

6101939

	GEO N - 1	GEO N - 3
RIG MOBILIZATION	\$3,000	\$8,723
ROTARY DRILLING	\$31,953	\$24,957
CEMENTING CASING INSTALLING BOP	\$17,830	\$33,682
WIRELINE CORING	\$233,776	\$255,462
LOGGING AND DEMOBILIZATION	?	\$37,619

TOTAL COST	\$286,559 (to 4000')	\$360,443
OVERALL COST/FT	\$72/FT	\$90/FT

TABLE 1b. Estimate of Expenditure for
GEO N - 1 and GEO N - 3 (based on daily
drilling reports by GEO Operator Corp.)

ITEMIZATION OF CTGH - 1 EXPENDITURE

		COST/FT
ROAD, SITE AND LOCATION:	\$11,544.39	OVERALL COST/FT = \$456,506/4800FT = \$95/FT
RIG MOB/DEMOB:	\$10,000.00	
RIG	\$296,807.04	
TRUCKING & HAULING	\$3,889.84	
DRILL SITE GEOLOGISTS	\$26,560.00	
MUD & CHEMICALS	\$24,618.32	
CEMENT MATERIALS	\$9,140.65	
GEOPHYSICAL LOGGING	\$10,031.91	
DRILL BITS & TOOLS	\$23,492.83	
OUTSIDE LABOR	\$1,423.85	
OTHER EVALUTATION	\$6,954.20	
OTHER	\$14,125.20	
CONDUCTOR CASING	\$418.80	
SURFACE CASING	\$10,588.64	
WELLHEAD EQUIPMENT	\$2,589.46	
CAMP & CATERING	\$4,270.89	
TOTAL:	\$456,506.02	

reference: CTGH - 1 FINAL TECHNICAL REPORT by Thermal Power Co.
30 September 1987

ROAD, SITE AND LOCATION	\$11,544.39
RIG MOB/DEMOB	\$10,000.00
RIG	\$296,807.04
TRUCKING & HAULING	\$3,889.84
DRILL SITE GEOLOGISTS	\$26,560.00
MUD & CHEMICALS	\$24,618.32
CEMENT MATERIALS	\$9,140.65
GEOPHYSICAL LOGGING	\$10,031.91
DRILL BITS & TOOLS	\$23,492.83
OUTSIDE LABOR	\$1,423.85
OTHER EVALUTATION	\$6,954.20
OTHER	\$14,125.20
CONDUCTOR CASING	\$418.80
SURFACE CASING	\$10,588.64
WELLHEAD EQUIPMENT	\$2,589.46
CAMP & CATERING	\$4,270.89

TOTAL:	\$456,506.02
OVERALL COST/FT =	\$456,506/4800ft
=	\$95/FT

TABLE 1a. Detailed Itemization of Expenditures for CTGH - 1 (based on CTGH - 1 Final Technical Report by Thermal Power Co., 1987)

ITEMIZATION OF GEO N - 3 EXPENDITURE

estimates based on daily drilling reports

RIG MOBILIZATION	\$8,723.00
ROTARY - FOOTAGE, MATERIALS AND BITS, RIG	\$24,957.00
CEMENTING CASING, INSTALLATION OF BOPE	\$33,682.00
WIRELINE CORING	\$255,462.00
LOGGING AND DEMOBIL.	\$37,619.00
TOTAL COST	=====
	\$360,443.00

COST/FT

ROTARY = \$24,957/454FT
= \$55/FT
WIRELINE = \$255,462/3548FT
= \$72/FT
OVERALL = \$360,443/4002FT
= \$90.1/FT

ITEMIZATION OF EXPENDITURE

	GEO N - 1	GEO N - 3
RIG MOBILIZATION:	\$3,000.00	\$8,723.00
ROTARY DRILLING	\$31,953.00	\$24,957.00
CEMENTING CASING, INSTALLING ROPE	\$17,830.00	\$33,682.00
WIRELINE CORING	\$233,776.00	\$255,462.00
LOGGING AND DEMOBIL.		\$37,619.00
TOTAL COST	\$286,559.00 (to 4000')	\$360,443.00
ROTARY COST/FT	\$68/FT	\$55/FT
WIRELINE COST/FT	\$66/FT	\$72/FT
OVERALL COST/FT	\$72/FT	\$90/FT

