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GEO Operator Corporation
A Subsidiary of Geothermal Resources International, Inc.

August 7, 1985

Ronald A. King
R & D Contracts Branch
Contracts Management Division

Re: Project Management Plan Geo-Newberry
(Solicitation #DE-SCOF-85ID12580

Dear Sir:

Pursuant to your communication of July 18, 1985, GEO Operator Corporation submits the following Project Management Plan for your review and approval. The following information is submitted in accordance with Section 4.0 (Technical Tasks):

4.1 Project Management

PROJECT LOCATION

The following are the approved locations for the Newberry Flank (GEO-Newberry) core hole program:

- Site N-1; East Lake Quad:
  3500' West and 2450' North of the Southeast corner of Section 25, T22S, R12E.
- Site N-3; Fuzztail Butte Quad:
  4100' North and 500' East of the Southwest corner of Section 24, T20S, R12E.
- Site N-4; East Lake Quad:
  1500' North and 2250' West of the Southwest corner of Section 35, T21S, R13E.

The Lessee/Operator for the project will be:

- GEO Operator Corporation
  545 Middlefield Road Suite 200
  Menlo Park, CA 94025

Project Manager

- Chandler Swanberg
  545 Middlefield Rd. Suite 200
  Menlo Park, CA 94025
  (415) 321-5662

Dr. Swanberg shall be the principal contact on any and all questions pertaining to the operations of the Geo-Newberry Project. Unless otherwise directed, all correspondence will be initially transmitted to Dr. Swanberg for review and disposition.

Environmental Affairs

- Michael J. Cale
  2300 County Center Drive
  Santa Rosa, CA 95401
  (707) 523-4272

Geology/Drilling

- Dr. Walter Randall
  2300 County Center Drive
  Santa Rosa, CA 95401
  (707) 523-4272

Land

- Peter Hansen
  545 Middlefield Rd.
  Menlo Park, CA 94025
  (415) 321-5662

Legal

- Tom Hamilton
  545 Middlefield Rd.
  Menlo Park, CA 94025
  (415) 321-5662

4.2 Permitting and Environmental Reporting

The Geothermal Resources Operational Orders, issued under the Geothermal Steam Act of 1970, states "....the Lessee shall be responsible for the monitoring of readily identifiable localized impacts associated with specific activities that are under the control of the Lessee...." (GRO Order 4. General Environmental Protection Requirements). As the project is a federal unit the Oregon State Office of the Bureau of Land Management acted as lead agency for the project. The Prineville District Office, under the direction of Gerald E. Magnusun, was responsible for preparation of the Environmental Assessment.

The following specific impacts were addressed in the Plan of Exploration (Attachment 1) as a potential consequence of the project:

- Aesthetics
- Land Use & Reclamation
- Public Access & Recreational Opportunities
- Slope Stability & Erosion Control
- BIOTA
- Cultural Resources
- Subsidence & Seismicity

- o Air Quality
- o Pits & Sumps
- o Water Quality
- o Noise

On July 29, 1985, the Prineville office of the BLM issued a Finding Of No Significant Impact (Attachment 2). In accordance with, and pursuant thereto, the Deputy State Director for Mineral Resources, BLM Oregon State Office, issued a Letter of Approval (Attachment 3) dated July 31, 1985.

Completion of the Environmental Assessment, and issuance of the Letter of Approval and Conditonal Drilling Permit (Attachment 4) satisfied federal requirements for Environmental Review of the GEO-Newberry Project. In addition, permits to drill a geothermal well were issued by the State of Oregon, Department of Geology and Mineral Industries on July 8, 1985 (Attachment 5).

The Environmental Assessment process associated with this project has three major objectives which ultimately dictate an Environmental Management Plan:

1. Identifying specific impacts
2. Magnitude of impact
3. Mitigation of impact

As shown in the Plan of Exploration (Attachment 1) GEO Operator Corporation accomplished objectives #1 & 2, and suggested a direction for objective #3. Our proposal coupled with the BLM assessment, including conditions and stipulations attached thereto, makes the goal of properly addressing institutional concerns a realistic expectation. Therefore, GEOOC believes that the criteria outlined in Section 4.2, paragraphs A, B, and C have been satisfied.

4.3 Drilling

The purpose of the Core Hole Program is the development of baseline geophysical data to assist in evaluating the presence of and recovery potential of a geothermal resource in a virtually unexplored region. Existing surface and subsurface characteristics suggest that the Newberry Area would have geothermal capability.

Access to the sites will be via existing roads (Attachment 6) requiring no surface disturbance. Fugitive dust will be controlled as directed by the BLM, Conditions of Approval For Geothermal Drilling, Surface Protection Requirements (5, C) (Attachment 7).

Site preparation will conform to the requirements specified in the Plan of Exploration, Land Use & Reclamation (Attachment 1). Mitigation will include all measures specified in the Condtions of Approval for Geothermal Drilling, Surface Protection Requirements (Attachment 7).

The hole design will conform to the specifications outlined in the approved drilling permits from the BLM and Oregon Department of Geology & Mineral Industries (Attachments 3 & 4).

The drill rig will be a truck mounted rotary rig with a CP50 drill motor (diesel), exhaust driven turbo charged capable of drilling 4,000' core holes. The rig will be supplied by Tonto Drilling Services, 2701 West 900 South, Salt Lake City, Utah 84104.

Well control will be subject to the Conditions of Approval for Geothermal Drilling, Conditions 6 through 18 (Attachment 7).

Drilling fluids will be regulated in accordance with the Conditons of Approval for Geothermal Drilling, Condtion 5; subparagraphs d and e (Attachment 7).

Hole completion will be accomplished as specified in the Conditions of Approval for Geothermal Drilling (Attachment 7).

Plugging and abandonment shall be accomplished in accordance with the Conditions of Approval For Geothermal Drilling, Condition 18 (Attachment 7).

Site restoration shall be subject to the Conditions of Approval For Geothermal Drilling, Condition 5; subparagraphs a through e (Attachment 7), and the specifications contained in the approved Plan of Exploration (Attachment 1).

GEOOC does not anticipate any unusual problems impeding or preventing completion of the core holes.

All drilling and appurtenant operations shall be conducted in such a fashion that insures complicance with all pertinent federal and state health/safety standards. This will include, but not be limited to, adequate noise protection, safety equipment, traffic control, and regulated access on or near equipment. Environmental considerations will be closely monitored, and strict adherence to the Conditions of Approval For Geothermal Drilling will be mandatory to insure compliance with the approved Plan of Exploration.

No site facilities are anticipated for this phase of the project.

The first core hole (N-1) is proposed to be spudded August 19, 1985, and completion not to exceed 45 days thereafter. Snow fall will preclude the drilling of the second core hole (N-3) until June 1, 1986 (approximate). If this hole can be completed by August 15, 1986, we would be in a position to drill N-4 if necessary. This schedule satisfies the terms and conditions of the GEO-Newberry Unitization Agreement.

The Drilling Supervisor will be assigned by Tonto Drilling Services and will be responsible to the Project Manager or his designate. Geologist(s) associated with the drilling operation will be assigned by GEOOC's Chief Geologist (Dr. Walter Randall) with the concurrance of the Project Manager.

The DOE representative shall receive drilling reports in a timely fashion regarding well status and data recovery. Said reports will be disseminated by the Project Manager or his designate.

The comments contained herein respond to the specific questions contained under Section 4.3 (Drilling); paragraph A, and should meet the DOE criteria for the Approved Project Drilling Plan.

MJC:bc

GEO-Newberry Crater, Inc.
A Subsidiary of Geothermal Resources International, Inc.

August 14, 1985

Noble H. Larsen, President
Tonto Drilling Services
#200-3920 Norland Ave.
Burnaby,B.C. Canada V5G 4K7

Dear Noble:

Attached for your file is a signed original copy of our contract for corehole drilling at Newberry Crater. It is understood that the contract covers the four items (A-D)outlined in your letter of 8/8/85.

Please purchase the Kuster 1000 ml (450°F, $4,287 + $1,000) sampling device for use in this and future GEO corehole drilling projects.

The following GEOOC personnel have the authority to represent the company during the term of this contract:

1. Chandler A. Swanberg, V.P., project manager,
2. Walter Randall, V.P., chief Geologist,
3. Mike Johnson, Geologist,
4. Any officer of GEOOC or its parent company Geothermal Resources International, Inc.,
5. Other GEOOC personnel including additional well site Geologists and/or drilling foremen.

The following persons will be episodically on site but do not have the authority to represent GEOOC on matters pertaining to this contract:

1. Gene Ciancanelli, Cascadia Expl.
2. Keith Johnson, Cascadia Expl.
3. Rick Silverman, Cascadia Expl.
4. Bruce Sibbett, Univ.Utah Research Inst.
5. Dennis Nielson, Univ. Utah Research Inst.
6. Susan Prestwich, U.S. Dept. Energy
7. Ron King, U.S. Dept. Energy

In addition, there may be various researchers requesting access to the drill site. Such persons will have access to the site only with the approval of and upon the presence of the GEOOC representative on site.

Very truly yours,

Chandler A. Swanberg

CAS/rs
cc: T. Hamilton Esq. w/original signed contract
R. King, w/encl.
B. Sibbett, w/encl.
J. Combs, w/o encl.

61419 South Highway 97, Suite A, Bend, OR 97701 (503) 389-6681

tonto drilling services

DIAMOND AND PERCUSSION DRILLING

August 8, 1985

GEO Operator Corporation
545 Middlefield Road
Suite 200
Menlo Park, California
94025

Attention: Mr. Chandler A. Swanberg

Dear Chandler:

I am pleased to submit the signed contract covering the holes near Newberry Crater. I am in agreement with the changes to the contract.

I propose that we treat the changes as follows:

A) The mud cooler if required would be rented by Tonto and charged to GEO as a third party.

B) In the event a break between holes occurs then an interim mob and demob cost would be chargeable.

C) The hole will be completed with 2 3/4" casing 5.1 lbs./ft. and grade to exceed J55.

D) We are prepared to purchase a sampling device as required in section 14.H. The cost of this purchase shall be borne equally by the client and the contractor or the client may supply.

I believe the project will commence the week of August 12th to 16th.

Yours very truly,

TONTO DRILLING SERVICES

Noble H. Larsen

NHL:lc
Encl.

THIS AGREEMENT made the 26th day of April, 1985

BETWEEN:

Tonto Drilling Services, of 2701 West, 900 South, Salt Lake City, Utah 84104,

(hereinafter referred to as the "Contractor")

OF THE FIRST PART

AND:

G.E.O. Operator Corporation, of 200-545 Middlefield Road, in the City of Menlo Park, California

(hereinafter referred to as the "Owner")

OF THE SECOND PART

WHEREAS:

A. The Owner wishes to have certain diamond drilling and other related services conducted on that certain portion of the Owner's geothermal leases generally situated in the Newberry Crater area of Oregon (hereinafter referred to as the "Area");

B. The Contractor warrants to the Owner that it is engaged in the business of conducting diamond drilling and other related services and has the equipment, personnel, and expertise necessary for the proper performance and completion of the diamond drilling and other related services (hereinafter called the "Work") required by the Owner;

C. The Contractor agrees to undertake to perform and complete the Work for the Owner under the terms and conditions hereinafter contained.

D. The following Schedules attached to this Agreement form a part here of:

(i) Schedule A

Maps and/or description of location of the Work.

(ii) Schedule B

Details of the drilling to be performed.

(iii) Schedule C

Itemized statement of Rates for Work performed.

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of the mutual premises, convenants and agreements hereinafter contained the parties hereto convenant and agree, subject to acceptance of this Agreement by the Owner as follows:

1. GENERAL UNDERTAKING

1.01 The Contractor hereby agrees, at its sole risk and expense for the consideration and upon the terms and conditions hereinafter set forth, diligently to perform and complete the Work in a good and workmanlike manner in accordance with generally accepted engineering practice and as hereinafter more particularly described.

2. THE WORK

2.01 Subject to subsection 21, the Contractor shall drill, in the manner more particularly described in subsection 6.02, a series of drill holes (singularly, the "hole" and plurally the "holes") totalling approximately the number of lineal feet or meters set forth in item 1 of Schedule B and with the sizes of wireline core set forth in item 2 of Schedule B.

2.02 The Owner shall, prior to commencement of the Work, advise the Contractor of the person or persons who will be the Owner's representative for the Work. Except as to matters which alter or amend the provisions of this Agreement, which matters are to be dealt with by a written amendment to this Agreement, the Contractor shall follow the directions of the Owner's representative. The Owner shall be entitled to change its representative at any time and from time to time.

3. COMMENCEMENT AND PERFORMANCES

3.01 The Contractor shall mobilize its personnel, equipment and material to the Area and commence the drilling operations at the drill site of the first hole on or about the date set forth in item 3 of Schedule B, and shall diligently continue performance of the Work to its completion.

4. PAYMENT OF COSTS

4.01 The Contractor shall pay the entire cost of performing the Work subject, however, to such payment by or on the part of the Owner as is expressly provided for in Schedule C.

4.02 The Owner shall pay the Contractor for footage or meterage drilled and other services performed in accordance with the Owner's requirements, within 45 ~~XX~~ days of receipt of the Contractor's invoice therefore, with the amounts set forth in the invoice being charged according to the rates set forth in Schedule C attached to this Agreement.

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4.03 The Owner shall pay to the Contractor an amount equivalent to ~~xxxx~~ one percent per month on overdue accounts.

4.04 In the event an amount or item on an invoice is disputed then payment on this item only shall be withheld by the Owner and the balance paid as per section 4.02. An explanation of the withheld amount shall be submitted with or prior to the payment.

5. REPORTS AND INVOICES

~~5.02~~ 5.01 The Contractor shall:

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(a) make and deliver to the Owner's representative daily drilling reports, in a form acceptable to the Owner's representative, as to the progress of the drilling of each of the holes including, without limiting the generality of the foregoing;

(i) the length of footage or meterage drilled;

(ii) travel time and mileage;

(iii) the nature of consumable materials used which are chargeable to the Owner in addition to the Drilling Rate set forth in Schedule C; and

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(b) invoice the Owner ~~semi~~-monthly for footage or meterage drilled and other services performed as contemplated in subsection 4.02.

5.02 It is agreed by both parties that drilling reports, consumable charges, third party charges, and other information pertaining to invoice amounts shall be subject to revision to correct errors and omissions.

6. SCOPE OF DRILLING OPERATIONS

6.01 The Owner's representative shall specify, in a consistent manner, the location of each hole it wishes drilled.

6.02 The Contractor shall diligently perform and do any and all things necessary and incidental to the proper drilling, equipping and completing of the holes and without limiting the generality of the foregoing shall:

(a) drill the holes in the sequence designated by the Owner's representative;

(b) drill each hole at the location marked or specified by the Owner's representative or if a number of feet or meters are specified in item 5 of Schedule B then drill each hole within that number of feet or meters of the location specified by the Owner's representative;

(c) collar each hole at the angle and azimuth directed by the Owner's representative within the range set forth in item 6 of Schedule B, such angles and azimuth to be checked and approved by the Owner before drilling commences;

(d) use drilling mud or other drilling fluid additives in each hole when it is, in the Contractor's opinion, necessitated by ground conditions and approved by the Owner's representative;

(e) use its best efforts to drill each hole to the target depth established for it by the Owner's representative;

(f) use its best efforts to drill each hole in such a manner as to produce as high a percentage of core as the core barrel used and the nature of the ground being drilled will permit;

(g) replace all drill-string items as required by good drilling practice and, in any event, before wear seriously affects core recovery or completion of a hole; and

(h) upon completing or abandoning each hole, close the hole off and mark it in the manner directed by the Owner's representative.

7. DEPTH MEASUREMENT

7.01 The Contractor shall:

(a) at all times be responsible for keeping an accurate record of the depth of each hole;

(b) disclose to the Owner the length of casing protruding above the surface of the ground level and the depth that the casing is set into the bedrock of each hole; and

(c) measure all hole depths from the top of the casing.

8. CORES

8.01 The Contractor shall core the entire depth of each hole after penetrating the overburden and rock to a depth agreed to by the Owner's representative to the bottom of each hole and in that regard shall:

(a) keep all cores in core trays provided by the Owner unless the Contractor is required to provide the same as may be set forth in Schedule C;

(b) take all reasonable precautions to keep the cores and core trays free from contamination;

(c) place the cores in proper sequence and orientation in the core trays, setting in wooden tags to designate the depth of overburden and the end of each run;

(d) mark on each tray the hole number, box number and depth of the hole; and

(e) the core shall become the property of the Owner at the drill site.

