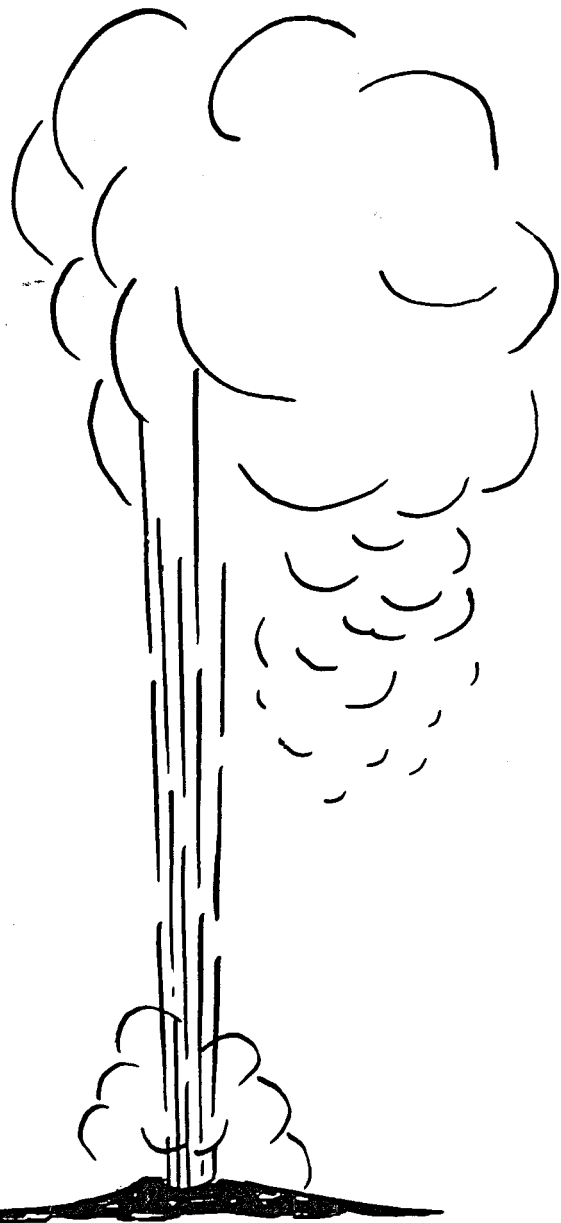


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C. D. HOPKINS ET AL. NO. 2 GEOTHERMAL  
WELL-OF-OPPORTUNITY, WAYNE COUNTY,  
GEORGIA

Operational Report

By  
Alan Lohse

July 1978

Work Performed Under Contract No. EG-77-C-08-1528

Gruy Federal, Inc.  
Houston, Texas



**U. S. DEPARTMENT OF ENERGY**  
**Geothermal Energy**

**MASTER**

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C. D. HOPKINS ET AL. NO. 2  
GEOTHERMAL WELL-OF-OPPORTUNITY  
WAYNE COUNTY, GEORGIA

OPERATIONAL REPORT

Alan Lohse

GRUY FEDERAL, INC.  
2500 TANGLEWILDE, SUITE 150  
HOUSTON, TEXAS 77063  
Date Published--July 1978

Prepared for the  
U.S. DEPARTMENT OF ENERGY  
DIVISION OF GEOTHERMAL ENERGY  
UNDER CONTRACT NO. EG-77-C-08-1528

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## ABSTRACT

On December 8, 1977, Gruy Federal, Inc. took over the C. D. Hopkins et al. No. 2 well, located near Jesup in Wayne County, Georgia (lat.  $31^{\circ} 32'$  N., long.  $81^{\circ} 43'$  W.), to be deepened and used for geothermal temperature-gradient measurements. The well was drilled from 4,009 to 4,341 feet, then diamond cored to 4,371 feet, 28 feet of core being obtained for analysis. After logging by the U.S.G.S. District Groundwater Office in Atlanta, the well was terminated with  $3\frac{1}{2}$ " tubing to 4,386 feet.

Scientists from Virginia Polytechnic Institute determined the bottom-hole temperature to be  $60^{\circ}\text{C}$  ( $140^{\circ}\text{F}$ ) at 1,331 meters (4,365 feet). Over the interval 47-1,331 meters (154-4,365 feet) the least-squares temperature gradient was  $29.3 \pm 0.14$   $^{\circ}\text{C}/\text{km}$  ( $1.61 \pm 0.25$   $^{\circ}\text{F}/100$  ft).

