GL02977-11

IDO-10062
NVO-410-30

COMPLETION REPORT

RAFT RIVER GEOTHERMAL EXPLORATORY HOLE NO. 1

(RRGE - 1)

OCTOBER 1975

PREPARED BY
REYNOLDS ELECTRICAL & ENGINEERING CO., INC.
LAS VEGAS, NEVADA

FOR
U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
NEVADA OPERATIONS OFFICE

CONTRACT E(26-1)-410

IDO-10062
(NVO-410-30)

COMPLETION REPORT

RAFT RIVER
GEOTHERMAL EXPLORATORY HOLE No.1
(RRGE-1)

OCTOBER 1975

PREPARED BY

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

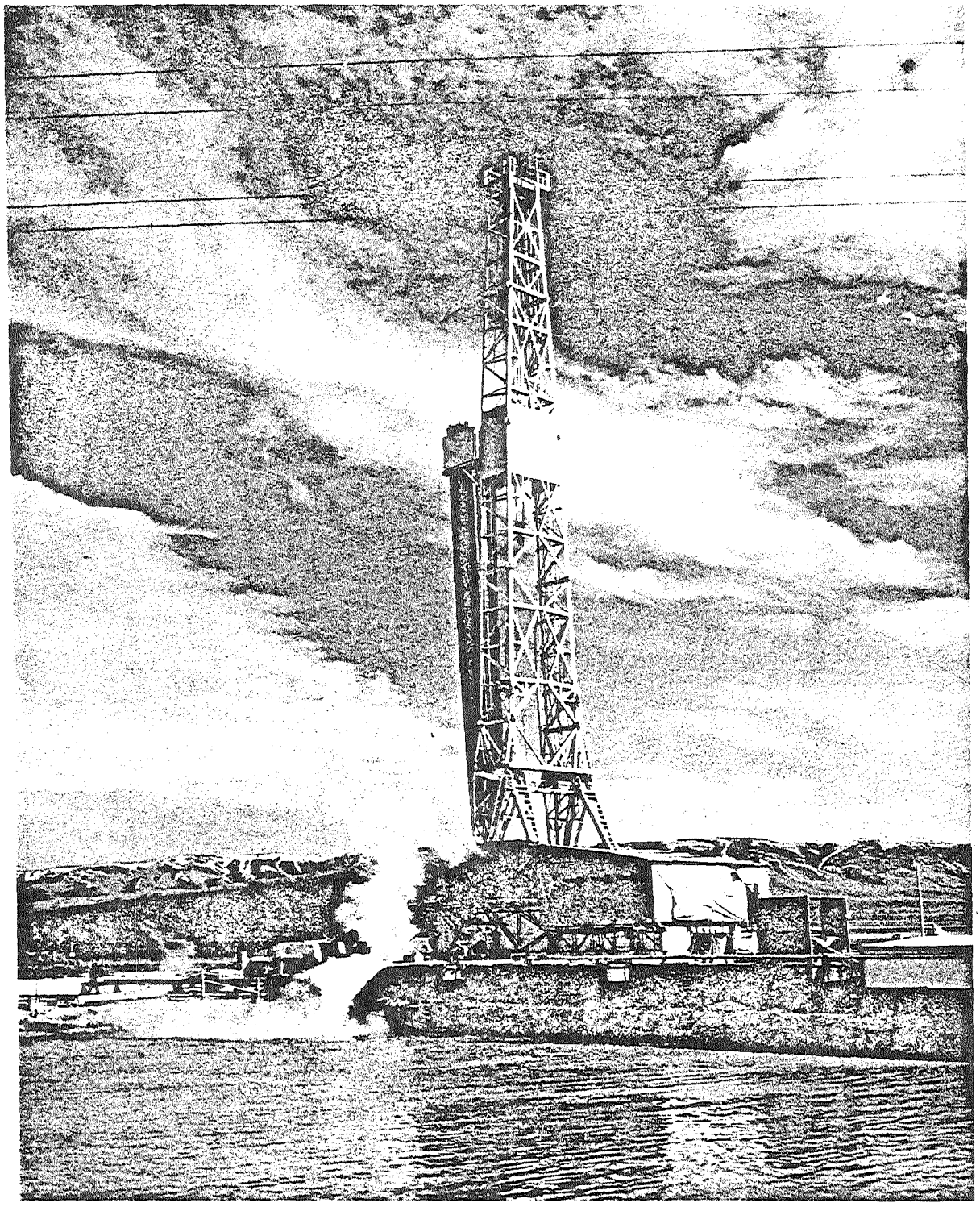
LAS VEGAS, NEVADA

FOR

U. S. ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION

NEVADA OPERATIONS OFFICE

CONTRACT E(26-1)-410



The first geothermal exploratory hole is located in the Raft River Valley of Southern Idaho. Geothermal hot water is shown flowing into the fluid reserve pit from the ERDA drill rig.

ABSTRACT

Raft River Geothermal Exploratory Hole No. 1 (RRGE-1) is an exploratory hole drilled to a depth of 5,000 feet in intruded quartz monzonite basement rock of the Raft River valley of southeastern Idaho. The goal of the Raft River Geothermal R&D program is to determine the feasibility of developing and utilizing medium temperature (300° F) geothermal resources for power generation and nonelectrical applications.

This well was drilled to obtain geological information and evaluate the deep geothermal reservoir system. This report describes the drilling and completion of RRGE-1 and includes the daily drilling reports, drill bit records, descriptions of the casing, cementing, logging and coring programs, and the containment techniques employed on RRGE-1. A subsequent report, IDO 10063, will describe the planning, technology, and testing of RRGE-1.

COMPLETION REPORT - RRGE-1

TABLE OF CONTENTS

	PAGE
Introduction	1
Exploratory Hole Drilling	5
1. Drilling Summary	5
2. Formation Tops	6
3. Surface Equipment and Services	9
3.1 Wellhead	9
3.2 Flow Testing Manifold	9
3.3 Mud Logging Services	9
3.4 Drilling Recorder	9
4. Downhole Equipment & Services	9
4.1 Surface Casing	9
4.2 Production Casing	9
4.3 Drill Bit Summary	10
4.4 Coring	10
4.5 Directional Control	11
4.6 Drilling Fluid Summary	11
4.7 Samples	11
4.8 Logging Program	11
4.9 Cementing	12
5. Sand, Barite and Cement Plug	13
5.1 Sand	13
5.2 Barite	14
5.3 Cement	15
6. Containment Equipment	15
6.1 Conductor Hole	15
6.2 Production Hole	15
Appendix A - Daily Drilling Reports	17
Appendix B - Casing Record	35
Appendix C - Bit Record	39
Appendix D - Drilling Deviation Summary	41

LIST OF ILLUSTRATIONS

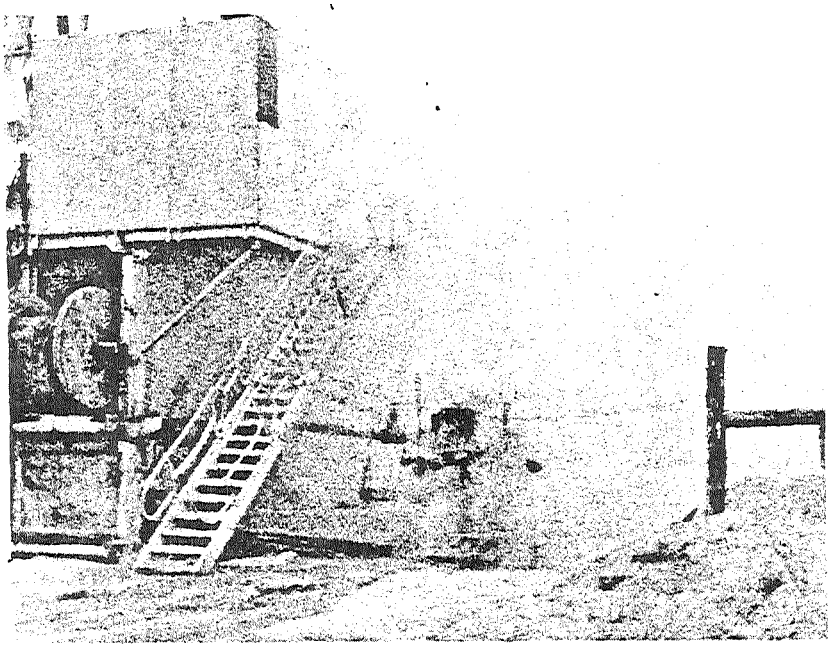
FIGURE NO.		PAGE
1	Site Location - Idaho Geothermal R&D Project	2
2	Raft River Valley with Drill Site Location	3
3	Location Survey and Coordinates	4
4	Drilling and Operations Summary - RRGE-1	7
5	Present Subsurface Well Status - RRGE-1	8
6	Sand, Barite & Cement Plug Configuration	14
7	Containment Equipment	16

I. INTRODUCTION

This report describes the drilling operation for the completion of the first deep geothermal exploratory hole drilled in the Raft River Valley of Southern Idaho. The operation is a part of the Idaho Geothermal R&D Project. (See Figures 1, 2, and 3 for location.)

The Site for the Raft River Geothermal Exploratory Hole No. 1 (RRGE-1) was one of several considered after extensive surveys were conducted by the Aerojet Nuclear Company and the U. S. Geological Survey in the late fall of 1974. The RRGE-1 Well was designed to initially confirm the existence of hot water in quantities potentially suitable for commercial power applications. Drilling operations were started early in January 1975 and were completed at a total depth of about 5,000 feet on April 1, 1975. Limited flow testing and reinjection testing were performed before demobilizing the drill rig. A flow rate of approximately 600 gallons per minute was measured and a maximum downhole temperature of 292° F was recorded.

The drilling and completion work on RRGE-1 was performed by Reynolds Electrical & Engineering Co., Inc. (REECo), utilizing a drill rig and equipment mobilized to Idaho from an area in northwest Colorado. The U. S. Energy Research & Development Administration (ERDA), Nevada Operations Office (NV) was responsible for all drill site activities through its on-site representative. Drilling program requirements were provided by the Aerojet Nuclear Company (ANC), a prime contrator to ERDA, Idaho Operations Office (ID). The Manager, ID, was responsible for the coordination of all project-related activities between NV/REECo and ANC and providing funding for the drilling operation. For the technical data obtained from this hole, refer to IDO 10063.



RRGE-1 – Well Flowing and Flashing at Surface near Shale Shaker.