9. ABANDONMENT OF HOLES

9.01 The Contractor shall not abandon any hole without the prior authorization of the Owner's representative. The Contractor shall bear the cost of footage or meterage drilled in holes abandoned without the prior authorization of the Owner's representative and hereby agrees that this cost shall not be charged to the Owner.

10. CAVITIES

10.01 The Owner hereby agrees that if cavities, loose and caving ground, excessive water, or gas flows which may be encountered in any hole are of such a magnitude as to render further drilling impractical the Contractor may abandon that hole, with the prior approval of the Owner's representative, and the Owner shall pay to the Contractor for the actual footage or meterage completed an amount determined according to the Drilling Rate referred to in Schedule C. If the Owner's representative does not approve the abandonment of that hole and requires the Contractor to continue the Work on that hole the Owner shall pay to the Contractor an amount determined as follows:

(a) for footage or meterage drilled prior to the request for approval to abandon, an amount determined according to the Drilling Rate referred to in Schedule C; and

(b) for drilling thereafter, an amount determined according to the Day Rate referred to in Schedule C.

11. RESPONSIBILITY FOR DELAYS AND FISHING JOBS

11.01 Except where the Contractor has been required to continue the Work on a hole pursuant to section 10, the Contractor assumes full responsibility for completing each hole to the depth specified by the Owner's representative and agrees to bear all expenses in connection with the completion of each hole, subject to provisions referred to in Schedule C.

12. CONTRACTORS PERSONNEL, EQUIPMENT AND MATERIALS

12.01 The Contractor hereby convenants and agrees:

(a) to assign and keep assigned to the Work during the times and periods referred to in subsection 3.01 such qualified personnel as may be necessary properly to perform and complete the Work including, without limiting the generality of the foregoing, a minimum of the number and type of personnel, if any, set forth in item 8 of Schedule B;

(b) to provide the number and type of drills set forth in item 9 of Schedule B, together with such number of spares as, in the opinion of the Contractor, are necessary to ensure the proper performance and completion of the Work;

(c) to supply and maintain sufficient drill carriers and drill service vehicles, except helicopters and other aircraft, as may be necessary properly to perform and complete the Work including, without limiting the generality of the foregoing, a minimum of the number and type of drill carriers and drill service vehicles set forth in item 10 of Schedule B; and

(d) to provide such supplies as may be necessary properly to perform and complete the Work including, without limiting the generality of the foregoing, drilling mud, additives, diamond set tools, core barrels, casing, drill rod, fuel, oil, grease, repair parts, storage facilities, fishing tools for core and drill-string items and the supplies and equipment, if any, more particularly set forth in item 10 of Schedule B.

13. OWNER'S PERSONNEL, EQUIPMENT AND MATERIAL

13.01 The Owner hereby covenants and agrees to assign to the Work such personnel and to provide and maintain for use by the Contractor in connection with the Work such equipment and material, if any, as may be set forth in item 11 of Schedule B.

14. SECRECY AND NON-ACQUISITION

14.01 The Contractor hereby agrees that all information and data relating to the Work obtained or collected by or coming to the attention of the Contractor, its officers employees, agents, servants, subcontractors, invitees and licencees during the course of the Work shall be for the exclusive use and benefit of the Owner and shall remain the Owner's sole and exclusive secret property forever to be dealt with or used by the Owner as it deems best. The Contractor hereby covenants and agrees that:

(a) the Contractor and its officers shall not, and the Contractor shall use its best efforts to ensure that the Contractor's employees, agents, servants, sub-contractors, invitees and licencees do not, divulge to anyone other than the Owner and its duly authorized representatives, any information or data concerning the progress or results of the Work; and

(b) the Contractor and its officers shall not, and the Contractor shall use its best efforts to ensure that the Contractor's employees, agents, servants, subcontractors, invitees and licencees do not, in any manner make use of any information or data which may be gained by them with respect to the Work, except as directed in writing by the Owner.

15. INSURANCE

15.01 The Contractor shall:

(a) provide, maintain and pay for the following insurance which shall be placed with such insurance company or companies and in such form as may be acceptable to the Owner:

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* (i) Comprehensive General Liability Insurance protecting the Owner, Owner's parent corporation and other wholly-owned subsidiaries of such parent corporation (collectively "Owner Group"), invitees and licencees under this Agreement including coverage for liability arising out of products, whether manufactured or supplied by the Contractor, completed operations, contingent employer's liability and contractual liability and forest fire fighting expense;

(ii) Automobile Insurance on the Contractor's owned and non-owned vehicles, protecting the Contractor, the Owner and their respective officers, employees, agents, servants, subcontractors, invitees and licencees against damages arising for bodily injury (including death) and from claims for property damage arising out of the operations of the Contractor, its officers, employees, agents, servants, subcontractors, invitees and licencees under this Agreement;

(b) ensure that each of the policies of insurance:

(i) is in an amount acceptable to the Owner and in any event not less than $1,000,000 inclusive of any one occurrence;

(ii) includes a standard form of crossliability clause;

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(iii) contains a clause waiving the insurer's right of subrogation against the Owner; and Group

(iv) indicates that the insurer will give the Owner at least 30 days prior written notice of amendment, cancellation or termination of the coverage; and

(c) provide the Owner with such evidence of insurance as the Owner may request.

15.02 The Contractor hereby agrees that the requirement for insurance in the amounts and for the coverage as stated in this section is not and shall not be construed as being a representation on the part of the Owner that the insurance is adequate or as limiting the liability of the Contractor to the Owner as contemplated in this Agreement. The Contractor will obtain insurance in such greater amounts and for such greater coverage as it deems prudent to protect itself and the Owner hereunder.

16. INDEMNITY

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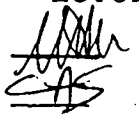
Initial 

16.01 The Contractor agrees to indemnify and save the Owner harmless from and against any loss, liability, claim, demand, damage, expense, injury or death (including, unless the Contractor assumes and pays the defence, with counsel approved in advance by the Owner, legal fees and the reasonable cost of investigating and defending against any judicial proceedings) arising out of or in connection with:

(a) the operations of the Contractor, its officers, employees, agents, servants, subcontractors, invitees and licencees excepting that portion of the loss, liability, claim, demand, damage, expense, injury or death caused by the negligence or wilful misconduct of the Owner;

(b) the non-performance by the Contractor, its officers, employees, agents, servants, subcontractors, invitees and licencees of any provisions of this Agreement;

(c) any infringement or alleged infringement of patent resulting from the use of any patented process or device by the Contractor in performing this Agreement.

17. LAWS, RULES AND WORKERS' COMPENSATION

17.01 The Contractor shall comply with:

(a) all provisions of law including, without limiting the generality of the foregoing;

(i) all federal, provincial, state, territorial, and municipal laws, by-laws, ordinances and regulations relating to the performance of the Work;

(ii) all laws in respect of Workers' Compensation and all other laws in effect with reference to employing, safeguarding, insuring, protecting and paying all labour employed or used by the Contractor, and the Contractor shall provide the Owner with evidence of insurance and such other proofs as the Owner may reasonably require; and

(b) the Land Use Regulations and Safety Regulations, if any, of the Owner.

18. MECHANIC'S OR OTHER LIENS

18.01 The Contractor shall promptly pay all costs and charges incurred by it in connection with the Work and shall not suffer nor permit any Mechanics' or other liens to attach to any property of the Owner.

19. ECOLOGY AND SANITATION

19.01 During the course of the Work, the Contractor shall keep the site of any drilling and camp areas free of accumulations of waste materials, rubbish or garbage and upon completion of the Work shall remove all tools, scaffolding, surplus materials, rubbish and garbage and leave the working and camp site in a clean condition.

19.02 Any environmental responsibility relating to the construction, use, or reclamation of drill sites or access roads shall be borne by the Owner.

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19.03 The Owner will be responsible for procuring and maintaining the necessary permits for land ~~and water~~ usage.

19.04 The Owner will hold the Contractor harmless for any liability claims which may arise from normal activities pursuant to this agreement, including but not limited to pollution of ground water or surrounding land by discharge of drilling fluids and wastes save if the Contractors'employees act in a grossly negligent manner.

20. ENFORCE DISCIPLINE

20.01 The Contractor shall at all times enforce discipline and maintain good order among its employees, officers,

agents, servants, subcontractors, invitees or licencees, and shall not retain on the job any person not skilled in the work assigned to him. Any employees, officers, agents, servants, subcontractors, invitees or licencees of the Contractor who are objectionable to the Owner shall be removed from the job forthwith.

21. TERMINATION

21.01 If the Contractor defaults in any of its covenants, obligations or agreements under this Agreement the Owner may, upon notice to the Contractor, forthwith terminate this Agreement, without liability to the Contractor, except for payments for actual footage or meterage completed and Work performed.

21.02 The Owner may, at its option, terminate this Agreement for any reason other than as set forth in subsection 21.01 or 22.01 prior to the completion of drilling of the approximate lineal footage or meterage set forth in Schedule B, without liability to the Contractor, except for payments for actual footage or meterage completed and Work performed, or as otherwise specified in Schedule C, item 13.

22. FORCE MAJEURE

22.01 Notwithstanding anything in this Agreement to the contrary, a party hereto shall not be deemed to be in default with respect to the performance of any of the covenants, obligations or agreement under this Agreement, if its failure to comply is due to any strike, lock-out, civil commotion, invasion, rebellion, hostilities, sabotage, governmental regulations or controls, Acts of God, inability to obtain any required materials or services, or, excluding inclement or severe weather conditions, otherwise beyond the control of the party. The party seeking to rely on this subsection shall give immediate written notice of the same to the other party and shall take all reasonable steps to eliminate the circumstances giving rise to the condition of force majeure. If the condition of force majeure continues for a period of 14 days after receipt of the notice the party receiving the notice shall be entitled to terminate this Agreement upon notice to the party claiming the force majeure.

23. NON-WAIVER

23.01 No condoning, excusing or waiver by the Owner of any default, breach or non-observance by the Contractor at any time or times in respect of any covenant, proviso

or condition contained in this Agreement shall operate as a waiver of the Owner's rights under this Agreement in respect of any continuing or subsequent default, breach or non-observance, or so as to defeat or affect in any way the rights of the Owner in respect of any continuing or subsequent default, breach or non-observance. No waiver shall be inferred from or implied by anything done or omitted to be done by the Owner.

24. NOTICE

24.01 All notices, demands and payments required or permitted to be given under this Agreement shall be in writing and may be delivered personally, sent by telex or may be forwarded by first class prepaid registered mail to the addresses set forth below. Any notice delivered or sent by telex shall be deemed to have been given and received on the business day next following the date of delivery or sending. Any notice mailed in Canada or the United States as aforesaid shall be deemed to have been given and received on the seventh business day next following the date it is posted, addressed to the Contractor or the Owner at their respective addresses set forth in items 12 and 13 of Schedule B or at such other address or addresses as the parties may from time to time give notice of; provided that if there shall be between the time of mailing and the actual receipt of the notice, a mail strike, slowdown or other labour dispute which might affect the delivery of the notice by the mails, then the notice shall only be effective if and when actually delivered.

25. NON ASSIGNABILITY

25.01 The Contractor shall not assign nor subcontract out any of its obligations or rights hereunder without the prior written consent of the Owner.

26. ENUREMENT

26.01 This Agreement shall enure to the benefit of and be binding upon the parties hereto, their successors and permitted assigns.

27. CAPTIONS

27.01 The captions appearing in this Agreement have been inserted only for reference and as a matter of convenience and do not define, limit or enlarge the scope or meaning of this Agreement or any provision thereof.

28. GENERAL

28.01 Whenever in this Agreement it is stipulated that anything shall be done or be performed by either of the parties hereto, it shall be assumed that such party does hereby enter, into a convenant with the other party to do or perform the same.

28.02 All grants, covenants privileges and liabilities contained in this Agreement shall be read and held as made by and with and granted to and imposed upon the respective parties hereto and their respective successors and assigns, in the same manner as if the words "Successors" and "Assigns" had been inscribed in all proper and necessary places, and in the event of more than one person being the Contractor, the said grants, covenants, provisos and liabilities, shall be construed and held to be several as well as joint.

28.03 Whenever the singular or masculine is used throughout this Agreement, the same shall be construed as meaning the plural or feminine or body corporate, as the context or the Parties so require.

28.04 Any condoning, excusing or overlooking by the Owner of any breach, or non-performance by the Contractor at any time or times in respect to any covenant, term, condition, and proviso contained in this Agreement shall not operate as a waiver of the Owner's right in respect of any continuing or subsequent default, breach or non-performance.

28.05 This Agreement may be altered only by written consent of both parties hereto.

28.06 Time is of the essence in this Agreement.

IN WITNESS WHEREOF the parties hereto have caused these presents to be executed as of the day and year first above written.

TONTO DRILLING SERVICES)
Per:)
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)
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)
G.E.O. OPERATOR CORPORATION)
Per:)
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SCHEDULE A

OF

AGREEMENT BETWEEN

TONTO DRILLING SERVICES

and

G.E.O. OPERATOR CORPORATION

The area of drilling is near Newberry Crater in the State of Oregon. Exact drill hole locations are to be provided by the Owner's representative. Approximate locations are as follows:

N-1 3,500' west and 2,450' north of the southeast corner of Sec. 25; T22S, R12E, Deschutes County, Oregon.

N-3 4,100' north and 500' east of the southwest corner of Sec. 24; T20S, R12E, Deschutes County, Oregon.

SCHEDULE B

ACTIVITIES TO BE UNDERTAKEN:

The total diamond drilling program comprises two vertical holes, each having a planned total depth of 4,000 feet.

1.	Minimum total lineal footage to be drilled	8,000 feet
2.	Size(s) of wireline core	HQ and NQ
3.	Date of Commencement of the work	Contractor will mobilize during the summer of 1985 for Hole N-1 at a mutually agreeable date and during the summer of 1986 for Hole N-3 at a mutually agreeable date.
4.	Work Schedule	Two 12-hour shifts, seven days per week.
5.	Number of feet to be drilled from each location	4,000 feet in each hole, one hole per drill location.
6.	Angle of holes	vertical.
7.	Depth of casing to be cemented in	400 feet
8.	The number and type of personnel to be provided by the Contractor	A. one driller-foreman B. one driller C. two driller's helpers D. one expeditor E. water truck driver(s) as required.
9.	The number and type of drill rig to be used by the Contractor	One Hydrostatic Longyear 44 or BBS HD56. The drill will be truck or trailer mounted.
10.	The quantity and type of drilling to be used by the Contractor	A. Fuel, lubricants, drill rods, casing, core barrels, diamond products (bits, shells, shoes) power and hand tools and all other equipment to perform the work in a work manlike manner.

10.	(Cont'd)	B. Two 4x4 crew transport service trucks. C. Highway transport truck as required. D. Bean 450 pressure pump, mud mixing tanks, mud settling tanks. E. Tandem axle water truck (3,500 gal. capacity) F. Mobile spare parts trailer. G. BOP equipment. H. Hole liner pipe I. Drilling mud and additives. J. Cement. K. Lost circulation materials. L. Core boxes and lids.
11.	The personnel, equipment and services to be provided and assigned by the Owner	A. Field representatives D. Drill site access roads. E. Transport of core from the drill sites F. Ancilliary equipment for moving contractors equipment if required. G. Purchase of water if required.
12.	The address for notice to the Contractor	Tonto Drilling Services 2701 West 900 South Salt Lake City, Utah 84104
13.	The address for notice to the Owner	GEO Operator Corporation 545 Middlefield Road, Suite 200 Menlo Park, California 94025
14.	Additional equipment services to be provided by Contractor	A. Water for drilling, dust settlement and other uses and the permits for but not the purchase of said water. B. A kill line and a blow down line, Contractor's personnel as outlined in schedule B-8 are to be familiar with their use. C. A mud cooler in the event that extremely high high temperatures are encountered.

14. (Cont'd)

D. Measurement of bottom hole temperatures each 100' or as follows:
   a) every 50' if temperatures exceed 125°F
   b) every 30' if temperatures exceed 175°F

E. Completion of the hole with tubing and couplings meeting or exceeding the following specifications:
   a) 4½" casing; 10.7 lb/ft grade A53
   b) 2 7/8" casing; 6.4 lb/ft grade J55

F. Drill site preparation, suitable for equipment indicated in item 9 of this schedule, at a subcontract price agreeable to and approved by Owner.

