

G100929

Oregon

DEPARTMENT
OF GEOLOGY
AND MINERAL
INDUSTRIES

ADMINISTRATIVE
OFFICE

October 15, 1992

*Rec
Oct 21 1992
APP*

Robert J. Creed
Project Officer
Advanced Technologies Branch
U.S. Department of Energy
Idaho Field Office
785 DOE Place, MS 1220
Idaho Falls, Idaho 83401-1562

Dear Mr. Creed:

Enclosed is the map and final report for Grant No. DE-FGO7-89ID12834, Investigation of the Thermal Regime of the High Cascades, Oregon. These products complete all requirements for the project except our final financial statement.

The final statement must await my receiving final accounting reports from the state system. This will not occur for the October accounting period until about November 20. The final report forms will be submitted at that time.

It has been a privilege to contribute to the U.S. Department of Energy's program of research and development of geothermal energy. This project revealed for the first time the deeper thermal structure under the apex of the High Cascade Range. The data and interpretations are important fundamental contributions to our understanding of this complex and challenging terrain. I hope that this work will lead to more partnerships between state, federal, and private groups to further the development of the geothermal option for our energy future.

Sincerely,



George R. Priest
Regional Geologist

Enclosures

- C Don Hull
- John Beaulieu
- Marshall Reed w. encl.
- Howard Ross " "
- Linda Hallum " "
- Joel Renner " "



Suite 965
800 NE Oregon Street # 28
Portland, OR 97232
(503) 731-4100
FAX (503) 731-4066

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108-1295
TELEPHONE 801-524-3422

September 9, 1992

George R. Priest
Regional Geologist
Oregon Dept. of Geology & Mineral Industries
Suite 965
800 NE Oregon Street #28
Portland, OR 97232

Dear George:

Thanks for the opportunity to review the draft final report for the Santiam Pass Project, DOE Grant No. DEFG07-89ID12834. This is a well written report with excellent technical content which nicely summarizes the DOGAMI Santiam Pass drilling project. The report shows the results of previous review and editing.

From the history of the project, and a reading of the report, I understand that the only geophysical logging (Task 4.5) completed was temperature logging and that no downhole fluid samples were collected (Task 4.5). If this is the case, then interpretation (Task 4.6) and reporting (Task 4.8) requirements under the grant have been completed. I do not recall seeing a statement as to the final condition of well 77-24. Task 4.5 called for plugging the hole and abandoning the site in accordance with existing regulations, but Section 7, Special Conditions, provided for delaying the P and A if DOGAMI provided the necessary legal documents accepting full responsibility for the well. Please clarify this item for DOE/ID.

Attached is a list of Review Comments of errors, typos, and questions noted in my review of the report. I had no problem with the presentation of data, interpretation and conclusions reached, and think it is an excellent report. In your cover letter you noted that you considered this

Page two
Mr. Priest
September 9, 1992

draft copy to be final form, camera-ready copy. None the less, certain obvious errors should be corrected. Most important of these are adding a DOE Disclaimer (a second notice on p. ii?), correcting the Grant No. (p. v), acknowledging UURI funding for the K-Ar dating, correcting the year of one reference (p. 40), labeling Plate 1, and naming a Table (2-1) referred to in the text. Other corrections are optional, depending on DOGAMI editorial standards. DOGAMI may wish to correct the narrow left hand margin before printing a final copy.

Thanks again for the opportunity to review this draft final report. The project further illustrates the difficult geothermal exploration problem in the Cascades, and offers new insight into the regional hydrology and alteration.

Sincerely,



Howard P. Ross
Project Manager

HR/mt
Enclosure

cc: P. Brookshier
B. Creed

REVIEW COMMENTS
DOGAMI SANTIAM PASS DRILLING REPORT

<u>Page</u>	<u>Item</u>
ii	add a second notice, DOE Disclaimer
v.	line 13: has occurred <u>in</u> the High Cascades
v.	ACKNOWLEDGEMENTS, 1.1; Grant DE-FG07-89ID12834 The University of Utah Research Institute provided funding for the three radioactive age dates of the SP 77-24 drill core and contributed quantitative whole rock analyses.
3	1.6: Is it Prineville or Pineville District?
9	1. 16...3.6-2.2 Ma basalt
11	1. 21...domes of Table 2-1 are ...
13	note: Plate 1 is not labeled as such
not done — 16	Hughes, S.C., 1983 -- Oregon State University ...
not done — 18	White, C.M., <u>and</u> McBirney, A.R., 1978
34	ACKNOWLEDGEMENTS UURI provided funding for the SP77-24 drill core K-Ar age dates completed by R. Duncan and described in this chapter.
left @ 1991 40	1. 3 from bottom: Ingebritsen and others (1991)? It is 1989 in references.
not done 42	1. 5 below 900 m in the first log
44	✓ 1. 5 average _ for not done 1. 21 warm water from <u>an</u> as yet
✓ 44, 47	$\Omega \cdot m$ is generally used for ohm-m, not Ωm
✓ 48	1. 14 due either <u>to</u>
52	✓ Ingebritsen et al 1989 or 1991? ✓ Steele et al p. 31-42

General Comments

- narrow lefthand margins on several pages should be corrected for final camera ready copy — i.e., p. iii, iv, v, vi, 2, 6, 8, 10, etc.
- order of references is not always chronological (i.e., Priest et al, p. 16, 17)
- varying use of commas in page references, i.e., Blackwell used , s, others did not
- label Plate 1

UNIVERSITY OF UTAH RESEARCH INSTITUTE

UURI

EARTH SCIENCE LABORATORY
391 CHIPETA WAY, SUITE C
SALT LAKE CITY, UTAH 84108-1295
TELEPHONE 801-524-3422

Memorandum

TO: Peggy Brookshier, DOE/ID
Bob Creed, DOE/ID

FROM: Howard Ross, UURI

DATE: September 10, 1992

Enclosed is a draft letter to George Priest with review comments on the Draft Final Report for the DOGAMI Santiam Pass report. Please review the letter for your information, and let me know if you have any corrections or comments on the letter before it is sent to George Priest.

Oregon

DEPARTMENT
OF GEOLOGY
AND MINERAL
INDUSTRIES

ADMINISTRATIVE
OFFICE

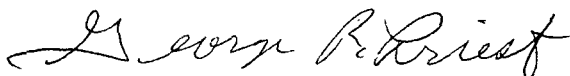
May 27, 1992

Linda Hallum
U.S. Department of Energy
785 DOE Place, MS-1221
Idaho Falls, ID 83401-1562

Dear Linda:

As per our conversation of May 26, 1992, we herein request a no-cost time extension for the budget period of Coperative Agreement No. DE-FG07-89ID12834 to October 15, 1992. This brings the budget period into alignment with the project period.

Sincerely,



George R. Priest
Regional Geologist

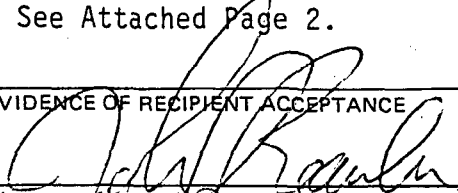
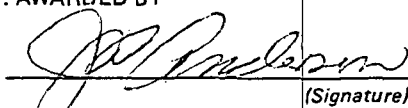
cc: Howard Ross
Trudy Thorne
Peggy Brookshier
Ken Osborne
Joel Renner

GRP:ch



Suite 965
800 NE Oregon St. # 28
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U.S. DEPARTMENT OF ENERGY
NOTICE OF FINANCIAL ASSISTANCE AWARD
(See Instructions on Reverse)Under the authority of Public Law 94-40 Geothermal Research, Development, and Demonstration Act of 1984 and subject to legislation, regulations and policies applicable to (cite legislative program title): Geothermal Programs

1. PROJECT TITLE Investigation of the Thermal Regime of the High Cascades, Oregon			2. INSTRUMENT TYPE <input checked="" type="checkbox"/> GRANT <input type="checkbox"/> COOPERATIVE AGREEMENT	
3. RECIPIENT (Name, address, zip code, area code and telephone no.) Oregon Department of Geology and Mineral Industries, 910 State Office Building Portland, OR 97208			4. INSTRUMENT NO. DE-FG07-89ID12834	5. AMENDMENT NO. A000
8. RECIPIENT PROJECT DIRECTOR (Name and telephone No.) Dr. George R. Priest (503) 229-5580			6. BUDGET PERIOD FROM: 6/27/89 THRU: 11/26/89	
9. RECIPIENT BUSINESS OFFICER (Name and telephone No.) Mr. John Nielsen (503) 229-5580			7. PROJECT PERIOD FROM: 6/27/89 THRU: 6/26/91	
11. DOE PROJECT OFFICER (Name, address, zip code, telephone No.) Peggy A. Brookshier (208) 526-1403 U.D. DOE, Idaho Operations Office 785 DOE Place, Idaho Falls, Idaho 83402			10. TYPE OF AWARD <input checked="" type="checkbox"/> NEW <input type="checkbox"/> CONTINUATION <input type="checkbox"/> RENEWAL <input type="checkbox"/> REVISION <input type="checkbox"/> SUPPLEMENT	
13. RECIPIENT TYPE <input checked="" type="checkbox"/> STATE GOV'T <input type="checkbox"/> INDIAN TRIBAL GOV'T <input type="checkbox"/> HOSPITAL <input type="checkbox"/> FOR PROFIT ORGANIZATION <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> LOCAL GOV'T <input type="checkbox"/> INSTITUTION OF HIGHER EDUCATION <input type="checkbox"/> OTHER NONPROFIT ORGANIZATION <input type="checkbox"/> C <input type="checkbox"/> P <input type="checkbox"/> SP <input type="checkbox"/> OTHER (Specify)			12. ADMINISTERED FOR DOE BY (Name, address, zip code, telephone No.) Ken Osborne (208) 526-0805 U.S. Department of Energy Idaho Operations Office 785 DOE Place Idaho Falls, Idaho 83402	
14. ACCOUNTING AND APPROPRIATIONS DATA				15. EMPLOYER I.D. NUMBER/SSN
a. Appropriation Symbol 89X0224.91	b. B & R Number AM1500000	c. FT/AFP/OC ID 9491 410	d. CFA Number 424164	93.6001955
16. BUDGET AND FUNDING INFORMATION				
a. CURRENT BUDGET PERIOD INFORMATION			b. CUMULATIVE DOE OBLIGATIONS	
(1) DOE Funds Obligated This Action	\$ 15,860	(1) This Budget Period [Total of lines a. (1) and a. (3)]	\$ 15,860	
(2) DOE Funds Authorized for Carry Over	\$ -0-	(2) Prior Budget Periods	\$ -0-	
(3) DOE Funds Previously Obligated in this Budget Period	\$ -0-	(3) Project Period to Date [Total of lines b. (1) and b. (2)]	\$ 15,860	
(4) DOE Share of Total Approved Budget	\$ 15,860			
(5) Recipient Share of Total Approved Budget	\$ -0-			
(6) Total Approved Budget	\$ 15,860			
17. TOTAL ESTIMATED COST OF PROJECT \$ 200,000 (This is the current estimated cost of the project. It is not a promise to award nor an authorization to expend funds in this amount.)				
18. AWARD/AGREEMENT TERMS AND CONDITIONS This award/agreement consists of this form plus the following: a. Special terms and conditions (if grant) or schedule, general provisions, special provisions (if cooperative agreement) b. Applicable program regulations (specify) _____ (Date) _____ c. DOE Assistance Regulations, 10 CFR Part-600, as amended, Subparts A and <input type="checkbox"/> B (Grants) or <input type="checkbox"/> C (Cooperative Agreements). d. Application/proposal dated <u>May 28, 1988</u> , <input type="checkbox"/> as submitted <input checked="" type="checkbox"/> with changes as negotiated				
19. REMARKS See Attached Page 2.				
20. EVIDENCE OF RECIPIENT ACCEPTANCE			21. AWARDED BY	
 (Signature of Authorized Recipient Official) John D. Beaujieu (Name) Deputy State Geologist (Title)			 (Signature) W. P. Anderson (Name) Contracting Officer (Title)	
7/7/89 (Date)			6/27/89 (Date)	

Grant No. DE-FG07-89ID12834
Part I
Continuation (NFAA Block 19 "Remarks")

This Agreement consists of the following:

A. Directly Incorporated

- Part I Notice of Financial Assistance Awards (NFAA-Form 4600.1)
- Part II Statement of Work
- Part III Reporting Requirements Checklist (DOE F EIA 459A) Report Distribution List
- Part IV Federal Assistance Budget Information Form (EIA-459C)
- Part V Special Terms and Conditions for Financial Assistance
- Part VI General Terms and Conditions for Financial Assistance

B. Incorporated by Reference

1. DOE Financial Assistance Rules (10 CFR Part 600)
2. DOE Order 1332.2
3. Cost Principles for States and Local Governments (OMB Circulars A-87)

STATEMENT OF WORK

1.0 INTRODUCTION

The goal of this grant is to support research in resource assessment in the Cascade Range of Oregon. The U.S. Geological Survey and the geothermal industry have identified the Cascade volcanic province as a region of high geothermal resource potential. The Oregon Department of Geology and Mineral Industries (DOGAMI) has been funded by DOE since 1979 for geothermal resource assessment activities, and a recent DOE initiative supported cost-shared drilling with industry.

The principal objective of this grant is to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade volcanism. This is in contrast with earlier deep drilling which tested local known or perceived hot spots, generally associated with major volcanic complexes. Favorable results from the drilling program to be conducted in this grant would likely stimulate and guide industry in additional resource exploration and development.

This project will be completed in two phases. Phase I will include all site selections, site identification, permitting and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition, interpretation, core curation and final reporting as described in 4.0, Technical Tasks.

Phase I will be funded at a level of approximately 10 percent of the total project amount. Phase II funding will be contingent on the satisfactory completion of Phase I activities, and the availability of funds when a final report of Phase I activities has been submitted to, and accepted by, DOE.

2.0 SCOPE

The technical objectives of this grant are to conduct resource assessment along the axis of Cascade volcanism away from major volcanic centers. The proposed drilling will also provide the first drilling in a proposed deep continental drilling transect across the Santiam Pass area. Following a review of geologic, geophysical, and geochemical data, a site will be selected and a 600 m to 650 m temperature gradient hole will be drilled. Temperature and other geophysical logs will be completed, and the temperature gradient and heat flow will be determined. Hydrologic and lithologic information will also be determined. All data will be interpreted and the results presented in final report all project work will be completed and a final report submitted within 24 months.

3.0 APPLICABLE DOCUMENTS

The research described herein is abstracted from an unsolicited proposal titled "Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon," dated May 28, 1988 and revised January 10, 1989, and submitted by the Oregon Department of Geology and Mineral Industries. Previous studies and recommendations for scientific drilling in the

Santiam Pass area were submitted to DOE in DOGAMI Open File Report 0-86-3, titled "Investigation of the Thermal Regime and Geologic History of the Cascade Volcanic Arc: First Phase of a Program for Scientific Drilling in the Cascade Range." This report was a deliverable under DOE Grant No. DE-FG07-84ID12526.

4.0 TECHNICAL TASKS

The following tasks will be accomplished in two phases under this grant. Phase II tasks will be completed subject to the satisfactory completion of Phase I tasks, DOE-ID approval of the preliminary Environmental Analysis or Action Description memorandum, whichever is required, and the availability of funding.

Phase I

- 4.1 Site Selection. Compile a geologic map at a scale of 1:62,500 which covers the area from Santiam Junction on the west to Green Ridge on the east, and from Three Fingered Jack volcano on the north to Mount Washington on the south. Compile all geophysical and geochemical data for this area, and relevant data for adjacent areas. Interpret geoscience data and evaluate environmental factors, and select the optimum feasible drill site in conjunction with relevant county, state, and federal regulatory personnel. Identify the drill site in writing and on a detailed topographic map.
- 4.2 Permitting and Environmental Studies. Prepare a detailed plan of operations, and obtain all necessary permits for drilling. Perform necessary environmental assessments to conform with DOE-ID/NEPA environmental requirements.
- 4.3 Complete a technical report summarizing Tasks 4.1 and 4.2 and submit as a Phase I Final Report to DOE. Include the draft geologic map (Task 4.1) as part of this deliverable.

→ Phase II

- ✓ 4.4 Solicit bids for drilling and select a qualified drilling contractor.
- 4.5 Drilling and Data Acquisition. Complete a diamond cored drill hole to 600 m to 650 m. Log the hole using accepted geophysical logging procedures. Airlift at any deep aquifers and take down-hole fluid samples from these aquifers. Set a string of 6.4 cm diameter pipe to final depth and surround with heavy mud. Demobilize rig. Monitor temperatures for a period of one year, recording not less than three complete temperature logs. Plug hole and abandon site in accordance with existing regulations following completion of temperature monitoring.
- 4.6 Interpret geophysical logs and drill cuttings, and prepare a lithologic log for the drill hole. Prepare temperature gradient profiles, measure thermal conductivities for all major lithologic units, and determine heat flow. Correlate subsurface rock units with surface lithologies using petrologic, mineralogic, and

geochemical analyses. Prepare an east-west cross section passing through the drill site and the area of the geologic map. Complete geochemical analyses for any fluids recovered as down hole samples. Interpret water-rock interaction and the location of and importance of fluid pathways.

- 4.7 Core Curation. Curate drill core using accepted methods established by DOE. Complete core photography and initial sample dissemination from a temporary facility near the drill site. Drill core will be transmitted to permanent storage upon completion of the technical studies, but not later than the delivery date of the final report. Permanent storage will be either at DOGAMI or the UURI Geothermal Sample Library, with core abstracts at the other facility.
- 4.8 Reporting. Complete an integrated interpretation of all data obtained during the project, and prepare a final technical report describing the methodologies and the significance of the results. document all new data in appendices, and submit drill logs to Petroleum Information Service, Denver, Colorado for distribution to the public. The technical results may be presented at appropriate public forums.

5.0 REPORTS, DATA, AND OTHER DELIVERABLES

5.1 Management Records

Reports will be due as indicated on the Federal Assistance Reporting Checklist and the Report Distribution List.

- 5.2 A Phase I Final Report shall be completed which summarizes all Phase I activities. This report will include a detailed discussion of the site selection data, the draft geologic map, environmental actions and approvals and copies of appropriate drilling and land use permits.

5.3 Final Report

A detailed final technical report will be prepared which will describe the drilling history and the methodologies of all technical studies employed during the project. All new data will be presented in the report together with interpretations and significance of the results. Deliverables will include a final geologic map and appropriate representations of the compiled geochemical and geophysical data maps, lithologic and temperature logs for the drill hole, and a geologic cross section across the area of the drill hole. A draft final report will be submitted for review and comment not less than 45 days prior to the scheduled delivery of the final report.

6.0 SCHEDULE

Phase I. To be completed within five months of receipt of grant.

Phase II. To be completed within 24 months of receipt of grant.

7.0 SPECIAL CONDITIONS

DOGAMI may wish to reenter the subject hole and extend the drilling at some later date with non-DOE funds. If this should be the case, DOGAMI will accept all legal responsibility for the future conduct of the drilling and for later plugging and abandonment of the drill hole. DOGAMI will provide the necessary legal documents, fully executed, to DOE to show that this transfer of responsibility has been accomplished.

PART III

U.S. DEPARTMENT OF ENERGY

FEDERAL ASSISTANCE REPORTING CHECKLIST

FORM EIA-459A
(10/80)

FORM APPROVED
OMB NO. 1900-0127

1. Identification Number: DE-FG07-89ID12834	2. Program/Project Title: Investigation of the thermal regime of the high cascades, Oregon
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3. Recipient:
Oregon Department of Geology and Mineral Industries

4. Reporting Requirements:	Frequency	No. of Copies	Addressees
PROGRAM/PROJECT MANAGEMENT REPORTING			
<input type="checkbox"/> Federal Assistance Milestone Plan			
<input type="checkbox"/> Federal Assistance Budget Information Form			
<input checked="" type="checkbox"/> Federal Assistance Management Summary Report	Q,F	1,1,1	A,C,D
<input type="checkbox"/> Federal Assistance Program/Project Status Report			
<input checked="" type="checkbox"/> Financial Status Report, OMB Form 269	Q,F	1,1,1	A,B,D
TECHNICAL INFORMATION REPORTING			
<input checked="" type="checkbox"/> Notice of Energy RD&D	O,X,Y	1,1,1	A,B,C
<input checked="" type="checkbox"/> Technical Progress Report	Q	1,1,1	A,B,C
<input checked="" type="checkbox"/> Topical Report	A	1,1,1	A,B,C
<input checked="" type="checkbox"/> Final Technical Report	F	1,1,1	A,B,C

FREQUENCY CODES AND DUE DATES:

A - As Necessary; within 5 calendar days after events.
 F - Final; 90 calendar days after the performance of the effort ends.
 Q - Quarterly; within 30 days after end of calendar quarter or portion thereof.
 O - One time after project starts; within 30 days after award.
 X - Required with proposals or with the application or with significant planning changes.
 Y - Yearly; 30 days after the end of program year. (Financial Status Reports 90 days).
 S - Semiannually; within 30 days after end of program fiscal half year.

5. Special Instructions:

<p>A. Project Manager Isamu Aoki U.S. Department of Energy 785 DOE Place Idaho Falls, Idaho 83402</p>	<p>C. Contracting Officer Trudy A. Thorne U.S. Department of Energy 785 DOE Place Idaho Falls, Idaho 83402</p>
<p>B. Earth Science Laboratory University of Utah Research Institute ATTN: Howard Ross 391 Chipeta Way Salt Lake City, UT 84108</p>	<p>D. Chief, Financial Management Br. U.S. Department of Energy 785 DOE Place Idaho Falls, Idaho 83402</p>

SEE ATTACHED SPECIAL REQUIREMENTS

6. Prepared by: (Signature and Date) <i>Isamu Aoki</i> 3/14/89	7. Reviewed by: (Signature and Date) <i>Kenneth Osborne</i> 3/21/89
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SPECIAL REQUIREMENTS

(ATTACHMENT TO FEDERAL ASSISTANCE REPORTING CHECKLIST)

1. QUARTERLY TECHNICAL PROGRESS REPORTS

Camera-ready copies of the Quarterly Technical Progress Report shall be delivered to the Project Manager. This report should summarize all project work accomplished to date and that which is planned for the next quarter. The report should be written in summary form; four to six single-space typewritten pages, with no more than three to four reproducible illustrations; in a format suitable for direct incorporation into the DOE EOR Quarterly Progress Review. The report shall include a list of manuscripts published during the quarter. (Sample formats for this and other required reports will be provided by the Project Manager.)