ITEMIZATION OF GEO N - 1 EXPENDITURE

estimates based on daily drilling reports

		COST/FT
RIG MOBILIZATION	\$3,000.00	ROTARY = \$31,953/470FT
		= \$68/FT
ROTARY - FOOTAGE,	\$4,606.00	
MATERIALS AND BITS,	\$14,747.00	
RIG	\$12,600.00	
	\$31,953.00	
CEMENTING CASING,		
INSTALLATION OF BOPE	\$17,830.00	
WIRELINE CORING	\$233,776.00	WIRELINE = \$233,776/3530FT
		= \$66/FT
TOTAL COST TO	=====	=====
4000 FEET	\$286,559.00	OVERALL = \$286,559/4000FT
		= \$72/FT
DEMOBILIZATION	?	
GEOPHYSICAL WELL LOGGING	?	



GEO Operator Corporation

A Subsidiary of Geothermal Resources International, Inc.

20 July 1988

Mr. Jeff Hoyles
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

RE: DOE Cascades Geothermal Drilling Program
Cooperative Agreement No. DE-FC-85ID12613

Dear Jeff,

Enclosed is GEO Operator Corporation's (GEOOC) statement for costs incurred during the evaluation and technology transfer phases (phases 2 and 3) of corehole N-3 at Newberry Crater, Deschutes County, Oregon. Documentation supporting the statement is also included. Per our contract agreement, we are providing four copies of our statement package.

The documentation consists of vendor invoices and GEOOC employee expense reports. Lead schedules, summarizing the data in the supporting documents, are provided for each support type. Vendor invoices have been approved for payment (to vendors) by Dr. Swanberg. The GEOOC employee time sheets were prepared on a timely basis and approved by management.

We allocate labor costs based upon the hours spent by employees on the various projects undertaken by the Company. The rate used for each hour of labor by a salaried employee is based on employee's monthly salary divided by the total hours worked that month. Therefore, the rate typically will fluctuate each month (depending on the number of hours worked). A burden rate of 54.26%, which covers all employees overhead, is assessed to every labor dollar committed through December 31, 1987. Effective January 1, 1988 the burden rate is 172.00%.

Note that we have applied phase 1 costs overrun in our statement of costs calculations. Due to the overlapping nature of these three phases, costs incurred during phase 1 time period have been applied to phases 2 and 3. Phase 1 cost overruns were documented and copies of invoices sent to the DOE on voucher no. 1. We have also subtracted total project costs overrun to

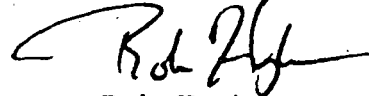
Mr. Jeff Hoyles
20 July 1988
Page Two

reflect total costs reimbursable under our contract agreement.
If possible, please transfer funds to the following account:

Bank of America
San Francisco, California
GEO Operator Corporation
#12331-07745

Should you have any questions regarding our statement of costs, please feel free to contact me.

Sincerely,



Rob Hughes
Financial Accounting
Manager

RH/dap

cc: Robert Brown
Mark Campion
Ed Collins
W. Joseph Dryer
Lynn Filley
Chandler Swanberg
Deborah Walsh
Cliff Walkey



GEO Operator Corporation

A Subsidiary of Geothermal Resources International, Inc.

STATEMENT OF COST
(Corehole N-3 Phase 2 and 3 billing)

July 19, 1988

Period of Performance Covered by this billing:

Cooperative Agreement No. DE-FC07-85ID12613
Voucher No. 2

October 1, 1986 to May 31, 1988

Contract Amount: \$429,455

DOE Share: \$212,580 (49.5%)

GEO Share: \$216,875 (50.5%)