G. Mud sump pits at a subcontract price agreeable to and approved by Owner.

H. A surface support system adequate for downhole collection of formation fluids; and the sampling devices themselves. The technical specifications of the sampling devices are to be approved by Owner.

SCHEDULE C

RATES FOR SERVICES PERFORMED BY CONTRACTOR:

This schedule sets forth the rates referred to in Subsection 4.02 of this agreement.

1. DAY RATE

$875/hr.

A. The day rate charge shall be two thousand one hundred dollars ($2100.00) per calendar day (24 hours). Day rate charges shall commence upon the drilling rig reaching a convenient highway tractor discharge point, and shall cease when the equipment is ready to leave the Owner's leases upon completion of the Work.

The day rate shall apply to all activities in relation to the Work, including normal periodic maintenance and servicing of the Contractors equipment. Major overhaul to equipment shall not be chargeable. The following equipment and services are covered by the day rate:

(i) the labour of a two man crew per twelve hour shift;

(ii) equipment rental - drilling rig
- water truck
- 4x4's
- parts trailer

2. DRILLING RATES

The Contractor shall charge the Owner for all footage drilled either by triconing or by diamond coring according to the following schedule:

Footage Intervals	Tricone	HQ	NQ
0' - 500'	$9.80 per foot	$9.80 per foot	$8.80 per foot
500' - 1000'		$11.50 per foot	$10.50 per foot
1000' - 1500'		$14.20 per foot	$13.20 per foot
1500' - 2000'		$18.60 per foot	$17.60 per foot
2000' - 2500'		$22.60 per foot	$21.60 per foot
2500' - 3000'		$27.60 per foot	$26.60 per foot
3000' - 3500'		$32.60 per foot	$31.60 per foot
3500' - 4000'		$37.60 per foot	$36.60 per foot

If the Owner desires hole depths greater than four thousand feet (4000 feet), then Contractor may undertake such drilling only upon such conditions and at such rates as may be agreed prior to the commencement of such drilling.

3. EXTRA LABOUR

In the event extra labour above the regular two man crew is required, the Contractor agrees to provide such additional labour at a rate of twenty-five dollars ($25.00) per man per hour.

4. EXPEDITOR

The expeditor's labour shall not be chargeable to the Owner, except in such cases where the expeditor performs duties which would normally be performed by those persons whose labour would be chargeable under Item 3 above ("Extra Labour") or by Third Parties.

5. CONSUMABLES

Materials supplied by the Contractor and consumed in the Work shall be charged to the Owner at cost FOB the drill site plus a handling fee of ten percent (10%).

Consumables such as, but not limited to, the following are chargeable:

a) cement and additives, drill mud and additives, soluble oils, and rod grease
b) core boxes, lids, core marker blocks
c) diamond products (bits, shells, shoes), tricones
d) casing and hole liner pipe
e) lost circulation materials
f) special tools or accessories as may be required

6. ACCOUNTING AND INVOICING OF CONSUMABLES

Consumables chargeable to the Owner will be invoiced as soon as possible after their arrival on the job site. Shipments will be direct from the vendor or from Contractor's stock point. Transportation of consumables will be via a common carrier or the Contractor's trucks. The Owner will be presented with appropriate waybills and/or packing slips and will be requested to co-sign such freight bills as these will form the back-up for invoicing.

Upon job completion, an inventory of remaining consumables will be taken and a credit at cost less freight will be issued to the Owner for same. Bulk shipment invoicing shall take precedence over daily consumable usage as reported on the drill logs or daily reports. In cases where hole-by-hole costing is requested, the Contractor will endeavour to report the consumable cost accordingly.

7. LOST OR DAMAGED MATERIALS

In the event that drill rods, casing, core barrels or other equipment become stuck in the drill hole for any reason excepting gross negligence on the part of the Contractor, the Owner shall reimburse the Contractor at the Day Rate for efforts to recover the stuck equipment. If the equipment is not recovered or is damaged in the process of recovery the Owner shall reimburse the Contractor for the replacement cost of such tools at no mark up.

8. THIRD PARTY SERVICES

The contractor may engage the services of third parties on behalf of the Owner. Such services may be in the form of BOP equipment rental, cat operations, directional drilling services, cementation services, mud engineering services, or other services, rentals, or labour as may be required.

The Contractor shall charge the Owner the Third Party invoice amount plus a handling fee of ten percent (10%).

9. WATER TRUCKS

The Contractor shall supply one tandem axle water truck with a carrying capacity of 3500 gallons. The Owner shall pay to the Contractor a rental rate of one thousand eight hundred dollars ($1800.00) per month plus a mileage fee of fifty cents (.50) per mile, such charges to commence upon arrival at the transport discharge point.

10. WATER TRUCK DRIVER LABOUR

The labour of water truck drivers shall be charged at twenty-five dollars ($25.00) per man per hour.

11. MOBILIZATION, MOVING, DEMOBILIZATION

A. It is agreed that the moving of all contractor supplied equipment and personnel, necessary for the commencement of the Work to the transport discharge point and their removal from the Owners leases shall be charged to the Owner at a rate of six thousand dollars ($6000.00). Three thousand dollars ($3000.00) is chargeable on the first invoice and the balance of three thousand ($3000.00) is chargeable when the Work has been completed.

B. Moving, including unloading, loading, assembly, and teardown times from the transport discharge point to the first hole location, between locations, and back to the loading point shall be charged to the Owner at the Day Rate.

12. ACCOMMODATION

The Contractor agrees to provide room and board for its employees and shall charge the Owner a per diem rate of thirty dollars ($30.00) per man per day worked.

13. SHORTFALL ON MINIMUM FOOTAGE

In the event that the minimum footage referred to in Item 1, Schedule B is not completed at the Owner's request, the Contractor shall charge the Owner $ NIL per foot for each foot of uncompleted drilling, such charges to cover any costs of mobilization, demobilization or any other services which may have been included in footage, hourly, or other rates and not included in the flat rate sums quoted in Item 11, of this Schedule C.

GEO - Operators N-3 Agreement

Phase I Data (p. 3)

a. Geophysical logs
b. Temperature logs.
c. Lithographic logs (?)
d. Drillers log
e. Hole Completion schematic
f. Temperatures measured during drilling
h. Other data collected during Phase I

Phase II Data (p. 4)

a. Geophysical data - fluids
b. Geochemical data - rocks
c. Age data
d. Petrographic analysis
e. Mercury Survey
f. Splits of core, cuttings, fluids, etc.
g. Final temperature log
h. Plug and abandonment plan
i. Project status and management reports
j. Other reports as required
k. Other data collected during Phase II
l. All reports written during Phase II

Appendix A # 4.2 A.
"Project Isititutional Plan ... will identify items required by governmental regulatory agencies. ...

4.3 Drilling

A. Project Drilling Plan.
B. ..Shall report on drilling status daily - - -

GEO-South

Statement of Work

1.0 Introduction

The Cascade volcanic region has long been suspected to contain considerable geothermal potential, as evidenced by recent volcanism and other thermal expressions. There are few known surface manifestations of geothermal energy in spite of the obvious occurrence of heat sources. One possible explanation is that the downward percolation of the extensive regional cold ground-water system suppresses surface evidence of underlying hydrothermal systems. However, there have been few wells drilled in the Cascades region to a sufficient depth to properly evaluate the temperature and hydrological conditions beneath the cold water zone. There is a great need for characterization identification of the deeper hydrothermal regime in order to more conclusively define the geothermal potential of the Cascades volcanic environment.

DOE's primary objectives for this cost-shared drilling project are to obtain and release to the public subsurface information to include but not be limited to the following:

- o rock samples (core and/or drill chips),
- o equilibrium temperature profiles,
- o uncontaminated fluid samples,
- o evidence for the existence and depth of potentially producible aquifers,
- o geophysical well logs, and
- o information on drilling conditions and problems in the Cascades environment.

2.0 Scope

The Participant will drill a deep thermal gradient hole to a depth of 4000 feet located 3,500 feet west and 2450 feet north of the southeast corner of section 25, T22S, R12E, Deschutes County, Oregon. The Participant will perform data collection both during and subsequent to drilling. The Participant will maintain the hole and allow DOE access to the hole to collect data. The Participant will be responsible for obtaining any permits or approvals required by government regulatory agencies in the performance of this project. The Participant will provide all data and information gathered under this project to DOE.

3.0 Applicable Documents

Work performed by the Participant will be in compliance with all Federal, State, and local laws, rules and regulations, and agency orders and guidelines.

4.0 Technical Tasks

4.1 Project Management

A. The Participant will prepare and obtain DOE approval of a Project Management Plan within 30 days after award of this agreement. The plan will include a work breakdown structure and a list of deliverables by task, identify the individuals and subcontractors responsible for each task, discuss the management techniques to be used, and include a schedule that shows the period for performance of each subtask and identifies principal milestones and decision points for each. The plan will also designate an individual or individuals who will act as principal points of contact with DOE on behalf of the Participant.

B. The Participant will perform project management in accordance with the approved Project Management Plan. In addition to close general coordination with DOE, immediate and full disclosure of any project problem areas to DOE is required, so that timely corrective action may be taken with DOE technical support, if necessary.

Deliverable: Approved Project Management Plan

4.2 Permitting and Environmental Reporting

A. The Participant will submit and obtain DOE approval of a Project Institutional Plan prior to initiation of site preparation. The plan will identify items required by governmental regulatory agencies for the performance of this work, the agency whose requirement the item fulfills, and the actual or projected submittal and agency approval dates. The plan will also discuss any legal, social or institutional problems anticipated during performance of the project and planned solution.

B. The Participant will prepare, submit and obtain approval of any documentation required by governmental regulatory agencies for the performance of this work. The Participant will provide a copy of all documentation provided to any governmental agency and pertinent to this project to DOE for information.

C. An approved environmental document is required for this project prior to any ground disturbance. It is anticipated that an environmental assessment will be prepared by the Bureau of Land Management for this project. This environmental assessment may satisfy DOE's environmental reporting requirements. If DOE determines that an Environmental Evaluation Report is required prior to any ground disruptive activity, DOE will notify the Participant in writing. In that event, the Participant will prepare the Environmental Evaluation Report in accordance with DOE Environmental Guidelines. If a DOE Environmental Assessment is required, the Participant will provide information to DOE as required for DOE's preparation of the Environmental Assessment.

Deliverables: Approved Project Institutional Plan, Regulatory Documentation. Approved Environmental Document

4.3 Drilling

A. The Participant will prepare and obtain DOE approval of a Project Drilling Plan prior to drilling. The plan shall describe:

- o Surface and subsurface conditions anticipated to be encountered during drilling, including configuration of the resource.
- o Site access.
- o Site preparation.
- o Hole design including hole size, casing size, cementing, etc.
- o Rig and equipment specifications.
- o Well containment during and after drilling (including applicable regulatory requirements).
- o Drilling fluids and disposal method.
- o Hole completion.
- o Plugging and abandonment.
- o Site restoration.
- o Anticipated hole problems, if any, and proposed solutions.
- o Health, safety and environmental considerations.
- o Site facilities, if any.

- o Drilling schedule including major activities and estimated duration.

- o On-site supervision to be used during drilling, including drilling supervisor(s) and geologist(s).

B. The Participant will prepare the drill site and drill a deep thermal gradient hole in accordance with the approved Project Drilling Plan. The Participant shall report on drilling status daily to the designated DOE representative, so that decisions concerning the drilling operation can be made in a timely manner.

Deliverable: Approved Project Drilling Plan

4.4 Data Collection

A. The Participant will prepare and obtain DOE approval of a Project Data Collection Plan prior to drilling. This plan will address data collection both during drilling and after drilling. The plan will identify the types of data to be collected, the depth(s) at which each type of data will be collected, the timing of collection, and the method by which the Participant plans to collect each type of data (including type of instrument and planned calibration, where appropriate). The plan will specifically identify all logs, samples of rock and fluid and other data that are to be collected.

B. The Participant will collect the following data as a minimum in accordance with the approved Project Data Collection Plan. These samples and data shall be provided to DOE by the Participant as soon as possible after collection. The Participant will incorporate its analysis and interpretation of the data collected as part of the final project report.

Rock Sampling. Cuttings will be collected at 15-foot intervals in the section of the hole to be rotary drilled. Four (4) splits of cutting samples of each sampled interval will be provided to DOE. The remainder of the hole will be continuously cored. The Participant will warehouse the core and cuttings in Bend and make them available to DOE. DOE will provide procedures for identification and splitting of core and cuttings. The Participant will make thin sections of selected core samples and complete a petrographic study of these sections. The Participant will also select core samples for age dating. The results of these studies will be made available to DOE.

Drilling Records. Logs describing primary lithology and secondary mineral content and mud return temperatures will be kept during the tricone drilling and core portion of the

hole, copies of which will be provided to DOE. These logs will also include information on lost circulation amounts, times and depths and/or the location of water entries.

Temperature. The bottomhole temperature shall be recorded at a minimum of 100 ft. intervals during drilling and preferably at least at every other change of core barrel. One objective of these measurements will be to obtain a useable temperature profile in the event a subsequent equilibrium temperature profile cannot be obtained. The measurements shall be made using calibrated thermometers.

Hydraulic head. At the start of daily drilling, or whenever the drilling operation will allow, measurements of the hydraulic head or depth to fluid surface in the hole will be made.

Drilling fluid samples. An appropriate number of sets of one-liter samples of drilling fluid will be collected every trip for bit during drilling. Additional fluid samples will be collected when warranted by geologic conditions. One set will be delivered to DOE for possible analysis. If the Participant analyzes samples, copies of the results will be given to DOE.

Aquifer fluid samples. If artesian flow is encountered during drilling, representative samples of uncontaminated aquifer fluid will be collected in accordance with procedures outlined in the approved Data Collection Plan. If no artesian flow is encountered, the Participant will still endeavor to collect samples of uncontaminated aquifer fluids at locations in the hole at which fluid production would be anticipated on the basis of lost circulation, indications of fracturing in the core or chips, geophysical well logs or other standard indicators. Potential methods for collection of these samples include swabbing, bailing, airlift, drill stem tests and pumping. The Participants will examine these and/or other fluid sampling techniques and address collection of these samples in the Project Data Collection Plan.

Geophysical well logging. Temperature, caliper, resistivity and self-potential logs will be run in the interval between the surface pipe and total depth. Density and sonic velocity logs will also be run if tools are available which can operate in the conditions encountered in the hole. The temperature tool capable of 0.01°F precision in measurement will be used to measure the geothermal gradient. One set of field prints will be sent to DOE as soon as available.

Detailed Mercury (Hg) Survey. A comprehensive 3-[illegible] of Hg distribution at Newberry Volcano will be conducted analyzing Hg at 10 foot intervals throughout the corehole and the results compared with the published Hg soil survey of Hadden, et al. (1982, DOGAMI-BPA Coop. Agr. DE-AC79-82BP36734). The proposed study will be used to establish the theoretical basis for Hg surveys in geothermal exploration, provide data pertaining to the reliability, limitations, and general utility of such surveys, and provide insight into the relationship among fracture permeability, mercury distribution, magma bodies, and geothermal reservoirs.

A byproduct of the proposed Hg study will be "splits" of the samples for which Hg has been analyzed. These "splits" will be made available to DOE for analysis of other elements. Analyses and interpretation of these data will be conducted.

Deliverables: Approved Data Collection Plan, Data and Samples

4.5 Hole Completion and Maintenance

A. Upon satisfactory completion of openhole geophysical logging and sampling, standard black pipe, 2" ID, with a knockout plug at the bottom, will be run by the Participant from surface to total depth, filled with fresh water and capped. After allowing sufficient time for thermal equilibration to occur, the Participant will run a temperature log and derive a geothermal gradient.

B. Upon completion of the hole, DOE and the Participant shall review and discuss the data. The Participant will obtain the DOE Project Manager's agreement prior to releasing the rig.

C. The Participant shall provide to DOE within 15 days of completion of the hole a schematic of the actual completed hole configuration.

D. The Participant shall maintain the hole and site facilities for 12 months after hole completion in accordance with the approved Project Drilling Plan. The hole and site facilities shall be made available to DOE during this period for DOE's scientific use. The Participant may also collect data during this period at its own expense and on a non-interference basis.