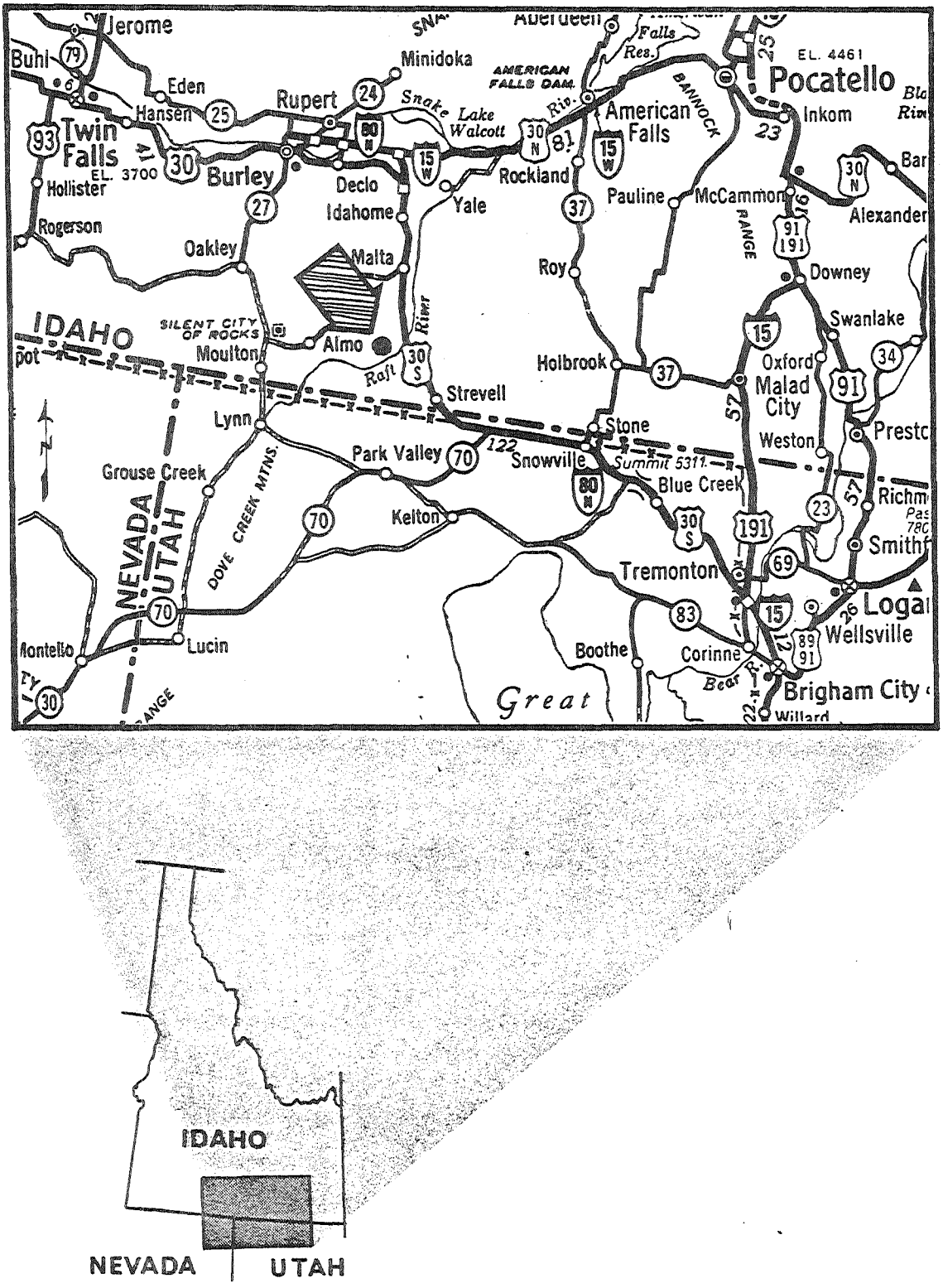


Figure 1. Idaho Geothermal R & D Project Site Location

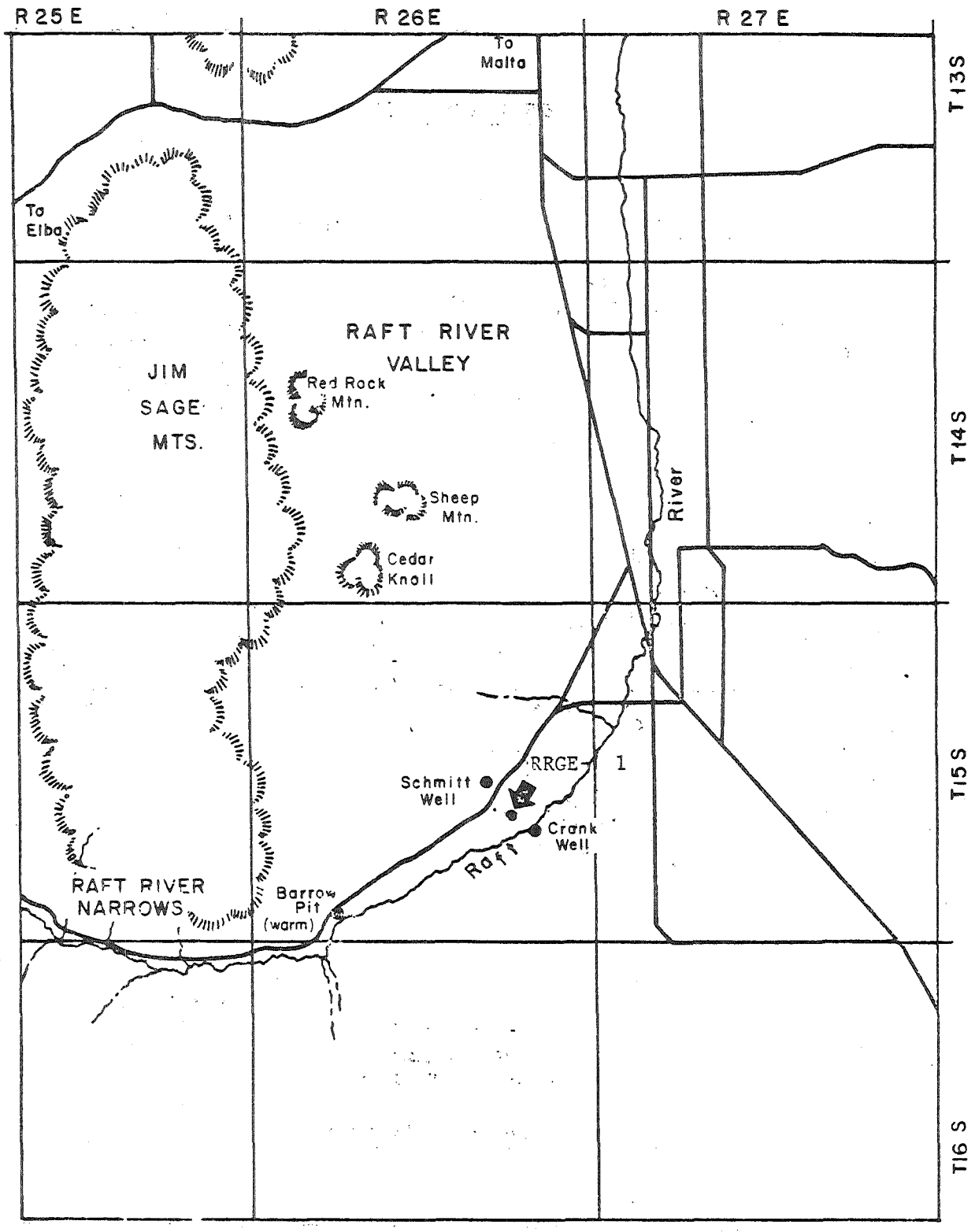


Figure 2. Raft River Valley with Drill Site Location

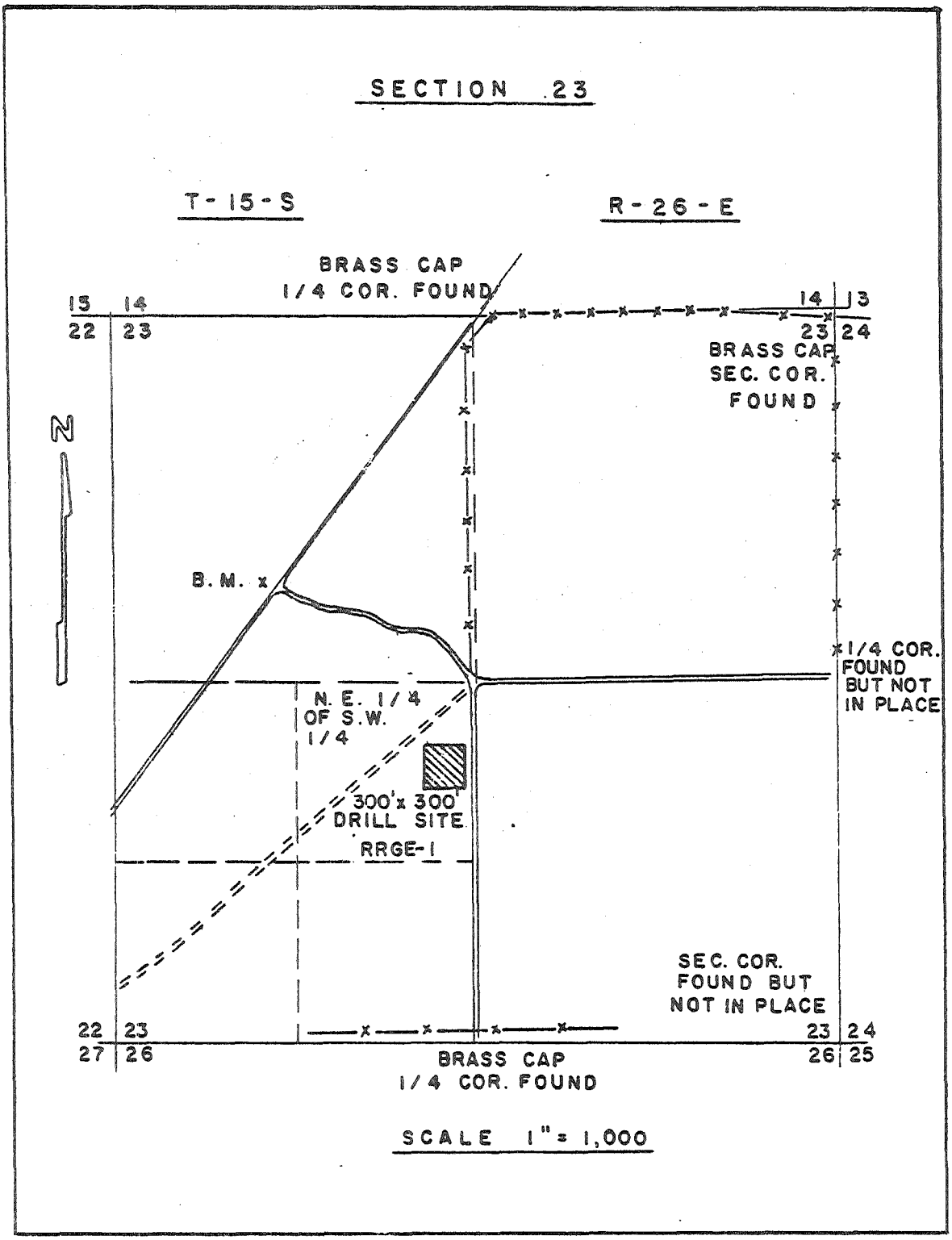


Figure 3. Location Survey and Coordinates

EXPLORATORY HOLE DRILLING

1. DRILLING SUMMARY

The drill site with approximate dimensions of 300 feet by 300 feet was prepared in order to accommodate the drill rig and supporting equipment. Preparation included site leveling and grading, excavation of the fluid reserve pit and grading of road and storage surfaces adjoining the drill site. A domestic water well was drilled to approximately 200 feet using a water well drilling contractor.

A 42-inch diameter hole was drilled to 40 feet (from ground level depth) and 30-inch diameter conductor pipe was set at 40 feet and cemented with 18 cubic yards of plant mix concrete. An 8 foot by 8 foot by 12 foot timber-lined cellar was constructed around the conductor pipe.

A 15-inch diameter hole was drilled with mud to 921 feet (RKB)* and reamed to 26 inches in diameter to 920 feet. A total of 22 joints of 20-inch, H-40, 94.0-lb/ft casing was landed at 901 feet (GL - ground level) and was cemented to the surface in one stage with good cement returns to the surface.

A 12 1/4-inch diameter hole was drilled with water to 4,495 feet. Core #1 was cut with an 8 3/4-inch diamond bit from 4,495 feet to 4,555 feet with 23 feet of core recovered. The cored interval was reamed to 12 1/4-inches and the same diameter hole was drilled from 4,555 feet to 4,650 feet. After circulating and while logging, the hole began to flow hot water at an inital rate of approximately 1,000 barrels per hour and a surface temperature of approximately 200°F.

Efforts to stop the flow by injecting cold water were halted when this activity resulted in development of a major "thief zone," principally between 1600 feet and 1700 feet. The flow was successfully controlled by staging plugs of sand (862 feet), barite (12 feet), and cement (120 feet) pumped down the drill pipe. The top of the cement plug was tagged at 3,642 feet.

Based upon a 4-arm caliper log the average hole diameter from the 13 3/8-inch casing setting depth to the 20-inch casing shoe was approximately 20 1/4 inches, with a maximum diameter of 25 inches and a minimum diameter of 16 1/2 inches. A 15-inch diameter bit was run to the top of the cement plug at 3,642 feet to assure clearance and to circulate before running the 13 3/8-inch casing. A total of 92 joints of 13 3/8-inch, 54.5 and 61.0-lb/ft casing with float shoe and two differential fill float collars (see Section 4.2 - Production Casing) were run and set at 3,623 feet (GL).

While cementing the first stage through the shoe with 454.5 barrels of cement displaced and 98 barrels of slurry remaining to be displaced, the casing parted at a coupling at approximately 240 feet GL (seventh joint from the surface). The casing was successfully screwed back together, torqued and pressure tested. Before proceeding with the second stage, a cement bond log

* All depths (unless otherwise noted) are referenced to the rotary kelly bushing (RKB) which is 18 feet above ground level.

was run which indicated an annulus cement top at approximately 1,820 feet GL and the cement top inside the casing at 2,891 feet. The second cement stage was pumped through the casing head ports (Braden head) in accordance with the cementing program. A total of 407 barrels of cement slurry were pumped until the pumping pressure rise indicated the annular space was cemented. A cement bond log was run which confirmed the cement in place outside the casing from 1,820 feet GL to the surface.

While drilling out the cement in the 13 3/8-inch casing, collapsed casing zones were encountered at 3,325 feet and 3,584 feet. A total of 13 milling tool runs were made in addition to numerous runs with magnets (11 1/2-inch and 9 inch) and various junk baskets before drilling out of the 13 3/8-inch casing shoe at 3,642 feet. The actual zones of casing collapse were determined to extend from 3,325 feet to 3,338 feet (13 feet) and from 3,584 feet to 3,591 feet (7 feet). These depths were determined from strapped drill pipe lengths and were at variance with the 4-arm caliper log on April 6, 1975. Pressure tests of the casing to 300 psi were conducted during milling operations which indicated no leaks. The cement plug below the 13 3/8-inch casing shoe was drilled out and the barite and sand plugs were circulated out of the hole to the previous total depth of 4,650 feet.

After drilling formation from 4,650 feet to 4,686 feet, Core #2 was cut with an 8 3/4-inch diamond bit from 4,686 feet to 4,698 feet with nine feet of core recovered. The cored interval was reamed to 11 inches and the same diameter hole drilled to 5,005 feet. A bottom hole core (#3) was cut with an 8 3/4-inch diamond bit from 5,005 to 5,007 feet with 2 feet of recovery.

Upon completion of the drilling and coring operations, a retrievable bridge plug was set in the 13 3/8-inch casing at 1,380 feet to permit removal of the blowout equipment. A master gate valve was installed to allow for future flow tests and temperature measurements.

A summary of the daily drilling reports from mobilization through rig-down is presented as Appendix A.

Figure 4 depicts the Drilling and Operations Summary and Figure 5 reveals the current Subsurface Well Status of RRGE-1.

2. FORMATION TOPS

The following are the formation tops encountered in RRGE-1.

Formation	Drilled Depth (ft)	Sea Level Depth (ft)
Alluvium	Surface	+4,835
Raft River	100	+4,735
Salt Lake	820	+4,015
Contact Metamorphosed Zone	4,595	+ 240
Elba Quartzite	4,708	+ 127
Quartz Monzonite (Intermittent)	4,928	- 93