OPERATIONAL REPORT

C. D. Hopkins et al. No. 2

Geothermal Well-of-Opportunity, Wayne County, Georgia

On November 21, 1977, Gruy Federal, Inc. was instructed to monitor the C. D. Hopkins et al. No. 2 oil and gas exploratory well to be drilled in Wayne County, Georgia, and, if it was a dry hole, to obtain it for deepening and use as a geothermal temperature-gradient measurement well. This action originated in a conference call with:

- DOE/DGE Washington,
- DOE/NOO Las Vegas, and
- State of Georgia, Department of Natural Resources, in Atlanta.

The well is located within the Atlantic Coastal Plain province in southeastern Georgia, near the community of Jesup about 25 miles north-east of Brunswick (figure 1).

Interest holders in the Hopkins No. 2 test well are:

- Mr. W. K. Davis (responsible for drilling and testing under a contract with the other principals)  
One Allen Center, Suite 1000  
Houston, Texas 77002
- American Quasar Petroleum Company  
Suite 1415, Annex Bank of New Orleans  
New Orleans, Louisiana 70112
- Champlin Petroleum Company (not included as an operator in permits from the State of Georgia)  
700 Houston Natural Gas Building  
Houston, Texas 77002

The Georgia well was considered a geothermal well-of-opportunity (WOO) as defined in Gruy's existing DOE/DGE contract number EG-77-C-08-1528. The well-of-opportunity program uses conventional petroleum wells to gather geothermal-geopressure data by enabling Gruy Federal to act as an agent for DOE/DGE in negotiating for the well, if it is a dry hole or is abandoned and can be reentered. Without risk or liability to the original operator, Gruy Federal drills the well deeper or recompletes in the geothermal zone of interest and logs, tests, produces and analyzes it as necessary to gather specific data on reservoir characteristics, production performance, fluids, etc.

Authorization for Gruy Federal, Inc. to proceed under modification of contract EG-77-C-08-1528 was documented by telegram from Dr. James C. Bresee to Dr. Alan Lohse, Dated December 2, 1977.