Deliverable: Completed Hole Configuration Schematic

4.6 Abandonment

The Participant will plug and abandon the hole in accordance with U.S. Bureau of Land Management requirements (Form 3200-9, #5) and other applicable regulations within one month subsequent to the end of the DOE access period. The Participant shall provide DOE

with a copy of the plug and abandonment plan as approved by the Bureau of Land Management. If for any reason the hole is not plugged and abandoned by the end of the period of this agreement, the hole becomes the legal and financial responsibility solely of the Participant. DOE will not cost-share costs incurred after the project period of this agreement.

Deliverable: Approved P&A Plan

4.7 Site Restoration

The Participant will clear the site, fill the pits, and restore the site in accordance with applicable state and federal regulation and as outlined in the approved Project Drilling Plan. The Participant shall provide DOE with confirmation of restoration activities and Bureau of Land Management or Forest Service approval.

5.0 Reports, Data and Other Deliverables

A. The Project Drilling Plan as required by Subtask 4.3.A.
B. The Project Data Collection Plan as required by Subtask 4.4.A.
C. The Project Management Plan as required by Subtask 4.1.A
D. The Project Institutional Plan as required by Subtask 4.2.A.
E. All data collected by the Participant under Task 4.4.

F. Regulatory documentation and approved environmental document under Subtasks 4.2.B and 4.2.C.
G. Completed hole completion schematic as required by Subtask 4.5.C.
H. Approved plug and abandonment plan as required by Task 4.6.
I. Project status and management reports as identified on DOE Form CR-537, Reporting Requirements Checklist. The described final technical report shall include a summary of drilling and completion and a section describing data collected along with a discussion of analysis and interpretation.

PLAN OF EXPLORATION

NEWBERRY FLANK

(GEO-NEWBERRY)

DESCHUTES COUNTY, OREGON

Project Location

The following are the proposed locations for the Newberry Flank (GEO-Newberry) Core Hole Program:

- N-1: East Lake Quad

  3500' west and 2430' north of the southeast corner of Section 25, T22S, R12E.

- N-2: Paulina Peak Quad

  950' west and 2600' north of the southeast corner of Sec. 32, T21S, R12E.

- N-3: Fuzztail Butte Quad

  4100' north and 500' east of the southwest corner of Sec. 24, T20S, R12E.

- N-4: East Lake Quad

  1500' north and 2250' west of the southwest corner of Sec. 35, T21S, R13E.

Operations

The lessee/operator for the project will be:

- GEO Operator Corporation for GEO-Newberry
  2300 County Center Drive, #250
  Santa Rosa, CA 95401
  (707) 523-4272

Key personnel assigned to the project are:

- Chandler Swanberg (Project Manager)
  545 Middlefield Road
  Menlo Park, CA 94025
  (415) 321-5662

- Michael Cale (Senior Environmental Coordinator/Regulatory Liaison)
  2300 County Center Drive, #250
  Santa Rosa, CA 95401
  (707) 523-4272

- Michael Johnson (Project Geologist)
  2300 County Center Drive, #250
  Santa Rosa, CA 95041
  (707) 523-4272

Location of a field office will be provided when established.

Project Description

The core hole program is a low-key operation utilized in developing baseline geophysical data. This information is a preliminary step in evaluating resource recovery potential in a virtually unexplored region that suggests the presence of geothermal capability. The project will consist of the following:

- Preparation of up to four (4) drilling locations and mud pits (total area: 100' x 100'± per site)
- Utilizing a truck-mounted rotary drill rig, the core holes will be drilled to a maximum depth of 4000'.
- Log temperatures and collect core samples.
- Rig down.
- Continue logging.
- Abandonment.
- The project should begin not later than July 1, 1985, and terminate November 1, 1986 (estimates).

Drilling Program

- Prepare drill location.
- Rig-up.
- Spud 5-5/8" diameter hole and drill to 400'.
- Record mud return temperature and collect core samples.
- Run 400' of 4-1/2" casing with cementing shoe.
- Install cementing head and pressure cement to fill annulus to surface.
- Cut off casing approximately 2' below ground level and install B.O.P.E. flange.
- Install 2" fill-up line and blowdown line below flange.
- Install B.O.P.E. equipment.

- Wait 24 hours for cement to set; lower one joint of drill pipe into hole; close preventer and test to 300 psi.
- After completing successful B.O.P.E. test, drill out shoe and continue drilling with mud system to T.D.
- Record temperatures of mud returns and collect cores to T.D.
- When T.D. is reached circulate to clean out cuttings and condition hole.
- Run bull-plugged string of 2-3/4" tubing to T.D. and fill with water.
- Backfill annulus with Sure-Gel or equivalent.
- Remove B.O.P.E. and wellhead.
- Install locking cap on tubing.
- Rig-down and remove drill rig, support vehicles, and materials from site.
- Backfill mud pits and grade to original contour.
- Clean area of debris and restore to (as near) original condition.
- Run temperature and gamma-ray logs at least twice (1 month interval) prior to final abandonment.

Environmental

Pursuant to the Geothermal Resources Operational Orders, issued under the Geothermal Steam Act of 1970, the lessee shall be responsible for the monitoring of readily identifiable localized impacts associated with specific activities that are under the control of the lessee (GRO Order 4, General Environmental Protection Requirements).

Specific impacts that may be associated with this project, and mitigration measures proposed to reduce said impacts to a level of insignificance are as follows:

- Aesthetics

  Compatibility with the existing view shed is a primary goal. The short-term duration of each drilling operation (30-45 days) coupled with the low profile of a truck-mounted rotary drill rig (30'± to top of mast) ensure that visual intrusion will not be significant. Additionally, sites have been selected that are well removed from populated areas and traditional recreation centers in the Deschutes/Newberry region.

- Land Use and Reclamation

  The project has been designed to reduce vegetation impacts to a minimum. Access will be via the existing road network to the pad location. The pad area will require only clearing and grading an area approximately 100' x 100'. When the project terminated, the area will be graded to as near the original contour, and revegetated with similar vegetation species as directed by B.L.M. Aquatic

habitat will not be impacted, and water will only be secured as directed by the State Watermaster. At project termination, all debris, scrap, or other materials imported by the operator shall be removed.

The project proposed by GEO Operator Corporation meets the criteria for exploration and development of a managed resource as defined by the United States Department of the Interior. Additionally, the project is compatible with the Deschutes County Geothermal Element as incorporated into the Deschutes County Comprehensive Plan and Zoning Ordinance.

- Public Access/Recreational Opportunities

The short duration of each drilling operation, minimal amount of surface area required, and isolated location ensure that public access will be maintained, and that recreational value of the Deschutes/Newberry area will not be adversely impacted.

- Slope Stability/Erosion Control

The project is so designed that with maximum surface disturbance, slope stability could not be an issue. Mud pits are constructed to a standard that alleviates the potential of encroachment on a natural drainage course, or deposition of sediment/drilling waste into a waterway. As previously described, at project termination, the sites will be regraded to as near the original contour, and revegetated with native species as required by BLM.

- Biota

A core drilling project does not have the potential (long-term) to adversely impact the associated flora and/or fauna (terrestrial or aquatic). The drilling operation could temporarily inconvenience some species, particularly avian raptors, causing a minor alteration in migration and/or hunting habits. Historically, these types of operations have not produced any noticeable adverse impact to biota.

- Cultural Resources

In the event a cultural or historic resource is located on or near any of the drill sites, the location will be shifted, under the direction of BLM, to preserve the integrity of the resource. As a core drilling program is designed to incorporate maximum flexibility, at the discretion of the permitting agency, avoidance of any area of significant value is easily accomplished.

- Subsidence and Seismicity

Concerns regarding geothermal resource production would not be an issue during a core drilling program.

- Air Quality

The project as proposed does not have the potential to adversely impact ambient air quality.

- Pits and Sumps

  During the core drilling operation, waste material (cuttings/drilling medium) will be directed to a waste sump for containment. The sumps will be constructed and lined with an impervious material to ensure the integrity of the natural environment, and eliminate the potential of contaminants entering a drainage course or waterway. At the conclusion of the drilling operation, the sumps will be purged as directed by the BLM prior to backfilling. As part of site restoration, the sumps/pads will be regraded to as near the original contour and revegetated per BLM requirements.

- Water Quality

  The project, as defined, does not have the potential to degrade water quality.

- Noise

  Due to the isolated locations proposed and the nature of the equipment involved, the project will not impact on any human receptors. Intrusion by humans in a remote area may have the ability to disrupt some wildlife species, particulary avian raptors, which rely on a keen sense of hearing to locate and secure a food source. However, the limited scope of the project adequately mitigates significant short-term, and precludes any long-term impact from occurring.

It is the position of GEO Operator Corporation that the project, as proposed, does not have the potential to produce any significant long-term environmental impacts. Utilizing Best Management Practices and conditions proposed by BLM, short-term effects will be reduced to a level of insignificance.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

GEOTHERMAL DRILLING PERMIT

Newberry Flank (GEO Newberry)

N-1

STATUS: Core Hole to be drilled. No existing wells

Operator Corporation (GEO-Newberry)

) County Center Dr. #250 Santa Rosa, CA 95401

Newberry

25 22S 12E

3500' West & 2450' North of the Southeast corner of Sec 25, T22S, R12E

N/A

Deschutes

miles south of inner sourthern boudary of unit

Oregon

5 miles from N-2

)' West & 2600' North of the Southwest corner of Sec 24, T20S, R12E

July 85

N/A

4,000'

5350'

5/8"	4½"	7.7#	Diamond Drill Flush Joint 3 threads/in.	A-120	Surf	400'	25 cu.ft.
/8"	2-3/4"	5.4#	Flush Joint	J-55	Surf	4,000'	14.7 cu.ft. Shur-Gel

fer to attached Drilling Program.

Michael J. Cole

Senior Environmental Coordinator

3-26-85

(See instructions on reverse side)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

SUNDRY NOTICES AND REPORTS ON WELLS

Use this form for proposals to drill or to deepen or plug back to a different reservoir. Use Form 9-331-C for such proposals.

1. OIL WELL [ ] GAS WELL [ ] OTHER [X]

2. NAME OF OPERATOR
Operator Corporation (GEO-Newberry)

3. ADDRESS OF OPERATOR
0 County Center Dr. #250 Santa Rosa, CA 95401

4. LOCATION OF WELL
4100' North & 500' East of the Southwest corner of Sec 24, T20S, R12E

5. LEASE DESIGNATION AND SERIAL NO.

6. IF INDIAN, ALLOTTEE OR TRIBE NAME
N/A

7. UNIT AGREEMENT NAME
Newberry Flank(GEO-Newberry)

8. FARM OR LEASE NAME

9. WELL NO.
N-3

10. FIELD AND POOL, OR WILDCAT
Newberry

11. SEC., T., R., M., OR BLK. AND SURVEY OR AREA
24 20S 12E

12. COUNTY OR PARISH
Deschutes

13. STATE
Oregon

14. DISTANCE IN MILES AND DIRECTION FROM NEAREST TOWN OR POST OFFICE
miles south of ourac northern boundary of unit

15. DISTANCE FROM PROPOSED* LOCATION TO NEAREST PROPERTY OR LEASE LINE, FT. (Also to nearest drlg. unit line, if any)
tles from N-2 (980'West & 2500'North of the Southeast corner of 32, T21S, R12E

16. NO. OF ACRES IN LEASE

17. NO. OF ACRES ASSIGNED TO THIS WELL

18. DISTANCE FROM PROPOSED LOCATION* TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR, ON THIS LEASE, FT.

19. PROPOSED DEPTH
4000'

20. ROTARY OR CABLE TOOLS
Rotary

21. ELEVATIONS (Show whether DF, RT, GR, etc.)

22. APPROX. DATE WORK WILL START*
July 1985

23. PROPOSED CASING AND CEMENTING PROGRAM

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH	QUANTITY OF CEMENT
5/8"	4½"	7.7#	Diamond Drill Flush Joint 3 threads/in. A-120 Surf 400'	25 cu. ft.
/8"	2-3/4"	6.4#	Flush Joint J-55 Surf 4,000'	14.7 cu. ft. Shur-Set

er to attached Drilling Program.

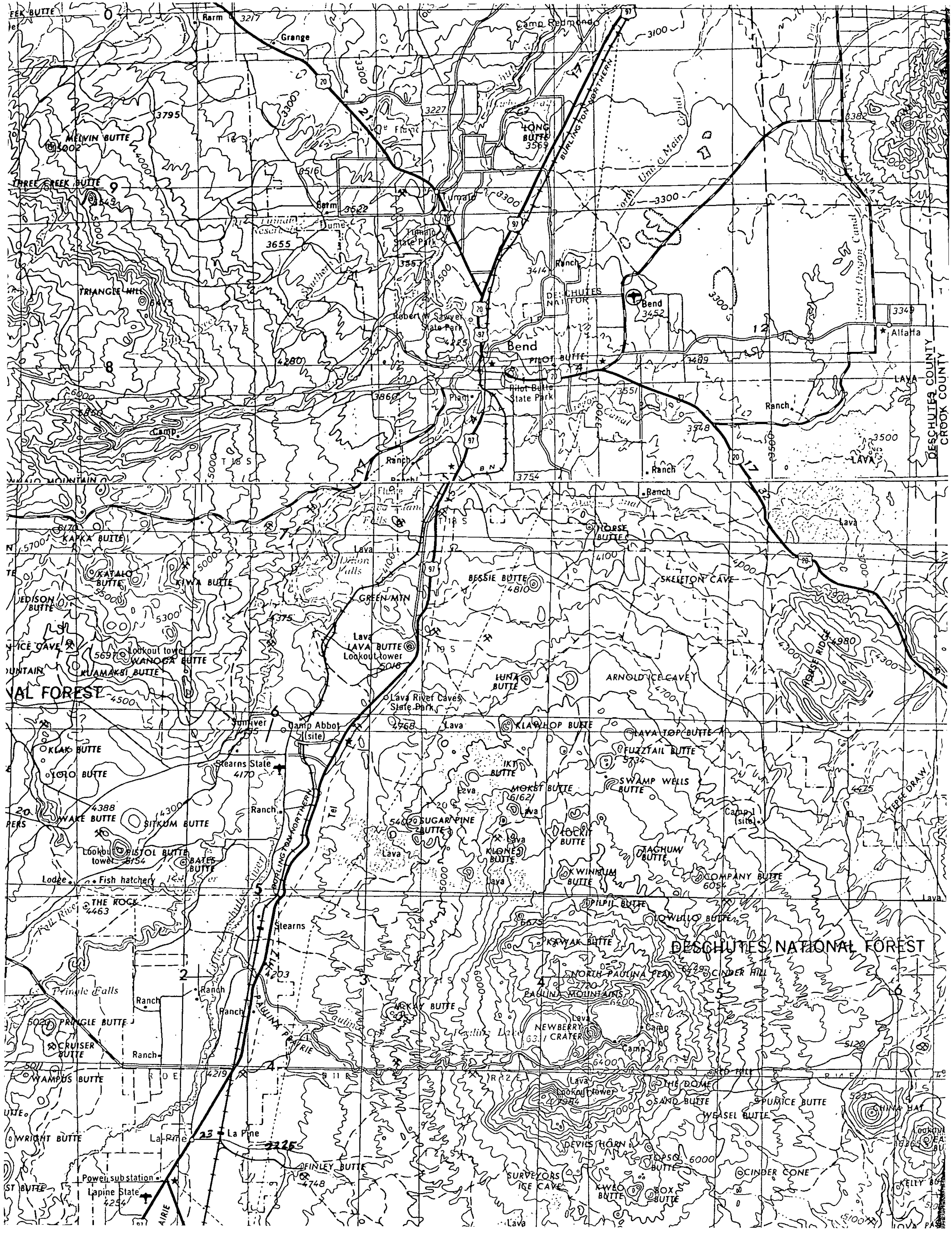
Michael D. Cole
Michael D. Cole TITLE Sr. Env. Coordinator DATE 3-26-85