2. FINAL REPORTS

A technical report summarizing Phase I activities will be submitted and approved prior to performance of Phase II. Three (3) draft copies of the final report covering Phase I and Phase II are to be submitted to the Project Manager within 45 days of completion of the grant, detailing the results of all project work accomplished, problems encountered, and conclusions reached. The report shall document and summarize work for the period, including implications of results and recommendations for future work, based upon the experiences and results gained. The report shall include tables, graphs, photos and diagrams in sufficient detail to comprehensively explain the results achieved under the contract.

3. GOVERNMENT REVIEW/APPROVAL ACCEPTANCE OF REPORTS

The Government will be allowed thirty (30) days from the date of receipt to review the draft of the Annual or Final Report and to notify the contractor of approval or recommended changes to be made in the final copy. If the Government does not approve or recommend changes within the specified time frame (30 days), the report will be deemed approved.

Within twenty (20) days of receipt of a notice of approval of the draft Annual or Final Report from the Contracting Officer, the Contractor shall furnish the Government with a reproducible master (camera-ready) copy for photocopying and the required number of copies of the Annual or Final Report in final form, including all modifications and additions as recommended by the Government in its review of the draft Annual or Final Report.

FEDERAL ASSISTANCE BUDGET INFORMATION FORM

FORM EIA-450C
10/80

FORM APPROVED
OMB No. 1900-0127

DE-FG07-89TD12834	Investigation of the Thermal Regime of the High Cascades, Oregon	6/27/89	6/26/91
Oregon Department of Geology and Mineral Industries 910 State Office Bldg, Portland, OR 97208			

SECTION A - BUDGET SUMMARY

Grant Program, Function or Activity (a)	Federal Citation No. (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. ITRVAHCO	81.078	\$	\$	\$15,860	\$	\$15,860
2.						
3.						
4.						
5. TOTALS		\$	\$	\$15,860	\$	\$15,860

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	Grant Program, Function or Activity				Total (5)
	(i) Phase I	(ii)	(iii)	(iv)	
a. Personnel	\$ 7,100	\$	\$	\$	\$ 7,100
b. Fringe Benefits	3,333				3,333
c. Travel	790				790
d. Equipment					
e. Supplies	50				50
f. Contractual	2,100				2,100
g. Construction					
h. Other					
i. Total Direct Charges	13,373				13,373
j. Indirect Charges (18.6%)	2,487				2,487
k. TOTALS	\$ 15,860	\$	\$	\$	\$ 15,860
7. Program Income	\$ N/A	\$	\$	\$	\$ N/A

Special Terms and Conditions

The requirements of this attachment take precedence over conditions of this award.

1. Payment and Preaward Costs

- a. Preaward Costs - Effective April 13, 1989, DOE approved the incurrence of preaward costs in connection with the "Investigation of the Thermal Regime of the Volcanic Axis of the High Cascades, Oregon" project. Preaward costs incurred between April 13, 1989, and the effective date of this agreement are eligible for reimbursement if the costs otherwise meet the requirements of this agreement.
- b. Method of Payment - Payments due for amounts properly invoiced in accordance with the terms of this agreement shall be on a reimbursement basis by Treasury check, either payable to the Awardee or designee or by electronic funds transfer(s) to a financial institution designated by the awardee for that purpose.

After award but no later than fourteen (14) days before an invoice or bill is submitted for payment, the awardee shall designate a financial institution for the receipt of electronic funds transfer payments hereunder; and provide the appropriate Government representative (contracting officer or finance official as determined by the Government) with the name of the designated financial institution, financial institution's or correspondent financial institution's 9-digit American Bankers Association identifying number, telegraphic abbreviation of such financial institution, and account number at the designated financial institution to be credited with funds.

In the event the awardee during the performance of this agreement elects to designate a different financial institution for the receipt of any payment made using electronic funds transfer procedures, notification of such change and the information as specified in the above paragraph must be received by the appropriate Government representative thirty (30) days prior to the date such change is to become effective.

The document furnishing the information required above must be dated and contain the signature, title, and telephone number of the authorized awardee official, as well as the awardee's name and the cooperative agreement number.

- c. Audit Adjustments - The Contracting Officer may have invoices or vouchers and statements of cost submitted under this agreement audited at any time prior to the end of the required retention period for the cooperative agreement records. Each payment made shall be subject to reduction for amounts included in the related

invoice or voucher which are found by the Contracting Officer, on the basis of audit, not to constitute allowable cost. If a final audit of costs has not been performed prior to close of the agreement, DOE or its successor agency, shall have the right to recover an appropriate amount after fully considering the recommendations on disallowed costs resulting from the final audit when conducted.

- d. Cognizant Office - Invoices should be sent to the individual designated in Block 12. of the Notice of Financial Assistance award Form (NFAA).

2. Designated Key Personnel

The following individual is designated key personnel:

Dr. George R. Priest

3. Technical Data

Except for technical data contained in pages N/A of the recipient's application, dated N/A, which are asserted by the grantee as being proprietary data, it is agreed that as a condition of this award, and notwithstanding the provisions of any notice appearing on the application, the Government shall have the right to use, duplicate, disclose and have others do so for any purpose whatsoever the technical data not identified in the above blanks contained in the application upon which this award is based.

4. Patent Clauses

The following patent clauses are applicable to this award:

- 600.33 Patent Rights
- 600.33 Rights in Technical Data (Long Form) (Alternates I and II)
- 600.33 Additional Technical Data Requirements
- 600.33 Authorization and Consent
- 600.33 Notice and Assistance
- 600.33 Reporting of Royalties

5. Publication of Results

Subject to restrictions relating to patents, the awardee may publish the results of its work. However, publications and reports prepared under this award shall contain the following acknowledgment statement: "This (e.g., material, report) was prepared with the support of the U. S. Department of Energy (DOE) Cooperative Agreement No. DE-FG07-89ID12834.

However, any options, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of DOE."

When issuing statements, press releases, requests for proposals, bid solicitations, and other documents describing projects of programs funded in whole or part with federal money, all grantees receiving Federal funds, including but not limited to state and local governments, shall clearly state (1) the percentage of the total cost of the program of project which will be financed with Federal money, and (2) the dollar amount of Federal funds for the project or program.

6. Audit Requirements

In addition to the terms and conditions identified in blocks 18.b and 18.c of the Notice of Financial Assistance Award, the recipient shall comply with the audit requirements contained in the DOE Financial Assistance Rules, 10 CFR 600, Subpart D, Audits of State and Local Governments.

7. Uniform Administrative Requirements

In addition to the terms and conditions identified in blocks 18.b and 18.c of the notice of Financial Assistance Award, the recipient shall comply with the Uniform Administrative Requirements contained in the DOE Financial Assistance Rules, 10 CFR Part 600, Subpart E, applicable when Financial Assistance Awards are made to state and local governments.

8. Disputes and Appeals

Shall be in Accordance with 10 CFR Part 600.26.

PART VI

General Terms and Conditions for Assistance Awards

1. Award Terms and Conditions

These general terms and conditions do not restate all the provisions of applicable statutes and regulations nor do they represent an exhaustive listing of all requirements applicable to this award. In addition to these general terms and conditions, the awardee must comply with all governing requirements, including those identified in Block 18 of the Notice of Financial Assistance Award and those included in the Special Terms and Conditions attached to this award.

The awardee's signature on the application and on the Notice of Financial Assistance Award signifies the awardee's agreement to all of the terms and conditions of award.

2. Cost-Sharing

Any cost-sharing as shown on the face page of this award shall defray allowable costs of the project only. Allowability of such costs shall be determined in accordance with the statutes, regulations, applicable cost principles, and other terms and conditions governing this award.

3. Maximum DOE Obligation

This award is subject to the requirement that the maximum DOE obligation to the awardee is the amount shown on the Notice of Financial Assistance Award as the amount of DOE funds obligated. DOE shall not be obligated to make any additional, supplemental, continuation, renewal or other award for the same or any other purpose.

The Government obligations may be increased unilaterally by DOE by written notice to the awardee and may be increased or decreased by written agreement of the parties.

4. Payment

Payments under this award will be made by an advance payment method unless DOE determines that the awardee's financial management system does not meet the requirements of 10 CFR 600.109 or the awardee has not maintained, or demonstrated the willingness and ability to maintain, procedures that will minimize the time elapsing between transfer of funds from the U.S. Treasury and their disbursement for grant-related purposes.

The appropriate advance payment method or the reimbursement method and the cognizant finance office are specified in the attached Special Terms and Conditions.

Advances by the awardee to subawardee or contractor organizations must conform substantially to the same standards of timing and amount that govern advances made by the Federal Government to the awardee. Excess cash advances erroneously withdrawn from the U.S. Treasury shall be promptly refunded to DOE unless the funds will be disbursed within seven calendar days or the amount is less than \$10,000 and will be disbursed within 30 calendar days.

Interest earned on advance payments to other than state governments or their subawardees shall be reported on the Report of Federal Cash Transactions (SF-272) and promptly remitted to the cognizant finance office (unless otherwise specified in the attached Special Terms and Conditions by check payable to the Department of Energy.

Payments to the awardee shall equal the Federal share of actual allowable costs of performance of this award, provided however, and notwithstanding any other provision of this award, that the Government's monetary liability under this award shall not exceed the Government share of the total approved budget or an amount equal to the Federal share of actual allowable costs, whichever is less. The awardee shall be obligated to perform under this award throughout the agreed-upon period of performance, and to bear all costs which DOE has not agreed to pay. However, the awardee shall have the right to cease to perform when or after the Federal share of actual allowable costs equals or exceeds the Government share of the total approved budget and if prior written notice to that effect has been provided to DOE.

Upon termination or expiration of the total period of performance, the awardee shall promptly refund to DOE (or make such disposition as DOE may in writing direct) any sums paid by DOE to the awardee under this award in excess of the cumulative government allowable cost incurred in performance under the award.

The awardee agrees that any refunds, rebates, credits, or other amounts (including any interest thereon) accruing to or received by the awardee or any assignee under this award shall be paid by the awardee to the Government, to the extent that they are properly allocable to costs for which the awardee has been reimbursed by the Government under this award. Reasonable expenses incurred by the awardee for the purpose of securing such refund, rebates, credits, or other amounts shall be allowable costs hereunder when approved by the Contracting Officer.

5. Allowable Costs/Applicable Cost Principles

In accordance with the applicable cost principles cited below and up to the amount shown on the face page of this award for the total approved budget for the current budget period (line 16.a.(6)), the allowable costs of this award shall consist of the actual allowable direct costs incident to performance of this project plus the allocable portion of the allowable indirect costs, if any, of the organization less applicable credits.

The allowability of costs for work performed under this award and any subsequent subaward will be determined in accordance with the Federal cost principles applicable to the awardee or subawardee in effect on the date of award or, for any subaward, in effect as of the date of that subaward, except as modified by other provisions of this award or the subaward.

The Federal cost principles applicable to specific types of awardees and subawardees are:

1. Institutions of Higher Education. OMB Circular A-21, Cost Principles Applicable to Grants, Contracts and Other Agreements with Institutions of Higher Education, is applicable to both public and private colleges and universities.
2. State and local governments and Indian tribal governments. OMB Circular A-87, Cost Principles Applicable to Grants, Contracts and other Agreements With State and Local Governments, is applicable to state, local, and Indian tribal governments (and shall also be used to the extent appropriate for foreign governments).
3. Hospitals. 45 CFR Part 74, Appendix E, Principles for Determining Costs Applicable to Research and Development under Grants and Contracts with Hospitals, applies to nonprofit and for-profit hospitals.
4. Other nonprofit organizations and individuals. OMB Circular A-122, Cost Principles Applicable to Grants, Contracts, and other Agreements with Nonprofit Organizations, applies to nonprofit organizations and individuals except for nonprofits specifically exempted by the terms of the circular or those nonprofits covered by the cost principles cited in items 1.- 3. above.
5. Commercial firms and certain nonprofit organizations. 48 CFR Subpart 31.2, Contracts with Commercial Organizations, as supplemented by 48 CFR Subpart 931.2, applies to those nonprofit organizations not covered by OMB Circular A-122, as specified by the terms of that circular, and to all commercial organizations other than those covered by the cost principles in item 3. above.

6. Preaward Costs

Costs incurred prior to the beginning date of a new or renewal award are allowable only if they were approved in writing, prior to incurrence, by a DOE Contracting Officer. (Note - this provision does not apply to such bid and proposal costs as may be recovered through an indirect cost rate negotiated in accordance with the applicable Federal cost principles.)

7. Interest

(a) Notwithstanding any other term or conditions of this award, all amounts that become payable by the awardee to the Government under this award shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of Treasury (Secretary) as provided in Section 11 of the Debt Collection Act of 1982 (31 U.S.C. 3717), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this provision, and then at the rate applicable for each three-month period as fixed by the Secretary until the amount is paid.

(b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this award.

(2) The date of the first written demand for payment consistent with this award, including any demand resulting from a termination.

(3) The date the Government transmits to the awardee a proposed agreement to confirm completed negotiations establishing the amount of debt.

(c) The interest charge made under this provision may be reduced in accordance with the procedures prescribed in 4 CFR 102.13 or in accordance with agency regulations in effect on the date of the original award.

8. Prior Approvals

A prior approval is a statement in writing, signed by the DOE Contracting Officer, that a cost may be incurred or an action may be taken. The approval may take the form of a letter or of a revision to the award. If actions or costs requiring prior approval are specified in the application and are not expressly disapproved by DOE in the attached Special Terms and Conditions, this award constitutes such prior approval.

a. Requests. All requests for prior approval must be signed by an individual who is authorized to act for the awardee. The signature of the Principal Investigator (unless also a corporate officer or otherwise authorized) is insufficient to obtain action on a prior approval request, although countersignature by the Principal Investigator is not discouraged. Requests for budget revisions shall be made on the same budget format as used in applying for this award and must be supported by a narrative justification. Other prior approval requests may be made by letter. Prior approval requests should be addressed to the Contracting Officer named on the face page of this award.

b. Principal Investigator or Key Personnel. Since the DOE decision to fund a project is based, to a significant extent, on the qualifications and level of participation of the Principal Investigator, a change of Principal Investigator or of the level of effort of the Principal Investigator is considered a change in the

approved project. The approval of DOE must be obtained prior to any change of the Principal Investigator or, in certain cases, other key personnel who have been identified as key personnel in the Special Terms and Conditions of this award. In addition, any continuous absence of the Principal Investigator in excess of three months or plans for the Principal Investigator to become substantially less involved in the project than was indicated in the approved application requires DOE prior approval. The awardee is encouraged to contact DOE immediately upon becoming aware that any of these changes are likely to be proposed, but in any event must do so and receive DOE prior approval before effecting any such change.

- c. Changes in Objectives or Scope Any change in the objectives or scope of a supported project requires the prior approval of DOE. Such changes include changes in the phenomenon or phenomena under study and in the methodology or experiment if they are a specific objective of the research work as stated in the application approved by DOE.
- d. Transfer of Substantive Programmatic Effort None of the substantive effort of this project may be transferred by contract or subaward to another organization or person without the prior approval of DOE. This provision does not apply to the procurement of equipment, supplies, materials, or general support services which may, however, be subject to other prior approval requirements as found, for example, in the applicable cost principles or procurement standards.
- e. General Procurement Prior Approval Requirements An awardee must receive prior approval from DOE before entering into any sole source contract or a contract where only one bid or proposal is received when the value of the contract in the aggregate is expected to exceed 1) \$10,000 and the awardee is a state, local, or Indian tribal government or 2) \$5,000 for all other awardees.
- f. Equipment and Other Capital Expenditures Expenditures for equipment and other capital assets having a unit acquisition cost of \$500 or more require the prior approval of DOE with one exception. For special purpose equipment, prior approval is required only when the unit acquisition cost is \$1,000 or more. (Special purpose equipment means equipment which is used only for research, medical, scientific, or other technical activities.)
- g. Foreign Travel Any foreign trip not listed and justified in the approved budget must receive DOE prior approval. Foreign travel must be directly related to the project objectives. Foreign travel is any travel outside Canada and the United States and its territories and possessions or, for grantees located in another country, travel outside the country. The International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 1517)(Fly America Act) requires Federal grantees to use U.S. flag carriers for Government-financed international air travel to the

extent these carriers are available. Grantees contemplating the use of non-U.S. flag carriers should consult with the DOE Contracting Officer prior to the trip.

- h. Domestic Travel Grantees may exceed the approved budget amount for domestic travel by up to 25 percent of \$500, whichever is greater, without DOE prior approval. All other expenditures for domestic travel beyond these limits require prior approval.
- i. Consultant Services Costs of consultant services are allowable subject to satisfaction of the requirements of the applicable cost principles, including the requirement that the consultant not be an employee of the awardee. There is one exception to the requirement that the consultant not be an employee of the awardee which applies to colleges and universities only. For colleges and universities, in unusual cases, and only with the prior approval of DOE, intra-organizational consultation may be permitted where consultation is across departmental lines or involves a separate or remote operation.
- j. Information Collection This award is subject to the requirements of the Paperwork Reduction Act of 1980 as implemented by the Office of Management and Budget rules, "Controlling Paperwork Burdens on the Public," published at 5 CFR 1320 (48 FR 13666, 3/31/83) if the awardee will collect information from ten or more respondents either:
 - A. At the specific request of DOE, or
 - B. If the award requires specific DOE approval of the information collection or the collection procedures.

Any proposed sponsored information collection under B. above shall be submitted by the awardee to the Contracting Officer named on the face page of this award at least 90 days prior to the intended date of information collection. DOE will seek the requisite approval from the Office of Management and Budget and will promptly notify the awardee of the disposition of the request.

9. Contracting Officer's Technical Representative (COTR)

The individual identified in Block 11. of the Notice of Financial Assistance Award as the DOE Project Officer is the Contracting Officer's Technical Representative (COTR). The COTR is responsible for 1) monitoring the research efforts being conducted by the awardee under the scope of this award; 2) advising the Contracting Officer on technical matters related to administration of the award, including progress and status of the awardee's research; and 3) providing technical advice and guidance to the awardee in order to assist both the research efforts of the awardee and the awardee's adherence to the terms and conditions of the award.

The COTR does not have the authority to:

Cause an increase or decrease in the total estimated cost of, or the time required for, the research effort being supported;

Cause any change in the express terms and conditions of the award;

Cause any change in the objectives or scope of the effort being supported;

Act in the capacity of the Contracting Officer by issuing any approval or disapproval required by the terms and conditions of the award;

Interfere with the Awardee's right to perform under the terms and conditions of the award.

10. Reporting Requirements

- a. Copies. Copies of reports and all other related data and information generated under this award shall be submitted in accordance with the attached Federal Assistance Reporting Checklist (DOE Form EIA-459A).
- b. Distribution. The awardee shall prepare and submit (postage prepaid) the plans and reports indicated on the Federal Assistance reporting checklist. Preparation of the specified plans and reports shall be in accordance with the DOE Order 1332.2. The level of detail the awardee provides in the plans and reports shall be commensurate with the scope and complexity of the task.
- c. Proprietary information. All reports delivered to DOE shall be the sole property of DOE. The awardee shall not claim that any report contains any trade secrets or commercial or financial information deemed by the awardee to be privileged or confidential, or that the awardee has any proprietary interest in any report.

11. Public Access to Information

The Freedom of Information Act, as amended, and the DOE implementing regulations (10 CFR Part 1004) require the release by DOE of certain documents and records regarding awards upon written request by any member of the public. The intended use of the information will not be a criterion for release. These requirements apply to information held by DOE, and do not require awardees or their contractors to permit public access to their records.

Records maintained by DOE with respect to awards are subject to the provisions of the Privacy Act and the DOE implementing regulations (10 CFR Part 1008) if those records constitute a "system of records" as defined in the Act and the regulations. Generally, records maintained by awardees or their contractors are not subject to these requirements.

12. Continuations, Renewals, and Extensions

Awardees are responsible for assuring that properly completed applications for continuation awards are received no later than 4 months prior to the expiration date of the current budget period shown on the Notice of Financial Assistance Award.

If an awardee wishes to apply for a renewal award in order to receive funding beyond the scheduled expiration of the existing project period, a properly completed application must be submitted to DOE no later than four months prior to the scheduled expiration date of the project period as shown on the Notice of Financial Assistance Award.

Awardee requests for extensions (modifications extending an existing project period by 18 months or less in order to complete a project) must be submitted prior to the expiration date of the project period as shown on the face page of this award, and must include a budget for the use of any remaining funds or any additional funds requested. Any request for an extension, which includes a request for additional funds and any request for an extension of more than 90 days, should be submitted to DOE no later than four months prior to the scheduled expiration date of the project period.

13. Property

Real and Tangible Personal Property

No real property may be acquired under this award.

Title to any equipment (an article of tangible personal property that has a useful life of more than 2 years and an acquisition cost of \$500 or more) or supplies acquired by a nonprofit institution of higher education or a nonprofit organization whose primary purpose is the conduct of scientific research shall vest in the awardee and such equipment shall be exempt from accountability except that DOE has the right to transfer ownership of any item of equipment having a unit acquisition cost of \$1,000 or more under the conditions specified in 10 CFR 600.117(d)(2). This exemption is derived from Public Law 95-224. The Federal Grant and Cooperative Agreement Act of 1977, as amended.

Title to equipment and supplies acquired by all other awardees shall vest in the awardee. However, such awardees shall be accountable for equipment with a unit acquisition cost of \$1,000 or more acquired under this award as specified in 10 CFR 600.117(d)(2), (3) and (4).

For such awardees, supplies need only be accounted for at closeout and then only if they are unused and exceed \$1,000 in total aggregate current fair market value. In this case accountability requires that DOE be compensated in an amount computed in accordance with Section 600.117(e) if the supplies are retained for use on non-Federal activities.

All awardees shall follow property management policies and procedures which provide for adequate control of the acquisition and use of assets acquired under the award.

Intangible Property

Treatment, including reporting, of patent and data rights and copyrights shall be as specified in the Special Terms and Conditions of this award.

14. Nondiscrimination

This award is subject to the provisions of 10 CFR Part 1040 "Nondiscrimination in Federally Assisted Programs."

15. National Security

It is not expected that activities under this award will generate or otherwise involve classified information (i.e., Restricted Data, Formerly Restricted Data, National Security Information).

However, if in the opinion of the awardee or DOE such involvement becomes expected prior to the closeout of the award, the awardee or DOE shall notify the other in writing immediately. If the awardee believes any information developed or acquired may be classifiable, the awardee shall not provide the potentially classifiable information to anyone, including the DOE officials with whom the awardee normally communicates, except the Director of Classification, and shall protect such information as if it were classified until notified by DOE that a determination has been made that it does not require such handling. Correspondence which includes the specific information in question shall be sent by registered mail to U.S. Department of Energy, Attn: Director of Classification, DP-32, Washington, DC 20545. If the information is determined to be classified the awardee may wish to discontinue the project, in which case the awardee and DOE shall terminate the award by mutual agreement. If the award is to be terminated, all material deemed by DOE to be classified shall be forwarded to DOE, in a manner specified by DOE, for proper disposition. If the awardee and DOE wish to continue the award, even though classified information is involved, the awardee shall be required to obtain both personnel and facility security clearances through the Office of Safeguards and Security. Costs associated with handling and protecting any such classified information shall be negotiated at the time the determination to proceed is made.

