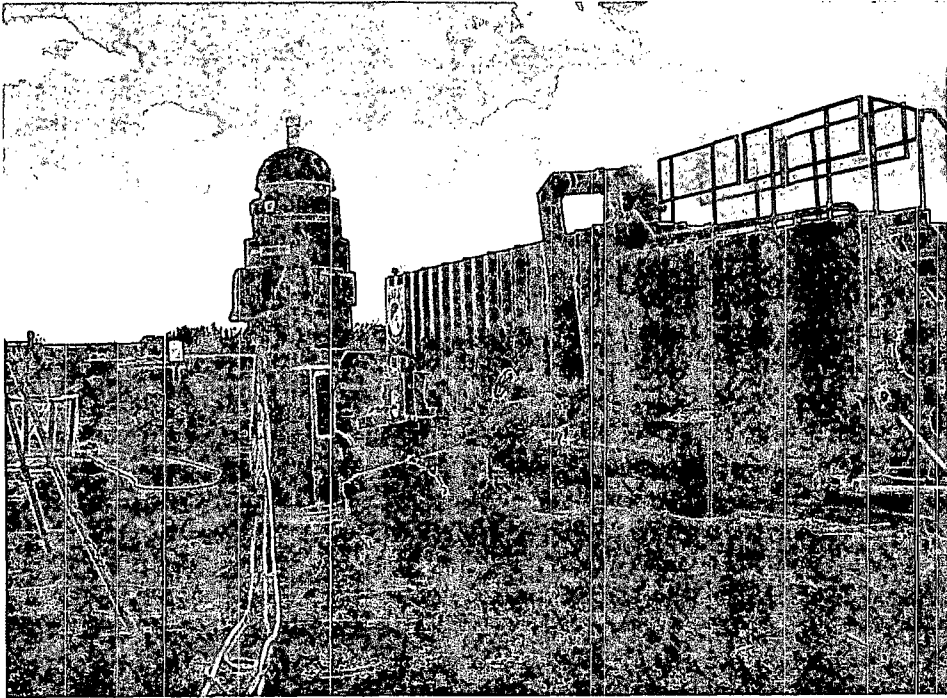
1. Runoff from cloudburst near Lightning Dock Peak, June 28, 2010, showing irrigation line crossing ditch from TFD 55-7 well site to field.



2. Ditch and irrigation line two days later, June 30, 2010.



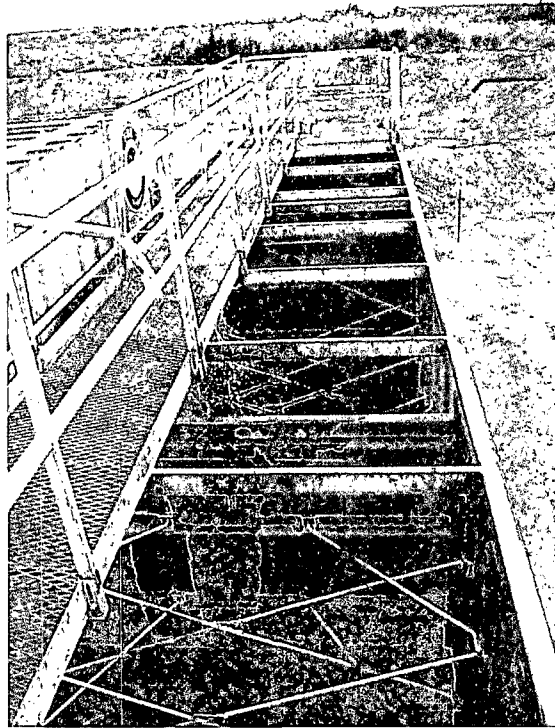
3. Pump acceptance test run, June 30, 2010



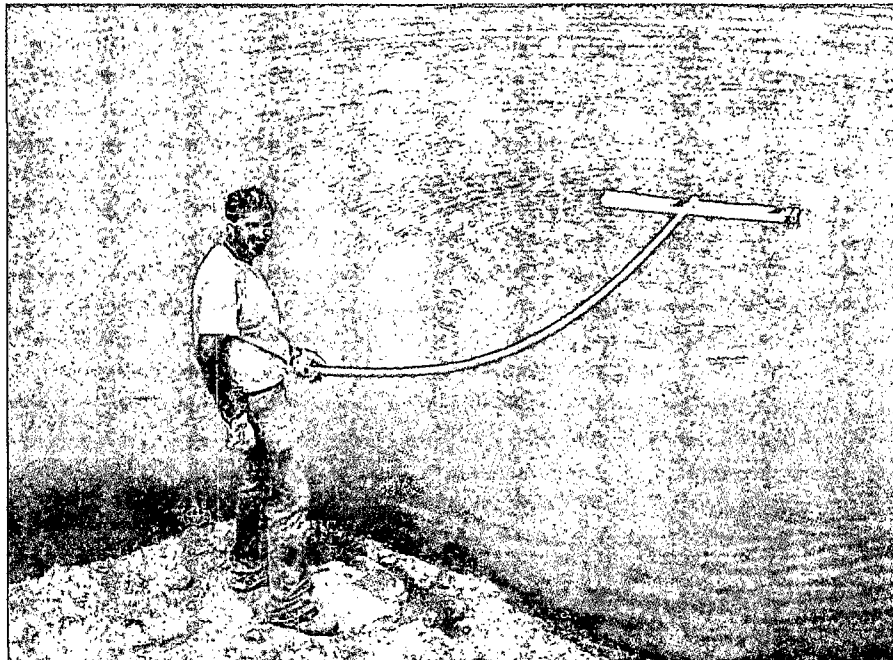
4. Completing tank and irrigation line connections, July 8, 2010



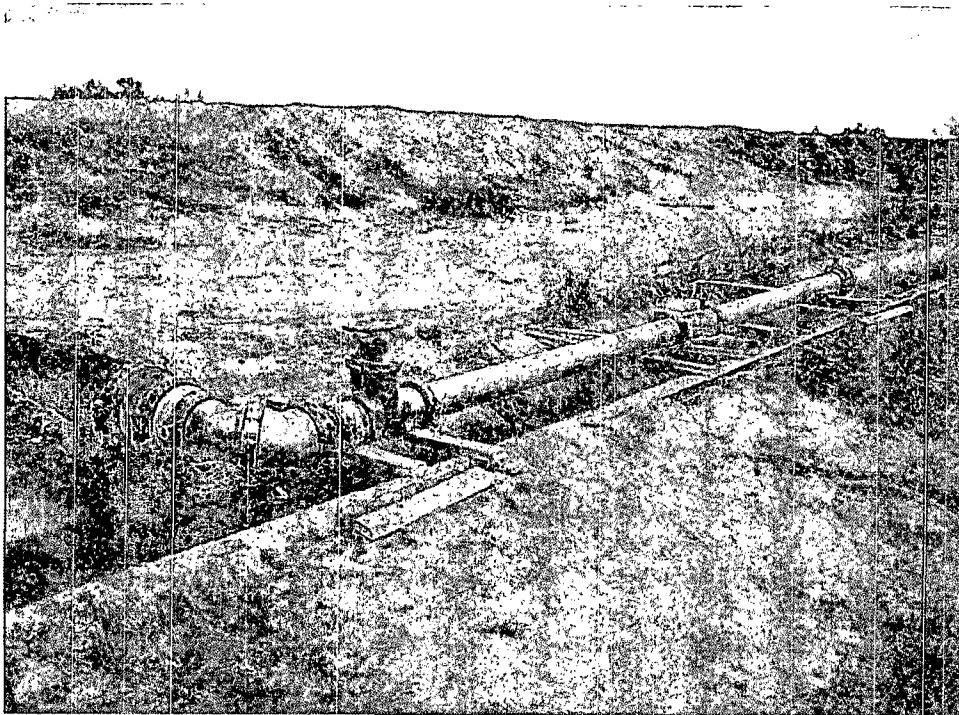
5. Flushing tanks with rig water line, July 8, 2010.



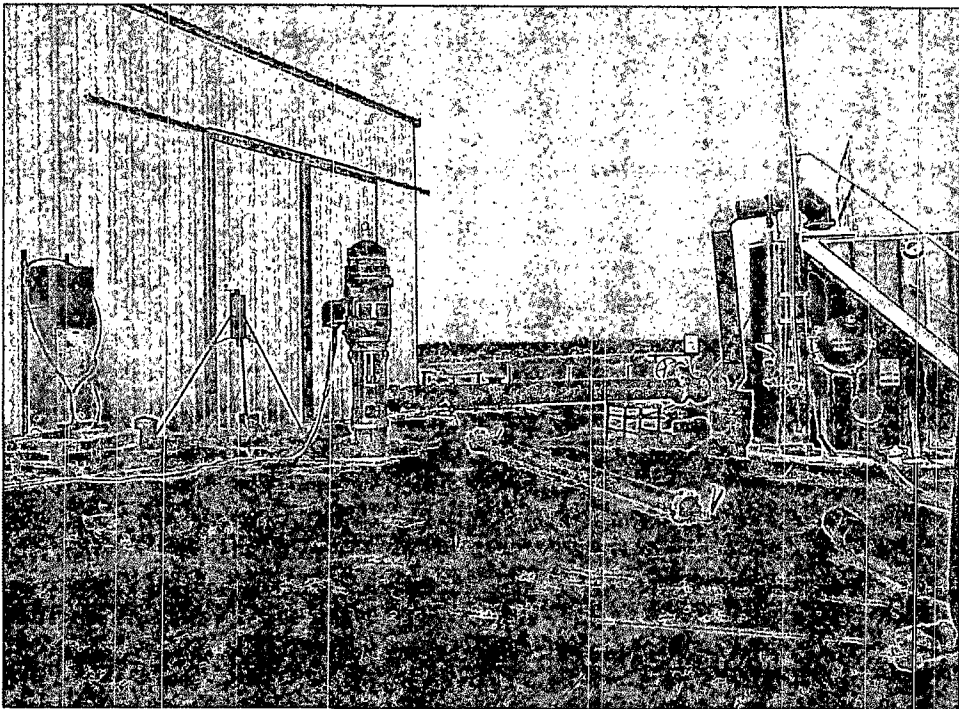
6. Measuring ambient water temperature in pit, July 14, 2010



7. Irrigation meter installation, July 12, 2010



8. Two phase sampling meter run under construction, July 15, 2010



NEW MEXICO OIL CONSERVATION DIVISION  
1301 WEST GRAND AVE.  
ARTESIA, NEW MEXICO 88210  
(575)748-1283 FAX (575)748-9720



# Fax

To: Carl Chavez From: Darold Gray  
Fax: (505)476-3462 Pages: 3  
Phone: Date: 7-6-2010  
Re: CC:

Urgent  For Review  Please Comment  Please Reply  Please Recycle

● Comments:

These are the sundries from  
Lightning Dock - as you requested for records.

Darold Gray

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOHERMAL SUNDRY NOTICE

RECEIVED  
LAS CRUCES DISTRICT OFFICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

2010 JUN 17 AM 9

6. Lease Serial No.  
NM 4790

7. Surface Manager:  BLM  FS  
 Other Private

8. Unit Agreement Name

9. Well No. 10. Permit No.  
82-18 07

11. Field or Area

12. Sec., T., R., B. & M.  
Sec 18 T26S R19W NMBM

13. County  
Hidalgo

14. State  
NM

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
Never drilled

2. Name of Lessee/Operator  
Lightning Dock Geothermal No. HI-01, LLC

3. Address of Lessee/Operator  
8152 North Edgewood Drive, Suite 200, Provo, Utah 84604

4. Location of Well or Facility

5. Type of Work
- Change Plans
  - Site and Road Construction
  - Construct New Production Facilities
  - Alter Existing Production Facilities
  - Convert to Injection
  - Fracture Test
  - Shoot or Acidize
  - Repair Well
  - Pull or Alter Casing
  - Multiple Complete
  - Abandon
  - Other

RECEIVED  
JUN 25 2010  
NMOCD ARTESIA

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

Closing GDP/final abandonment for this well. Well never drilled. Pad never constructed.

16. Describe Proposed Operations (Use this space for activities other than well work.)

see above

17. I hereby certify that the foregoing is true and correct.

Signed [Signature] Title VP Resource Management Date 06/16/2010

(This space for Federal use)  
Approved by [Signature] Title District Manager Date 6/20/2010  
Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

D22



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOHERMAL SUNDRY NOTICE

RECEIVED  
LAS CRUCES DISTRICT OFFICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

2010 JUN 17 AM 9:14

6. Lease Serial No. NM 34790	
7. Surface Manager: <input type="checkbox"/> BLM <input type="checkbox"/> FS <input checked="" type="checkbox"/> Other Private	
8. Unit Agreement Name	
9. Well No. 62-18	10. Permit No. 06
11. Field or Area	
12. Sec., T., R., B. & M. Sec18 T25S R19W NMBM	
13. County Hidalgo	
14. State NM	

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

1b. Well Status:  
Never drilled

2. Name of Lessee/Operator  
Lightning Dock Geothermal No. HI-01, LLC

3. Address of Lessee/Operator  
6152 North Edgewood Drive, Suite 200, Provo, Utah 84604

4. Location of Well or Facility

5. Type of Work
- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Change Plans                         | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Pull or Alter Casing |
| <input type="checkbox"/> Site and Road Construction           | <input type="checkbox"/> Fracture Test        | <input type="checkbox"/> Multiple Complete    |
| <input type="checkbox"/> Construct New Production Facilities  | <input type="checkbox"/> Shoot or Acidize     | <input checked="" type="checkbox"/> Abandon   |
| <input type="checkbox"/> Alter Existing Production Facilities | <input type="checkbox"/> Repair Well          | <input type="checkbox"/> Other                |

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)  
Closing GDP/final abandonment for this well. Well never drilled. Pad never constructed.

16. Describe Proposed Operations (Use this space for activities other than well work.)  
see above

17. I hereby certify that the foregoing is true and correct.

Signed *B. J. Barber* Title VP Resource Management Date 06/16/2010

(This space for Federal use)

Approved by *Bill Childers* Title District Manager Date 6/20/2010

Conditions of Approval, if any:

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Continued on page 2)

*DJS*

## Chavez, Carl J, EMNRD

---

**From:** Chavez, Carl J, EMNRD  
**Sent:** Thursday, June 10, 2010 8:18 AM  
**To:** 'Layne Ashton'; Ben Barker  
**Cc:** 'Mike\_Smith@blm.gov'; Dade, Randy, EMNRD  
**Subject:** FW: OCD Discharge Permit (GTHT-1) Final Processing of APDs for final ODC approval signatures w/ conditions

Layne:

Good morning.

I see BLM GDP approvals for all of the OCD Discharge Permit project geothermal wells with the exception of Injection Wells 53-12 and 51-07.

OCD may issue approvals w/ conditions on Injection Well 42-18 and Development Wells 13-07, 33-07, 45-07, 47-07 and 53-07.

By receipt of this e-mail message, OCD is requesting that BLM confirm the GDP approvals for the above wells and confirm that BLM GDP approvals for Wells 53-12 and 51-07 have not been approved yet.

Upon receipt of confirmation, OCD will act on the above APD approvals with conditions. Thank you.

Carl J. Chavez, CHMM  
New Mexico Energy, Minerals & Natural Resources Dept.  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Dr., Santa Fe, New Mexico 87505  
Office: (505) 476-3490  
Fax: (505) 476-3462  
E-mail: [CarlJ.Chavez@state.nm.us](mailto:CarlJ.Chavez@state.nm.us)  
Website: <http://www.emnrd.state.nm.us/ocd/index.htm>  
(Pollution Prevention Guidance is under "Publications")

---

**From:** Layne Ashton [mailto:[lashton@rasertech.com](mailto:lashton@rasertech.com)]  
**Sent:** Wednesday, June 09, 2010 8:42 AM  
**To:** Chavez, Carl J, EMNRD  
**Subject:** 55-07 hard copy

Carl, I haven't received the original, signed hard copy of the 55-7 permit. Have you sent it yet? Also, I sent you copies of the BLM permits associated with the 5 production wells and 3 injection wells; I believe this is everything that you needed. Is there an approval letter that I should receive?

Thanks,

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
[layne.ashton@rasertech.com](mailto:layne.ashton@rasertech.com)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 AUG 11 AM 10:09  
LAS CRUCES, NM 88005

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

GEOHERMAL DRILLING PERMIT

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 82-18

11. Permit No. 07

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1278.3 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,267.2 ft.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

20. Elevations:  Estimated  Final 4245 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)


SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Steven Braun, Manager e/oc/oc  
Signed Title Date

(This space for Federal use)

Approved by  Title Asst. Dist Mgr Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(See instructions on page 2)

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-07  
Well 82-18  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260<sup>o</sup> F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*PUE*



- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- R/H and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

RUE

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

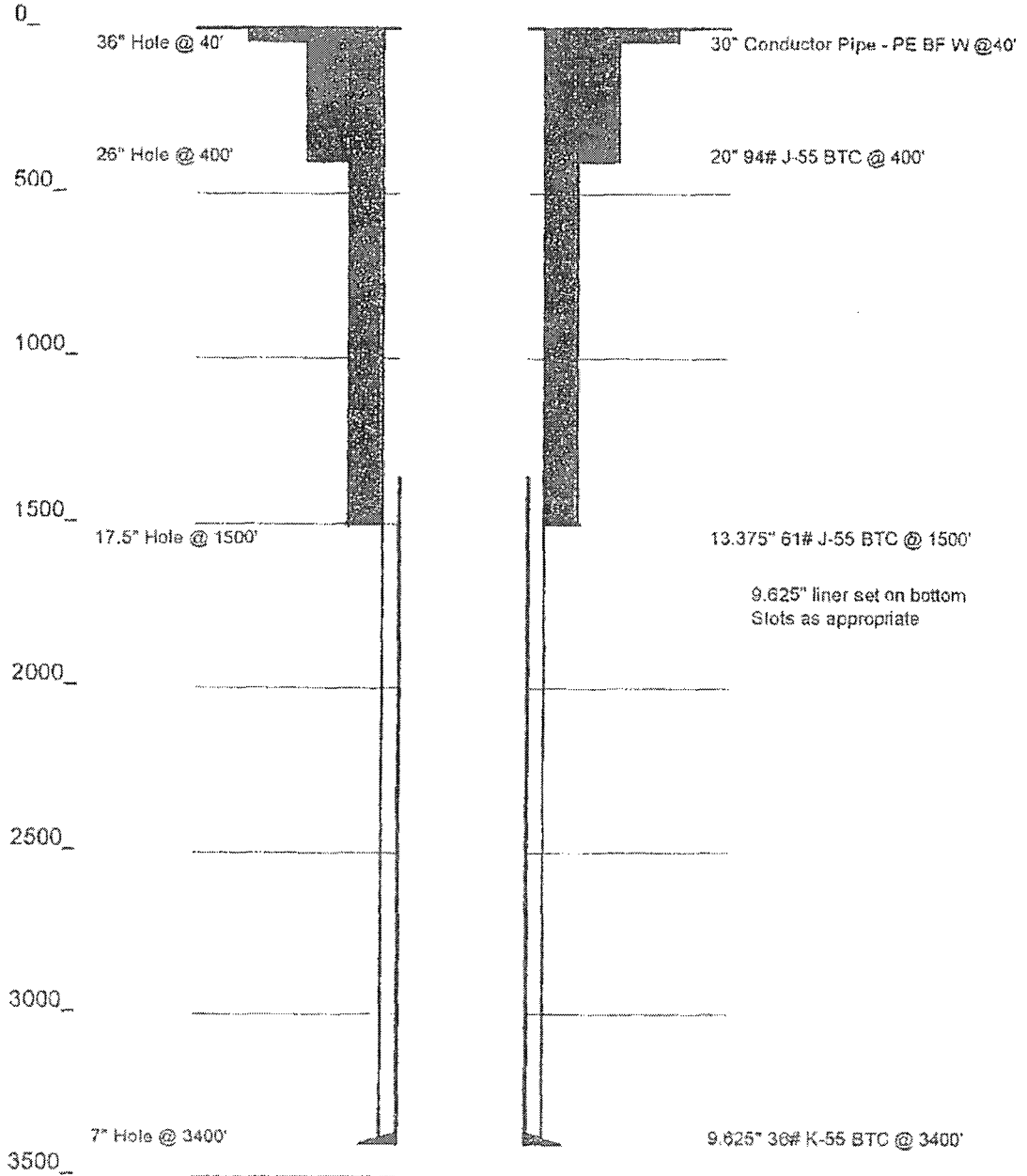
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



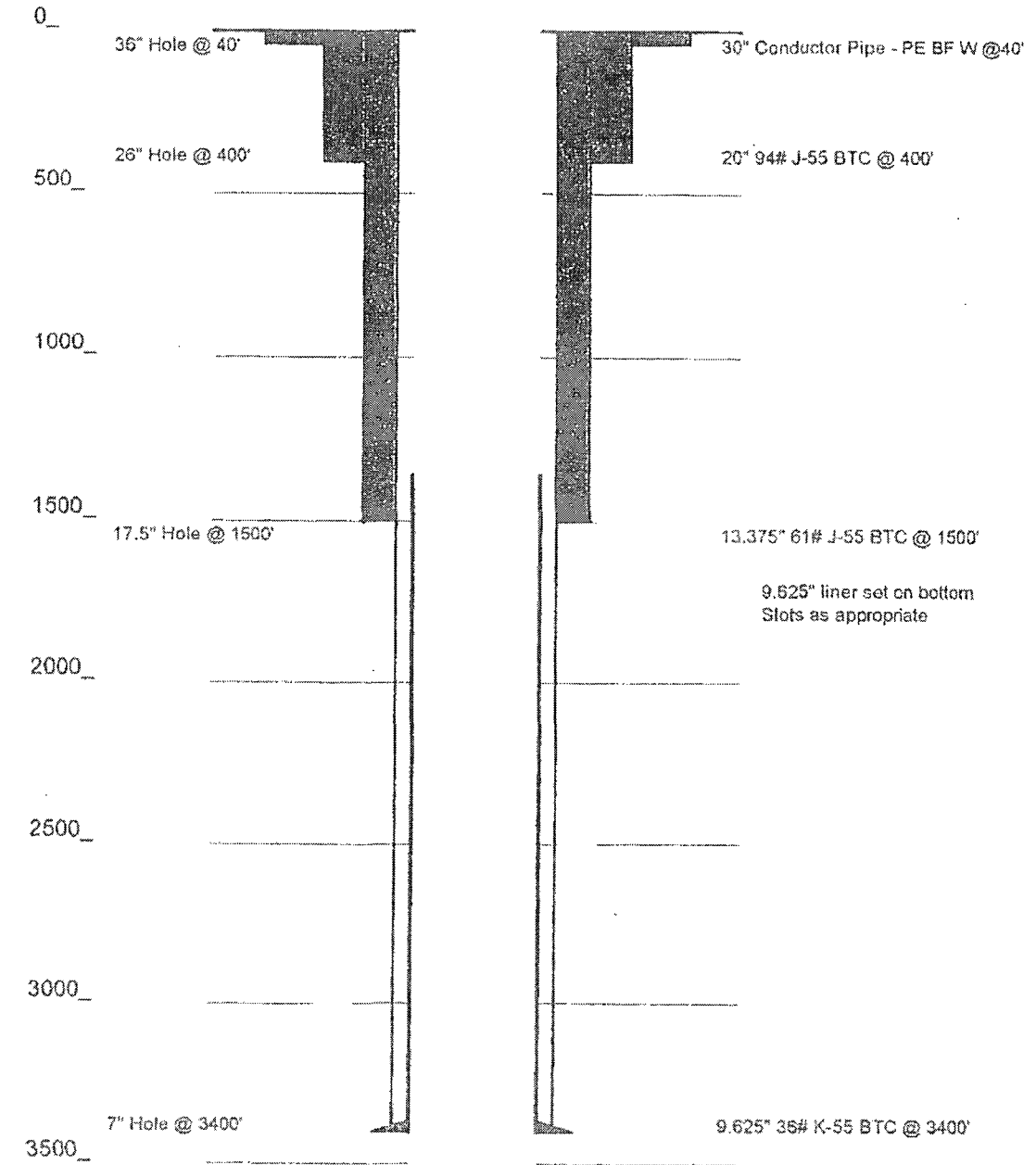
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*Red*

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
- i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
  - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
  - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
  - iv. Kelly cock and standpipe valve.
  - v. A fill-up line installed above the BOPE.
  - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
  - viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
  - ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.
- Using Air as the Drilling Fluid
    - a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
      - i. A rotating-head will be installed at the top of the BOPE stack.
      - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
      - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
      - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes. *pipe*
      - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
      - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
      - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
      - viii. Float and standpipe valves.
      - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
      - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

RME

- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers; bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

- b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

- c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

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## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

RECEIVED  
2008 AUG 11 AM 10:09  
LAS CRUCES, NM 88003

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. 1 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 62-18

11. Permit No. 016

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1278.3 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,267.2 ft.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

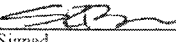
19. Proposed Depth Measured: True Vertical: 3,400

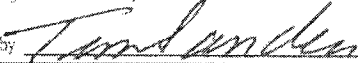
20. Elevations:  Estimated  Final 4245 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM-168801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23. Signed  Title Steven Brown, Manager Date 8/06/08

(This space for Federal use)  
Approved by  Title Asst. Dist. Mgr. Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-06  
Well 62-18  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall



be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

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- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

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Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

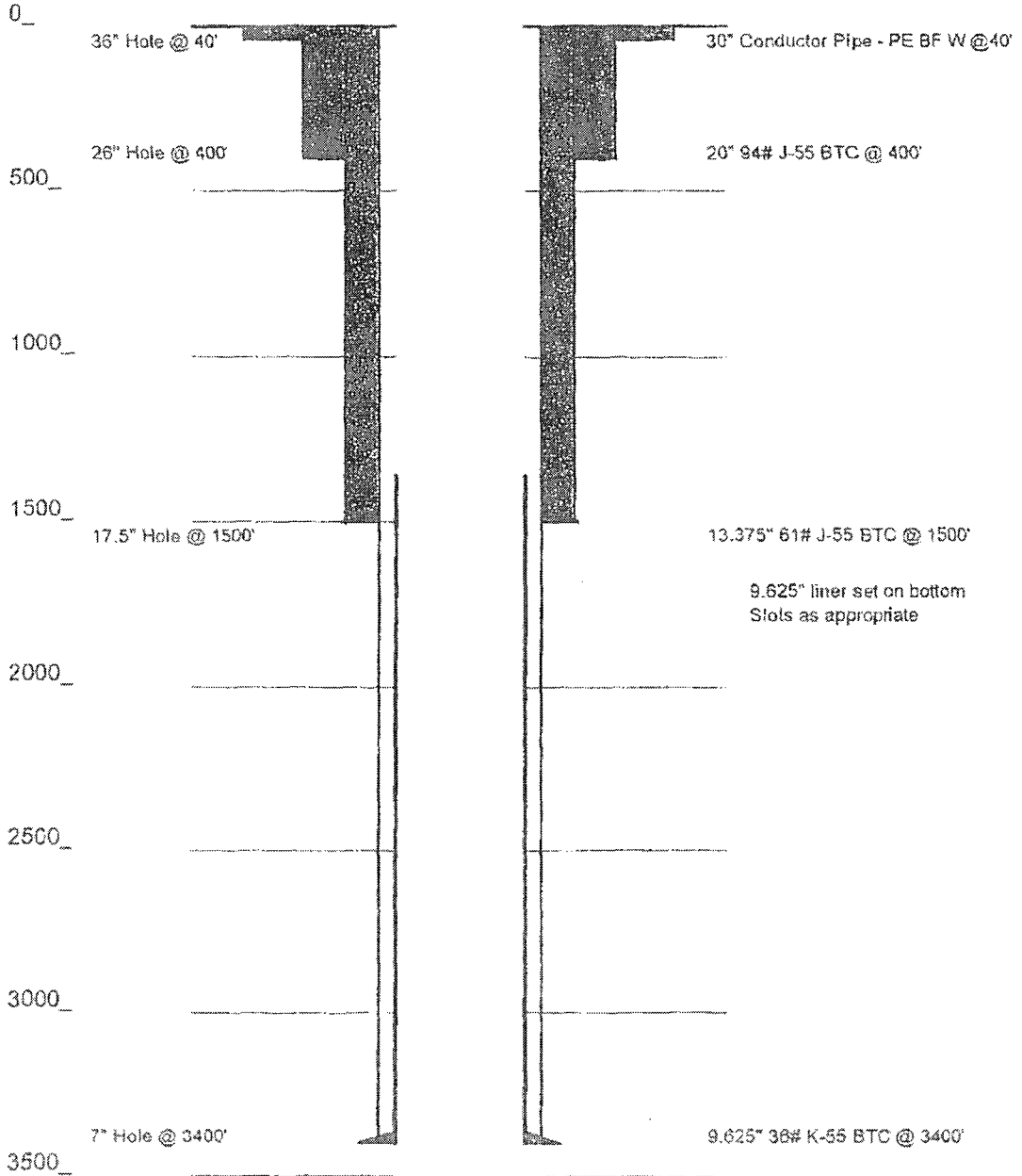
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE



- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

pipe

RUE

- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RME

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*Bill*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

RME

## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

RUE

c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8 slotted liner will be hung from the 13-3/8 casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*Kelle*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 AUG 11 AM 10:20  
LAS CRUCES, NM 88005

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790  
8. Surface Manager:  BLM  FS  
 Other Private

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drilled  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator: LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator: 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface: SEE ATTACHMENT  
At proposed prod. zone: SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line: 3052 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease: 1,320 ft.

10. Well No.: 53-07

11. Permit No.: 05

12. Field or Area

13. Sec., T., R., B. & M.: SEC 7 T25S R19W

14. County: Hidalgo

15. State: NM

16. Approx. Starting Date: 08/30/2008

17. Acres Assigned (Well Spacing)

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

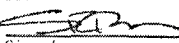
19. Proposed Depth Measured: True Vertical: 3,400


20. Elevations:  Estimated  Final 4209 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Steven Brown, Manager Title Date 8/06/08

(This space for Federal use)  
Approved by  Title Asst. Dist Mgr Date 8/30/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(See instructions on page 2)

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-05  
Well 53-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2000 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*DW*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE



# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

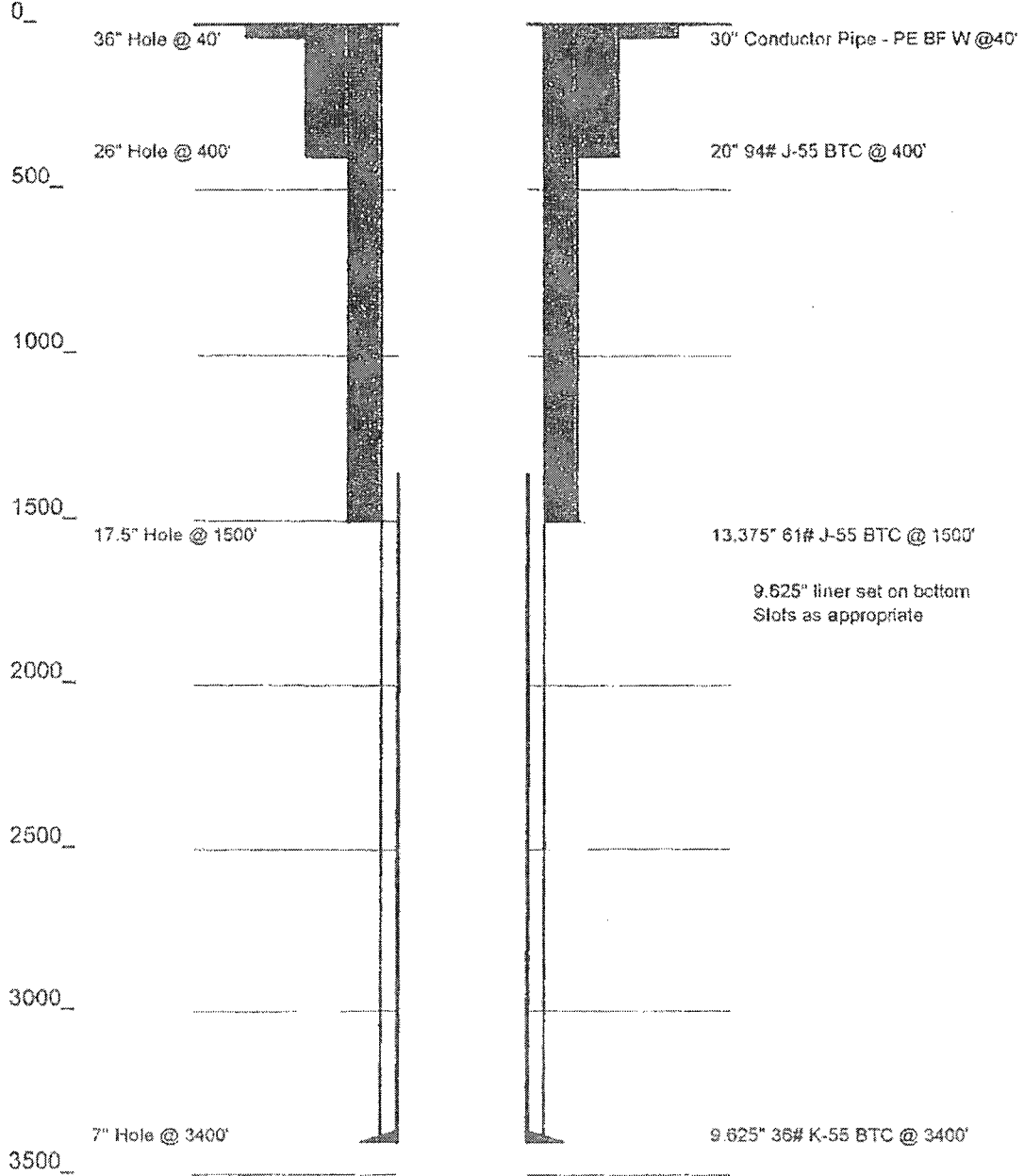
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOPE TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

- b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

- c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*Rule*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
- BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

RUE



c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*Rette*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

RECEIVED  
2008 AUG 11 AM 10:09  
LAS CRUCES, NM 88005

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790  
8. Surface Manager:  BLM  FS  
 Other Private  
9. Permit Agreement Name

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directional Drilling

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. H1-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1219 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease 1,320 ft.