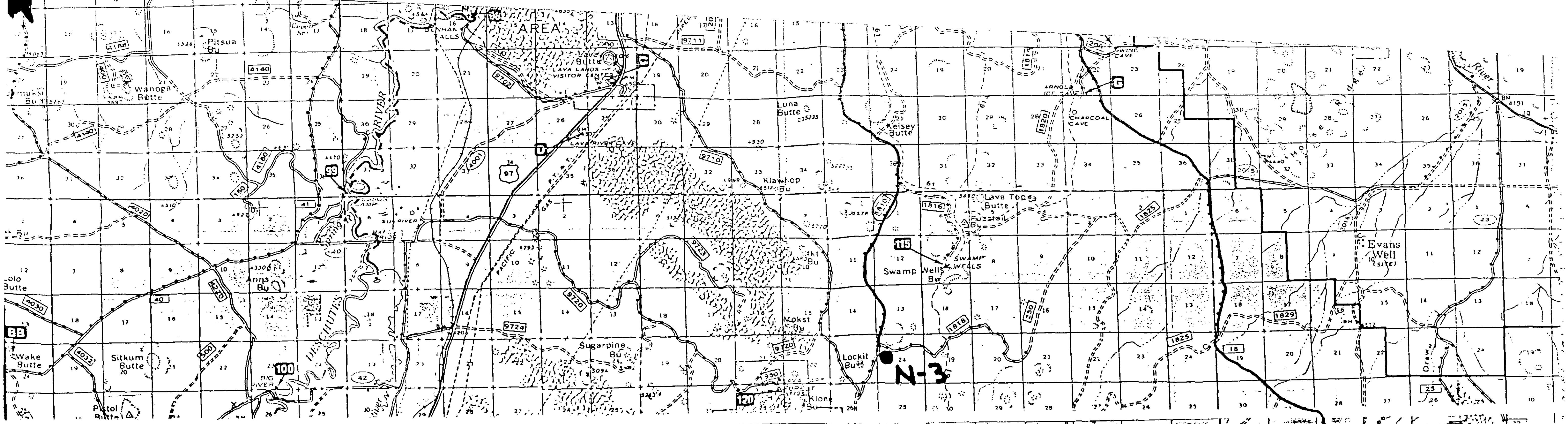
(This space for Federal or State office use)

APPROVED BY _____ TITLE _____ DATE _____

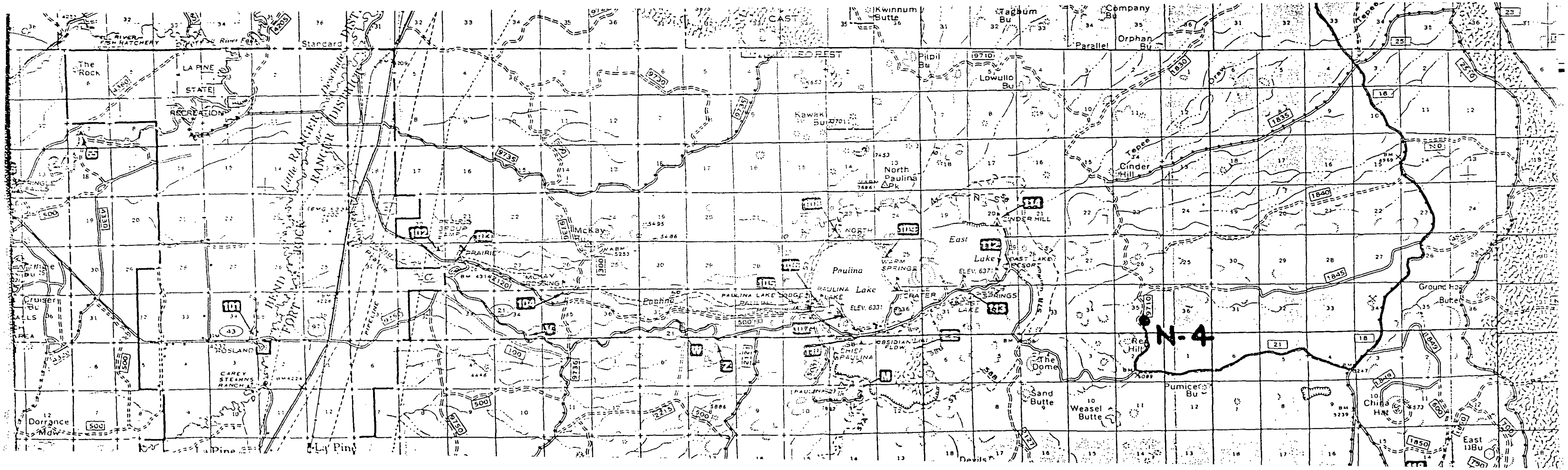
CONDITIONS OF APPROVAL, IF ANY:

*See Instructions on Reverse Side


Camp Redmond
Grange
Tumalo
Tumalo State Park
MELVIN BUTTE
THREE CREEK BUTTE
TRIANGLE HILL
LONG BUTTE
BURLINGTON NORTHERN
Robert W. Sawyer State Park
Bend
PILOT BUTTE
Pilot Butte State Park
DESCHUTES NAT FOR
Alfalfa
DESCHUTES COUNTY
CROOK COUNTY
LAVA
Ranch
HORSE BUTTE
KAPKA BUTTE
KATALO BUTTE
KIWA BUTTE
EDISON BUTTE
BESSIE BUTTE
SKELETON CAVE
GREEN MTN
LAVA BUTTE
Lookout tower
WANOGA BUTTE
KUAMAKSI BUTTE
NAL FOREST
LUNA BUTTE
ARNOLD ICE CAVE
HORSE RIDGE
Lava River Caves State Park
Sunriver
Camp Abbot (site)
KLAWHOP BUTTE
LAVA TOP BUTTE
FUZZTAIL BUTTE
KLAK BUTTE
LOLO BUTTE
Stearns State
IKT BUTTE
MOKST BUTTE
SWAMP WELLS BUTTE
TEPEE DRAW
WAKE BUTTE
SITKUM BUTTE
SUGAR PINE BUTTE
LOCKIT BUTTE
Camp 1 (site)
PISTOL BUTTE
BATES BUTTE
KLONE BUTTE
TAGHUM BUTTE
Lodge
Fish hatchery
KWINNUM BUTTE
COMPANY BUTTE
THE ROCK
Fall River
Stearns
PILPIL BUTTE
LOWULLO BUTTE
KAWAK BUTTE
DESCHUTES NATIONAL FOREST
NORTH PAULINA PEAK
CINDER HILL
PAULINA MOUNTAINS
Pringle Falls
PRINGLE BUTTE
McKAY BUTTE
PAULINA PRAIRIE
NEWBERRY CRATER
Paulina Lake
CRUISER BUTTE
WAMPUS BUTTE
THE DOME
SAND BUTTE
PUMICE BUTTE
CHINA HAT
WEASEL BUTTE
WRIGHT BUTTE
La Pine
DEVILS HORN
FINLEY BUTTE
TOPSO BUTTE
CINDER CONE
Power sub station
Lapine State
SURVEYORS ICE CAVE
KWEO BUTTE
BOX BUTTE



AREA
Pitsua Bu
Wanoga Butte
Lava Butte
Luna Butte
Kelsey Butte
Arnold Ice Cave
Charcoal Cave
Klawhop Bu
Lava Top Butte
Puzzle Bu
Swamp Wells Bu
Evans Well (SITE)
Lolo Butte
Anns Bu
DESCHUTES
RIVER
Spring R
Sunriver
Pacific Gas
Sugarpine Bu
Nokst Bu
Lockit Bu
Klone Bu
Wake Butte
Sitkum Butte
Pistol Butte
N-3



Kwinnum Butte
Tagbum Bu
Company Bu
Parallel
Orphan Bu
Pilpil Bu
Lowullo Bu
The Rock
LA PINE STATE RECREATION
Standard
DESCHUTES
FOREST
Kawak Bu
North Paulina Pk
Tepee
Cinder Hill
CINDER HILL
McKay
PRAIRIE
Paulina Lake
ELEV. 6331
East Lake
ELEV. 6371
EAST LAKE RESORT
WARM SPRINGS
CRATER
PAULINA LAKE LODGE
OBSIDIAN FLOW
The Dome
Sand Butte
Weasel Butte
Pumice Bu
Ground Hog Butte
China Hat
East Bu
ROSLAND
CAREY STEARNS RANCH
PIPELINE
Dorrance Mdw
La Pine
N-4

GEO Operator Corporation
A Subsidiary of Geothermal Resources International, Inc.

August 7, 1985

Ronald A. King
R & D Contracts Branch
Contracts Management Division

Re: Project Management Plan Geo-Newberry
(Solicitation #DE-SCOF-85ID12580

Dear Sir:

Pursuant to your communication of July 18, 1985, GEO Operator Corporation submits the following Project Management Plan for your review and approval. The following information is submitted in accordance with Section 4.0 (Technical Tasks):

4.1 Project Management

PROJECT LOCATION

The following are the approved locations for the Newberry Flank (GEO-Newberry) core hole program:

- Site N-1; East Lake Quad:
  3500' West and 2450' North of the Southeast corner of Section 25, T22S, R12E.
- Site N-3; Fuzztail Butte Quad:
  4100' North and 500' East of the Southwest corner of Section 24, T20S, R12E.
- Site N-4; East Lake Quad:
  1500' North and 2250' West of the Southwest corner of Section 35, T21S, R13E.

The Lessee/Operator for the project will be:

- GEO Operator Corporation
  545 Middlefield Road Suite 200
  Menlo Park, CA 94025

Project Manager

- Chandler Swanberg
  545 Middlefield Rd. Suite 200
  Menlo Park, CA 94025
  (415) 321-5662

Dr. Swanberg shall be the principal contact on any and all questions pertaining to the operations of the Geo-Newberry Project. Unless otherwise directed, all correspondence will be initially transmitted to Dr. Swanberg for review and disposition.

Environmental Affairs

- Michael J. Cale
  2300 County Center Drive
  Santa Rosa, CA 95401
  (707) 523-4272

Geology/Drilling

- Dr. Walter Randall
  2300 County Center Drive
  Santa Rosa, CA 95401
  (707) 523-4272

Land

- Peter Hansen
  545 Middlefield Rd.
  Menlo Park, CA 94025
  (415) 321-5662

Legal

- Tom Hamilton
  545 Middlefield Rd.
  Menlo Park, CA 94025
  (415) 321-5662

4.2 Permitting and Environmental Reporting

The Geothermal Resources Operational Orders, issued under the Geothermal Steam Act of 1970, states "....the Lessee shall be responsible for the monitoring of readily identifiable localized impacts associated with specific activities that are under the control of the Lessee...." (GRO Order 4. General Environmental Protection Requirements). As the project is a federal unit the Oregon State Office of the Bureau of Land Management acted as lead agency for the project. The Prineville District Office, under the direction of Gerald E. Magnusun, was responsible for preparation of the Environmental Assessment.

The following specific impacts were addressed in the Plan of Exploration (Attachment 1) as a potential consequence of the project:

- Aesthetics
- Land Use & Reclamation
- Public Access & Recreational Opportunities
- Slope Stability & Erosion Control
- BIOTA
- Cultural Resources
- Subsidence & Seismicity

- o Air Quality
- o Pits & Sumps
- o Water Quality
- o Noise

On July 29, 1985, the Prineville office of the BLM issued a Finding Of No Significant Impact (Attachment 2). In accordance with, and pursuant thereto, the Deputy State Director for Mineral Resources, BLM Oregon State Office, issued a Letter of Approval (Attachment 3) dated July 31, 1985.

Completion of the Environmental Assessment, and issuance of the Letter of Approval and Conditonal Drilling Permit (Attachment 4) satisfied federal requirements for Environmental Review of the GEO-Newberry Project. In addition, permits to drill a geothermal well were issued by the State of Oregon, Department of Geology and Mineral Industries on July 8, 1985 (Attachment 5).

The Environmental Assessment process associated with this project has three major objectives which ultimately dictate an Environmental Management Plan:

1. Identifying specific impacts
2. Magnitude of impact
3. Mitigation of impact

As shown in the Plan of Exploration (Attachment 1) GEO Operator Corporation accomplished objectives #1 & 2, and suggested a direction for objective #3. Our proposal coupled with the BLM assessment, including conditions and stipulations attached thereto, makes the goal of properly addressing institutional concerns a realistic expectation. Therefore, GEOOC believes that the criteria outlined in Section 4.2, paragraphs A, B, and C have been satisfied.

4.3 Drilling

The purpose of the Core Hole Program is the development of baseline geophysical data to assist in evaluating the presence of and recovery potential of a geothermal resource in a virtually unexplored region. Existing surface and subsurface characteristics suggest that the Newberry Area would have geothermal capability.

Access to the sites will be via existing roads (Attachment 6) requiring no surface disturbance. Fugitive dust will be controlled as directed by the BLM, Conditions of Approval For Geothermal Drilling, Surface Protection Requirements (5, C) (Attachment 7).

Site preparation will conform to the requirements specified in the Plan of Exploration, Land Use & Reclamation (Attachment 1). Mitigation will include all measures specified in the Condtions of Approval for Geothermal Drilling, Surface Protection Requirements (Attachment 7).

The hole design will conform to the specifications outlined in the approved drilling permits from the BLM and Oregon Department of Geology & Mineral Industries (Attachments 3 & 4).

The drill rig will be a truck mounted rotary rig with a CP50 drill motor (diesel), exhaust driven turbo charged capable of drilling 4,000' core holes. The rig will be supplied by Tonto Drilling Services, 2701 West 900 South, Salt Lake City, Utah 84104.

Well control will be subject to the Conditions of Approval for Geothermal Drilling, Conditions 6 through 18 (Attachment 7).

Drilling fluids will be regulated in accordance with the Conditons of Approval for Geothermal Drilling, Condtion 5; subparagraphs d and e (Attachment 7).

Hole completion will be accomplished as specified in the Conditions of Approval for Geothermal Drilling (Attachment 7).

Plugging and abandonment shall be accomplished in accordance with the Conditions of Approval For Geothermal Drilling, Condition 18 (Attachment 7).

Site restoration shall be subject to the Conditions of Approval For Geothermal Drilling, Condition 5; subparagraphs a through e (Attachment 7), and the specifications contained in the approved Plan of Exploration (Attachment 1).

GEOOC does not anticipate any unusual problems impeding or preventing completion of the core holes.

All drilling and appurtenant operations shall be conducted in such a fashion that insures complicance with all pertinent federal and state health/safety standards. This will include, but not be limited to, adequate noise protection, safety equipment, traffic control, and regulated access on or near equipment. Environmental considerations will be closely monitored, and strict adherence to the Conditions of Approval For Geothermal Drilling will be mandatory to insure compliance with the approved Plan of Exploration.

No site facilities are anticipated for this phase of the project.

The first core hole (N-1) is proposed to be spudded August 19, 1985, and completion not to exceed 45 days thereafter. Snow fall will preclude the drilling of the second core hole (N-3) until June 1, 1986 (approximate). If this hole can be completed by August 15, 1986, we would be in a position to drill N-4 if necessary. This schedule satisfies the terms and conditions of the GEO-Newberry Unitization Agreement.

The Drilling Supervisor will be assigned by Tonto Drilling Services and will be responsible to the Project Manager or his designate. Geologist(s) associated with the drilling operation will be assigned by GEOOC's Chief Geologist (Dr. Walter Randall) with the concurrance of the Project Manager.

The DOE representative shall receive drilling reports in a timely fashion regarding well status and data recovery. Said reports will be disseminated by the Project Manager or his designate.

The comments contained herein respond to the specific questions contained under Section 4.3 (Drilling); paragraph A, and should meet the DOE criteria for the Approved Project Drilling Plan.

MJC:bc

PLAN OF EXPLORATION

NEWBERRY FLANK

(GEO-NEWBERRY)

DESCHUTES COUNTY, OREGON

Project Location

The following are the proposed locations for the Newberry Flank (GEO-Newberry) Core Hole Program:

- N-1: East Lake Quad

  3500' west and 2450' north of the southeast corner of Section 25, T22S, R12E.

- N-2: Paulina Peak Quad

  950' west and 2600' north of the southeast corner of Sec. 32, T21S, R12E.

- N-3: Pumice Butte Quad

  4100' north and 500' east of the southwest corner of Sec. 24, T20S, R12E.

- N-4: East Lake Quad

  1500' north and 2250' west of the southwest corner of Sec. 35, T21S, R13E.

Operations

The lessee/operator for the project will be:

- GEO Operator Corporation for GEO-Newberry
  2300 County Center Drive, #250
  Santa Rosa, CA 95401
  (707) 523-1272

Key personnel assigned to the project are:

- Chandler Swanberg (Project Manager)
  747 Middlefield Road
  Menlo Park, CA 94025
  (415) 321-4661

- Michael Dale (Senior Environmental Coordinator/Regulatory Liaison)
  2300 County Center Drive, #250
  Santa Rosa, CA 95401
  (707) 523-1272

- Michael Johnson (Project Geologist)
  2300 County Center Drive, #250
  Santa Rosa, CA 95041
  (707) 523-4272

Location of a field office will be provided when established.