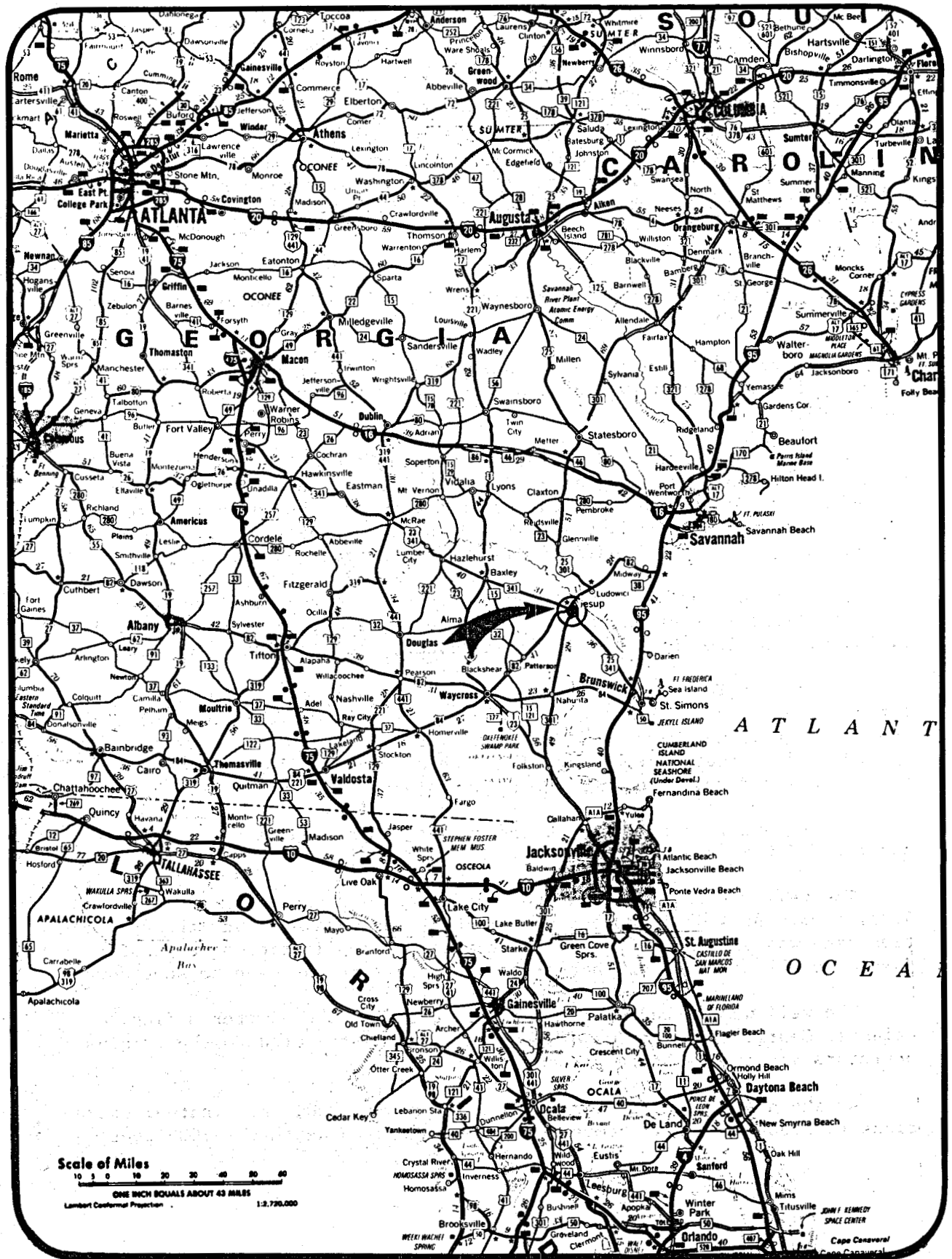


Figure 1. Index map showing location of well site area near Jesup, Georgia

Initial contact was made with Mr. Davis on November 28, 1977, in Brunswick, Georgia. At that time the well was already being drilled at a depth of about 1,200 feet.

Other conversations on November 30 and December 1 confirmed a mutual agreement between Davis and Gruy Federal to work toward culminating an equitable arrangement to transfer the well (dry hole) to Gruy Federal without interruption of field operations or support services, and defined and clarified numerous terms with respect to liabilities, material, costs and credits if the well became a dry hole of no further interest to the original operators.

Arrangements were made to repermit the well with the State of Georgia in the name of Gruy Federal, Inc.

Mr. Daniel A. Johnson, Area Engineer with the Gruy Management Service Company, Dallas, Texas, was assigned to work with Gruy Federal, and placed on standby.

On Thursday, January 8, 1978, the morning operations report indicated that the well was being logged at TD 4,009 feet. The test well was declared a dry hole by the operators that afternoon, whereupon inventory of on-site materiel was conducted by Mr. Johnson on behalf of Gruy Federal and the tool pusher on behalf of Davis and American Quasar.

Transfer of the well was accomplished by a conventional petroleum industry letter-of-agreement dated December 8, 1977, and signed by William K. Davis, John Trenchard for American Quasar, and Alan Lohse for Gruy Federal.

After Gruy Federal took over the well as operator, it was drilled through sands and shales of Cretaceous age from 4,009 feet to 4,305 feet, thence volcanic material to 4,335 feet. At 4,331 feet the penetration rate slowed to four feet/hour, indicating a change in lithology from overlying sedimentary and weathered igneous rocks to hard basement rocks.

During drilling operations, the cuttings were analyzed both by Baroid and the U.S.G.S. geologist on site.

The well was drilled ahead to 4,341 feet, and then diamond cored to 4,371 feet. At 4,371, 28 feet of core had been obtained, and the penetration rate was slowing once again with possible implication of expensive damage to the diamond core barrel, so the decision was made to shut down.

The well was logged by the U.S.G.S. District Groundwater Office, Atlanta, Georgia, and copies of all logs were distributed to the original operators and to the State of Georgia.

As shown in the Daily Chronologic Report (Appendix A), actual operations to deepen the well commenced January 10 at a depth of 4,009 feet,

and terminated January 15 with 3½" tubing run to 4,366 feet. The well was drilled to 4,371 feet but tubing could not be landed in the bottom four feet of rat hole.