10. Well No. 47-07

11. Permit No. 04

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

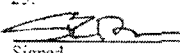
19. Proposed Depth Measured: True Vertical: 3,400


20. Elevations:  Estimated  Final 4199 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Steven Brown, Manager Date 8/06/08  
Signed Title Date

(This space for Federal use)  
Approved by  Title Asst. Dist. Mgr. Date 10/11/08

Conditions of Approval, if Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-04  
Well 47-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

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7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

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20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260<sup>o</sup> F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*



## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- R/H and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

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Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

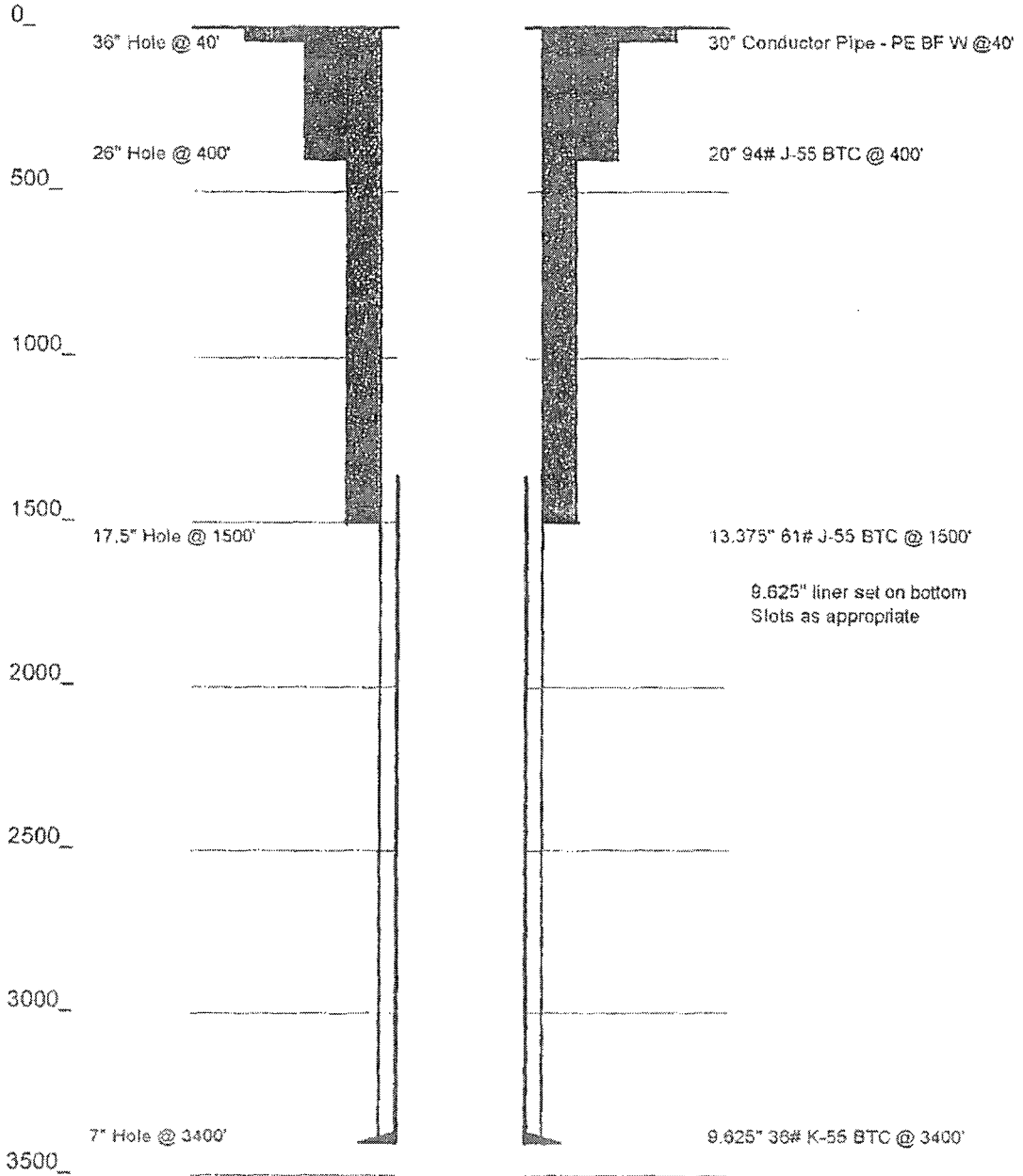
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

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# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 84# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

### • General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

### • Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
  - viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
  - ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.
- Using Air as the Drilling Fluid
    - a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
      - i. A rotating-head will be installed at the top of the BOPE stack.
      - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
      - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
      - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
      - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
      - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
      - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
      - viii. Float and standpipe valves.
      - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
      - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE



- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventors, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:
  - i. Check the accumulator pressure.
  - ii. Check pressure of the emergency backup system.
  - iii. Check hydraulic fluid level in the accumulator.
  - iv. Check air pressure to support system.
  - v. Record all of the above in IADC log book and well ledger.
- b. Every trip, but not twice within a 24 hour period:
  - i. Function test pipe rams (when inside shoe).
  - ii. Function test blind rams (when inside shoe).
  - iii. Operate all Kelly cocks.
  - iv. Check Drill pipe safety valve.
  - v. Function test HCR valve.
  - vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.
- c. Every 7 days (1 week) actuate the following:
  - i. Annular preventer.
  - ii. All gate valves in the choke and kill system.
  - iii. Inside BOP.
  - iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*Rule*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*Ret*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOHERMAL DRILLING PERMIT

RECEIVED  
LAS CRUCES DISTRICT OFFICE

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790

8. Surface Manager:  BLM  FS  
 Other Private

9. Unit Agreement Name

10. Well No. 45-07 11. Permit No. 23

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 2428 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,320 ft.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

20. Elevations:  Estimated  Final 4199 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23. Steven Brown, Manager 8/06/08  
Signed Title Date

(This space for Federal use)  
Approved by Tom Sanders Title Asst. Dist Mgr Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-08  
Well 45-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office



Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

---

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

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LAS CRUCES DISTRICT OFFICE  
2008 SEP -8 PM 1:50  
LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

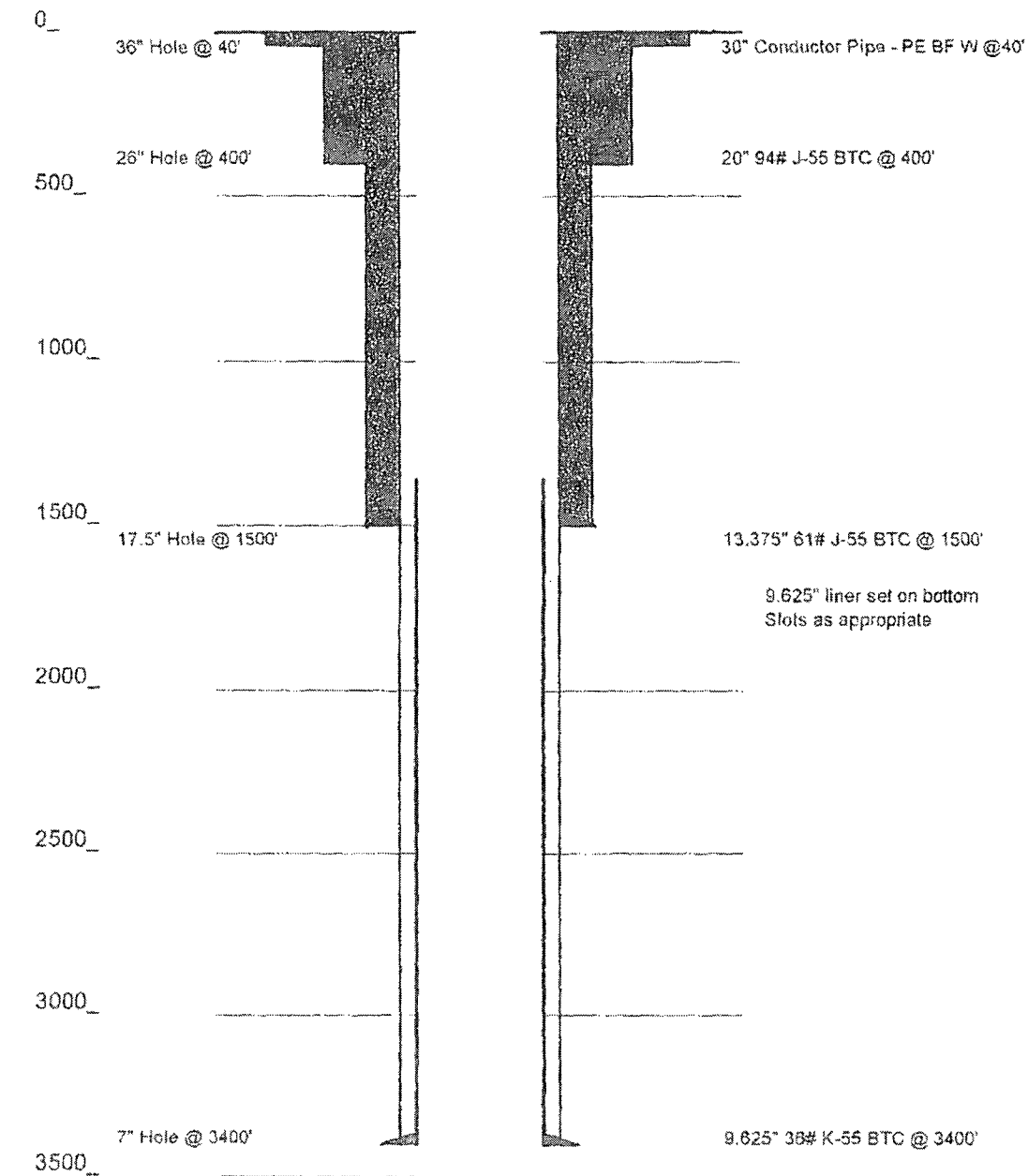
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

*RUE*

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4



## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

? pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*RUE*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*RelE*



## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s).

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

RECEIVED  
2008 AUG 11 AM 10:09  
LAS CRUCES, NM 88003

7. Lease Serial No. 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 42-18

11. Permit No. 23

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. H1-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1278.3 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,267.2 ft.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

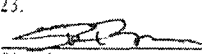
20. Elevations:  Estimated  Final 4245 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Steven Brown Manager 8/14/08  
Signed Title Date

(This space for Federal use)  
Approved by  Title Asst. Dist. Mgr Date 10/11/08

Conditions of Approval, if Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-03  
Well 42-18  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

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7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

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20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*PUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

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Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

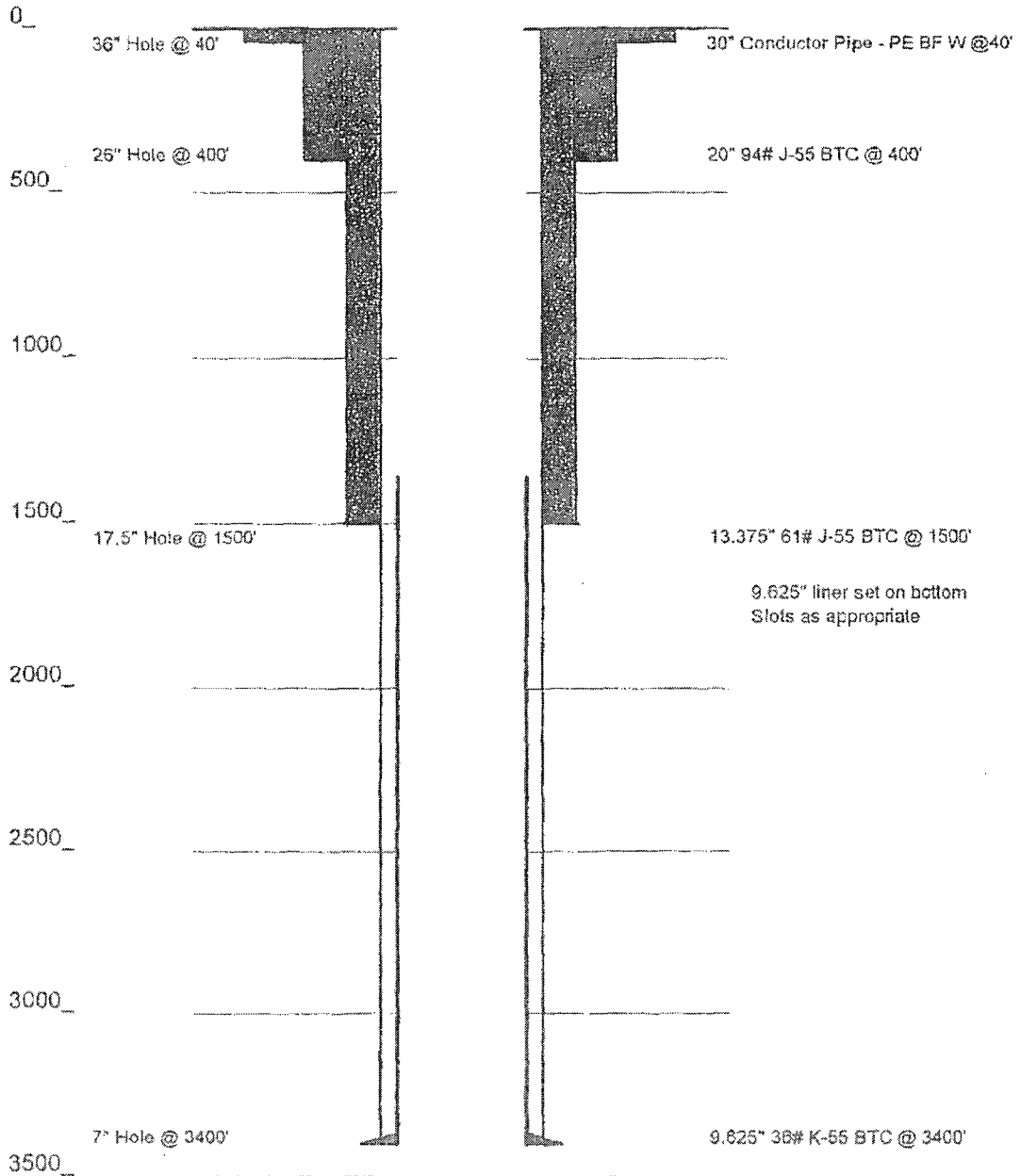
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



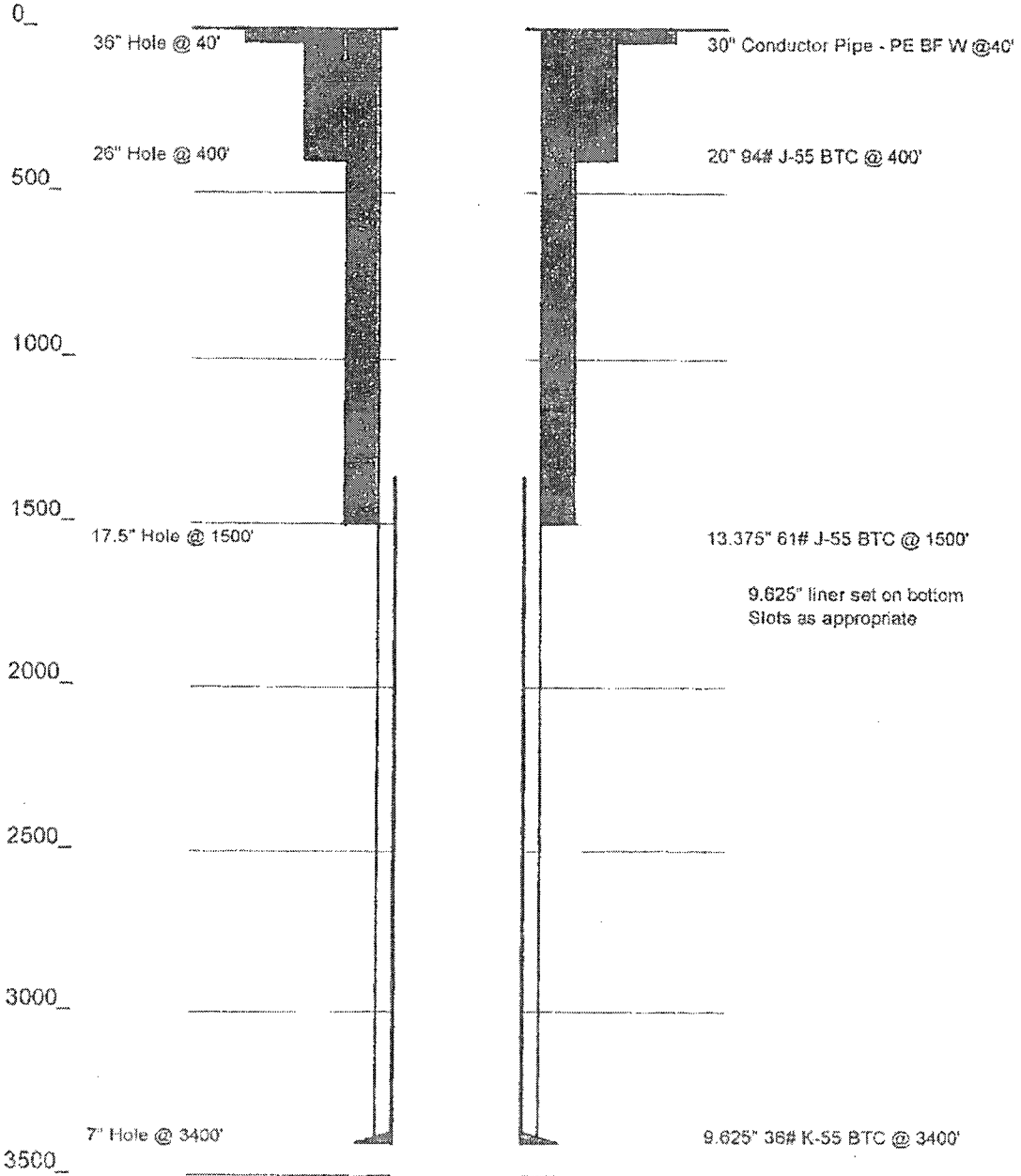
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4


*Ret*

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

- pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:
  - i. Check the accumulator pressure.
  - ii. Check pressure of the emergency backup system.
  - iii. Check hydraulic fluid level in the accumulator.
  - iv. Check air pressure to support system.
  - v. Record all of the above in IADC log book and well ledger.
- b. Every trip, but not twice within a 24 hour period:
  - i. Function test pipe rams (when inside shoe).
  - ii. Function test blind rams (when inside shoe).
  - iii. Operate all Kelly cocks.
  - iv. Check Drill pipe safety valve.
  - v. Function test HCR valve.
  - vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.
- c. Every 7 days (1 week) actuate the following:
  - i. Annular preventer.
  - ii. All gate valves in the choke and kill system.
  - iii. Inside BOP.
  - iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
    - Run a minimum of 60% excess and adjust as indicated by drilling conditions
    - Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
    - Monitor cement for fall back.
    - If cement falls back, locate top of cement and prepare for High-Density top job.
    - WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8 slotted liner will be hung from the 13-3/8 casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

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## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

GEOTHERMAL DRILLING PERMIT

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be completed and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

2008 AUG 11 AM 10:20  
LAS CRUCES, NM 88005

7. Lease Serial No. NM 34790

8. Surface Manager:  BLM  FS  
 Other Private

9. Unit Agreement Name

10. Well No. 33-07

11. Permit No. 02

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. H1-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 2389.4 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1.161 ft.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

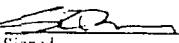
20. Elevations:  Estimated  Final 4199 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)


SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	GL	3,400'	

22. Proposed Work Summary

Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.   
Signed \_\_\_\_\_ Title Steven Brown, Manager Date 8/06/08

(This space for Federal use)

Approved by:  Title Asst. Dist. Mgr Date 9/30/08

Conditions of Approval, if Any:  
SEE ATTACHED (23)

File 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(See instructions on page 2)

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-02  
Well 33-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".



Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260<sup>o</sup> F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*DUG*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

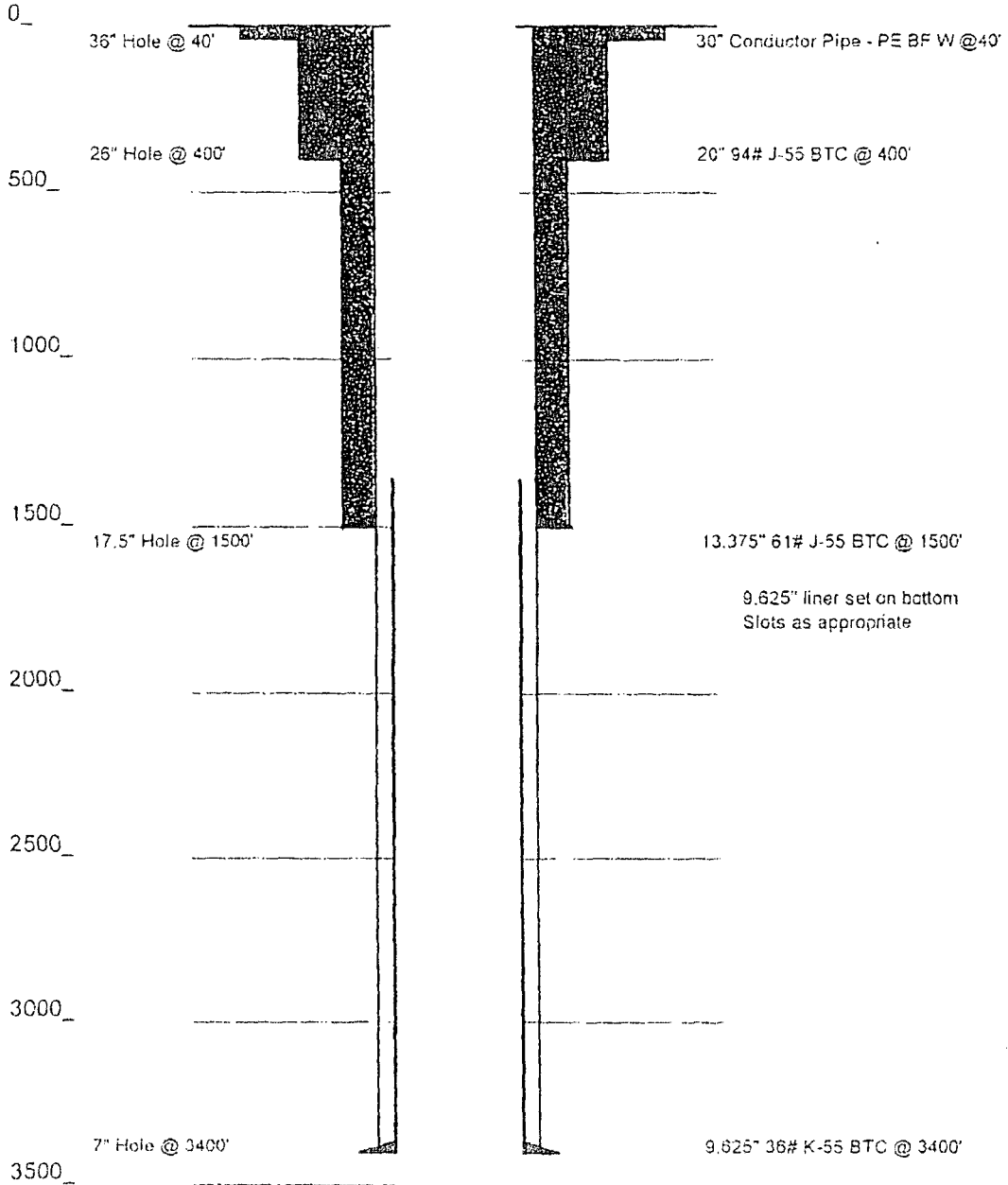
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



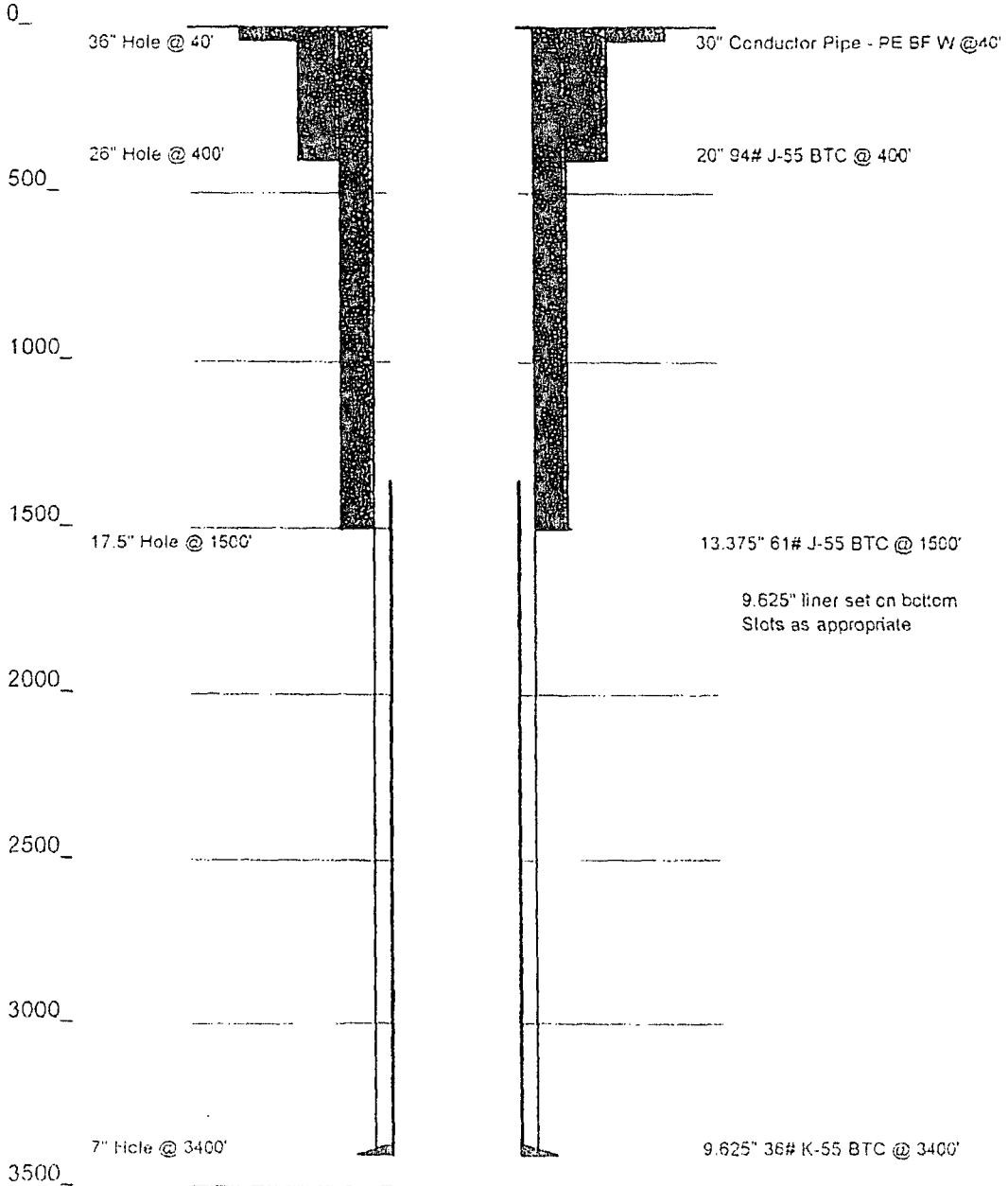
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*Relle*

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures
  - a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
    - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
    - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
    - iii. [Equal to] 2,000 psi.
  - b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
    - i. Drilling mud temperature.
    - ii. Drilling mud pit level.
    - iii. Drilling mud pump volume.
    - iv. Drilling mud weight.
    - v. Drilling rate.
    - vi. Hydrogen sulfide gas volume.
  - c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.
- Using Mud as the Drilling Fluid
  - a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

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- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes. - pipe
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

RULE



- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventors, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
- BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8 slotted liner will be hung from the 13-3/8 casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm. etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

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## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 JUL 11 AM 10:20  
LAS CRUCES, NM 88005

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared, approved, and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790  
8. Surface Manager:  BLM  FS  Other Private

9. Agreement Name

10. Well No. 13-07 11. Permit No. 21

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directional

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO, HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 530 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,161 ft.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400


20. Elevations:  Estimated  Final 4196 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.5"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Steven Brown, Manager Date 8/06/08  
Signed Title Date

(This space for Federal use)  
Approved by  Title Asst. Dist. Mgr Date 9/30/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.



DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-01  
Well 13-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

---

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 SEP -8 PM 1:50  
LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7, TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

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Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

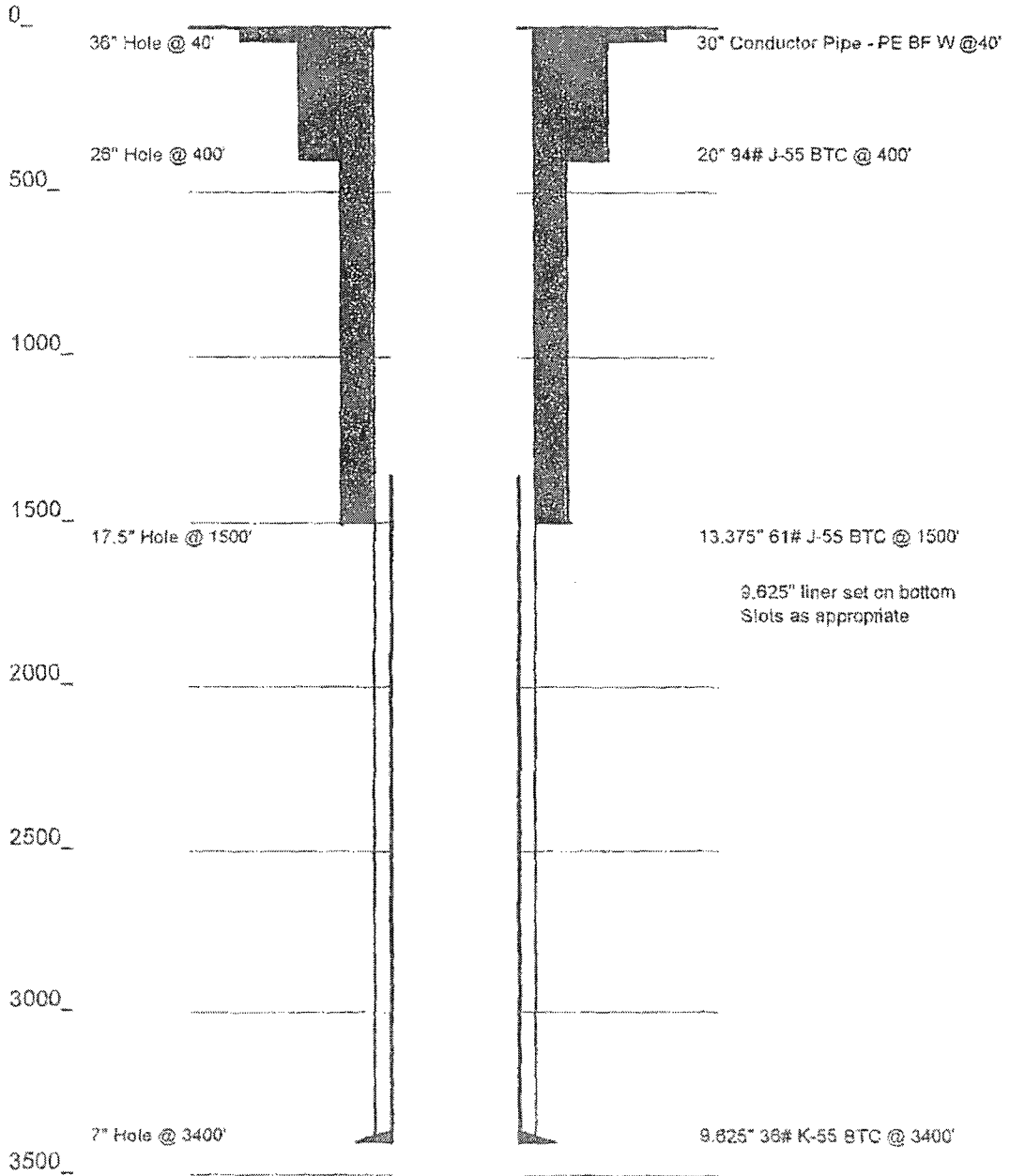
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

*RUE*

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOHERMAL PRODUCTION WELL DIAGRAM

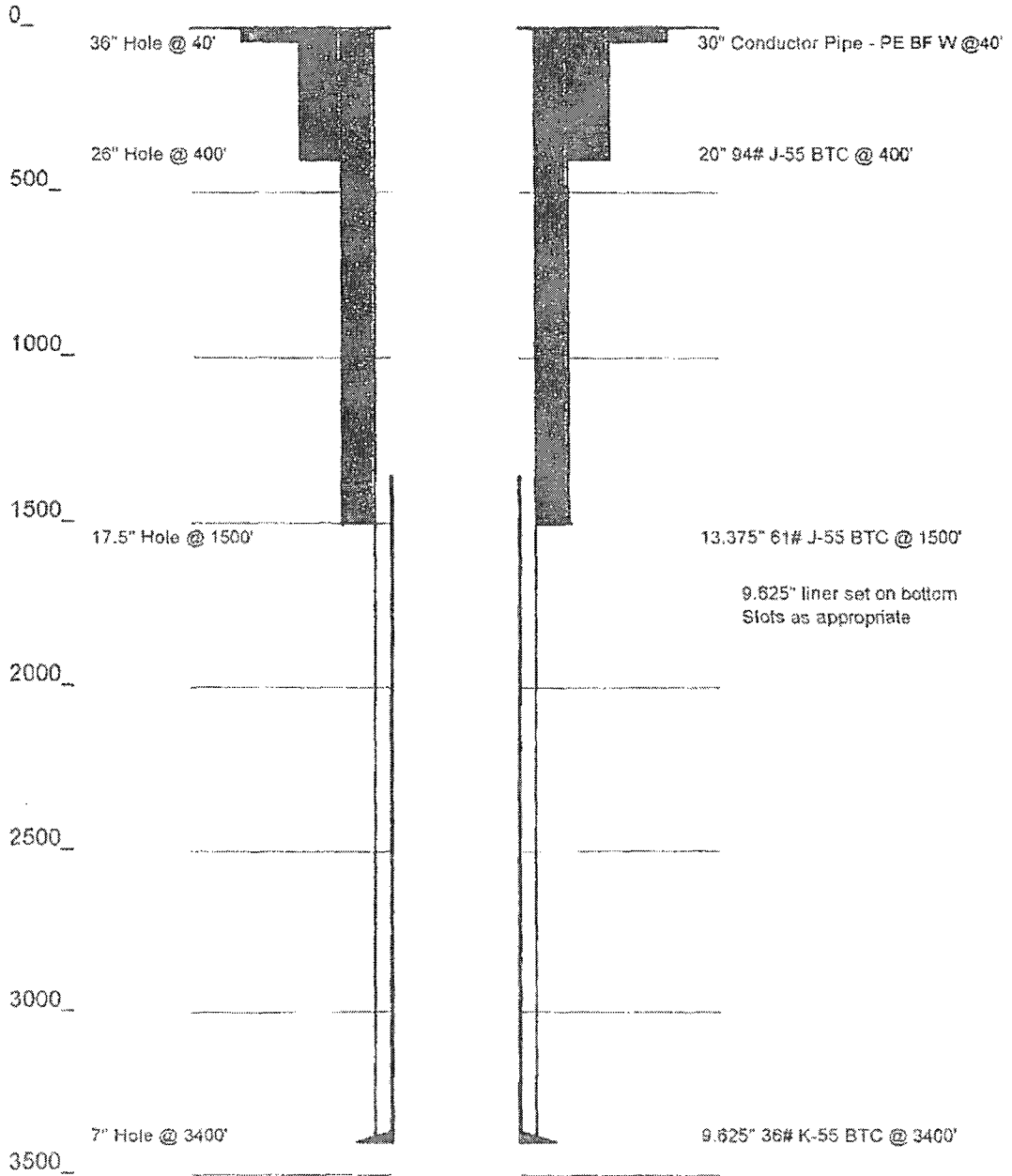
FIGURE 4A

*DUE*



# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*Beck*

## BOPE TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
- i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
  - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
  - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
  - iv. Kelly cock and standpipe valve.
  - v. A fill-up line installed above the BOPE.
  - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

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- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
    - Run a minimum of 60% excess and adjust as indicated by drilling conditions
    - Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
    - Monitor cement for fall back.
    - If cement falls back, locate top of cement and prepare for High-Density top job.
    - WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

RME



## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*RelE*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL SUNDRY NOTICE

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

RECEIVED

6- Lease Serial No.

NM 34790

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operations.

2010 JUN -  
7. Surface Management:  Other private  BLM  FS

8. Unit Agreement Name  
N/A

1a. Well Type:  Production  Injection  Heat Exchange  Observation  Other

9. Well No. TFD 55-7  
10. Permit No. 1

1b. Well Status:

GDP approved

11. Field or Area  
Wildcat

2. Name of Lessee/Operator

Lightning Dock Geothermal HI-01, LLC

12. Sec., T., R., B. & M.  
Sec. 7, T25S, R19W, NMBM

3. Address of Lessee/Operator

5152 North Edgewood Drive, Provo, Utah 84604

13. County

Hidalgo

4. Location of Well or Facility

2411.9' west of the East line and 2329.1' north of the South line of Sec. 7, T25S, R19W, NMBM

14. State

NM

5. Type of Work

- Change Plans
- Site and Road Construction
- Construct New Production Facilities
- Alter Existing Production Facilities
- Convert to Injection
- Fracture Test
- Shoot or Acidize
- Repair Well
- Pull or Alter Casing
- Multiple Complete
- Abandon
- Other

15. Describe Proposed Operations (Use this space for well activities only. See instructions for current well conditions on page 2.)