Project Description

The core hole program is a low-key operation utilized in developing baseline geophysical data. This information is a preliminary step in evaluating resource recovery potential in a virtually unexplored region that suggests the presence of geothermal capability. The project will consist of the following:

- Preparation of up to four (4) drilling locations and mud pits (total area: 100' x 100' per site)
- Utilizing a truck-mounted rotary drill rig, the core holes will be drilled to a maximum depth of 4000'.
- Log temperatures and collect core samples.
- Rig down.
- Continue logging.
- Abandonment.
- The project should begin not later than July 1, 1985, and terminate November 1, 1986 (estimates).

Drilling Program

- Prepare drill location.
- Rig-up.
- Spud 5-5/8" diameter hole and drill to 400'.
- Record mud return temperature and collect core samples.
- Run 400' of 4-1/2" casing with cementing shoe.
- Install cementing head and pressure cement to fill annulus to surface.
- Cut off casing approximately 2' below ground level and install B.O.P.E. flange.
- Install 2" fill-up line and blowdown line below flange.
- Install B.O.P.E. equipment.

- Wait 24 hours for cement to set; lower one joint of drill pipe into hole; close preventer and test to 300 psi.
- After completing successful B.O.P.E. test, drill out shoe and continue drilling with mud system to T.D.
- Record temperatures of mud returns and collect cores to T.D.
- When T.D.is reached circulate to clean out cuttings and condition hole.
- Run bull-plugged string of 2-3/4" tubing to T.D. and fill with water.
- Backfill annulus with Sure-Gel or equivalent.
- Remove B.O.P.E. and wellhead.
- Install locking cap on tubing.
- Rig-down and remove drill rig, support vehicles, and materials from site.
- Backfill mud pits and grade to original contour.
- Clean area of debris and restore to (as near) original condition.
- Run temperature and gamma-ray logs at least twice (1 month interval) prior to final abandonment.

Environmental

Pursuant to the Geothermal Resources Operational Orders, issued under the Geothermal Steam Act of 1970, the lessee shall be responsible for the monitoring of readily identifiable localized impacts associated with specific activities that are under the control of the lessee (GRO Order 4. General Environmental Protection Requirements).

Specific impacts that may be associated with this project, and mitigation measures proposed to reduce said impacts to a level of insignificance are as follows:

- Aesthetics

  Compatibility with the existing view shed is a primary goal. The short-term duration of each drilling operation (30-45 days) coupled with the low profile of a truck-mounted rotary drill rig (50'± to top of mast) ensure that visual intrusion will not be significant. Additionally, sites have been selected that are well removed from populated areas and traditional recreation centers in the Deschutes/Newberry region.

- Land Use and Reclamation

  The project has been designed to reduce vegetation impacts to a minimum. Access will be via the existing road network to the pad location. The pad area will require only clearing and grading in area approximately 100' x 100'. When the project terminated, the area will be graded to as near the original contour, and revegetated with similar vegetation species as directed by BLM. Aquatic

habitat will not be impacted, and water will only be secured as directed by the State Watermaster. At project termination, all debris, scrap, or other materials imported by the operator shall be removed.

The project proposed by GEO Operator Corporation meets the criteria for exploration and development of a managed resource as defined by the United States Department of the Interior. Additionally, the project is compatible with the Deschutes County Geothermal Element as incorporated into the Deschutes County Comprehensive Plan and Zoning Ordinance.

- Public Access/Recreational Opportunities

The short duration of each drilling operation, minimal amount of surface area required, and isolated location ensure that public access will be maintained, and that recreational value of the Deschutes/Newberry area will not be adversely impacted.

- Slope Stability/Erosion Control

The project is so designed that with maximum surface disturbance, slope stability could not be an issue. Mud pits are constructed to a standard that alleviates the potential of encroachment on a natural drainage course, or deposition of sediment/drilling waste into a waterway. As previously described, at project termination, the sites will be regraded to as near the original contour, and revegetated with native species as required by BLM.

- Biota

A core drilling project does not have the potential (long-term) to adversely impact the associated flora and/or fauna (terrestrial or aquatic). The drilling operation could temporarily inconvenience some species, particularly avian raptors, causing a minor alteration in migration and/or hunting habits. Historically, these types of operations have not produced any noticeable adverse impact to biota.

- Cultural Resources

In the event a cultural or historic resource is located on or near any of the drill sites, the location will be shifted, under the direction of BLM, to preserve the integrity of the resource. As a core drilling program is designed to incorporate maximum flexibility, at the discretion of the permitting agency, avoidance of any area of significant value is easily accomplished.

- Subsidence and Seismicity

Concerns regarding geothermal resource production would not be an issue during a core drilling program.

- Air Quality

The project as proposed does not have the potential to adversely impact ambient air quality.

- Pits and Sumps

  During the core drilling operation, waste material (cuttings/drilling medium) will be directed to a waste sump for containment. The sumps will be constructed and lined with an impervious material to ensure the integrity of the natural environment, and eliminate the potential of contaminants entering a drainage course or waterway. At the conclusion of the drilling operation, the sumps will be purged as directed by the BLM prior to backfilling. As part of site restoration, the sumps/pads will be regraded to as near the original contour and revegetated per BLM requirements.

- Water Quality

  The project, as defined, does not have the potential to degrade water quality.

- Noise

  Due to the isolated locations proposed and the nature of the equipment involved, the project will not impact on any human receptors. Intrusion by humans in a remote area may have the ability to disrupt some wildlife species, particulary avian raptors, which rely on a keen sense of hearing to locate and secure a food source. However, the limited scope of the project adequately mitigates significant short-term, and precludes any long-term impact from occurring.

It is the position of GEO Operator Corporation that the project, as proposed, does not have the potential to produce any significant long-term environmental impacts. Utilizing Best Management Practices and conditions proposed by BLM, short-term effects will be reduced to a level of insignificance.

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

Form Approved.
Budget Bureau No. [illegible]

GEOTHERMAL DRILLING PERMIT

U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in [illegible] with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to [illegible] operation.

1. LEASE SERIAL NO.: [illegible]

2. SURFACE MANAGER: BLM ( ) FS (X) Other ( )

TYPE OF WORK: DRILL NEW WELL ( ) REDRILL ( ) DEEPEN ( ) PLUG BACK ( ) DIRECTIONALLY DRILL ( ) OTHER (X)

UNIT AGREEMENT NAME: Newberry Flank (GEO Newberry)

WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) WATER SUPPLY ( ) OTHER (X)

WELL NO.: N-1

PERMIT NO.: [illegible]

WELL STATUS: Core Hole to be drilled. No existing wells

NAME OF LESSEE/OPERATOR: GEO Operator Corporation (GEO-Newberry)

FIELD OR AREA: Newberry

ADDRESS OF LESSEE/OPERATOR: 2300 County Center Dr. #250 Santa Rosa, CA 95401

SEC., T., R., B.& M.: 25 22S 12E

LOCATION OF WELL At surface: 3500' West & 2450' North of the Southeast corner of Sec 25, T22S, R12E

At proposed prod. zone: N/A

COUNTY: Deschutes

DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE: 2.5 miles south of inner southern boundary of unit

STATE: Oregon

DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE: 6.5 miles from N-2 (350' West & 2600' North of the Southwest corner of Sec 14, T20S, R12E)

APPROX. STARTING DATE: July 85

[illegible] WELL SPACING: N/A

DRILLING [illegible]: [illegible] ( ) [illegible] (X) [illegible] ( )

PROPOSED DEPTH: [illegible] 4,000'

ELEVATIONS, ESTIMATED OR FINAL: 5850'

[illegible] DATUM: [illegible] ( ) [illegible] ( ) [illegible] ( ) [illegible] ( ) [illegible] ( ) [illegible] ( ) [illegible] ( )

[illegible] PROPOSED CASING AND CEMENTING PROGRAM [illegible]

Size of Hole	Size of Casing	Weight per Foot	Coupling (Fittings, Threads)	Grade	Setting Depth Top	Setting Depth Bottom	Quantity of Cement
5-5/8"	4½"	7.7#	Diamond Drill Flush Joint 3 threads/in.	J-120	Surf	400'	25 cu.ft.
3-7/8"	2-3/4"	4.4#	Flush Joint	J-55	Surf	4,000'	14.7 cu.ft. Shur-Gel

PROPOSED WORK [illegible]

Refer to attached Drilling Program.

(Use additional space on reverse side of form)

[signature]

NAME: Michael [illegible] TITLE: [illegible] Environmental Coordinator DATE: 3-26-85

[illegible] FOR FEDERAL USE

APPROVED BY ______ TITLE ______ DATE ______

CONDITIONS OF APPROVAL, IF ANY:

See Instructions on reverse side

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

GEOTHERMAL DRILLING PERMIT

U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in [illegible] with requisite attachments with the Supervisor. The Supervisor must approve this permit prior to lease operation.

Type of work: Drill new well ( ) [illegible] ( ) Deepen ( ) Plug back ( ) Directionally drill ( ) Other (X)

Well type: Production ( ) Injection ( ) Heat exchange ( ) Observation ( ) Water supply ( ) Other (X)

Surface managed: BLM ( ) FS (X) Other ( )

Unit agreement name: Newberry Flank (GEO Newberry)

Well no.: N-3

Permit no.:

Well status: Core hole to be drilled. No existing wells

Field or area: Newberry

Name of lessee/operator: GEO Operator Corporation (GEO-Newberry)

Sec., T., R., B.& M.: 24 20S 12E

Address of lessee/operator: 2300 County Center Dr. #350 Santa Rosa, CA 95401

Location of well at surface: 4100' North & 500' East of the Southwest corner of Sec 24 T20S, R12E

At proposed prod. zone: N.A.

County: Deschutes

Distance from proposed location to nearest property or lease line: 1.2 miles south of outer northern boundary of unit

State: Oregon

Distance from proposed location to nearest well, drilling, completed, or applied for on this lease: 3 miles from N-2 (350' West & 2500' North of the Southeast corner of Sec 32, T21S, R12E

Approx. starting date: July 1985

[illegible]: N.A.

Drilling fluid and characteristics: Air ( ) Mud (X) Foam ( ) Other ( )

Proposed depth: Measured: 4000'

True vertical: [illegible]

Elevations: Estimated [illegible]: [illegible]

Reference datum: [illegible]

Describe casing program. Size of hole, size of casing, weight per foot, coupling, grade, setting depth, quantity of cement:

Size of hole	Size of casing	Weight per foot	Coupling (Welded & threaded)	Grade	Setting depth Top	Setting depth Bottom	Quantity of cement
5-5/8"	4½"	7.7#	Diamond Dril Drill Flush Joint 3 threads/in.	A-120	Surf	400	25 cu. ft.
3-7/8"	2-3/4"	5.4#	Flush Joint	J-55	Surf	4,000	14.7 cu. ft. [illegible]

Proposed work program:

Refer to attached Drilling Program.

M. Michael J. Gale

Name: Michael J. Gale Title: Sr. Env. Coordinator Date: 3-25-85

Approved by ______________________ Title ______________________ Date ______________________

Conditions of approval, if any:

This permit is required by law (30 U.S.C. 1001), regulations (30 CFR 270.71), Federal Geothermal Lease Terms and Stipulations and other regulatory [illegible]. The United States Criminal Code (18 U.S.C. 1001) makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

(See instructions on reverse side)

Mike Cale

United States Department of the Interior

IN REPLY REFER TO:

BUREAU OF LAND MANAGEMENT
District Office
P.O. Box 550
Prineville, Oregon 97754

3200

July 29, 1985

Dear Interested Party:

By letter of June 25, 1985, we sent you a copy of an Environmental Assessment and a preliminary finding that an EIS was not required for a proposal to drill temperature gradient holes on the Fort Rock Ranger District of the Deschutes National Forest. As a follow-up to that letter, we are now sending you copies of the final finding that an EIS is not required and the decision record with attached conditions for approval of the plan of operations and drilling permit.

These documents are also being sent to the BLM Oregon State Office with the recommendation that the drilling permits be issued for the three temperature gradient holes. The conditions of approval attached to the decision record will be attached to and made a part of the drilling permit. These drilling permits will be issued by the BLM Deputy State Director for Mineral Resources.

Please call this office (503) 447-4115, if you have questions or comments. Thank you for your continuing interest in the management of our federal resources.

Sincerely yours,

Gerald E. Magnuson
District Manager

Enclosure

Attachment "2"

Finding of No Significant Impact

Proposal to Drill Three Temperature Gradient Holes in Newberry Flank Unit

The Deschutes Resource Area, Prineville District, Bureau of Land Management, and the Fort Rock Ranger District, Deschutes National Forest have analyzed a proposal to drill three (3) 4,000 foot temperature gradient holes on the Fort Rock Ranger District.

The proposal, an alternative, site specific lease stipulations, special stipulations proposed for use under both alternatives, and the environmental consequences were described in Environmental Assessment No. OR-050-5-19. Operations and impacts under a geothermal lease were previously considered in detail in the Non Competitive Geothermal Leasing Environmental Assessment prepared by the staff of the Deschutes National Forest with cooperation by the BLM.

The proposal with the required site specific lease stipulations, and the special stipulations will assure that no significant impacts would occur to the human environment.

This finding is based upon the following reasons:

1. Surface impacts of temperature gradient hole drilling are temporary in nature and total surface restoration can be accomplished.

2. No road construction is proposed.

3. Many similar drill-holes have been drilled during the past ten years on the Ranger District and the results of these holes reassure us that the proposed stipulations are more than adequate to protect the other resources.

4. East and Paulina Lakes would not be affected by the type of proposed drilling.

5. No activity will take place within the KGRA or the crater area.

6. All drill hole locations would be sited on previously disturbed ground unless the Forest Service requests siting on undisturbed ground.

Determination

On the basis of the information contained in the EA, and all other information available to me as summarized above, it is my determination that when the special stipulations are included, the proposed action does not constitute a major Federal action affecting the quality of the human environment. Therefore an Environmental Impact Statement is unnecessary and will not be prepared.

Approved: _____ 7/25/85

Gerald E. Magnuson
District Manager
Prineville District
BLM, USDI

Date

I concur: _____ 7/29/85

David Monla
Forest Supervisor
Deschutes National Forest
U.S. Forest Service, USDA

Date

DECISION RECORD

Regarding a proposal by GEO Operator Corporation to drill temperature gradient wells in the Newberry Flank Unit.

I have carefully reviewed the USFS Noncompetitive Geothermal Leasing EA, the Environmental Assessment OR-050-5-19, and the Finding of No Significant Impact, as they relate to the proposed drilling activities within the Newberry Flank Unit on the Fort Rock Ranger District of the Deschutes National Forest.

My decision is to implement the preferred alternative and thereby approve the Plan of Exploration and recommend issuance of the three requested drill holes. This implementation includes the use of the Special Lease Stipulations already attached to issued leases and the special conditions shown on the attachment to this decision record.

This decision will be implemented by a letter of approval to GEO Operator Corporation and by issuance of the requested drill permits by the Deputy State Director for Mineral Resources, BLM Oregon State Office.

Gerald Magnuson — 7/25/85

Gerald Magnuson
District Manager
Prineville District
Bureau of Land Management, USDI

Date

I concur:

David Mohla — 7/29/85

David Mohla
Forest Supervisor
Deschutes National Forest
U.S. Forest Service, USDA

Date

Conditions of Approval for Geothermal Drilling

Permit No. OR-920-85-DNB-001
Well No. N-1
GEO Operator Corp.
Federal Lease OR 12442 (T. 22 N., R. 12 E., Sec. 25)
Deschutes National Forest
Deschutes County, Oregon

General

A. This hole is for determining stratigraphy, a temperature gradient and geophysical information, or other information approved by the Authorized Officer and cannot be used to produce or flow test geothermal resources.

B. Unless otherwise directed by the Authorized Officers, Deputy State Director for Minerals/District Manager or their designated representative, the lessee/operator shall comply with the following minimum requirements: (Waivers may be granted by the Authorized Officer whenever the lessee/operator can demonstrate on a site or project specific basis that some alternative method will satisfy the interest to protect life, property and the environment.)

1. All operations must be conducted in accordance with:

   a. Terms and conditions noted in the approval letter dated _____ for the Plan of Exploration.

   b. Special Lease Stipulations.