16. Liabilities and Losses

DOE assumes no liability with respect to any damages or loss arising out of any activities undertaken with the financial support of this award.

17. Generally Applicable Requirements

In accordance with 10 CFR 600.12, this grant is subject to a number of statutory and other generally applicable requirements. Those requirements most pertinent to research projects are highlighted below:

Animal Welfare

Any grantee performing research on warm-blooded animals shall comply with the Laboratory Animal Welfare Act of 1966 (Public Law 89-544, as amended) and the regulations promulgated thereunder by the Secretary of Agriculture at 9 CFR Chapter 1, Subchapter A, pertaining to the care, handling, and treatment of warm-blooded animals held or used for research, teaching, or other activities supported by Federal awards. The grantee is expected to ensure that guidelines described in Department of Health and Human Services (DHHS) Publication No. [NIH] 78-23, "Guide for the Care and Use of Laboratory Animals," are followed (Copies are available from the Superintendent of Documents, Government Printing Office, Washington, DC 20024, Stock No. 017-040-00427-3).

Research Involving Recombinant DNA Molecules

Any grantee performing research involving recombinant DNA molecules and/or organisms and viruses containing recombinant DNA molecules agrees by acceptance of this grant to comply with the National Institutes of Health "Guidelines for Research Involving Recombinant DNA Molecules," June 1983 (48 FR 24556) or such later revision of those guidelines as may be published in the Federal Register.

Use of Human Subjects in Research, Development, and Related Activities

Any DOE grantee performing research, development, or related activities involving any use of human subjects must comply with DOE regulations found at 10 CFR Part 74S "Protection of Human Subjects" and any additional Provisions which may be included in the Special Terms and Conditions of this grant. Such provisions are intended to safeguard the rights and welfare of human subjects at risk of possible physical, psychological, or social injury as a consequence of their participation.

OREGON - DOGAMI - VOUCHER RECORD

Voucher #	Amount	HPP		DOGAMI		Billed thru	Date of Voucher	Comments
		# DOE Added	Σ # billed	\$ Left	Σ # billed			
Phase 1		# 15,860					Signed 6/27/89	Grant DE-FG07-89ID12834
DOGAMI GRANT #68	1 ✓ \$ 4,928.59		\$ 4,928.59 ✓	\$ 10,931.41 ✓	4,928.59	6/1/89-6/30	sub. 7/26/89	Rec. DOE/ID 08/06/89
#87	20 ✓ \$ 398.41		\$ 5,327.00 ✓	\$ 10,533.00 ✓	5,327.00	9/1/89-9/30/89	sub. ~10/25/89	Rec. DOE/ID 11/02/89
#102	30 ✓ \$ 2,341.41		\$ 7,668.41 ✓	\$ 8,191.59 ✓	7,668.41	10/1/89-11/30/89		Rec. DOE/ID 1/05/190
#109	4 ✓ \$ 1,067.60	+ 184,140	\$ 8,736.01 ✓	\$ 191,263.99 ✓	8,736.01	11/1/89-12/31/89		Signed by PB, DOE/ID 2/6/90
#139	5 ✓ \$ 1,223.01		\$ 9,959.02 ✓	\$ 190,040.98 ✓	9,959.02	1/01/90-2/28/90		Signed by PB, DOE/ID 4/19/90
#147	6 ✓ \$ 3,730.77		13,689.79 13,325.79 ✓		13,325.79	3/1 - 3/31		Signed by PB, DOE/ID 5/11/90
#155	7 ✓ \$ 3,012.03		16,701.82	153,862.18	16,337.82	4/1 - 4/30		Rec. MR 6/28/90
#188	8 ✓ \$ 2,337.76		19,039.58	181,824.42	16,027.55	5/1 - 6/30/90		Signed by A.L. PMB 8/3/90
#202	9 ✓ \$ 7,788.24		26,827.82	173,526.18	23,815.79	7/1 - 7/31		
#212	10 ✓ \$ 20,951.37		47,779.19	152,220.8	44,767.16	8/1 - 8/31/90		
#155A	11 ✓ \$ 3,012.03		47,779.19		47,779.19	8/1 - 8/31/90		Corrects DOGAMI Accounting Balance
#225	12 ✓ \$ 24,167.46		71,946.65		71,946.65	9/1 - 9/30/90		Sig.
#238	12 ✓ \$ 80,675.62		152,622.27 ✓	47,377.73	152,622.27 ✓	10/1 - 10/31/90		Signed by PMB 12/11/90
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University of Utah Research Institute
 391 Chipeta Way Suite C
 Salt Lake City, Utah 84108
 Telephone 524-3422

REQUISITION

THIS IS NOT A PURCHASE ORDER

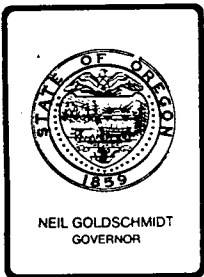
RI 1742

PURCHASE ORDER NO. RI 1559		1 REQUISITION DATE 10-4-90	EXPECTED DEL. DATE	2 DELIVERY CODE 65305	8 SUGGESTED SOURCE(S) College of Oceanography			VENDOR NUMBER		
3 REQUESTING DEPARTMENT Earth Science Laboratory				RM. # 391-C	BLDG. Chipeta Way	Oregon State University				
4 DELIVER TO ATTENTION OF Dee Petty				RM. # 391-C	BLDG. Chipeta Way	Corvallis, OR 97331				
5 DATE NEEDED BY:		6 SPECIAL DELIVERY INSTRUCTIONS			Attn: Dr. Robert Duncan (503) 737-2296					
7 ACCOUNT(S) TO BE CHARGED 5-85140-4890			8 ACCOUNT EXPIRATION DATE		BUYER NO.	TERMS	F.O.B.	S.C. NO.	BUYER INITIAL AND DATE	
BID <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO PUBLIC OPENING <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					10 ORDER BY <input type="checkbox"/> MAIL <input type="checkbox"/> TELEPHONE <input type="checkbox"/> PICK UP <input type="checkbox"/> TWX	11 SHIP BY <input type="checkbox"/> MOTOR FREIGHT <input type="checkbox"/> AIR <input type="checkbox"/> U.P.S. <input type="checkbox"/> PARCEL POST	12 Questions regarding this request should be directed to: Dee Petty 524-3441 Howard Ross 524-3444 Name Phone			
13 ITEM	C/S PROD. CODE	14 QUANTITY	15 UNIT ISSUED	16 CATALOG NUMBER	DESCRIPTION (INCLUDING STYLES, SIZE, COLOR, ETC.)			17 EST. UNIT PRICE	UNIT PRICE	TOTAL PRICE
1		3			K/Ar age dates in support of DOGAMI Santiam Pass scientific drill hole, 77-24. Vendor will provide age date information to: Mr. Brittain Hill, DOGAMI Dr. Howard P. Ross, UURI			\$ 400.00		
					CONFIRMING ORDER DO NOT DUPLICATE					
QUOTATION NO.		QUOTATION DATE		TELEPHONE CONFIRMATION TO			DATE		EST. TOTAL \$	
									\$1200.00	

18 THIS IS TO CERTIFY THAT THERE IS NO LIKE EQUIPMENT IN THIS DEPARTMENT, AVAILABLE FOR USE IN LIEU OF ITEM(S) REQUESTED AND TO THE BEST OF MY KNOWLEDGE, THE PURCHASE WILL NOT RESULT IN A PROHIBITIVE CONFLICT OF INTEREST AS DEFINED IN PPM4-1.1.

Dee Petty 10-4-90
 DEPARTMENT HEAD OR ACCOUNT EXECUTIVE DATE ADDITIONAL AUTHORIZATION - SIGNATURE DATE

SUBTOTAL \$
 FREIGHT \$
 TOTAL \$



Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

MEMORANDUM

July 14, 1989

To: Interested persons
 From: George Priest *GP*
 Subject: Current plan of operations for the Santiam Pass scientific drilling project

STATUS OF FUNDING FOR THE PROJECT

We have received the Phase I funding of about \$15K and have sent off the Phase I report. I expect the Phase II funding of about \$185K shortly. Oxbow Geothermal Corporation has committed \$100K of cost share, but a final contract is still being negotiated.

OVERVIEW OF THE PLAN OF OPERATIONS

A 3000 ft. hole will be drilled at Santiam Pass about 350 ft. south of Highway 20 on USFS road 900 (see attached map). The upper 500 ft. will be rotary drilled (7.921" inner diameter on casing); the rest will be diamond cored (hole diameter 3.937"; 2.875", if reduction required). Two-inch (inner diameter), water-filled iron pipe will be placed in the hole to ensure access for temperature logging. Management of the project will be handled by the Oregon Department of Geology and Mineral Industries (DOGAMI). Oxbow Geothermal Corporation (OGC) will manage the drilling operation and subcontract for all services necessary to drill, plug, and abandon the hole.

Drilling should begin between August 15 and September 15, 1989 and continue for approximately 40-45 days. Plugging and abandonment will be complete about one year after drilling begins, unless OGC elects to deepen the hole. Outside investigators may access the hole for experiments any time during this 1 year period.

PROJECT TASKS

Coordination of scientific work on the hole began with a meeting of all interested participants on June 27, 1989. The following tasks were addressed at the meeting and in subsequent conversations:

- > Project coordination and management. The DOGAMI representative will be in charge of the project and will be responsible for coordination between scientific and technical support personnel.
- > Public announcements and press releases. DOGAMI will have responsibility and authority for this task.
- > Drilling management and engineering. OGC will provide drilling experts who will be responsible for day-to-day drilling decisions and management; however, authority for decisions affecting collection of scientific data from the hole resides with the DOGAMI representative.

> Lithologic logging and scientific decisions. Two site geologists will be responsible for lithologic logging and for drilling decisions affecting acquisition of scientific data. One full-time geologist will be available from DOGAMI (funded by the grant). A second full-time geologist will be available at no cost to the grant. The University of Utah Research Institute (UURI) will provide Jeff Huelen for three weeks, and the USGS will provide the services of David Sherrod for the balance of the time that the UURI geologist will not be available, probably about 3 weeks. Right now it looks as though David Sherrod will be doing the initial 3 weeks with Jeff doing the final 3 weeks. David will also check in from time to time to examine core throughout the drilling. Carter Hull (University of Oregon) may be available for drill-site work during the rotary drilling operation. During diamond coring, the hole will be drilled 24 hrs. per day, so the site geologists will be on call or present during 12-hour shifts. It will probably not be necessary for 2 full-time site geologists to be available for the rotary drilling, unless it also goes 24-hours per day.

> Petrography. The analytical budget provides for 70 thin sections. DOGAMI personnel will examine the mineralogy in cooperation with other investigators.

> Analysis of hydrothermal alteration. USGS and UURI workers have offered to analyze hydrothermal alteration mineralogy and isotopic composition, including fluid inclusions, at no cost to the grant. Carter Hull of the University of Oregon may also do some analysis and, possibly, U-Th age determination on hydrothermal alteration minerals.

> Analysis of whole rock major- and minor-element chemistry. UURI will provide 20 free ICP analyses. The grant can fund up to 35 additional analyses, if necessary.

> Analysis of trace elements and isotopes relevant to igneous petrology. There is no support in the grant for this task. Scott Hughes of the Montana Bureau of Mines and Geology may provide some trace element analyses at no cost to the grant.

> Isotopic age determination. UURI will provide 2-4 K-Ar ages at no charge to the grant. USGS may provide 4-6 K-Ar ages at no charge, but there is likely to be an 8-month-plus wait for the data, and sample preparation would probably be required. The USDOE grant can directly fund up to 4 age determinations, if necessary.

> Geophysical logging and interpretation. David D. Blackwell (Southern Methodist University) will provide geophysical logging services, including temperature, heat flow, self potential, sonic velocity, gamma ray, and caliper logs. He will also provide a report interpreting the geophysical data. VSP would be highly desirable, but is not supported by the grant. All geophysical logs will be filed with Petroleum Information Service, Denver, Colorado.

> Paleomagnetic measurements. There is no support in the grant for this task, although flux gate magnetometer measurements will be made.

> Determination of physical properties of core. David Blackwell will determine thermal conductivity. UURI will, at no charge to the grant, determine density, magnetic susceptibility, and electrical resistivity.

> Core storage. Oregon State University will, at no cost to the grant, curate and dispense all core. DOGAMI will also curate a summary core for public use. OSU already has nearly 5000 ft. of drill core from four 800-2000 ft. holes drilled by UNOCAL in the High Cascades between the latitude of the South Sister and Mount Jefferson. For more information contact Martin Fisk or Andy Ungerer (Geological Oceanography Dept., OSU, Corvallis, 97331, (503)737-2296).

> Downhole water sampling. Carter Hull (U of O) will take a water sample of the first major aquifer encountered. The water will be blown out of the hole by the air rotary drilling process. Robert Mariner of the USGS will be on call for downhole water sampling in the diamond-cored part of the hole, should sufficient quantities of thermal water be encountered to warrant sampling. He will also provide chemical analysis of water samples. The above services will be at no cost to the grant, although some travel may be reimbursed to Carter Hull.

> In situ rock stress determination. There are no plans to do hydrofracture tests. Borehole breakout analysis may be analyzed from the caliper log, although no one has volunteered to do this as yet.

> Surface geological mapping. Existing map coverage is good. No further work is proposed in the grant.

> Surface geophysical surveys. In 1991 Craig Weaver and Dal Stanley plan to do east-west, regional-scale M-T, refraction, and reflection transects. No other surveys are planned or supported by the grant.

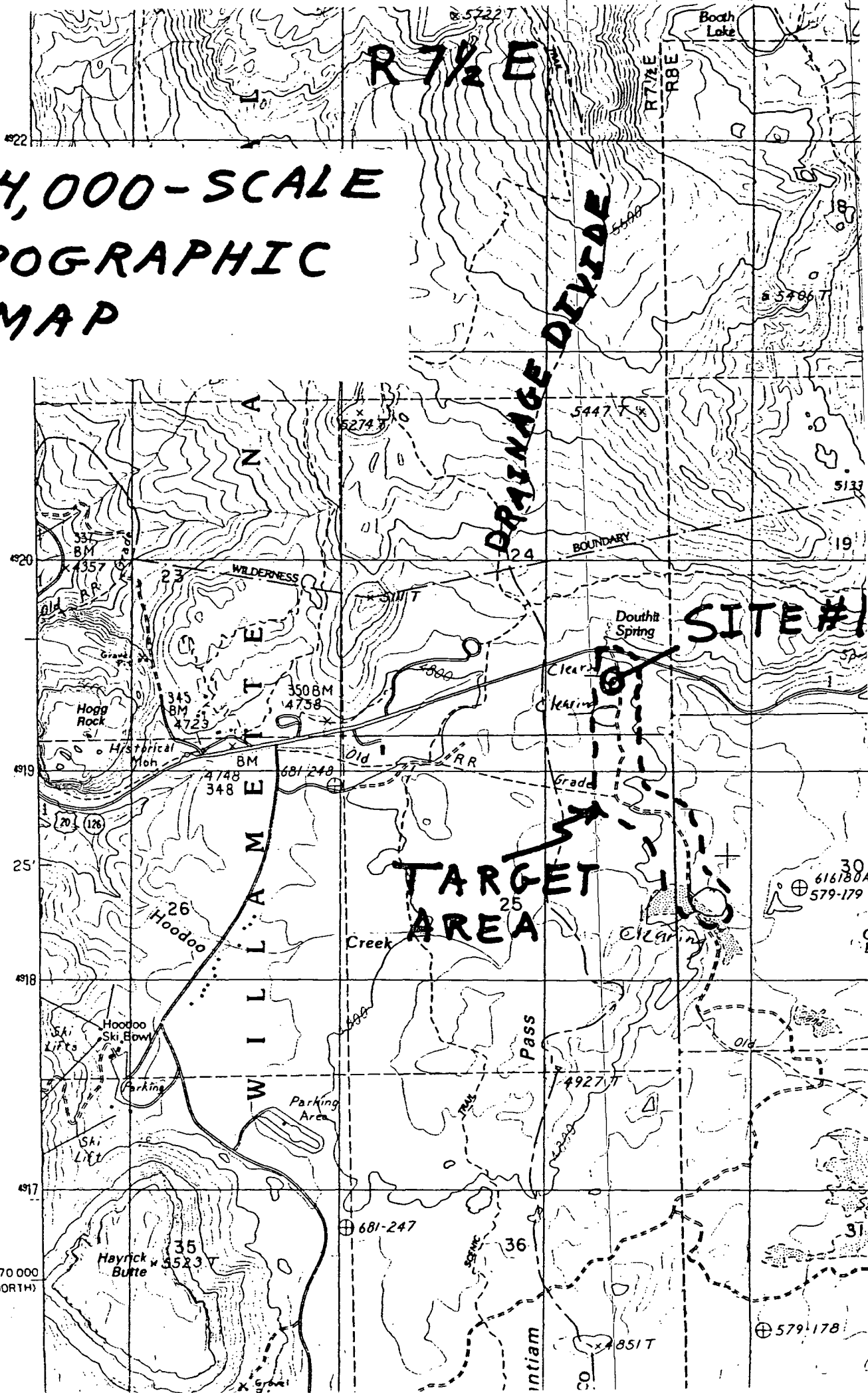
> Preparation of final report and interpretation. The DOGAMI representative will prepare the final report to USDOE. The report will summarize water-rock reactions, lithology, geochemistry, and age relationships in the drill hole, nearby drill holes, and at the surface. An east-west geologic cross section and summary 1:62,500-scale geologic map will be produced as part of the report.

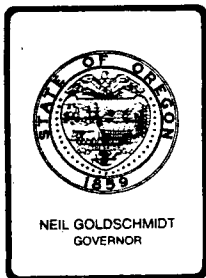
> Publication. The final report will be open-filed through DOGAMI.

1:24,000-SCALE TOPOGRAPHIC MAP

T13S

270 000
FEET (NORTH)





Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

July 19, 1989

Dr. Scott Hughes
Chief, Analytical Division
Montana Bureau of Mines and Geology
Montana College of Mineral Science and Technology
Butte, Montana 59701

Dear Scott:

Thank you for your interest in the Santiam Pass scientific drilling project. I hope that you will be able to get some good science out of the proposed hole.

As you know, there is no support in the USDOE grant for elegant trace element studies. There is, however, some meager (\$1050) support for major and minor element work on whole rocks. We also have a commitment from the University of Utah Research Institute to give us 20 free ICP analyses. I would like to analyze samples from both the Santiam Pass hole and the four UNOCAL holes to establish correlations and to characterize the volcanic sequences.

If you want to provide whole-rock analyses for the project, you will have to send me a proposal outlining what you intend to do, giving details of the quality control and analytical procedure. I would suggest that you confer directly with Gary Baxter, our Geochemist, concerning the information he would like to see included in your proposal (ph. 503-229-5580).

Thank you for your interest. I hope that you can obtain substantive support from NSF or other sources for this important project.

Best regards,

George R. Priest
Regional Geologist

cc Gary Baxter
John Beaulieu
Gordon Goles
Richard Conrey
Peter Hooper
Robert Duncan
Ed Taylor
Dave Christie
Roger Nielsen
Howard Ross



Department of Geology and Mineral Industries
ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

*W.K.
7/11/89*

July 10, 1989

Isamu Aoki
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

Dear Sam:

Thank you for your help and candid comments during our recent travails with the Santiam Pass grant. We are doing everything possible to ensure that the drilling will start between August 15 and September 15, 1989.

Enclosed is the Phase I report for the project (Grant No. DE-FG07-89ID12834). As you know, there was no support in Phase I for drafting and no time for preparation of an exhaustive report; nonetheless, the enclosed report covers all of the most critical reasoning for site selection, albeit in somewhat rough and abbreviated form. Note that your copy of the report does not have the environmental assessment (EA), because it was already sent to you and to Judy Stiger.

The report was also mailed to Howard Ross and Trudy Thorne, as specified in the grant. Their copies have the EA.

As you know, Oxbow Geothermal Corporation (OGC) was the only respondent to our January 25, 1989 solicitation for cost sharing partners. We are very lucky that, in addition to obligating \$100,000, OGC has volunteered to take on the management of the drilling. A draft copy of a personal services contract with OGC is enclosed with the Phase I report. The final copy of this subcontract will be available for your review once OGC gets back to us with their revisions.

I hope that you can move rapidly toward the Phase II modification. As you know, we cannot contract for the drilling until the Phase II funds are officially available. The Phase II

modification, obligating the rest of the funds, must be in our office by July 25, 1989, if we are to have any chance of drilling this year.

Please call if you have any questions.

Sincerely,

George R. Priest
Regional Geologist

CC Ken Osborne
Marshall Reed
Howard Ross
Trudy Thorne
Sue Stiger
Joel Renner
Don Hull
John Beaulieu



Personal Service Contract to OGC (includes Plan of Operations)

Department of Geology and Mineral Industries

ADMINISTRATIVE OFFICE

910 STATE OFFICE BLDG., 1400 SW 5th AVE., PORTLAND, OR 97201-5528 PHONE (503) 229-5580

July 5, 1989

W. Richard Benoit
Oxbow Geothermal
200 S. Virginia St.
Reno, NV 89501

Dear Dick:

Enclosed in the form of a personal services contract is the cost-sharing agreement for the Santiam Pass project. Please have your company sign it, if there are no needed changes.

I just found out that after we get you to sign we still have to get USDOE to sign off on the subcontract, so we are facing yet another delay. It may be that we will have to modify the time schedule to take account of these review delays at the Federal end (e.g. drill the rotary this year and diamond core next year). We should be able to do this easily with a contract modification. In the interim, I would like to proceed as quickly as possible on the assumption that the hole will be drilled this year.

Best regards,

George R. Priest

George R. Priest
Regional Geologist

CC Don Hull
John Beaulieu

encl.

DRAFT
(sent to OGC
7-6-89)

PERSONAL SERVICE CONTRACT

This contract is between the State of Oregon acting by and through its Department of Geology and Mineral Industries hereafter called "Department," and Oxbow Geothermal Corporation hereafter called "Contractor." The Department will utilize federal funds from the United States Department of Energy hereafter called "USDOE" to reimburse the Contractor. This contract is therefore subject to all restrictions and approvals applying to federal subcontracts as outlined in Exhibit E.