Technical data about the well completion are shown in the completion schematic (figure 2) and the wellhead equipment schematic (figure 3).

The tubing used to case the hole was run with a float shoe (steel plate welded onto the bottom end) in order to leave the tubing full of fresh water for the temperature surveys. The tubing was also set in heavy gel mud with a corrosion inhibitor additive, rather than the usual cement, in order to facilitate eventual salvage of the 136 joints of tubing.

The completed well, in its existing condition, is promised to the State of Georgia for use as a water resource monitoring well at the completion of the temperature-gradient observations. The procedure for making the transfer has been worked out and will be accomplished during the month of April 1978.

Because this well appeared to be favorably located with respect to the thermal anomaly shown on the AAPG Geothermal Gradient Map for North America (1976), it was logged by Virginia Polytechnic Institute scientists on January 12, 1978. The bottom-hole temperature at a depth of 1331 meters (4365 feet) was 60°C (140°F). Over the interval 47-1328 meters (154-4355 feet) the least-squares temperature gradient was  $29.3 \pm 0.14$  °C/km ( $1.61 \pm 0.25$  °F/100 ft). This is about 10% less than expected; however, the hole had not reached thermal equilibrium. Disturbance from ground-water convection was apparent at several depths in the hole, especially near the top of basement. Further logging will be conducted in the future.