2. A copy of this permit No. OR-920-85-DNB-001 with attached conditions, GRO orders and approved drilling program with all subsequently approved amendments (Sundry Notices) shall be retained at the well site for reference.

3. Variances from the approved Plan of Exploration or well program must be approved in advance by the Authorized Officer or his/her representative.

4. The Authorized Officer shall be contacted prior to actual entry onto the land. Contact shall be made as noted in Item 20 below.

Surface Protection Requirements

5. a. Operator will remove the minimum amount of vegetative cover necessary for safe operations and as directed by the Authorized Officer's designated representative.

b. Prior to operations, the operator will develop a fire plan in cooperation with the Fort Rock District Ranger and submit to an equipment inspection in order to comply with State Fire Laws and approved muffler, spark arrester, and other fire equipment requirements as outlined in Eastside Fire Protection and Suppression.

c. Operator will monitor the condition of access roads. The roads will be watered as needed as determined by the Fort Rock District Ranger. On completion of drilling, all necessary measures will be taken to restore roads to original condition.

d. Drilling fluids or cuttings shall not be discharged onto the surface where such discharge will contaminate lakes and perennial or intermittent streams. Drilling mud will be disposed of either by hauling to an approved sanitary land fill or other locations or as approved by the Authorized Officer.

e. Unattended sumps shall be completely fenced to protect the public, domestic animals and wildlife.

Surface Casing

6. The plan of operations and drilling permit application call for 400 feet of surface casing to be cemented to the surface. If it becomes necessary to set more than 400 feet of surface casing, the bottom hole temperature shall be taken, and before deepening the hole, the Authorized Officer shall be contacted for concurrence. Remedial cementing will be required if the original cementing job is not adequate.

Blowout Prevention Equipment (BOPE)

7. Blowout Prevention Equipment and auxiliary support equipment shall be properly installed, frequently tested and shall at least include either annular BOPE and full opening gate valve or a pipe ram/blind ram BOPE, acceptable to the Authorized Officer.

8. The BOPE shall be pressure tested when installed, before drilling out the shoe of the surface casing or any intermediate casing strings, and immediately following any repairs or operations that require disconnecting a pressure seal in the assembly. BOPE shall be tested to 500 p.s.i. with no more than a 10% decrease in pressure for 30 minutes. In the even that a pressure test cannot be conducted following the reconnection of a pressure seal, the BOPE shall be actuated to test for proper functioning.

9. A kill line shall be installed below the BOPE, leading directly to the mud pumps, and be fitted with a valve through which cement could be pumped, if necessary.

10. A choke line with an adjustable choke (sometimes called blowdown line) shall be installed below the BOPE. The choke line shall be placed in such a manner as to permit containment of displaced fluids and to minimize any safety hazard to personnel. (Properly tied down at the ends and bends).

11. BOPE shall have manually operated gates and hydraulic actuating systems and accumulators of sufficient capacity to close all of the hydraulically-operated equipment and have a minimum pressure of 69 bars (1,000 p.s.i.) remaining on the accumulator. Dual control stations shall be installed with a high pressure (N) backup system. One control panel shall be located at the driller's station and one control panel shall be located on the ground, at least 15 meters (50 feet) away from the wellhead.

12. During drilling operations, BOPE shall be actuated to test proper functioning as follows:

    a. One each trip for blind and pipe rams but not less than once each day for pipe rams; and

    b. At least once each week on the drill pipe for expansion-type preventers, and at least once each week for full opening gate valve.

Related Well Control Supplies and Equipment

13. a. A full opening drill string safety valve in the open position shall be maintained on the rig floor at all times while drilling operations are being conducted.

    b. Prior to core drilling, a test shall be conducted to determine if the hydraulic chuck will be adequate for shutting in the well should problems arise during core retrieval. If not adequate, a drill pipe safety valve or wireline BOP will be required.

    c. An adequate supply of drilling fluid and lost circulation and weighting materials shall be at the drillsite to cure significant lost circulation problems or abnormal formation pressures or water entries which may be encountered.

14. Hydrogen Sulphide Detectors

A strategically placed and properly functioning hydrogen sulphide (H_2S) indicator and alarm system shall be emplaced at the drill site. This must include: a) At least two H_2S detectors with audio and visual alarms set no higher than 20 ppm and preferably at 10 ppm; b) At least one windsock type streamer prominently and strategically placed to display wind direction.

15. Temperature Monitoring and Mud Requirements

a. During drilling operations, inlet and outlet temperatures shall be recorded either hourly or at 30 ft. (9m) intervals.

b. When drilling without the return of drilling fluid to the surface, the unstabilized bottom hole temperature (BHT) shall be recorded at a minimum of 100 ft. (30m) intervals. Should the BHT reach 125 degrees F (52 degrees C) and later 175 degrees F (79 degrees C), the recording intervals shall be decreased to 50 ft. (15m) and 30 ft. (9m) respectively. (Actual required intervals may be slightly shorter or longer, to coincide with core runs.)

c. If a 175 degree F (79 degree C) circulating temperature is reached while drilling, further drilling shall stop immediately and the hole will be either:

(1) Equipped with mud cooling equipment to maintain the return flowline temperature at or below 175 degrees F (79 degrees C). If approved by the Authorized Officer, drilling may then be resumed;

(2) Reviewed by the Authorized Officer as to the adequacy of on-site drilling equipment and supplies to control the temperature and pressure and if approved, drilling may be resumed.

(3) Completed as an observation hole by cementing steel tubing from total depth to surface; or

(4) Abandoned by cementing from total depth to surface.

d. If a 212 degree F (100 degree C) BHT is reached while drilling without return of drilling fluids to the surface, the lessee shall immediately stop drilling and the hole will then be either completed as a c(3), abandoned as in c(4), or if approved by the Authorized Officer the hole may be deepended if an adequate supply of cold water to pump downhole to

prevent flaring is maintained on-site. The amount of water will be determined during drilling, when the water losses are better known. At a minimum, 2000 gallons of cold water, and means to replenish this supply must be maintained on site.

e. High/low mud pit level indicators will not be required if mud pits can be visually monitored by driller during drilling operations. Desilters and desanders are not required.

16. Witnessing BOPE Testing and Cementing Jobs

The Authorized Officer, or his/her designated representative, shall be given the opportunity to witness all BOPE pressure tests, and cementing jobs. At least a 24 hour notice will be given prior to actual cementing and BOPE pressure testing. Contact can be made as noted in Item 20 below.

17. Reports

a. Throughout the duration of drilling operations, drilling reports to the Authorized Officer shall be made on Monday, Wednesday, and Friday mornings before 9:00 AM. The reports should include bottom hole depth, and significant temperatures encountered, e.g. in and out-flow temperatures, the last bottom hole temperature, if drilling without returns, the last few temperatures taken and any significant general information, problems or unusual encounters. They will be phoned in to Dennis Davis in the BLM, Prineville District Office (see Item 20 for phone numbers) or if unavailable, his alternate.

b. All information submitted that is to be held proprietary should be clearly noted or labeled. If the Authorized Officer concurs, all such information shall be kept proprietary according to 43 CFR 3164.5.

c. All reports after completion of drilling are to be submitted to the BLM Deputy State Director for Mineral Resources, P.O. Box 2965, Portland, Oregon 97208. Duplicate copies of any drilling completion, temperature and other downhole survey reports and logs, lithology, depths of any waters encountered, and drill hole location, shall be submitted to the Authorized Officer and to the Oregon Dept. of Geology and Mineral Industries within 30 days of reaching total depth. Subsequent temperature logs are due 30 days after logs are run. The abandonment report is due 30 days after abandonment.

d. The completion/abandonment report shall contain a copy of the approved Geothermal Drilling Permit; and the following information for the hole drilled:

1. A final hole designation and location;

2. A driller's log or well history that notes the depths to the water table and other water aquifers, and to any other mineral deposits (salt, coal, etc.) encountered;

3. The method of completion, including cementing, and casing or tubing used with wellhead components. The completion method may be presented by engineering drawings;

4. Complete details of the abandonment procedures;

5. Any information on drilling difficulties or unusual circumstances encountered with would be helpful in assuring future safety of operations or protection of the environment in the area concerned; and

6. All temperature data and other logs or surveys run for the hole surveyed, if not prevously submitted in writing.

18. Plugging and Abandonment

The downhole abandonment program must be designed and implemented to prevent intersonal migration of fluids. If no lost circulation or no abnormal formation pressures or water entry problems are evident, final abandonment may be done by either placing a 50 ft. (15m) cement plug across the shoe of the casing and plugging the hole with cement from 10 ft. (3m) to the surface or in such other manner as is approved by the Authorized Officer.

19. Modifications in Plan of Operations/Drilling Permit

Any proposed modifications in the proposed plan of operations and/or drilling permit with respect to approved operations, approved casing, cement, BOPE, and other equipment, shall be submitted to the Authorized Officer for approval. Adequate lead time should be given so that operations can resume as soon as possible.

20. For operational matters and in case of emergency, call the following designated representative in the order listed:

a.	Dennis Davis, Inspector Bend	Day (503) 447-4115 Night (503) 382-3440
b.	Dennis Simontacchi, Inspector Lakeview	Day (503) 947-2177 Night (503) 947-2355
c.	Gerald E. Magnuson District Manager, Prineville	Day (503) 447-4115 Night (503) 447-3022
d.	Pat Geehan Deputy State Director for Mineral Resources, Portland	Day (503 231-6812 Night (503) 654-5166

IN REPLY REFER TO
3262.4 (920)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

OREGON STATE OFFICE
P.O. Box 2965 (825 NE Multnomah Street)
Portland, Oregon 97208

July 31, 1985

Michael J. Cale
Senior Environmental Coordinator
GEO Operator Corporation
2300 County Center Dr. Suite 250
Santa Rosa, CA 95401

Dear Mr. Cale:

I am pleased to inform you that your Plan of Exploration for drilling of three temperature gradient/core holes (Holes N-1, N-3, and N-4) in the Newberry Flank Unit is hereby approved. The approved Geothermal Drilling Permit (Permit No. OR-920-85-DNB-001) for hole N-1 is also enclosed.

These approvals were made after completion of an Environmental Assessment (EA-OR-050-5-19), from which protective requirements were developed in consultation with the Deschutes National Forest. The protective requirements were also coordinated with the Oregon Department of Geology and Mineral Industries, which also regulates drilling, to avoid duplication and to ease the regulatory burden on your operations. All operations must be conducted in accordance with the Geothermal Steam Act of 1970, applicable regulations, GRC orders, lease terms, and special lease stipulations.

Barring any unforeseen difficulties, we expect that approval of the subsequent drill holes should proceed smoothly. The approval process will begin after we receive notification from you as to which hole you plan to drill next and when you plan to commence drilling. It is therefore in your best interest to provide us with that information as early as possible.

We wish you well in your exploration efforts and thank you for your cooperation and good communication throughout the environmental and drilling permit review processes.

Sincerely,

Patrick H. Deehan
Deputy State Director
for Mineral Resources

1 Enclosures
Encl. 1 - Geothermal Drilling Permit NO. OR-920-85-DNB-001

cc:
District Manager, Prineville w/encl.
Supervisor, Deschutes National Forest w/encl.
State Geologist, DOGAMI w/encl.
Herb Maciolek, California State Office 954
Carlin Jackson, USFS, Region 6 w/encl.

Attachment "3"

Form Approved.
Budget Bureau No. 42-R1425

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY, CONSERVATION DIVISION

SUNDRY NOTICES AND REPORTS ON WELLS

U.S. Geological Survey requires this form or other Supervisor approved form to be prepared and filed in triplicate with regulatory requirements with the Supervisor. The Supervisor must approve this permit prior to lease operations.

5. LEASE SERIAL NO.:

6. SURFACE MANAGEMENT AGENCY: USFS (X) BLM ( ) OTHER ( )

7. UNIT AGREEMENT NAME: Newberry Flank(GEO Newberry)

TYPE OF WORK: DRILL NEW WELL ( ) REDRILL ( ) DEEPEN ( ) PLUG BACK ( ) DIRECTIONALLY DRILL ( ) OTHER (X)

WELL TYPE: PRODUCTION ( ) INJECTION ( ) HEAT EXCHANGE ( ) OBSERVATION ( ) WATER SUPPLY ( ) OTHER (X)

8. WELL NO.: N-1

9. PERMIT NO.:

WELL STATUS:

NAME OF LESSEE/OPERATOR: GEO Operator Corporation (GEO-Newberry)

10. FIELD OR AREA: Newberry

ADDRESS OF LESSEE/OPERATOR: 2300 County Ctr. Dr. S=250 Santa Rosa, CA 95401

11. SEC., T., R., B. & M.: 25 22S 12E

LOCATION OF WELL
At surface: 3500' West & 2450' North of the Southeast corner of
At proposed prod. zone: N/A Section 25, T22S, R12E

12. COUNTY: Deschutes

DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE: 2.5 miles South of Inner Southern Boundary of Unit

13. STATE: Oregon

DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETED, OR APPLIED FOR ON THIS LEASE: 6.5 miles from N-2

14. APPROX. STARTING DATE: Aug 85

16. NO. OF ACRES ASSIGNED TO THIS WELL (SPACING): X

17. NO. OF ACRES ASSIGNED TO THIS WELL: X

18. PROPOSED DEPTH: 4,000'

20. ELEVATIONS: ESTIMATED (X) FINAL ( ): 5850'

ROTARY OR CABLE TOOLS: ROTARY (X) CABLE ( )

APPROX. DATE WORK WILL START: Aug 85

23. PROPOSED CASING AND CEMENTING PROGRAM

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	SETTING DEPTH (QUANTITY & DESCRIPTION)	GRADE	TYPE	SETTING DEPTH SECTION	QUANTITY OF CEMENT
6-5/8"	4½"	10.7#	Diamond Drill Flush Joint 3 threads/IN	A-53	Surf	400'	25 cu.ft.
3-7/8"	2-7/8"	6.4#	Flush Joint	J-55	Surf	4,000'	147 cu.ft. Shur-Gel

24. PROPOSED WORK SCHEDULE

Per Drilling Program as submitted.

(Use additional space on reverse side if necessary)

SIGNED: Michael L. Cole TITLE: Sr. Environmental Coordinator DATE: 7-24-85

(This space for Federal or State office use)

APPROVED BY: [signature] TITLE: Deputy State Director for Mineral Resources DATE: 7-31-85

CONDITIONS OF APPROVAL, IF ANY: "APPROVED SUBJECT TO THE ATTACHED CONDITIONS"

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 Reverse Side

Attachment "4"

Page 1

VICTOR ATIYEH
GOVERNOR

Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE
1005 STATE OFFICE BLDG., PORTLAND, OREGON 97201 PHONE (503) 229-5580

July 8, 1985

Michael J. Cale
GEO Operator Corporation
2300 County Center Dr., Suite 250
Santa Rosa, CA 95401

Dear Mike:

Enclosed are GEO Operator's permits, effective July 8, 1985 for the drilling of geothermal wells, Permits 118 and 119, Well Nos. N-1 and N-3, in Deschutes County. The January 1984 stipulations approved by the State Geologist are conditions of these permits.

Please call the Prineville office of the Bureau of Land Management (503-447-4115) to arrange for inspection of the blow-out prevention equipment.

In addition, if any trees are removed, the sites will need to be replanted upon abandonment of the wells.

If we can be of assistance, let us know.

Sincerely,

Dennis L. Olmstead
Petroleum Engineer

DLO:ak

Enclosure

Attachment "5"

6/83

Permit No. 118
API No. 36-017-90013

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

1005 State Office Building Portland, Oregon 97201

APPLICATION FOR PERMIT TO DRILL A GEOTHERMAL WELL
(To be accompanied by a $100.00 permit fee for new wells only and a surety bond conditioned as provided by law.)

DATE 5-01-85

In compliance with rules and regulations pursuant to ORS 522 (Chapter 552 OL 1975) application is hereby made for permit to drill a geothermal well: GEO Operator Corp. for GEO-Newberry Crater, Inc. (company or operator) (lease) Newberry Flank

Well No. N-1 in _____ of sec. 25, T. 22 S, R. 12E W.B.&M.,

Newberry Field, Deschutes County.

Survey Coordinates 3500' west and 2450' north of the southeast corner of Section 25.

Elevation of ground above sea level is 5860'(GR) feet. All depth measurements are taken from top of _____, which is _____ above ground.