1. Retirement System Status

Contractor is not a contributing member of the Public Employees' Retirement System and will be responsible for any federal or state taxes applicable to this payment. Contractor will not be eligible for any benefits from these contract payments of Federal Social Security, unemployment insurance, workers' compensation, or the Public Employees' Retirement System, except as a self-employed individual or entity.

2. Statement of Work

a. Contractor agrees to accomplish the work under this contract as shown on Exhibit "B" attached hereto and by this reference made a part hereof.

b. Contractor agrees to the following delivery schedule for the work mentioned in 2a:

- Begins July 25, 1989
- Start Drilling August 15, 1989 to September 15, 1989
- Drilling Report December 31, 1989
- Plugging and Abandonment December 1, 1990
- Plugging and Abandonment Report February 1, 1991

3. Consideration

a. Department agrees to pay Contractor not to exceed the sum of \$98,890 for accomplishment of work, subject to the conditions outlined in Exhibits "A," "B," and "C" and part 3d. USDOE funds will be used and made available through the Department. No funds from the State of Oregon will be used.

b. Interim payments shall be made to Contractor beginning after the start of drilling on the drill hole of Exhibit D. Interim payments that are included as part of this contract shall be made based on monthly billing by the Contractor. Payment will be made only if billings include copies of daily drilling receipts that have been signed by both the Contractor and the Department's representative.

c. The Department agrees to provide scientific support and project management for the project as outlined in Exhibit "C."

d. Payments for billings over \$88,890 will be withheld until after (1) accomplishment of the drilling task of Exhibit B is complete, and (2) the Department receives and approves the Drilling Report.

4. Travel

Travel expenses will not be reimbursed to the Contractor by the Department and are not included in the amount of consideration listed in 3. above.

5. Government Employment Status

a. If this payment is to be charged against Federal funds, the Contractor certifies that it is not currently employed by the Federal Government.

b. Contractor certifies it is not an employee of the State of Oregon.

6. Subcontracts

Contractor shall not enter into any subcontracts for any of the work scheduled under this contract without obtaining prior written approval from the Department. Drilling subcontractors must meet the conditions outlined in Exhibit B.

7. Dual Payment

Contractor shall not be compensated for work performed under this contract from any other Department of the State of Oregon.

8. Funds Available and Authorized

Department does not have the federal funds to reimburse the Contractor at the present time. Receipt of these federal funds is contingent upon approval by USDOE of site selection and permitting for the drill site. No State funds will be available for the work described herein.

9. Amendments

The terms of this agreement shall not be waived, altered, modified, supplemented or amended, in any manner whatsoever, except by written instrument signed by the parties.

10. Termination

a. This contract may be terminated by mutual consent of both parties in writing and delivered by certified mail or in person.

b. The Department may terminate this contract effective upon delivery of written notice to the Contractor, or at such other date as may be established by the Department, under any of the following conditions:

1. If Department funding from federal sources is not obtained and continued at levels sufficient to allow for purchase of the indicated quantity of services. The contract may be modified to accommodate a reduction in funds.

2. If federal or state regulations or guidelines are modified, changed, or interpreted in such a way that the services are no longer allowable or appropriate for purchase under this contract or are no longer eligible for the funding proposed for payments authorized by this contract.

3. If any license or certificate required by law or regulation to be held by the Contractor to provide the services required by this contract is for any reason denied, revoked, or not renewed.

Any such termination of this contract shall be without prejudice to any obligations or liabilities of either party already accrued prior to such termination.

c. The Department by written notice of default (including breach of contract) to the Contractor may terminate the whole or any part of this agreement:

1. If the Contractor fails to provide services called for by this contract within the time specified herein or any extension thereof; or

2. If the Contractor fails to perform any of the other provisions of this contract, or so fails to pursue the work as to endanger performance of this contract in accordance with its terms, and after receipt of written notice from the Department, fails to correct such failures within 1 day or such longer period as the Department may authorize.

The rights and remedies of the Department provided in the above clause related to defaults (including breach of contract) by the Contractor shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

11. Captions

The captions or headings in this contract are for convenience only and in no way define, limit or describe the scope or intent of any provisions of this contract.

12. Execution and Counterparts

This contract may be executed in several counterparts, each of which shall be an original, all of which shall constitute but one and the same instrument.

13. Severability

a. If any provision of this contract shall be held invalid or unenforceable by any court of competent jurisdiction, such a holding shall not invalidate or render unenforceable any other provision hereof.

b. The parties agree that if any term or provision of this contract is declared by a court of competent jurisdiction to be illegal or in conflict with any law the validity of the remaining terms and provisions shall not be affected, and the right and obligations of the parties shall be construed and enforced as if the contract did not contain the particular term or provision held to be invalid.

14. Assignment

Contractor shall not assign or transfer his interest in this agreement without the express written consent of the state.

15. Waiver

The failure of the State to enforce any provision of this contract shall not constitute a waiver by the State of that or any other provision.

16. Access to Records

a. The Department, the Secretary of State's Office of the State of Oregon, the Federal Government, and their duly authorized representatives shall have access to the books, documents, papers, and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts, and transcripts.

b. All geological, geochemical, geophysical, and engineering data, rock cores and cuttings, or fluid samples from the drill hole of Exhibit B and from any drilling beyond depths and times addressed in Exhibit B will be made available to the public by release to the Department. Such data and rock and fluid samples will not be released by the Contractor to any other party.

c. The Department will make all data and samples from the drill hole of Exhibit B available to the public in a timely fashion.

17. State Tort claims Act

Contractor is not an officer, employee, or agent of the State as those terms are used in ORS 30.265.

18. Indemnity

a. The Contractor shall save and hold harmless the State of Oregon and the Department, its officers, agents, employees, and members, from all claims, suits or actions of whatsoever nature resulting from or arising out of the activities of the Contractor or its subcontractor, agents, or employees under this contract.

b. The Contractor shall secure at its expense and keep in effect during the term of this contract comprehensive general liability with extended coverage endorsement from an insurance company authorized to do business in the State of Oregon. The limits shall not be less than one million dollars per occurrence for personal injury and property damage. The insurance policy or policies shall name the state of Oregon, its Department of Geology and Mineral Industries, and their officers, employees, and agents as additional insureds. The policies shall contain a corss liability endorsement and include the obligations specified in the first paragraph of this section.

c. The Contractor shall also secure at its expense and keep in effect during the term of this contract, comprehensive auto liability insurance from an insurance company authorized to do business in the State of Oregon. The limits shall not be less than one million dollars per occurrence for personal injury and property damage. The Contractor shall have the State of Oregon, its Department of Geology and Mineral Industries, and their officers, employees, and agents as additional insureds.

d. The policies listed above cannot be cancelled without thirty (30) days written notice to the State. The Contractor shall supply the State with a Certificate of Insurance listing the coverage and other requirements set out above.

19. Ownership of Work Product

All work products of the Contractor which result from this contract, with the exception of the drill hole itself, are the exclusive property of the Department.

20. Nondiscrimination

Contractor agrees to comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules, and regulations.

21. Justice Department Approval

Department of Justice approval is required before any work may begin under this contract.

22. Successors in Interest

The provisions of this agreement shall be binding upon and shall inure to the benefit of the parties hereto, and their respective successors and assigns.

23. Attorney Fees

In the event a lawsuit of any kind is instituted on behalf of the state to collect any payment due under this contract or to obtain performance of any kind under this contract, contractor agrees to pay such additional sums as the court may adjudge for reasonable attorney fees and to pay all costs and disbursements incurred therein.

24. Force Majeure

Contractor shall not be held responsible for delay or default caused by fire, riot, acts of God and war which was beyond the contractor's reasonable control.

25. Special Federal Requirements

Special Federal Requirements are contained in Exhibit A attached hereto and by this reference made a part hereof.

26. Data Release

Data developed under this contract shall not be released to the public during the period of the contract by the Contractor without the expressed written consent of the Department.

27. Compliance with Applicable Law

Contractor agrees to comply with all federal, state, county and local laws, ordinance and regulations applicable to this contract. This contract shall be governed by and construed in accordance with the laws of the State of Oregon. The Contractor specifically agrees that the provisions of ORS 279.312, 279.314, 279.316 and 279.320 shall govern performance of this contract.

28. MERGER CLAUSE

THIS AGREEMENT CONSTITUTES THE ENTIRE AGREEMENT BETWEEN THE PARTIES. NO WAIVER, CONSENT, MODIFICATION OR CHANGE OF TERMS OF THIS AGREEMENT SHALL BIND EITHER PARTY UNLESS IN WRITING AND SIGNED BY BOTH PARTIES. SUCH WAIVER, CONSENT, MODIFICATION OR CHANGE, IF MADE, SHALL BE EFFECTIVE ONLY IN THE SPECIFIC INSTANCE AND FOR THE SPECIFIC PURPOSE GIVEN. THERE ARE NO UNDERSTANDINGS, AGREEMENTS, OR REPRESENTATIONS, ORAL OR WRITTEN, NOT SPECIFIED HEREIN REGARDING THIS AGREEMENT. CONTRACTOR, BY THE SIGNATURE BELOW OF ITS AUTHORIZED REPRESENTATIVE, HEREBY ACKNOWLEDGES THAT HE/SHE HAS READ THIS AGREEMENT, UNDERSTANDS IT AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS.

29. Contractor Data

Oxbow Geothermal Corporation
NAME

200 South Virginia Street, Suite 450

Reno, Nevada 89501
ADDRESS

OFFICIAL REPRESENTATIVE

ADDRESS

CONTRACTOR CODE: Y9995

CONTRACTOR FEDERAL IDENTIFICATION NUMBER: _____

CONTRACTOR STATE IDENTIFICATION NUMBER: _____

APPROVED AS TO LEGAL SUFFICIENCY:

APPROVED EXECUTIVE DEPARTMENT:

Name: _____
Assistant Attorney General

By: _____
Director or Delegate

Date: _____

Date: _____

STATE OF OREGON by and through its Department of Geology and Mineral Industries:

Name: _____
State Geologist

Date: _____

OXBOW GEOTHERMAL CORPORATION:

Officer Name: _____

Title: _____

Date: _____

EXHIBIT A

1. Packaging and Marking

a. Preservation, packaging, and packing for all items to be delivered hereunder shall be in accordance with standard commercial practice and adequate to insure acceptance by common carrier and safe arrival at destination.

b. All reports will be prepared and packaged in a cost-effective manner. Elaborate art work, expensive paper and bindings are neither necessary or desired.

2. Inspection and Acceptance

Inspection and acceptance of all items delivered under this personal service contract shall occur at destination. Work in progress may also be inspected at the Contractor's facilities or other work sites, and reasonable access shall be provided to authorized Department representatives. The inspection of all reports will be performed by the Project Officer who will assure that results conform to the general objectives and contract requirements listed herein. Inspection results shall be furnished to the Contractor in writing by the Project Officer within thirty (30) consecutive calendar days after receipt of the respective deliverable item. If any deliverable items are rejected, the Contractor will have fifteen (15) calendar days after receipt of the rejection to submit corrections. Department will have fifteen (15) calendar days to inspect the resubmission.

3. Notice of Delays

In the event the Contractor encounters difficulty in meeting performance requirements, or when he anticipates difficulty in complying with the Agreement delivery schedule or date, or whenever the Contractor has knowledge that any actual or potential situation is delaying or threatens to delay the timely performance of this Agreement, the Contractor shall immediately notify the Project Officer, in writing, giving pertinent details; provided, however, that this data shall be informational only in character and that this provision shall not be construed as a waiver by the Department of any delivery schedule or date, or any rights or remedies provided by law or under this Agreement.

4. News Releases

Press releases or other public announcements regarding this project will be made through the Department.

"EXHIBIT B"

Statement of Work and Responsibilities of the Contractor

Santiam Pass Scientific Drilling Project

1. Introduction

The Contractor agrees that the primary purpose of the drilling program specified here is to obtain scientific data, particularly heat flow and lithologic data, from the volcanic axis of the High Cascades in the Santiam Pass area. The Contractor also agrees that the drilling program will be carried out so as to maximize the amount of scientific data obtained.

2. Drilling Task

The Contractor, agrees to accomplish the following for the Department:

a. Obtain all necessary permits and bonds to drill a hole to 3000 ft. depth in an existing forest clearing adjacent to U.S. Forest Service (USFS) road 900 in sec. 24 T13S R7½E of Jefferson County.. Details of the hole design and location are given in Exhibit D.

b. Make a good faith effort to drill the above drill hole, expending at least \$100,000 of the Contractor's funds on drilling, plugging, and abandonment, followed by \$98,980 specified under Exhibit C of this contract. These funds will be expended for the services of subcontractors to be hired by the Contractor. Public notice of the opportunity to bid on drilling subcontracts must be posted in an appropriate publication commonly available in Oregon. Notice of the opportunity to bid will also be mailed to a list of drilling companies to be provided by the Department. The winning subcontractor(s) must provide:

1. Drilling equipment that can drill a hole in the location and to the specifications of the attached drilling permit (Exhibit D).

2. For the diamond-cored portion of the hole, a driller that has successfully drilled at least two diamond core holes to depths in excess of 1500 ft. in Quaternary volcanic rocks.

3. Guaranteed access, if needed, to equipment that is capable of air lifting and collecting samples of formation fluid from depths of 3000 ft. in the hole. This equipment need not be on site, but must be available should it be needed.

4. Water-proof core boxes of good quality that are appropriate for each size of core.

5. Placement of core in the core boxes in a standard, consistent orientation with footages marked by labeled wooden blocks. Intervals without core recovery will be marked by wooden blocks with appropriate footages. Core will be delivered to the Department or its designee.

6. Bottom-hole temperature measurements as possible (e.g. during drill bit changes or other pauses in drilling). If a maximum-reading thermometer is used for bottom-hole temperature measurements, the thermometer must be contained in a vessel that isolates it from hydrostatic pressures in the drill hole.

7. Hourly temperature logs of the circulating drilling mud at intake and output points.

8. Any needed assistance to cooperating technical and scientific workers, including the subcontractor responsible for geophysical logging of the hole.

c. During drilling, provide daily reports and documentation of drilling expenditures to the Department's drill-site geologist within 12 hours of the previous day's work. In addition, weekly summaries of drilling expenditures will be sent to the Department headquarters.

d. Provide a full-time drilling expert at the site to supervise and facilitate the drilling operation.

e. Pursue the drilling operation with utmost care to comply with federal, state, and county environmental regulations. To this end, the site will be prepared in conformance with permit conditions and with the least possible surface disturbance. Surface disturbance will be limited to construction of mud pits, and, if necessary, smoothing of the site and the access road. During drilling, the site will, as far as feasible, be maintained with a clean and visually pleasing appearance.

f. Upon completion of drilling, a drilling report will be provided summarizing the well history. The report will include (1) a daily log of drilling operations and rate of progress, and (2) graphs of penetration and money expenditure versus time, with appropriate annotations documenting delays in drilling operations. The report will be delivered by December 31, 1989.

g. Upon completion of drilling, restore the site and road leading to the site to original condition as specified in permits. This work will be completed by December 31, 1989.

h. Remove and dispose of any hazardous waste produced during the drilling operation in a manner approved by the Oregon Department of Environmental Quality. This work will be completed by December 31, 1989.

3. Post-Drilling Tasks and Responsibilities

a. Contractor will allow the Department free access to the hole, even if the hole is deepened beyond the depth supported in this contract. Access is guaranteed for a period of 2 years after start of the drilling addressed in the drilling task. The hole will be maintained during this two-year period cased to total depth with water-filled, 2" or larger inner diameter iron or steel tubing. The entire length of the tubing will be maintained accessible to a standard cable-mounted thermistor-type temperature probe. The tubing will be surrounded by heavy drilling mud to reduce intraborehole movement of ground water.

b. Contractor will, after obtaining permission from the Department, plug and abandon the hole in accordance with State, county, and federal regulations. Plugging is to be witnessed by Federal and/or State of Oregon officials.

c. Contractor will send the Department written verification of plugging and abandonment by February 1, 1991.

4. Other Responsibilities

a. The Contractor is solely responsible for contingency of snowfall, including: (1) any and all costs for snow removal and snow plowing to maintain access and egress from the drill site, and (2) any costs or losses of equipment if gear is snow-bound or frozen; notwithstanding Exhibit B or any other portion of this contract.

b. The Contractor will retain total ownership of and responsibility for the drill hole and may deepen the hole beyond depths specified in Exhibit D.

c. The Contractor will transmit to the Department all rock samples and legible copies of all data, particularly temperature and other geophysical data, obtained by the Contractor from the drill hole of Exhibit D and from the same hole if the hole is deepened or reentered. Such data and rock samples will be transmitted by the Contractor within 60 days of collection for public release by the Department.

"EXHIBIT C"

Responsibilities and Rights of the Department

Santiam Pass Scientific Drilling Project

The Department will provide the following to the project:

1. Reimbursement to the Contractor for an amount not to exceed \$98,890 for costs incurred by the contractor for drilling services addressed in Exhibit B, under the following restrictions:
 - a. These funds will be used to reimburse the Contractor for drilling expenses in excess of \$100,000. Reimbursement will be authorized per the schedule of page 1, parts 2 and 3 when (1) proof is provided that the Contractor's expenses equal or exceed \$100,000, including estimated costs for plugging and abandonment of the hole, but excluding labor costs incurred for permitting and contract negotiation; and (2) in the Department's judgement, a diligent effort has been made to accomplish the drilling task of Exhibit B..
 - b. Reimbursement will be contingent upon the Department's receipt of authorization from the U.S. Department of Energy to expend \$98,890 of federal funds for drilling expenses.
2. Coordination of the project with participating and cooperating public and private entities.
3. Decision responsibility and authority for all activities, including drilling, that affect the collection of scientific data from the drill hole. Specifically, the Department has the authority to:
 - a. Suspend or modify drilling operations to facilitate collection of scientific data from the hole.
 - b. Suspend or modify drilling operations if, in the Department's judgement, diligent progress is not being made on the drilling program or support services for collection of scientific data from the drill hole.
4. Megascopic description of drill core lithology; and chemical and microscopic analysis of selected samples.
5. Scientific interpretation of the lithologic data.
6. Geophysical logging of the hole, including some or all of the following techniques: temperature, heat flow, self potential, sonic velocity, gamma ray, and caliper logs.

7. Scientific interpretation of the geophysical data.
8. A geologist who will serve as the Department's representative at the site.
9. Data release.

"EXHIBIT D"

Drilling Plan of Operations

EXHIBIT D

PLAN OF OPERATION DOGAMI SANTIAM PASS TEMPERATURE GRADIENT HOLE

1. LOCATION

- a. The drill site will be in Jefferson County on land managed by the Sisters Ranger District of the Deschutes National Forest.
- b. The site location is marked "Site 1" on the attached map and is located along Forest Service Road 900 (Enclosure 1). An accurate location of the site is SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec 24 T13S/R7 $\frac{1}{2}$ E (24ddb). The latitude is 44° 25' 26" N and the longitude is 121° 50' 22" W. The ground level elevation is 4800 ft.

2. PROJECT DESCRIPTION

a. INTENT AND ANTICIPATED RESULTS

1. The goal of the project is to support research in the Cascade Range of Oregon. The specific objectives of the hole are to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade Range volcanism.
2. The project will be completed in two phases. Phase 1 will include site identification, site selection, permitting, and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition and interpretation, core curation, and final reporting. All information gathered in the course of the project will be made available to the public.
3. A rough schedule of events is as follows:
 - a. April 13 -- received letter from USDOE guaranteeing funding for Phase 1 studies.
 - b. June 28 -- receive contract from USDOE for completion of Phase 1 siting studies.
 - c. June 19 -- submit USFS environmental analysis to USDOE for environmental review process.

- d. July 25 -- receive Phase II drilling money from USDOE.
 - e. August 1 -- complete state required bidding process (started June 1, 1989). Sign a contract with a driller.
 - f. August 15 - September 15, 1989 -- commence drilling.
 - g. October 15 - November 1, 1989 -- complete drilling and suspend hole.
 - h. September - November 1, 1990 -- abandon hole.
4. The general plan is to complete a diamond cored drill hole to the greatest depth possible with available support (3000 ft.), then log the hole using accepted geophysical logging procedures. If possible during drill, any deep thermal (>50 °C) aquifer that has sufficient flow will be airlifted. Down-hole fluid samples will be taken from these aquifers. Upon the completion of drilling a string of 2" inner diameter pipe will be set to total depth, filled with water, and surrounded with API approved cementing mud and/or cement (see detailed description of drilling operations below). The well will be suspended and the drill rig demobilized. The wellhead will be secured with a locked surface valve. Temperatures will be monitored for a period of one year. Three complete temperature logs will be recorded. Following completion of temperature monitoring, the hole will be plugged and abandoned in accordance with existing State and Federal regulations.

b. SITE PREPARATION

- 1. Virtually no site preparation will be required. The final drill site will be in a small existing clearcut. No existing vegetation will be disturbed. The drill rig will be mounted on tandem-axle trucks and will require modification of site topography. Trailer-mounted mud pits will be utilized. Water will be transported to the site via a tandem-axle tanker truck. A small reserve sump for site water storage may be required. If so, it will be dug with a backhoe and lined with plastic. Upon completion of drilling the plastic will be removed, the pit and cellar backfilled, and the topography restored to its original surface.
- 2. Access to the site will be via Forest Service Road 900, and an unimproved road that connects with Highway 20. No modifications to the road is required to provide access to the proposed site.

c. DRILLING OPERATIONS

1. Drilling operations will be supervised by an on-site geologist.
2. It is anticipated that two drill rigs will be used in the drilling process. The upper 500' of the hole will be drilled by a truck-mounted air rotary water well rig. The first step will be to dig a 4' deep 6' x 6' cellar. A 12 3/4" hole will then be drilled to 35', and 10 3/4" O.D. K-55 (40.5#/ft) surface conductor casing will be run to total depth and cemented in place. With the surface conductor in place, a 9 3/4" hole will be drilled to 500'. 8 5/8" O.D. K-55 (32 #/ft) casing will be run to total depth and cemented in place. An annular blowout prevention device will be installed and tested to 1000 psi. the pressure test will be witnessed by the USFS, BLM, and/or DOGAMI regulatory personnel. Enclosure 2 is a diagram of the proposed hole design.
3. A truck-mounted wireline coring rig will be brought in and the hole will be cored to the maximum depth practicable with available support (3000 ft.) HX (3.937" O.D.) rods will be used. If drilling problems require reductions in hole diameter, the first reduction will be to NX (2.875" O.D.) rods. During drilling operations the bottom-hole temperature will be measured whenever the drill rods are out of the hole.
4. Upon completion of drilling, a suite of geophysical logs will be run. A string of 2" or larger inner diameter iron or steel pipe will be set to total depth and filled with water. The pipe will be surrounded with API approved cementing mud. The well will be suspended and the drill rig demobilized. the wellhead will be secured with a locked surface valve. Temperatures will be monitored in the hole for a period of one year. Upon completion of temperature monitoring operations, the hole will be abandoned in accordance with State and Federal regulations.
5. Water for the project will be obtained from Lake Creek, the outlet of Suttle Lake. The water will be transported to the site via truck over Highway 20 and Forest Service Road 900. DOGAMI has already obtained a water right from the Oregon Department of Water Resources for this water supply (Permit No. 50385) (see Enclosure 3). The haul route will include only 1/4 to 1/2 mile of travel over Road 900.

d. ABANDONMENT

Abandonment of the hole will be in accordance with applicable State and Federal regulations.

e. RESTORATION

The final site selected will be on ground that has been previously disturbed by logging operations. No vegetation is expected to be removed to create a drill site. Site restoration will involve returning the ground to the state which existed prior to the commencement of drilling operations.