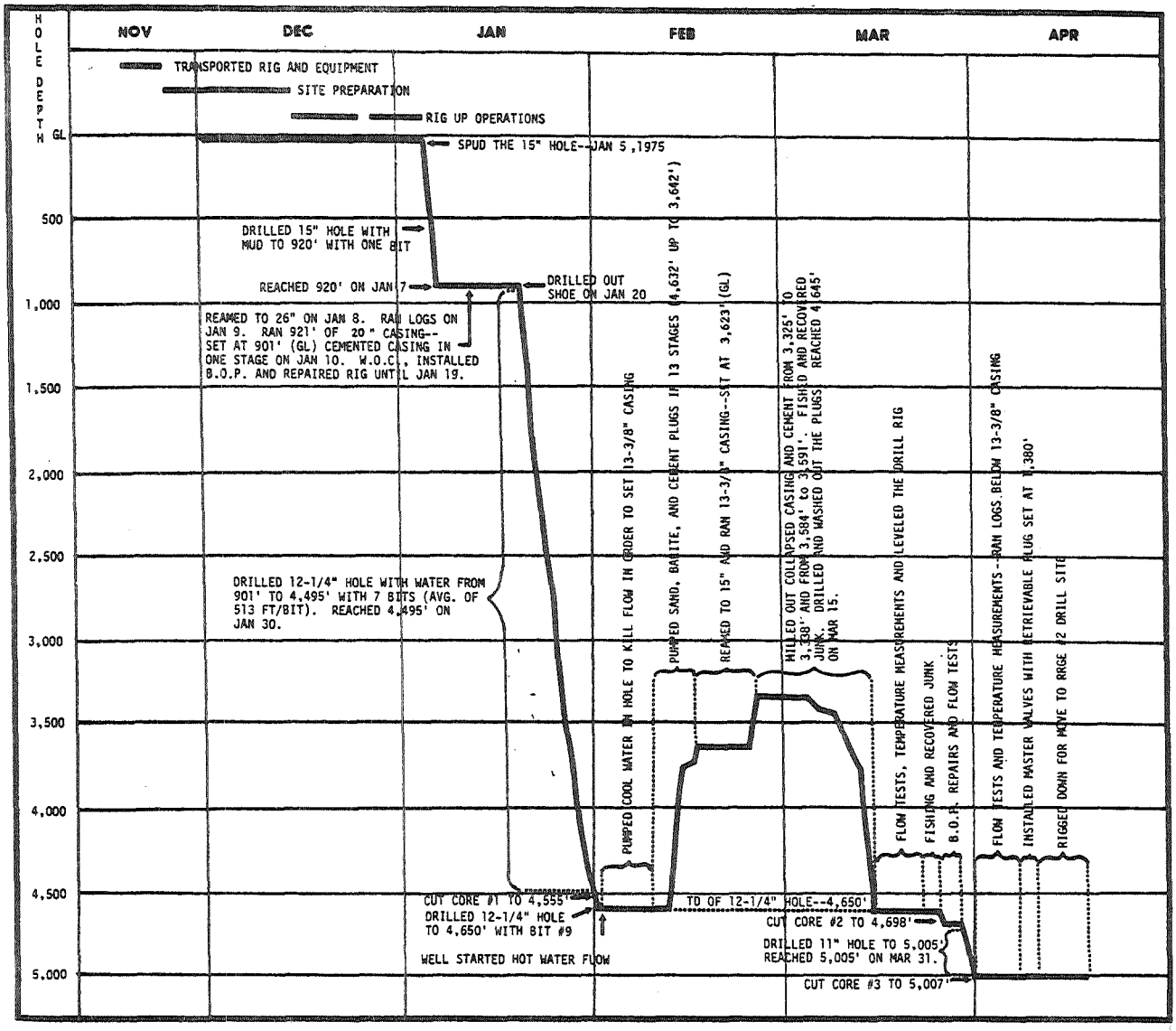


Figure 4. Drilling and Operations Summary

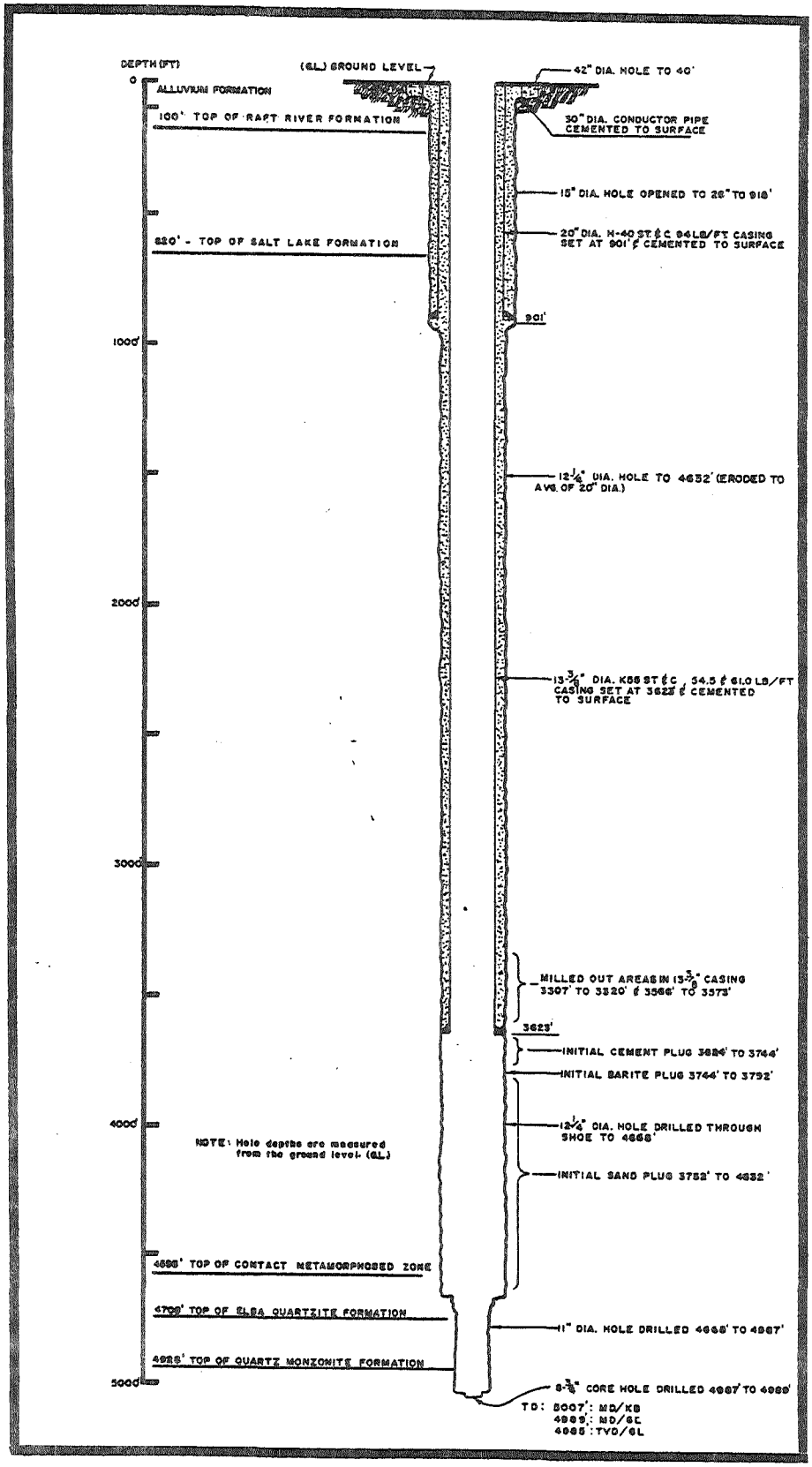


Figure 5. Present Subsurface Well Status

3. SURFACE EQUIPMENT AND SERVICES

3.1 Wellhead

The wellhead configuration consisted of a 20-inch by 14-inch reduction spool with two 4-inch flanged outlets from the 20-inch surface casing head and a manually-operated, ASA Series 300 lb. Petrovalve master gate valve. This wellhead was installed after drilling operations were completed and the blowout preventer equipment was removed.

3.2 Flow Testing Manifold

A 6-inch flow line was stabbed in the Hydril blowout preventer and secured with the pipe rams. This line extended across the rig floor when in use and was maneuvered with the rig cat line. Flow testing was also monitored through two 2-inch outlets from a spool under the blowout preventer equipment.

3.3 Mud Logging Services

A mud logging service monitoring drilling fluid and cutting returns was used from 900 feet (bottom of the 20-inch surface casing) to a depth of 4,650 feet. This service monitored fluid temperatures (in and out), hydrogen sulfide and hydrocarbons. Lithologic characteristics were also determined by analyzing the drill cuttings at regular intervals.

3.4 Drilling Recorder

A Geolograph drilling recorder was used on the drill rig while drilling from the surface to the total depth. This multi-pen recorder continuously indicated depth, penetration rate, bit weight and pump pressure.

4. DOWNHOLE EQUIPMENT & SERVICES

4.1 Surface Casing

Twenty-two joints of 20-inch, H-40, 94.0 lb/ft., ST&C casing totaling 921.08 feet was landed at 901 feet (GL). A float collar was positioned one joint (43 feet) above the guide shoe and centralizers were positioned on the collar of each joint of casing. Refer to Appendix B for the 20-inch Casing Record.

4.2 Production Casing

Ninety-two joints of 13 3/8-inch, 54.5 and 61.0-lb/ft casing totaling 3,651.25 feet were landed at 3,623 feet (GL). The 13 3/8-inch casing string configuration was as follows:

No. Jts.	Wall Thick(in)	Weight Lb/Ft	Grade	Depth (GL) From	To	Remarks
1	0.43	61.0	K-55	0	11.81	ST&C 8RD
41	0.38	54.5	H-40	11.81	1646.65	ST&C 8RD
49	0.43	61.0	K-55	1646.65	3578.45	ST&C 8RD
				3578.45	3580.45	Diff. Fill Float Collar
1	0.43	61.0	K-55	3589.45	3619.80	ST&C 8RD
				3619.80	3621.80	Diff. Fill Float Collar
				3621.80	3623.00	Cement Guide Shoe

All casing ends were threaded and joined with couplings using power tongs and a torque recorder for registering specified torque. Refer to Appendix B for the 13 3/8-inch Casing Record.

4.3 Drill Bit Summary

The initial 42-inch hole was drilled to 40 feet with a rat hole drill rig, and 30-inch conductor pipe (CMP) was set and cemented to that depth.

The surface (pilot) hole was drilled from 40 feet to 920 feet with one 15-inch mill tooth bit in 35 3/4 rotating hours. The 15-inch hole was reamed to 26 inches to a depth of 918 feet and 20-inch casing was set and cemented to 901 feet GL. A 12 1/4-inch hole was drilled with water from 901 feet to 4,650 feet in 147 1/4 rotating hours with eight 12 1/4-inch mill tooth bits. A 15-inch bit was run from 901 feet to 3,642 feet after the 12 1/4-inch hole was plugged with sand, barite, and cement from 4,650 feet up to 3,642 feet. (The sand plugs were pumped in the well to shut off the flow of hot water until the 13 3/8-inch casing was run and cemented.) Extensive milling operations were required to drill out two intervals of casing which collapsed during the first stage cementing operation. Appendix C details the specialized milling and fishing tools used to mill to the bottom of the casing. After drilling again reached 4,650 feet, the ninth 12 1/4-inch bit was used to drill to 4,686 feet. An 11-inch mill tooth bit was then used to drill from 4,686 feet to 5,005 feet in 34 1/4 rotating hours.

Three cores were taken using two 8 3/4-inch diamond core bits (cores #1 and #3 were cut with bit #1 and core #2 with bit #2). Details of the coring operation are depicted in the following Section 4.4.

The complete bit record is presented in Appendix C.

4.4 Coring

Three cores were cut using a 6 3/4-inch by 4-inch by 60-foot core barrel as follows:

Core No.	Zone Cut	Drilling Fluid	Core Bit Size	Core Recovered	Percent Recovered
1	4,495 - 4,555	Water-No Additives	8-3/4"	23'	38%
2	4,686 - 4,698	Water-No Additives	8-3/4"	9'	75%
3	5,005 - 5,007	Water-No Additives	8-3/4"	2'	100%

4.5 Directional Control

A Sperry-Sun single-shot magnetic survey tool with a 6° compass unit was used throughout the drilling operation. Surveys of the hole deviation were taken approximately every 90 feet. A summary of the deviations recorded has been tabulated in Appendix D.

4.6 Drilling Fluid Summary

A fresh water-based gel mud was used to drill and ream the surface hole to 918 feet. Mud weight was maintained at approximately 9.1 lbs. per gallon and viscosity of 48 sec/1000 cc. Plastic viscosity averaged 10 centipoises and sand content was maintained between 1 and 2 percent of total volume.

Fresh water containing no additives was used for all drilling and coring operations below 918 feet.

Overall drill fluid circulation throughout the drilling operation was good with the exception of the "thief zone" encountered between approximately 1,600-1,700 feet. Water loss to the formation, as a result of this "thief zone," averaged approximately 130 barrels per hour and necessitated the support of a 100-barrel vacuum truck to haul water continually to the rig from the Raft River.

4.7 Samples

Four sets of samples of drill cuttings were taken at approximately every 10 feet by the mud logging representative between 900 feet to 4,650 feet, and below 4,650 feet by the drill crew. Samples were collected in sample sacks and were labeled and boxed for shipment to ANC, USGS, Standard American, Inc. and Boise State University.

4.8 Logging Program

Various logs were run in the RRGE-1 well to determine the condition of the hole at different stages of the drilling operations. A listing of the logs that were run, the logging interval, and the footage logged are displayed as follows:

Log Run No.	Type Log	Date Log Run	Ground Level Logged Interval (From)	(To)	Total Footage Logged
1	Dual induction laterolog	01-09-75	0	894	894
2	Bore hole compensated-sonic-gamma ray	01-09-75	0	866	866
3	4-arm caliber	01-09-75	0	880	880
4	Dual induction laterolog	02-02-75	900	4,612	3,712
5	4-arm caliper	02-02-75	900	4,619	3,719
6	High-resolution thermometer	02-02-75	350	4,620	4,270
7	Bore hole compensated-sonic-gamma ray	02-02-75	900	4,610	3,710
8	High-resolution thermometer	02-02-75	500	4,620	4,120
9	Density-combination w/compensated neutron	02-02-75	900	4,620	3,720
10	Compensated neutron log-combination w/density GR	02-02-75	900	4,620	3,720
11	High-resolution thermometer	02-03-75	800	4,620	3,820
12	Continuous flow meter	02-03-75	--	Equipment	Failure
13-15	High-resolution thermometer (3 runs)	02-09-75	900	4,610	11,130
16-21	High-resolution thermometer (6 runs)	02-09-75	900	4,610	22,260
22	4-arm caliper	02-09-75	900	4,616	3,716
23-26	High-resolution thermometer (4 runs)	02-10-75	900	4,616	14,864
27-28	Acoustical cement bond log				
	1st Stage	02-24-75	1,200	2,830	1,630
	2nd Stage (after Braden head squeeze)	02-25-75	0	2,000	2,000
29	Bore hole compensated-sonic	04-06-75	2,998	4,998	2,000
30	High-resolution thermometer	04-06-75	0	5,000	5,000
31	4-arm caliper	04-06-75	3,000	5,000	2,000
32	Density-combination w/compensated neutron GR	04-07-75	3,000	4,992	1,992
33	Compensated neutron log combination w/density GR	04-07-75	3,000	4,992	1,992

4.9 Cementing

Surface Casing

The 921.08 feet of 20-inch, 94.0 lb/ft casing was cemented with 326 barrels (1,090 sacks) of 50/50 poz-mix with 60 percent (by weight) silica flour and 3 percent (by weight) calcium chloride ($CACL_2$). Good circulation was maintained throughout the job although 30 barrels of circulation were slightly contaminated with mud.

Production Casing

The 3,651.25 feet of 13 3/8-inch, 54.5 and 61.0 lb/ft casing was cemented in two primary stages as follows:

STAGE #1 - 1,500 sacks of 50/50 poz-mix, 60 percent (by weight) silica flour, 1/2 of 1 percent (by weight) of HR-12, and 400 sacks of 50/50 poz-mix. Total yield was 568 barrels of slurry. Lacking 98 barrels of having the plug pumped down, the casing parted at the seventh joint from the surface. The separated casing was screwed together with 2,000 ft/lbs of torque and pulled to 122,000 lbs. Halliburton applied 500 psi pressure on the casing and it held for a 5-minute test. A cement bond log was run to the cement top in the casing at 2,837 feet. This cement bond log indicated cement outside the casing at 1,820 feet (GL).

Stage #2 - Pumped through casing head ports down the annulus from the surface with 50 sacks of 50/50 poz-mix with 4 percent calcium chloride and 25 lbs/sack of gilsonite (lost circulation material) followed by 1,176 sacks of 50/50 poz-mix with 60 percent silica flour. The total yield of 407 barrels of slurry were pumped until a pumping pressure rise occurred indicating annulus fill-up. A cement bond log confirmed cement from surface to 1,820 feet.

5. SAND, BARITE AND CEMENT PLUG

After unsuccessful attempts to control the hot water flowing from the well by pumping in cold water, the decision was made to install a temporary plug from total drilled depth to a point above the geothermal resource zone (see Figure 6).

The designed plug consisted of multiple stages of sand, followed by barite and topped by cement. The principle involved was to successively reduce the water flow with sand stages, further reduce percolation through the sand with barite, and finally seal off the flow with cement.

The sand used was of a gradation that would not be carried up hole by the flow and into the "thief zone," and the fill-up after each stage could be verified by setting down approximately 20,000 lbs. weight on the sand stage top with the open ended drill pipe. The reduction in water percolation through each successive sand stage was also verified by the increased period of time the sand stage top would sustain the 20,000 lbs. drill pipe weight before the sand was eroded away by the velocity increase up the annulus around the drill pipe. This design was adopted because it was a method of shutting off the flow from the resource zone, would permit the running and cementing of the 13 3/8-inch production casing and would also permit drilling out the cement plug and circulating the barite and sand stages out of the hole without any damage to the resource zone formations.

5.1 Sand

Sand was provided from a local vendor and delivered in bulk to the location. Utilizing a Halliburton blender and pump truck, the sand was pumped down the hole through open-ended drill pipe in a total of nine stages which plugged 861 linear feet of hole. As each stage was completed, the rise of sand was monitored, tagged, and recorded. A total volume of approximately 1,575 cu. ft. of sand was pumped for this plug.

5.2 Barite

Continuing to utilize the Halliburton blender and pump truck, a plug of barite was placed in three stages which plugged an additional 8 linear feet of hole. A total of 120 sacks of barite was pumped in the hole. This material was used to cap the top of the sand plug thus allowing for the installation of the cement plug.

5.3 Cement

A 120-foot cement plug was then pumped in one stage with the Halliburton trucks. A total volumn of 153 barrels of slurry consisting of 115 sacks of Class G Ideal cement was mixed to slurry weight at 16.8 lbs per gallon. Additives mixed with the cement included 108 sacks of CFR-2 at 1% by weight and 69 sacks of HR-4 at 0.6% by weight.