Step (1) of the approved Plan of Operations is :

"1) Inspect wellhead for dimensional consistency with ANSI series 400 standards."

The inspection carried out upon issuance of the geothermal drilling permit revealed the wellhead to be a non-standard item with no API ring groove. The proposed plan amendment is to add step (1)(A), "Make necessary correction."

The proposed repair operation is:

Replace non-standard wellhead with 12"-ANSI 400-series wellhead.

Operation is deemed necessary for compatibility with standard BOP equipment.

16. Describe Proposed Operations (Use this space for activities other than well work.)

17. I hereby certify that the foregoing is true and correct.

Signed Beggsman J. Barker Title Vice President Resource Management Date 05/25/2010

(This space for Federal use)

Approved by Bill Chelton Title District Manager Date 5/20/10

Conditions of Approval, if any:  
See attached COA

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

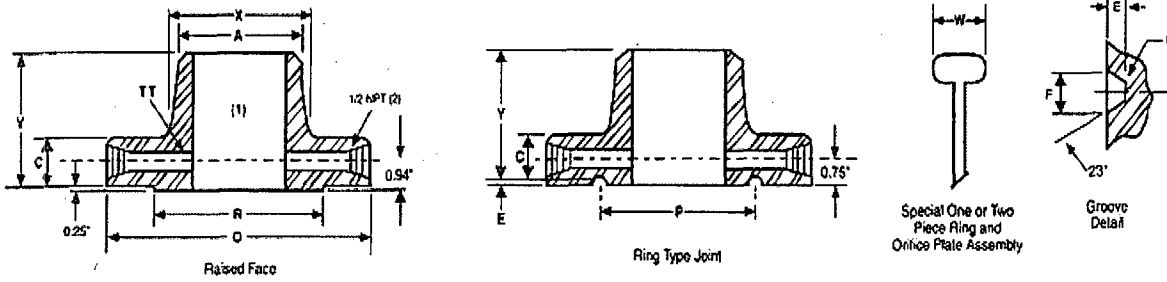
**CONDITIONS OF APPROVAL**

**NMNM034790 WELL 55-7**

**APPROVED: May 28, 2010**

1. The operator shall submit a comprehensive as-built for the new wellhead providing a scale diagram with dimensions and specifications for the ANSI 400 –series wellhead, the blow-out preventer and any attachments (valves, connects, in-line chokes, etc.). The as-built shall be filed with the LCDO within ten (10) days of completion of the wellhead replacement and the serial number for the wellhead shall be included on the as-built.

# Welding Neck Orifice Class 400



	Nom Size	Drilling																Ring Type Joint			
		OD	Thickness	OD of RF	Dia at Base	Dia Bevel	LTH	Dia of Pressure Connection	Bolt Circle	Hole Dia	# of holes	Bolt Dia	Groove #	Pitch Dia	Groove Depth	Groove width	Rad at Bottom	Spec Oval RH			
		O	C	R	X	A	Y	TT					P	E	F	r max	W				
in	4	10.00	1.50	6.19	5.75	4.50	3.50	1/2	7.88	1.00	8	7/8	R37	5.875	0.312	0.469	0.03	1.06			
mm		254.0	38.1	157.2	146.1	114.3	88.9	12.7	200.2	25.4		22.2		149.225	7.925	11.913	0.8	26.9			
in	6	12.50	1.62	8.50	8.12	6.63	4.06	1/2	10.62	1.00	12	7/8	R45	8.312	0.312	0.469	0.03	1.06			
mm		317.5	41.1	215.9	206.2	168.4	103.1	12.7	269.7	25.4		22.2		211.125	7.925	11.913	0.8	26.9			
in	8	15.00	1.88	10.62	10.25	8.63	4.62	1/2	13.00	1.12	12	1	R49	10.625	0.312	0.469	0.03	1.06			
mm		381.0	47.8	269.7	260.4	219.2	117.3	12.7	330.2	28.4		25.4		269.875	7.925	11.913	0.8	26.9			
in	10	17.50	2.12	12.75	12.62	10.75	4.88	1/2	15.25	1.25	16	1 1/8	R53	12.750	0.312	0.469	0.03	1.06			
mm		444.5	53.8	323.9	320.5	273.1	124.0	12.7	387.4	31.8		28.6		323.850	7.925	11.913	0.8	26.9			
in	12	20.50	2.25	15.00	14.75	12.75	5.38	1/2	17.75	1.38	16	1 1/4	R57	15.000	0.312	0.469	0.03	1.06			
mm		520.7	57.2	381.0	374.7	323.9	136.7	12.7	450.9	35.1		31.8		381.000	7.925	11.913	0.8	26.9			
in	14	23.00	2.39	16.25	16.75	14.00	5.88	1/2	20.25	1.38	20	1 1/4	R61	16.500	0.312	0.469	0.03	1.06			
mm		584.2	60.7	412.8	425.5	355.6	149.4	12.7	514.4	35.1		31.8		419.100	7.925	11.913	0.8	26.9			
in	16	25.50	2.50	18.50	19.00	16.00	6.00	1/2	22.50	1.50	20	1 3/8	R65	18.500	0.312	0.469	0.03	1.19			
mm		647.7	63.5	469.9	482.6	406.4	152.4	12.7	571.5	38.1		34.9		469.900	7.925	11.913	0.8	30.2			
in	18	28.00	2.62	21.00	21.50	18.00	6.50	1/2	24.75	1.50	24	1 3/8	R69	21.000	0.312	0.469	0.03	1.19			
mm		711.2	66.5	533.4	533.4	457.2	165.1	12.7	628.7	38.1		34.9		533.400	7.925	11.913	0.8	30.2			
in	20	30.50	2.75	23.00	23.12	20.00	6.62	1/2	27.00	1.62	24	1 1/2	R73	23.000	0.375	0.531	0.06	1.25			
mm		774.7	69.9	584.2	587.1	508.0	168.1	12.7	685.8	41.1		38.1		584.200	9.525	13.487	1.5	31.8			
in	24	36.00	3.00	27.25	27.62	24.00	6.88	1/2	32.00	1.89	24	1 3/4									
mm		914.4	76.2	692.2	701.5	609.6	174.8	12.7	812.8	48.0		44.5									

Note: Weld Neck flanges NPS 3" and smaller are identical to Class 600 flanges and may be so marked.

1. Bore diameter to be specified by purchaser.
2. Other NPT and SW connections available upon request.

# Casing Heads

## C-22 Casing Heads

C-22 casing heads feature a versatile straight bore design that can accept a wide variety of slip and mandrel type casing hangers.

### Features

- Features a 45° landing shoulder capable of supporting maximum loads
- Prevents test plugs from wedging under pressure

### Outlets

- Line Pipe Outlets
- Studded Side Outlets

### Casing Hanger Compatibility

- C-21 and C-22 slip-type casing hangers
- Mandrel style casing hangers

### Manufacturing Standard

- API-6A, PSL-1, DD, L-U, PR-1

### Availability

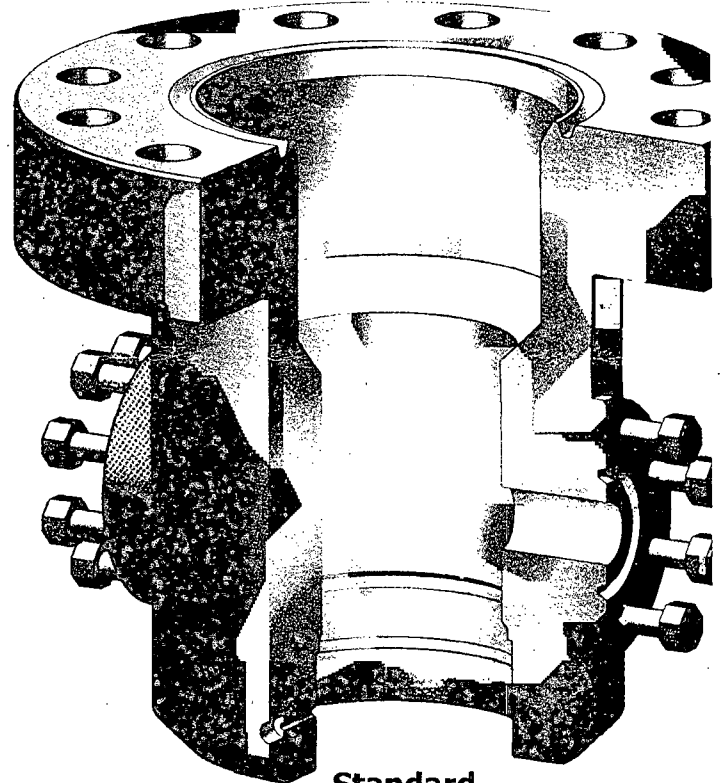
- Additional sizes available upon request
- Available in C-29 profile (Available upon request)

### Lockscrews

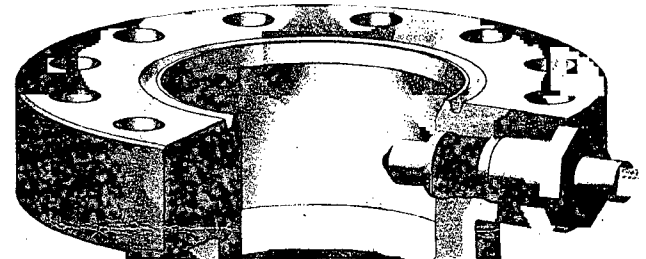
- C-22-BP casing heads are supplied with (2) lockscrews for wear bushing retention
- C-22-L and C-29-L casing heads are supplied with a full set of lockscrews for mandrel casing hanger and packoff retention (Available upon request)

### Bottom Connections

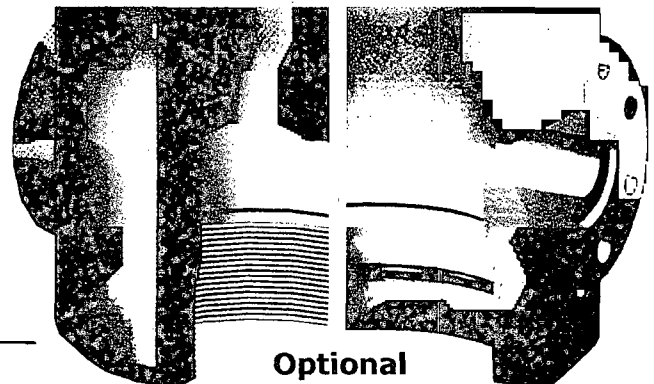
- Slip-on weld
- Slip-on weld with O-ring
- Threaded



**Standard**  
C-22 with Slip on Weld Prep  
with Line Pipe Outlets and Studded Side Outlets



**Optional**  
C-22-BP has lockscrews to hold the wear bushing in place



**Optional**  
Threaded Bottom Prep      Slip on Weld Prep  
with "O" Ring

## Chavez, Carl J, EMNRD

---

**From:** Layne Ashton [lashton@rasertech.com]  
**Sent:** Wednesday, June 02, 2010 1:51 PM  
**To:** Mike Smith  
**Cc:** Chavez, Carl J, EMNRD  
**Subject:** 3rd of 4 emails - 2008 approved GDPs  
**Attachments:** 53-07.pdf; 62-18.pdf

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
[layne.ashton@rasertech.com](mailto:layne.ashton@rasertech.com)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790  
8. Surface Manager:  BLM  FS  
 Other Private  
9. Lease Agreement Name  
LAS CRUCES, NM 88005

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drilled  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. H1-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 3052 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,320 ft.

10. Well No. 53-07

11. Permit No. 05

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

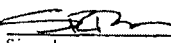
19. Proposed Depth Measured: True Vertical: 3,400

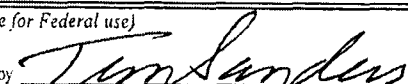
20. Elevations:  Estimated  Final 4209 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  
Signed  Steven Brown, Manager Title Date 8/06/08

(This space for Federal use)  
Approved by  Tom Sanders Title Asst. Dist Mgr Date 9/30/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.



DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-05  
Well 53-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the bloopie line, to allow complete shut in of the well at any time. The pipe rams and/or bloopie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*PLG*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWF*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

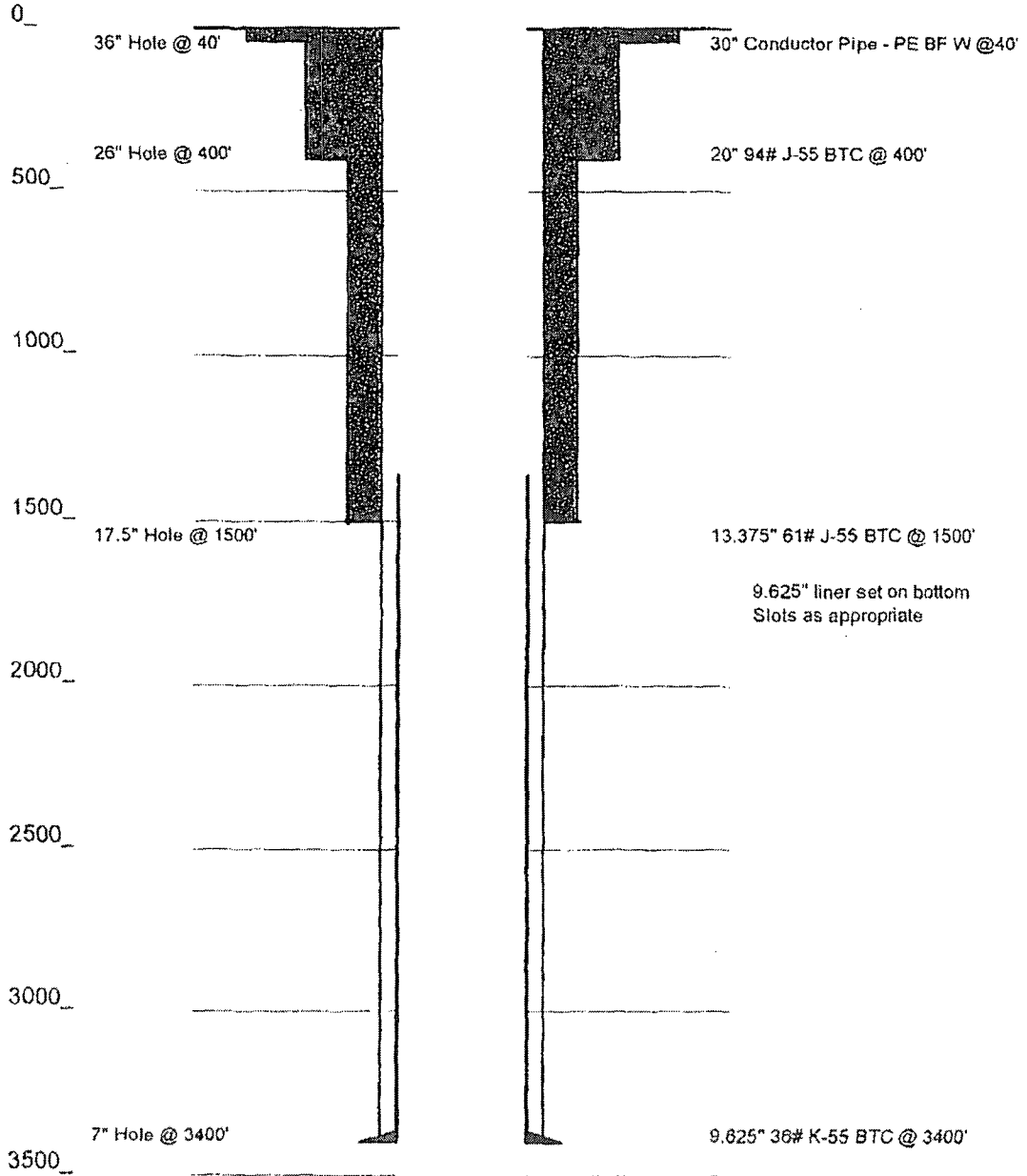
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



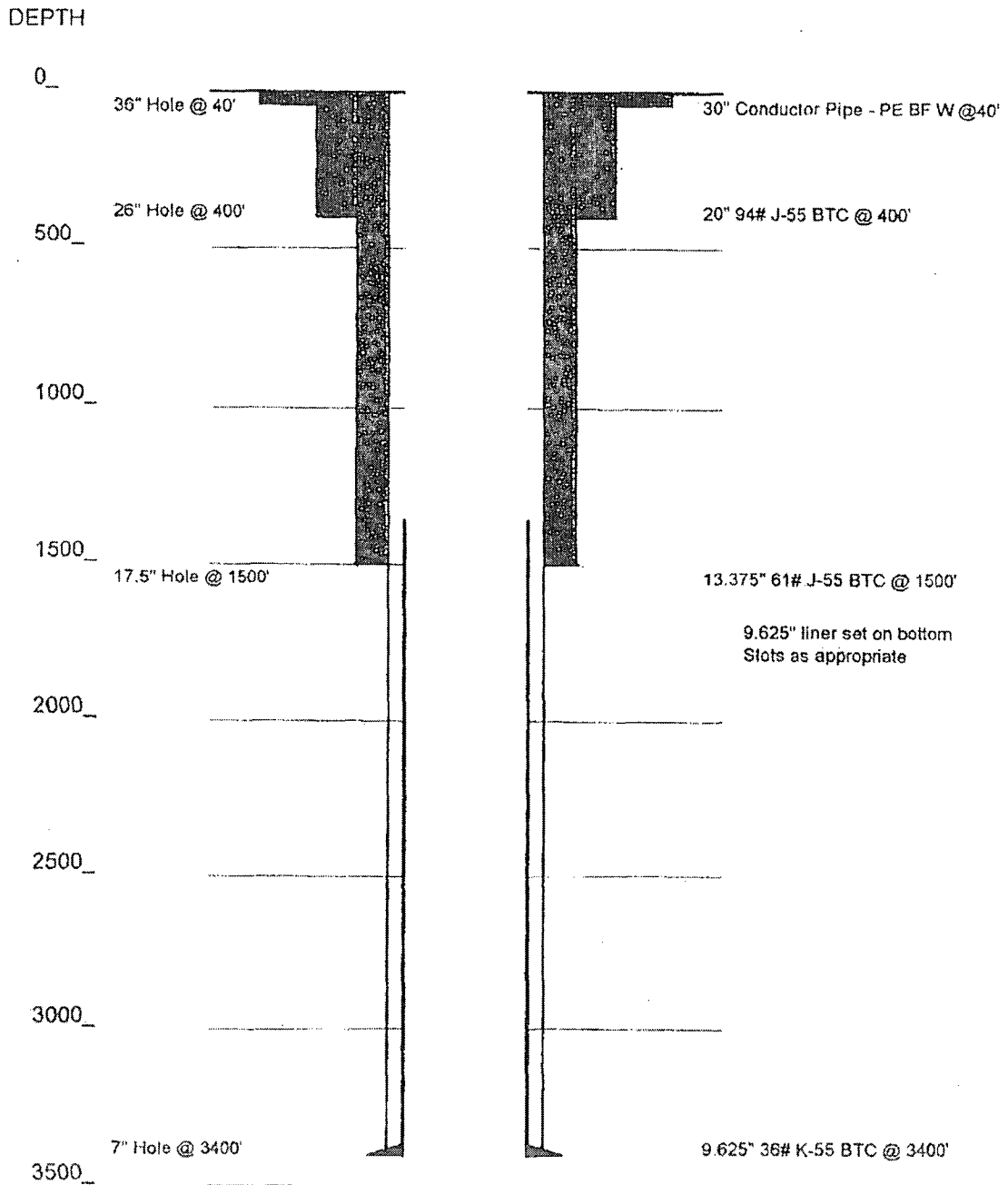
GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*



# PROPOSED INJECTION WELL DIAGRAM



GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*Red*

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

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## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**GEOTHERMAL DRILLING PERMIT**

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

**RECEIVED**  
**LAS CRUCES DISTRICT OFFICE**  
2008 AUG 11 AM 10:09  
LAS CRUCES, NM 88003

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. 134790	
8. Surface Manager: <input type="checkbox"/> BLM <input type="checkbox"/> FS <input checked="" type="checkbox"/> Other Private	
9. Unit Agreement Name	
10. Well No. 62-18	11. Permit No. 06
12. Field or Area	
13. Sec., T., R., B. & M. SEC 7 T25S R19W	
14. County Hidalgo	
15. State NM	
16. Approx. Starting Date 08/30/2008	
17. Acres Assigned (Well Spacing)	

18. Drilling Media and Characteristics: <input type="checkbox"/> Water <input checked="" type="checkbox"/> Mud <input type="checkbox"/> Foam <input type="checkbox"/> Air <input type="checkbox"/> Other	19. Proposed Depth Measured: True Vertical: 3,400	20. Elevations: <input checked="" type="checkbox"/> Estimated <input type="checkbox"/> Final 4245 ft. Reference Datum: <input checked="" type="checkbox"/> GR <input type="checkbox"/> MAT <input type="checkbox"/> DF <input type="checkbox"/> KB <input type="checkbox"/> RT <input type="checkbox"/> Casinghead Flange <input type="checkbox"/> Other
---	--	--

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
 Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
 See attached location map.  
 See attached Drilling Program for details.

23.  
 Signed: [Signature] Title: Steven Brown, Manager Date: 8/06/08

(This space for Federal use)  
 Approved by: [Signature] Title: Asst. Dist Mgr. Date: 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-06  
Well 62-18  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 SEP -8 PM 1:50  
LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

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## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*



- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly.

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

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# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH

0\_

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500\_

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000\_

1500\_

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000\_

2500\_

3000\_

3500\_

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
- i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
  - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
  - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
  - iv. Kelly cock and standpipe valve.
  - v. A fill-up line installed above the BOPE.
  - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RME

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:
  - i. Check the accumulator pressure.
  - ii. Check pressure of the emergency backup system.
  - iii. Check hydraulic fluid level in the accumulator.
  - iv. Check air pressure to support system.
  - v. Record all of the above in IADC log book and well ledger.
- b. Every trip, but not twice within a 24 hour period:
  - i. Function test pipe rams (when inside shoe).
  - ii. Function test blind rams (when inside shoe).
  - iii. Operate all Kelly cocks.
  - iv. Check Drill pipe safety valve.
  - v. Function test HCR valve.
  - vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.
- c. Every 7 days (1 week) actuate the following:
  - i. Annular preventer.
  - ii. All gate valves in the choke and kill system.
  - iii. Inside BOP.
  - iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

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## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*KEE*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

## Chavez, Carl J, EMNRD

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**From:** Layne Ashton [lashton@rasertech.com]  
**Sent:** Wednesday, June 02, 2010 1:49 PM  
**To:** Mike Smith  
**Cc:** Chavez, Carl J, EMNRD  
**Subject:** 2008 approved GDPs - 1 of 4 emails  
**Attachments:** 45-07.pdf; 13-07.pdf

Mike,

Carl Chavez informed me that your office is missing two GDPs that Raser requires from BLM prior to OCD issuing its final authorization for 5 production and 3 injection wells. Raser has received all 8 GDPs from BLM.

I don't know which two GDPs your office is missing, so I am sending all 8 to you for your files. After you review said approved GDPs, please notify Carl.

Due to the size of the documents, I am going to send 4 emails with 2 GDPs attached to each email.

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
[layne.ashton@rasertech.com](mailto:layne.ashton@rasertech.com)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

RECEIVED  
LAS CRUCES DISTRICT OFFICE

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

GEOTHERMAL DRILLING PERMIT

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 45-07 11. Perm. No. 28

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 2428 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,320 ft.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

20. Elevations:  Estimated  Final 4199 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23. Signed Steven Brown, Manager Title Steven Brown, Manager Date 8/06/08

(This space for Federal use)  
Approved by Tom Sanders Title Asst. Dist Mgr Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(See instructions on page 2)

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-08  
Well 45-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office



Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 SEP -8 PM 1:50  
LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7, TFD 55-7 that encountered and briefly produced 260<sup>o</sup> F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Pure*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*PUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

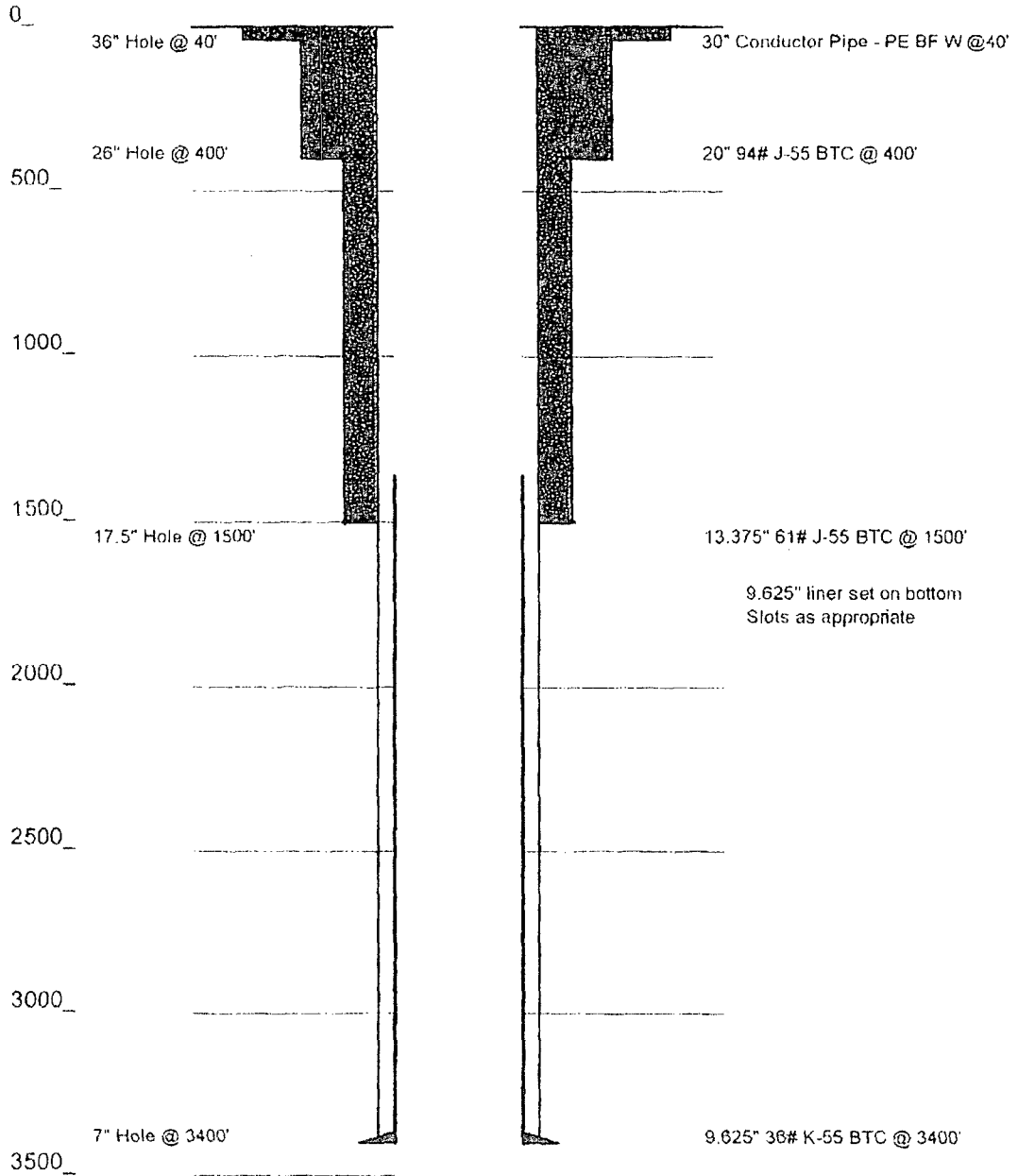
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



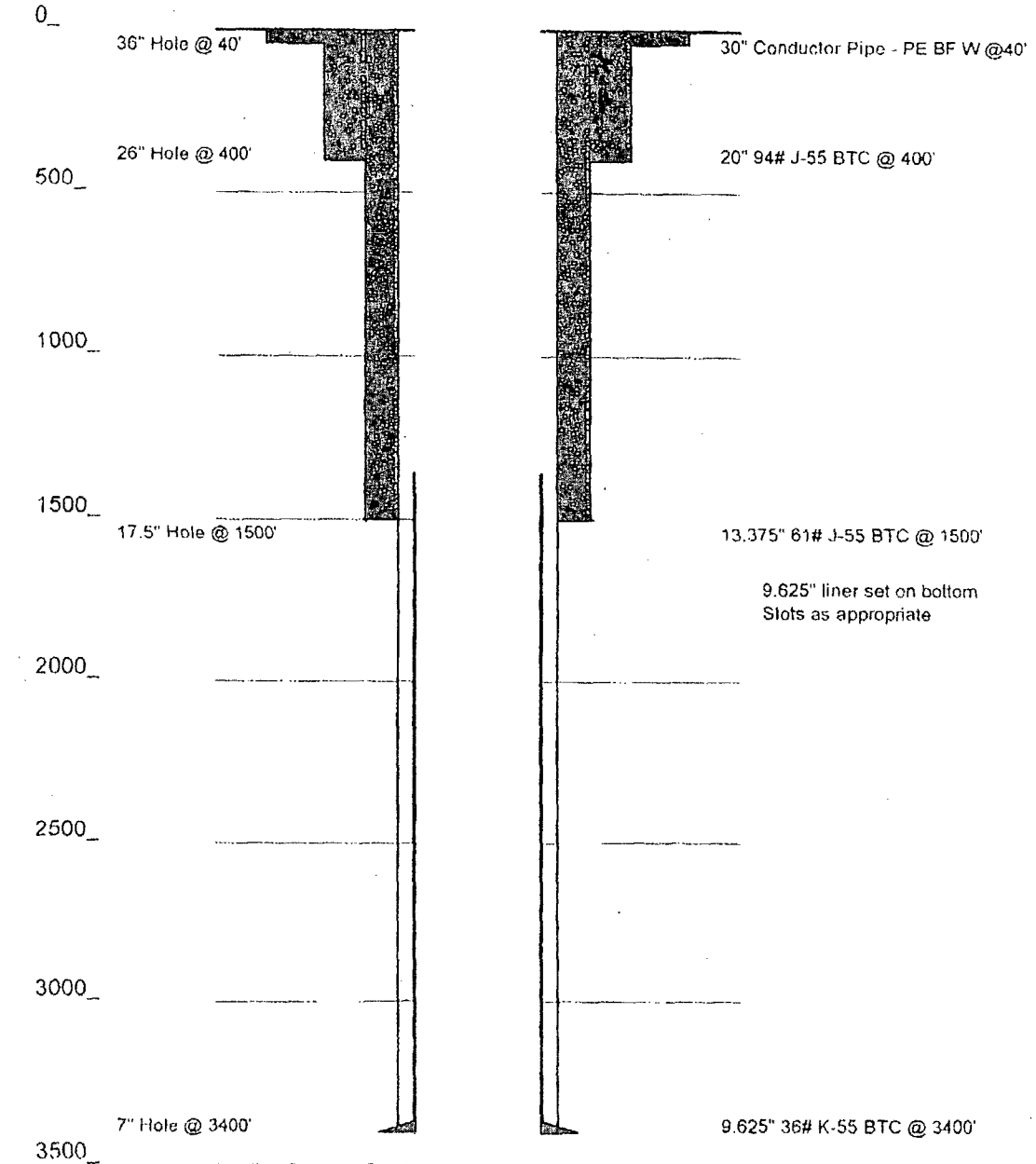
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*Reilly*



## BOPE TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures
  - a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
    - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
    - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
    - iii. [Equal to] 2,000 psi.
  - b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
    - i. Drilling mud temperature.
    - ii. Drilling mud pit level.
    - iii. Drilling mud pump volume.
    - iv. Drilling mud weight.
    - v. Drilling rate.
    - vi. Hydrogen sulfide gas volume.
  - c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.
- Using Mud as the Drilling Fluid
  - a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

? pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventors, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*RULE*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

RUE

## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

*RUE*

c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8 slotted liner will be hung from the 13-3/8 casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

RUE

## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*RelE*



## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
GEOTHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

RECEIVED  
LAS CRUCES DISTRICT OFFICE

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared, signed, and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790

8. Surface Manager:  BLM  FS  
 Other PRIVATE

9. Agreement Name  
LAS CRUCES, NM 88005

10. Well No.  
13-07

11. Permit No.  
81

12. Field or Area

13. Sec., T., R., B. & M.  
SEC 7 T25S R19W

14. County  
Hidalgo

15. State  
NM

16. Approx. Starting Date  
08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directional

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line  
530 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease.  
1,161 ft.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured:  
True Vertical: 3,400


20. Elevations:  Estimated  Final 4196 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

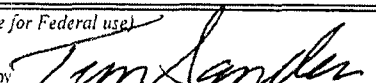
SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.5"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.

Signed  Steven Brown, Manager Title Date 8/06/08

(This space for Federal use)

Approved by  Title Asst. Dist. Mgr Date 9/30/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-01  
Well 13-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE  
2008 SEP -8 PM 1:50  
LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Rue*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10-foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*



Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

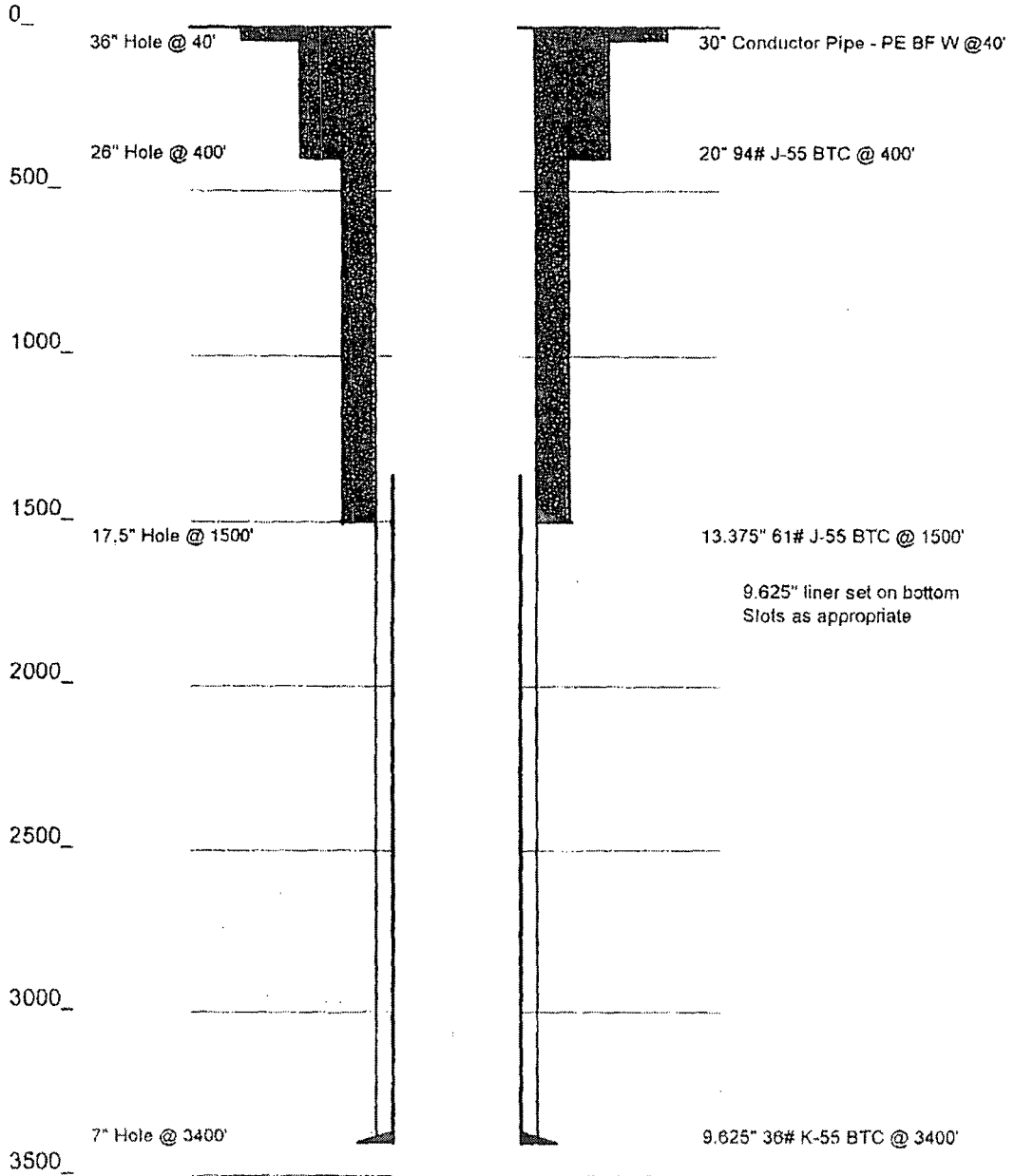
Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 36# K-55 BTC @ 3400'

GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE

- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
  - viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
  - ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.
- Using Air as the Drilling Fluid
    - a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
      - i. A rotating-head will be installed at the top of the BOPE stack.
      - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
      - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
      - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
      - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
      - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
      - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
      - viii. Float and standpipe valves.
      - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
      - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

pipe

RME

- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventors, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:
  - i. Check the accumulator pressure.
  - ii. Check pressure of the emergency backup system.
  - iii. Check hydraulic fluid level in the accumulator.
  - iv. Check air pressure to support system.
  - v. Record all of the above in IADC log book and well ledger.
- b. Every trip, but not twice within a 24 hour period:
  - i. Function test pipe rams (when inside shoe).
  - ii. Function test blind rams (when inside shoe).
  - iii. Operate all Kelly cocks.
  - iv. Check Drill pipe safety valve.
  - v. Function test HCR valve.
  - vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.
- c. Every 7 days (1 week) actuate the following:
  - i. Annular preventer.
  - ii. All gate valves in the choke and kill system.
  - iii. Inside BOP.
  - iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*RULE*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

RUE



## CEMENTING PROGRAM

- General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- Casing Cementing

- a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
    - Run a minimum of 60% excess and adjust as indicated by drilling conditions
    - Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
    - Monitor cement for fall back.
    - If cement falls back, locate top of cement and prepare for High-Density top job.
    - WOC for 24 hours.