Lessee GEO-Newberry Crater Inc./GEO Operator Corporation

Address 545 Middlefield Road, Suite 200, Menlo Park, CA 94025

Lessor Department of the Interior, Bureau of Land Management

Address 825 NE Multnomah St., Portland, Oregon 97208

RECEIVED · PTLD
MAY 7 1985
DEPT OF GEOLOGY & MINERAL INDUSTRIES

We propose to use the following strings of casing and to land or cement them as herein indicated:

Size of hole	Size of casing	Weight in pounds per foot	Grade and type	New or second hand	Depth	Landed or cemented No. sacks cement
5 5/8"	4½"	7.7#	A-120	NEW	Surf to 400'	25 CU FT
3 7/8"	2 3/4"	6.4#	J-55	NEW	Surf to 4000'	147 CU FT
						CEMENT

Proposed Depth 4000' Objectives Obtaining core samples/temperature

Approved July 5, 19 85
except as follows:
The January 1984 stipulations approved by the State Geologist are conditions of this permit.

DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
By _____
Petroleum Engineer

GEO Operator Corporation
company or operator
By Michael J. Cale
Michael J. Cale
position Environmental Coordinator

Send communications regarding well to:
Name Michael J. Cale
Address 2300 County Center Drive Suite 250
Santa Rosa, CA 95401

NOTE: This permit expires 180 days from date of issue. Land use approval must be obtained from the county or city in which the drilling takes place. Issuance of this permit is not a finding of compliance with the Statewide Planning Goals or the acknowledged comprehensive plan.

6/83

Permit No. 119
API No. 36-017-90014

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

1005 State Office Building Portland, Oregon 97201

APPLICATION FOR PERMIT TO DRILL A GEOTHERMAL WELL
(To be accompanied by a $100.00 permit fee for new wells only and a surety bond conditioned as provided by law.)

DATE 5-1-85

In compliance with rules and regulations pursuant to ORS 522 (Chapter 552 OL 1975) application is hereby made for permit to drill a geothermal well: GEO Operator Corp. for GEO-Newberry Crater, Inc.. (company or operator) (lease) Newberry Flank

Well No. N-3 in _____ of sec. 24, T. 20S, R. 12E W.B.&M.,

_____ Field, _____ County.

Survey Coordinates 4100' north and 500' east of the southwest corner of Section 24.

Elevation of ground above sea level is 5750'(GR) feet. All depth measurements are taken from top of _____, which is _____ above ground.

Lessee GEO-Newberry Crater Inc./GEO Operator Corporation

Address 545 Middlefield Road, Suite 200, Menlo Park, CA 94025

Lessor Department of the Interior, Bureau of Land Management

Address 825 NE Multnomah St., Portland, Oregon 97208

RECEIVED - PTLD
MAY 7 1985
DEPT. OF GEOLOGY & MINERAL INDUSTRIES

We propose to use the following strings of casing and to land or cement them as herein indicated:

Size of hole	Size of casing	Weight in pounds per foot	Grade and type	New or second hand	Depth	Landed or cemented No. sacks cement
6 5/8"	4½"	7.7#	A-120	NEW	surf to 400'	25 CU FT.
3 7/8"	2 3/4"	6.4#	J-55	NEW	surf to 4000'	147 CU FT. CEMENT

Proposed Depth 4000' Objectives Obtaining core samples/temperature

Approved July 9, 1985 except as follows:

The January 1984 stipulations approved by the State Geologist are conditions of this permit.

DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
By _____
Petroleum Engineer

GEO Operator Corporation
company or operator
By Michael J. Cale Senior Environmental
Michael J. Cale position Coordinator

Send communications regarding well to:

Name Michael J. Cale

Address 2300 County Center Drive Suite 250

Santa Rosa, CA 95401

NOTE: This permit expires 180 days from date of issue. Land use approval must be obtained from the county or city in which the drilling takes place. Issuance of this permit is not a finding of compliance with the Statewide Planning Goals or the acknowledged comprehensive plan.

January 1984

STIPULATIONS WHICH APPLY TO GEOTHERMAL DRILLING PERMITS

1. The operator of a geothermal well must keep a daily record of work, collect drill samples, and maintain a log of rock formations penetrated.

2. If redrilling, deepening, altering of casing, testing or plugging is planned, notice must be given to the Department on Form 5, "Miscellaneous Notices and Reports on Geothermal Wells." Approval or disapproval can be given by phone but work approved in this way must still be proposed in writing by the operator.

3. Well summary (Form 8), well history, representative drill samples and copies of borehole surveys must be submitted to the Department within 60 days after completion, abandonment, or suspension. These records will be kept confidential for a four-year period from date of completion, abandonment, or suspension.

4. In the event of an emergency or blow-out, a Department representative should be contacted as soon as possible:

Dennis L. Olmstead - Petroleum Engineer	(503) 229-5580 office (503) 231-3835 home
William L. King - Petroleum Geologist	(503) 229-5580 office (503) 644-9331 home
Donald A. Hull - State Geologist	(503) 229-5580 office (503) 281-4895 home
John D. Beaulieu - Deputy State Geologist	(503) 229-5580 office (503) 234-6323 home

5. Permission must be obtained from the State Department of Environmental Quality (DEQ) for any extraordinary offsite disposal of drilling mud or wastes or any other emergency that could affect adjoining properties.

6. No fluid shall be discharged unless a permit has been issued by the State DEQ.

7. Notice is to be given to the State Geologist or his representative:
   a. Prior to construction of drill site and sump.
   b. ~~Prior to BOP tests after running casing strings.~~
   c. ~~Prior to performing work to complete or abandon a well.~~
   d. Prior to pulling casing strings.
   e. Prior to deviating a well from the vertical.
   f. In the event of fire, spill of fluids, or serious accident.

8. Unless the surface owner wants the drilling pad to be left, the site is to be restored to as near original condition as is practical, including revegetation using native species. Recommended seed mixture can be obtained by calling the Department of Fish and Wildlife at (503) 229-5679.

9. This permit does not include land-use approval. A separate approval should be obtained from the county or city in which the drilling takes place.

10. The State Geologist or his representative may enter the site at any time to make inspections and/or witness work done.

11. Release of the bond will be granted following proper plugging of the hole, restoration of the drill site, and filing of the required records.

Conditions of Approval for Geothermal Drilling

Permit No. OR-920-85-DNB-001
Well No. N-1
GEO Operator Corp.
Federal Lease OR 12442 (T. 22 N., R. 12 E., Sec. 25)
Deschutes National Forest
Deschutes County, Oregon

General

A. This hole is for determining stratigraphy, a temperature gradient and geophysical information, or other information approved by the Authorized Officer and cannot be used to produce or flow test geothermal resources.

B. Unless otherwise directed by the Authorized Officers, Deputy State Director for Minerals/District Manager or their designated representative, the lessee/operator shall comply with the following minimum requirements: (Waivers may be granted by the Authorized Officer whenever the lessee/operator can demonstrate on a site or project specific basis that some alternative method will satisfy the interest to protect life, property and the environment.)

1. All operations must be conducted in accordance with:

   a. Terms and conditions noted in the approval letter dated JUL 31 1985 for the Plan of Exploration.

   b. Special Lease Stipulations.

2. A copy of this permit No. OR-920-85-DNB-001 with attached conditions, GRO orders and approved drilling program with all subsequently approved amendments (Sundry Notices) shall be retained at the well site for reference.

3. Variances from the approved Plan of Exploration or well program must be approved in advance by the Authorized Officer or his/her representative.

4. The Authorized Officer shall be contacted prior to actual entry onto the land. Contact shall be made as noted in item 20 below.

Surface Protection Requirements

5. a. Operator will remove the minimum amount of vegetative cover necessary for safe operations and as directed by the Authorized Officer's designated representative.

b. Prior to operations, the operator will develop a fire plan in cooperation with the Fort Rock District Ranger and submit to an equipment inspection in order to comply with State Fire Laws and approved muffler, spark arrester, and other fire equipment requirements as outlined in Eastside Fire Protection and Suppression.

c. Operator will monitor the condition of access roads. The roads will be watered as needed as determined by the Fort Rock District Ranger. On completion of drilling, all necessary measures will be taken to restore roads to original condition.

d. Drilling fluids or cuttings shall not be discharged onto the surface where such discharge will contaminate lakes and perennial or intermittent streams. Drilling mud will be disposed of either by hauling to an approved sanitary land fill or other locations or as approved by the Authorized Officer.

e. Unattended sumps shall be completely fenced to protect the public, domestic animals and wildlife.

Surface Casing

6. The plan of operations and drilling permit application call for 400 feet of surface casing to be cemented to the surface. If it becomes necessary to set more than 400 feet of surface casing, the bottom hole temperature shall be taken, and before deepening the hole, the Authorized Officer shall be contacted for concurrence. Remedial cementing will be required if the original cementing job is not adequate.

Blowout Prevention Equipment (BOPE)

7. Blowout Prevention Equipment and auxiliary support equipment shall be properly installed, frequently tested and shall at least include either annular BOPE and full opening gate valve or a pipe ram/blind ram BOPE, acceptable to the Authorized Officer.

8. The BOPE shall be pressure tested when installed, before drilling out the shoe of the surface casing or any intermediate casing strings, and immediately following any repairs or operations that require disconnecting a pressure seal in the assembly. BOPE shall be tested to 500 p.s.i. with no more than a 10% decrease in pressure for 30 minutes. In the even that a pressure test cannot be conducted following the reconnection of a pressure seal, the BOPE shall be actuated to test for proper functioning.

9. A kill line shall be installed below the BOPE, leading directly to the mud pumps, and be fitted with a valve through which cement could be pumped, if necessary.

10. A choke line with an adjustable choke (sometimes called blowdown line) shall be installed below the BOPE. The choke line shall be placed in such a manner as to permit containment of displaced fluids and to minimize any safety hazard to personnel. (Properly tied down at the ends and bends).

11. BOPE shall have manually operated gates and hydraulic actuating systems and accumulators of sufficient capacity to close all of the hydraulically-operated equipment and have a minimum pressure of 69 bars (1,000 p.s.i.) remaining on the accumulator. Dual control stations shall be installed with a high pressure (N) backup system. One control panel shall be located at the driller's station and one control panel shall be located on the ground, at least 15 meters (50 feet) away from the wellhead.

12. During drilling operations, BOPE shall be actuated to test proper functioning as follows:

    a. One each trip for blind and pipe rams but not less than once each day for pipe rams; and

    b. At least once each week on the drill pipe for expansion-type preventers, and at least once each week for full opening gate valve.

Related Well Control Supplies and Equipment

13. a. A full opening drill string safety valve in the open position shall be maintained on the rig floor at all times while drilling operations are being conducted.

    b. Prior to core drilling, a test shall be conducted to determine if the hydraulic chuck will be adequate for shutting in the well should problems arise during core retrieval. If not adequate, a drill pipe safety valve or wireline BOP will be required.

    c. An adequate supply of drilling fluid and lost circulation and weighting materials shall be at the drillsite to cure significant lost circulation problems or abnormal formation pressures or water entries which may be encountered.

14. Hydrogen Sulphide Detectors

A strategically placed and properly functioning hydrogen sulphide (H2S) indicator and alarm system shall be emplaced at the drill site. This must include: a) At least two H2S detectors with audio and visual alarms set no higher than 20 ppm and preferably at 10 ppm; b) At least one windsock type streamer prominently and strategically placed to display wind direction.

15. Temperature Monitoring and Mud Requirements

a. During drilling operations, inlet and outlet temperatures shall be recorded either hourly or at 30 ft. (9M) intervals.

b. When drilling without the return of drilling fluid to the surface, the unstabilized bottom hole temperature (BHT) shall be recorded at a minimum of 100 ft. (30m) intervals. Should the BHT reach 125 degrees F (52 degrees C) and later 175 degrees F (79 degrees C), the recording intervals shall be decreased to 50 ft. (15m) and 30 ft. (9m) respectively. (Actual required intervals may be slightly shorter or longer, to coincide with core runs.)

c. If a 175 degree F (79 degree C) circulating temperature is reached while drilling, further drilling shall stop immediately and the hole will be either:

(1) Equipped with mud cooling equipment to maintain the return flowline temperature at or below 175 degrees F (79 degrees C). If approved by the Authorized Officer, drilling may then be resumed;

(2) Reviewed by the Authorized Officer as to the adequacy of on-site drilling equipment and supplies to control the temperature and pressure and if approved, drilling may be resumed.

(3) Completed as an observation hole by cementing steel tubing from total depth to surface; or

(4) Abandoned by cementing from total depth to surface.

d. If a 212 degree F (100 degree C) BHT is reached while drilling without return of drilling fluids to the surface, the lessee shall immediately stop drilling and the hole will then be either completed as a c(3), abandoned as in c(4), or if approved by the Authorized Officer the hole may be deepended if an adequate supply of cold water to pump downhole to

prevent flashing is maintained on-site. The amount of water will be determined during drilling, when the water losses are better known. At a minimum, 2000 gallons of cold water, and means to replenish this supply must be maintained on site.

e. High/low mud pit level indicators will not be required if mud pits can be visually monitored by driller during drilling operations. Desilters and desanders are not required.

16. Witnessing BOPE Testing and Cementing Jobs

The Authorized Officer, or his/her designated representative, shall be given the opportunity to witness all BOPE pressure tests, and cementing jobs. At least a 24 hour notice will be given prior to actual cementing and BOPE pressure testing. Contact can be made as noted in Item 20 below.

17. Reports

a. Throughout the duration of drilling operations, drilling reports to the Authorized Officer shall be made on Monday, Wednesday, and Friday mornings before 9:00 AM. The reports should include bottom hole depth, and significant temperatures encountered, e.g. in and out-flow temperatures, the last bottom hole temperature, if drilling without returns, the last few temperatures taken and any significant general information, problems or unusual encounters. They will be phoned in to Dennis Davis in the BLM, Prineville District Office (see Item 20 for phone numbers) or if unavailable, his alternate.

b. All information submitted that is to be held proprietary should be clearly noted or labeled. If the Authorized Officer concurs, all such information shall be kept proprietary according to 43 CFR 3264.5.

c. All reports after completion of drilling are to be submitted to the BLM Deputy State Director for Mineral Resources, P.O. Box 2965, Portland, Oregon 97208. Duplicate copies of any drilling completion, temperature and other downhole survey reports and logs, lithology, depths of any waters encountered, and drill hole location, shall be submitted to the Authorized Officer and to the Oregon Dept. of Geology and Mineral Industries within 30 days of reaching total depth. Subsequent temperature logs are due 30 days after logs are run. The abandonment report is due 30 days after abandonment.

d. The completion/abandonment report shall contain a copy of the approved Geothermal Drilling Permit; and the following information for the hole drilled:

1. A final hole designation and location;

2. A driller's log or well history that notes the depths to the water table and other water aquifers, and to any other mineral deposits (salt, coal, etc.) encountered;

3. The method of completion, including cementing, and casing or tubing used with wellhead components. The completion method may be presented by engineering drawings;

4. Complete details of the abandonment procedures;

5. Any information on drilling difficulties or unusual circumstances encountered with would be helpful in assuring future safety of operations or protection of the environment in the area concerned; and

6. All temperature data and other logs or surveys run for the hole surveyed, if not prevously submitted in writing.

18. Plugging and Abandonment

The downhole abandonment program must be designed and implemented to prevent interzonal migration of fluids. If no lost circulation or no abnormal formation pressures or water entry problems are evident, final abandonment may be done by either placing a 50 ft. (15m) cement plug across the shoe of the casing and plugging the hole with cement from 10 ft. (3m) to the surface or in such other manner as is approved by the Authorized Officer.

19. Modifications in Plan of Operations/Drilling Permit

Any proposed modifications in the proposed plan of operations and/or drilling permit with respect to approved operations, approved casing, cement, BOPE, and other equipment, shall be submitted to the Authorized Officer for approval. Adequate lead time should be given so that operations can resume as soon as possible.

20. For operational matters and in case of emergency, call the following designated representative in the order listed:

a. Dennis Davis, Inspector
Bend
Day (503) 447-4115
Night (503) 382-3440

b. Dennis Simontacchi, Inspector
Lakeview
Day (503) 947-2177
Night (503) 947-2355

c. Gerald E. Magnuson
District Manager, Prineville
Day (503) 447-4115
Night (503) 447-3022

d. Pat Geehan
Deputy State Director for Mineral Resources, Portland
Day (503 231-6812
Night (503) 654-5166