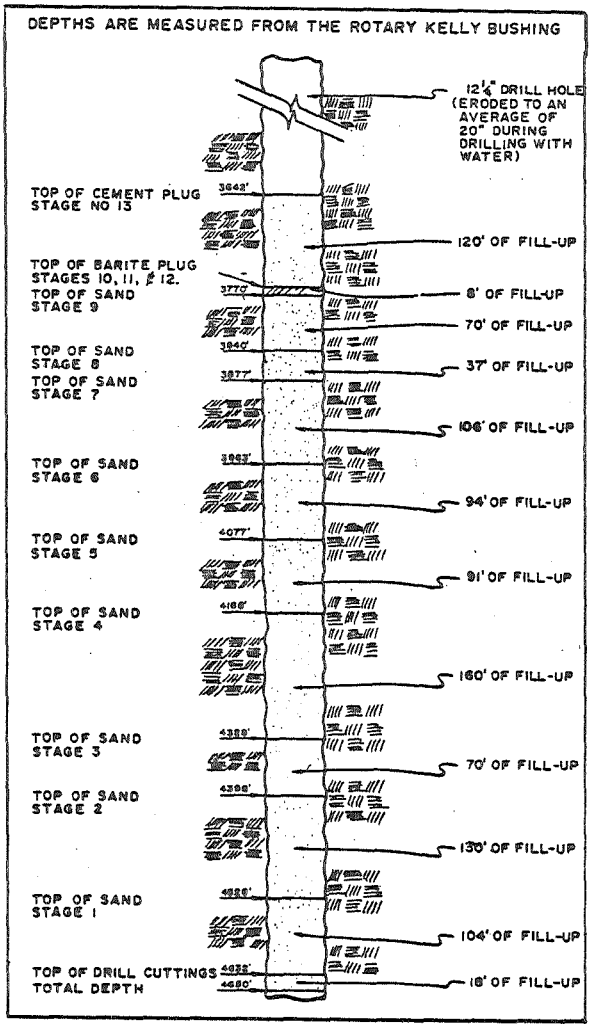


Figure 6. Sand, Barite, and Cement Plug Configuration

6. CONTAINMENT EQUIPMENT

6.1 Surface Hole

Containment equipment was not utilized while drilling the hole for the 20-inch surface casing from the bottom of the 30-inch conductor pipe to the depth of 918 feet (RKB).

6.2 Production Hole

After the 20-inch O.D. surface casing was installed and cemented to the surface, it was cut off at ground level, and the 20-inch casing head was welded on the casing. Containment equipment was then installed and utilized for the remainder of the drilling operation. The containment equipment (listed in order of installation above the casing head) was installed as follows:

a. Flanged Spool - size 20-inch x 16-inch; bolted onto the casing head and included two, threaded two-inch outlets complete with valves and connected to pipe for bleed-off to the reserve pit.

b. Rucker-Shaffer Double Gate LWS Blowout Preventer (BOP) - size 16-inch; bolted to the spool and equipped with 6 5/8-inch drill pipe and blind rams.

c. Hydril Type GK Blowout Preventer - size 16-inch; bolted to the BOP. This Hydril was utilized until the 13 3/8-inch production casing was installed and cemented. A 12-inch Hydril replaced this hydril for the remainder of the drilling operation.

d. Flanged Spool - size 16-inch x 12-inch; bolted to the Hydril and included two, flanged three-inch outlets with a companion flange, bull plug, double studded adapter and blind Flange. (Since this was the only spool available, it was necessary to close off the 3-inch outlets). This spool was used while the 16-inch Hydril was in the containment stack. After the 16-inch Hydril was replaced with the 12-inch Hydril, this spool was deleted.

e. Grant Rotating Head - size 12-inch, 3000 lbs; bolted to the 16 x 12 spool - or to the 12-inch hydril (after the spool was removed).

Figure 7 depicts the Containment Equipment as installed.

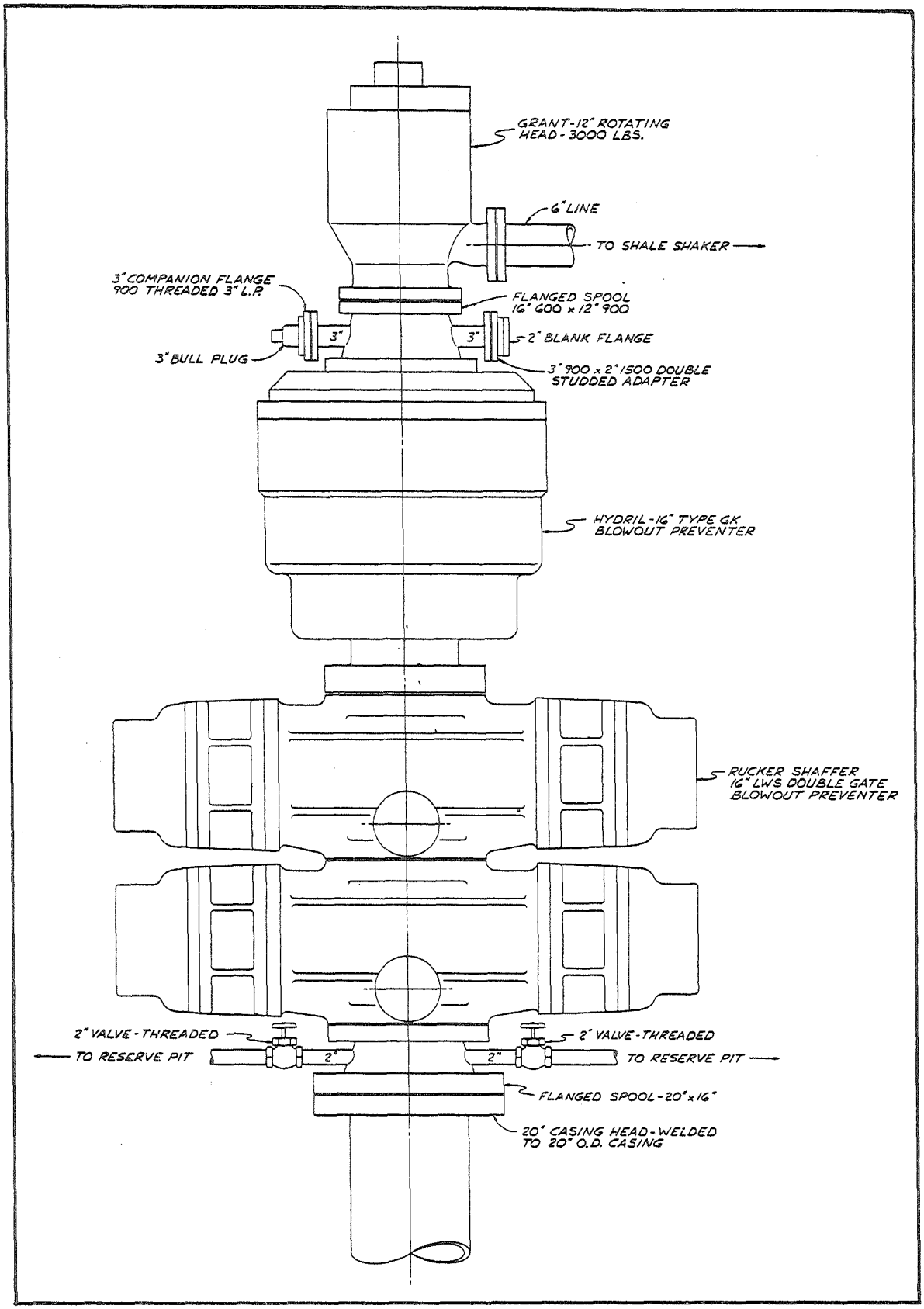


Figure 7. Containment Equipment

Completion Report, 1975, IDO-10062

DAILY DRILLING REPORTS - RRGE-1

November 18, thru November 19, 1974	Began loading trucks at the RB-U-4 location in Colorado for shipment to the RRGE-1 drill site. Loaded and dispatched 11 trucks.
November 20, 1974	Unloaded 11 trucks beside the selected drill site from 8 a.m. to 6:30 p.m. Commenced night watch on site.
November 21, thru November 24, 1974	Received and unloaded 32 trucks for a total of 43 loads from the RB-U-4 drill site.
November 25, 1974	Stacked drill pipe and miscellaneous equipment with the forklift for 8-1/2 hours.
November 26, thru December 15, 1974	Performed security watch during the site preparation activities. Sorted and arranged equipment to a limited degree pending hiring of the drill crew and start of the rig-up operations. The surface hole, rat and mouse holes were drilled during the period December 1 and 2, 1974. One joint of 30-inch conductor pipe was set with the forklift and cemented with 18 cubic yards of plant mix cement on December 2 and 3, 1974. The 8-foot by 8-foot by 12-foot cellar was excavated and lined with 3-inch by 12-inch boards on December 4, 1974.
December 16, 1974	9 hours - rigging up rotary tools with 20 men and two rig-up trucks. Set front of substructure in place.
December 17, 1974	10 hours - rigging up rotary tools with 20 men and two rig-up trucks. Finished setting in the substructure and assembled the derrick. Set in the mud tanks and mud pumps.
December 18, 1974	10 hours - continued rigging up with 20 men. Assembled A-frame for derrick and set the dog house and fuel tanks into place. Built the subdock and worked on mud pump liners and engines. Crane arrived on location today.
December 19, 1974	10 hours - continued rigging up with 20 men, three rig-up trucks and one crane. Set the derrick on the rig floor and pinned into the subbase. Set the crown end on the stand. Set the desander and desilter into position and set the compound and motor on the rig floor.
December 20, 1974	10 hours - continued rigging up with 20 men, two rig-up trucks and one crane. Set the draw works, A-frame and raising line in place. Set the three rig engines on the rig floor. Crane demobilized.

December 21, 1974	10 hours - continued rigging up with 20 men and two rig-up trucks. Loaded seven 8-inch drill collars and 50 joints of 6 5/8-inch drill pipe for transport to Drilco Machine Shop in Vernal, Utah, for inspection. Positioned compressor, water tank, and water line. Installed guardrail, engine shed frame, and curtains. Released rig-up trucks.
December 22, 1974	9 hours - continued general rig-up with 20 men. Approximately 85% rigged up.
December 23, 1974	8 hours - 19 men continued general rig-up operations. Started the rig engine. Raised the derrick, set in the rig floor, and installed the wind walls and all equipment lighting. Set the ramp and cat walk in place.
December 24, thru December 26, 1974	Secured for the Christmas holiday. Maintained a 24-hour security watch at the location during this period.
December 27, 1974	8 hours - resumed general rig-up operations with 8 men and 1 welder. Tied off the bridle line, strung the air hoist, and extended the 30-inch surface casing.
December 28, 1974	8 hours - continued general rig-up operations with 9 men and 1 welder. Dial-indicated the #2 motor clutch and removed the cracked fluid coupling housing from the #3 motor. Hung the rotary tong and set the rat hole. Commercial power was connected to the rig panel.
December 29, thru December 30, 1974	Continued general rig-up with 9 men. Assisted with repairs to the draw works high-drum clutch.
December 31, 1974	8 hours - continued general rig-up with 8 men. Laid the water line from the shallow domestic well to the rig and trailer house. Unloaded line truck from NTS loaded with tubing and drill pipe, then reloaded same truck with 11-inch drill collars and a 15-inch reamer for return to the NTS. Continued to support the draw works repairs.
January 1, 1975	Secured for New Year's holiday. Maintained security watch.
January 2, thru January 4, 1975	Rigging up rotary tools and continued to assist in the repairs to the draw works. Constructed a shed around mud pumps. Ran 2 7/8-inch tubing from the hot water well to the rig for the rig heaters. Filled pits with water, mixed spud mud, and picked up drilling tools.

DAILY DRILLING REPORTS - RRGE-1

January 5, 1975	Spudded the 15-inch hole at 2 a.m. and drilled from 40 feet to 301 feet (RKB)* in 15 1/2 hours. Bit #1 is a Security, 3-cone mill tooth, type M4N. Mud VIS-55, WT-9.1. Worked 3 additional men to install the hot water line in the subbase. Low temperature was 20°F at 5 a.m.
January 6, 1975	Drilled 15-inch hole from 301 feet to 787 feet in 14 1/2 rotating hours. Electrician checked permanent power and rig generator. Mud VIS-48-54, WT-9.1. Sand content 1.5%. Low temperature was 20° at 5 a.m.
January 7, 1975	Completed drilling the 15-inch hole from 787 feet to 920 feet at 6 a.m. in 5-3/4 rotating hours. Deviation survey: 1° at 170 feet and 1° at 295 feet. 5 1/2 hours - laid down drill pipe and 11-inch drill collars. 11-1/2 hours - picked up 26-inch hole opener (H.O.) and float sub and reamed 15-inch hole to 26 inches from 56 to 435 feet. Mud VIS-50, WT-9.1, plastic viscosity - 10, and sand content of 1%. Bit #1, Security M4N, made 880 feet in 35-3/4 hours.
January 8, 1975	Opened 15-inch hole to 26 inches from 435 feet to 918 feet (total surface casing depth) in 17 hours. (Total rig time to ream the 15-inch hole to 26 inches, including picking up the H.O., was 28 1/2 hours.) 6 hours - circulated hole for logs. Mud VIS-48-52, WT-9.1.
January 9, 1975	7 hours - conditioned hole and tripped for logs. 5 hours - logged with Schlumberger. (Loggers T.D. is 900 feet from ground level.) Logs run - 4-arm caliper, dual induction laterolog and bore hole compensated sonic. 11 hours - tripped in with a 26-inch H.O. to check for fill after logging - no fill. Tripped out and laid down 11-inch drill collars and hole opener. Rigged to run casing. Low temperature was 20° and snowing.
January 10, 1975	1 hour - worked on high-drum clutch bearing in the draw works. 4 hours - made up shoe and float collar on shoe joint. 7-1/2 hours - ran casing - 22 joints of 20-inch, 94.0 lb/ft, H-40, ST&C. Total length 921.08 feet of casing set at 901 feet ground level (919 feet RKB depth). The float collar was located 43 feet above the guide shoe on the first joint. Used 21 centralizers and 1 cement basket.

*All depths shown are referenced to the rotary kelly bushing (RKB) which is 18 feet greater than ground level.

January 10, 1975 (Continued)	Circulated hole for 30 minutes with mud. Started cementing at 5 p.m. with 1,090 sacks of 50/50 poz-mix with 60% silica flour and 3% $CaCL^2$. Dropped plug at 6 p.m. and displaced with 311 barrels of mud and water. Pumped plug with 900 psi and cement in place (CIP) at 7 p.m. Good circulation throughout job. 5 hours - wait on cement (W.O.C.). Low temperature was 16° with 40 mph winds. Bottom hole temperature was 109° F.
January 11, 1975	24 hours - W.O.C. and clean rig floor. Released pressure on 20-inch casing and cut off excess. Welded bradenhead on the 20-inch casing. Nippled up the B.O.P. Low temperature was 4° at midnight 1-11-75.
January 12, thru January 13, 1975	24 hours - W.O.C. and nippling up the B.O.P. Thawed mud and water lines. USGS on site to run a temperature survey in the 20-inch casing. Worked 3 men dayshift to install the hot water system. Nippling up B.O.P. and assisted mechanics from NTS in removal of guards from draw works for high-drum clutch bearing replacement.
January 14, thru January 17, 1975	Supported draw works repairs. High-drum sprocket assembly removed by NTS mechanics and departed for Idaho Nuclear Engineering Laboratory Machine Shop. Cleaned and worked on other rig equipment. Continued work on the hot water blower system. Installed hot water line from the rig to the cattle pond to dispose of hot water after circulation through rig heating system.
January 18, 1975	NTS mechanics installed the repaired high-drum clutch and bearing and shimmed in place at 8:30 p.m. Cleaned and worked on other rig equipment.
January 19, 1975	24 hours - completed rig repairs and finished chipping cement from under shaker tanks. Installed shaker screens, hooked up mud lines and started pump engines.
January 20, 1975	6 3/4 hours - connected flow line, water line, and filled mud pits. 1 3/4 hours - pressure tested B.O.P. to 300 lbs. - okay. Ran in one drill collar and one joint of 6 5/8-inch drill pipe. Pressure tested pipe ram to 300 lbs - okay. Tripped in hole at 2 p.m. and tagged cement inside the 20inch casing at 867 feet. 5 hours - drilled out the plug, cement and shoe with Bit #2, a 12 1/4-inch, Smith, type DTJ, mill tooth. Cleared shoe at 10 p.m. and drilled new hole from 918 feet to 975 feet in 2 hours. Drilling fluid is water with no additives. Placement of stabilizers is one-near bit, one-string at 35 feet up and one-string at 65 feet up.