3. ENVIRONMENTAL CONCERNS

Environmental analysis will be completed by the U.S. Bureau of Land Management in cooperation with the U.S. Forest Service as part of the permitting process. Results of the environmental analysis will be forwarded to USDOE for review. The purpose of this review is to insure compliance with NEPA environmental requirements. Receipt of Phase II drilling monies is contingent upon the environmental analysis passing the USDOE review process.

4. CULTURAL RESOURCES CONCERNS

- a. There are no standing water bodies or streams in the vicinity of the drill site. Water for drilling operations will be trucked to the site.
- b. The planned operations will not affect air quality. Drilling operations involve running only one diesel engine.
- c. Noise will not be a problem. The site is isolated and screened by trees. There are no commercial operations in the area.
- d. Archaeological concerns will be addressed by the federal environmental review.

5. CONTACTS

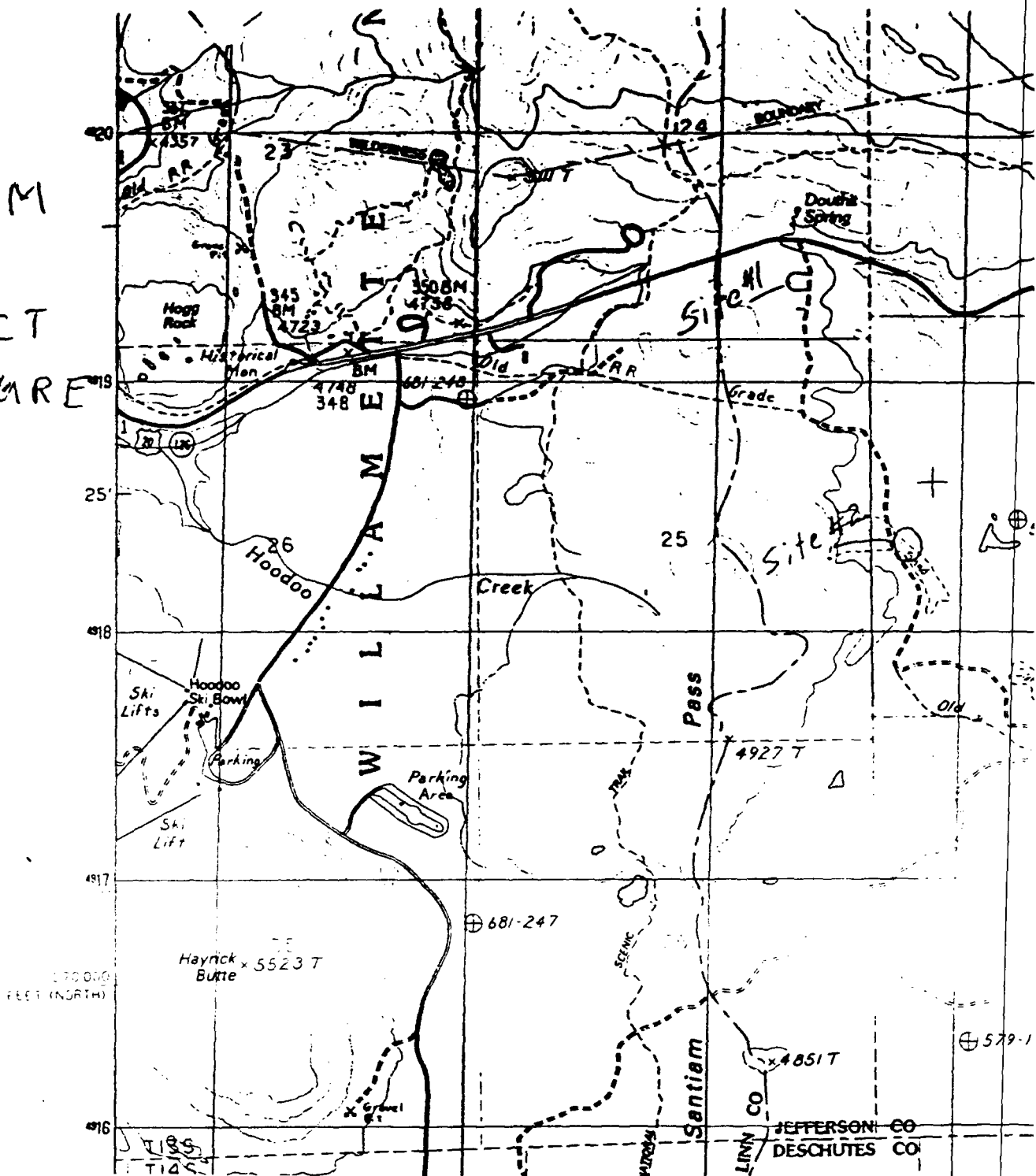
The project manager for the drilling subcontractor, Oxbow Geothermal Corporation, is:

Walter R. Benoit
Chief Geologist
Oxbow Geothermal Corporation
200 South Virginia Street, Suite 450 Reno, NV 89501
Phone: (702) 322-1300

6. EMERGENCY/FIRE CONTINGENCY PLAN

- a. Fire precautions taken will be in accordance with USFS regulations. All vehicles will have exhaust systems in good working order. All internal combustion engines will have spark arresters. Fire extinguishers, axes, Pulaskis, shovels, and buckets will be available in quantities specified by Forest Service District regulations. A water supply will be available in the form of the water truck used to haul water to the drill site.
- b. Prior to the commencement of operations, drilling crews will be briefed on the location and use of all fire fighting equipment. All equipment will be checked to insure proper operations.

ANTIAM
 PASS
 PROJECT
 ENCLOSURE
 -2-89

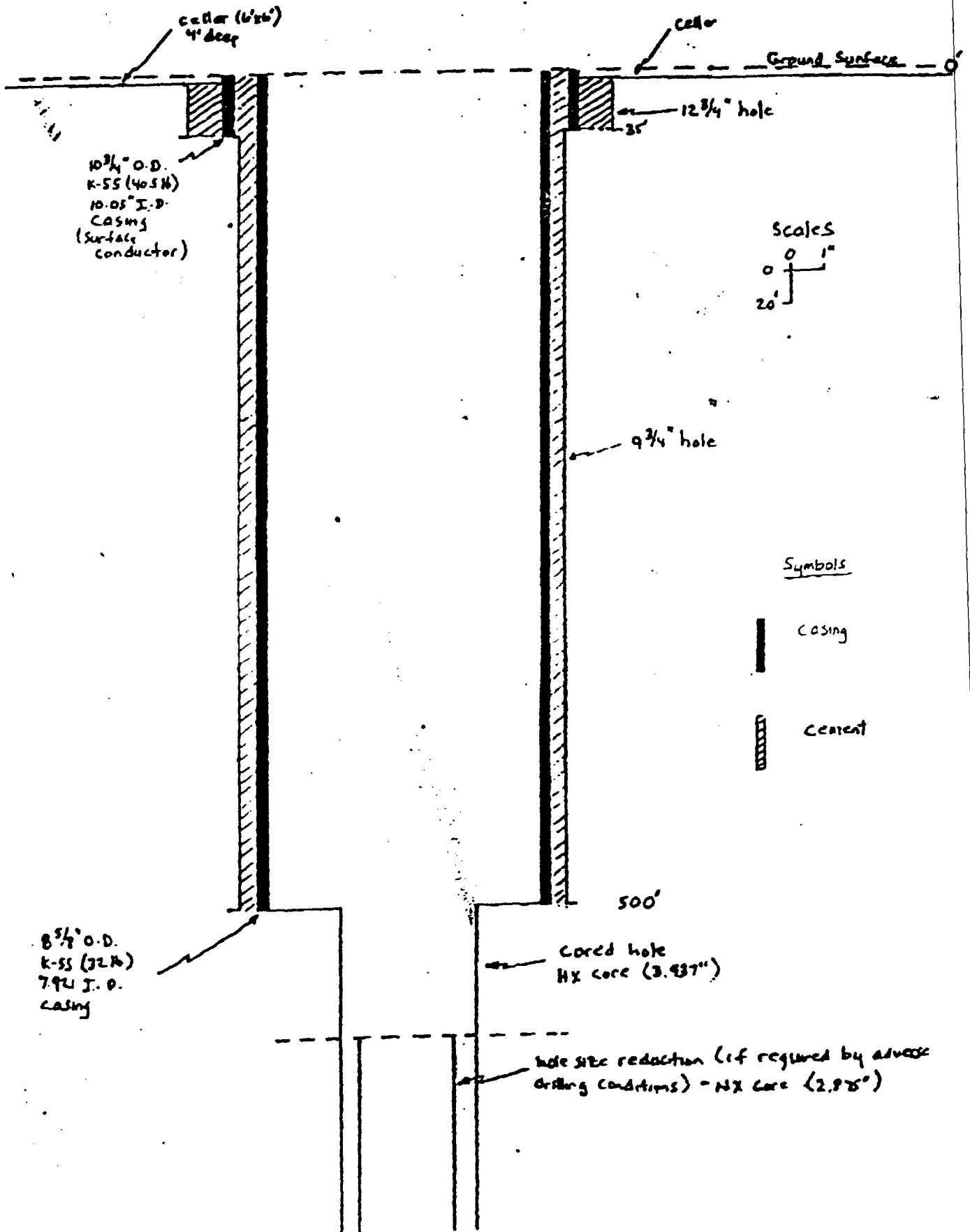


ENCLOSURE
 Portion of three fingered jack U.S.G.S
 7.5. minimum quad showing site 1 in
 T135 R 7 1/2 E Section 24.

Enclosure 2.

Preliminary Hole Design - Santrian Pass Gradient Hole (SP-1)

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STATE OF OREGON

COUNTY OF JEFFERSON

PERMIT TO APPROPRIATE THE PUBLIC WATERS

**OREGON DEPARTMENT OF GEOLOGY &
MINERAL INDUSTRIES
910 STATE OFFICE BUILDING
PORTLAND, OREGON 97201**

503-229-5580

Is hereby issued a permit to use the waters from LAKE CREEK, A
TRIBUTARY OF METOLIUS RIVER for RESEARCH AND EXPLORATION
DRILLING. The permit to the use of these waters has been issued under
Application 69625 with a date of priority of MAY 27, 1988. The permit is
limited to not more than 0.03 CUBIC FOOT PER SECOND or its equivalent in
case of rotation, measured at the point of diversion.

The point of diversion is located as follows:

NW 1/4 SE 1/4, Section 24, T 13 S, R 8 E, WM;
45 FEET SOUTH & 340 FEET EAST FROM CENTER CORNER, SECTION 24.

The use of water allowed under this permit shall conform to such reasonable
rotation system as may be ordered by the proper state officer.

The place of use is as follows:

1/4 1/4 SECTION TOWNSHIP RANGE, WM

INDUSTRIAL	SW	NW	1	14 S	8 E
INDUSTRIAL	NW	SW	27	13 S	8 E
INDUSTRIAL	NW	SE	27	13 S	8 E

This permit was reviewed and considered by the Water Resources
Commission on September 16, 1988.

Actual construction work shall begin on or before October 10, 1989, and shall
be completed on or before October 1, 1990. Complete application of the water
to the use shall be made on or before October 1, 1991.

This permit is for the beneficial use of water. By law, the land use associated
with this water use must be in compliance with statewide land-use goals and
any local acknowledged land-use plan. It is possible that the land use you
propose may not be allowed if it is not in keeping with the goals and the
acknowledged plan. Your city or county planning agency can advise you
about the land-use plan in your area.

Application 69625

Water Resources Department

Permit 50385

Page 2

The right is subject to minimum flows established by the Water Resources Commission with an effective date prior to this right.

Issued this date, October 10, 1988.

William H. Young

Water Resources Department
William H. Young
Director

Application 69625

Water Resources Department

Permit 50385

O X B O W C O R P O R A T I O N

June 7, 1989

113 Elm Street
Andover, Massachusetts 01810

JD
Marla B. Bohl
Bureau of Land Management
850 Harvard Way
P.O. Box 12000
Reno, Nevada 89520

RECEIVED

JUN 8 1989

OXBOW GEOTHERMAL CORP

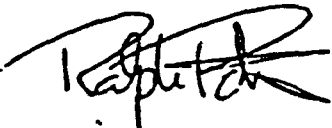
Re: Oxbow Power Nationwide Lease Bond

Dear Ms. Bohl,

The following supplemental information is provided as support for the attached Oxbow Power Nationwide Lease Bond application. The treasury notes referenced below were wired on May 31, 1989, to the Federal Reserve Bank of Kansas City, Denver Branch for deposit to the BLM-Nevada State Office book entry account.

1. Licensee: Oxbow Power Corporation
200 South Virginia Street
Reno, Nevada 89501
2. Taxpayer ID: 51-0296440
3. Par Value: \$150,000
4. Commercial Bank: NCNB National Bank of Florida
1555 Palm Beach Lakes Bld.-Suite 310
West Palm Beach, Florida 33401
5. Type of Security: Treasury Notes
6. Interest Rate: 8 7/8
7. Maturity Date: February 15, 1999
8. Interest Paid To: Oxbow Power Corporation
NCNB National Bank of Florida
#360-118-7914

Sincerely,



Ralph P. Petrone
Controller

CC: Lori Orser
Bernita Dawson - BLM-Nevada

RPP\deb

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

OIL AND GAS OR GEOTHERMAL LEASE BOND

Act of February 25, 1920 (39 U.S.C. 181 et seq.)
Act of August 7, 1947 (39 U.S.C. 351-359)
Department of the Interior Appropriations Act, FY 1981 (42 U.S.C. 6508)
Act of December 24, 1970 (39 U.S.C. 1001-1025)
Other Oil and Gas and Geothermal Leasing Authorities as Applicable

Bond Number

Lease Serial Number (For Individual Bond Only)

CHECK ONE: OIL AND GAS GEOTHERMAL RESOURCES

CHECK ONE:

SURETY BOND

KNOW ALL BY THESE PRESENTS, THAT _____

(name)

of _____

(address)

as principal, and _____

(name)

of _____

(address)

as surety.

are held and firmly bound unto the United States of America in the sum of _____

dollars (\$ _____).

lawful money of the United States, which may be increased or decreased by a rider hereto executed in the same manner as this bond.

PERSONAL BOND

KNOW ALL BY THESE PRESENTS, That _____

Oxbow Power Corporation

(name)

of 200 So. Virginia Street, Reno, Nevada

(address)

as principal, is held and firmly

bound unto the United States of America in the sum of One Hundred Fifty Thousand

dollars (\$ 150,000.00

), lawful money of the United States which sum may be

increased or decreased by a rider hereto executed in the same manner as this bond.

The principal, in order to more fully secure the United States in the payment of the aforesaid sum, hereby pledges as security therefore United States negotiable securities of a par value equal to the amount specified. The principal, pursuant to the authority conferred by Section 1 of the Act of September 13, 1982 (31 U.S.C. 9303), does hereby constitute and appoint the Secretary of the Interior to act as his attorney. The interest accruing on the United States securities deposited, in the absence of any default in the performance of any of the conditions, or stipulations set forth in this bond and the instrument(s) granting rights and interests in Federal lands, must be paid to the principal. The principal hereby for himself/herself, any heirs, executors, administrators, successors, and assigns, joint and severally, ratifies and confirms whatever the Secretary shall do by virtue of these presents.

The principal/surety shall apply this bond or the Secretary shall transfer this deposit as security for the faithful performance of any and all of the conditions and stipulations as set forth in this bond and the instruments granting rights and interests in Federal lands. In the case of any default in the performance of the conditions and stipulations of such undertaking, it is agreed that: (1) for a Surety Bond, the surety/principal shall apply the bond or any portion thereof; (2) for a Personal Bond, the Secretary shall have full power to assign, appropriate, apply or transfer the deposit or any portion thereof, to the satisfaction of any damages, assessments, late payment charges, penalties, or deficiencies arising by reason of such default.

This bond is required for the use and benefit of (1) the United States; (2) the owner of any of the land subject to the coverage of this bond, who has a statutory right to compensation in connection with a reservation of the oil and gas and geothermal deposits to the United States; (3) any lessee, permittee, or contractor, under a lease, permit, or resource sale contract issued, or to be issued, by the United States covering the same land subject to this bond, covering the use of the surface or the prospecting for, or the development of other mineral deposits in any portion of such land, to be paid to the United States. For such payment, well and truly to be made, we bind ourselves and each of our heirs, executors, administrators, successors, and assigns, jointly and severally.

This bond shall cover all surface disturbing activities related to drilling operations on a Federal leasehold(s) in accordance with authorization(s) granted under the Acts cited above for:

CHECK ONE:

NATIONWIDE BOND - Operations conducted by or on behalf of the principal(s) or on the leasehold(s) of the principal(s) in the United States including the National Petroleum Reserve in Alaska (NPR-A) when a rider sufficient to bring the amount in compliance with 43 CFR 3134 is provided, and provided a rider is obtained, also coverage of multiple exploration operations.

STATEWIDE BOND - Operations conducted by or on behalf of the principal(s) or on the leasehold(s) of the principal(s), except the NPR-A, and, provided a rider is obtained, also coverage of multiple exploration operations within the single state of _____.

INDIVIDUAL BOND - Operations conducted by or on behalf of the principal or on the leasehold of the principal on the single lease identified by the serial number above.

NATIONAL PETROLEUM RESERVE IN ALASKA (NPR-A) BOND - This bond shall cover:

NPR-A LEASE BOND - The terms and conditions of a single lease.

NPR-A WIDE BOND - The terms and conditions of all leases, and provided a rider is obtained, coverage of multiple exploration operations.

EXHIBIT E

GENERAL PROVISIONS

COOPERATIVE AGREEMENTS

ARTICLE A-I - ALLOWABLE COST

Costs shall constitute allowable costs as specified in Title 41, Code of Federal Regulations Part 1-15 of the Code of Federal Regulations in effect on the date of this Agreement.

ARTICLE A-II - APPROVAL OF SUBCONTRACTS

All subcontracts and purchase orders in excess of \$10,000 shall require the written approval of the Contracting Officer.

ARTICLE A-III - PUBLIC INFORMATION RELEASES

The parties agree that public disclosure or dissemination of new data or information arising out of the feasibility assessment will be coordinated by the parties, it being understood that the intent of both the Participant and DOE is to release all data and information to the greatest practicable extent in order to achieve the objective of obtaining maximum public value from the results of this project. It is understood that the foregoing is not intended to afford either party the right to prevent a public release by the other; however, nothing in this article shall impair the rights of the parties set forth elsewhere in this Agreement.

ARTICLE A-IV - AUDIT

A. The Participant shall maintain, and the Contracting Officer or his representative shall have the right to examine books, records, documents, and other evidence and accounting procedures and practices, sufficient to reflect properly all direct and indirect costs of whatever nature claimed to have been incurred and anticipated to be incurred for the performance of this Agreement. Such right of examination shall include inspection at all reasonable times of the Participant's plants, or such parts thereof, as may be engaged in the performance of this Agreement.

B. The materials described above, shall be made available at the office of the Participant, at all reasonable times, for inspection, audit or reproduction, until the expiration of three (3) years from the date of final payment under this Agreement or such lesser time specified in Title 41, Code of Federal Regulations Part 1-20 and for such lesser period, if any, as is required by applicable statute, or by other articles of this Agreement, or by subparagraphs B.(1) and (2) below:

ARTICLE A-IV - AUDIT (Cont'd)

(1) If this Agreement is completely or partially terminated, the records relating to the work terminated shall be made available for a period of three (3) years from the date of any resulting final settlement.

(2) Records which relate to appeals under the "Disputes" article of this Agreement, or litigation or the settlement of claims arising out of the performance of this Agreement, shall be made available until such appeals, litigation, or claims have been disposed of.

ARTICLE A-V - OFFICIALS NOT TO BENEFIT

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

ARTICLE A-VI - COVENANT AGAINST CONTINGENT FEES

The Participant warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the Participant for the purpose of securing business. For breach or violation of this warranty the Government shall have the right to annul this Agreement without liability or in its discretion to deduct from the Agreement price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE A-VII - EXAMINATION OF RECORDS BY COMPTROLLER GENERAL

A. The Participant agrees that the Comptroller General of the United States or any of his duly authorized Government employees shall, until the expiration of three (3) years after final payment under this Agreement, unless DOE authorizes their prior disposition, have access to and the right to examine any directly pertinent books, documents, papers, and records of the Participant involving transactions related to this Agreement.

B. The Participant further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that the Comptroller General of the United States or any of his duly authorized Government employees shall, until the expiration of three (3) years after

ARTICLE A-VII - EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (Cont'd)

final payment under the subcontract or such lesser time specified in either Appendix M of the Armed Services Procurement Regulation or the Federal Procurement Regulations Part 1-20, as appropriate, have access to and the right to examine any directly pertinent books, documents, papers, and records of such subcontractor, involving transactions related to the subcontract. The term "subcontract" as used in this article excludes (1) purchase orders not exceeding \$10,000 and (2) subcontracts or purchase orders for public utility services at rates established for uniform applicability to the general public.

C. The periods of access and examination described in paragraphs A. and B., above, for records which relate to (1) appeals under the "Disputes" article of this Agreement, (2) litigation or the settlement of claims arising out of the performance of this Agreement, or (3) costs and expenses of this Agreement as to which exception has been taken by the Comptroller General or any of his duly authorized representatives, shall continue until such appeals, litigation, claims or exceptions have been disposed of.

D. Nothing in this Agreement shall be deemed to preclude an audit by the General Accounting Office of any transaction under this Agreement.