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c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

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## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*KEE*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

## Chavez, Carl J, EMNRD

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**From:** Layne Ashton [lashton@rasertech.com]  
**Sent:** Wednesday, June 02, 2010 1:50 PM  
**To:** Mike Smith  
**Cc:** Chavez, Carl J, EMNRD  
**Subject:** 2nd of 4 emails - 2008 approved GDPs  
**Attachments:** 82-18.pdf; 47-07.pdf

2 of 4 emails with signed GDPs

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
[layne.ashton@rasertech.com](mailto:layne.ashton@rasertech.com)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

**GEOHERMAL DRILLING PERMIT**  
**2008 AUG 11 AM 10:09**  
**LAS CRUCES, NM 88005**

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790

8. Surface Manager:  BLM  FS  Other Private

9. Unit Agreement Name

10. Well No. 82-18 11. Permit No. 07

12. Field or Area

13. Sec., T., R., B. & M. SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. H1-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1278.3 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,267.2 ft.

18. Drilling Media and Characteristics:  Air  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

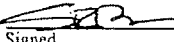
20. Elevations:  Estimated  Final 4245 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)


SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary

Drill a geothermal injection well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
See attached location map.  
See attached Drilling Program for details.

23.  Signed \_\_\_\_\_ Title Steven Braun, Manager Date 8/06/08

(This space for Federal use)

Approved by  Title Asst. Dist Mgr Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-07  
Well 82-18  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall



be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blooie line, to allow complete shut in of the well at any time. The pipe rams and/or blooie line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1:50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Ruse*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*RUE*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.
- 

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWE*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

Send 2 copies of all logs to BLM and /or State as required.

RUE

# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH

0

36" Hole @ 40'

30" Conductor Pipe - PE BF W @ 40'

500

26" Hole @ 400'

20" 94# J-55 BTC @ 400'

1000

1500

17.5" Hole @ 1500'

13.375" 61# J-55 BTC @ 1500'

9.625" liner set on bottom  
Slots as appropriate

2000

2500

3000

3500

7" Hole @ 3400'

9.625" 38# K-55 BTC @ 3400'

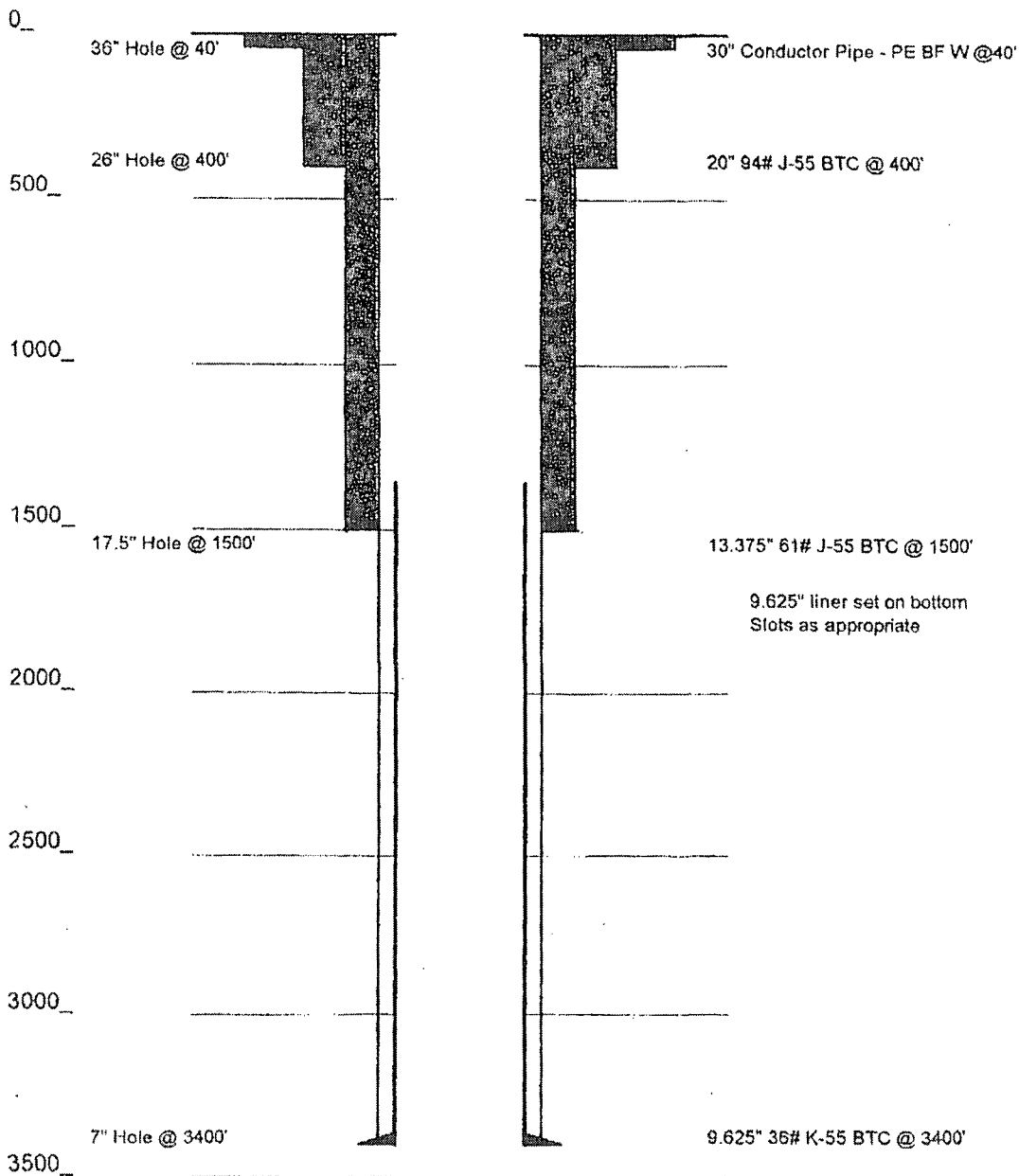
GEOTHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOTHERMAL INJECTION WELL DIAGRAM

FIGURE 4

*REK*

## BOP TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
- i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
  - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
  - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
  - iv. Kelly cock and standpipe valve.
  - v. A fill-up line installed above the BOPE.
  - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

RUE



- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

? pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

a. When the BOP is installed after running casing (See Figure 6 and 7):

- i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
- ii. All following tests will have the same pressures and time limits.
- iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
- iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
- v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
- vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
- vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
- viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
- ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
- x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
- xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
- xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
- xiii. Check all levels in accumulator and backup systems, record in log book.

b. During normal operation, every 14 days:

- i. Blind rams will be tested with a test plug when out of the hole.
- ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

RUE

- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

*Bill E*

- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

RWE

## CEMENTING PROGRAM

### • General

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

### • Lost Circulation Control

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

### • Casing Cementing

#### a. Conductor Pipe

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

#### b. Surface 20" String

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

*RUE*

c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8 slotted liner will be hung from the 13-3/8 casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

RME

## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*Relle*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE



UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**RECEIVED**  
LAS CRUCES DISTRICT OFFICE  
GEOHERMAL DRILLING PERMIT

FORM APPROVED  
OMB No. 1004-0132  
Expires: January 31, 2004

The Bureau of Land Management (BLM) requires this form or other BLM approved form to be prepared, approved, and filed in triplicate with requisite attachments with the authorized officer. The authorized officer must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790  
8. Surface Manager:  BLM  FS  
 Other Private

9. Well Name: LAS CRUCES NM 88005 (Lease Agreement Name)

10. Well No. 47-07 11. Permit No. 04

12. Field or Area

13. Sec., T., R., B. & M.  
SEC 7 T25S R19W

14. County Hidalgo

15. State NM

16. Approx. Starting Date 08/30/2008

17. Acres Assigned (Well Spacing)

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drilled

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

1c. Well Status: NEW WELL

2. Name of Lessee/Operator LIGHTING DOCK NO. HI-01 LLC

3. Address of Lessee/Operator 5152 NORTH EDGEWOOD DRIVE, SUITE 375, PROVO, UTAH

4. Location of Well  
At surface SEE ATTACHMENT  
At proposed prod. zone SAME AS ABOVE

5. Distance from Proposed Location to Nearest Property or Lease Line 1219 ft.

6. Distance from Proposed Location to Nearest Well, or Previously Applied for Well Location on this Lease. 1,320 ft.

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other

19. Proposed Depth Measured: True Vertical: 3,400

20. Elevations:  Estimated  Final 4199 ft.  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	30" (Conductor)	3/8" Wall		PEBFM	GL	40'	496 Sacks
26"	20"	94 lb/ft		J55 BT&C	GL	400'	750 Sacks
17.5"	13.375"	61 lb/ft		J55 BT&C	GL	1,500'	913 Sacks
12.25"	9.625" Liner	36 lb/ft		K55 BT&C	1500'	3,400'	

22. Proposed Work Summary  
 Drill a geothermal production well from drill site on private land to extract geothermal fluids from federal lease number NM-108801 & NM-034790.  
 See attached location map.  
 See attached Drilling Program for details.

23. [Signature] Steven Brown, Manager 8/06/08  
 Signed Title Date

(This space for Federal use)  
 Approved by [Signature] Title Asst. Dist. Mgr. Date 10/1/08

Conditions of Approval, If Any:  
SEE ATTACHED (23)

Title 18 U.S.C. Section 1001, makes it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

DOWNHOLE CONDITIONS OF APPROVAL FOR GDP-050-08-04  
Well 47-07  
Federal Lease NM-34790  
Lightning Dock  
Hidalgo County, New Mexico

Unless otherwise authorized by the Las Cruces Field Office Manager:

General:

1. All operations shall be conducted in accordance with lease stipulations, Federal Regulations (43 CFR 3260), Geothermal Resource Operational (GRO) Orders, and the attached Drilling Plan, as amended by Conditions of Approval.
2. A daily drilling report shall be given by FAX, telephone, or email to John Besse, Glen Garnand, and Rich Estabrook, Monday through Friday, by 8:30 am, until the well is completed or abandoned.

Name	Telephone	Fax	e-mail
John Besse	505-525-4363	505-525-4412	John_Besse@nm.blm.gov
Glen Garnand	575-627-0209	575-627-0276	Glen_Garnand@nm.blm.gov
Rich Estabrook	707-468-4052	707-468-4095	restabro@ca.blm.gov

3. Within 30 days of well completion, a complete well history, all directional surveys taken, and all logs run shall be mailed or delivered to:

John Besse  
Bureau of Land Management  
1800 Marquess St.  
Las Cruces, NM 88005

with a copy of all of the above going to:

Rich Estabrook  
Bureau of Land Management  
2550 N. State St.  
Ukiah, CA 95482

4. A copy of this permit, attached conditions, the approved operations/drilling plan, and any relevant Sundry Notices shall be retained at the wellsite for reference.
5. In case of downhole emergency, Richard Estabrook (home phone: 707-459-5711) shall be notified. In case of a spill or surface-related emergency, John Besse (home phone: 575-644-8324X) shall be notified.
6. Variances from the approved well program shall be approved by the Las Cruces Field Office

Manager or, in emergency situations verbal approval may be obtained from Rich Estabrook. Any verbal approvals shall be followed up by submitting a Sundry Notice within 24 hours of approval.

---

7. Glen Garnand (575-627-0209) shall be given a 48-hour notice of any well tests, including Blowout Prevention Equipment tests, formation integrity tests, and flow tests.

Geothermal Resource Operational Order 2 (GRO 2) Items :

8. The BOP shall be pressure tested following repairs and prior to drilling out plugs or casing shoes.
9. All flange bolts shall be inspected weekly and auxiliary controls shall be inspected daily.
10. All BOPE controls shall be plainly labeled.
11. At least one kelly cock (upper or lower) shall be installed and operational.
12. The accumulator shall be capable of closing all hydraulically-operated BOP equipment with at least 1000 psig remaining in the accumulator.
13. All BOPE packing elements shall be rated for high temperature service.
14. Hydrogen sulfide monitors, one in the cellar and one on the drilling floor shall be installed and operational at all times. Audio and visual alarms shall be set to go off if either of the hydrogen sulfide monitors detects levels of 10 ppm or greater.
15. All wellhead welding shall be made in accordance with applicable standards and shall be liquid pressure tested to the working pressure rating.
16. During all drilling operations, a member of the drilling crew shall monitor the rig floor unless the well is secured with BOPs or a cement plug.

Additional Conditions:

17. After drilling 3-5' of new formation below the 13 3/8" casing shoe, drilling shall stop and the casing shoe and formation shall be tested to a minimum of a .6 psi/ft gradient for 30 minutes. If a successful test cannot be obtained, drilling shall not continue until verbal approval is granted by Richard Estabrook.
18. The pressure gauge used in the above test shall have a span that is less than 2 times the anticipated surface pressure of the test and shall be calibrated against a known standard prior to the test. The calibration shall be documented in the drilling history.
19. At least 500 bbls of water shall be retained on site at all times. The water container(s) shall

be connected to the well in such a way that the water can be immediately pumped into the kill line in case of an emergency.

20. All BOPE pressure testing shall be done with clear water.
21. Prior to testing the accumulator as required in Condition 12, the accumulator pressure gauge shall be checked for accuracy at "zero" pressure. Error shall be remedied by installing a new gauge, calibrating the existing gauge, or offsetting the gauge readings by the error noted.
22. During the cementing of any casing string, if the fallback in the annulus exceeds 100' from the surface, the top of cement shall be determined by a cement bond log. The logging procedure and equipment shall be such that a clear indication of the top of cement can be derived. A top job shall be done using "tremie" pipe, from the top of cement indicated by the log to the surface.
23. The BOP requirements under the headings "Using Mud as the Drilling Fluid" and "Using Air as the Drilling Fluid" in the "BOP Testing, Inspection, Training, and Maintenance" procedure, shall be followed for this well, with the following exceptions:

#### Mud Drilling

- a. BOPE is not required while drilling below the conductor shoe;
- b. A double ram preventer is not required while drilling below the surface casing shoe;
- c. The blowdown line shall also include at least one adjustable choke valve, shall extend to the reserve pit, and shall be anchored at all bends;

#### Air Drilling

- d. The BOPE shall include either a set of pipe rams below the banjo box/diverter or a hydraulically-controlled shut off valve in the blowdown line, to allow complete shut in of the well at any time. The pipe rams and/or blowdown line valve shall be function tested as part of the BOPE test, but do not have to be pressure tested. The rest of the BOPE shall be pressure tested per the "BOP Testing procedure submitted".

Drilling Plan  
Raser Technologies Inc  
Lightning Dock Production well

RECEIVED  
LAS CRUCES DISTRICT OFFICE

2008 SEP -8 PM 1: 50

LAS CRUCES, NM 88005

### Overview

The purpose of this well is to define, test and produce the binary geothermal resource encountered by well TFD 55-7.

The wells will be step outs from the wells TG 52-7. TFD 55-7 that encountered and briefly produced 260° F + fluids from the tertiary volcanics encountered from 180 feet to 2000 feet and the underlying sedimentary strata.

### Borehole Design

Drill 36" hole to 40'

Set 30" conductor pipe

Drill 26" hole to 400' or 50' into the volcanics

Set 20" Surface string at 400'

Drill 17.5" hole to 1500'

Set 13.375" Intermediate String at 1500'

Drill 12.25" hole to 3,400' using light mud or aerated fluids

Hang 9.625" or similar perforated liner if needed to total depth. Liner will not be cemented.

*Pure*

## Procedure

The drill pad will be cleared and leveled using standard earth moving equipment and a reserve pit dug along side. The anticipated pad size will be 200' by 300' with a 100' by 100' reserve pit having a maximum depth of 12'.

Move in suitable conductor rig and drill 36" hole to 40 feet and set 30" conductor pipe. The pipe will be cemented to the surface with a sand/cement slurry. Monitor for fall and perform top job if necessary.

WOC for 24 hours.

Dig cellar as needed and install flow lines.

Move in a suitable conventional rotary drill rig and associated equipment. Completely rig up all accouterments prior to spud.

Drill 26" hole to 400' +/- or 50' into the volcanics using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 400' +/- of 20" 94#, j-55 Buttress casing equipped with float shoe and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 191 sacks in lead and 305 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 60% excess and adjust as indicated by drilling conditions

*PLG*

- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 500 psig. Make up 17.5" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Drill 17.5" hole to 1500' +/- using mud as the circulating medium. Treat lost circulation with LCM or if severe, cement plugs.

- Monitor flow line temperatures at all times.
- Catch 10 foot samples from drill cuttings and monitor for hydrothermal alteration.
- Monitor returns for changes in pH, weight, or viscosity.
- Insure drill hole is kept straight, run deviation surveys every 250 feet
- Use directional driller and mudmoter to maintain borehole alignment
- Provide H<sub>2</sub>S monitoring on the rig in compliance with state and federal requirements.

Circulate hole clean.

- Keep hole full and check for excess flow.
- Measure out of hole.
- Be sure all casing running equipment is ready for use.

Rig up and run 1500' +/- of 13.375" 61#, j-55 Buttress casing equipped with float shoe, float collar, and stabilizers. Centralize casing first 3 joints. Be sure casing is centered prior to cementing

- Run casing at slow speed to prevent down surge.
- Fill casing as required to overcome buoyancy.
- Have casing sized to remain 10' off bottom.
- Spot weld lower three joints.

Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slury

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Use 692 sacks in lead and 221 sacks in tail
- Adjust for final TD and conditions encountered
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Monitor cement for fall back
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

Cut off casing and weld on casing head equipped with 2" side outlets.

*RWA*

Install BOPE (double rams (blind & pipe), & rotating head or annular preventer) and rig up flow lines.

Test casing, blind rams, and choke lines to 1000 psig. Make up 12.25" drilling assembly

- RIH and test pipe rams and rotating head. Log results
- Have BLM or State witness BOP test.

Clean out shoe and cement to TD and circulate hole clean.

Make 5 to 10 feet of new hole and hold BOP drill.

Drill 12.25 hole to 3,400 +/- feet keeping the hole straight. Use LSND, or aerated fluids as conditions dictate.

- Catch 10 foot samples
- Monitor Well for increase or decrease in flow
- Monitor flow line temperature.
- If increased flow or temperature are noted contact geological staff
- Run deviation surveys every 500'

After reaching 3,500 feet +/- circulate hole clean.

Mechanical Integrity Testing (MIT) will be conducted prior to operation.

Run temperature and other logs as directed by geology staff.

If hole is unstable rig up and run 9.625" perforated liner to total depth.

Rig up for well tests 24 hour and long testing per geologic staff directions.

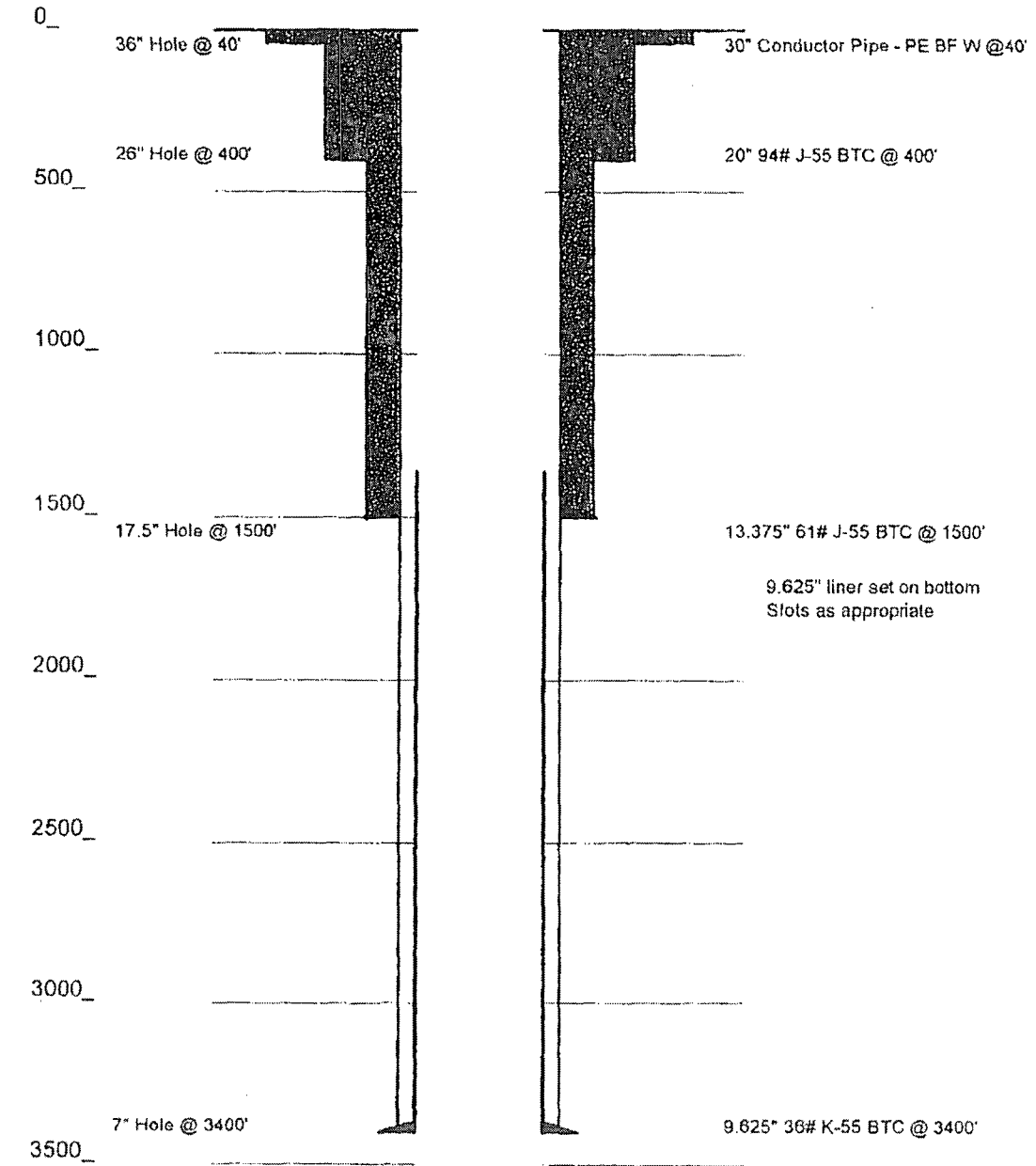
Send 2 copies of all logs to BLM and /or State as required.

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# PROPOSED PRODUCTION WELL DIAGRAM

DEPTH



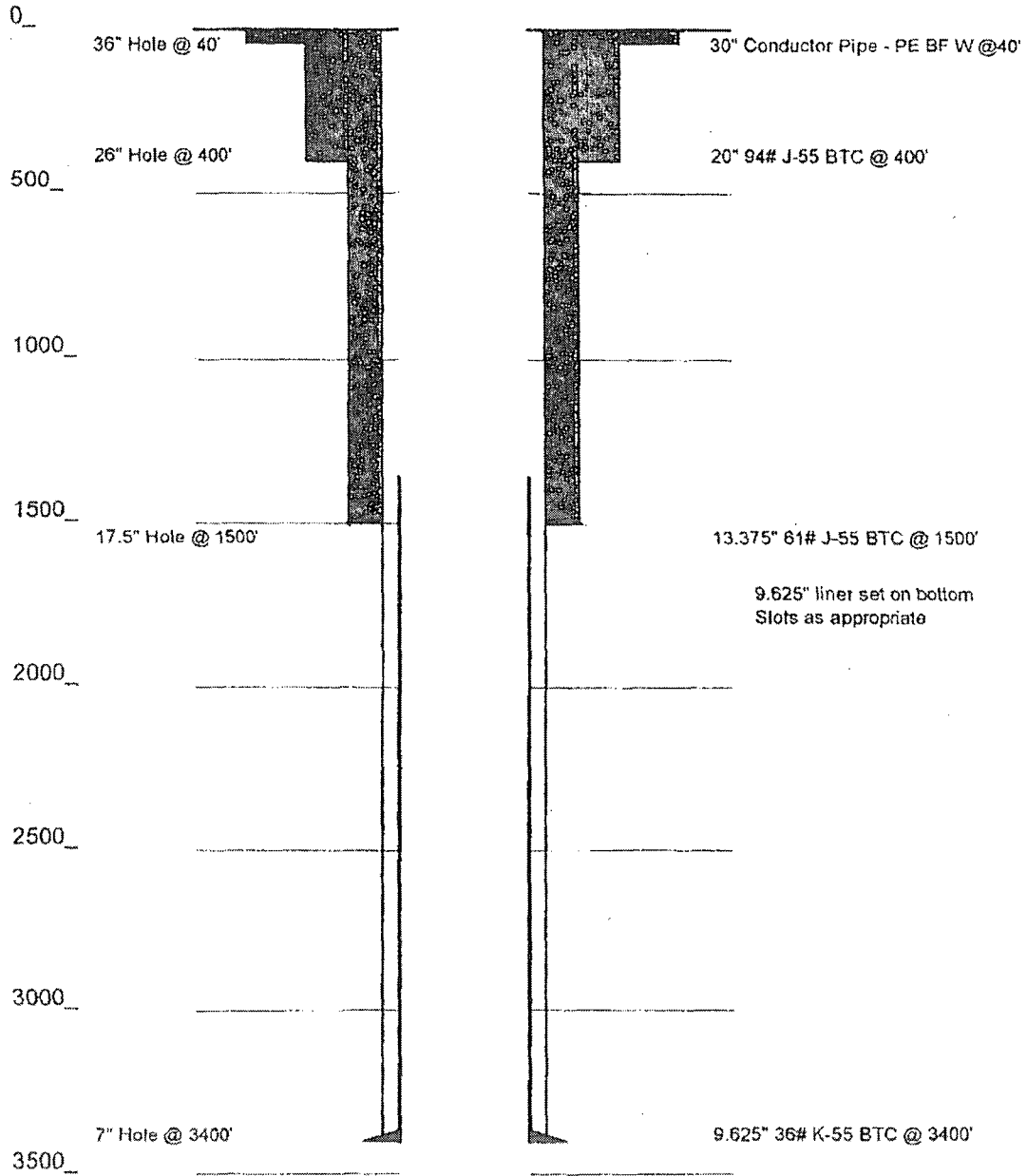
GEOHERMAL PRODUCTION WELL DIAGRAM

FIGURE 4A

*DUE*

# PROPOSED INJECTION WELL DIAGRAM

DEPTH



GEOHERMAL INJECTION WELL DIAGRAM

FIGURE 4

## BOPE TESTING, INSPECTION, TRAINING, AND MAINTENANCE

- General Procedures

- a. Blowout-Prevention Equipment (BOPE) installations will include high temperature-rated packing units and ram rubbers, when available, and will have a minimum working pressure rating as follows:
  - i. [Equal to] the product of the depth (ft.) of the BOPE anchor string times 1 psi per foot.
  - ii. [Equal to] the rated burst pressure of the BOPE anchor string.
  - iii. [Equal to] 2,000 psi.
- b. A logging unit equipped to regularly record the following data will be installed and operated continuously after drilling out the shoe of the conductor pipe and until the well has been drilled to the total depth:
  - i. Drilling mud temperature.
  - ii. Drilling mud pit level.
  - iii. Drilling mud pump volume.
  - iv. Drilling mud weight.
  - v. Drilling rate.
  - vi. Hydrogen sulfide gas volume.
- c. The owner understands that the Division may waive the requirement for installation of a logging unit on evidence that the owner or operator has engaged a qualified mud engineer to monitor, log and record the data specified in the above subparagraphs.

- Using Mud as the Drilling Fluid

- 
- a. In exploratory areas, unstable areas containing: fumaroles, geysers, hot springs, mud pots, and for fields with a history of lost circulation, a blowout, or zone pressures less than 1000 psi the applicant shall implement the following procedures:
    - i. An annular BOPE and a spool, fitted with a low-pressure safety pop-off and blow-down line, installed on the conductor pipe, may be used to ensure against possible gas blowouts during the drilling of the surface casing hole.
    - ii. Annular BOPE and pipe-ram BOPE with a minimum working pressure rating of 2,000 psi will be installed on the surface casing so the well can be shut in at any time. The double-ram preventer shall have a mechanical locking device.
    - iii. A hydraulic actuating system utilizing an accumulator of sufficient capacity and high pressure auxiliary backup system shall be equipped with dual controls; one at the driller's station and one at least 50 feet away from the wellhead.
    - iv. Kelly cock and standpipe valve.
    - v. A fill-up line installed above the BOPE.
    - vi. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.

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- vii. A blow-down line fitted with two valves installed below the BOPE. The blow-down line will be operated in a manner to permit containment of produced fluids, and to minimize any safety hazard to personnel.
- viii. All lines and fittings shall be steel and have a minimum working-pressure rating of at least that which is required of the BOPE.
- ix. The temperature of the return mud during the drilling of the surface casing hole will be monitored regularly. Either a continuous temperature monitoring device will be installed and maintained in working condition, or the temperature will be read manually. The Mud temperatures will be logged after each joint of pipe is drilled down every 30 feet.

- Using Air as the Drilling Fluid

- a. If it is known that dry steam exists at depth, or formation pressures are less than hydrostatic, the operator shall implement the following procedures:
  - i. A rotating-head will be installed at the top of the BOPE stack.
  - ii. A pipe-ram/blind-ram BOPE with a minimum working-pressure rating of 2,000 psi will be installed below the rotating-head, so the well can be shut in at any time.
  - iii. A banjo-box, or mud-cross steam diversion unit shall be installed below the double-ram BOPE, fitted with a muffler capable of lowering sound emissions to within state standards.
  - iv. A blind-ram BOPE with a minimum working-pressure of 2,000 psi, installed below the banjo-box or mud-cross, so the well can be shut in while removing the rotating-head during bit changes.
  - v. A master gate valve with a minimum working-pressure rating of 600 psi, installed below the blind-ram so the well can be shut in after being completed, prior to removal of the BOPE stack.
  - vi. A ram-type BOPE that will have a hydraulic actuating system utilizing an accumulator of sufficient capacity, and a high-pressure backup system.
  - vii. Dual control stations for hydraulic backup system: one at the driller's station and the other at least 50 feet away from the wellhead.
  - viii. Float and standpipe valves.
  - ix. A kill line installed below the BOPE, leading directly to the mud pumps, fitted with a valve through which cement could be pumped if necessary.
  - x. BOPE capable of shutting in the well during any operation will be installed on the surface casing maintained ready for use at all times.

pipe

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- BOP Testing Procedure

The Annular, double gate, Hydraulic Control Remote Valve (HCR), Accumulator, and all auxiliary equipment will be tested when installed, and every 14 days thereafter. We will follow an overbearing program to protect all parties involved. Testing shall be as follows:

- a. When the BOP is installed after running casing (See Figure 6 and 7):
  - i. Fill hole, close blind rams, close standpipe, open kill line master and control valves, open choke line master and control valves, open HCR, open master valve on panic line, open inward choke valves, open chokes, close panic line control valve and isolation valves for chokes. Do low pressure test (200-300 psi) for 5 minutes. Do high pressure test (1000psi) for 30 minutes. Record in log book.
  - ii. All following tests will have the same pressures and time limits.
  - iii. Bleed pressure off at pump, see if check valve closes and what pressure is left. Record in Book. Bleed off pressure
  - iv. Close inward valves on chokes and master valve on panic line. Do low pressure test. Record. Do high pressure test and record. Bleed off.
  - v. Open blind rams and Run In Hole (RIH) with Bottom Hole Assembly (BHA) and drill pipe (no float), circulate out air.
  - vi. With the Kelly made up into string, close pipe rams, close master valve on Kelly and choke line. Disconnect kill line at check valve. Do low pressure test, record, do high pressure test, record, and bleed off.
  - vii. With pipe rams still closed, open master valves on Kelly, choke lines, close control valves on kill, choke lines, do low pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open upper Kelly cock, do high pressure test, record, close upper Kelly cock, bleed off at pump, and record. Open Kelly cock and bleed off.
  - viii. With pipe rams closed, kill and choke lines closed, do low pressure test and close standpipe trapping pressure. Bleed off at pump and record. Same with high pressure test.
  - ix. Open pipe rams, close bag, close kill line, open control and master valves on choke line, close HCR valve. Do low pressure test, record, do high pressure test, record and bleed off.
  - x. Reconnect kill line, open both valves, and install Full Open Safety Valve (FOSV) drill pipe. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xi. Take off FOSV and install internal preventer. Do low pressure test through kill line, record, do high pressure test, record and bleed off.
  - xii. The auxiliary pump line valve will be tested every time, as well as most other valves.
  - xiii. Check all levels in accumulator and backup systems, record in log book.
- b. During normal operation, every 14 days:
  - i. Blind rams will be tested with a test plug when out of the hole.
  - ii. Pipe, bag, and HCR will be tested with a test plug while still inside the shoe (on trip in the hole.)

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- iii. All low and high pressure tests will be the same.
- iv. All shall be recorded in log book.
- v. Upon installation, ram-type blowout preventers, bag-type blowout preventers, valves and manifolds will be tested to a minimum of 750 psi pressure. Test may be witnessed by a Division representative on all wells prior to drilling out the shoe of the surface casing, and the Division will be notified of the date and hour any such test is to be conducted sufficiently in advance of the test to allow a Division representative to travel to the well to witness the test.
- vi. Ram-type preventers will be operated at least once each 24 hours and bag-type preventers closed on the drill pipe at least once each week, provided however, that an exception to this provision may be granted by the Division's geothermal section to prevent undue wear and tear on the preventer rubbers when drilling drysteam wells.

- BOP Inspection and Actuation

All required BOP equipment will be actuated periodically to ensure operational readiness.

- a. The following are to be performed every 12 hour shift:

- i. Check the accumulator pressure.
- ii. Check pressure of the emergency backup system.
- iii. Check hydraulic fluid level in the accumulator.
- iv. Check air pressure to support system.
- v. Record all of the above in IADC log book and well ledger.