	<u>Current</u>	<u>Cumulative</u>
Consultants	\$ 6,650.00	\$149,652.02
Material	-	107,283.77
Direct Labor	7,659.24	29,732.28
Labor O/H	9,477.31	15,776.28
Travel/living	-	11,278.58
Other	-	<u>133,042.42</u>
Sub-total	23,786.55	446,765.35
G&A (7%)	<u>1,655.06</u>	<u>31,273.57</u>
Sub-total	25,451.61	478,038.92
Add Cost Overrun (phase 1)	<u>132,507.38</u>	-
Sub-total	157,958.99	<u>478,038.92</u>
Less Costs Overrun (total project)	<u>48,584.38</u>	<u>48,584.38</u>
Sub-total	109,374.61	429,454.54
Less GEO's Share (50.5%)	<u>55,234.18</u>	<u>216,874.54</u>
DOE Share (49.5%)	54,140.43	212,580.00
Add Phase 1 Retention	<u>15,843.96</u>	-
Total Payment Due	<u><u>\$ 69,984.39</u></u>	<u><u>\$212,580.00</u></u>

119/14

CERTIFICATION: I certify that this invoice is correct and in accordance with the terms of the Cooperative Agreement and that the costs included herein have been incurred, represent payments made by the participants except as otherwise authorized in the payments provisions of the Cooperative Agreements, and properly reflect the work performed.

Charles J. Lively
(Signature)

Vice President, Earth Science GEO/GE00C
(Title)



GEO Operator Corporation

A Subsidiary of Geothermal Resources International, Inc.

20 July 1988

Mr. Jeff Hoyles
U.S. Department of Energy
785 DOE Place
Idaho Falls, Idaho 83402

RE: DOE Cascades Geothermal Drilling Program
Cooperative Agreement No. DE-FC-85ID12612

Dear Jeff,

Enclosed is GEO Operator Corporation's (GEOOC) statement for costs incurred during the evaluation and technology transfer phases (phases 2 and 3) of corehole N-1 at Newberry Crater, Deschutes County, Oregon. Documentation supporting the statement is also included. Per our contract agreement, we are providing four copies of our statement package.

The documentation consists of vendor invoices and GEOOC employee expense reports. Lead schedules, summarizing the data in the supporting documents, are provided for each support type. Vendor invoices have been approved for payment (to vendors) by Dr. Swanberg. The GEOOC employee time sheets were prepared on a timely basis and approved by management.

We allocate labor costs based upon the hours spent by employees on the various projects undertaken by the Company. The rate used for each hour of labor by a salaried employee is based on employee's monthly salary divided by the total hours worked that month. Therefore, the rate typically will fluctuate each month (depending on the number of hours worked). A burden rate of 54.26%, which covers all employees overhead, is assessed to every labor dollar committed through December 31, 1987. Effective January 1, 1988 the burden rate is 172.00%.

Note that we have applied phase 1 costs overrun in our statement of costs calculations. Due to the overlapping nature of these three phases, costs incurred during phase 1 time period have been applied to phases 2 and 3. Phase 1 cost overruns were documented and copies of invoices sent to the DOE on voucher no. 1. We have also subtracted total project costs overrun to

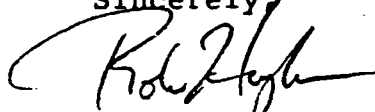
Mr. Jeff Hoyles
20 July 1988
Page Two

reflect total costs reimbursable under our contract agreement.
If possible, please transfer funds to the following account:

Bank of America
San Francisco, California
GEO Operator Corporation
#12331-07745

Should you have any questions regarding our statement of costs, please feel free to contact me.

Sincerely,



Rob Hughes
Financial Accounting
Manager

RH/dap

cc: Robert Brown
Mark Campion
Ed Collins
W. Joseph Dryer
Lynn Filley
~~Chandler Swanberg~~
Deborah Walsh
Cliff Walkey



GEO Operator Corporation

A Subsidiary of Geothermal Resources International, Inc.