ARTICLE A-VIII - ASSIGNMENT OF CLAIMS

Pursuant to the provisions of the Assignment of Claims Act of 1940, as amended (31 U.S.C. 203, 41 U.S.C. 15), claims for moneys due or to become due the Participant from the Government under this Agreement may be assigned to a bank, trust company, or other financing institution, including any Federal lending agency, and may thereafter be further assigned and reassigned to any such institution. Any such assignment or reassignment shall cover all amounts payable under this Agreement and not already paid, and shall not be made to more than one party, except that any such assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in such financing. Unless otherwise provided in this Agreement, payments to assignee of any moneys due or to become due under this Agreement shall not, to the extent provided in said Act, as amended, be subject to reduction or setoff.

ARTICLE A-IX - PERMITS

Except as otherwise directed by the Contracting Officer, the Participant shall procure all necessary permits or licenses and abide by all applicable laws, regulations, and ordinances of the United States and of the State, territory, and political subdivision in which the work under this Agreement is performed.

ARTICLE A-X - DISPUTES

A. This Agreement is subject to the Contract Disputes Act of 1978 (41 U.S.C. 601, et seq.). If a dispute arises relating to the Agreement, the Participant may submit a claim to the Contracting Officer who shall issue a written decision on the dispute in the manner specified in DAR 1-314 (FPR 1-1.318).

B. "Claim" means:

- (1) a written request submitted to the Contracting Officer;
- (2) for payment of money, adjustment of Agreement terms, or other relief;
- (3) which is in dispute or remains unresolved after a reasonable time for its review and disposition by the Government; and
- (4) for which a Contracting Officer's decision is demanded.

C. In the case of disputed requests or amendments to such requests for payment exceeding \$50,000, or with any amendment causing the total request in dispute to exceed \$50,000, the Participant shall certify, at the time of submission as a claim, as follows:

I certify that the claim is made in good faith, that the supporting data are accurate and complete to the best of my knowledge and belief; and that the amount requested accurately reflects the Agreement adjustment for which the Participant believes the Government is liable.

(Participant's Name) _____

(Title) _____

D. The Government shall pay the Participant interest:

- (1) on the amount found due on claims submitted under this article;
- (2) at the rates fixed by the Secretary of the Treasury, under the Renegotiation Act, Public Law 92-41;
- (3) from the date the Contracting Officer receives the claim, until the Government makes payment.

ARTICLE A-X - DISPUTES (Cont'd)

E. The decision of the Contracting Officer shall be final and conclusive and not subject to review by any forum, tribunal, or Government agency unless an appeal or action is timely commenced within the times specified by the Contract Disputes Act of 1978.

F. The Participant shall proceed diligently with performance of this Agreement, pending final resolution of any request for relief, claim, appeal or action related to the Agreement, and comply with any decision of the Contracting Officer.

ARTICLE A-XI - PAYMENT OF INTEREST ON PARTICIPANTS' CLAIMS

A. If an appeal is filed by the Participant from a final decision of the Contracting Officer under the "Disputes" article of this Agreement, denying a claim arising under the Agreement, simple interest on the amount of the claim finally determined owed by the Government shall be payable to the Participant. Such interest shall be at the rate determined by the Secretary of the Treasury pursuant to Public Law 92-41, 85 Stat. 97, from the date the Participant furnishes to the Contracting Officer its written appeal under the "Disputes" article of this Agreement, to the date of (1) a final judgment by a court of competent jurisdiction, or (2) mailing to the Participant of a supplemental agreement for execution either confirming completed negotiations between the parties or carrying out a decision of a board of Agreement appeals.

B. Notwithstanding paragraph A., above, (1) interest shall be applied only from the date payment was due, if such date is later than the filing of appeal, and (2) interest shall not be paid for any period of time that the Contracting Officer determines the Participant has unduly delayed in pursuing its remedies before a board of Agreement appeals or a court of competent jurisdiction.

ARTICLE A-XII - SEX DISCRIMINATION PROHIBITED

No person shall on the ground of sex be excluded from participation in, be denied a license under, be denied the benefits of, or be subjected to discrimination under any program or activity carried on or receiving Federal assistance under any title of this Act (P. L. 93-438).

ARTICLE A-XIII - CIVIL RIGHTS

The Participant agrees that no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity for which the Participant receives Federal financial assistance from DOE.

ARTICLE A-XIV - DISCRIMINATION AGAINST HANDICAPPED PROHIBITED

The Participant agrees that no otherwise qualified handicapped individual in the United States shall, solely by reason of his handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

ARTICLE A-XV - SMALL AND MINORITY BUSINESS PARTICIPATION

It is the policy of DOE to ensure that small and minority businesses have a reasonable opportunity to participate in the projects which it supports. In accordance with this policy, the Participant will make a reasonable effort to ensure fair consideration and utilization of small and minority businesses in purchases and subcontracts awarded by the Participant under this Agreement.

ARTICLE A-XVI - PREFERENCE FOR U. S. FLAG AIR CARRIERS

A. It is the policy of the United States that all Federal agencies and Government contractors and subcontractors utilize U.S. flag air carriers for international air transportation of personnel and cargo.

B. The Participant agrees to utilize U. S. flag air carriers to the maximum extent practicable in connection with the performance of this Agreement in the transportation by air of any personnel and cargo between the United States and a foreign country, or between foreign countries.

C. The terms used in this article have the following meanings:

(1) "International air transportation" means transportation by air of personnel and cargo from the United States to a foreign country, between two or more foreign countries, and between a foreign country and the United States.

(2) "U. S. flag air carrier" means one of a class of air carriers holding a certificate of public convenience and necessity issued by the Civil Aeronautics Board, approved by the President, authorizing operations between the United States and/or its territories and one or more foreign countries.

(3) The term "United States" includes the fifty States, Commonwealth of Puerto Rico, possessions of the United States and the District of Columbia.

ARTICLE A-XVI - PREFERENCE FOR U. S. FLAG AIR CARRIERS (Cont'd)

(4) "Practicable" includes (i) satisfactory servicing of agency programs, and (ii) timely deliveries at fair and reasonable prices.

D. The Participant shall include the substance of this article, including this paragraph D. in each subcontract or purchase order hereunder which may involve air transportation between the United States and a foreign country, or between foreign countries.

ARTICLE A-XVII - CLEAN AIR AND WATER

A. The Participant agrees as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by P. L. 91-604) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. 1251, et seq., as amended by P. L. 92-500), respectively, relating to inspection, monitoring, entry, reports and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, respectively, and all regulations and guidelines issued thereunder before the award of this Agreement.

(2) That no portion of the work required by this Agreement will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this Agreement was awarded unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use its best efforts to comply with clean air standards and clean water standards at the facility in which the Agreement is being performed.

(4) To insert the substance of the provisions of this article into any nonexempt subcontract, including this subparagraph A.(4).

B. The terms used in this article have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. 1857, et seq., as amended by P. L. 91-604).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et seq., as amended by P. L. 92-500).

ARTICLE A-XVII - CLEAN AIR AND WATER (Cont'd)

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110(d) of the Clean Air Act [42 U.S.C. 1857c-5(d)], an approved implementation procedure or plan under section 111(c) or section 111(d), respectively, of the Air Act [42 U.S.C. 1857(c)-6(c) or (d)], or an approved implementation procedure under section 112(d) of the Air Act [42 U.S.C. 1857c-7(d)].

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standard, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

(5) The term "compliance" means compliance with clean air or water standards. Compliance shall also mean compliance with a schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency or an air or water pollution control agency in accordance with the requirements of the Air Act or Water Act and regulations issued pursuant thereto.

(6) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location, or site of operations, owned, leased, or supervised by a contractor or subcontractor, to be utilized in the performance of an agreement or subcontract. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location or site shall be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA - LONG FORMA. Definitions

(1) "Technical Data" means recorded information regardless of form or characteristic, of a scientific or technical nature. It may, for example, document research, experimental, developmental, or demonstration, or engineering work, or be usable or used to define a design or process, or to procure, produce, support, maintain, or operate material. The data may be graphic or pictorial delineations in media such as drawings or photographs, text in specifications or related performance or design type documents or computer software (including computer programs, computer software data bases, and computer software documentation). Examples of technical data include research and engineering data, engineering drawings and associated lists, specifications, standards, process sheets, manuals, technical reports, catalog item identification, and related information. Technical data as used herein does not include financial reports, cost analyses, and other information incidental to Agreement administration.

(2) "Proprietary Data" means technical data which embody trade secrets developed at private expense, such as design procedures or techniques, chemical composition of materials, or manufacturing methods, processes, or treatments, including minor modifications thereof, provided that such data:

(i) Are not generally known or available from other sources without obligation concerning their confidentiality;

(ii) Have not been made available by the owner to others without obligation concerning its confidentiality; and

(iii) Are not already available to the Government without obligation concerning their confidentiality.

(3) "Contract Data" means technical data first produced in the performance of the Agreement, technical data which are specified to be delivered in the Agreement, technical data that may be called for under the "Additional Technical Data Requirements" article of the Agreement, if any, or technical data actually delivered in connection with the Agreement.

(4) "Unlimited Rights" means rights to use, duplicate, or disclose technical data, in whole or in part, in any manner and for any purpose whatsoever, and to permit others to do so.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)B. Allocation of Rights

(1) The Government shall have:

(i) Unlimited rights in contract data except as otherwise provided below with respect to proprietary data.

(ii) The right to remove, cancel, correct or ignore any marking not authorized by the terms of this Agreement on any technical data furnished hereunder, if in response to a written inquiry by DOE concerning the propriety of the markings, the Participant fails to respond thereto within sixty (60) days or fails to substantiate the propriety of the markings. In either case DOE will notify the Participant of the action taken.

(iii) No rights under this Agreement in any technical data which are not contract data.

(2) The Participant shall have:

(i) The right to withhold proprietary data in accordance with the provisions of this article.

(ii) The right to use for its private purposes, subject to patent, security or other provisions of this Agreement, contract data it first produces in the performance of this Agreement provided the data requirements of this Agreement have been met as of the date of the private use of such data. The Participant agrees that to the extent it receives or is given access to proprietary data or other technical, business or financial data in the form of recorded information from DOE or a DOE contractor or subcontractor, the Participant shall treat such data in accordance with any restrictive legend contained thereon, unless use is specifically authorized by prior written approval of the Contracting Officer.

(3) Nothing contained in this "Rights in Technical Data" article shall imply a license to the Government under any patent or be construed as affecting the scope of any licenses or other rights otherwise granted to the Government under any patent.

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)C. Copyrighted Material

(1) The Participant shall not, without prior written authorization of the Contracting Officer, establish a claim to statutory copyright in any contract data first produced in the performance of the Agreement. To the extent such authorization is granted, the Government reserves for itself and others acting on its behalf a royalty-free, nonexclusive, irrevocable, worldwide license for Governmental purposes to publish, distribute, translate, duplicate, exhibit and perform any such data copyrighted by the Participant.

(2) The Participant agrees not to include in the technical data delivered under the Agreement any material copyrighted by the Participant and not to knowingly include any material copyrighted by others without first granting or obtaining at no cost a license therein for the benefit of the Government of the same scope as set forth in subparagraph C.(1) above. If such royalty-free license is unavailable and the Participant nevertheless determines that such copyrighted material must be included in the technical data to be delivered, rather than merely incorporated therein by reference, the Participant shall request the written authorization of the Contracting Officer to include such copyrighted material in the technical data without a license.

D. Subcontracting. It is the responsibility of the Participant to obtain from its subcontractors technical data and rights therein, on behalf of the Government, necessary to fulfill the Participant's obligations to the Government with respect to such data. In the event of refusal by a subcontractor to accept an article affording the Government such rights, the Participant shall:

(1) Promptly submit written notice to the Contracting Officer setting forth reasons for the subcontractor's refusal and other pertinent information which may expedite disposition of the matter; and

(2) Not proceed with the contract without the written authorization of the Contracting Officer.

E. Withholding of Proprietary Data. Notwithstanding the inclusion of the "Additional Technical Data Requirements" article in this Agreement or any provision of this Agreement specifying the delivery of technical

ARTICLE A-XVIII - RIGHTS IN TECHNICAL DATA (Cont'd)

data, the Participant may withhold proprietary data from delivery, provided that the Participant furnishes in lieu of any such proprietary data, so withheld technical data disclosing the source, size, configuration, mating and attachment characteristics, functional characteristics and performance requirements ("Form, Fit and Function" data, e.g., specification control drawings, catalog sheets, envelope drawings, etc.) or a general description of such proprietary data where "Form, Fit and Function" data are not applicable. The Government shall acquire no rights to any proprietary data so withheld except that such data shall be subject to the "Inspection Rights" provisions of paragraph F., and if included, the "Limited Rights in Proprietary Data" provisions of paragraph G. and the "Participant Licensing" provisions of paragraph H.

F. Inspection Rights. Except as may be otherwise specified in this Agreement for specific items of proprietary data which are not subject to this paragraph, the Contracting Officer's representatives, at all reasonable times up to three (3) years after final payment under this Agreement, may inspect at the Participant's facility any proprietary data withheld under paragraph E. and not furnished under paragraph G. for the purposes of verifying that such data properly fell within the withholding provision of paragraph E., or for evaluating work performance.

ARTICLE A-XIX - REPORTING OF ROYALTIES

If this Agreement is in an amount which exceeds \$10,000 and if any royalty payments are directly involved in the Agreement or are reflected in the Agreement price to the Government, the Participant agrees to report in writing to the Patent Counsel (with notification by Patent Counsel to the Contracting Officer) during the performance of this Agreement and prior to its completion or final settlement the amount of any royalties or other payments paid or to be paid by it directly to others in connection with the performance of this Agreement together with the names and addresses of licensors to whom such payments are made and either the patent numbers involved or such other information as will permit the identification of the patents or other basis on which the royalties are to be paid. The approval of DOE of any individual payments or royalties shall not stop the Government at any time from contesting the enforceability, validity or scope of, or title to, any patent under which a royalty or payments are made.

ARTICLE A-XX - NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT

(The provisions of this article shall be applicable only if the amount of this Agreement exceeds \$10,000.)

ARTICLE A-XX - NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT
INFRINGEMENT (Cont'd)

A. The Participant shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this Agreement of which the Participant has knowledge.

B. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this Agreement or out of the use of any supplies furnished or work or services performed hereunder, the Participant shall furnish to the Government when requested by the Contracting Officer, all evidence and information in possession of the Participant pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Participant has agreed to indemnify the Government.

C. This article shall be included in all subcontracts.

ENVIRONMENTAL ASSESSMENT

Finding of No Significant Impact

Reference: EA No. OR-050-9-51
Santiam Pass Core Hole

The Bureau of Land Management, Prineville District, and the Deschutes National Forest, Sisters Ranger District, have analyzed a proposal to drill a 3000 foot core hole and monitor the temperatures for one year at a location on the Sisters Ranger District.

The attached environmental assessment (EA) describes the proposed action and two alternatives. It discusses the potential environmental consequences of the proposed action and the mitigation measures that are applicable and that have been applied to many similar core holes drilled on the Deschutes National Forest over the past several years. The EA was available to the public beginning June 20, 1989.

The conditions of approval if adopted would assure that no significant adverse impacts would occur to the human environment.

Determination

On the basis of the information contained in the EA and all other information available to me, it is my determination that the alternatives analyzed do not constitute a major Federal action affecting the quality of the human environment. Therefore, an Environmental Impact Statement is not necessary and will not be prepared.

Date

District Manager
U.S.D.I.
Bureau of Land Management
Prineville District

Date

Forest Supervisor
U.S.D.A.
U.S. Forest Service
Deschutes National Forest

Environmental Assessment
No. OR-050-9-51

GEOHERMAL TEMPERATURE GRADIENT
CORE DRILL
SANTIAM PASS AREA

I. NEED FOR ACTION

Oxbow Geothermal of Reno, Nevada has applied for a Geothermal Drilling Permit for a single temperature gradient well on the Sisters Ranger District of the Deschutes National Forest. This temperature gradient well is needed to evaluate the geothermal potential of the area and to provide information about the geology of the Cascade Mountains. This drill hole will be jointly funded by the applicant and the U.S. Department of Energy and therefore all scientific information gained from the well will be public information. The area was leased for geothermal resources under the Belknap-Foley Geothermal Area Final Environmental Statement issued in September 1981. This environmental assessment documents the review of the environmental consequences of the proposed drilling operation.

II. PROPOSED ACTION AND ALTERNATIVE

General Project Description Applicable to All Alternatives - The drill site would be positioned on an existing clearing that has previously been disturbed and would cover an area approximately 100 feet by 100 feet. On this drill pad would be placed the truck-mounted drill rig, water tank, mud pit(s), fuel storage, a small work trailer and workshop. All drilling fluids would be formulated from non-toxic components (as defined by EPA). Drilling mud and fluids would be contained in steel or plastic lined earthen pits.

Water for drilling would be hauled in by truck and obtained under State of Oregon permit. Blowout prevention equipment will be installed after surface casing is in place. Appendix B contains the Conditions of Approval which have been used on most previous temperature gradient wells. These have proven to be more than adequate to protect all of the environment, these Conditions of Approval will be made a part of the approval for the proposed project. Informal scoping discussions were held with Federal and State agency individuals and some interested public. The issues which were identified include the Northern Spotted Owl habitat, the no surface occupancy stipulation and the small "wetlands" in the area.

Proposed Action - It is proposed to drill a 3000 foot core hole at the SE1/4 NW1/4SE1/4 Section 24, T. 13 S., R. 71/2 E. The project would entail drill site preparation, drilling to approximately 500 feet and setting surface casing, installing blowout prevention equipment, coring to the total depth, running 6.4 cm diameter pipe to total depth, removing drilling equipment, and rehabilitating most of the site. The well would be monitored for at least one year after which the well would be plugged and the remainder of the site rehabilitated.

The proposed action is detailed in Appendix A, Plan of Exploration and Geothermal Drilling Permit application. Some of the items discussed in submitted Plan of Exploration will be modified in the approved Plan, Drill Permit and Conditions of Approval. These final documents would be controlling in the drilling of the proposed well.

Alternative No. 1 - Allow drilling of proposed temperature gradient hole at the proposed location, SE1/4NW1/4SE1/4 Section 24, T. 13 S., R. 71/2 E.

Alternative No. 2 - No Action - This alternative would disallow temperature gradient drilling at this site. However, other areas would then be examined to find a suitable drill site and therefore the no action alternative becomes the Alternative No. 3 - different location.

Alternative No. 3 - Different Location - An alternative site was examined in the field and determined to be acceptable but not as desirable as the proposed action site. This alternate site will not be considered further.

III. AFFECTED ENVIRONMENT

Previous Studies - The affected environment is thoroughly discussed in the Deschutes National Forest Land Management Plan 1978 and the Belknap-Foley Geothermal Area Final Environmental Statement, Geothermal Leasing Willamette and Deschutes National Forests.

General Description - The project area is within Land type 94, (Soil Resource Inventory, Deschutes National Forest, 1976) which occurs on uneven glaciated uplands at relatively high elevations. Elevation is approximately 4800 feet with an annual precipitation of 50-80 inches. The plant association is classified as Lodgepole Pine/Beargrass (CL-M4-11, Plant Associations of the Central Pumice Zone, September 1982). It includes Lodgepole pine, mountain hemlock, and true firs. A wide variety of forbs, grasses, sedges, and shrubs may be present including lupine, huckleberry, and beargrass.

Wildlife - Deer, elk, cavity nesters, small mammals, amphibians, birds and insects may be found in the project area.

Threatened, Endangered, Sensitive Species - The proposed project area is in habitat for the Northern Spotted Owl, a sensitive species. The general project location is low quality habitat (Martin, USFS Wildlife Biologist, Personal Communication, June 1989) because of the tree species, Lodgepole pine, mountain hemlock, and subalpine fir; and the size of these trees. Protocol established in the "Spotted Owl Inventory and Monitoring Handbook", Barss, January 12, 1989, Deschutes National Forest, has been followed to determine if the Northern Spotted Owl is present at the project area. No owls were detected following three separate nighttime visits. The Deschutes National Forest will be meeting with the U.S. Fish and Wildlife Service in July to discuss planned activities on the forest and anticipated impacts to the Northern Spotted Owl. There are no other known threatened, endangered or sensitive plant or animal species in the project area.

Recreation - The Pacific Crest Trail is located approximately one-half mile west of the proposed project area. The Mt. Jefferson Wilderness boundary is located approximately one-half mile north and across U.S. Highway 20/126 from the proposed project site. The general area has a moderate level of summer recreation use. A moderate to high level of winter recreation use is expected from both snowmobile and cross-country skiers. The geothermal lease for the proposed site has a no surface occupancy stipulation because of dispersed recreation unroaded area values. This stipulation allows modification of the stipulation for the type of activity proposed. (see Special Stipulation 4., Appendix C.)

Visual - The proposed project is within a retention foreground allocation because of its proximity to the U.S. Highway 20/126 travel corridor.

Cultural Resources - A cultural resource survey has been completed for the Key West timber sale, a timber sale planned for 1990, within which the proposed project is located. No cultural resources were detected in the survey.

Previous Drilling- Geothermal exploration on the Deschutes National Forest has been ongoing since 1974 by numerous organizations, and with several techniques. The U.S. Geological Survey has done extensive work in the region including geologic mapping, seismic studies and core hole drilling. Since 1975 there have been 37 drill or core holes permitted to measure the temperature gradients of various areas of the forest. The following shows the depths of these temperature gradient wells:

Depths	Number of Wells
Less than 1000'	20
2000 to 3000'	3
3000 to 4000'	7
4000'+	7

Wells have been drilled by the U.S. Geological Survey, Oregon Department of Geology and Mineral Industries, Sandia National Laboratories, and several private exploration companies.

IV. ENVIRONMENTAL CONSEQUENCES

Previous Drilling Environmental Results - Geothermal temperature gradient core drilling has occurred within the Deschutes National Forest with minimal to no impacts to the surface and subsurface resources. Surface impacts associated with temperature gradient core drilling are temporary in nature since all well sites are restored in accordance with lease stipulations and permit conditions of approval. As a result of the experience gained in permitting and supervising these temperature gradient wells there have been developed a set of conditions of approval for the wells that have proven to mitigate all of the environmental concerns involved in the drilling of these type of wells.

Impacts to Wildlife - Because of the time of year of the proposed project, fawning and calving would not be impacted. The use of an existing cleared area and the minimal disturbance, little, if any impacts to wildlife are expected.

Impacts to Threatened, Endangered, Sensitive Species - The only specie in these categories that might be present is the Northern Spotted Owl. The Deschutes National Forest has examined the area and has not located any owls. The area appears to be marginal owl habitat. Since no trees will be removed, the Spotted Owl habitat would only be temporarily impacted by the presence of a drill rig. The existing habitat will still be present once drilling activity has ceased. Therefore no impacts to the Northern Spotted Owls are expected. However, a final decision on this proposed project will not be released until after the consultation with the U.S. Fish and Wildlife Service in July 1989.