**C. D. Hopkins, etal. No. 2  
Completion Schematic**

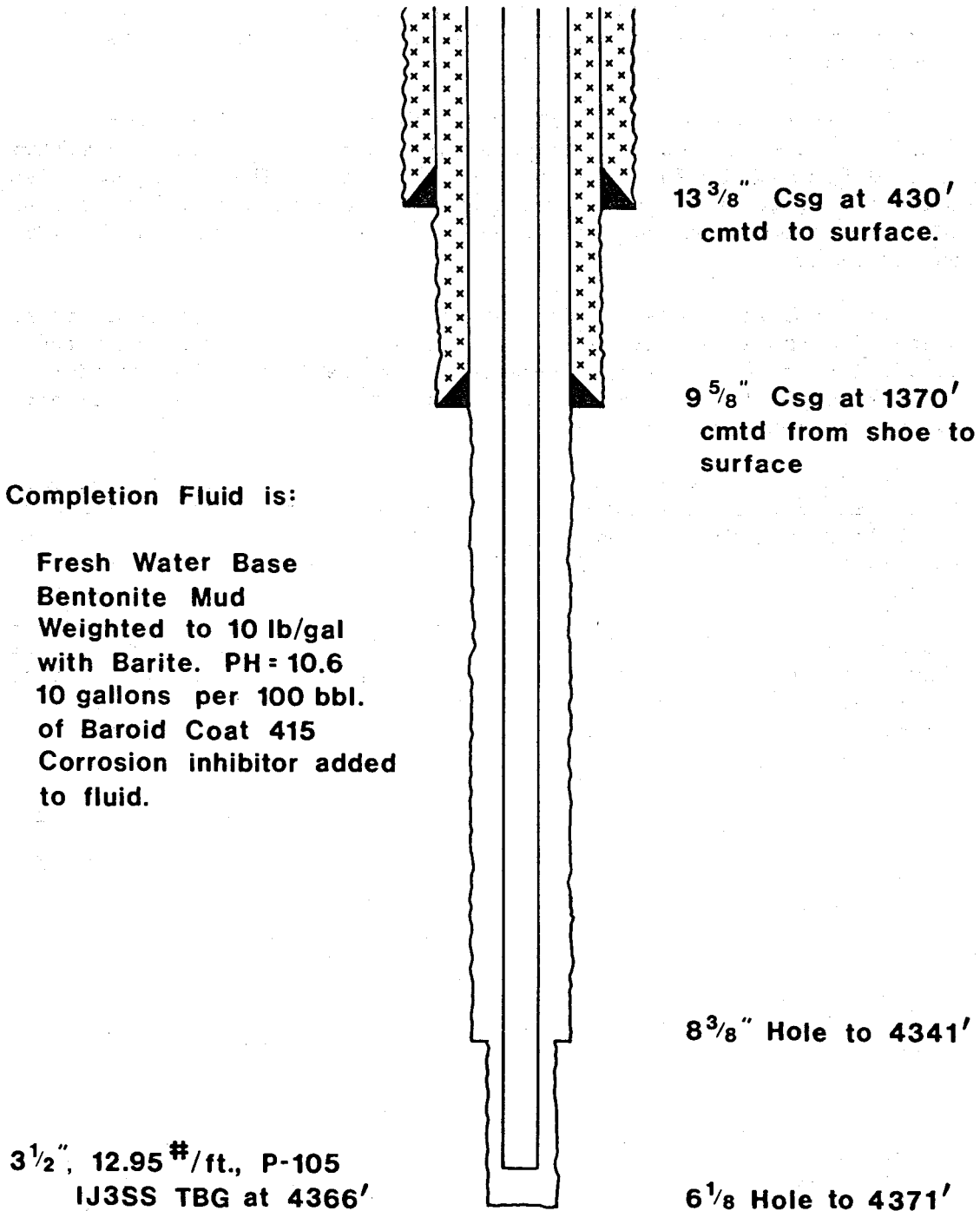


Figure 2

C. D. Hopkins et al No. 2  
Wellhead Equipment

Item #	Description
1.	9-5/8" x 7", J-55 Casing Swage
2.	Larkin 7" x 3 1/4", 2000# WP, Wellhead w/2-2" side outlets w/2" LP threads
3.	2", XH, Bullplug
4.	2", XH, Nipple, 10" long
5.	2", 2000# Ball valve WKM w/2" threaded ends
6.	2", XH Tapped bullplug
7.	1/2" Pressure gauge needle valve
8.	1/2" 2000 psi oil filled Marsh Pressure Gauge
9.	3 1/2", 12.95#/ft., P-105, IJ3SS TBG
10.	Crossover sub - 3 1/2" IJ3SS Pin x 8rd Pin
11.)	Tubing valve 1500# WP
12.	3 1/2" 8rd x 2-7/8" 8rd Swage Nipple, J-55
13.	2-7/8" coupling, J-55
14.	2-7/8" 8rd x 2-3/8" 8rd Swage Nipple, J-55
15.	2-3/8", J-55 coupling
16.	2-3/8" 8rd x 2" LP Swage Nipple XH
17.	2", 3000# coupling
18.	2", XH, Tapped bullplug
19.	1/2" Pressure Gauge Needle Valve
20.	1/2", 2000# oil filled Marsh Pressure Gauge