January 21, 1975 — 15 3/4 hours - drilled 12 1/4-inch hole in sand and shale from 975 feet to 1,427 feet. 7 1/2 hours - drained mud lines and changed head and liners in mud pump. Hole is taking about 100 barrels of water per hour. Temperature was 18° at 5 a.m.

January 22, 1975 — Drilled 12 1/4-inch hole with water from 1,427 feet to 1,521 feet in 2 1/4 hours. Hole is taking between 150 to 200 barrels of water per hour. Ran out of water at 5:15 a.m. Drained water and mud lines, desander, and mud pump. Connected hose from hot water line to pit. Waited on mud pits to fill, and filled rig tank. A 100-barrel vacuum truck arrived on site from Duschesne, Utah to haul drilling water to the rig from the Raft River. 4 hours - tripped for new bit while waiting on required water volume and went in hole with new Bit #3, 12 1/4-inch Smith, type DTJ, mill tooth with jet nozzles - 2 14/32-inch and 1 15/32-inch. (Bit #2 made 603 feet in 17 3/4 hours.) No fill encountered on trip to bottom. Drilled 12 1/4-inch hole with Bit #3 from 1,521 feet to 1,745 feet in 4 hours. Temperature was 11° at 5 a.m.

January 23, 1975 — Drilled 12 1/4-inch hole in sand and shale from 1,745 feet to 2,142 feet in 11 1/2 hours. Continuing to drill with water and no additives. Survey at 2,105 feet: 1° 5 minutes S 82° W. 6 hours - drained mud lines and tripped for new bit. (Bit #3 made 621 feet in 15 1/2 hours.) 18 feet of fill encountered in return trip with Bit #4, a 12 1/4-inch, Smith, type DTJ. Drilled 12-1/4-inch hole from 2,142 feet to 2,235 feet in 3-1/2 hours. Temperature was 22° at 5 a.m.

January 24, 1975 — Drilled 12 1/4-inch hole with water in sand and shale from 2,235 feet to 2,635 feet in 14 3/4 hours. Survey at 2,558 feet: 2° 5 minutes S 74° W. 2 1/2 hours - waited on drilling water, hooked up fill-up line and drained lines for trip. 2 hours - tripped out. (Bit #4 made 493 feet in 18 1/4 hours.

January 25, 1975 — Pick up Bit #5, Smith DTJ, mill tooth and tripped back in hole. 40 feet of fill encountered. Cleaned to bottom and drilled 12 1/4-inch hole from 2,635 feet to 3,060 feet in 18 1/2 hours.

January 26, 1975 — Drilled 12 1/4-inch hole from 3,060 feet to 3,091 feet in 1 1/2 hours. 3 hours - drained lines and tripped out of hole. 3 hours - dressed near bit stabilizer with new chert pin and blocks. (Bit #5 drilled 456 feet in 20

January 26, 1975 (Continued)	hours.) 2 1/4 hours - picked up the Smith Bit #6, type DTJ and cleaned 55 feet of fill during trip to bottom. Drilled 12 1/4-inch hole with water from 3,091 feet to 3,326 feet in 9 1/4 hours. Temperature was 45° at 5 a.m. with blowing snow.
January 27, 1975	Drilled 12 1/4-inch hole with water from 3,326 feet to 3,533 feet in 11 1/2 hours. 2 1/4 hours - tripped for new bit. (Bit #6 drilled 442 feet in 20 3/4 hours.) Picked up Bit #7, a Smith DTJ mill tooth, and float sub. Tripped in the hole and cleaned 12 feet of fill. Drilled 12 1/4-inch hole from 3,533 feet to 3,612 feet in 4 hours.
January 28, 1975	Drilled 12 1/4-inch hole in volcanic tuff from 3,612 feet to 4,030 feet in 16 hours. Survey at 3,953 feet: 3° 10 minutes N 67° W. 4 1/2 hours - drained lines and tripped out of hole. (Bit #7 drilled 497 feet in 20 hours.) Hole is taking about 135 barrels of water per hour. Low temperature was 12° at 4 a.m.
January 29, 1975	6 hours - finished trip out of hole and picked up Bit #8, a Smith DTJ. Tripped in and cleaned 18 feet of fill. Drilled 12 1/4-inch hole from 4,080 feet to 4,260 feet in 11 3/4 hours. Hole continued to take approximately 130 barrels of water per hour. Low temperature was 8° at 3 a.m.
January 30, 1975	Drilled 12 1/4-inch hole from 4,260 feet to 4,495 feet in 8 1/4 hours. Survey at 4,356 feet: 2° 45 minutes N 85° W. 3 hours - circulate hole for #1 core. 4 hours - tripped out of hole. Hole is taking 130 barrels of water per hour. Low temperature was 9° at 5 a.m. (Bit #8 drilled 465 feet in 21 hours.)
January 31, 1975	6 hours - picked up and serviced the core barrel and worked on compressors. 3 1/2 hours - tripped in hole for Core #1 with an 8 3/4-inch diamond core bit. 4 1/4 hours - cut Core #1 from 4,495 feet to 4,555 feet and recovered 23 feet of core (38%). 7 1/4 hours - laid down core barrel and USGS ran temperature survey. Hole still taking approximately 135 barrels of water per hour.
February 1, 1975	USGS temperature survey line broke and left the instrument and 1,100 feet of line in the hole. Reamed core hole to 12 1/4-inches from 4,495 feet to 4,555 feet and drilled from 4,555 feet to 4,650 feet in 14 hours. Circulated hole for logs. Low temperature was 26° at 5 a.m.

GRAPHIC LOGS

DEPTH	ALTERATION (1. WEAK 2. MOD 3. STRONG)								GRAPHIC GEOLOGY	Tr. TRACE 1. WEAK 2. MOD. 3. STRONG VEINLETS	DESCRIPTIONS
	SILICIFIED 123	2ND CLAYS 123	CALC. 123	Fe_2O_3 123	123	123	123				
4100											
4200											
4300											
4400											
4500				Tr.							TUFF; LT. GRAY, ARGILLIZED, CALCITE DECREASING.
4600											POOR SAMPLE; ABUNDANT BIT GOUGE, DRILL ADDITIVES, COPPER WIRES (?), CEMENT, ETC.
4700				Tr.							QUARTZ - MICA SCHIST; LT. TO MED. GRAY SOME PYRITE CUBES, CALC. VEINING. QUARTZITE, SOME QUARTZ-MICA SCHIST, CALCITE AS DISCRETE GRAINS (VEIN MATERIAL)
4800											QUARTZITE (PREDOMINANTLY); SOME QUARTZ-MICA SCHIST, INCREASING ARGILLIC ALTERATION.
4900											MIXED LITHOLOGIES; MOSTLY MICA-SCHIST AND QUARTZITE, ~20-25% ARGILLACEOUS MATERIAL.
5000											QUARTZ MONZONITE; GNEISSIC TEXTURE.

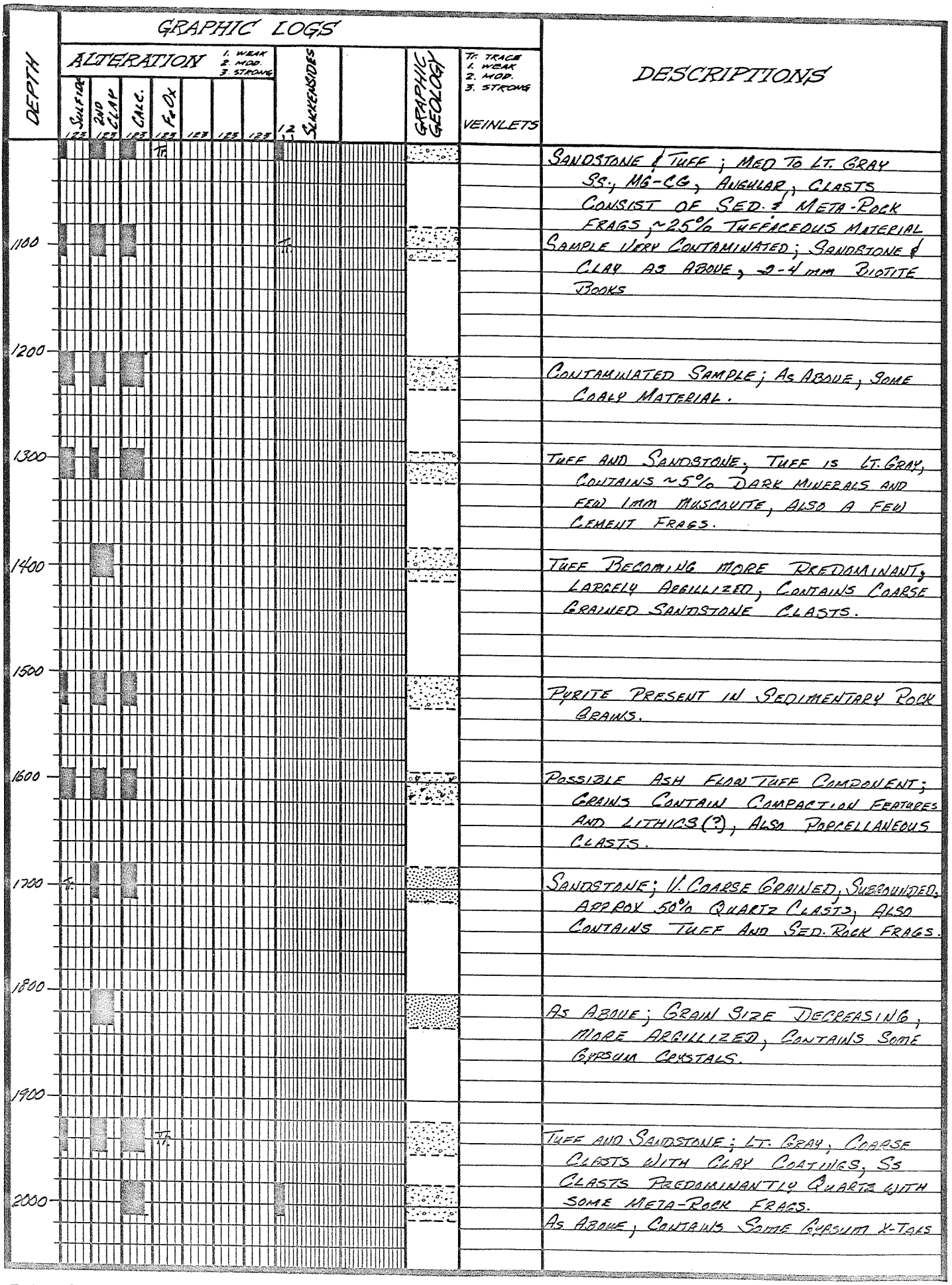
4620
1,067 barrels/hr
198°F

4800
1067 barrels/hr
199°F
Well began to flow hot water

DRILL HOLE RRGE-1

LOCATION SEC. 23, T. 15S., R. 36E.

LOGGED BY REB



DRILL HOLE PRGE-1

LOCATION SEC. 23, T. 15 S., R. 26 E.

LOGGED BY DAR

GRAPHIC LOGS

DEPTH

ALTERATION 1. WEAK 2. MOD. 3. STRONG

SULFIDE	2ND CLAY	CALC.	FeOx			
123	123	123	123	123	123	123

GRAPHIC GEOLOGY

Tr. TRACE 1. WEAK 2. MOD. 3. STRONG

VEINLETS

DESCRIPTIONS

2100

SANDSTONE; MED. TO COARSE GRAINED, SUBANG. TO SUBROUND, CALCAREOUS.

2200

Tr.

SANDSTONE; MED GRAINED, QUARTZ CLASTS, PREDOMINATE, ALSO TUFF AND CEMENT FRAGS, MUSCOVITE

2300

Tr.

TUFFACEOUS CLAYSTONE AND SILTSTONE, ARGILLIZED

2400

Tr.

TUFFACEOUS CLAYSTONE, SOME MUSCOVITE AND BITUMINOUS MATERIAL, CONTAINS YELLOW SULFIDE MINERAL (CHALCOPYRITE?) SOME 2-4mm BIOTITE BOOKS

2500

Tr.

AS ABOVE; WITH COALY MATERIAL (VITRAIN) PRESENT.

2600

Tr.

2700

AS ABOVE; PLUS LARGE MASS OF LIGNITIC (?) MATERIAL POSSIBLY DRILL ADDITIVE; 3mm BIOTITE.

2800

Tr.

2900

Tr. Tr.

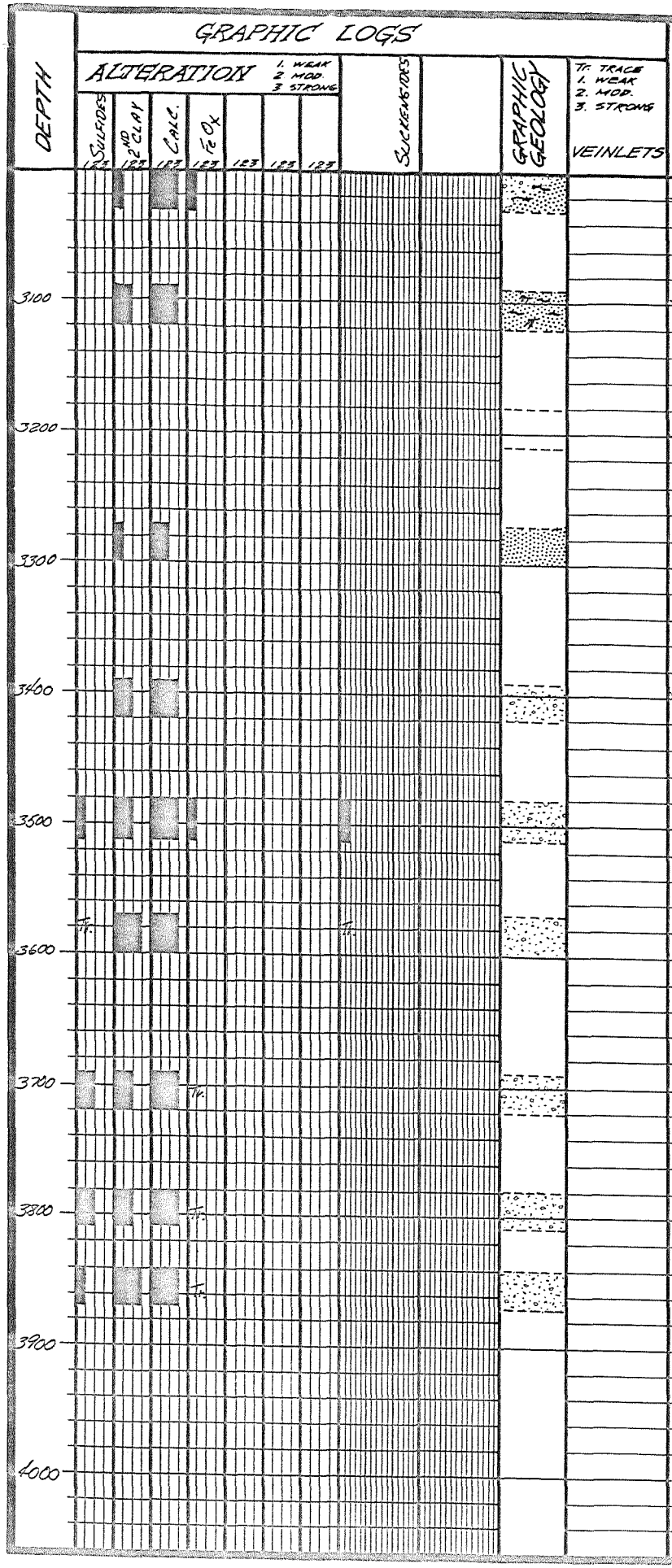
SANDSTONE; MEDIUM GRAINED, ANGULAR, MIXED CLASTS.