Impacts to Recreation - The proposed project could possibly be heard from the Pacific Crest Trail and the Mt. Jefferson Wilderness Area. However, both the project and the resultant sound would be temporary in nature and considering the proximity to the Highway 20/126 the noise increase is not expected to be discernable to most people. The proposed project area is covered by a no surface occupancy stipulation for dispersed recreation unroaded values, but can be modified for this type of low-impacting project. Because of the minor and short-term impacts to the dispersed recreation unroaded experience the stipulation should be modified to allow for surface occupancy for this project.

Impacts to Visual - Because the location of the proposed project is at an elevation higher than Highway 20/126 and because of the screening by the trees, the project would not be evident to the casual observer nor visually evident from the travel corridor.

Impacts to Cultural Resources - No cultural resources were detected in the cultural survey completed on the proposed project site. However, as much for scientific interest as for potential mitigation, an archaeologist may be present during any excavations for the well cellar and sumps in order to examine the near surface lithology. Should cultural material be found during these excavations, earth disturbing activities will stop until the site has been examined and a determination of effect completed.

Impacts to Wilderness Values, Areas of Critical Environmental Concern, Prime or Unique Farmlands, Wild and Scenic Rivers, Special Areas - There are no identified areas in the proposed project area which have been designated as Wilderness, Areas of Critical Environmental Concern, Prime or Unique Farmlands, Wild and Scenic Rivers, or Special Areas. Therefore there will be no impacts to any of these special designation areas.

Impacts to Surface Water Resources, Floodplains and Wetlands - There are no floodplains or permanent surface water in the proposed project area. There are a few very small "wetland" areas. The drainage from the drill pad will be contained by placing a small berm at the downslope side of the drill pad.

Well Blowout Hazard - Blowouts in which steam, gases, or hot water escape uncontrolled, pose an environmental hazard in geothermal operations, but the risk is low. The potential adverse environmental effects of accidental releases of geothermal fluids include air contamination from gaseous emissions, pollution of surface and shallow ground water resources, and hazards to health and safety of workers. Blowouts in exploratory work are highly unlikely due to required well control programs which include installation of blowout prevention equipment and periodic equipment testing and required safety drills.

The blowout equipment and standard BLM testing procedures have resulted in no blowouts on wells that have been core drilled.

In the unlikely event of a blowout, the small diameter of the hole would prevent large quantities of materials from escaping. Such small amounts of escaping material would not have a discernible effect on surrounding subsurface geothermal features and surface resources since the lessee would take immediate measures to control the well.

IV. CONSULTATION/COORDINATION

The following individuals either participated in the environmental assessment or were consulted for their input to the EA.

Bureau of Land Management

Dennis Davis
Donald Smith

Geologist/Inspector
Assistant District Manager,
Resources

U.S. Forest Service - Sisters Ranger District

Donna Owens
Kevin Martin
Mollie Chaudet
Al McPherson

Realty Specialist
Wildlife Biologist
Timber Sale Planner
Resource Assistant

Others

Ken Lovegren
Paul Dewey

Blue Lake Resort
Sisters Forest Planning Council

APPENDICES

- A - PLAN OF EXPLORATION AND GEOTHERMAL DRILL PERMIT APPLICATION
- B - CONDITIONS OF APPROVAL - TEMPERATURE GRADIENT WELLS
- C - GEOTHERMAL LEASE AND SPECIAL STIPULATIONS
- D - REFERENCES CITED

APPENDIX A

PLAN OF EXPLORATION AND GEOTHERMAL DRILL PERMIT APPLICATION

GEO-THERMAL PERMIT

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

1a. TYPE OF WORK: DRILL NEW WELL (X) RE-DRILL () DEEPEN () PILE BACK () DIRECTIONALLY DRILL () OTHER ()

1b. WELL TYPE: PRODUCTION () INJECTION () HEAT EXCHANGE () OBSERVATION () WATER SUPPLY () OTHER ()

1c. WELL STATUS: Thermal Gradient to be drilled

2. NAME OF LESSEE/OPERATOR

OXBOW POWER CORPORATION

3. ADDRESS OF LESSEE/OPERATOR

200 S. Virginia Street Suite 450 Reno, NV 89501

13. LOCATION OF WELL

At surface NW 1/4 SE 1/4 Sec. 24 T13S R7 1/2 E

At proposed prod. hole see attached map(Site 1)

16. DISTANCE FROM PROPOSED LOCATION TO NEAREST PROPERTY OR LEASE LINE

1/4 mile E to Sec. 19 (lease line)

17. DISTANCE FROM PROPOSED LOCATION TO NEAREST WELL, DRILLING, COMPLETES, OR APPLIED FOR ON THIS LEASE

N/A

18. DRILLING MEDIA AND CHARACTERISTICS: AIR (X) WATER () MUD () FOAM () OTHER ()

19. PROPOSED DEPTH MEASURED:

950 miles
TRUE VERTICAL:

20. ELEVATION, SURFACE (X) / FINAL ()

4750'
REFERENCE SURFACE: OR () NAV () BY () NG () BY ()
CASTROVALLE PLANE () OTHER ()

21. EXISTING AND/OR PROPOSED CASINGS AND CEMENTING PROGRAMS (List existing program (first, followed by proposed program, and separate by a sufficient space to clearly distinguish the two programs)

SIZE OF HOLE	SIZE OF CASING	WEIGHT PER FOOT	COUPLING (Collars & Threads)	GRADE	SETTING DEPTH		QUANTITY OF CEMENT
					TOP	BOTTOM	
SEE ATTACHED							

22. PROPOSED WORK SUMMARY

SEE ATTACHED

(Use additional space on reverse side of form)

23. *[Signature]*

SIGNED TITLE Manager Land & Environment DATE 06/08/89

(This space for Federal use)

APPROVED BY TITLE DATE

CONDITIONS OF APPROVAL, IF ANY:

This permit is required by law (30 U.S.C. 1023); regulations: 30 CFR 170.71; Federal Geothermal Lease Terms and Stipulations and other regulatory requirements. 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)

PLAN OF OPERATION
DOGAMI SANTIAM PASS TEMPERATURE GRADIENT HOLE

I. LOCATION

The drillsite will be in Jefferson County on land managed by the Sisters Ranger District of the Deschutes National Forest.

The site location is marked "Site 1" on the attached map and is located along Forest Service Road 900 (Enclosure 1). An accurate location of the site is SE 1/4 NW 1/4 SE 1/4 SE 1/4 sec 24 T13S/R7 1/2E (24ddb). The latitude is 44°25'26"N and the longitude is 121°50'22"W. The ground level elevation is ~4800 ft.

II. PROJECT DESCRIPTION

A. INTENT AND ANTICIPATED RESULTS

The goal of the project is to support research in resource assessment in the Cascade Range of Oregon. The specific objectives of the hole are to obtain temperature gradient, heat flow, and hydrologic information along the axis of Cascade Range volcanism.

The project will be completed in two phases. Phase I will include site identification, site selection, permitting, and pre-drilling environmental studies to satisfy NEPA requirements. Phase II will include drilling, data acquisition and interpretation, core curation, and final reporting. All information gathered in the course of the project will be made available to the public.

A rough schedule of events is as follows:

1. April 13 -- received letter from USDOE guaranteeing funding for Phase I studies.
2. May 1 -- receive contract from USDOE for completion of Phase I siting studies.
3. May 20 -- submit USFS environmental analysis to USDOE for environmental review process.
4. June 30 -- receive Phase II drilling money from USDOE.

5. July 15 -- complete state required bidding process. Sign a contract with a driller.
6. August 1 -- commence drilling.
7. September 30, 1989 -- complete drilling and suspend hole.
8. September 1990 -- abandon hole.

The general plan is to complete a diamond cored drill hole to the greatest depth possible with available support (900-950 m), then log the hole using accepted geophysical logging procedures. If possible during drilling, any deep thermal ($>50^{\circ}\text{C}$) aquifer that has sufficient flow will be airlifted. Down-hole fluid samples will be taken from these aquifers. Upon the completion of drilling a string of 6.4 cm diameter pipe will be set to total depth, filled with water, and surrounded with API approved cementing mud and/or cement (see detailed description of drilling operations below). The well will be suspended and the drill rig demobilized. The wellhead will be secured with a locked surface valve. Temperatures will be monitored for a period of one year. Not less than two complete temperature logs will be recorded. Following completion of temperature monitoring, the hole will be plugged and abandoned in accordance with existing State and Federal regulations.

SITE PREPARATION

Virtually no site preparation will be required. The final drill site will be in a small existing clearcut. No existing vegetation will be disturbed. The drill rig will be mounted on tandem-axle trucks and will require modification of site topography. Trailer-mounted mud pits will be utilized. Water will be transported to the site via a tandem-axle tanker truck. A small reserve sump for site water storage may be required. If so, it will be dug with a backhoe and lined with plastic. Upon completion of drilling the plastic will be removed, the pit and cellar backfilled, and the topography restored to its original surface.

Access to the site will be via Forest Service Road 900, an unimproved road that connects with Highway 20. No modifications to the road is required to provide access to the proposed site.

Forest Service Road 900. DOGAMI has already obtained a water right from the Oregon Department of Water Resources for this water supply (Permit No. 50385) (see Enclosure 3). The haul route will include only 1/4 to 1/2 mile of travel over Road 900.

ABANDONMENT

Abandonment of the hole will be in accordance with applicable State and Federal regulations.

RESTORATION

The final site selected will be on ground that has been previously disturbed by logging operations. No vegetation is expected to be removed to create a drill site. Site restoration will involve returning the ground to the state which existed prior to the commencement of drilling operations.

III. ENVIRONMENTAL CONCERNS

Environmental analysis will be completed by the U.S. Forest Service as part of the permitting process. Results of the USFS environmental analysis will be forwarded to USDOE for review. The purpose of this review is to insure compliance with NEPA environmental requirements. Receipt of Phase II drilling monies is contingent upon the environmental analysis passing the USDOE review process. If further environmental studies are found to be needed, they will be completed by and/or contracted for by DOGAMI.

IV. CULTURAL RESOURCES CONCERNS

There are no standing water bodies or streams in the vicinity of the drill site. Water for drilling operations will be trucked to the site.

The planned operations will not affect air quality. Drilling operations involve running only one diesel engine.

Noise will not be a problem. The site is isolated and screened by trees. There are no commercial operations in the area.

Archaeological concerns will be addressed by the USFS environmental review.

DRILLING OPERATIONS

Drilling operations will be supervised by an on-site geologist.

It is anticipated that two drill rigs will be used in the drilling process. The upper 500' of the hole will be drilled by a truck-mounted air rotary water well rig. The first step will be to dig a 4' deep 6' x 6' cellar. A 12 3/4" hole will then be drilled to 35', and 10 3/4" O.D. K-55 (40.5#/ft) surface conductor casing will be run to total depth and cemented in place. With the surface conductor in place, a 9 3/4" hole will be drilled to 500'. 8 5/8" O.D. K-55 (32 #/ft) casing will be run to total depth and cemented in place. A manually operated gate valve rated to a minimum of 1500 psi will be installed and tested to 1000 psi. The pressure test will be witnessed by the USFS, BLM, and/or DOGAMI regulatory personnel.

A truck-mounted wireline coring rig will be brought in and the hole will be cored to the maximum depth practicable with available support (900-950m) HX (3.937" O.D.) rods will be used. If drilling problems require reductions in hole diameter, the first reduction will be to NX (2.875" O.D.) rods. During drilling operations the bottom-hole temperature will be measured whenever the drill rods are out of the hole. If the bottom-hole temperature exceeds 150° F (65° C), an annular preventer will be installed and tested. The test will be witnessed by USFS, BLM, and/or DOGAMI regulatory personnel.

Enclosure 2 is a diagram of the proposed hole design.

Upon completion of drilling, a suite of geophysical logs will be run. A string of 6.4 cm diameter iron pipe will be set to total depth and filled with water. The pipe will be surrounded with API approved cementing mud and/or cement. The well will be suspended and the drill rig demobilized. The wellhead will be secured with a locked surface valve. Temperatures will be monitored in the hole for a period of one year. Upon completion of temperature monitoring operations, the hole will be abandoned in accordance with State and Federal regulations.

Water for the project will be obtained from Lake Creek, the outlet of Suttle Lake. The water will be transported to the site via truck over Highway 20 and

Forest Service Road 900. DOGAMI has already obtained a water right from the Oregon Department of Water Resources for this water supply (Permit No. 50385) (see Enclosure 3). The haul route will include only 1/4 to 1/2 mile of travel over Road 900.

ABANDONMENT

Abandonment of the hole will be in accordance with applicable State and Federal regulations.

RESTORATION

The final site selected will be on ground that has been previously disturbed by logging operations. No vegetation is expected to be removed to create a drill site. Site restoration will involve returning the ground to the state which existed prior to the commencement of drilling operations.

III. ENVIRONMENTAL CONCERNS

Environmental analysis will be completed by the U.S. Forest Service as part of the permitting process. Results of the USFS environmental analysis will be forwarded to USDOE for review. The purpose of this review is to insure compliance with NEPA environmental requirements. Receipt of Phase II drilling monies is contingent upon the environmental analysis passing the USDOE review process. If further environmental studies are found to be needed, they will be completed by and/or contracted for by DOGAMI.

IV. CULTURAL RESOURCES CONCERNS

There are no standing water bodies or streams in the vicinity of the drill site. Water for drilling operations will be trucked to the site.

The planned operations will not affect air quality. Drilling operations involve running only one diesel engine.

Noise will not be a problem. The site is isolated and screened by trees. There are no commercial operations in the area.

Archaeological concerns will be addressed by the USFS environmental review.

V. CONTACTS

The project manager is:

Walter R. Benoit
Chief Geologist
Oxbow Geothermal Corporation
200 South Virginia Street, Suite 450 Reno, NV 89501
Phone: (702) 322-1300

A drilling manager has yet to be selected.

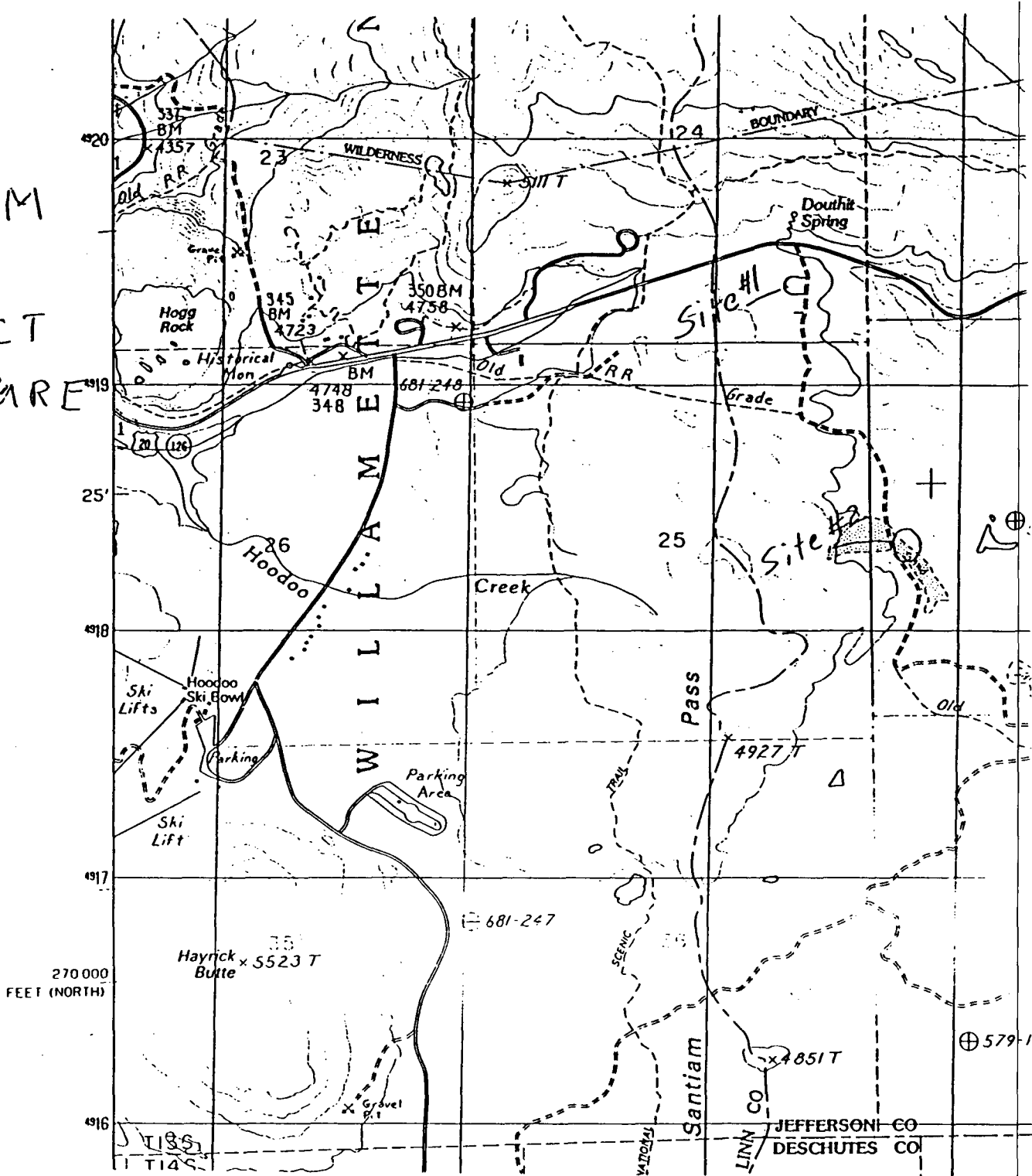
VI. EMERGENCY/FIRE CONTINGENCY PLAN

Fire precautions taken will be in accordance with USFS regulations. All vehicles will have exhaust systems in good working order. All internal combustion engines will have spark arresters. Fire extinguishers, axes, Pulaskis, shovels, and buckets will be available in quantities specified by Forest Service District regulations. A water supply will be available in the form of the water truck used to haul water to the drill site.

Prior to the commencement of operations, drilling crews will be briefed on the location and use of all firefighting equipment. All equipment will be checked to insure proper operation.

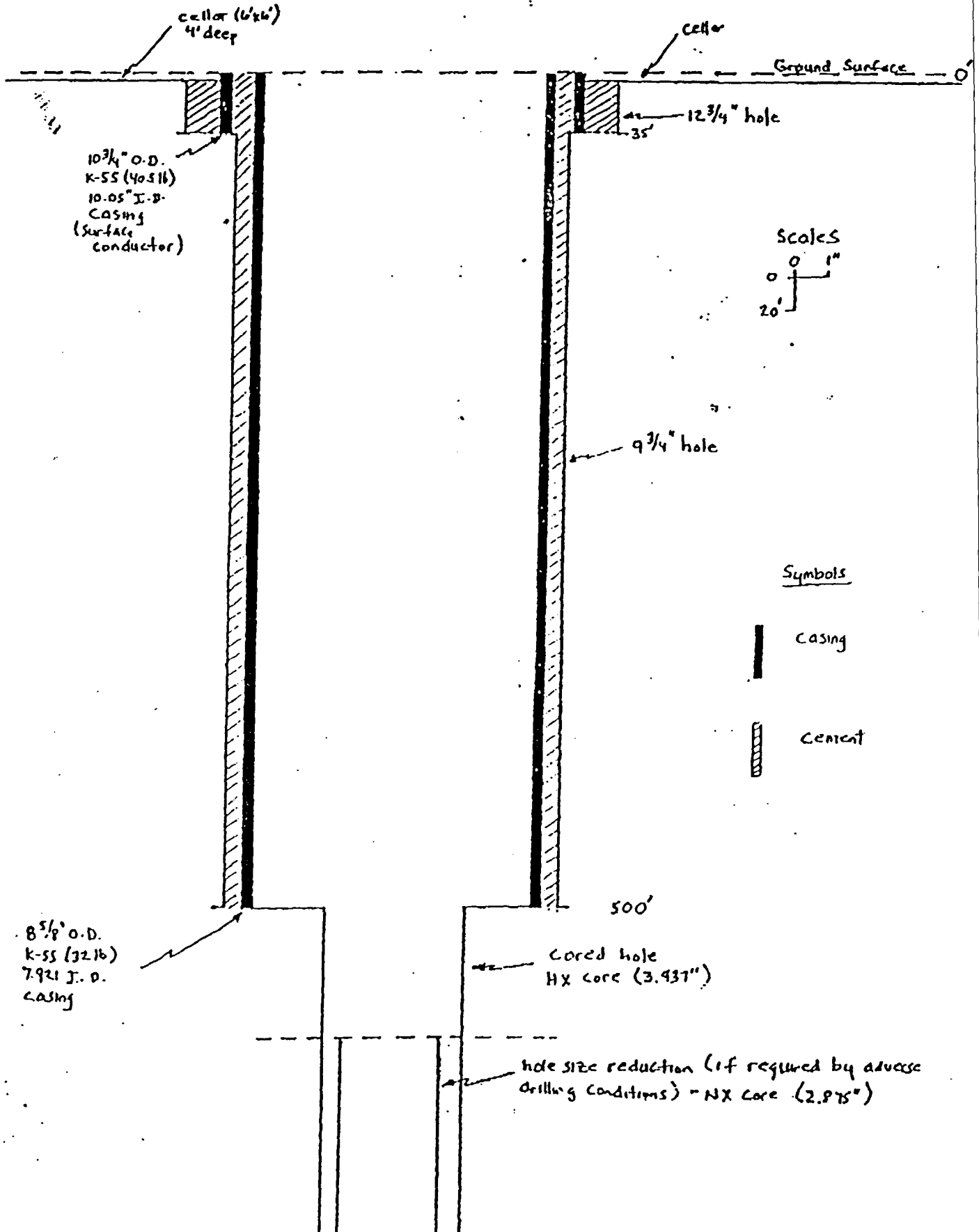
SANTIAM
PASS
PROJECT
ENCLOSURE

-2-89



ENCLOSURE 1
Portion of three fingered jack U.S.G.S
7.5. minimum quad showing site 1 in
T13S R 7½E Section 24.