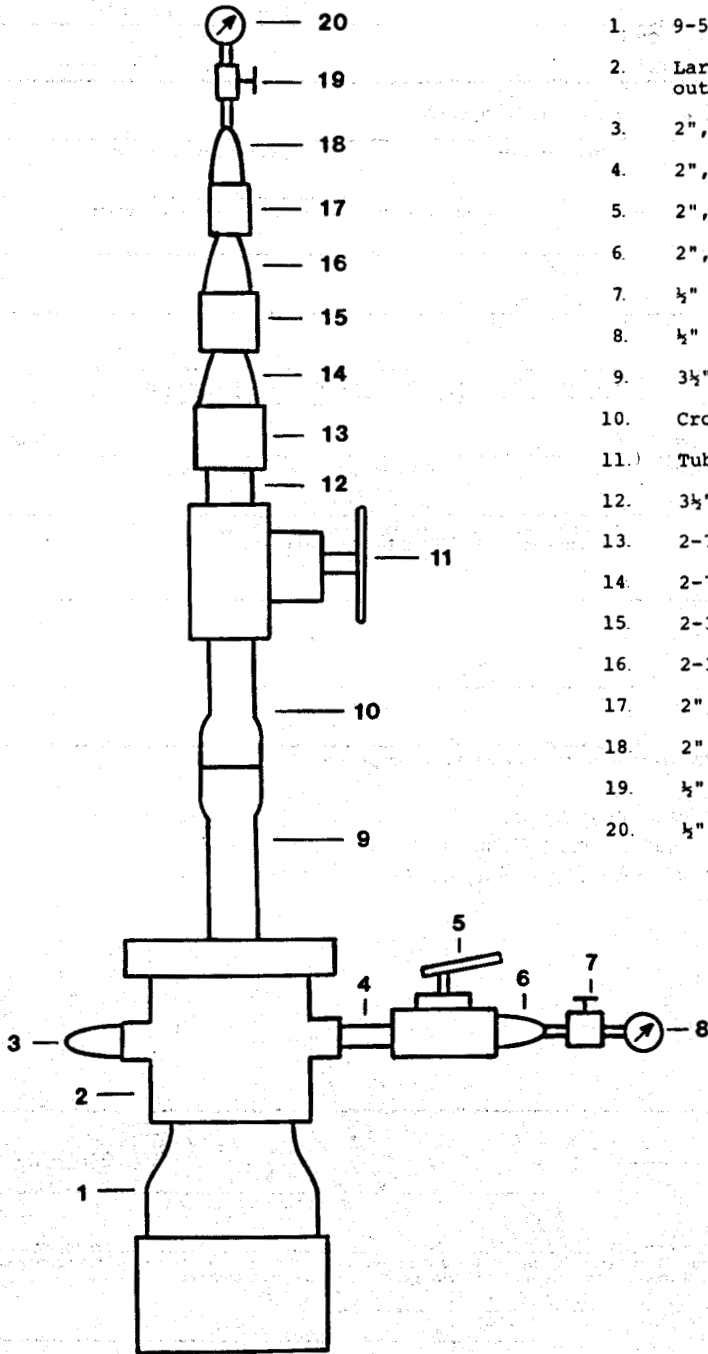


Figure 3

APPENDIX A  
APPLICATION FOR PERMIT TO DRILL, DEEPEN OR PLUG BACK

APPLICATION TO DRILL  DEEPEN  PLUG BACK

NAME OF COMPANY OR OPERATOR

DATE

Gruy Federal, Inc.

December 6, 1977

Address

City

State

517 Southwest Tower

Houston

Texas 77002

DESCRIPTION OF WELL AND LEASE

Name of lease

Well number

Elevation (ground)

C. D. Hopkins et al

#2

Well location

(give footage from section lines)

Section—township—range or block & survey

Field & reservoir (If wildcat, so state)

County

WC

Wayne

Distance, in miles, and direction from nearest town or post office

Nearest distance from proposed location to property or lease line:

feet

Distance from proposed location to nearest drilling, completed or applied—for well on the same lease:

feet

Proposed depth:

4500 or less

Rptary or cable tools

Rotary

Approx. date work will start

12/8/77

Number of acres in lease:

Number of wells on lease, including this well, completed in or drilling to this reservoir:

If lease, purchased with one or more wells drilled, from whom purchased:

Name

Address

Status of bond

Remarks: (If this is an application to deepen or plug back, briefly describe work to be done, giving present producing zone and expected new producing zone)

Please refer to permit to drill submitted by W. K. Davis and American Quasar for above information on location and plat. Gruy Federal, Inc. is applying only to deepen the well on behalf of the Division of Geothermal Energy, Department of Energy.

Executed this 7<sup>th</sup> day of December, 1977

State of TX

County of Marin

Signature of Affiant

Before me, the undersigned authority, on this day personally appeared ALAN LOHSE known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath states, that he is duly authorized to make the above report and that he has knowledge of the facts stated therein, and that said report is true and correct.

Subscribed and sworn to before me this 7<sup>th</sup> day of December, 1977

SEAL

My commission expires August 31, 1978

Notary Public in and for TX

County, Marin

Permit Number: \_\_\_\_\_

Approval Date: \_\_\_\_\_

Approved By: \_\_\_\_\_

Notice: Before sending in this form be sure that you have given all information requested. Much unnecessary correspondence will thus be avoided.

See Instruction on Reverse Side of Form

Name of Regulatory Body \_\_\_\_\_

Application to Drill, Deepen or Plug Back

Form No. P-1

Authorized by Order No. \_\_\_\_\_

Effective \_\_\_\_\_, 19\_\_\_\_

APPENDIX B

DAILY CHRONOLOGICAL REPORT

(Reports for Previous 24 hrs.)