- b. Every trip, but not twice within a 24 hour period:

- i. Function test pipe rams (when inside shoe).
- ii. Function test blind rams (when inside shoe).
- iii. Operate all Kelly cocks.
- iv. Check Drill pipe safety valve.
- v. Function test HCR valve.
- vi. Record all of the above in International Association Drilling Contractors (IADC) log book and well ledger.

- c. Every 7 days (1 week) actuate the following:

- i. Annular preventer.
- ii. All gate valves in the choke and kill system.
- iii. Inside BOP.
- iv. Record all of the above in IADC log book and well ledger.

- Crew Training and Drills

BOP Practice drills and training sessions will be conducted at least once a week for each crew. These drills will be performed with everyone on site, to provide training for each member to ensure:

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- a. A clear understanding of the purpose and method of operation of each preventer, and all associated equipment.
  - b. The ability to recognize the warning signs that accompany a kick.
  - c. The crew shall be aware this is a shallow hole that reduces volume in the annulus and requires increased attention.
  - d. A clear understanding of each crew member station and duties, in the event of a kick while drilling, tripping, or out of the hole.
  - e. A clear understanding of the maximum allowable casing pressure (MACP), and the significance of the pressure for well conditions that exist at the time of the drill or training session.
- BOP Record Requirements
    - a. A record of all inspections and tests must be recorded in IADC log book and well ledger.
    - b. A record of all crew drills and training sessions must be kept in the IADC log book and well ledger.
  - BOP Maintenance and Requirements
    - a. All equipment will be maintained in accordance with the manufacturer's recommendations.
    - b. All maintenance records will be kept for the past three years.

RWE

## CEMENTING PROGRAM

- **General**

Cementing on wells is used for two main purposes: (1) It is first used to bond the casing to the formation, forming a seal to prevent movement of fluids from one formation to another; thereby preventing the casing from being pushed up out of the hole, similar to a large hydraulic ram; and (2) the second use is to control lost circulation by sealing off any zones with excessive amounts of drilling fluids escaping into the formation. All cementing will be performed by standard industry practices.

- **Lost Circulation Control**

Lost circulation will be controlled with standard LCM materials while drilling. If lost circulation zones are encountered that can not be successfully controlled with standard LCM practices they will be treated with cement plugs.

- **Casing Cementing**

- a. **Conductor Pipe**

The conductor pipe will be cemented by the standard practice of using read mix pumped down the annulus with trim pipe from the surface.

- b. **Surface 20" String**

The surface string will be cemented by circulating the cement slurry down the casing and up the annulus to the surface. The cement will first be led by a spacer of mud cleaner, then pumped in a lead slurry at around 13 pounds per gallon (ppg). The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug. Cement casing using 13.0 ppg lead slurry and 15.8 ppg tail slurry.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 60% excess and adjust as indicated by drilling conditions
- Use approximately 191 sacks in lead and 305 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

*RLK*



c. Production 13-3/8" String

The production string will be cemented by circulating the cement slurry down the casing and up the annulus to the hanger. The cement will first be led by a spacer of mud cleaner, then pumping in lead slurry at around 13 ppg. The lower weight reduces the total hydraulic head on the casing and formation. The second cement, or tail, slurry will be pumped in at around 15.8 ppg. This provides the maximum strength to the lower portion of the casing and shoe joint. The cement will then be displaced using fresh water and a wiper plug.

- Use class G cement with a minimum 30% silica and additives as determined by the cementing contractor to match actual conditions encountered.
- Run a minimum of 100% excess and adjust as indicated by drilling conditions
- Use approximately 692 sacks in lead and 221 sacks in tail and adjust for final TD and conditions encountered.
- Monitor cement for fall back.
- If cement falls back, locate top of cement and prepare for High-Density top job.
- WOC for 24 hours.

d. 9-5/8" slotted liner

A 9-5/8" slotted liner will be hung from the 13-3/8" casing string. No cement will be used with the slotted liner.

- All casing strings will be cemented to the surface, monitored for fall back and top cemented if necessary.
- Additional additives will be determined in consultation with the cementing contractor at the time the order is placed and the actual down hole conditions have been determined.
- This and other portions of the well plans will be subject to change as conditions dictate in the field.

RUE

## MECHANICAL INTEGRITY TESTING (MIT)

Mechanical integrity testing of the casing will be conducted prior to injection. The Division will be notified 48 hours before the date upon which a test for mechanical integrity is to be performed, so a representative may be on site to witness the test.

- MIT Tests
  - a. Internal Test - No leaks from casing or other casing components.
  - b. External Test - No movement of fluids/water behind the casing.
  - c. MIT Tests to demonstrate the internal and external test will be "Casing Integrity Tool" and "Cement Bond" respectively.
  - d. Pressure testing will be conducted before the casing shoe is drilled out.
  - e. Division will be notified a minimum of 48 hours before conducting MIT testing, so a representative may be on site to witness the test.
  - f. Drilling manager will be responsible in maintaining a pressure monitoring system. The system will record tests in real time and Division will be sent annotated graphics of the test.
  
- MIT Procedure
  - a. Casing Test Pressure – Test 4 hours up to 600 psi, or maximum authorized injection pressure.
  - b. A successful test is one in which pressure stabilizes within 10% of the required test pressure, and remains so for a minimum of 4 hours minutes.
  
- MIT Report
  - a. Within 30 days after completion of testing, a Summary Report will be compiled and submitted to Division with the following information:
    - i. Conditions of injection well(s) prior to test (e.g. static, injecting at ### gpm, etc)
    - ii. Conditions of well(s) during test(s), such as, but not limited to: operating conditions of the well; water level; changes in status/conditions of the well during test; anomalies witnessed prior to, or during test; gauge calibration; and conditions for any gauges used, etc.
    - iii. A static temperature, pressure, spinner log will be submitted.

*Retz*

## DEVIATION TESTS AND DIRECTIONAL DRILLING

Any well which is deepened or drilled with rotary tools will be tested at reasonable frequent intervals to determine the deviation from the vertical. Such tests will be made at least each 250 feet. A tabulation of all deviation tests, sworn to and notarized, will be filed with form G-105, geothermal resources well log. When the deviation averages more than five degrees in a 500-foot interval, the Division director may require that a directional survey be run to establish the location of the producing interval(s)

The Division, at the request of an offset operator, may require any operator to make a directional survey of any well. Said directional survey and all associated costs will be at the expense of the requesting party and will be secured in advance by a \$5,000.00 indemnity bond posted with and approved by the Division. The requesting party may designate the well survey company, and said survey will be witnessed by a representative of the Division.

No well will be intentionally deviated except toward the vertical without prior permission from the Division. Permission to deviate a well other than toward the vertical will be on Division forms with copies of the form being furnished to all other operators owning leases offsetting the drilling tract, if there be any. Upon request of the Division any well which was intentionally deviated will be directionally surveyed. The Division may at its option witness such survey and the Santa Fe office will be notified of the date and hour all directional surveys are to be conducted. All directional surveys run on any well which was intentionally deviated in any manner for any reason will be filed with the Division upon completion of the well. The operator understands that the certificate of compliance and authorization to produce geothermal resources form will not be approved until the operator has submitted an affidavit that all such directional surveys have been filed.

RUE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

**GEOHERMAL DRILLING PERMIT**

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operation.

7. Lease Serial No. NM 34790  
8. Surface Manager:  BLM  FS  Other private

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other  
1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other  
1c. Well Status:  
2. Name of Lessee/Operator: Lightning Dock Geothermal HI-01, LLC  
3. Address of Lessee/Operator: 5152 North Edgewood Drive, Provo, Utah 84604  
4. Location of Well: At surface 2411.9' west of the East Line and 2329.1' north of the South Line of Sec 7, T25S, R19W. At proposed prod. Zone: Same  
5. Distance from Proposed Location to Nearest Property or Lease Line: 1631' (to McCants surface at the NW 1/4 of the NE 1/4 of Sec 7, T25S, R19W)  
6. Distance from Proposed Location to Nearest Well or Previously Applied for Well Location on this Lease: 500' (to 45-07)  
9. Unit Agreement Name: N/A  
10. Well No.: TFD 55-7  
11. Permit No.: 1  
12. Field or Area: Wildcat  
13. Sec., T., R. B. & M.: Sec 7, T25S, R19W, NMBM  
14. County: Hidaigo  
15. State: NM  
16. Approx. Starting Date: 04/21/2010  
17. Acres Assigned (Well Spacing): N/A

18. Drilling Media and Characteristics:  Water  Mud  Air  Foam  Other  
19. Proposed Depth: Measured: 3,400' True Vertical: 3,400'  
20. Elevations:  Estimated  Final. Reference Datum:  GR  MAT  DF  KB  RT.  Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36" 26"	30" 20"	unknown 94#	none buttress st&c	unknown unknown	0 0	30' 360'	unknown 760 sacks class H CMT w/40% silica & 2% callchor
17-1/2"	13-3/8"	61#	buttress st&c	K-55	0	1050'	780 sacks class H w/40% ssc+8# sk pearlite
No proposed casing or cementing.							

22. Proposed Work Summary

- MIRU drill rig.
- Drill out cement plug from 1450' to 1550' approx.
- Drill out cement plug from 1890' to 2090' approx.
- RIH to locate cement plug at 5400' approx.
- Set bridge plug in 3000'-3400' interval.
- Collect water samples for geochemical and environmental analysis.
- Set production pump at 850' approx.
- Release rig.
- Hook up well for pump test to irrigation system.
- Run pump test for up to four weeks.
- Secure well.

Please see attached Proposed Operations and Drilling Plan for details.

RECEIVED  
 LAS CRUCES DISTRICT OFFICE  
 2010 APR 12 AM 11:33  
 LAS CRUCES, NM 88005

23. Benjamin Barber Vice President, Resource Management 04/12/2010  
Signed Title Date

(This space for Federal use)  
Approved by Bill Alden Title District Manager Date May 21, 2010  
Conditions of Approval, if any: See attached COA list

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

# GENERAL INSTRUCTIONS

This form must be submitted for any application to drill for, test, extract, produce, dispose and/or utilize the actual geothermal resources on Federally leased land or lands covered by a unit or cooperative agreement.

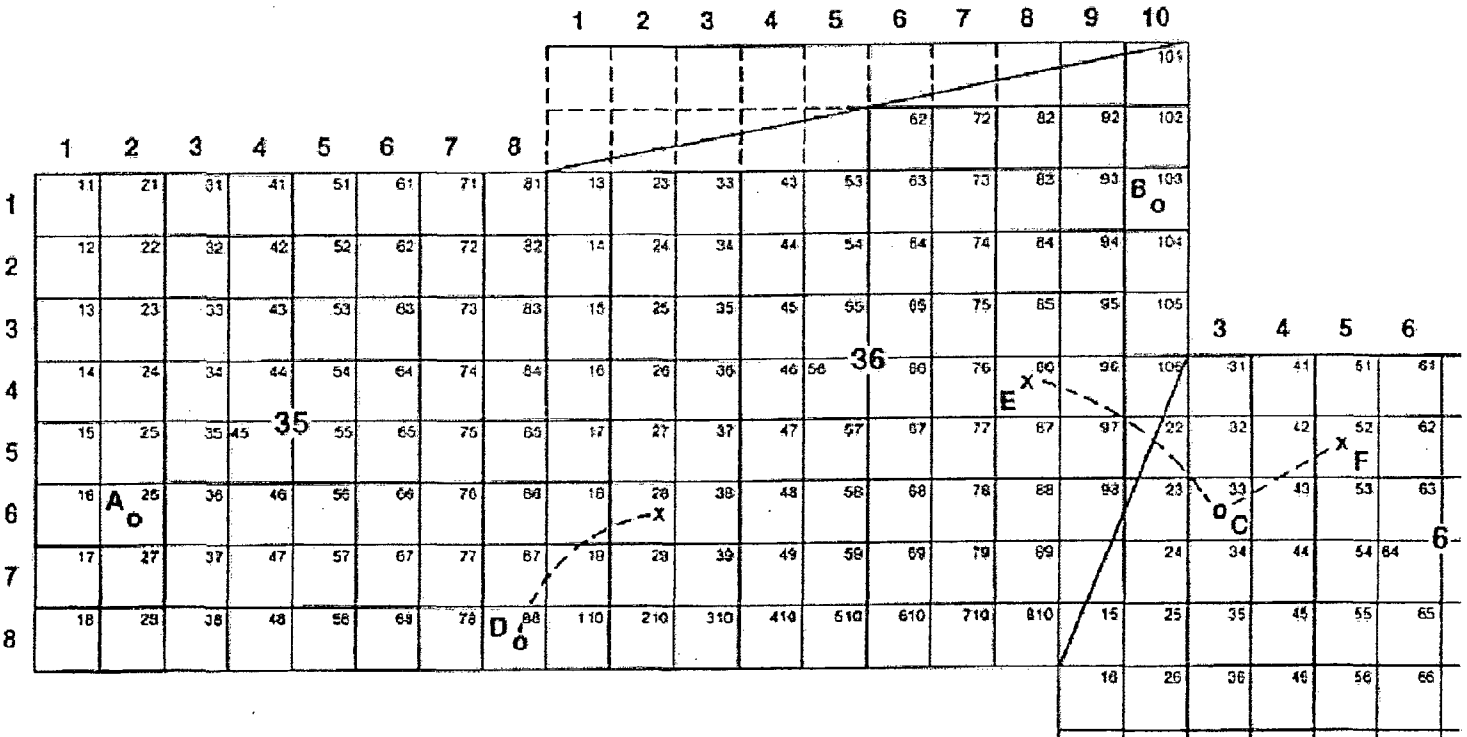
## SPECIFIC INSTRUCTIONS

- Item 1C: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (explain).
- Item 7: Number the wells using the Modified Kettleman Well Numbering System (see below).
- Item 15: Show the surface location coordinates from the nearest section corner or tract lines and if the well is to be directionally drilled, the proposed zone coordinates (top and bottom) from the surface location.
- Item 19: Indicate reference datum from which measurement was made (see item 20).
- Item 20: If the reference datum shown is not the graded mat, also show the measurement from the mat surface (e.g., mat-to-derrick floor (DF) measurement, mat-to-rotary table (RT) measurement, mat-to-kelly bushing (KB) measurement, etc.)
- Item 21: For subsequent well work the latest well conditions along with all proposed additions and changes must be shown. To show current well conditions, either fill out this item or attach the latest completion report on the subject well.
- Item 22: Summarize other pertinent existing data such as producing and injecting zones, type, size, density of perforations and perforated intervals, etc., in addition to the proposed work. Indicate reasons for changes undertaken.

### PROCEDURE FOR NUMBERING GEOTHERMAL WELLS USING THE MODIFIED KETTLEMAN WELL NUMBERING SYSTEM

1. Subdivide the sections where the wells are to be located into 10-acre (660 feet x 660 feet) subdivisions. Number each horizontal and vertical subdivision starting in the northwest corner of each section with 1.1 and increasing to the east and south. A regular 640-acre section contains 64 subdivisions numbered from 11 to 88 (vertical digit first followed by the horizontal digit).
2. Number the first vertical well with the number of the 10-acre subdivision in which it is located followed by the section number. (See examples "A", "B", and "C", below.) If the first well is directionally drilled, number it with the subdivision number of its surface location, followed by the subdivision number in which the bottom of the completion interval lies and that section number (if different from the surface section number), and followed by the surface section number. (See Example "D".)
3. Subsequent wells drilled from the same 10-acre surface location are numbered in the manner described above with an A, B, C, etc., added following the surface subdivision number. (See Examples "E" and "F".)
4. For sections with irregular boundaries, align a 10-acre grid pattern North-South, running through the westernmost section point or line and East-West running through the northernmost section point or line. Number wells according to the 10-acre grid, subdividing as far as possible to the east and south.

Example A	26-35	Example D Directional	88(28-36)-35
Example B	103-36	Example E Directional	33A(86-36)-6
Example C	33-6	Example F Directional	33B(52)-6



## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

**AUTHORITY:** 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

**PRINCIPAL PURPOSE:** The BLM uses this information to evaluate the technical, safety, and environmental factors involved with geothermal resources on Federal geothermal leases.

**ROUTINE USES:** (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal; and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to process the application. If all information is not provided, the application may be rejected.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM collects this information to allow us to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

The BLM will use this information to analyze and approve operations.

Response to this request is mandatory only if you want to initiate drilling operations on a geothermal lease.

The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0132), Bureau Information Collection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington D.C. 20240.

**CONDITIONS OF APPROVAL**

**NMNM034790 WELL 55-7**

**APPROVED: MAY 21, 2010**

1. The following information shall be posted at a conspicuous location at the well:

**Operator Name:** Lightning Dock LLC  
**Well Name & No.:** TFD 55-7  
**Location:** 2411.9' F.E.L. and 2329.1' F.S.L.

**Lease No.:** NMNM034790  
**County:** Hidalgo  
**NWSE Sec 7 T25S R19W NMPM**

2. The operator shall follow all procedures outlined in the approved operations and drilling plan and addendums. Any variations in the approved operations and drilling plan shall be incorporated by written amendment (sundry notice: BLM form 3260-3) to the approved GDP and shall be subject to approval by the Las Cruces District Office (LCDO). The operator shall permit the LCDO sufficient time to evaluate any environmental effects of the amendment prior to initiating the revised activities (43 CFR §3261.17).

3. This permit is issued for exploratory and well test purposes only. Any direct use shall constitute willful trespass against the United States subject to civil penalties outlined in 43 CFR §9239.5-2.

4. The operator shall be responsible for the protection from damage of all identified cultural resources within the area which may be affected by their actions. In addition, the operator shall be liable for all damage or injury to the identified cultural resources caused by their actions. The operator shall immediately notify the Agency Official if any damage occurs to any cultural resource and immediately halt work in the area in which damage has occurred until approval to proceed has been granted by the Agency Official after consultation with the BLM Archeologist.

5. If previously undiscovered heritage resources (historic or prehistoric) are exposed or disturbed as a result of operations authorized under this contract, the operator shall leave such discoveries intact, cease operations in the area so affected, and immediately notify the Las Cruces Field Office. The operator shall not proceed until they are notified by the BLM in writing that all provisions or recovery of heritage resources are met.

6. Pursuant to the Native American Grave Protection and Repatriation Act (NAGPRA) 25 USC 3002(d); 43 CFR Part 10.4, if any human remains, funerary objects, sacred objects, or objects of possible cultural significance are discovered during the course of ground disturbing activity, the operator will immediately cease activity in the area of the discovery and will make a reasonable effort to protect the remains and objects. The operator will provide immediate telephone notification of the discovery to the Las Cruces Field Office, and will follow up with written confirmation to the authorized officer. The operator will not resume the activity that resulted in the discovery until the authorized officer gives written approval. Approval to resume the activity, if otherwise lawful, will be given thirty (30) days after certification by the Agency Official of the operator's written confirmation of the discovery, or at any time that a written binding agreement is executed between the BLM and the affiliated tribes adopting a recovery plan for the remains and objects.

7. To prevent the spread of noxious weeds, the contractor shall clean all earth-moving and hauling equipment prior to its initial move-in to the area. If any equipment subsequently operates outside this project area, it shall be treated the same as an initial move-in. This cleaning shall remove all soil, seeds, vegetative matter, or other debris that could contain or

hold seeds or plant parts. The LCDO shall reserve the right to inspect equipment prior to entry or staging on BLM lands. The contractor shall employ power-wash or high pressure cleaning or whatever cleaning methods are necessary to ensure that equipment is free of noxious weed sources. Equipment shall be considered free of soil, seed and plant debris when a visual inspection does not detect such material.

8. Operator shall utilize water trucks for onsite dust control as necessary.

9. Operator shall provide the LCDO with a minimum five (5) days notice prior to beginning operations in order to schedule inspections over the projected four weeks of operations. The operator shall inform BLM of test completion and schedule a final inspection no more than three (3) days

10. In the event water analysis exceeds applicable State of New Mexico standards and Oil Conservation Division (OCD) requirements, all pump testing and discharge/irrigation activities shall cease until the operator has met the requirements of the OCD conditions of approval for water quality. Prior to restarting operations, the operator shall obtain written acknowledgement from OCD that State standards and requirements have been met and provide a copy to the LCDO.

11. To minimize visual impacts and disorientation of birds and bats during night operations, drill rig and testing facility lights shall be limited to those required to safely conduct operations. All lights shall be shielded and/or directed in a manner which focuses direct light to the immediate work area.

12. The reserve pit, if used for cooling of geothermal waters, shall be constructed in a manner consistent with applicable best management practices outlined in *BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration* (the "Gold Book"), fourth edition, 2007 (p. 16-17). The pit shall be sloped and fenced to prevent wildlife entry.

13. Operator shall complete pre-construction survey for listed species and for burrowing owl nests. Survey for and avoid Giffith's saltbrush and night-blooming cereus within the area of operations. Survey results shall be presented in writing to BLM prior to initiating operations.

14. If used for cooling well discharge, the reserve pit shall be covered with a safe grating or approved floating devices ("bird balls") sufficient to prevent migratory birds from accessing the pits. Nets shall not be installed as this tends to trap birds and bats. Reserve pits shall be monitored to minimize entrapment of small mammals, reptiles and amphibians

15. If used for cooling geothermal waters, a minimum of two feet of freeboard shall be maintained in the reserve pit. If a synthetic liner is required, it shall have a permeability of  $< 10^{-7}$  cm/sec and be composed of materials compatible with pit temperatures and contents.

16. All equipment shall be kept in safe operating order and free of any oil, fuel or fluid leaks. Any soils, water or materials contaminated by fuels, lubricants or engine fluids shall be



immediately cleaned, isolated in appropriate containers and disposed of at approved waste-receiving facilities.

17. All activities described in this GDP, including reclamation, shall be completed within one year of the date of approval. Any activities after this period shall require a new sundry notice (BLM form 3260-3).

18. Within thirty (30) days of completion, the operator shall submit a completed BLM Form 3260-4 (well completion form).

19. The operator shall submit a new sundry notice regarding future use of well 55-7 within sixty (60) days of completing the pump test. Otherwise, well 55-7 shall be permanently plugged to New Mexico OSE standards.

**Lightning Dock Geothermal HI-01, LLC**  
**Proposed Operations and Drilling Plan, Well TFD 55-7**

April 12, 2010

Prepared For:

New Mexico Energy, Minerals and Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, NM 87505

New Mexico Office of the State Engineer  
Water Rights District III Office  
301 South Tin Street, Deming, NM 88030

U.S. Department of the Interior, Bureau of Land Management  
Las Cruces District Office  
1800 Marquess Street, Las Cruces, NM 88005

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**I. Summary of Proposed Operations:**

Lightning Dock Geothermal HI-01, LLC, ("LDG") is a wholly owned subsidiary of Los Lobos Renewable Power, LLC, which is wholly owned by Raser Technologies, Inc. (See Attachment A, Raser Technologies Corporate Structure). LDG proposes to re-enter and test well TFD 55-7 for the purpose of determining its suitability as a geothermal production well. LDG intends to mobilize a drilling rig about April 21, 2010 and will commence operations according to the Plan in Section II, below, as soon as approved by BLM and upon receipt of requisite permits from NMOSE and NMOCD.

The operations for which Lightning Dock Geothermal seeks permission in the present application are comprised of three parts:

- Remove two of the three remaining cement abandonment plugs set in the wellbore by Steam Reserve Corp. in 1985. The deepest plug will remain in place. Rosette, Inc., removed the uppermost two of the five Steam Reserve plugs pursuant to an NMOSE irrigation well permit. LDG intends to test the upper 3,400 ft of the open hole. The water will be sampled and analyzed in accordance with WQCC standards as described below. Compliance with those standards will be verified before any water is discharged in a pump test.
- Install a down-hole production pump and conduct a well and reservoir test. The discharged water will be metered and conveyed to a planted field for irrigation purposes. This will be done using standard farm irrigation equipment such as a wheel line. The test will exercise water rights owned by Rosette, Inc. and already assigned to this well. Rosette, Inc. has agreed to provide the 2010 water rights to LDG for this test. LDG does not intend to use TFD 55-7 for injection in this operation. The existing unlined reserve pit may be used for cooling and water storage if approved by NMOCD upon receipt of produced water analyses.
- Install proper wellhead equipment and secure the well.

The water in well TFD 55-7 will be sampled and analyzed for dissolved fraction of all 26.2.3103 NMAC constituents, VOCs (8260B), SVOCs (8270C), PAHs (8310), TPH (418.1), metals – dissolved (6010B/6020) including Bromide, Lithium, Rubidium, and Tungsten (by approved EPA methods), Mercury (7470A/7471A), general chemistry (methods specified in 40 CFR 136.3), Uranium (6010B/6020), radioactivity (E903/E904), and Radon (EPA method approved by NMOCD). An EPA Methods, QA/QC, and DQOs-compliant laboratory will analyze samples.

If TFD 55-7 demonstrates adequate potential as a geothermal production well, LDG will proceed to obtain all approvals and permits (BLM, NMOCD, and NMOSE) required for further development.

## II. Well Preparation

The first part of the operation requires reopening TFD 55-7 to collect fluid samples, set a bridge plug and install a test pump. The following is the proposed plan for the drilling operation. This detail is incorporated by reference into the BLM Drilling Program, described in Section V of this document.

- 1) Inspect wellhead for dimensional consistency with ANSI series 400 standards.
- 2) Move in and rig up a rotary drilling rig with a rated capacity of at least 5000 ft and a mud system with a minimum volume of 500 barrels and a 500 hp circulating pump.
- 3) Install annular or rotating BOP on the wellhead above flow tee with gate valve on side outlet (see Attachment E).
- 4) Mix non-toxic gel-lime mud and fill hole.
- 5) Pick up slick bottom-hole assembly (BHA) #1: 8-1/2" insert bit, BS, 4x6" DC, jars, 1x6" DC, XO.
- 6) Test BOP for leakage by inflating around BHA and pumping in the side outlets to maximum working pressure of the surface piping, not to exceed 900 psig.
- 7) Run in hole and tag bottom, expected at about 1400 ft. Circulate bottoms up.
- 8) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ* (i.e., down hole) if possible but may be taken by sampling separator from the flow line. Airlift will be accomplished by injecting compressed air through the drilling assembly in sufficient quantity to stimulate flow to the surface. Discharging the flow line into a gauging tank will allow measurement of the produced liquid after its separation from the injected air. The volumes produced during the drilling operation will be recorded and will not exceed the storage capacity of the tank and reserve pit on site. No water will be discharged to "Waters of the State".
- 9) Pull out of hole and pick up 9-5/8" bit and stabilizers. Make up stiff BHA #2.
- 10) RIH and time drill cement plug #1. The plugs in well TFD 55-7 are of neat Portland cement. The plugs are reportedly each 50 - 400 ft in length and set in uncased open hole at about 1450 ft and 1850 ft. Time drilling and a "locked" (i.e., stiff and highly stabilized) BHA will be used to drill the plugs while staying in the original hole. Non-toxic, temperature-stable drilling mud will be used, composed of a bentonite clay-water or polymer-water mix to lubricate and cool the drill bit. The drilling fluids will bring the rock cuttings to the surface and then be cleaned and recirculated, preventing loss of drilling fluids into the rock and minimizing discharge into the reserve pit.
- 11) POH and stand back BHA #2.
- 12) Pick up BHA #3: float shoe, XO, 2x6" DC.
- 13) RIH and tag cement plug #2, expected at about 1800 ft.
- 14) Circulate hole clean.
- 15) Displace mud with water. POH to 1500 ft. Close BOP.
- 16) Pump water at 10-25 bbl/min and record stable casing head pressure.
- 17) Rig for air injection through drill pipe. Set up fluid sample collection point on flow line.
- 18) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ*

(i.e., down hole) if possible but may be taken by sampling separator from the flow line. The airlift, water sampling, and analysis will be performed as described in step 8 of this Section and in Section I, above. The volume of produced water will be recorded. No water will be discharged to "Waters of the State."

- 19) POH, stand back BHA #3.
- 20) Pick up BHA #2. RIH to cement plug #2.
- 21) Circulate mud and drill out plug #2.
- 22) POH, lay down BHA #2.
- 23) Pick up BHA #3. RIH and tag cement plug # 3, expected at about 5400 ft. Circulate hole clean.
- 24) POH, lay down BHA #3.
- 25) Run caliper log and select zone for bridge plug installation about 3400 ft.
- 26) Pick up bridge plug and BHA #4: setting tool and DCs as directed.
- 27) RIH and set bridge plug.
- 28) POH to 2800 ft, circulate hole clean.
- 29) POH to 1000 ft.
- 30) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ* (i.e., down hole) if possible but may be taken by sampling separator from the flow line. The airlift, water sampling, and analysis will be performed as described in step 8 of this Section and in Section I, above. The volume of produced water will be recorded. No water will be discharged to "Waters of the State."
- 31) POH laying down drill pipe; lay down BHA #4.
- 32) Make up 9-5/8" pump casing string and set test pump.
- 33) Release rig.

### III. Resource Test

- 34) The results of the analyses from steps 8, 18 and 30 of the preceding section will be compiled in a single report and delivered to NMOCD, NMOSE, and BLM. If the discharge meets WQCC standards, LDG will confer with the agencies to verify the conditions are met for permitted discharge into an unlined reserve pit and delivery to an irrigation system. Should the quality of water not meet the standards of 20.6.2.3103 NMAC for irrigation, LDG will suspend flow test operations, redesign the test and seek approval of subsequent applications to NMOCD, NMOSE, and BLM.
- 35) Connect flow line to irrigation system.  
The flow line will discharge the water into a gauging tank and thence into the irrigation transfer pump or the reserve pit. The pit measures 170 ft x 170 ft x 12 ft deep (see Attachment B). If WQCC standards (20.6.2.3103 NMAC) are met, the reserve pit will be left unlined. The irrigation transfer pump (e.g., 25 hp centrifugal) will remove discharged water from the tank or pit and send it via a 10 inch Victaulic line to the irrigation system for application to a crop under an existing NMOSE permit. The designated crop area is the area directly south of the plant site on Attachment B. Flow will be metered using a totalizing ultrasonic or orifice meter to ensure volume does not exceed the NMOSE-permitted total.
- 36) Conduct pump test as directed. LDG will conduct the pump test in consultation with engineers representing the interests of potential investors in the Lightning Dock project. The operation of the test may therefore vary from day to day, but will at all times conform to the requirements of the applicable NMOCD, NMOSE and BLM permits and regulations.

LDG plans to use a 12-inch American-Marsh vertical shaft 10 stage turbine pump for this test. The pump is owned by Raser Technologies and has performance characteristics detailed in Attachment F. The power for the pump will be a 300 hp electric motor with a variable speed controller. The pump will be set at approximately 850 ft depth to allow a maximum drawdown from static water level of about 700 ft. Engineering analysis of Raser's airlift test in 2008 suggests a flow rate of 400 gpm is likely from the well in its present state, i.e., open from 1050 ft to 1450 ft. Since lost circulation occurred at greater depths (e.g., 2275 ft) during the drilling of TDF 55-7, LDG expects the reopened hole may be able to supply fluid up to the pump's maximum capacity, approaching 1500 gpm at this depth.

The pumping rate during the first week of the test will be programmed to gradually bring in flow and to establish the reservoir deliverability as a function of water level drawdown. Thereafter, the rate will be set so as not to exceed the landowner's NMOSE-designated water rights. LDG expects to satisfy itself and its investors' engineers within a test pumping duration of four weeks.

Discharge water samples will be collected weekly and analyzed at an EPA Methods, QA/QC, DQOs-compliant laboratory. LDG will also monitor the discharge daily for standard field parameters including pH, turbidity, color, DO, and specific conductivity. If anomalous readings are detected that indicate a significant change in water source or properties, water samples will be collected immediately and discharge halted. Discharge will not be resumed until and unless laboratory analytical results confirm that the water meets the required criteria.

- 37) Move in and rig up well service rig.
- 38) Remove and lay down pump and casing.
- 39) Install master valve and survey flange.
- 40) Secure well and release rig.
- 41) File operations reports as required with NMOCD, NMOSE and BLM.

#### **IV. BLM Operations Plan, 43 CFR 3261.12**

(a) The proposed project is on private land. Clearing and grubbing will be confined to the project area as approved by BLM in consultation with the landowner. No surface disturbance of BLM-managed public lands is proposed.

##### **Well Pad Layout and Design**

The well pad layout is approximately 150 ft x 150 ft with an existing reserve pit measuring 170 ft x 170 ft x 12 ft adjacent to the pad.

See Attachment B – Lightning Dock Aerial Map

See Attachment C – Survey of Well Location

##### **(b) Description of Existing and Planned Roads**

The well site is accessed via existing state, county and private roads. As such no new roads are necessary for this activity. The primary access roads to the site include: SR-338 (paved); CO98 Geothermal Road (paved), which extends to the surface owner's property. All roads and access at the well site on the surface owner's property are existing compacted dirt and/or graveled.

##### **(c) Description of Ancillary Facilities**

Sanitary Facilities – Portable chemical sanitary facilities will be available and used by all personnel during periods of well drilling and/or flow testing.

Mobile drilling office will be set upon on the site during drilling activities.

Existing water holding pond 170 ft x 170 ft x 12 ft.

Trash collection facilities e.g. roll-off container.

##### **(d) Source of Drill Pad and Road Building Materials**

Drill pad building material will be derived from any necessary excavation of the existing reserve pit.

The pad will be graded to provide 2% grade to reserve pit.

Existing improved roads will be used.

Any additional material required for pad construction will be secured from a local contractor.

##### **(e) Water Source**

Water required for this operation will be secured from an established private owner.

Water derived from the operation will be discharged into a gauging tank and thence to an irrigation transfer pump or the reserve pit. The irrigation transfer pump (e.g., 25 hp centrifugal) will remove



discharged water from the tank or pit and send it via a 10 inch Victaulic line to the irrigation system for application to a crop under an existing NMOSE permit. The designated crop area is the area directly south of the plant site on Attachment B. Flow will be metered using a totalizing ultrasonic or orifice meter to ensure volume does not exceed the NMOSE-permitted total.

The water in well TFD 55-7 will be sampled and analyzed for dissolved fraction of all 26.2.3103 NMAC constituents, VOCs (8260B), SVOCs (8270C), PAHs (8310), TPH (418.1), metals – dissolved (6010B/6020) including Bromide, Lithium, Rubidium, and Tungsten (by approved EPA methods), Mercury (7470A/7471A), general chemistry (methods specified in 40 CFR 136.3), Uranium (6010B/6020), radioactivity (E903/E904), and Radon (EPA method approved by NMOCD). An EPA Methods, QA/QC, and DQOs-compliant laboratory will analyze samples.

Potable water for human consumption will be provided by bottled water.

**(f) Statement Describing Surface Ownership**

Surface of the well site is owned by Rosette, Inc. of Animas, NM. Lightning Dock Geothermal holds a Surface Access and Use Agreement, dated 10 January, 2008, with Rosette granting access to the well site.

See Attachment F – Surface Access Agreement.

**(g) Description of Procedures to Protect the Environment and Other Relevant Sources**

**Air Quality:** During drilling activities hydrogen sulfide will be monitored by instruments on the drill rig.

**Hydrology and Water Quality Monitoring:** Water samples will be collected during the cleanout operation and tested to assure compliance with WQCC standards for agricultural use.

Portable chemical toilets supplied by a licensed contractor shall be used for human waste. The waste shall not be buried on site.

Trash and debris will be contained on site, and then hauled to an approved landfill by a licensed contractor. Burial and or burning on site will not be permitted.

Clearing and grubbing will be confined to the project area as approved by BLM in consultation with the landowner.

**(h) Plan of Surface Reclamation**

Top soil excavated during the construction of the pad, as feasible, will be stockpiled for use during subsequent reclamation of the disturbed area.

**(i) Any Other Information That BLM May Require**

Will be provided upon request.

**V. BLM Drilling Program, 43 CFR 3261.13**

**(a) Description of Equipment, Materials and Procedures**

A large portable rotary drill rig will be used to drill the well.

**Equipment Specifications:**

The availability of equipment and contractors changes from day to day. LDG will make its selection based on the best units available when the necessary permits are received. The rig will be functionally similar to the following: Drawworks – Taylor RT 5000; Mast – Taylor RT 5000 square set derrick; Substructure – Height 10 ft hydraulic w/ 15 ft K.B. elevation; Two (2) mud pumps; Rotary table; Swivel & Drilling Block; Tripping Block; Generators 235 kW, Air Compressor 500 SCFM.