Preliminary Hole Design - Santiam Pass Gradient Hole (SP-1)



APPENDIX B

CONDITIONS OF APPROVAL - TEMPERATURE GRADIENT WELLS

Deep Temperature Gradient Core Holes
Conditions of Approval for Geothermal Drilling

Permit No. OR-050-89-DSP-002
Well No. 77-24
Oxbow Power Company
Federal Lease OR 20492 (T. 13 S., R. 7½ E., Sec. 24)
Deschutes National Forest
Jefferson County, Oregon

General

- A. This hole is for determining stratigraphy, 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-050-89-DSP-002 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 Sisters 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 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 Sisters 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 as approved by the Authorized Officer. All sumps/pits will be lined with impervious liners to prevent seepage.
- e. All drilling sumps and reserve pits shall be lined with impervious material.
- f. Unattended sumps shall be completely fenced to protect the public, domestic animals and wildlife.
- g. A berm shall be placed on the downslope side of the drill pad in such a manner as to prevent escape of minor fluid flows from the drill pad.

Surface Casing

- 6. a. The surface casing shall be installed in accordance with the Plan of Exploration - Preliminary Hole Design.
- b. The drill hole shall be conditioned prior to cementing with at least equivalent weight mud to the weight of cement to be used.
- c. Should little or no cement returns be encountered while cementing any casing string, the Authorized Officer shall be contacted before any further work is carried out. Remedial cementing operations may be required.

Blowout Prevention Equipment (BOPE)

- 7. Blowout Prevention Equipment and auxiliary support equipment shall be properly installed, frequently tested and shall include an annular BOPE, and a gate valve 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 700 p.s.i. for 30 minutes.

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). The choke line shall be either steel or steel reinforced hose capable of being tested to BOP test pressure. The choke line shall be pressure tested to 700 p.s.i. during the test of other BOPE.
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, at least once each week on the drill pipe for the annular preventer, and at least once each week for the 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. This valve shall be pressure tested to 700 p.s.i. during the test of other BOPE.
 - 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 to be installed.
 - c. An adequate supply of drilling fluid and lost circulation and weighting materials shall be at the drill site to cure significant lost circulation problems or abnormal formation pressures or water entries that may be encountered.
14. Hydrogen Sulphide Detectors
 - a. 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.

- b. An H2S contingency plan should be formulated to include communications capability to readily contact an appropriate law enforcement office should the need arise. The plan must be kept on the drill site readily available to the drill foreman and crew.

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 in the driller's log at a minimum of 100 ft. (30m) intervals. Should the BHT reach 125° F (52° C) and later 175° F (79° 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° F (79° 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° F (79° 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° F (100° 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 deepened, provided that an adequate supply of cold water is maintained on-site for pumping downhole to prevent flashing. An adequate supply of cold water is, at a minimum, that amount which is being used each day during current coring operations.

- 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.
- f. Any completion of this well will require the installation of an appropriate well head and a pressure gauge. The well head with valve and pressure gauge will also be required if the well is temporarily abandoned (suspended) for more than 30 days.

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, cementing jobs, and P&A operations. At least 24 hour notice will be given prior to actual cementing and BOPE pressure testing and P&A operations. 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, and if drilling without returns, the last few temperatures taken. Include any significant general information, problems or unusual encounters. Reports will be phoned in to Dennis Davis at the BLM Prineville District Office or, if he is not available, to his alternates as listed in Item 20.
- b. All reports after completion of drilling are to be submitted to the Authorized Officer (Prineville BLM District Manager). 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 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.
- c. 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 would be helpful in assuring future safety or 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 previously submitted in writing.

18. Plugging and Abandonment

Plugging and abandonment operations shall be done in accordance with Geothermal Resource Operational Order No. 3, or in such other manner as is approved by the Authorized Officer. A dry hole marker, acceptable to the Authorized Officer, shall be required unless otherwise waived by the surface management agency.

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, BOPE, cement, 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. Bureau of Land Management contacts:

- | | | | |
|----|---|--------------|----------------------------------|
| a. | Dennis Davis, Inspector
Bend | Day
Night | (503) 447-4115
(503) 382-3440 |
| b. | Dennis Simontacchi, Inspector
Lakeview | Day
Night | (503) 947-2177
(503) 947-2355 |
| c. | Steve Henderson, Inspector
Portland | Day
Night | (503) 231-2048
(503) 642-4446 |
| d. | Pat Geehan
Deputy State Director of
Mineral Resources, Portland | Day
Night | (503) 231-6812
(503) 654-5166 |

APPENDIX C

GEOHERMAL LEASE AND SPECIAL STIPULATIONS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OBM NO. 1004-0038
Expires January 31, 1986

OFFER TO LEASE AND LEASE FOR GEOTHERMAL RESOURCES

Serial No. OR 20492

The undersigned (see reverse) offers to lease all or any of the lands in item 2 that are available for lease pursuant to the Geothermal Steam Act of 1980 (30 U.S.C. 1001-1025).

Read Instructions Before Completing

1. Name **Southland Royalty Company**
c/o Meridian Oil Inc.
Street ~~801 W. Broadway~~ P. O. Box 1855
City, State, Zip Code **Billings, MT 59103**
~~Billings, MT 59103~~

RECEIVED
BUREAU OF LAND MANAGEMENT
1986 MAY 27 AM 8:30
STATE OFFICE
PORTLAND, OREGON

2. Surface managing agency if other than BLM: FS, USDA Unit/Project _____

Legal description of land requested (segregate by public domain and acquired lands):

T. **13 S.**, R. **7 1/2 E.**, Meridian **Willamette** State **Oregon** County **Linn and Deschutes**

Sec. 23, all excluding that part within the Mt. Jefferson Wilderness boundary;
Sec. 24, all excluding that part within the Mt. Jefferson Wilderness boundary;
Sec. 25, all;
Sec. 26, all.

Total acres applied for 1,960.00
Percent U.S. interest 100%
Total \$ 2,010.00

Amount remitted: Filing fee \$ 50.00 Rental fee \$ 1,960.00

DO NOT WRITE BELOW THIS LINE

3. Land included in lease:

T. _____ R. _____ Meridian _____ State _____ County _____

Same as Item 2.

Attachment 1 shows the approximate location of the wilderness boundary. This lease specifically excludes all wilderness lands irrespective of any errors between the map and the final wilderness boundary.

Total acres in lease 1,960.00
Rental retained \$ 1,960.00

In accordance with the above offer, or the previously submitted competitive bid, this lease is issued granting the exclusive right to drill for, extract, produce, remove, utilize, sell, and dispose of all the geothermal resources in the lands described in item 3 together with the right to build and maintain necessary improvements thereupon, for a primary term of 10 years. Rights granted are subject to applicable laws, the terms, conditions, and attached stipulations of this lease, the Secretary of the Interior's regulations and formal orders in effect as of lease issuance and, when not inconsistent with lease rights granted or specific provisions of this lease, regulations and formal orders hereafter promulgated.

THE UNITED STATES OF AMERICA

by Robert E. Mallock (Signing Officer)
Chief, Lands and Minerals
Adjudication Section (Title) MAY 30 1986 (Date)

Type of lease:
 Noncompetitive
 Competitive
 Other _____

Described lands were
not within a KGRA
as of 5-28-86 *jc*

EFFECTIVE DATE OF LEASE June 1, 1986

4. (a) Undersigned certifies that:

(1) Offeror is a citizen of the United States; an association of such citizens; a municipality; or a corporation organized under the laws of the United States, any State or the District of Columbia; (2) All parties holding an interest in the offer are in compliance with 43 CFR 3200 and the authorizing Act; (3) Offeror's chargeable interests, direct and indirect, do not exceed that allowed under the Act; and (4) Offeror is not considered a minor under the laws of the State in which the lands covered by this offer are located.

(b) Undersigned agrees that signature to this offer constitutes acceptance of this lease, including all terms, conditions and stipulations of which offeror has been given notice, and any amendment or separate lease that may cover any land described in this offer open to lease application at the time this offer was filed but omitted for any reason from this lease. The offeror further agrees that this offer cannot be withdrawn, either in whole or part, unless the withdrawal is received by the BLM State Office before this lease, an amendment to this lease, or a separate lease, whichever covers the land described in the withdrawal, has been signed on behalf of the United States.

This offer will be rejected and will afford the offeror no priority if it is not properly completed and executed in accordance with the regulations, or if it is not accompanied by the required payments. Title 18 U.S.C. Sec. 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.

SOUTHLAND ROYALTY COMPANY

Duly executed this 15th day of May, 1986

By:

D. L. Black
(Signature of Lessee or Attorney-in-fact)
D. L. Black, Vice President

Described lands were not within a KGRA as of

Lease subject also to attached stipulations. See Exhibits "A" & "B"

LEASE TERMS

Sec. 1. Rentals—Rentals shall be paid to proper office of lessor in advance of each lease year until there is production in commercial quantities from the leased lands. Annual rental rates per acre or fraction thereof are: \$1 for noncompetitive leases and \$2 for competitive leases.

If this lease or a portion thereof is committed to an approved cooperative or unit plan which includes a well capable of producing leased resources, and the plan contains a provision for allocation of production, royalties shall be paid on the production allocated to this lease. However, annual rentals shall continue to be due for those lands not within a participating area.

Failure to pay annual rental, if due, on or before the anniversary date of this lease (or next official working day if office is closed) shall automatically terminate this lease by operation of law. Rentals may be suspended by the Secretary upon a sufficient showing by lessee.

Sec. 2. Royalties—Royalties shall be paid to proper office of lessor. Royalties shall be computed in accordance with regulations and orders. Royalty rates on production are: 10 percent for steam, heat, or energy; 5 percent for byproducts; and 5 percent for demineralized water.

Lessor reserves the right to establish reasonable minimum values on production after giving lessee notice and an opportunity to be heard. Royalties shall be due and payable on the last day of the month following the month in which production occurred.

A minimum royalty shall be due for any lease year beginning on or after the commencement of production in commercial quantities in which royalty payments aggregate less than \$2 per acre. Lessee shall pay such difference at the end of lease year. This minimum royalty may be waived, suspended, or reduced, and the above royalty rates may be reduced for all or portions of this lease if the Secretary determines that such action is necessary to encourage the greatest ultimate recovery of the leased resources, or is otherwise justified.

Sec. 3. Bonds—Lessee shall file and maintain any bond required under regulations.

Sec. 4. Diligence, rate of development, unitization, and drainage—Lessee shall perform diligent exploration as required by regulations and shall prevent unnecessary damage to, loss of, or waste of leased resources. Lessor reserves right to specify rates of development and production in the public interest and to require lessee to subscribe to a cooperative or unit plan, within 30 days of notice, if deemed necessary for proper development and operation of the area, field, or pool embracing these leased lands. Lessee shall drill and produce wells necessary to protect leased lands from drainage or pay compensatory royalty for drainage in amount determined by lessor.

Sec. 5. Documents, evidence, and inspection—Lessee shall file with proper office of lessor, not later than (30) days, after effective date thereof, any contract or evidence of other arrangement for the sale or disposal of production. At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing amounts and quality of all products removed and sold, proceeds therefrom, and amount used for production purposes or unavoidably lost. Lessee may be required to provide plats and schematic diagrams showing development work and improvements, and reports with respect to parties in interest, expenditures, and depreciation costs.

In the form prescribed by lessor, lessee shall keep a daily drilling record, a log, and complete information on well surveys and tests and keep a record of subsurface investigations and furnish copies to lessor when required. Lessee shall keep open at all reasonable times for inspection by any authorized officer of lessor, the leased premises and all wells, improvements, machinery, and fixtures thereon, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or in the leased lands. Lessee shall maintain copies of all contracts; sales agreements, accounting records, and documentation such as billings, invoices, or similar documentation that support costs claimed as manufacturing, preparation, and/or transportation costs. All such records shall be maintained in lessee's accounting offices for future audit by lessor. Lessee shall maintain required records for 6 years after they are generated or, if an audit or investigation is underway, until released of the obligation to maintain such records by lessor.

During existence of this lease, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 6. Conduct of operations—Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by

lessor to accomplish the intent of this section. To the extent consistent with leased rights granted, such measures may include, but are not limited to, modification to siting or design of facilities, timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-ways. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessees.

Prior to disturbing the surface of the leased lands, lessee shall contact lessor to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects.

Sec. 7. Production of byproducts—If the production, use, or conversion of geothermal resources from these leased lands is susceptible of producing a valuable byproduct or byproducts, including commercially demineralized water for beneficial uses in accordance with applicable State water laws, lessor may require substantial beneficial production or use thereof by lessee.

Sec. 8. Damages to property—Lessee shall pay lessor for damage to lessor's improvements, and shall save and hold lessor harmless from all claims for damage or harm to persons or property as a result of lease operations.

Sec. 9. Protection of diverse interests and equal opportunity—Lessee shall maintain a safe working environment in accordance with standard industry practices and take measures necessary to protect the health and safety of the public. Lessor reserves the right to ensure that production is sold at reasonable prices and to prevent monopoly.

Lessee shall comply with Executive Order No. 11246 of September 24, 1965, as amended, and regulations and relevant orders of the Secretary of Labor issued pursuant thereto. Neither lessee nor lessee's subcontractor shall maintain segregated facilities.

Sec. 10. Transfer of lease interests and relinquishment of lease—As required by regulations, lessee shall file with lessor, any assignment or other transfer of an interest in this lease. Lessee may relinquish this lease or any legal subdivision by filing in the proper office a written relinquishment, which shall be effective as of the date of filing, subject to the continued obligation of the lessee and surety to pay all accrued rentals and royalties.

Sec. 11. Delivery of premises—At such time as all or portions of this lease are returned to lessor, lessee shall place all wells in condition for suspension or abandonment, reclaim the land as specified by lessor, and within a reasonable period of time, remove equipment and improvements not deemed necessary by lessor for preservation of producible wells or continued protection of the environment.

Sec. 12. Proceedings in case of default—If lessee fails to comply with any provisions of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation in accordance with the Act. However, if this lease includes land known to contain a well capable of production in commercial quantities, it may be cancelled only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor or any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later cancellation for the same default occurring at any other time.

Whenever the lessee fails to comply in a timely manner with any of the provisions of the Act, this lease, the regulations, or formal orders, and immediate action is required, the Lessor may enter on the leased lands and take measures deemed necessary to correct the failure at the expense of the Lessee.

Sec. 13. Heirs and successors-in-interest—Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

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BUREAU OF LAND MANAGEMENT

OR 20492
Exhibit "A"

1986 MAY 27 AM 8:30

STATE OFFICE
Special Stipulations PORTLAND, OREGON
Willamette National Forest

The lessee shall comply with the following special conditions and stipulations unless they are modified by mutual agreement of the lessee, the authorized officer of the Bureau of Land Management and the authorized representative of the United States Department of Agriculture, Forest Service.

1. All surface disturbing operations, other than "casual use" as defined by 43 CFR 3209.0-5(d), must be culturally cleared by the authorized representative of the Forest Service. When a lessee cultural report is necessary to comply with standard lease term No. 6, it must be signed and certified by a qualified archaeologist acceptable to the authorized representative of the Forest Service.
2. The lessee shall make every possible effort to prevent, control and suppress any fire on federally owned or managed lands or near the lease operational site. All uncontrolled fires shall be immediately reported to Forest Dispatch 503-687-6712.
3. Prior to submission of a plan of operation for surface disturbing operations, the lessee shall meet with the authorized representative of the Forest Service, to be apprised of specific requirements, restrictions, administrative rules and regulations, e.g., timber sales, special use permits, experimental studies contracts and resource closures. This meeting may be waived if the lessee is sufficiently aware of local problems and ground rules of the area involved in the proposed operation.
4. In order to protect developed recreation sites, unstable/very unstable land types and dispersed recreation unroaded area values, the lessee agrees not to occupy or use the surface of the following described lands unless this stipulation is modified or eliminated.

Willamette Meridian, Oregon

T. 13 S., R. 7½ E.,

Secs. 23, 24, 25, and 26, those parts shown in - 480.00 acres
blue on Attachment 1. *appr*

5. No permanent facilities such as power plants allowed on the following described land unless this stipulation is modified or eliminated. Roads, drill pads, transmission lines and pipelines are permitted.

Willamette Meridian, Oregon

T. 13 S., R. 7½ E.,

Secs. 23, 24, 25, and 26, those parts shown in
green on Attachment 1.

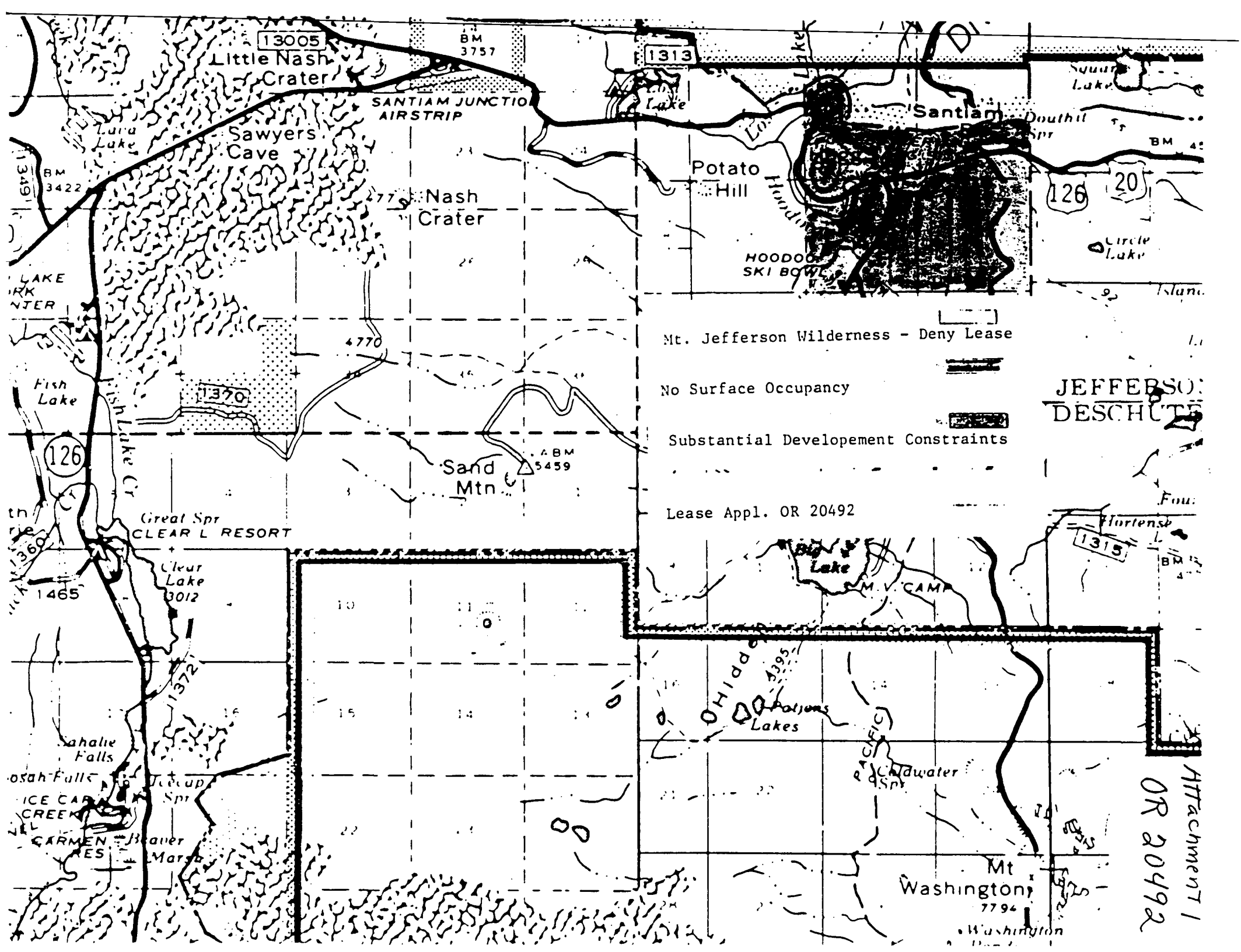
OR 20492
Exhibit "B"

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

SPECIAL STIPULATION

The Bureau of Land Management has reviewed existing information and planning documents and except as noted in attached special stipulations, knows of no reason why normal development, subject to the controls of applicable laws and regulations, and the lease terms and conditions, cannot proceed on the leased lands. However, specific activities could not be considered prior to lease issuance since the nature and extent of the geothermal resource were not known and specific operations have not been proposed. The lessee is hereby made aware that, consistent with 43 CFR 3262.4, all post lease operations will be subject to appropriate environmental review and may be limited or denied, but only if unmitigatable and unacceptable impacts on other land uses or resources would result.

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1986 MAY 27 AM 8 30
STATE OFFICE
PORTLAND, OREGON



13005

BM 3757

1313

Little Nash Crater

SANTIAM JUNCTIO AIRSTRIP

Santiam Douthitt Spr

Sawyers Cave

Potato Hill

HOODOO SKI BOWL

Nash Crater

126 20

Circle Lake

4770

Mt. Jefferson Wilderness - Deny Lease

No Surface Occupancy

JEFFERSON DESCHUTE

Substantial Development Constraints

Sand Mtn

BM 5459

Lease Appl. OR 20492

Great Spr CLEAR L RESORT

Clear Lake 3012

1315

10

11

15

18

Adams Lakes

PACIFIC CREEK WATER SPR

Mt Washington 7794

Washington

Attachment 1
OR 20492

OR 20485
OR 20487
OR 20491
OR 20492
OR 20493
3210 (943.3)

MAY 30 1986

DECISION

Assignor:

Southland Royalty Company : Assignment of Record Title Interest
c/o Meridian Oil Inc. : in Geothermal Resources Lease(s)
P.O. Box 1855 : Lease Date: June 1, 1986
Billings, MT 59103 :

Assignee:

Oxbow Geothermal Company :
c/o Oxbow Geothermal Corporation :
200 South Virginia Street, Suite 450 :
Reno, NV 89501 :

Assignment(s) Approved

The assignment of geothermal lease OR 20485, et al. is hereby approved simultaneously with the issuance of the lease effective June 1, 1986.

Oxbow Geothermal Company, the assignee, having gained an undivided 100 percent interest in the record title to the lease, will be responsible for payment of rental.

/s/ Robert E. Mollohan

Chief, Lands and Minerals
Adjudication Section

Dupl. Orig., Assignor
Orig., Assignee w/copy of assignment

cc:
920
Willamette & Deschutes NF, w/copy of assignment
940
Accounts (943.5)
MMS

943.3:JClark:mjo:5-28-86:x6917:(1904m)

APPENDIX D

REFERENCES CITED

APPENDIX D

REFERENCES CITED

1. Belknap-Foley Geothermal Area Final Environmental Statement, Geothermal Leasing Willamette and Deschutes National Forests
2. CL - M4-11, Plant Associations of the Central Pumice Zone, September 1982
3. Deschutes National Forest Land Management Plan 1978
4. Martin, USFS Wildlife Biologist, Personal Communication, June, 1989
5. Soil Resource Inventory, Deschutes National Forest, 1976
6. Spotted Owl Inventory and Monitoring Handbook, Barss, January 12, 1989, Deschutes National Forest