STATEMENT OF COST
(Corehole N-1 Phase 2 and 3 billing)

July 19, 1988

Period of Performance Covered by this billing:

Cooperative Agreement No. DE-FC07-85ID12612
Voucher No. 2

January 1, 1986 to May 31, 1988

Contract Amount: \$429,455

DOE Share: \$210,433 (49%)

GEO Share: \$219,022 (51%)

	<u>Current</u>	<u>Cumulative</u>
Consultants	\$ 59,101.24	\$373,637.00
Material	7,982.93	51,801.41
Direct Labor	7,360.33	25,287.48
Labor O/H	8,778.49	13,758.65
Travel/living	199.93	12,185.36
Other	<u>1,069.19</u>	<u>4,864.01</u>
Sub-total	84,492.11	481,533.91
G&A (7%)	<u>5,914.45</u>	<u>33,707.37</u>
Sub-total	90,406.56	515,241.28
Add Cost Overrun (phase 1)	<u>103,096.61</u>	<u>-</u>
Sub-total	193,503.17	<u>515,241.28</u>
Less Costs Overrun (total project)	<u>85,786.18</u>	<u>85,786.18</u>
Sub-total	107,716.99	429,455.10
Less GEO's Share (51%)	<u>54,935.66</u>	<u>219,022.10</u>
DOE Share (49%)	52,781.33	210,433.00
Add Phase 1 Retention	<u>15,765.13</u>	<u>-</u>
Total Payment Due	<u>\$ 68,546.46</u>	<u>\$210,433.00</u>

113/PE
Total cost

CERTIFICATION: I certify that this invoice is correct and in accordance with the terms of the Cooperative Agreement and that the costs included herein have been incurred, represent payments made by the participants except as otherwise authorized in the payments provisions of the Cooperative Agreements, and properly reflect the work performed.

(Signature)

Vice President, Earth Science GEO/GE00C
(Title)

-1229

6 wells \$450,000
deepest 1965

1. Eugene W, SEB No 1
depth 1837 ft
cost (w/ share of work) = \$41,400 or \$22.57/ft
2. Eugene W, SEB No 2
TD 1965 ft
3. Eugene W, SEB No 3
TD 960 ft - hole lost
4. Eugene W, SEB No 4
TD 1160 ft - hole lost
5. Eugene W, SEB No 5
TD 730 ft ~~total~~ 1 no to dull 730'
6. Eugene W, SEB No 6
TD 1570 ft

So total footage was 8162
 total cost presumably \$450,000
 w/ first 1837' costing 41,400: rest averages $\frac{\$450,000 - 41,400}{8162 - 1837} = \$64.60/ft$

Crawfordson - Occy design for +g holes
Newberry or Medicine Lake
2000-ft hole, return \$500K

1 3/8 conductor

1500' prebs

9 5/8 case to 1500

7" below

open hole can't get to target. -

Smaller dia. - less weight, no sag on
casing, loose on rig time -

20-30 days

2000 - 4000/day rig

Core Rig

- cheaper for 2000' hole

Longest in Reno - ideas of costs

would use a bigger rig
not conventional - would use core
high costs, lots troubles -
Anything not a real prod well - reduce
core - reduces costs, directs cost
COG

Longest guy in Reno →

Gilbert D. Speaker

13875 Mt. McCallum St.

Reno 89506

702-972-0296

\$85.40/ft average - 8000' hole
down

- what to do

Going to SFO to meet w/
Chevron

Cal Energy

what to do in Cascades

EWEB -

People w/ close proximity in Cascades

Uman, Chevron, EWEB, Davidson, Cal Energy -

Cascades

Gil Spedner

Core

3500 - 4000' holes down:

turnkey \$50/ft
includes everything
bits, water trucks

HA core 3.980 2 1/2" core -

134CHD 5.287 OD 3.345 Core
\$65-70/ft. 0-4000'

got big rig on 2 am good holes
shift costs - \$3200/day + \$9 ft.
about 200' / 24 hrs -

puts up first failures

new use max-sized bits - one clearance

light rods

run bit plants -

new use 2 or 3 or 600' -

Sars - USOs - Colo plateau holes \$800'

5 holes
drilled in
Cascades

LACKLAND AIR FORCE BASE - PHASE II
SUBCONTRACT DRILLING COSTS (Unburdened)