C. D. Hopkins et al No. 2  
Wayne County, Georgia

- 12-9-77 0700 hrs. PTD = 4009 FT RKB. W. K. Davis terminated operations at 1700 hrs. Gruy Federal, Inc., W. K. Davis, and American Quasar, Inc. finalizing release of well to Gruy Federal, Inc. Inventoried mud materials, bits and fuel at 1700 hrs. Picked up new HTC XIG 8-3/4" bit and RIH to 4009 FT RKB. Circulated 3 hrs. and pulled bit into 9-5/8" casing shoe @ 1372. Standing by while release of well is being negotiated.
- 12-10-77 0700 hrs. PTD 4009 FT RKB. Finalized release of well to Gruy Federal, Inc. at 1200 hrs. RIH to 4009 FT and drilled soft to firm shale and sands to 4192 FT RKB. Drilled hard shale and sand from 4192-4212 FT RKB. Drilled soft to firm sand and shales to 4305 FT RKB. Drilled firm volcanics shale and sand to 4335 FT RKB. Penetration rate slowed to 4 FT/Hr. @ 4331 FT RKB.
- 12-11-77 0700 hrs. PTD = 4335 FT RKB. Drilled hard basement rock to 4341 FT RKB. USGS representative confirmed basement rock by thin section. POOH w/bit. Examination of bit indicates no junk on bottom of hole, but extreme dulling. Picked up diamond corehead and core barrel and RIH. Washed to bottom from 4330 FT. Circulated 1 hr. and dropped ball to close inner core BBL. circulating port. Started to spud corehead and swivel packing went out. POOH to casing shoe. Shut down waiting on swivel packing @ 0700 hrs.
- 12-12-77 0700 hrs. PTD - 4341 Waiting on swivel parts and repairing swivel to 1045. RIH w/core BBL. and started cutting core at 1200 hrs. Initial rate of penetration 2 ft/hr. slowing to 1 ft/hr. @ 4340 FT. Made connection @ 4351 FT. Could not make any hole after connection. POOH to inspect corehead. Recovered 8 FT. of black basement core. Found piece of tong die insert on top of core. Corehead and insert examination indicated corehead damaged by tong die insert. Picked up new corehead and started in hole w/coring assembly.

C. D. Hopkins et al No. 2  
Wayne County, Georgia

- 12-13-77 0700 hrs. PTD = 4351 FT RKB. Finished running in hole w/coring assembly and cut core from 4351-4371 FT RKB. Penetration rate 2 FT/HR. initially slowing to 1 FT/HR. @ 4371 FT. POOH. Recovered  $\pm$  20 FT. of black basement rock core. Corehead in very good condition. Laid Down core barrel and jars. Rigged up USGS logging truck and recorded logs as follows:
- Run #1: Gamma Ray, Temperature, Caliper  
Run #2: IES - 16", 64" Normal
- 12-14-77 0700 hrs. PTD - 4371 FT RKB. Continued running USGS logs as follows:
- Run #3: Gamma Gamma Density  
Run #4: Neutron Porosity  
Run #5: Acoustic Velocity  
Run #6: Three Electrode Resistivity
- Started running in hole w/8-3/4" bit @ 0430 hrs.  
Repaired drawworks @ 0600 hrs. Have 2000 ft. of pipe in hole @ 0700 hrs.
- 12-15-77 0700 hrs. PTD = 4371 FT RKB. Ran in hole to 4341 FT and circulated and conditioned hole and mud. Waiting on decision from State of Georgia concerning abandonment procedure. Began mixing heavy gel mud @ 1200 hrs. Weighted mud to 10.0 lb/gal and added gel and caustic to increase viscosity. Added 1 drum of Baroid Coat 415 corrosion inhibitor on final circulation. Final mud properties:
- Wt. = 10 lb/gal  
Viscosity = Too thick to measure  
Funnel viscosity = 100 second plus  
PH = 10.6
- POOH w/drillpipe laying down same. Nippled down BOP stack and nipped up well head equipment. Started running 3½' tubing. 51 jts. in hole @ 0700 hrs.
- 12-16-77 0700 hrs. PTD = 4371 FT RKB. Continued running 3½" 12.95 #/ft., P-105, IJ3SS tubing. Slips would not hold after joint 55. Hotshotted new slip inserts from Laurel, Mississippi. Ran 3½" tubing and tagged bottom of hole @ 4368 FT RKB. Spaced out tubing w/pup jts. and landed tubing with shoe @ 4366 ft. Total of 136 jts. of tubing in hole. Rigged down tubing tools and released rig @ 1800 hrs. Final report.