3000

DRILL HOLE RRGE-1

LOCATION SEC. 13, T. 15S., R. 96E.

LOGGED BY RBB



DESCRIPTIONS

SANDSTONE; MIXED CLASTS, MOSTLY VRFs, SOME CARBON TRASH

SANDSTONE AS ABOVE, VERY COARSE GRAINED, SAMPLE CONTAINS MUCH CEMENT AND CARBON TRASH.

SAMPLE VERY CONTAMINATED WITH DRILLING ADDITIVES; MUSCOVITE, WALNUT HULLS, ETC.

SANDSTONE; COARSE GRAINED, MOSTLY VRFs, ANGULAR TO SUBROUND, FEW SELENITE (GYPSUM) CRYSTALS.

SANDSTONE & SILTSTONE; TUFFACEOUS SANDSTONE, SUBROUND, COARSE GRAINED, LIGHT GRAY, PREDOMINANTLY VRFs.

AS ABOVE

TUFFACEOUS LITHOLOGIES CONTINUE SAMPLE CONTAINS SOME CEMENT AND DRILL ADDITIVES.

CLASTS BECOMING VERY COARSE GRAINED.

TUFFACEOUS LITHOLOGIES CONTINUE SAMPLES CONTAIN GYPSUM CRYSTALS, CLASTS WITH OCCASIONAL MINOR QUARTZ VEINING.

DRILL HOLE RRGE-1

LOCATION SEC 23, T15S., R.26 E.

LOGGED BY RAB

DAILY DRILLING REPORTS - RRGE-1

February 2, 1975	5 hours - circulated for logs and tripped out of hole. (Bit #9 drilled 155 feet in 14 hours.) (One cone and bearings missing.) 19 hours - logged with Schlumberger. The 4-arm caliper depth was 4,620 feet (ground level) and also ran dual induction with S.P. sonic, temperature compensated gamma ray, and temperature with flow meter (meter did not work). Crew unloaded 48 joints of 9 5/8-inch casing delivered from NTS. Hole began to flow hot water. Flow rate was 1,067 barrels of hot water per hour at 11:30 p.m. Flow line temperature was 198° F.
February 3, 1975	5 hours - completed logging and rigged down logging equipment. 19 hours - closed B.O.P. blind rams at 6 a.m. and pumped cold water in the hole with 100 psi in an attempt to kill the flow. 2,000 barrels pumped in hole and monitored well head pressure rise from 47 lbs. to 58 lbs.
February 4, 1975	B.O.P. shut-in. Continually monitored pressure on the well head - pressure ranged from 48 psi to 58 psi. Pump pressure while trying to kill well was 150 psi at 35 strokes per minute. 800 barrels of cold water injected today.
February 5, 1975	Waited on Grant rotating head from NTS. Changed oil in one rig engine and pump engine and performed other general maintenance. Well head pressure ranged from 55 psi to 60 psi. Set in the rotating head, rotary table and floor. Ran two drill collars, one joint of pipe and kelly in hole to circulate.
February 6, 1975	Pulled drilling tools out of the hole. 6 hours - tripped in hole and tagged fill at 4,631 feet. 8 hours - pumped cold water in the hole - 1,300 barrels today. Off loaded 4-inch aluminum pipe and ran line from Raft River to the rig. Well head pressure ranged from 45 psi to 70 psi.
February 7, 1975	21 1/2 hours - pumped cold water in the hole through drill pipe at 28 to 40 strokes per minute (S.P.M.) with pipe rams closed.
February 8, 1975	24 hours - continued pumping cold water in hole through drill pipe. Ran the Amarada temperature bomb on 100-foot stations and on 271-foot stations. Tripped out of the hole to log.
February 9, 1975	24 hours - logged with Schlumberger and continuously pumped cold water at 16 S.P.M. while logging. Ran the caliper log to 4,616 feet and the temperature survey to 4,610 feet.

February 10, 1975 — Tripped in hole to 3,798 feet. Rigged up 2-inch return line from Braden head to mud pits. Continued pumping water down drill pipe. Rigged up and ran the Schlumberger temperature survey. Shut the well in at 6 p.m. and shut off pump at 7 p.m. Waited on orders.

February 11, 1975 — 17 hours - continued to circulate hot water out of the hole with cold water. 2 hours - repaired the trash pump used for pumping from the river. 7 hours - tripped out of the hole; made up the Otis sub and plug and tripped in the hole in preparation for setting the sand plug. Drill string open-ended at 4,399 feet.

February 12, 1975 — 4 hours - picked up 4 joints of drill pipe and ran in to 4,399.26 feet. Picked up kelly, filled drill pipe with water and rigged up Halliburton to set the sand plug. Tried to pull the Otis plug with the wireline - no success.

February 13, 1975 — 10 hours - tripped out of hole and waited on Otis plug parts. Serviced the rig. 6 hours - picked up a cross-over sub and float sub, a single joint of drill pipe and put on the rotating head. The float sub connection leaked. Broke the float sub off, picked up one stand of drill collars, installed the rotating head and tripped in hole to 4,404 feet. Halliburton primed the pumps and started pumping sand in the hole at 4 p.m. Stage #1 - 4,632 feet to 4,528 feet, 104 feet of fill-up. Stage #2 - 4,528 feet to 4,398 feet, 130 feet of fill-up. Pumped in Stage #3 with the pipe set at 4,216 feet.

February 14, 1975 — Halliburton continued pumping the sand plug. Finished Stage #3 - 4,398 feet to 4,328 feet - 70 feet of fill-up; Stage #4 - 4,328 feet to 4,168 feet - 160 feet of fill-up; and Stage #5 - 4,168 feet to 4,077 feet - 91 feet of fill-up. Pulled pipe up to 3,876 feet. Pumped Stage #6 - 4,077 feet to 3,983 feet - 94 feet of fill-up.

February 15, 1975 — Continued to monitor the sand rise after pumping Stage #6. Pulled up to 3,783 feet. Started pumping Stage #7 at 4 a.m. Stage #7 - 3,983 feet to 3,877 feet - 106 feet of fill-up. (Used approximately 50,000 lbs. of sand in 7 stages.) Plugged the drill pipe when trying to displace sand with water in Stage #8 with the drill pipe hung at 3,660 feet. Tripped out and unplugged 6 stands and 1 single joint of drill pipe. Tripped in the hole and tagged the top of Stage #8 at 3,840 feet - 37 feet of fill-up. Started pumping sand Stage #9 at 9:10 p.m. with the drill pipe hung at 3,628 feet. Tagged top of Stage #9 at 3,770 feet - 70 feet of fill-up.

February 16, 1975	3 hours - pressure tested for water flow. 3 hours - pumped 30 sacks of barite as Stage #10, tagged top of plug at 3,770 feet - no fill-up. Pumped Stage #11, an additional 30 sacks of barite with the drill pipe hung at 3,750 feet. 12 hours - continued to tag the top of the barite Stage #11. Final tag at 5:45 p.m. was 3,769 feet - 1 foot fill-up. Pumped 60 sacks of barite Stage #12 with drill pipe hung at 3,752 feet. Stage #12 - 3,769 feet to 3,763 feet - 6 feet of fill-up. Plug held 20,000 lbs. weight for 10 minutes.
February 17, 1975	Final tag on barite plug (Stage #12) at 12:05 a.m. was 3,762 feet. Laid down a single joint of drill pipe. Pumped a cement plug (Stage #13) in hole and pulled the drill pipe up the hole to clear the cement plug. Stage #13 - 115 sacks of Class G cement, slurry weight - 16.8 lbs./gal. and volume was 1.02 $feet^3$/sack with 4.0 gals. of water per sack. C.I.P. at 1:05 a.m. 8 hours - W.O.C. Tripped in the hole and tagged the top of cement Stage #13 at 3,642 feet - 120 feet of fill-up. Checked pressure on the well and tripped out of the hole. Set out the floor and rotary table. Changed out the 13 3/8-inch Hydril BOP to a 16-inch Hydril BOP and bolted on the rotating head.
February 18, 1975	Welder rebuilt the flow line and changed out a 6-inch valve in the line. Serviced the rig and tripped in the hole. Filled the drill pipe with water, started the desander and jetted the pits. 8 1/4 hours - ran the Amarada temperature bomb and concurrently flow tested the well through the 6-inch flow valve. Temperatures recorded: 3,100 feet, 231°; 3,300 feet, 239°; 3,600 feet, 239°. 2 1/2 hours - pulled temperature bomb out of the hole and started to trip out of the hole to pick up a 15-inch bit.
February 19, 1975	5 hours - tripped out of hole and picked up Bit #10, a 15-inch Smith, DSJ mill tooth. Reamed 12 1/2-inch hole to 15 inches with tight spot encountered between 3,167 feet to 3,257 feet. (The 15-inch bit was run only to assure clearance for the 13 3/8-inch casing string, since the average eroded bore hole diameter after drilling the 12 1/4-inch hole with water was 20 inches.) 11 1/2 hours - attempted to level rig. Moved drill pipe from front of rig and spread sand around jack pad.
February 20, thru February 21, 1974	Waited on rig leveling equipment and attempted to level rig. (Ground-thaw settlement caused rig to settle to the southeast. The attempt proved unsuccessful.) Thawed and drained the 4-inch water line to the rig from the river and serviced the rig and equipment.

February 22, 1975 — 12 1/2 hours - continued to attempt to level the rig and rigged down the leveling equipment. 2 3/4 hours - tripped out of the hole to run casing. 5 1/4 hours - rigged to run casing, (13 3/8-inch, H-40, 54.5 and 61.0 lbs./ft.) 3 hours - running casing - picked up and ran 20 joints on the hook.

February 23, 1975 — 6 hours - finished running 13 3/8-inch casing; total of 3,651 feet on the hook. Rigged up to cement and circulated out fill from 3,621 feet to 3,642 feet. Started cementing Stage #1 at 12:30 p.m. with bottom of casing set at 3,623 feet (GL). 3 1/4 hours - cementing with Halliburton. Stage #1 - 1,500 sacks of 50/50 poz-mix, 60% silica flour and 1/2 of 1% of HR-12 and 400 sacks of 50/50 poz-mix - yielded 568 barrels of slurry. The casing parted approximately 7 joints down while displacing the cement at 2:45 p.m. Screwed back into casing and torqued to 2,000 ft/lbs. Pulled the casing string to 122,000 lbs. Hooked up the Halliburton lines and put 500 lbs. pressure on the casing - held okay. Low temperature was 12° at 5 a.m.

February 24, 1975 — 16 hours - wait on cement (W.O.C.) Dresser-Atlas ran a cement bond log which stopped at 2,837 feet. Cleared area around rig during W.O.C. period. 3 1/4 hours - rigged up and cemented Stage #2 at 5:45 p.m. Cemented from the top and down the annulus with 50 sacks of 50/50 poz-mix with 60% silica flour; 250 sacks of 50/50 poz-mix with 4% gel, 2% $CACL_2$ and 25 lbs./sack of gilsonite and 1,176 sacks of 50/50 poz-mix with 60% silica flour - yielded 407 barrels of slurry. Drained water pump and water lines. Drained the kelly hose, stand pipe, and the #1 pump while W.O.C.

February 25, 1975 — 8 hours - W.O.C. Cut off 13 3/8-inch casing and rigged up Dresser-Atlas for running the cement bond log. Ran the bond log at 10 a.m. 6 1/2 hours - cleared the rig floor of cementing and casing tools, picked up Bit #11, a Smith 12 1/4-inch DTJ and tripped in hole. Tagged cement at 2,835 feet. 4 hours - drilled plug and cement from 2,835 feet to 2,937 feet. Low temperature was 18° at 6 a.m.

February 26, 1975 — 7 1/2 hours - drilled cement out of 13 3/8-inch casing from 2,937 feet to 3,328 feet. Drill pipe torquing up at 3,325 feet. 3 1/2 hours - drilled on junk - tripped out of the hole to pick up a 9 7/8-inch bit. (Bit #11 drilled 493 feet of cement in 11 1/2 hours.) 4 1/2 hours - picked up a 9 7/8-inch security mill tooth bit, tripped in the hole and drilled on junk. 8 1/2 hours - tripped out of hole and pressure tested casing to 300 psi. Picked up 4 3/4-inch collars, bit sub and 5 3/4-inch Gruner mill tooth bit. Picked up a pin-box float sub.

DAILY DRILLING REPORTS - RRGE-1

February 27, 1975	24 hours - layed down the 5 3/4-inch tools and picked up an 11 3/4-inch Globe junk basket. Tripped in the hole and milled the collapsed casing from 3,325 feet to 3,331 feet. Serviced the rig and equipment intermittently during the day.
February 28, 1975	15 1/2 hours - tripped out after milling and left the float sub (1.82 feet), junk sub (2.81 feet), and mill (1.91 feet) in the hole. Waited on overshot for fishing operation. 8 1/2 hours - made up the fishing tools and tripped in the hole with the overshot. Fished for 1 hour with no recovery. Tripped out and used welder to hard face the bit guide.
March 1, 1975	24 hours - fished with the overshot. Recovered the fish at 8:30 p.m., tripped out of the hole and laid down the fishing tools.
March 2, 1975	24 hours - cleared rig floor of fishing equipment and picked up a dual milling assembly, a 12 1/4-inch clusterite mill behind an 11 3/4-inch mill. Milled 2 inches and tripped out - the 12 1/4-inch mill was out of gauge 1 1/4-inches. 5 hours - slipped and cut 88 feet of drilling line and picked up 6-inch drill collars and an 8 1/2-inch Security bit, type M44N. 11 hours - tripped in the hole (tight spot at 3,325 feet) and drilled on junk at 3,329 feet. Tripped out to check bit after no penetration and found the center teeth worn completely off. Picked up 9 3/8-inch globe basket and tools and tripped in the hole. The tools would not get past a tight spot at 3,325 feet. Tripped out of the hole for a mill.
March 3, 1975	24 hours - laid down the globe basket and picked up milling tools. Milled on collapsed casing with 12 3/8-inch clusterite mill and 12 1/4 concave and taper mills from 3,325 feet to 3,335 feet.
March 4, 1975	7 hours - milled with 12 1/4-inch (concave) tapered Mill #5 from 3,335 feet to 3,338 feet. Tripped out to check the mill. The junk sub skirt was torn off and the mill was worn out. 9 hours - picked up Mill #6, a 12 1/4-inch flat-bottom concave mill, tripped in and milled from 3,332 feet to 3,338 feet. Tripped out - 12 1/4-inch mill was worn out and 1/2-inch out of gauge. 8 hours - off-loaded Servco mills and pressure tested the casing for 15 minutes to 300 lbs. Tripped in the hole with a 9-inch magnet and worked the magnet from 3,336 feet to 3,338 feet. Tripped out and recovered the junk sub skirt pieces and other junk steel.