Vendor	Services Performed	Amount
1. W. R. Dirks Petroleum Engineers, Inc.	✓ Drilling Consultant	\$ 29,031
2. Magee-Poole Drilling Company	✓ Drilling	121,526
3. Pat Smith Vacuum Service	✓ Mud Hauling	31,345
4. South Texas Rathole Services, Inc.	✓ Conductor Pipe	3,336
5. Dresser Industries, Inc.	✓ Wireline Logging	21,968
6. C. F. Thomas and Co.	✓ Site Prep. & Restoration	4,596
7. Inland Tanks, Inc.	✓ Frac Tank	999
8. Bunker Supply, Inc.	✓ Drilling Bits	7,515
9. Halliburton Services	✓ Cement & DST	25,990
10. Allen Oil Tools, Inc.	Water Line	1,460
11. Associated Oil Tools, Inc.	Mud Cleaner Rental	4,250
12. Cactus Pipe & Supply	9 5/8" Casing	14,097
13. Milchem Incorporated	Drilling Fluids	63,401
⊗ 14. UMI Corporation (Gramco)	Casinghead	9,030
15. Bakerline	Liner Hanger	8,206
16. International Hammer Services Co.	Casing Crews	6,394
17. Tooke Engineering Co., Inc.	Mud Logging	8,989
18. NL Industries, Inc.	Stabilizers	2,742
19. DOW Chemical (Dowell)	Gravel Pack & Screen	71,192
⊗ 20. Fesco Inc.	Pressure, Temperature & Lift Test	1,499
21. Core Services, Inc.	Sample Analyses	550
22. Pat Baker Co.	Load & Unload Casing	839
23. Johnson Construction Co.	Tubing Freight	254
⊗ 24. McKenzie Equipment Co., Inc.	Air Compressor Rental	1,109
25. Drilco	Drilling Collars Inspection	923
26. Gearhart Industries, Inc.	Cement Bond Log	2,218
27. B.A. Box	Mud Tanks Rental	1,098
⊗ 28. Pool Well Servicing Co.	Workover Rig	2,797
29. Leggett Welding & Construction Co.	Hauling Tubing	257
30. Tri-State Oil Tool Industries, Inc.	Underreaming	17,302
31. O'Brien's Welding	Welding	286
32. Gary Hain Welding	Welding	420
33. Patterson Truck Line, Inc.	Slips Freight	136
34. Associated Services, Inc.	Water Hauling	702

TOTAL

\$466,457

(items marked ⊗)

*This includes the preliminary air-lift test, but does not include ESL personnel.
The 1st casing was left over from Raff River, and so doesn't enter here.*



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

walter young guest

PO Box 5501

Engle, OR 97405

(503) 343-9768

November 30, 1984

MEMORANDUM

TO: Mike Wright
FROM: Bruce Sibbett
SUBJECT: Drilling Costs in the Cascades

Several companies and individuals were contacted and asked about drilling costs for intermediate depth thermal gradient holes in the Cascade Mountains. Most of the good information was obtained from one drilling company and one geothermal company. However, ~~this~~ ^{then} sparse data ~~is~~ ^{are} in fairly good agreement.

Core Drilled Holes:

Core drilling averages \$65 to \$70 per foot for the drilling contract with 10% of the hole depth cased with H casing (4" x 4½"). A contingency of 20% was suggested as reasonable. Mobilization charges are additional. An example is \$6,000 one way to Mt. Shasta for a Salt Lake City based rig.

A four hole average footage cost of \$73.34 per foot with 30% variability includes mobilization-demobilization, water and supervision. The surface casing hole was drilled with rotary and the holes cored below that.

These two average cost figures are comparable to the Ascension Island cost of \$75/ft. which does not include mob-demob and shipping. A 3000 ft. hole at Coso cost is \$63/ft.

Rotary Drilled Holes:

Few intermediate depth holes have been rotary drilled in the area due

to lost circulation problems and the available data are sparse and highly variable. Two reported holes (2300 ft. and 4000 ft.) averaged \$117 per foot with 36% cost variability. The shallow hole was more expensive.

Primary sources of information were Tonto Drilling and Phillips Geothermal.

Bruce S. Sibbett

BS/cd