Procedures will be as described in Section II, Well Preparation.

**(b) Proposed / Anticipated Depth of the Well:**

The well will be drilled and completed to the designed depth of 3,400 ft.

**(c) Directional Drilling:**

No directional drilling will be employed.

**(d) Casing and Cementing Program:**

This is a re-entry into an existing well that currently has cemented casing to approximately 1050 ft and approximately 400 ft of open hole to the first plug at a depth of approximately 1450 ft. The remainder of the well is open hole to the TD of 7000 ft. No additional casing or cement will be utilized in the operation to open this well to 3400 ft.

**(e) Circulation Media (mud, air, foam, etc.)**

The well will be drilled to a depth of 3,400 ft using non-toxic, temperature-stable drilling mud or aerated fluids. The drilling mud is composed of a bentonite clay-water or polymer-water mix to lubricate and cool the drill bit, bringing the rock cuttings to the surface discharged into the reserve pit, and preventing loss of drilling fluids into the rock.

**(f) Description of Logs to be Run:**

Caliper Logs

**(g) Description and Diagram of Blowout Prevention Equipment:**

Blowout prevention equipment (BOPE), which is typically inspected and approved by the BLM and/or the Oil Conservation Division (NMOCD) of the New Mexico Energy, Mining, and Natural Resources

Department (NMEMNRD), as applicable, would be installed, tested and ready for use while drilling to ensure that any geothermal fluid encountered does not flow uncontrolled to the surface.

See Attachment E.

**(h) Expected Depth and Thickness of Fresh Water Zones:**

N/A – existing casing is set to 1,000 ft hence no fresh, shallow water getting into well.

Static water depth is 71 ft. Total available water column of 1300 ft available

**(i) Anticipated Lost Circulation Zones**

None anticipated. The only instance of lost circulation recorded by Steam Reserve in the interval 1050 ft – 3400 ft was a minor episode at 2275 ft. That was successfully treated with a small batch of lost circulation material. This is below the deepest plug that LDG intends to drill out. LDG therefore anticipates that lost circulation will not be encountered in carrying out the proposed program.

**(j) Anticipated Reservoir Temperatures and Pressures:**

Temperature: Peak temperatures have been recorded at 307.4 F at a depth of 1263 ft remaining constant to 1400 ft.

Pressures: High pressure at the depth of 1365 ft is 549.66 psig.

**(k) Anticipated Temperature Gradient in the Area:**

The regional heat flow is ~80-90mW/m<sup>2</sup> (Blackwell and Steele, 1992). This heat flow would yield a temperature gradient of about 35°C/km (1.9°F/100 ft) in igneous rocks and 60°C/km (3.3°F/100 ft) in valley fill clays. Most of the non-thermal wells have a gradient near 45°C/km (2.5°F/100 ft). Therefore, 45°C/km (2.5°F/100 ft) will be taken as the background temperature gradient value for the valley fill.

Thermal gradient conditions will range from 78°C/km (4.3°F/100 ft) (*well 672-225*) to 200C/km (11°F/100 ft) (*well 93-8 and AN-104*) and will be similar or higher in 55-7.

**(l) Plat Certified by a Licensed Surveyor:**

See Attachment C.

**(m) Procedures and Duration of Well Testing**

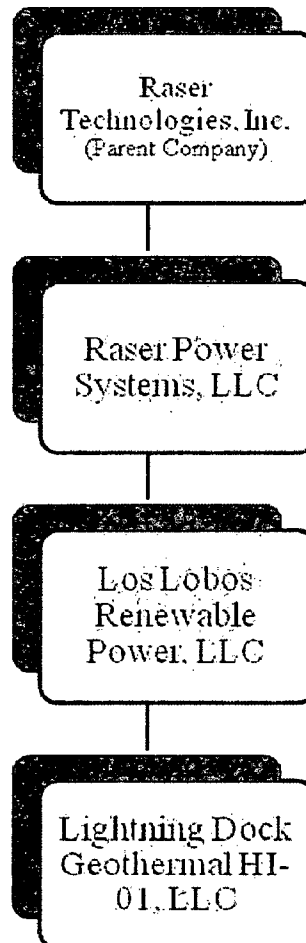
See Section II, Resource Test

**(n) Any Other Information That BLM May Require**

Will be provided upon request.

**Attachment A**

**Raser Technologies Corporate Structure**



Lightning Dock Geothermal HI-01, LLC is the permit applicant and operator. The illustration above describes the corporate organization of which Lightning Dock Geothermal is a part as follows: Raser Technologies, Inc is the parent company; Raser's geothermal development company is Raser Power Systems, LLC; the New Mexico entity is Los Lobos Renewable Power, LLC; and Lightning Dock Geothermal HI-01, LLC is the Animas, NM project entity.

EXHIBIT B

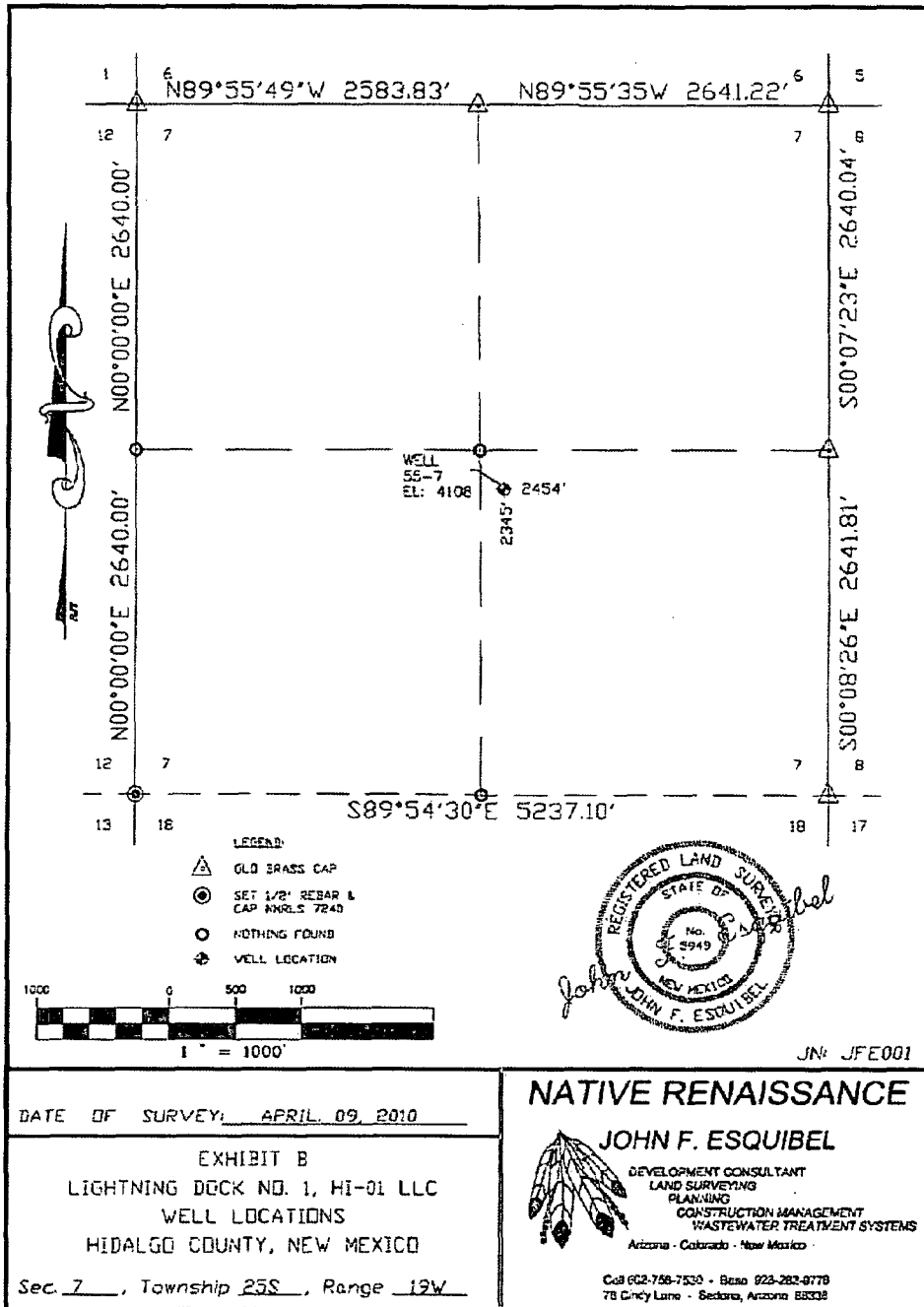
Initial Inventory of Existing Wells and Location of Initial Contemplated ROWs



- Legend**
- Surpet Boundary
  - River/Federal/Departmental Lease
- Wells**
- Number, Label**
- 1 - HP Home Heating - Federal
  - 2 - Exploratory Well - Federal
  - 3 - Exploratory Well - Federal
  - 4 - Exploratory Well - Federal
  - 5 - Well No. 1 - State - Surpet
  - 6 - Well No. 2 - State - Surpet
  - 7 - Well No. 3 - State - Surpet
  - 8 - Pacome Heating - Federal
  - 9 - Pacome Heating - Federal
  - 10 - Meters Production Well No. 9 Well - Federal
  - 11 - Meters Production Well No. 10 Well - Federal
  - 12 - HP Greenhouse Heating - Federal
  - 13 - HP Greenhouse Heating - Federal
  - 14 - Electricity Well - Federal
  - 15 - Abandoned Well - Federal
  - 16 - Meters Prod. Well No. 10 Well - Federal
  - 17 - Abandoned Well - Federal
  - 18 - Meters Production Well No. 2 Well - Federal
  - 19 - Abandoned Well - Federal
  - 20 - Test Exploratory Well - Federal
  - 21 - Pacome Heating - Federal
  - 22 - Abandoned Well - Federal
  - 23 - Heating Well - Federal
  - 24 - Pacome Heating - Federal
  - 25 - Meters Production Well No. 1 Well - Federal
  - 26 - Abandoned Well - Federal
  - 27 - Abandoned Well - Federal
  - 28 - HP Heating Pump - Federal
  - 29 - Electricity Well - Federal
  - 30 - Heating Well - Private
  - 31 - Exploratory Well - Federal
  - 32 - Cessant
  - 33 - Well No. 7 State - Surpet
  - 34 - State Well - Agriculture
  - 35 - State Well - Agriculture
  - 36 - State Well - Mechanics
  - 37 - Abandoned Well - State
  - 38 - Electricity Well - Federal
  - 39 - Meters Well - Federal
  - 40 - Meters Well Home Heating - Federal
  - 41 - Meters Well Home Heating - Federal

Attachment C

Survey of Well 55-7 Location



DATE OF SURVEY: APRIL 09, 2010

EXHIBIT B  
 LIGHTNING DOCK NO. 1, HI-01 LLC  
 WELL LOCATIONS  
 HIDALGO COUNTY, NEW MEXICO

Sec. 7, Township 25S, Range 19W

**NATIVE RENAISSANCE**



**JOHN F. ESQUIBEL**

DEVELOPMENT CONSULTANT  
 LAND SURVEYING  
 PLANNING  
 CONSTRUCTION MANAGEMENT  
 WASTEWATER TREATMENT SYSTEMS  
 Arizona - Colorado - New Mexico

Call 602-758-7533 • Base 928-282-8778  
 78 Cindy Lane • Sedona, Arizona 86338

Attachment D

**Down-Hole Test Pump Specifications**

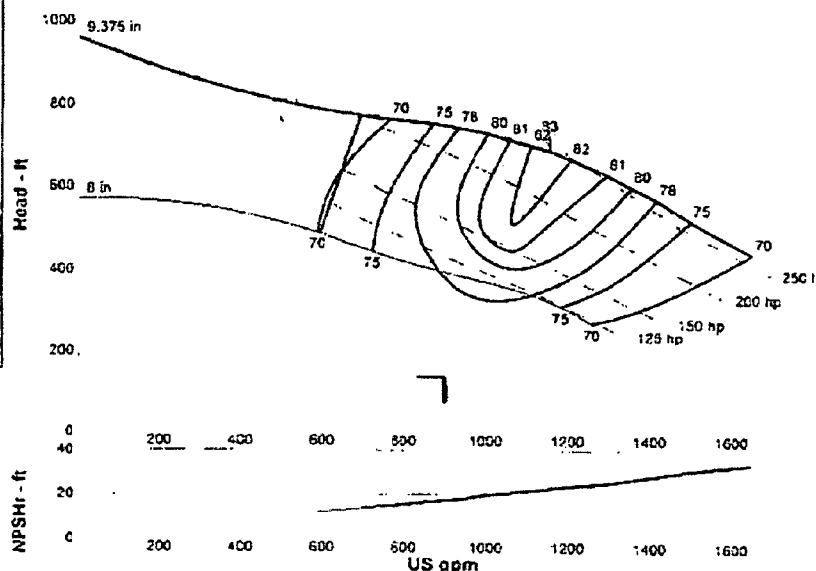
Pump Data Sheet - American-Marsh Pumps

Company:  
 Name:  
 Date: 7/9/2009



<b>Pump:</b>		<b>Search Criteria:</b>	
Size: 12MC (10 stage)	Speed: 1760 rpm	Flow: 930 US gpm	Head: 140 ft
Type: 480_VRT-TURBINE/ENCL	Dis: 9.375 in	<b>Fluid:</b>	
Synch speed: 1800 rpm	Impeller:	Water	Temperature: 60 °F
Curve: 2951	Ns: 2526	Density: 62.25 lb/ft <sup>3</sup>	Vapor pressure: 0.2563 psi a
Specific Speeds:	N13: 5635	Viscosity: 1.105 cP	Atm pressure: 14.7 psi a
Dimensions:	Suction: 8 in	<b>Motor:</b>	
Vertical Turbine:	Discharge: 6 in	Standard: NEMA	Size: 300 hp
	Bowl size: 11.25 in	Enclosure: TEFC	Speed: 1800
	Max lateral: 0.75 in		Frame: 44BT
	Thrust K factor: 10.6 lb/ft	Sizing criteria: Max Power on Design Curve	
<b>Pump Data:</b>			
Temperature: 250 °F	Power: 450 hp		
Pressure: 584 psi g	Eye area: — in <sup>2</sup>		
Sphere size: 0.625 in			

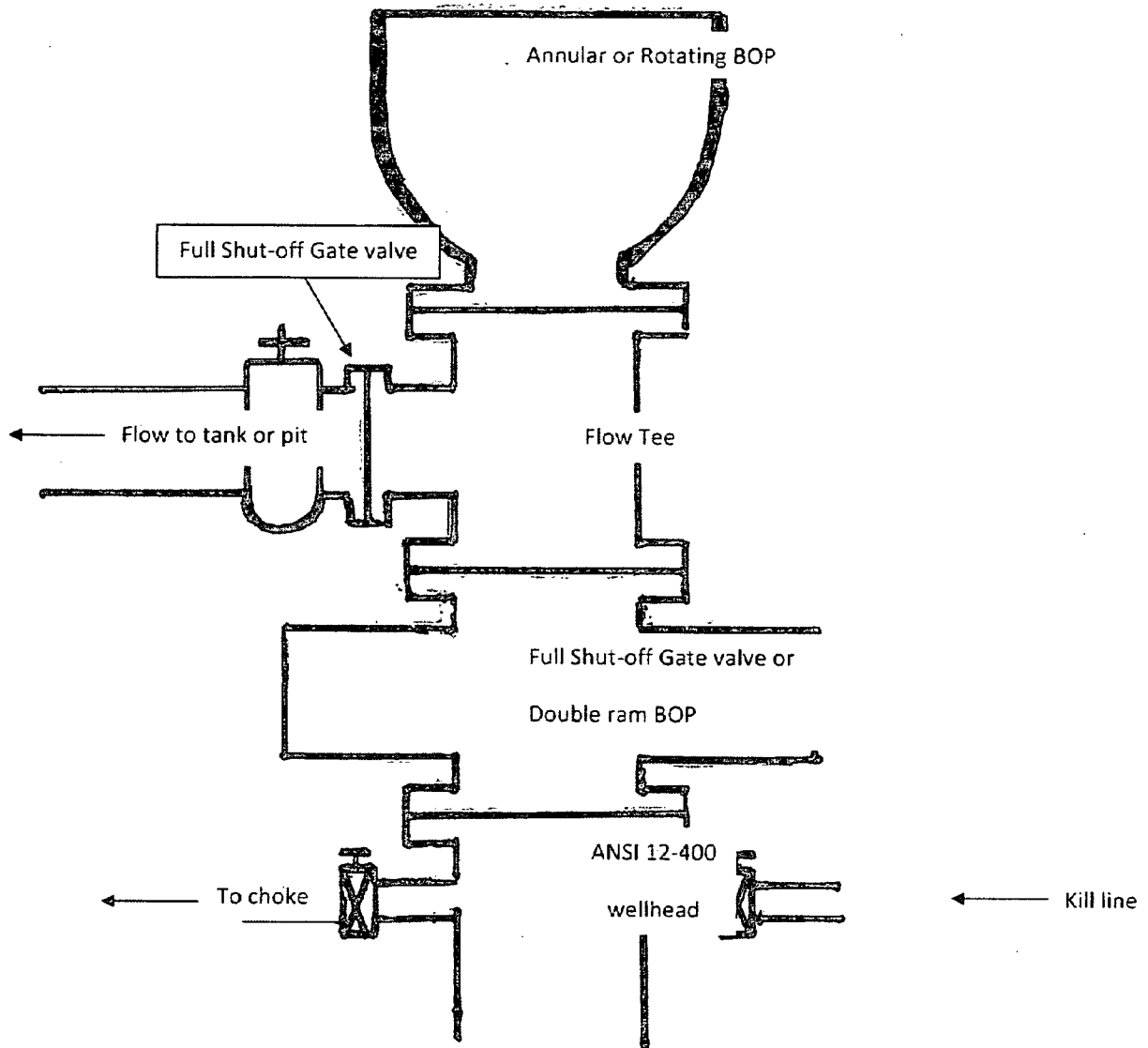
<b>Data Point:</b>	
Flow:	1152 US gpm
Head:	668 ft
Eff:	82%
Power:	243 hp
NPSHr:	22.9 ft
<b>Design Curve:</b>	
Shutoff head:	960 ft
Shutoff dP:	415 psi
Min flow:	693 US gpm
BEP:	83% @ 1155 US gpm
NOL power:	263 hp @ 1500 US gpm
<b>Max Curve:</b>	
Max power:	263 hp @ 1500 US gpm



Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
1030	1760	709	81	237	21.4
900	1760	745	76	223	17.5
720	1760	778	68	207	14.1
540	1760	—	—	—	—
360	1760	—	—	—	—

Attachment E

**Blowout Prevention Equipment Diagram**





**EXHIBIT A**

Legal Description of the Subject Lands

- A. LDG is the owner of Federal Geothermal Lease NM -34790 ("Subject Lease"), granting LDG the right to explore for and develop geothermal resources underlying the lands covered by the lease, described as follows:

1.

**T25S, R19W, N.M.P.M.**  
**Sec. 6: Lots 3, 4, 5, 6, 7, SE1/4NW1/4**  
**Sec. 6: E1/2SW1/4**  
**Sec. 7: Lots 1, 2, 3, 4, S1/2NE1/4, SE1/4NW1/4, E1/2SW1/4, SE1/4,**  
**NW1/4NE1/4, NE1/4NW1/4**  
**Sec. 18: Lot 1, N1/2NE1/4, NE1/4NW1/4**

and

**T25S, R20W, N.M.P.M.**  
**Sec. 1: NW1/4SW1/4, S1/2SW1/4, SW1/4SE1/4**  
**Sec. 11: NE1/4, S1/2**  
**Sec. 12: ALL**  
**Sec. 13: N1/2N1/2**

**Containing 1,500.86 acres, more or less**

2. LDG has applied for Federal Geothermal Lease NM 108801, which is pending final approval by the BLM and will be included with the Subject Lease upon approval, granting LDG the right to explore for and develop geothermal resources underlying the lands covered by the Subject Lease, described as follows:

**T25S, R20W, N.M.P.M.**  
**Sec. 14: All**

**Containing 640.00 acres, more or less**

- B. Owner is the owner of the land ("Surface Lands") covering, in part, the Subject Lease, which is described as follows:

1. Sections 7 and 18  
T25 S, R19 W, N.M.P.M

And

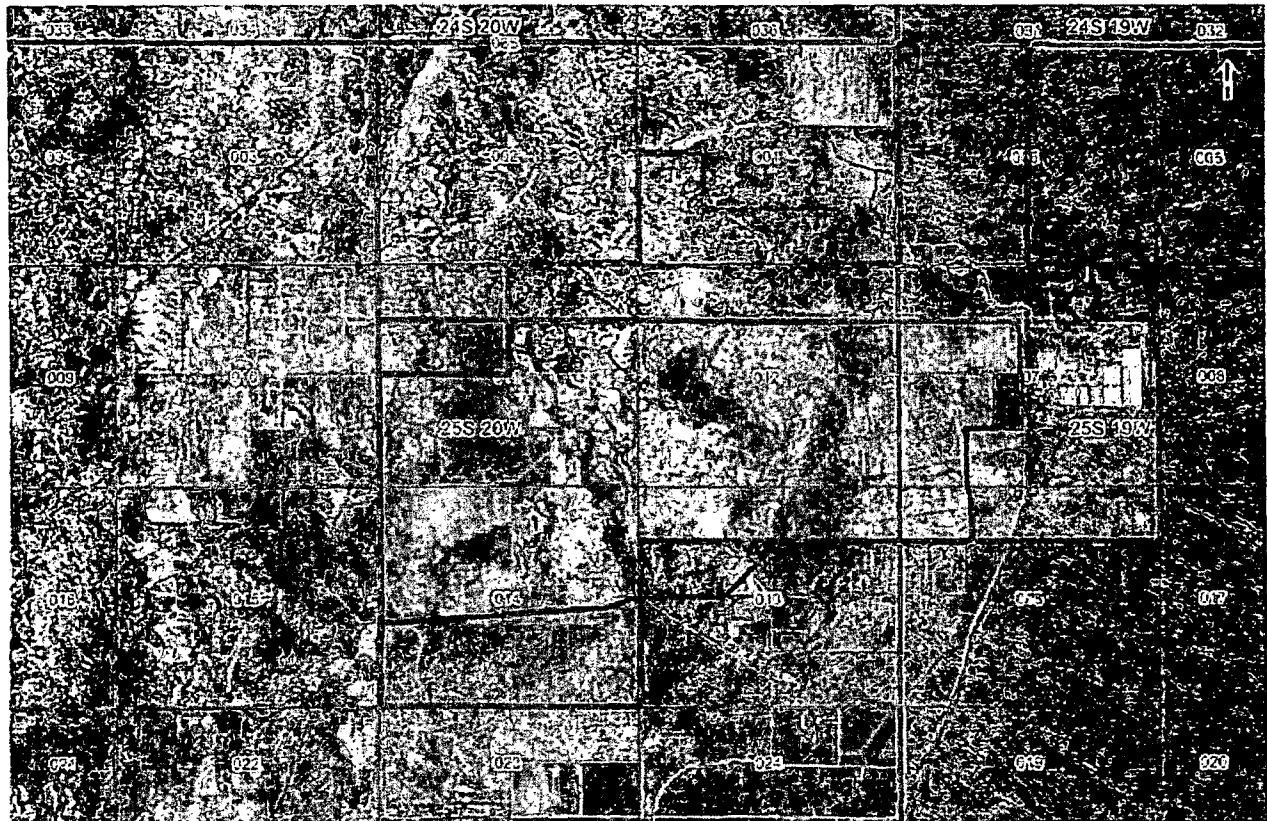
Sections 11, 12, 13, 14, and 23  
T25 S, R20 W, N.M.P.M  
Containing 2,592.473 acres, more or less

- C. "Subject Lands" shall be the surface area wherein LDG's Subject Lease underlies Owners Surface Lands.








EXHIBIT C

Sample Power Plant ROW and Access Roads for a Power Plant



Legend

-  Secondary Access Route
-  Primary Access Route
-  Proposed Plant Location
-  Faser Federal Geothermal Lease
-  Burget\_Boundary

Lightning Dock Geothermal  
 Power Plant and  
 Access ROW  
 Hildago County, Nevada

Lightning Dock Geothermal HI-01, LLC  
 5152 North Edgewood Drive Suite 375  
 Provo, UT 84604



RECEIVED  
LAS CRUCES DISTRICT OFFICE

2010 APR 21 PM 12:16

LAS CRUCES, NM 88005

April 20, 2010

Bureau of Land Management  
Las Cruces District Office  
c/o Michael Smith  
1800 Marquess Street  
Las Cruces, NM 88005

Dear Mr. Smith,

This letter is in response to correspondence received from Mr. Edward Seum of your office, dated 16 April, 2010. In said correspondence, Mr. Seum requested additional information as it pertains to Lightning Dock Geothermal HI-01, LLC's ("LDG") pending Geothermal Drilling Permit for Well 55-7. I trust the following response meets your requirements.

*Reclamation: Provide details on removal of equipment and facilities, restoration and seeding of any disturbed areas, mulch applications and other soil treatments (43 CFR §3261.12(h)).*

Well 55-7 is on a privately-owned, existing disturbed site. LDG will work with the land owner to return the site to, at minimum the same as and/or better than condition than existed prior to LDG's proposed activities. Notwithstanding, all reclamation activities will be consistent with the existing EA.

All ancillary facilities and equipment associated with the drilling operation and subsequent testing activities will be removed from the site as such activities are completed. For example, the drill rig and the mobile drilling office described in LDG's Proposed Operations and Drilling Plan (p. 9) will be demobilized and removed from the site as soon as it is no longer required on site.

In addition, the temporary pond associated with the operation will not be used for any permanent water storage and/or otherwise become a permanent water body. The pond area is currently, and will remain unlined and as such water will naturally seep into the ground.

*Well Testing: Provide details regarding how Well 55-07 will be closed and secured (consistent with New Mexico State Engineer's requirements) after the flow test is completed. Specify if irrigation use is intended to continue after the flow test. Also specify what actions will be taken with this well if the flow test fails to meet required operational specifications (43 CFR §3261.13(b)(14)).*

The Plan of Operations accompanying the TDF 55-7 Geothermal Drilling Permit concludes with the removal of the test pump from the well and drilling equipment from the well site.

A small amount of test equipment such as tanks or wireline equipment may remain in place for future observation.

The test described in the present Geothermal Drilling Permit is a scientific enterprise for the purposes of: understanding the resource; describing its potential to investors; and guiding further development drilling. It is not a qualification test with a binary (pass/fail) outcome.

Project development activities are likely to require more than a year and LDG plans to use TFD 55-7 for observation of the resource throughout that time. Well 55-7 will therefore be secured and under LDG's active control and equipped with scientific instrumentation, including wireline survey equipment, that will preclude any other use of the well, including long-term irrigation.

In addressing the question as it pertains to NMOSE requirements, Ms. Haddy Phillips, Water Resource Specialist, NMOSE, provided the following description of requirements:

“Once testing is completed [LDG] will either file [a] Permit to Use the well as an production well (which will be "secured" by the conditions of approval) or if [LDG] do[es] not plan on using the well [it] will be required to plug the well - back to 1400 ft.” . . . “OSE will require an approved OSE plugging plan prior to the plugging of the well, the well must also be plugged by a OSE licensed well driller.”

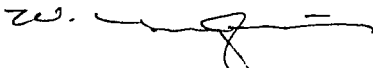
Finally, upon the conclusion of LDG's activities, the well will be suspended or abandoned as required by State and Federal regulation.

*Exhibit "B": Much of the writing on this exhibit is illegible; please reformat this figure so it can be read. Clearly illustrate on Exhibit "B" the location of Well 55-7, the location of the reserve pit where this well will discharge, and the area to be irrigated. This information is necessary to verify analysis of wildlife and hydrologic impacts (43 CFR §3261.13(b)(14)).*

Please find attached two new "Exhibit B" maps; the first provides an aerial detail of the well and pond; and the second illustrates the proposed irrigated area.

I trust the foregoing adequately addresses the questions raised by Mr. Seum. Please feel free to contact me with any additional comments or questions you have.

Respectively,



W. Layne Ashton  
Geothermal Project Development

# Lighting Dock Geothermal Aerial Map

Animas Valley, NM

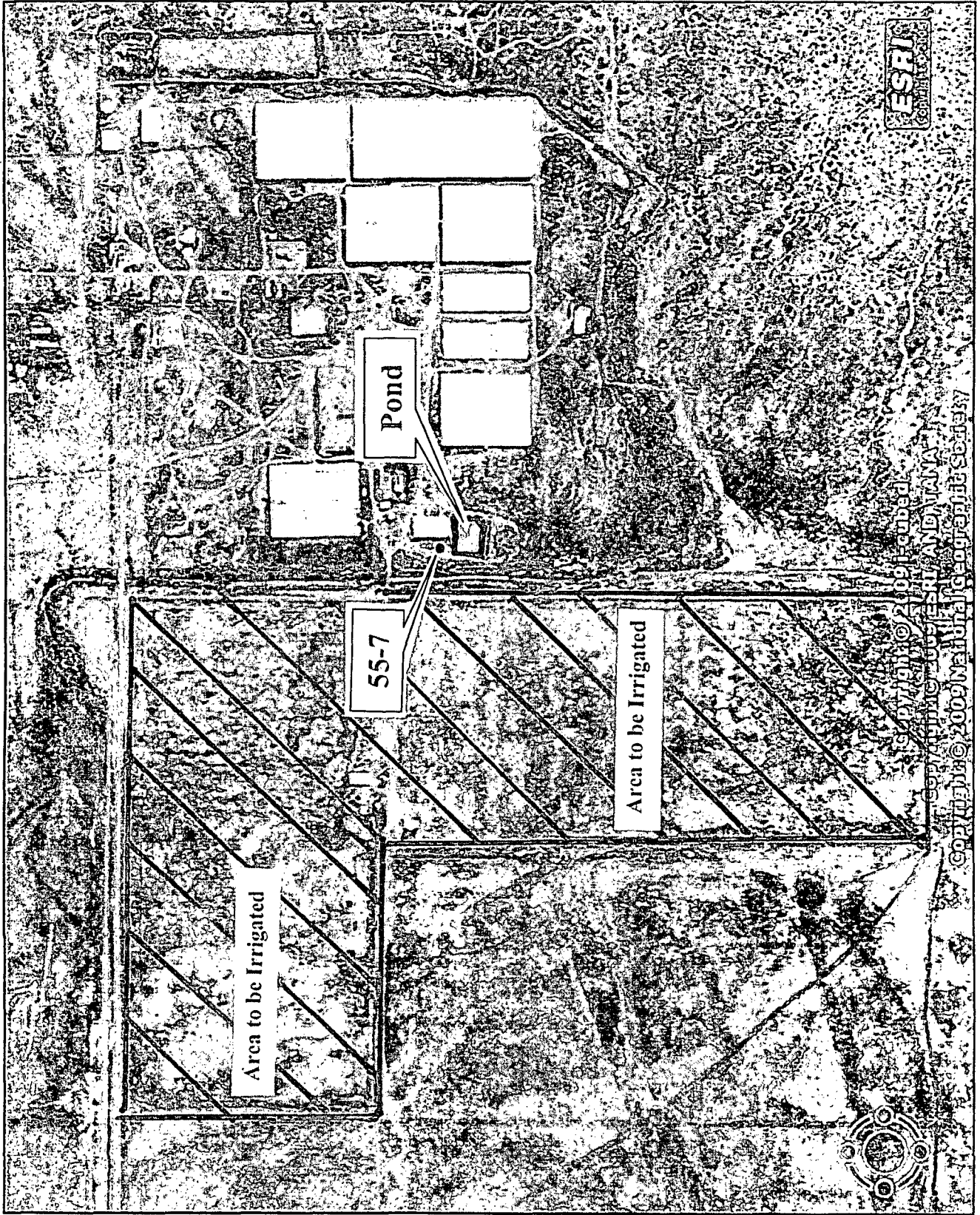
raser

TECHNOLOGIES





Exhibit B (a) Area to be Irrigated



"Layne Ashton" <lashton@rasertech.com>

04/21/2010 01:27 PM

To  
<mike\_smith@nm.blm.gov>  
cc  
bcc  
Subject  
Correction on map

Mike,

I discovered this morning that I had made a small error on the map illustrating the area to be irrigated. Please find attached the corrected map. I have also pasted the NMOSE water rights number, place of authorized use and the not-to-exceed amount into the corner of the corrected map.

I will follow up with a phone call this afternoon to verify your receipt of this corrected map.

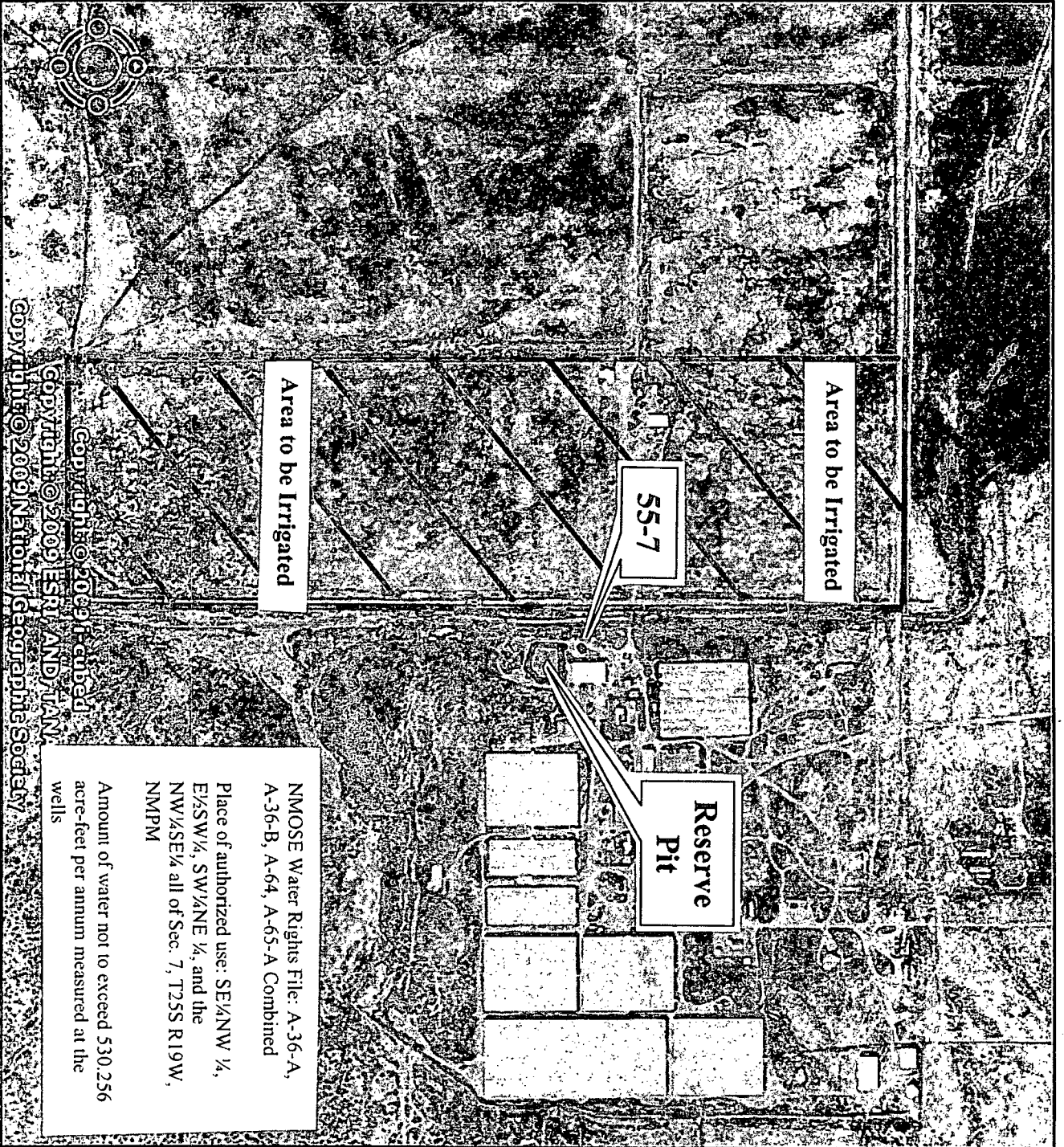
Best regards,

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
[layne.ashton@rasertech.com](mailto:layne.ashton@rasertech.com)



Exhibit B Area to be Irrigated correct 04 21 2010.pdf





## Chavez, Carl J, EMNRD

---

**From:** Mike\_Smith@blm.gov  
**Sent:** Friday, May 21, 2010 1:52 PM  
**To:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD  
**Subject:** Raser well 55-7 GDP approved  
**Attachments:** NMNM34790\_APPROVED GDP.pdf

Carl and Randy:

Here's the approved Federal Geothermal Permit to drill for Raser Tech's well 55-7. Due to attachment size limits for our server, I will have to send the Operations and drilling plan in a separate e-mail. I will also mail paper copies to OCD in Santa Fe and Artesia.