March 5, 1975 — 5 hours - worked in the hole with a 9-inch magnet. Recovered additional pieces of the junk sub skirt and other steel. 11 hours - laid down the magnet and picked up Mill #7, an 8 1/2-inch tapered mill. Milled from 3,338 feet to 3,370 feet and tripped out of the hole. 8 hours - picked up Mill #8, an 8 3/4-inch mill and milled on junk and cement from 3,370 feet to 3,435 feet.

March 6, 1975 — 6 1/2 hours - drilled cement out of 13 3/8-inch casing from 3,435 feet to 3,585 feet. 8 1/2 hours - tripped out of the hole, broke down the milling tools and cleared the rig floor of all fishing tools. Pressure tested the 13 3/8-inch casing to 300 lbs. for 30 minutes. 9 hours - picked up Mill #9, a 12 1/4-inch tapered mill and tripped in the hole. Milled on junk and cement from 3,571 feet to 3,584 feet. Started to trip out of the hole.

March 7, 1975 — 4 hours - finished the trip out of the hole with Mill #9. Picked up an 11 1/4-inch O.D. Globe basket and float sub and tripped in the hole to fish for junk. Fished for junk for 2 3/4 hours. Tripped out of the hole and tool joints were tight after pulling 3 stands of drill pipe. Serviced the rig. Picked up a 9-inch magnet and subs and tripped in the hole. 11-3/4 hours - fished with the magnet and tripped out of hole 3 times and recovered a full basket of junk each time.

March 8, 1975 — 17 1/4 hours - made magnet runs Numbers 5, 6, and 7 and recovered junk each time. 6 hours - laid down the 9-inch magnet and subs and picked up a 12 1/4-inch Smith bit (a rerun of #5). Tripped in and tried to get past junk at 3,585 feet. Tripped out to pick up a magnet. 1 hour - picked up and started to trip in hole for a 9-inch magnet run #8.

March 9, 1975 — 2 3/4 hours - fished with the 9-inch magnet and tripped out with 1/2 basket of junk. 7 1/4 hours - broke down the magnet and subs and picked up a 12 1/4-inch bit (rerun of #3). Tripped in and drilled on junk at 3,586 feet. 6 hours - tripped out and picked up a 9-inch magnet. Tripped in and fished with magnet run #9 and recovered a full basket of small junk. Picked up an 11 1/2-inch magnet, tripped in and recovered small junk. Picked up an 11 1/2-inch flat-bottom mill, tripped in and milled from 3,586 feet to 3,587 feet.

March 10, 1975 — 3 1/2 hours - milled from 3,586 feet to 3,590 feet. 6 1/2 hours - tripped out to check mill. The junk sub skirt was pushed in and split and the mill was worn out. Picked up an 11 1/2-inch magnet and clusterite shoe and

March 10, 1975 (Continued)	tripped in the hole to 3,587 feet. Drilled down with magnet to 3,589 feet and pulled out of the hole. 8 1/2 hours - picked up a 12-inch concave mill and milled to 3,590 feet. 4 1/2 hours - tripped out and picked up an 11 1/2-inch magnet. Tripped in, fished from 3,587 feet to 3,590 feet and recovered 1 1/2 cups of junk.
March 11, 1975	8 hours - fished with 11 1/2-inch magnet and recovered a full cup of junk at 3,590 feet. Tripped out, picked up 6-inch collars and an 8 3/4-inch tapered mill. 8 hours - tripped in and milled on junk from 3,587 feet to 3,591 feet. Tripped out, laid down tools and repaired the rotating head. 8 hours - picked up a 9 3/4-inch tapered mill and milled junk and cement from 3,591 feet to 3,617 feet.
March 12, 1975	16 hours - milled junk and cement to 3,631 feet and tripped out for a 12 1/2-inch mill and picked up a staged 9 3/4-inch and 12 1/4-inch mill and milled to 3,631 feet. 8 hours - made up an 11 1/2-inch magnet assembly, worked on the B.O.P. and accumulators and tripped in with magnet run #14.
March 13, 1975	10 1/2 hours - tripped out with magnet run #14 and recovered a large piece of junk casing (2 feet, 7 inches long and 7 inches wide). Two additional magnet runs (#15 and #16) recovered numerous pieces of casing, a nose cone from a mill and other small junk. 9 1/2 hours - worked on the blowout equipment and picked up a 12 1/4-inch drilling assembly with Bit #14, a Smith, mill tooth, type DGHT. Tripped in the hole to 3,632 feet and drilled out the float collar and shoe, the Halliburton cement barite and sand plugs to 3,752 feet with water.
March 14, 1975	24 hours - drilled out the sand plug from 3,752 feet to 4,613 feet with water in 16 1/2 rotating hours circulated hole and jetted pits every 120 feet.
March 15, 1975	24 hours - finished drilling sand plug to 4,645 feet and encountered junk. Tripped out of the hole and installed a new rotating head. Pumped water down the drill pipe to kill the flow for 6 hours. Pumped water down the annulus for 10 hours while a welder hooked up the 6 5/8-inch flow test manifold. Used backhoe to bury a reserve pit drain line.

DAILY DRILLING REPORTS - RRGE-1

March 16, 1975	24 hours - worked on the flow test system and flow tested the well. The well flowed approximately 700 to 900 gallons per minute at surface temperatures ranging from 110° to 236° F. Tested the flow by pumping cool water down 13 3/8-inch casing and gauging flow rates back into mud pits. Hot water is flashing at the surface.
March 17, thru March 18, 1975	Injected cool water and flow tested. Wellhead pressure during flow test was 25 lbs. (max.) and when the well was shut in was 150 lbs. Welder worked on flow test manifold. The maximum flow rate and surface temperature recorded was 1,000 gpm at 265° F. The drill crew serviced equipment and cleaned the location.
March 19, 1975	12 1/2 hours - continued to flow test the well. 11 1/2 hours - rigged down the test line at 12:30 p.m. for a trip in the hole. Ran 29 stands and 1 single joint in the hole and laid down drill pipe in preparation for leveling the rig.
March 20, thru March 21, 1975	24 hours - laid down 6 5/8-inch drill pipe and drill collars and moved out some equipment to allow for rig leveling. Off-loaded leveling equipment at 9 a.m. (shipped from NTS). Leveled the rig and reloaded the leveling equipment by 8 p.m. on March 20. Moved equipment in and reassembled the equipment around the subbase area. Nippled up the blowout equipment, worked on the flow test manifold system and prepared to go in the hole with fishing tools.
March 22, 1975	24 hours - finished picking up the 12 1/4-inch Globe basket, drill collars and 6 5/8-inch drill pipe. Fished for junk and bit cone at 4,645 feet.
March 23, 1975	Completed trip out with Globe basket and recovered the bit cone and a piece of formation. Tripped back in the hole and recovered 2 pieces of formation. Picked up an 11-inch magnet, tripped in and fished with the magnet at 4,651 feet. Started out of hole with magnet and pumped down annulus because float was not holding.
March 24, 1975	2 hours - finished trip out of hole and recovered 17 bearings and 7 stripper rubber bolts. 12 hours - picked up a 12 1/4-inch Smith DGAT bit (Bit #15) and drilled from 4,651 feet to 4,686 feet in 4 1/2 hours. Conditioned hole for a core and tripped out of the hole. 10 hours - picked up a Christensen core barrel and 8 3/4-inch and 4-inch core

March 24, 1975 (continued)	bit. Tripped in and cut Core #2 from 4,686 feet to 4,690 feet. Coring at 35 rmp, 12,000 lbs. on the bit, 575 psi pump pressure at 23 strokes per minute.
March 25, 1975	10 hours - completed cutting Core #2 from 4,690 feet to 4,698 feet. Tripped out, serviced the core barrel and recovered 9 feet of core. 14 hours - laid down core assembly and jetted pits to flow test. Worked on B.O.P. for 2 1/4 hours.
March 26, thru March 27, 1975	Tried to pressure test the well but pipe rams would not hold. Worked on the B.O.P. and accumulator. 17 hours - drained and thawed water lines. Low temperature was 10° at 5 a.m. with high winds. Detected an earthquake at 8:30 p.m. The crews serviced equipment and cleaned up around the drill site. Flow testing 600 G.P.M. at 207° F.
March 28, 1975	23 hours - repaired water pump and ran injection test. Repaired Schaffer B.O.P. - 3 1/2 hours. 1 hour - made up the junk sub and Bit #16, a Security 11-inch button, type M-88.
March 29, 1975	6 hours - repaired Hydril accumulator and tripped in the hole to 4,686 feet. 1 hour - reamed 8 3/4-inch core hole to 11 inches from 4,686 feet to 4,698 feet. Drilled new formation with 11-inch bit from 4,698 feet to 4,825 feet with water in 12 1/4 hours.
March 30, 1975	Drilled 11-inch hole with Bit #16 from 4,825 feet to 4,995 feet in 21 rotating hours. 1 3/4 hours - repaired mud line and pumped cool water in annulus for connections.
March 31, 1975	Drilled the 11-inch hole from 4,995 feet to 5,005 feet (TD) in 1 hour. Conditioned hole for 2 hours for Core #3. 21 hours - tripped out with Bit #16. (The 11-inch Bit #16 drilled 307 feet in 34 1/2 hours.) Picked up the Christensen core barrel and Core Bit #3, an 8 3/4-inch by 4-inch type MC20, and tripped in the hole. Cut Core #3 from 5,005 feet to 5,007 feet. Coring was at 42 rpm, 15 to 20,000 lbs. on bit, 800 psi pump pressure at 20 strokes per minute. Pulled out of hole and recovered 2 feet of core.
April 1, thru April 3, 1975	Rigged up and performed flow tests through 6-inch flow line and two 2-inch lines. Crew worked on equipment and sorted spare parts in bins. Picked up and ran the Amarada temperature bomb. Picked up water sampler and took 2 water samples at 2,000 feet.

DAILY DRILLING REPORTS - RRGE-1

April 4, 1975	11 1/2 hours - laid down 101 joints of 6 5/8-inch drill pipe and thirteen 8-inch drill collars. 12 1/2 hours - ran the Amarada temperature bomb to 1,000 feet and flow tested the well. Maximum recorded temperature and flow rate was 255° F and 425 gpm.
April 5, 1975	Took well pressure readings with the well shut-in. Ran the Amarada temperature bomb and flow tested the well through the 6-inch flow line and two 2-inch lines.
April 6, 1975	Continued to take well head pressure readings while waiting for Schlumberger to arrive on location. Rigged up to log at 9:30 a.m. Schlumberger ran the temperature log and sonic log to 5,000 feet and the 4-arm caliper log from 5,000 feet to 3,000 feet. Maximum bottom hole temperature was 292° F.
April 7, 1975	Finished running caliper and density logs at 5:30 a.m. and rigged down Schlumberger. Picked up kelly and a single joint of drill pipe for tests. Tested well for flow temperature and flow rate. Shut the well in and pumped cool water in the hole at 20 s.p.m.
April 8, 1975	Pumped cool water in the hole and waited for valves and spools. Picked up the Halliburton retrievable packer and set the packer in the 13 3/8-inch casing at 1,380 feet to stop flow. Installed the 20-inch by 14-inch spools two-inch valves and pressure tested to 575 psi. No leaks were observed.
April 9, 1975	Broke down tools and B.O.P. equipment. Nippled up the 14-inch master gate valve and spools, Hydril, rotating head and 6-inch flow line. Laid down 45 joints of drill pipe. Broke out the water line from Raft River. Crews worked on equipment and cleaned location.
April 10, 1975	Commenced rigging down on graveyard shift. Laid down kelly, rat and mouse holes and steam blowers. Worked 2 crews - 10 men during day shift for rig down operations.
April 11, 1975	Rigged down for 8 hours on day shift with 3 crews (15 men).
April 12, 1975	Rigged down for 8 hours on day shift with 3 crews (14 men). Stacked and prepared 13 3/8-inch casing, 30-inch casing, drill collars, drill pipe and subs for inspection.

DAILY DRILLING REPORTS - RRGE-1

April 13, 1975	Rigged down for 8 hours on day shift with 3 crews (14 men). Worked with the forklift in the yard and broke out the water well line to the rig. Lowered mast on the stand at 3:15 p.m.
April 14, 1975	Rigged down for 8 hours on day shift with 3 crews (14 men). Drained the draw works drum and changed liners in mud pumps.
April 15, 1975	Rigged down for 8 hours on day shift with 3 crews (15 men). Unbolted subbase and cleaned and painted the derrick.
April 16, thru April 18, 1975	Rigged down for 8 hours on day shift with 3 crews (15 men). Worked with casing inspectors and off-loaded 13 3/8-inch casing (3 loads). Worked on the B.O.P. Rigged down the desilter and mud pits. Cleaned and painted some equipment and loaded tools in junk boxes while waiting on trucks. Trucks will be on site tomorrow morning (April 19) to start the move to RRGE-2.

DAILY DRILLING REPORTS - RRGE-1

April 13, 1975	Rigged down for 8 hours on day shift with 3 crews (14 men). Worked with the forklift in the yard and broke out the water well line to the rig. Lowered mast on the stand at 3:15 p.m.
April 14, 1975	Rigged down for 8 hours on day shift with 3 crews (14 men). Drained the draw works drum and changed liners in mud pumps.
April 15, 1975	Rigged down for 8 hours on day shift with 3 crews (15 men). Unbolted subbase and cleaned and painted the derrick.
April 16, thru April 18, 1975	Rigged down for 8 hours on day shift with 3 crews (15 men). Worked with casing inspectors and off-loaded 13 3/8-inch casing (3 loads). Worked on the B.O.P. Rigged down the desilter and mud pits. Cleaned and painted some equipment and loaded tools in junk boxes while waiting on trucks. Trucks will be on site tomorrow morning (April 19) to start the move to RRGE-2.

XRC-29c

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

CASING RECORD
RRGE-1 - SURFACE CASING - 20 INCH O.D., 94 lb/ft, H-40
DATE INSTALLED - JANUARY 10, 1975

Joint No.	Measured Length (ft.)	Cumulative Length (ft.)	Remarks
	2.20	2.20	Float Shoe
1	43.52	45.72	Centralizer located 30' up
	1.90	47.62	Float Collar
2	39.33	86.95	Centralizer on collar
3	43.01	129.96	Centralizer on collar
4	43.30	173.26	Centralizer on collar
5	38.44	211.70	Centralizer on collar
6	42.92	254.62	Centralizer on collar
7	42.91	297.53	Centralizer on collar
8	42.22	339.75	Centralizer on collar
9	42.23	381.98	Centralizer on collar
10	36.37	418.35	Centralizer on collar
11	43.34	461.69	Centralizer on collar
12	42.74	504.43	Centralizer on collar
13	42.80	547.23	Centralizer on collar
14	42.82	590.05	Centralizer on collar
15	41.75	631.80	Centralizer on collar
16	42.89	674.69	Centralizer on collar
17	42.78	717.47	Centralizer on collar
18	39.73	757.20	Centralizer on collar
19	38.65	796.85	Centralizer on collar
20	40.82	837.65	Centralizer on collar
21	40.02	877.63	Centralizer on collar
22	43.45	921.08	Centralizer on collar

Total casing length: 921.08 feet
Casing setting depth: 901.00 feet (G.L.)