APPENDIX C

COMPLETION DATA

C. D. Hopkins et al. No. 2  
Wayne County, Georgia

Surface Casing

9 5/8", 36#/ft., K-55, ST&C set at 1370 FT RKB.

Wellhead Equipment

Larkin 7", 2000# wellhead with slips and packoff for  
3 1/2" tubing. Two side outlets are 2" LP threads.

Tubing Data

3 1/2", 12.95 #/ft., P-105, IJ3SS Range II Tubing landed at  
4366 FT RKB. End of tubing is capped and welded.

RKB-TBG	6.50'
Pup Jt.	7.62'
Pup Jt.	9.60'
136 Jts. Tbg.	4388.62'
Shoe Pup	<u>3.25'</u>
Landing depth	4365.59'

Completion Fluid--Annulus

10.0 lb/gal fresh water gel mud w/ 10 gal/100 BBLs. Baroid  
Coat 415 Corrosion Inhibitor. PH = 10.6  
Funnel Viscosity = 100 seconds plus.

Completion Fluid--Inside Tubing

Fresh water w/ 10 gal/100 BBLs. Baroid Coat 415 Corrosion  
Inhibitor.

Cementing Data

Surface Casing - 9 5/8  
Cemented to surface with top job.

Tubing - 3 1/2"  
No cement used--pipe run blanked off in heavy thick packer  
type mud.

APPENDIX D

Tubing Tally as Run 12-15-77  
 3½", 12.95 #/ft., P-105, IJ3SS  
 C. D. Hopkins et al No. 2  
 Wayne Co., Georgia

<u>Jt.</u>	<u>Length</u>	<u>Jt.</u>	<u>Length</u>	<u>Jt.</u>	<u>Length</u>	<u>Jt.</u>	<u>Length</u>
<u>#</u>		<u>#</u>		<u>#</u>		<u>#</u>	
1	31.68	41	32.70	81	32.00	121	31.98
2	32.50	42	31.56	82	32.43	122	32.28
3	31.40	43	30.90	83	32.25	123	31.11
4	33.06	44	31.50	84	32.50	124	32.24
5	31.44	45	32.28	85	32.20	125	32.60
6	32.13	46	31.92	86	30.40	126	32.03
7	32.54	47	32.65	87	31.78	127	32.16
8	31.93	48	30.15	88	32.24	128	32.31
9	32.18	49	32.10	89	29.39	129	28.70
10	30.57	50	32.50	90	32.46	130	32.41
11	32.85	51	31.56	91	31.34	131	31.30
12	31.74	52	31.91	92	31.86	132	32.05
13	32.25	53	32.15	93	32.45	133	32.63
14	32.67	54	32.21	94	32.12	134	32.84
15	32.40	55	32.35	95	29.96	135	32.45
16	32.48	56	32.30	96	32.34	136	32.38
17	32.55	57	32.45	97	32.09		
18	32.38	58	31.93	98	31.96		
19	32.10	59	32.35	99	32.59	TOTAL	4338.62
20	32.13	60	30.30	100	30.00	Pup Jt.	7.62
21	30.41	61	32.15	101	32.17	Pup Jt.	9.60
22	32.58	62	32.10	102	32.39	Shoe	3.25
23	32.78	63	32.53	103	32.04	GRAND TOTAL	4359.09
24	32.24	64	32.05	104	31.43	RKB-TBG	6.50
25	31.20	65	31.80	105	32.27	Landing	
26	31.75	66	32.45	106	31.94	Depth	4365.59
27	31.27	67	32.68	107	32.96		
28	32.12	68	29.70	108	31.93		
29	32.50	69	30.73	109	32.24	Note:	Shoe joint
30	31.75	70	30.97	110	32.58		has ½" steel
31	32.23	71	32.58	111	31.52		plate welded
32	32.64	72	31.95	112	30.37		over end.
33	31.94	73	32.43	113	32.47		
34	32.60	74	31.35	114	31.55		
35	32.27	75	31.18	115	32.20		
36	31.83	76	31.26	116	32.10		
37	32.15	77	31.92	117	31.77		
38	30.68	78	32.14	118	32.18		
39	29.72	79	31.95	119	31.58		
40	31.33	80	32.44	120	32.00		