I have already sent a copy to Layne Ashton at Raser Tech

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[Mike\\_Smith@blm.gov](mailto:Mike_Smith@blm.gov)

(See attached file: NMNM34790\_APPROVED GDP.pdf)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**GEOHERMAL DRILLING PERMIT**

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790

8. Surface Manager:  BLM  FS  
 Other: private

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

9. Unit Agreement Name  
N/A

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

10. Well No. TFD 55-7 | 11. Permit No. 1

1c. Well Status:

12. Field or Area  
Wildcat

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

13. Sec., T., R., B. & M.  
Sec 7, T25S, R19W, NMBM

3. Address of Lessee/Operator  
5152 North Edgewood Drive, Provo, Utah 84604

14. County  
Hidalgo

4. Location of Well  
At surface 2411.9' west of the East Line and 2329.1' north of the South Line of Sec 7, T25S, R19W  
At proposed prod. Zone Same

15. State  
NM

5. Distance from Proposed Location to Nearest Property or Lease Line  
1831' (to McCants surface at the NW 1/4 of the NE 1/4 of Sec 7, T25S, R19W)

16. Approx. Starting Date  
04/21/2010

6. Distance from Proposed Location to Nearest Well or Previously Applied for Well Location on this Lease.  
500' (to 45-07)

17. Acres Assigned (Well Spacing)  
N/A

18. Drilling Media and Characteristics:  Air  Water  Mud  Foam  Other  
19. Proposed Depth Measured: 3,400' True Vertical: 3,400'  
20. Elevations:  Estimated  Final  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Culvert & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36" 28"	30" 20"	unknown 94#	none buttress st&c	unknown unknown	0 0	30' 360'	unknown 760 sacks class H CMT w/40% silica & 2% calcium
17-1/2"	13-3/8"	81#	buttress st&c	K-55	0	1050'	780 sacks class H w/40% ssc+3# sk pearlite
No proposed casing or cementing.							

22. Proposed Work Summary

- MIRU drill rig.
- Drill out cement plug from 1450' to 1550' approx.
- Drill out cement plug from 1890' to 2090' approx.
- RIH to locate cement plug at 5400' approx.
- Set bridge plug in 3000'-3400' interval.
- Collect water samples for geochemical and environmental analysis.
- Set production pump at 850' approx.
- Release rig.
- Hook up well for pump test to irrigation system.
- Run pump test for up to four weeks.
- Secure well.

Please see attached Proposed Operations and Drilling Plan for details.

RECEIVED  
 LAS CRUCES DISTRICT OFFICE  
 2010 APR 12 AM 11:33  
 LAS CRUCES, NM 88004

23. Deborah J. Burke Vice President, Resource Management 04/12/2010  
Signed Title Date

(This space for Federal use)

Approved by Bill Alden Title District Manager Date May 21, 2010

Conditions of Approval, if any:  
See attached COA list

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

## GENERAL INSTRUCTIONS

This form must be submitted for any application to drill for, test, extract, produce, dispose and/or utilize the actual geothermal resources on Federally leased land or lands covered by a unit or cooperative agreement.

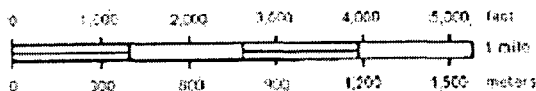
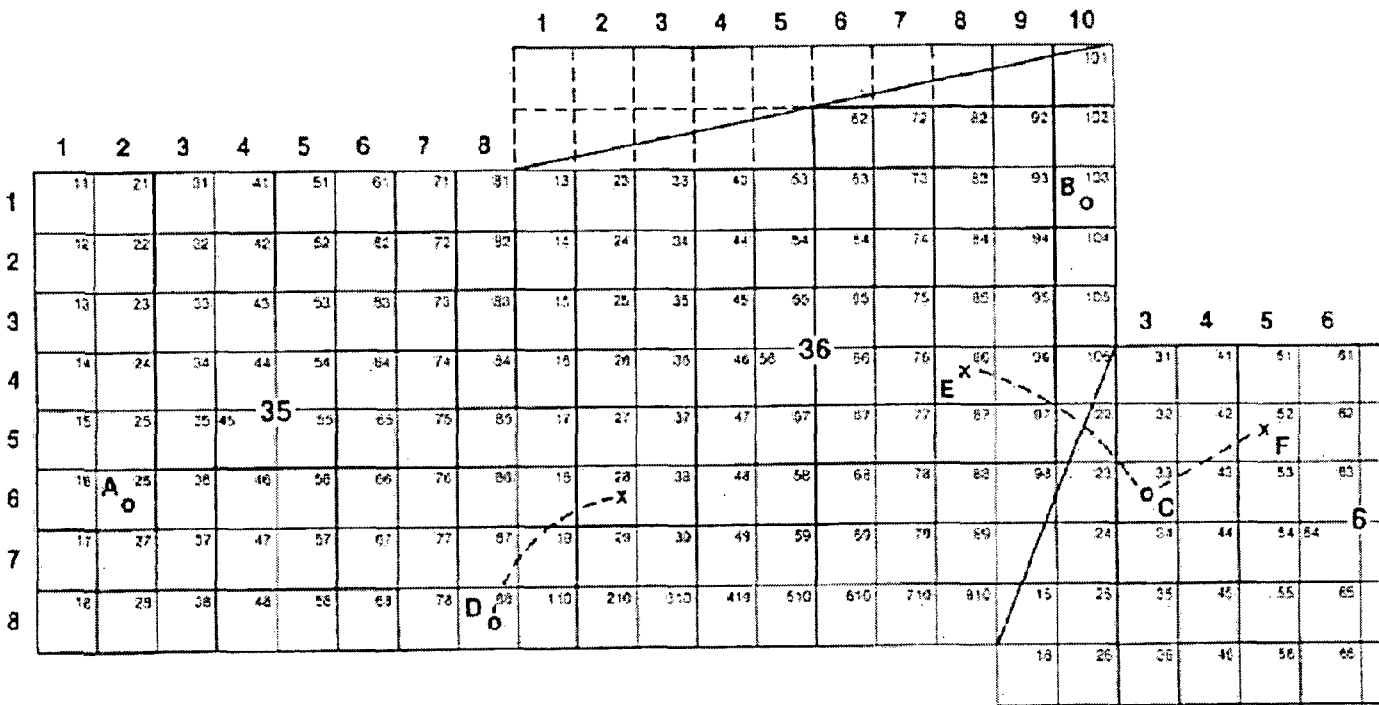
## SPECIFIC INSTRUCTIONS

- Item 1C: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (explain).
- Item 7: Number the wells using the Modified Kettleman Well Numbering System (see below).
- Item 15: Show the surface location coordinates from the nearest section corner or tract lines and if the well is to be directionally drilled, the proposed zone coordinates (top and bottom) from the surface location.
- Item 19: Indicate reference datum from which measurement was made (see item 20).
- Item 20: If the reference datum shown is not the graded mat, also show the measurement from the mat surface (e.g., mat-to-derrick floor (DF) measurement, mat-to-rotary table (RT) measurement, mat-to-kelly bushing (KB) measurement, etc.)
- Item 21: For subsequent well work the latest well conditions along with all proposed additions and changes must be shown. To show current well conditions, either fill-out this item or attach the latest completion report on the subject well.
- Item 22: Summarize other pertinent existing data such as producing and injecting zones, type, size, density of perforations and perforated intervals, etc., in addition to the proposed work. Indicate reasons for changes undertaken.

### PROCEDURE FOR NUMBERING GEOTHERMAL WELLS USING THE MODIFIED KETTLEMAN WELL NUMBERING SYSTEM

1. Subdivide the sections where the wells are to be located into 10-acre (660 feet x 660 feet) subdivisions. Number each horizontal and vertical subdivision starting in the northwest corner of each section with 1.1 and increasing to the east and south. A regular 640-acre section contains 64 subdivisions numbered from 11 to 88 (vertical digit first followed by the horizontal digit).
2. Number the first vertical well with the number of the 10-acre subdivision in which it is located followed by the section number. (See examples "A", "B", and "C", below.) If the first well is directionally drilled, number it with the subdivision number of its surface location, followed by the subdivision number in which the bottom of the completion interval lies and that section number (if different from the surface section number); and followed by the surface section number. (See Example "D".)
3. Subsequent wells drilled from the same 10-acre surface location are numbered in the manner described above with an A, B, C, etc., added following the surface subdivision number. (See Examples "E" and "F".)
4. For sections with irregular boundaries, align a 10-acre grid pattern North-South, running through the westernmost section point or line and East-West running through the northernmost section point or line. Number wells according to the 10-acre grid, subdividing as far as possible to the east and south.

Example A	26-35	Example D Directional	83(28-36)-35
Example B	103-36	Example E Directional	33A(86-36)-6
Example C	33-6	Example F Directional	33B(52)-6



## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

**AUTHORITY:** 30 U.S.C 181 et seq.; 43 CFR 3200 and 3260.

**PRINCIPAL PURPOSE:** The BLM uses this information to evaluate the technical, safety, and environmental factors involved with geothermal resources on Federal geothermal leases.

**ROUTINE USES:** (1) The adjudication of the form. (2) Documentation for public information in support of notations made on land status, records for the management, disposal, and use of public lands and resources. (3) Transfer to appropriate Federal agencies when concurrence is required prior to granting a right in public lands or resources. (4) Information from the record and/or the record will be transferred to appropriate Federal, State, local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecutions.

**EFFECT OF NOT PROVIDING INFORMATION:** Disclosure of the information is required to process the application. If all information is not provided, the application may be rejected.

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The BLM collects this information to allow us to evaluate the technical, safety and environmental factors involved with geothermal resources on Federal geothermal leases.

The BLM will use this information to analyze and approve operations.

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**CONDITIONS OF APPROVAL**

**NMNM034790 WELL 55-7**

**APPROVED: MAY 21, 2010**

1. The following information shall be posted at a conspicuous location at the well:

**Operator Name:** Lightning Dock LLC

**Lease No.:** NMNM034790

**Well Name & No.:** TFD 55-7

**County:** Hidalgo

**Location:** 2411.9' F.E.L. and 2329.1' F.S.L.

**NWSE Sec 7 T25S R19W NMPM**

2. The operator shall follow all procedures outlined in the approved operations and drilling plan and addendums. Any variations in the approved operations and drilling plan shall be incorporated by written amendment (sundry notice: BLM form 3260-3) to the approved GDP and shall be subject to approval by the Las Cruces District Office (LCDO). The operator shall permit the LCDO sufficient time to evaluate any environmental effects of the amendment prior to initiating the revised activities (43 CFR §3261.17).

3. This permit is issued for exploratory and well test purposes only. Any direct use shall constitute willful trespass against the United States subject to civil penalties outlined in 43 CFR §9239.5-2.

4. The operator shall be responsible for the protection from damage of all identified cultural resources within the area which may be affected by their actions. In addition, the operator shall be liable for all damage or injury to the identified cultural resources caused by their actions. The operator shall immediately notify the Agency Official if any damage occurs to any cultural resource and immediately halt work in the area in which damage has occurred until approval to proceed has been granted by the Agency Official after consultation with the BLM Archeologist.

5. If previously undiscovered heritage resources (historic or prehistoric) are exposed or disturbed as a result of operations authorized under this contract, the operator shall leave such discoveries intact, cease operations in the area so affected, and immediately notify the Las Cruces Field Office. The operator shall not proceed until they are notified by the BLM in writing that all provisions or recovery of heritage resources are met.

6. Pursuant to the Native American Grave Protection and Repatriation Act (NAGPRA) 25 USC 3002(d); 43 CFR Part 10.4, if any human remains, funerary objects, sacred objects, or objects of possible cultural significance are discovered during the course of ground disturbing activity, the operator will immediately cease activity in the area of the discovery and will make a reasonable effort to protect the remains and objects. The operator will provide immediate telephone notification of the discovery to the Las Cruces Field Office, and will follow up with written confirmation to the authorized officer. The operator will not resume the activity that resulted in the discovery until the authorized officer gives written approval. Approval to resume the activity, if otherwise lawful, will be given thirty (30) days after certification by the Agency Official of the operator's written confirmation of the discovery, or at any time that a written binding agreement is executed between the BLM and the affiliated tribes adopting a recovery plan for the remains and objects.

7. To prevent the spread of noxious weeds, the contractor shall clean all earth-moving and hauling equipment prior to its initial move-in to the area. If any equipment subsequently operates outside this project area, it shall be treated the same as an initial move-in. This cleaning shall remove all soil, seeds, vegetative matter, or other debris that could contain or

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8. Operator shall utilize water trucks for onsite dust control as necessary.

9. Operator shall provide the LCDO with a minimum five (5) days notice prior to beginning operations in order to schedule inspections over the projected four weeks of operations. The operator shall inform BLM of test completion and schedule a final inspection no more than three (3) days

10. In the event water analysis exceeds applicable State of New Mexico standards and Oil Conservation Division (OCD) requirements, all pump testing and discharge/irrigation activities shall cease until the operator has met the requirements of the OCD conditions of approval for water quality. Prior to restarting operations, the operator shall obtain written acknowledgement from OCD that State standards and requirements have been met and provide a copy to the LCDO.

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12. The reserve pit, if used for cooling of geothermal waters, shall be constructed in a manner consistent with applicable best management practices outlined in BLM *Surface Operating Standards and Guidelines for Oil and Gas Exploration* (the "Gold Book"), fourth edition, 2007 (p. 16-17). The pit shall be sloped and fenced to prevent wildlife entry.

13. Operator shall complete pre-construction survey for listed species and for burrowing owl nests. Survey for and avoid Giffith's saltbrush and night-blooming cereus within the area of operations. Survey results shall be presented in writing to BLM prior to initiating operations.

14. If used for cooling well discharge, the reserve pit shall be covered with a safe grating or approved floating devices ("bird balls") sufficient to prevent migratory birds from accessing the pits. Nets shall not be installed as this tends to trap birds and bats. Reserve pits shall be monitored to minimize entrapment of small mammals, reptiles and amphibians

15. If used for cooling geothermal waters, a minimum of two feet of freeboard shall be maintained in the reserve pit. If a synthetic liner is required, it shall have a permeability of  $< 10^{-7}$  cm/sec and be composed of materials compatible with pit temperatures and contents.

16. All equipment shall be kept in safe operating order and free of any oil, fuel or fluid leaks. Any soils, water or materials contaminated by fuels, lubricants or engine fluids shall be

immediately cleaned, isolated in appropriate containers and disposed of at approved waste-receiving facilities.

17. All activities described in this GDP, including reclamation, shall be completed within one year of the date of approval. Any activities after this period shall require a new sundry notice (BLM form 3260-3).

18. Within thirty (30) days of completion, the operator shall submit a completed BLM Form 3260-4 (well completion form).

19. The operator shall submit a new sundry notice regarding future use of well 55-7 within sixty (60) days of completing the pump test. Otherwise, well 55-7 shall be permanently plugged to New Mexico OSE standards.



## Chavez, Carl J, EMNRD

---

**From:** Mike\_Smith@blm.gov  
**Sent:** Friday, May 21, 2010 1:52 PM  
**To:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD  
**Subject:** Raser well 55-7 GDP approved  
**Attachments:** NMNM34790\_APPROVED GDP.pdf

Carl and Randy:

Here's the approved Federal Geothermal Permit to drill for Raser Tech's well 55-7. Due to attachment size limits for our server, I will have to send the Operations and drilling plan in a separate e-mail. I will also mail paper copies to OCD in Santa Fe and Artesia.

I have already sent a copy to Layne Ashton at Raser Tech

Regards,

Michael Smith  
Geologist - BLM  
Las Cruces District Office  
1800 Marquess Street  
Las Cruces, NM 88005  
575-525-4421  
[Mike\\_Smith@blm.gov](mailto:Mike_Smith@blm.gov)

(See attached file: NMNM34790\_APPROVED GDP.pdf)

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT  
**GEOHERMAL DRILLING PERMIT**

FORM APPROVED  
OMB NO. 1004-0132  
Expires: July 31, 2010

The Bureau of Land Management (BLM) requires this form or other BLM approved forms to be prepared and filed in triplicate with requisite attachments. The BLM must approve this permit prior to any lease operation.

7. Lease Serial No.  
NM 34790

8. Surface Manager:  BLM  FS  
 Other private

1a. Type of Work:  Drill New Well  Redrill  Deepen  Plug Back  Directionally Drill  Other

9. Unit Agreement Name  
N/A

1b. Well Type:  Production  Injection  Heat Exchange  Observation  Water Supply  Other

10. Well No. TFD 55-7 | 11. Permit No. 1

1c. Well Status:

12. Field or Area  
Wildcat

2. Name of Lessee/Operator  
Lightning Dock Geothermal HI-01, LLC

13. Sec. T., R., B. & M.  
Sec 7, T25S, R19W, NMBM

3. Address of Lessee/Operator  
5152 North Edgewood Drive, Provo, Utah 84604

4. Location of Well  
At surface 2411.9' west of the East Line and 2329.1' north of the South Line of Sec 7, T25S, R19W  
At proposed prod. Zone Same

14. County  
Hidalgo

15. State  
NM

5. Distance from Proposed Location to Nearest Property or Lease Line  
1531' (to McCants surface at the NW 1/4 of the NE 1/4 of Sec 7, T25S, R19W)

16. Approx. Starting Date  
04/21/2010

6. Distance from Proposed Location to Nearest Well or Previously Applied for Well Location on this Lease.  
500' (to 45-07)

17. Acres Assigned (Well Spacing)  
N/A

18. Drilling Media and Characteristics:  Air  
 Water  Mud  Foam  Other

19. Proposed Depth  
Measured: 3,400'  
True Vertical: 3,400'

20. Elevations:  Estimated  Final  
Reference Datum:  GR  MAT  DF  KB  RT  
 Casinghead Flange  Other

21. Existing and/or Proposed Casing and Cementing Program (List existing program first, followed by proposed program and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					Top	Bottom	
36"	36"	unknown	none	unknown	0	30'	unknown 760 sacks class H CMT w/40% silica & 2% calcium
28"	28"	94#	buttress st&c	unknown	0	280'	
17-1/2"	13-3/8"	81#	buttress st&c	K-55	0	1050'	780 sacks class H w/40% sec+ 8# sk pebble
No proposed casing or cementing.							

22. Proposed Work Summary

- MIRU drill rig.
- Drill out cement plug from 1450' to 1550' approx.
- Drill out cement plug from 1890' to 2090' approx.
- RIH to locate cement plug at 5400' approx.
- Set bridge plug in 3000'-3400' interval.
- Collect water samples for geochemical and environmental analysis.
- Set production pump at 850' approx.
- Release rig.
- Hook up well for pump test to irrigation system.
- Run pump test for up to four weeks.
- Secure well.

Please see attached Proposed Operations and Drilling Plan for details.

RECEIVED  
 LAS CRUCES DISTRICT OFFICE  
 2010 APR 12 AM 11:33  
 LAS CRUCES, NM 88001

23. Gregory J. Burke Vice President, Resource Management 04/12/2010

Signed \_\_\_\_\_ Title \_\_\_\_\_ Date \_\_\_\_\_

(This space for Federal use)

Approved by Bill Chulden Title District Manager Date May 21, 2010

Conditions of Approval, if any:  
See attached COA list

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212 make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

## GENERAL INSTRUCTIONS

This form must be submitted for any application to drill for, test, extract, produce, dispose and/or utilize the actual geothermal resources on Federally leased land or lands covered by a unit or cooperative agreement.

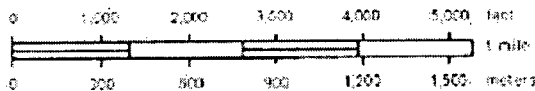
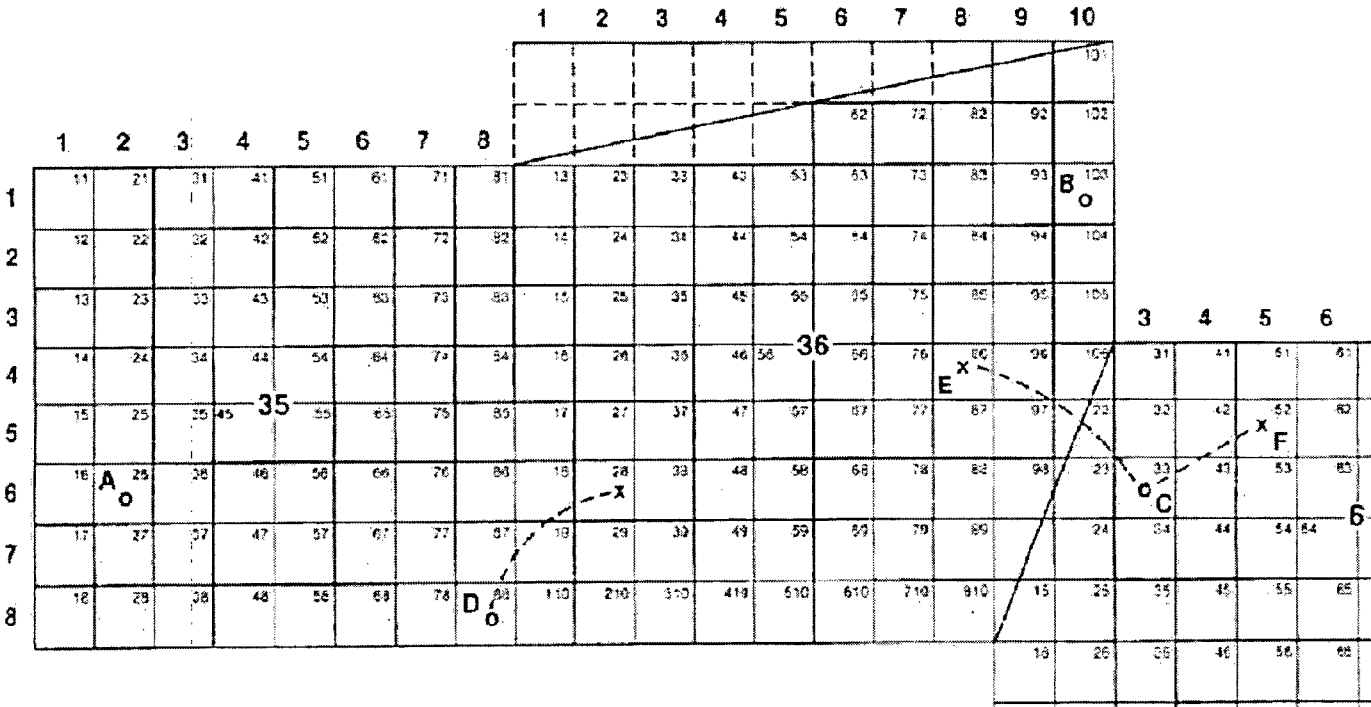
## SPECIFIC INSTRUCTIONS

- Item 1C: Show the current status for existing wells: I=injecting, F=flowing, P=pumping, HE=heat exchange, SI=shut-in, WS=water supply, OB=observation, O=other (explain).
- Item 7: Number the wells using the Modified Kettleman Well Numbering System (see below).
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### PROCEDURE FOR NUMBERING GEOTHERMAL WELLS USING THE MODIFIED KETTLEMAN WELL NUMBERING SYSTEM

1. Subdivide the sections where the wells are to be located into 10-acre (660 feet x 660 feet) subdivisions. Number each horizontal and vertical subdivision starting in the northwest corner of each section with 1,1 and increasing to the east and south. A regular 640-acre section contains 64 subdivisions numbered from 11 to 88 (vertical digit first followed by the horizontal digit).
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4. For sections with irregular boundaries, align a 10-acre grid pattern North-South, running through the westernmost section point or line and East-West running through the northernmost section point or line. Number wells according to the 10-acre grid, subdividing as far as possible to the east and south.

Example A	26-35	Example D Directional	88(28-36)-35
Example B	103-36	Example E Directional	33A(86-36)-6
Example C	33-6	Example F Directional	33B(52)-6



## NOTICES

The Privacy Act of 1974 and the regulations in 43 CFR 2.48(d) provide that you be furnished with the following information required by this application.

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**CONDITIONS OF APPROVAL**

**NMNM034790 WELL 55-7**

**APPROVED: MAY 21, 2010**

1. The following information shall be posted at a conspicuous location at the well:

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**Lease No.:** NMNM034790

**Well Name & No.:** TFD 55-7

**County:** Hidalgo

**Location:** 2411.9' F.E.L. and 2329.1' F.S.L.

**NWSE Sec 7 T25S R19W NMPM**

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## Chavez, Carl J, EMNRD

---

**From:** Mike\_Smith@blm.gov  
**Sent:** Friday, May 21, 2010 1:55 PM  
**To:** Chavez, Carl J, EMNRD; Dade, Randy, EMNRD  
**Subject:** well 55-7 Operations and drilling plan (attach to Federal GDP)  
**Attachments:** NMNM34790\_ApprovedO&D PLAN.pdf

(See attached file: NMNM34790\_ApprovedO&D PLAN.pdf)



**Lightning Dock Geothermal HI-01, LLC**  
**Proposed Operations and Drilling Plan, Well TFD 55-7**

April 12, 2010

Prepared For:

New Mexico Energy, Minerals and Natural Resources Department  
Oil Conservation Division, Environmental Bureau  
1220 South St. Francis Drive, Santa Fe, NM 87505

New Mexico Office of the State Engineer  
Water Rights District III Office  
301 South Tin Street, Deming, NM 88030

U.S. Department of the Interior, Bureau of Land Management  
Las Cruces District Office  
1800 Marquess Street, Las Cruces, NM 88005

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## **I. Summary of Proposed Operations:**

Lightning Dock Geothermal HI-01, LLC, ("LDG") is a wholly owned subsidiary of Los Lobos Renewable Power, LLC, which is wholly owned by Raser Technologies, Inc. (See Attachment A, Raser Technologies Corporate Structure). LDG proposes to re-enter and test well TFD 55-7 for the purpose of determining its suitability as a geothermal production well. LDG intends to mobilize a drilling rig about April 21, 2010 and will commence operations according to the Plan in Section II, below, as soon as approved by BLM and upon receipt of requisite permits from NMOSE and NMOCD.

The operations for which Lightning Dock Geothermal seeks permission in the present application are comprised of three parts:

- Remove two of the three remaining cement abandonment plugs set in the wellbore by Steam Reserve Corp. in 1985. The deepest plug will remain in place. Rosette, Inc., removed the uppermost two of the five Steam Reserve plugs pursuant to an NMOSE irrigation well permit. LDG intends to test the upper 3,400 ft of the open hole. The water will be sampled and analyzed in accordance with WQCC standards as described below. Compliance with those standards will be verified before any water is discharged in a pump test.
- Install a down-hole production pump and conduct a well and reservoir test. The discharged water will be metered and conveyed to a planted field for irrigation purposes. This will be done using standard farm irrigation equipment such as a wheel line. The test will exercise water rights owned by Rosette, Inc. and already assigned to this well. Rosette, Inc. has agreed to provide the 2010 water rights to LDG for this test. LDG does not intend to use TFD 55-7 for injection in this operation. The existing unlined reserve pit may be used for cooling and water storage if approved by NMOCD upon receipt of produced water analyses.
- Install proper wellhead equipment and secure the well.

The water in well TFD 55-7 will be sampled and analyzed for dissolved fraction of all 26.2.3103 NMAC constituents, VOCs (8260B), SVOCs (8270C), PAHs (8310), TPH (418.1), metals – dissolved (6010B/6020) including Bromide, Lithium, Rubidium, and Tungsten (by approved EPA methods), Mercury (7470A/7471A), general chemistry (methods specified in 40 CFR 136.3), Uranium (6010B/6020), radioactivity (E903/E904), and Radon (EPA method approved by NMOCD). An EPA Methods, QA/QC, and DQOs-compliant laboratory will analyze samples.

If TFD 55-7 demonstrates adequate potential as a geothermal production well, LDG will proceed to obtain all approvals and permits (BLM, NMOCD, and NMOSE) required for further development.

## II. Well Preparation

The first part of the operation requires reopening TFD 55-7 to collect fluid samples, set a bridge plug and install a test pump. The following is the proposed plan for the drilling operation. This detail is incorporated by reference into the BLM Drilling Program, described in Section V of this document.

- 1) Inspect wellhead for dimensional consistency with ANSI series 400 standards.
- 2) Move in and rig up a rotary drilling rig with a rated capacity of at least 5000 ft and a mud system with a minimum volume of 500 barrels and a 500 hp circulating pump.
- 3) Install annular or rotating BOP on the wellhead above flow tee with gate valve on side outlet (see Attachment E).
- 4) Mix non-toxic gel-lime mud and fill hole.
- 5) Pick up slick bottom-hole assembly (BHA) #1: 8-1/2" insert bit, BS, 4x6" DC, jars, 1x6" DC, XO.
- 6) Test BOP for leakage by inflating around BHA and pumping in the side outlets to maximum working pressure of the surface piping, not to exceed 900 psig.
- 7) Run in hole and tag bottom, expected at about 1400 ft. Circulate bottoms up.
- 8) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ* (i.e., down hole) if possible but may be taken by sampling separator from the flow line. Airlift will be accomplished by injecting compressed air through the drilling assembly in sufficient quantity to stimulate flow to the surface. Discharging the flow line into a gauging tank will allow measurement of the produced liquid after its separation from the injected air. The volumes produced during the drilling operation will be recorded and will not exceed the storage capacity of the tank and reserve pit on site. No water will be discharged to "Waters of the State".
- 9) Pull out of hole and pick up 9-5/8" bit and stabilizers. Make up stiff BHA #2.
- 10) RIH and time drill cement plug #1. The plugs in well TFD 55-7 are of neat Portland cement. The plugs are reportedly each 50 - 400 ft in length and set in uncased open hole at about 1450 ft and 1850 ft. Time drilling and a "locked" (i.e., stiff and highly stabilized) BHA will be used to drill the plugs while staying in the original hole. Non-toxic, temperature-stable drilling mud will be used, composed of a bentonite clay-water or polymer-water mix to lubricate and cool the drill bit. The drilling fluids will bring the rock cuttings to the surface and then be cleaned and recirculated, preventing loss of drilling fluids into the rock and minimizing discharge into the reserve pit.
- 11) POH and stand back BHA #2.
- 12) Pick up BHA #3: float shoe, XO, 2x6" DC.
- 13) RIH and tag cement plug #2, expected at about 1800 ft.
- 14) Circulate hole clean.
- 15) Displace mud with water. POH to 1500 ft. Close BOP.
- 16) Pump water at 10-25 bbl/min and record stable casing head pressure.
- 17) Rig for air injection through drill pipe. Set up fluid sample collection point on flow line.
- 18) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ*

(i.e., down hole) if possible but may be taken by sampling separator from the flow line. The airlift, water sampling, and analysis will be performed as described in step 8 of this Section and in Section I, above. The volume of produced water will be recorded. No water will be discharged to "Waters of the State."

- 19) POH, stand back BHA #3.
- 20) Pick up BHA #2, RIH to cement plug #2.
- 21) Circulate mud and drill out plug #2.
- 22) POH, lay down BHA #2.
- 23) Pick up BHA #3, RIH and tag cement plug # 3, expected at about 5400 ft. Circulate hole clean.
- 24) POH, lay down BHA #3.
- 25) Run caliper log and select zone for bridge plug installation about 3400 ft.
- 26) Pick up bridge plug and BHA #4; setting tool and DCs as directed.
- 27) RIH and set bridge plug.
- 28) POH to 2800 ft, circulate hole clean.
- 29) POH to 1000 ft.
- 30) Airlift fluid in the wellbore if necessary to clean out well. Collect and analyze geochemical water samples and record volume of produced water. Water samples will be collected *in situ* (i.e., down hole) if possible but may be taken by sampling separator from the flow line. The airlift, water sampling, and analysis will be performed as described in step 8 of this Section and in Section I, above. The volume of produced water will be recorded. No water will be discharged to "Waters of the State."
- 31) POH laying down drill pipe; lay down BHA #4.
- 32) Make up 9-5/8" pump casing string and set test pump.
- 33) Release rig.

### III. Resource Test

34) The results of the analyses from steps 8, 18 and 30 of the preceding section will be compiled in a single report and delivered to NMOCD, NMOSE, and BLM. If the discharge meets WQCC standards, LDG will confer with the agencies to verify the conditions are met for permitted discharge into an unlined reserve pit and delivery to an irrigation system. Should the quality of water not meet the standards of 20.6.2.3103 NMAC for irrigation, LDG will suspend flow test operations, redesign the test and seek approval of subsequent applications to NMOCD, NMOSE, and BLM.

35) Connect flow line to irrigation system.

The flow line will discharge the water into a gauging tank and thence into the irrigation transfer pump or the reserve pit. The pit measures 170 ft x 170 ft x 12 ft deep (see Attachment B). If WQCC standards (20.6.2.3103 NMAC) are met, the reserve pit will be left unlined. The irrigation transfer pump (e.g., 25 hp centrifugal) will remove discharged water from the tank or pit and send it via a 10 inch Victaulic line to the irrigation system for application to a crop under an existing NMOSE permit. The designated crop area is the area directly south of the plant site on Attachment B. Flow will be metered using a totalizing ultrasonic or orifice meter to ensure volume does not exceed the NMOSE-permitted total.

36) Conduct pump test as directed. LDG will conduct the pump test in consultation with engineers representing the interests of potential investors in the Lightning Dock project. The operation of the test may therefore vary from day to day, but will at all times conform to the requirements of the applicable NMOCD, NMOSE and BLM permits and regulations.

LDG plans to use a 12-inch American-Marsh vertical shaft 10 stage turbine pump for this test. The pump is owned by Raser Technologies and has performance characteristics detailed in Attachment F. The power for the pump will be a 300 hp electric motor with a variable speed controller. The pump will be set at approximately 850 ft depth to allow a maximum drawdown from static water level of about 700 ft. Engineering analysis of Raser's airlift test in 2008 suggests a flow rate of 400 gpm is likely from the well in its present state, i.e., open from 1050 ft to 1450 ft. Since lost circulation occurred at greater depths (e.g., 2275 ft) during the drilling of TDF 55-7, LDG expects the reopened hole may be able to supply fluid up to the pump's maximum capacity, approaching 1500 gpm at this depth.

The pumping rate during the first week of the test will be programmed to gradually bring in flow and to establish the reservoir deliverability as a function of water level drawdown. Thereafter, the rate will be set so as not to exceed the landowner's NMOSE-designated water rights. LDG expects to satisfy itself and its investors' engineers within a test pumping duration of four weeks.

Discharge water samples will be collected weekly and analyzed at an EPA Methods, QA/QC, DQOs-compliant laboratory. LDG will also monitor the discharge daily for standard field parameters including pH, turbidity, color, DO, and specific conductivity. If anomalous readings are detected that indicate a significant change in water source or properties, water samples will be collected immediately and discharge halted. Discharge will not be resumed until and unless laboratory analytical results confirm that the water meets the required criteria.

- 37) Move in and rig up well service rig.
- 38) Remove and lay down pump and casing.
- 39) Install master valve and survey flange.
- 40) Secure well and release rig.
- 41) File operations reports as required with NMOCD, NMOSE and BLM.

#### **IV. BLM Operations Plan, 43 CFR 3261.12**

(a) The proposed project is on private land. Clearing and grubbing will be confined to the project area as approved by BLM in consultation with the landowner. No surface disturbance of BLM-managed public lands is proposed.

##### **Well Pad Layout and Design**

The well pad layout is approximately 150 ft x 150 ft with an existing reserve pit measuring 170 ft x 170 ft x 12 ft adjacent to the pad.

See Attachment B – Lightning Dock Aerial Map

See Attachment C – Survey of Well Location

##### **(b) Description of Existing and Planned Roads**

The well site is accessed via existing state, county and private roads. As such no new roads are necessary for this activity. The primary access roads to the site include: SR-338 (paved); CO98 Geothermal Road (paved), which extends to the surface owner's property. All roads and access at the well site on the surface owner's property are existing compacted dirt and/or graveled.

##### **(c) Description of Ancillary Facilities**

Sanitary Facilities – Portable chemical sanitary facilities will be available and used by all personnel during periods of well drilling and/or flow testing.

Mobile drilling office will be set upon on the site during drilling activities.

Existing water holding pond 170 ft x 170 ft x 12 ft.

Trash collection facilities e.g. roll-off container.

##### **(d) Source of Drill Pad and Road Building Materials**

Drill pad building material will be derived from any necessary excavation of the existing reserve pit.

The pad will be graded to provide 2% grade to reserve pit.

Existing improved roads will be used.

Any additional material required for pad construction will be secured from a local contractor.

##### **(e) Water Source**

Water required for this operation will be secured from an established private owner.

Water derived from the operation will be discharged into a gauging tank and thence to an irrigation transfer pump or the reserve pit. The irrigation transfer pump (e.g., 25 hp centrifugal) will remove

discharged water from the tank or pit and send it via a 10 inch Victaulic line to the irrigation system for application to a crop under an existing NMOSE permit. The designated crop area is the area directly south of the plant site on Attachment B. Flow will be metered using a totalizing ultrasonic or orifice meter to ensure volume does not exceed the NMOSE-permitted total.

The water in well TFD 55-7 will be sampled and analyzed for dissolved fraction of all 26.2.3103 NMAC constituents: VOCs (8260B), SVOCs (8270C), PAHs (8310), TPH (418.1), metals – dissolved (6010B/6020) including Bromide, Lithium, Rubidium, and Tungsten (by approved EPA methods), Mercury (7470A/7471A), general chemistry (methods specified in 40 CFR 136.3), Uranium (6010B/6020), radioactivity (E903/E904), and Radon (EPA method approved by NMOCD). An EPA Methods, QA/QC, and DQOs-compliant laboratory will analyze samples.

Potable water for human consumption will be provided by bottled water.

**(f) Statement Describing Surface Ownership**

Surface of the well site is owned by Rosette, Inc. of Animas, NM. Lightning Dock Geothermal holds a Surface Access and Use Agreement, dated 10 January, 2008, with Rosette granting access to the well site.

See Attachment F – Surface Access Agreement.

**(g) Description of Procedures to Protect the Environment and Other Relevant Sources**

Air Quality: During drilling activities hydrogen sulfide will be monitored by instruments on the drill rig.

Hydrology and Water Quality Monitoring: Water samples will be collected during the cleanout operation and tested to assure compliance with WQCC standards for agricultural use.

Portable chemical toilets supplied by a licensed contractor shall be used for human waste. The waste shall not be buried on site.

Trash and debris will be contained on site, and then hauled to an approved landfill by a licensed contractor. Burial and or burning on site will not be permitted.

Clearing and grubbing will be confined to the project area as approved by BLM in consultation with the landowner.

**(h) Plan of Surface Reclamation**

Top soil excavated during the construction of the pad, as feasible, will be stockpiled for use during subsequent reclamation of the disturbed area.

**(i) Any Other Information That BLM May Require**

Will be provided upon request.



**V. BLM Drilling Program. 43 CFR 3261.13**

**(a) Description of Equipment, Materials and Procedures**

A large portable rotary drill rig will be used to drill the well.

**Equipment Specifications:**

The availability of equipment and contractors changes from day to day. LDG will make its selection based on the best units available when the necessary permits are received. The rig will be functionally similar to the following: Drawworks – Taylor RT 5000; Mast – Taylor RT 5000 square set derrick; Substructure – Height 10 ft hydraulic w/ 15 ft K.B. elevation; Two (2) mud pumps; Rotary table; Swivel & Drilling Block; Tripping Block; Generators 235 kW, Air Compressor 500 SCFM.

Procedures will be as described in Section II, Well Preparation.

**(b) Proposed / Anticipated Depth of the Well:**

The well will be drilled and completed to the designed depth of 3,400 ft.

**(c) Directional Drilling:**

No directional drilling will be employed.

**(d) Casing and Cementing Program:**

This is a re-entry into an existing well that currently has cemented casing to approximately 1050 ft and approximately 400 ft of open hole to the first plug at a depth of approximately 1450 ft. The remainder of the well is open hole to the TD of 7000 ft. No additional casing or cement will be utilized in the operation to open this well to 3400 ft.

**(e) Circulation Media (mud, air, foam, etc.)**

The well will be drilled to a depth of 3,400 ft using non-toxic, temperature-stable drilling mud or aerated fluids. The drilling mud is composed of a bentonite clay-water or polymer-water mix to lubricate and cool the drill bit, bringing the rock cuttings to the surface discharged into the reserve pit, and preventing loss of drilling fluids into the rock.

**(f) Description of Logs to be Run:**

Caliper Logs

**(g) Description and Diagram of Blowout Prevention Equipment:**

Blowout prevention equipment (BOPE), which is typically inspected and approved by the BLM and/or the Oil Conservation Division (NMOCD) of the New Mexico Energy, Mining, and Natural Resources

Department (NMEMNRD), as applicable, would be installed, tested and ready for use while drilling to ensure that any geothermal fluid encountered does not flow uncontrolled to the surface.

See Attachment E.

**(h) Expected Depth and Thickness of Fresh Water Zones:**

N/A – existing casing is set to 1,000 ft hence no fresh, shallow water getting into well.

Static water depth is 71 ft. Total available water column of 1300 ft available

**(i) Anticipated Lost Circulation Zones**

None anticipated. The only instance of lost circulation recorded by Steam Reserve in the interval 1050 ft – 3400 ft was a minor episode at 2275 ft. That was successfully treated with a small batch of lost circulation material. This is below the deepest plug that LDG intends to drill out. LDG therefore anticipates that lost circulation will not be encountered in carrying out the proposed program.

**(j) Anticipated Reservoir Temperatures and Pressures:**

Temperature: Peak temperatures have been recorded at 307.4 F at a depth of 1263 ft remaining constant to 1400 ft.

Pressures: High pressure at the depth of 1365 ft is 549.66 psig.

**(k) Anticipated Temperature Gradient in the Area:**

The regional heat flow is ~80-90mW/m<sup>2</sup> (Blackwell and Steele, 1992). This heat flow would yield a temperature gradient of about 35°C/km (1.9°F/100 ft) in igneous rocks and 60°C/km (3.3°F/100 ft) in valley fill clays. Most of the non-thermal wells have a gradient near 45°C/km (2.5°F/100 ft). Therefore, 45°C/km (2.5°F/100 ft) will be taken as the background temperature gradient value for the valley fill.

Thermal gradient conditions will range from 78°C/km (4.3°F/100 ft) (*well 672-225*) to 200°C/km (11°F/100 ft) (*well 93-8 and AN-104*) and will be similar or higher in 55-7.

**(l) Plat Certified by a Licensed Surveyor:**

See Attachment C.

**(m) Procedures and Duration of Well Testing**

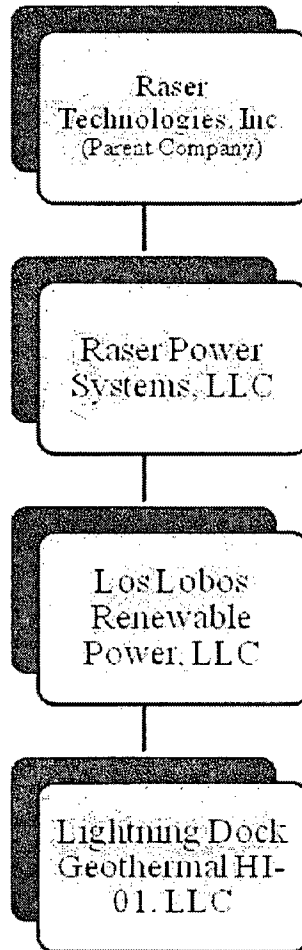
See Section II, Resource Test

**(n) Any Other Information That BLM May Require**

Will be provided upon request.

Attachment A

**Raser Technologies Corporate Structure**



Lightning Dock Geothermal HI-01, LLC is the permit applicant and operator. The illustration above describes the corporate organization of which Lightning Dock Geothermal is a part as follows: Raser Technologies, Inc is the parent company, Raser's geothermal development company is Raser Power Systems, LLC; the New Mexico entity is Los Lobos Renewable Power, LLC; and Lightning Dock Geothermal HI-01, LLC is the Animas, NM project entity.

EXHIBIT B

Initial Inventory of Existing Wells and Location of Initial Contemplated ROWs



Legend

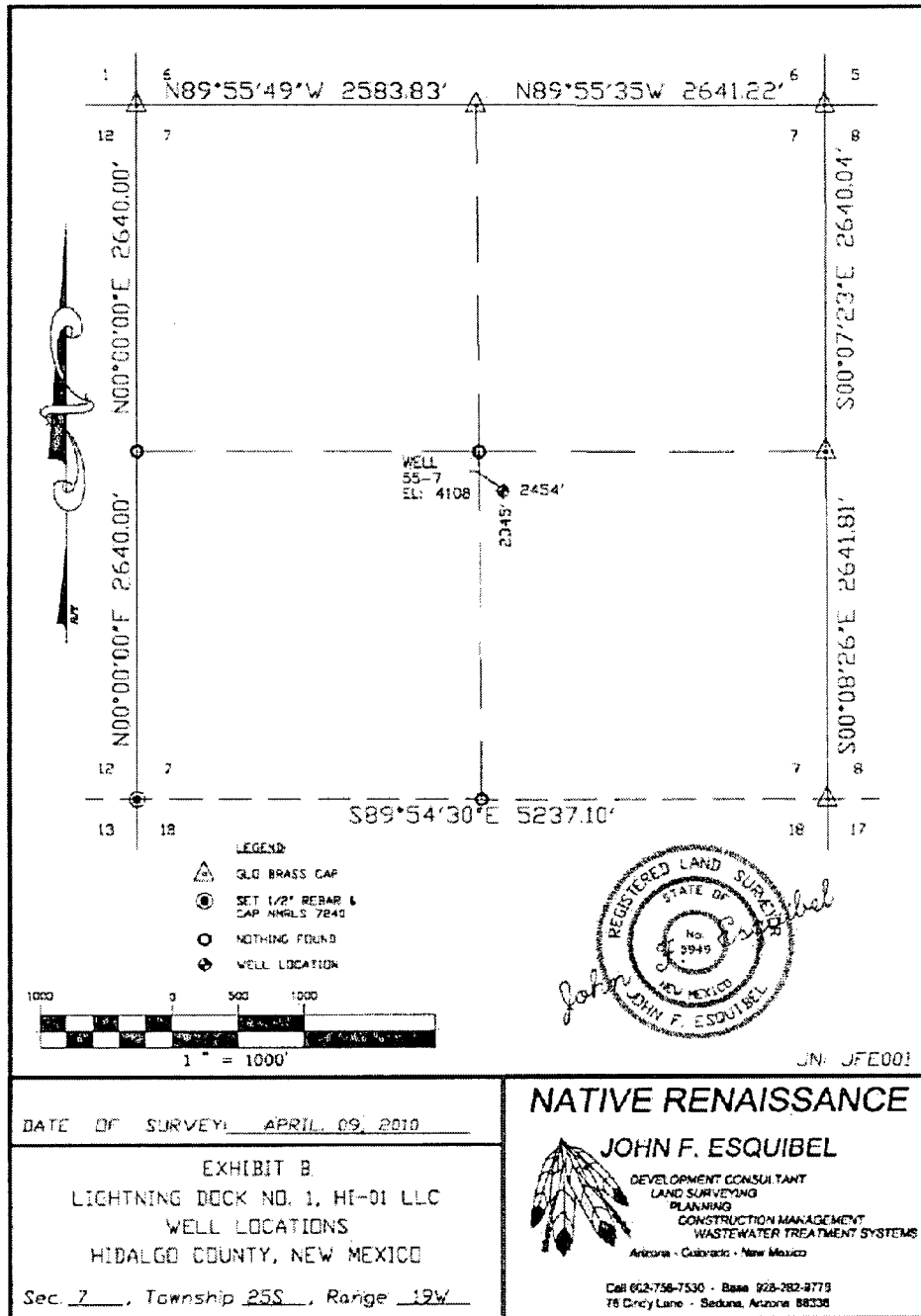
- Survey Boundary
- Well Location

Number Label

- |   |  |  |  |
|---|--|--|--|
| <ul style="list-style-type: none"> <li>1 - 1000 ft. 1/4 Sec. Buffer</li> <li>2 - 500 ft. 1/4 Sec. Buffer</li> <li>3 - 250 ft. 1/4 Sec. Buffer</li> <li>4 - 100 ft. 1/4 Sec. Buffer</li> <li>5 - 50 ft. 1/4 Sec. Buffer</li> <li>6 - 25 ft. 1/4 Sec. Buffer</li> <li>7 - 10 ft. 1/4 Sec. Buffer</li> <li>8 - 5 ft. 1/4 Sec. Buffer</li> <li>9 - 2 ft. 1/4 Sec. Buffer</li> <li>10 - 1 ft. 1/4 Sec. Buffer</li> </ul> | <ul style="list-style-type: none"> <li>11 - 1000 ft. 1/4 Sec. Buffer</li> <li>12 - 500 ft. 1/4 Sec. Buffer</li> <li>13 - 250 ft. 1/4 Sec. Buffer</li> <li>14 - 100 ft. 1/4 Sec. Buffer</li> <li>15 - 50 ft. 1/4 Sec. Buffer</li> <li>16 - 25 ft. 1/4 Sec. Buffer</li> <li>17 - 10 ft. 1/4 Sec. Buffer</li> <li>18 - 5 ft. 1/4 Sec. Buffer</li> <li>19 - 2 ft. 1/4 Sec. Buffer</li> <li>20 - 1 ft. 1/4 Sec. Buffer</li> </ul> | <ul style="list-style-type: none"> <li>21 - 1000 ft. 1/4 Sec. Buffer</li> <li>22 - 500 ft. 1/4 Sec. Buffer</li> <li>23 - 250 ft. 1/4 Sec. Buffer</li> <li>24 - 100 ft. 1/4 Sec. Buffer</li> <li>25 - 50 ft. 1/4 Sec. Buffer</li> <li>26 - 25 ft. 1/4 Sec. Buffer</li> <li>27 - 10 ft. 1/4 Sec. Buffer</li> <li>28 - 5 ft. 1/4 Sec. Buffer</li> <li>29 - 2 ft. 1/4 Sec. Buffer</li> <li>30 - 1 ft. 1/4 Sec. Buffer</li> </ul> | <ul style="list-style-type: none"> <li>31 - 1000 ft. 1/4 Sec. Buffer</li> <li>32 - 500 ft. 1/4 Sec. Buffer</li> <li>33 - 250 ft. 1/4 Sec. Buffer</li> <li>34 - 100 ft. 1/4 Sec. Buffer</li> <li>35 - 50 ft. 1/4 Sec. Buffer</li> <li>36 - 25 ft. 1/4 Sec. Buffer</li> <li>37 - 10 ft. 1/4 Sec. Buffer</li> <li>38 - 5 ft. 1/4 Sec. Buffer</li> <li>39 - 2 ft. 1/4 Sec. Buffer</li> <li>40 - 1 ft. 1/4 Sec. Buffer</li> </ul> |
|---|--|--|--|

Attachment C

Survey of Well 55-7 Location



Attachment D

**Down-Hole Test Pump Specifications**

Model: 60, Pump Data Sheet - American Marsh Pumps, Inc.

Company:  
 Name:  
 Date: 7/9/2009

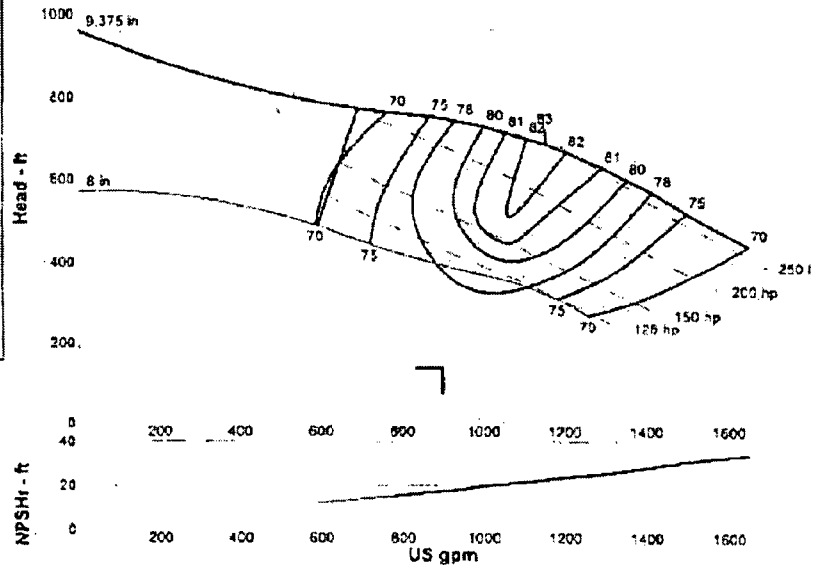


**Curve:**  
 Size: 12MC (10 stages)  
 Type: 460\_VRT-TURBINE/ENCL  
 Synch speed: 1800 rpm  
 Curve: 2951  
 Specific Speed:  
 Dimensions:  
 Vertical Turbine:  
 Speed: 1760 rpm  
 Dia: 9.375 in  
 Impeller:  
 Ns: 2525  
 Nss: 5695  
 Suction: 8 in  
 Discharge: 6 in  
 Bowl size: 11.25 in  
 Max lateral: 0.75 in  
 Thrust K factor: 10.6 b/m

**Search Criteria:**  
 Flow: 900 US gpm  
 Head: 140 ft  
**Fluid:**  
 Water  
 Density: 62.25 lb/ft<sup>3</sup>  
 Viscosity: 1.105 cP  
 Temperature: 60 °F  
 Vapor pressure: 0.2563 psi a  
 Atm pressure: 14.7 psi a  
 NPSHr: -- ft  
**Motor:**  
 Standard: NEMA  
 Enclosure: TEFC  
 Sizing criteria: Max Power on Design Curve  
 Size: 300 hp  
 Speed: 1800  
 Frame: 4487

**Pump Limits:**  
 Temperature: 250 °F  
 Pressure: 584 psi g  
 Sphere size: 0.625 in  
 Power: 450 hp  
 Eye area: -- in<sup>2</sup>

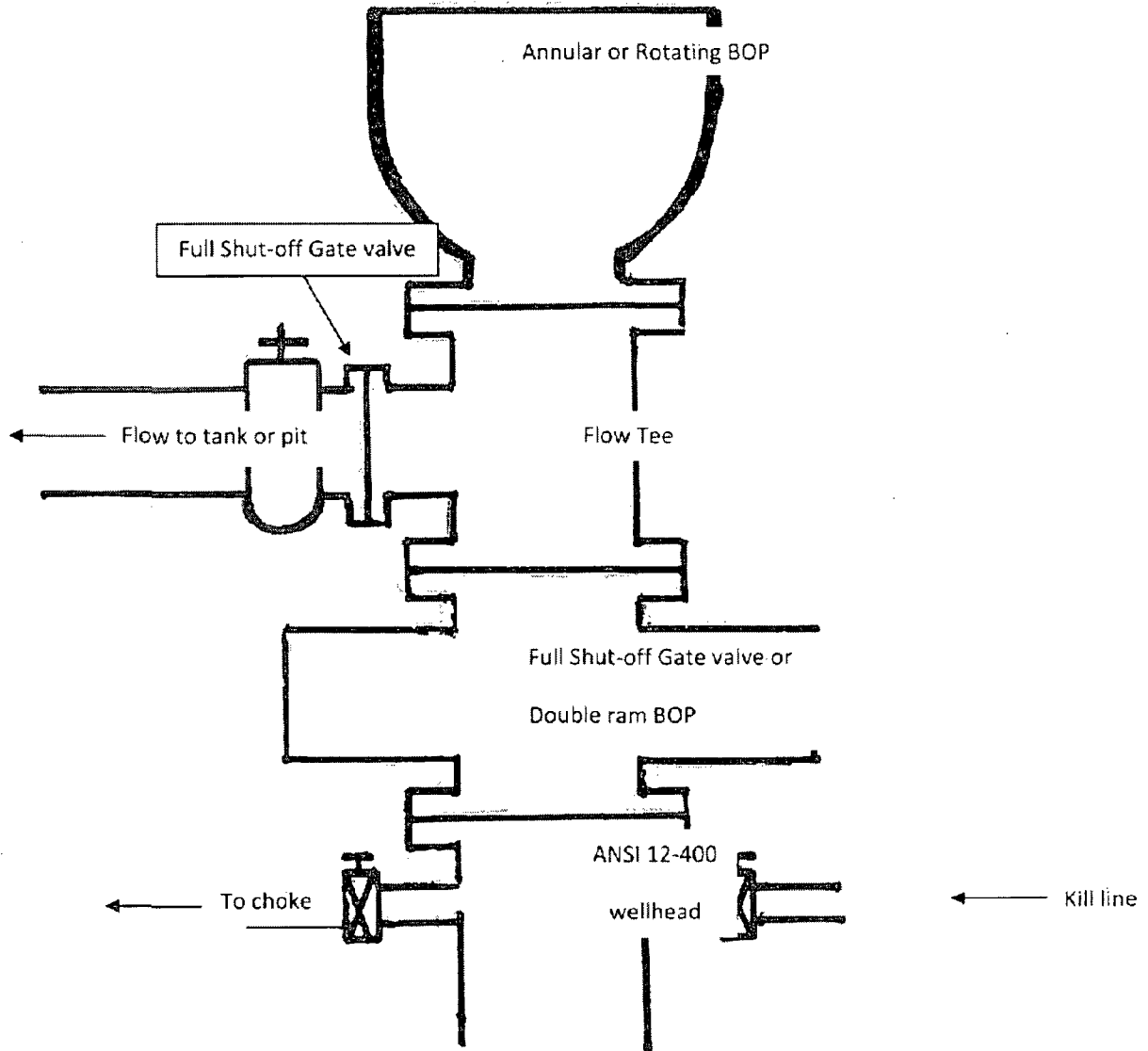
Data Point	
Flow:	1152 US gpm
Head:	668 ft
Eff:	82%
Power:	243 hp
NPSHr:	22.9 ft
Design Curve	
Shutoff head:	960 ft
Shutoff dP:	415 psi
Min flow:	693 US gpm
BEP:	83% @ 1155 US gpm
NCL power:	263 hp @ 1500 US gpm
Max Curve	
Max power:	263 hp @ 1500 US gpm



Performance Evaluation					
Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
1080	1760	709	81	237	21.4
900	1760	749	76	223	17.5
720	1760	778	68	207	14.1
540	1760	--	--	--	--
360	1760	--	--	--	--

Attachment E

**Blowout Prevention Equipment Diagram**





RECEIVED  
LAS CRUCES DISTRICT OFFICE

2010 APR 21 PM 12:16

LAS CRUCES, NM 88005

April 20, 2010

Bureau of Land Management  
Las Cruces District Office  
c/o Michael Smith  
1800 Marquess Street  
Las Cruces, NM 88005

Dear Mr. Smith,

This letter is in response to correspondence received from Mr. Edward Seum of your office, dated 16 April, 2010. In said correspondence, Mr. Seum requested additional information as it pertains to Lightning Dock Geothermal HI-01, LLC's ("LDG") pending Geothermal Drilling Permit for Well 55-7. I trust the following response meets your requirements.

*Reclamation: Provide details on removal of equipment and facilities, restoration and seeding of any disturbed areas, mulch applications and other soil treatments (43 CFR §3261.12(h)).*

Well 55-7 is on a privately-owned, existing disturbed site. LDG will work with the land owner to return the site to, at minimum the same as and/or better than condition than existed prior to LDG's proposed activities. Notwithstanding, all reclamation activities will be consistent with the existing EA.

All ancillary facilities and equipment associated with the drilling operation and subsequent testing activities will be removed from the site as such activities are completed. For example, the drill rig and the mobile drilling office described in LDG's Proposed Operations and Drilling Plan (p. 9) will be demobilized and removed from the site as soon as it is no longer required on site.

In addition, the temporary pond associated with the operation will not be used for any permanent water storage and/or otherwise become a permanent water body. The pond area is currently, and will remain unlined and as such water will naturally seep into the ground.

*Well Testing: Provide details regarding how Well 55-07 will be closed and secured (consistent with New Mexico State Engineer's requirements) after the flow test is completed. Specify if irrigation use is intended to continue after the flow test. Also specify what actions will be taken with this well if the flow test fails to meet required operational specifications (43 CFR §3261.13(b)(14)).*

The Plan of Operations accompanying the TDF 55-7 Geothermal Drilling Permit concludes with the removal of the test pump from the well and drilling equipment from the well site.



A small amount of test equipment such as tanks or wireline equipment may remain in place for future observation.

The test described in the present Geothermal Drilling Permit is a scientific enterprise for the purposes of: understanding the resource; describing its potential to investors; and guiding further development drilling. It is not a qualification test with a binary (pass/fail) outcome.

Project development activities are likely to require more than a year and LDG plans to use TFD 55-7 for observation of the resource throughout that time. Well 55-7 will therefore be secured and under LDG's active control and equipped with scientific instrumentation, including wireline survey equipment, that will preclude any other use of the well, including long-term irrigation.

In addressing the question as it pertains to NMOSE requirements, Ms. Haddy Phillips, Water Resource Specialist, NMOSE, provided the following description of requirements:

"Once testing is completed [LDG] will either file [a] Permit to Use the well as an production well (which will be "secured" by the conditions of approval) or if [LDG] do[es] not plan on using the well [it] will be required to plug the well - back to 1400 ft." . . . "OSE will require an approved OSE plugging plan prior to the plugging of the well, the well must also be plugged by a OSE licensed well driller."

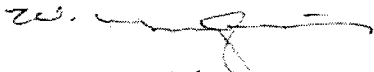
Finally, upon the conclusion of LDG's activities, the well will be suspended or abandoned as required by State and Federal regulation.

*Exhibit "B": Much of the writing on this exhibit is illegible; please reformat this figure so it can be read. Clearly illustrate on Exhibit "B" the location of Well 55-7, the location of the reserve pit where this well will discharge, and the area to be irrigated. This information is necessary to verify analysis of wildlife and hydrologic impacts (43 CFR §3261.13(b)(14)).*

Please find attached two new "Exhibit B" maps; the first provides an aerial detail of the well and pond; and the second illustrates the proposed irrigated area.

I trust the foregoing adequately addresses the questions raised by Mr. Seum. Please feel free to contact me with any additional comments or questions you have.

Respectively,



W. Layne Ashtor  
Geothermal Project Development

# Lighting Dock Geothermal Aerial Map

Animas Valley, NM

raser

TECHNOLOGIES

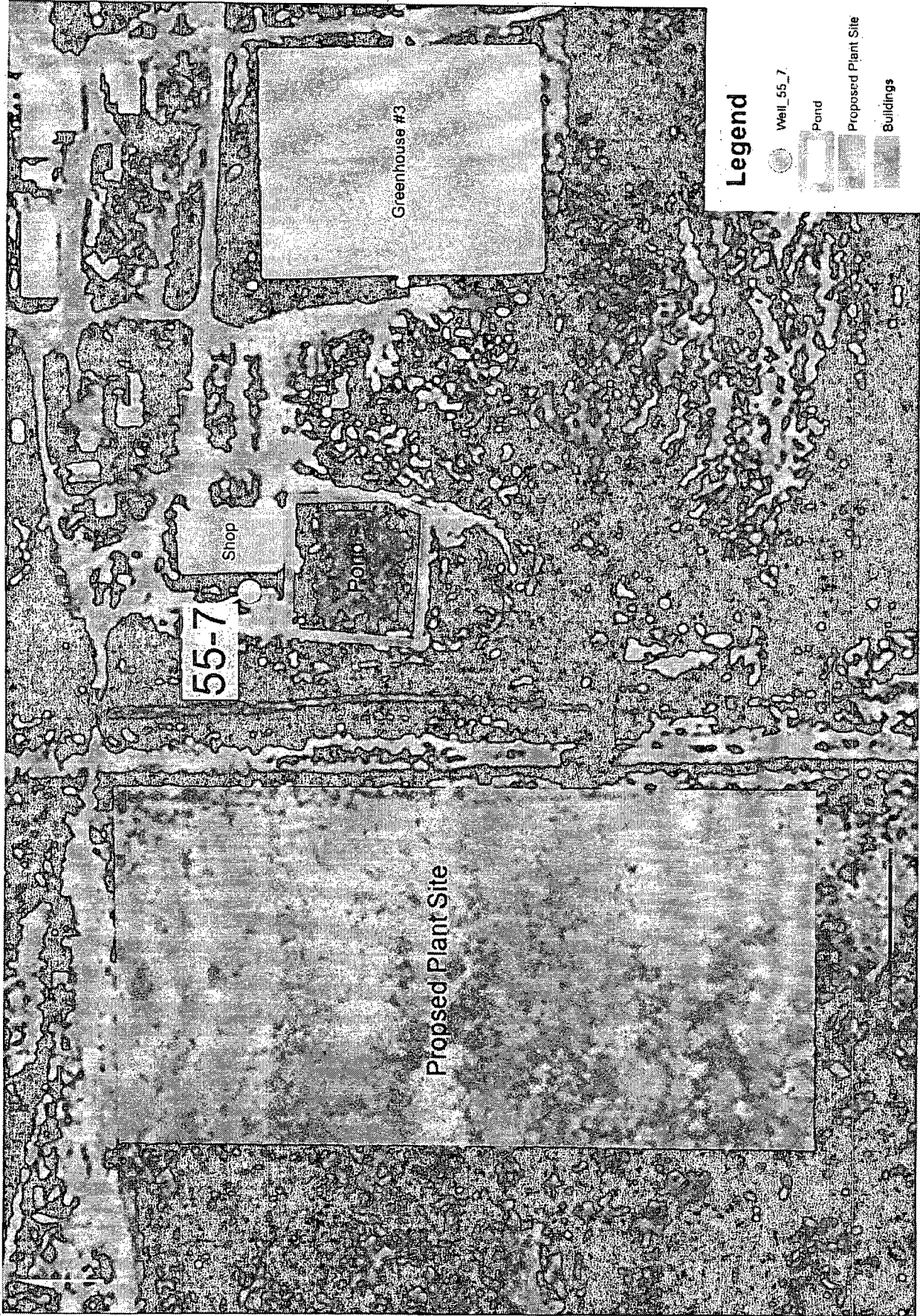
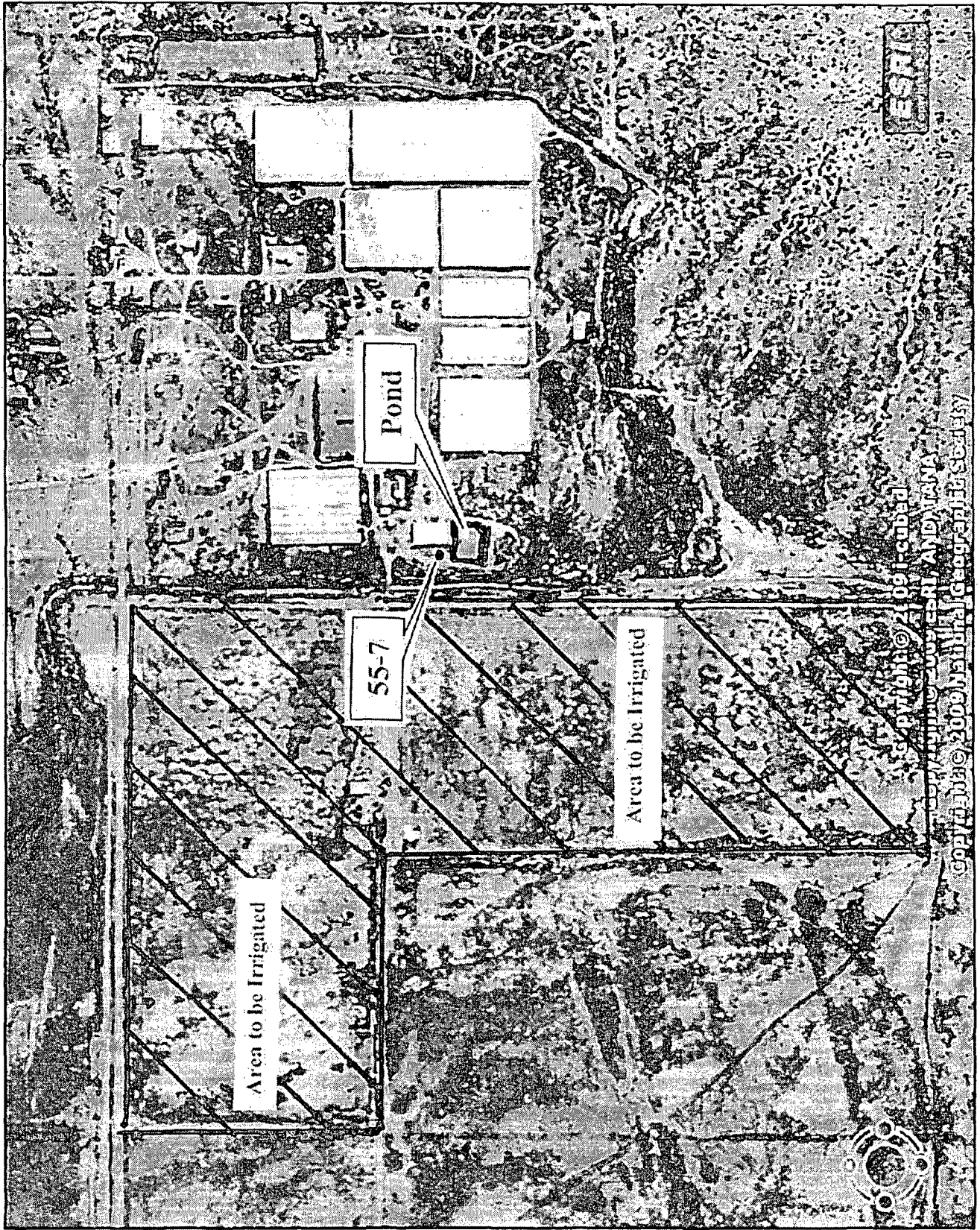


Exhibit B (a) Area to be Irrigated





"Layne Ashton"  
<lashton@rasertech.com>  
04/21/2010 01:27 PM

To <mike\_smith@nm.blm.gov>  
cc  
bcc  
Subject Correction on map

Mike,

I discovered this morning that I had made a small error on the map illustrating the area to be irrigated. Please find attached the corrected map. I have also pasted the NMOSE water rights number, place of authorized use and the not-to-exceed amount into the corner of the corrected map.

I will follow up with a phone call this afternoon to verify your receipt of this corrected map.

Best regards,

W. Layne Ashton  
Raser Technologies, Inc.  
5152 Edgewood Drive, Suite 375  
Provo, Utah 84604  
Tel. (801) 765-1200  
Fax (801) 374-3314  
Cell (801) 473-6090  
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Exhibit B Area to be Irrigated correct 04, 21 2010.pdf



Exhibit B (a) Area to be Irrigated - corrected 04 21 2010