XRC-29d

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

CASING RECORD
RRGE-1 - PRODUCTION CASING - 13 3/8-INCH O.D.
DATE INSTALLED - FEBRUARY 22, 1975

Joint No.	Weight	Measured Length (ft.)	Cumulative Length (ft.)	Remarks
		1.20	1.20	Float Shoe
		2.00	3.20	Float Collar
1	61 lb/ft	39.35	42.55	Centralizer
		2.00	44.55	Float Collar
2	61 lb/ft	39.83	84.38	
3	61 lb/ft	39.32	123.70	Centralizer
4	61 lb/ft	41.15	164.85	
5	61 lb/ft	41.10	205.95	
6	61 lb/ft	37.75	243.70	Centralizer
7	61 lb/ft	40.41	284.11	
8	61 lb/ft	39.27	323.38	
9	61 lb/ft	37.26	360.64	Centralizer
10	61 lb/ft	37.05	397.69	
11	61 lb/ft	37.82	435.51	Cement basket
12	61 lb/ft	38.69	474.20	Centralizer
13	61 lb/ft	37.94	512.14	
14	61 lb/ft	40.15	552.29	
15	61 lb/ft	39.71	592.00	Centralizer
16	61 lb/ft	38.79	630.79	
17	61 lb/ft	29.34	670.13	
18	61 lb/ft	41.72	711.85	Centralizer
19	61 lb/ft	37.20	749.05	
20	61 lb/ft	39.09	788.14	
21	61 lb/ft	38.34	826.48	Centralizer
22	61 lb/ft	39.14	865.62	
23	61 lb/ft	37.72	903.34	Cement basket
24	61 lb/ft	41.02	944.36	Centralizer
25	61 lb/ft	36.87	981.23	
26	61 lb/ft	40.43	1,021.66	
27	61 lb/ft	40.58	1,062.24	Centralzer
28	61 lb/ft	38.98	1,101.22	
29	61 lb/ft	38.15	1,139.37	
30	61 lb/ft	41.11	1,180.48	
31	61 lb/ft	41.27	1,221.55	
32	61 lb/ft	39.13	1,260.58	
33	61 lb/ft	38.59	1,299.27	Centralizer
34	61 lb/ft	39.78	1,339.05	Cement basket
35	61 lb/ft	41.43	1,380.48	
36	61 lb/ft	40.60	1,421.08	Centralizer
37	61 lb/ft	40.08	1,461.16	
38	61 lb/ft	39.65	1,500.81	
39	61 lb/ft	38.64	1,539.45	Centralizer
40	61 lb/ft	36.91	1,596.36	
41	61 lb/ft	37.22	1,613.58	
42	61 lb/ft	39.32	1,652.90	Centralizer
43	61 lb/ft	38.26	1,691.16	
44	61 lb/ft	39.29	1,730.45	
45	61 lb/ft	41.21	1,771.66	Centralizer
46	61 lb/ft	41.18	1,812.84	Cement basket

XRC-29e

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

CASING RECORD
RRGE-1 - PRODUCTION CASING - 13 3/8-INCH O.D.
DATE INSTALLED - FEBRUARY 22, 1975

Joint No.	Weight	Measured Length (ft.)	Cumulative Length (ft.)	Remarks
47	61 lb/ft	41.08	1,853.92	
48	61 lb/ft	40.62	1,894.54	Centralizer
49	61 lb/ft	41.74	1,936.28	
50	61 lb/ft	40.07	1,976.35	
51	54.5 lb/ft	42.70	2,019.05	Centralizer
52	54.5 lb/ft	41.66	2,060.71	
53	54.5 lb/ft	40.93	2,101.64	
54	54.5 lb/ft	43.20	2,144.84	Centralizer
55	54.5 lb/ft	41.94	2,186.78	
56	54.5 lb/ft	41.11	2,227.89	
57	54.5 lb/ft	39.21	2,267.10	
58	54.5 lb/ft	33.88	2,300.98	
59	54.5 lb/ft	42.00	2,342.98	
60	54.5 lb/ft	41.43	2,384.41	
61	54.5 lb/ft	42.08	2,426.49	
62	54.5 lb/ft	42.44	2,468.93	
63	54.5 lb/ft	41.97	2,510.90	
64	54.5 lb/ft	40.91	2,551.81	
65	54.5 lb/ft	39.94	2,591.75	
66	54.5 lb/ft	39.48	2,631.23	
67	54.5 lb/ft	40.76	2,671.99	
68	54.5 lb/ft	41.16	2,713.15	
69	54.5 lb/ft	40.54	2,753.69	
70	54.5 lb/ft	43.26	2,796.95	
71	54.5 lb/ft	34.57	2,831.52	
72	54.5 lb/ft	38.35	2,869.87	
73	54.5 lb/ft	40.59	2,910.46	
74	54.5 lb/ft	40.25	2,950.71	
75	54.5 lb/ft	39.70	2,990.41	
76	54.5 lb/ft	39.48	3,029.89	
77	54.5 lb/ft	41.21	3,071.10	
78	54.5 lb/ft	39.03	3,110.13	
79	54.5 lb/ft	43.21	3,153.34	
80	54.5 lb/ft	40.18	3,193.52	
81	54.5 lb/ft	40.47	3,233.99	
82	54.5 lb/ft	40.16	3,274.15	
83	54.5 lb/ft	38.72	3,312.87	
83	54.5 lb/ft	40.16	3,274.15	
84	54.5 lb/ft	37.33	3,350.20	
85	54.5 lb/ft	35.22	3,385.42	
86	54.5 lb/ft	40.25	3,425.67	
87	54.5 lb/ft	41.54	3,467.21	
88	54.5 lb/ft	33.77	3,500.98	
89	54.5 lb/ft	38.02	3,539.00	
90	54.5 lb/ft	37.35	3,567,35	
91	54.5 lb/ft	34.84	3,611.19	
92	61.0 lb/ft	40.06	3,651.25	Landing Joint

Total casing length: 3,651.25 feet
Casing setting depth: 3,623.00 feet (G.L.)

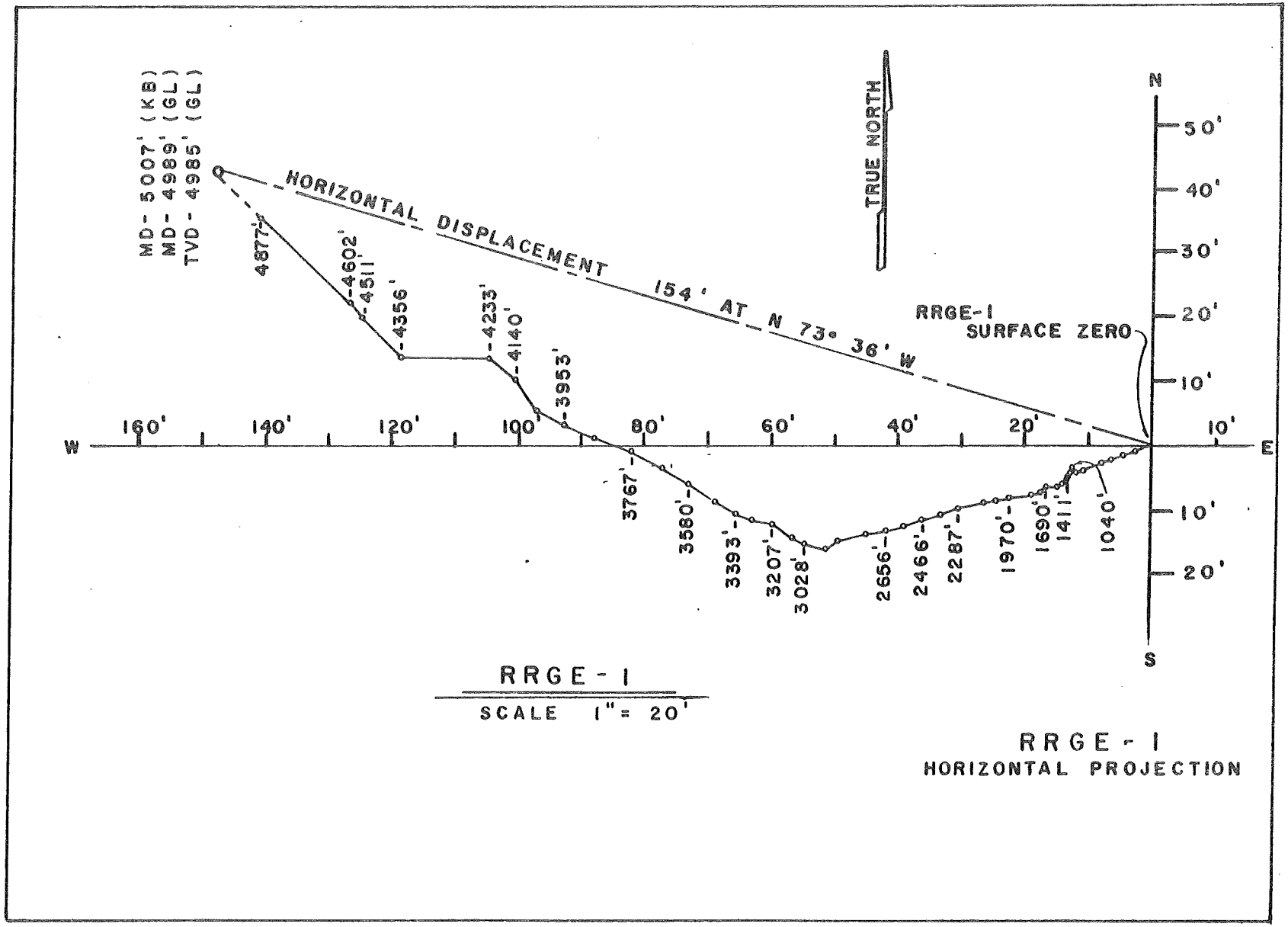
NOTE: All 61.0 lb/ft casing type K-55; all 54.5 lb/ft casing type H-40.

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.

RAFT RIVER GEOTHERMAL EXPLORATORY HOLE NO. 1
RRGE #1
BIT RECORD

PUMP LINER SIZE: 7-1/4"
DRILL FLUID BELOW 20" CASING: H_2O

BIT	MILL	MAGNET	GLOBE	Make	Size	Type	JETS 32nd In	Serial	Depth Out (RKB)	Feet	Hours	Wt. 1000 lbs.	RPM	Pump Press	SPM	Dull. Cond. / T/ B/ G/ Other	Formation Remarks
1				Security	15"	MDJ	Open	1607	920	864	35-3/4	5/10	80	200	62	6 4 I	Mud Weight 9.2; Vis.-45
				Hole Opener	26"				OPEN 15" HOLE TO 26" to 918'								Run 20" casing to 918'
2				Smith	12-1/4"	DTJ	14-14-15	AP835	1,521	603	17-3/4	5/10	80	1,250	62	5 2 0 3/16"	
3				Smith	12-1/4"	DTJ	14-14-15	AP854	2,142	621	15-1/2	5/10	80	1,250	62	5 3 0 1/8"	
4				Smith	12-1/4"	DTJ	14-14-15	AP756	2,635	493	18-1/4	5/10	80	1,300	62	5 2 0 1/8"	
5				Smith	12-1/4"	DTJ	14-14-15	AP224	3,091	456	20	5/10	80	1,350	62	4 3 0 3/8"	
6				Smith	12-1/4"	DTJ	14-14-15	AP875	3,533	442	20-3/4	10/15	80	1,400	62	4 5 0 3/16"	
7				Smith	12-1/4"	DTJ	14-14-15	AP791	4,030	497	20	5/10	80	1,400	62	3 4 0 1/8"	
8				Smith	12-1/4"	DTJ	14-14-15	AP703	4,495	465	21	5/10	80	1,400	62	3 4 0 1/8"	
Core #1				Christensen	8-3/4"x4"	MC-20 Diamond	Diamond	4545257	4,555	60	4-1/4	10/15	60	500	30		Rec. 23' core
9				Smith	12-1/4"	DTJ	14-14-15	AP876	4,650	155	14	20	85	1,400	62	8 8 0	1 cone missing; all bearings missing.
10				Smith	15"	DSJ	Open		Open 12-1/4" hole to 15" from 918' to 3,642'								
11				Smith	12-1/4"	DTJ	Open	AP894	Drilled out cement 2,835' to 3,325' junk @ 3,325							4 4 0 1/8"	Drlg. on casing
12				Security	9-7/8"	M44N	Open	443214	(Used) Drill 2" on collapsed casing @ 3,325'							4 4 0 1/8"	
	1			McNutt	11-3/4"	Flat Bottom Mill			Milled collapsed 13-3/8" casing from 3,325' to 3,331'								
	2			Servco	12-1/4"	Flat Bottom Mill			Milled out 11-3/4" hole from 3,325' to 3,331'								
13				Security	8-1/2"	M44N	Open	572913	Run in on junk and collapsed casing @ 3,325'							3 1 I	
	3			McNutt	12-3/8"	Flat Bottom Mill			Milled from 3,283' to 3,285'; 3,325' to 3,325-1/2"								
	4			Servco	12-1/4"	Flat Bottom Mill			Milled casing from 3,328' to 3,333'								
	5			McNutt	12-3/8"	Tapered Mill			Milled casing from 3,320' to 3,338'								
		1-2		McNutt	9"	Magnet			Recovered--metal (2 big pieces looked like junk sub skirt)								
	6			McNutt	12-1/4"	Flat Bottom Mill			Milled casing from 3,332' to 3,338'								
	7			McNutt	8-1/2"	Tapered Mill			Milled casing								
	8			Servco	8-3/4"	Tapered Mill			Milled cement out of casing from 3,370' to 3,585'								
	9			Servco	12-1/4"	Tapered Mill			Milled cement and junk from 3,571' to 3,584'								
			1	Globe	11-1/4"	Basket			Cored from 3,584' to 3,585' no recovery								
		3-9		McNutt	9"	Magnet Basket			Made 7 runs and recovered about two-2 lb. cans full								
Rerun Bit #5				Smith	12-1/4"	DTJ	B-Open-Open	AP224	Try to get by junk @ 3,585'-could not-broke 5 teeth off -got junk in sub								
		10		McNutt	9"	Magnet Basket			Rec'd 2 cups of junk								
Rerun Bit #3				Smith	12-1/4	DTJ	B-Open-Open	AP854	Try to get by junk @ 3,585.50'--could not								
		11		McNutt	9"	Magnet Basket			Rec'd full shoe of junk								
		12		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd cup full of junk								
	10			Servco	12-1/4"	Flat Bottom Mill			Milled on junk 3,586' to 3,590'--junk sub skirt torn up								
		13		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd 1/2 cup of junk								
	11			Servco	12-1/4"	Flat Bottom Mill			Milled from 3,587' to 3,590'								
		14		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd full cup junk from Magnet; 2 cups from junk sub								
		15		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd very little junk from Magnet or junk sub								
	Rerun Mill #8			McNutt	8-3/4"	Tapered Mill			Milled thru junk from 3,587' to 3,590' and cement 3,590 to 3,591								
	12			Servco	9-3/4"	Tapered Mill			Milled thru bottom Plug, diff. float collar/and cement from 3,591' to 3,631'								
	13			Servco	12-1/4"	Tapered Mill			Milled thru 3,587', diff. float collars and cement in casing to 3,631'								
		16		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd piece of casing 2'7" long 7" wide; pieces of junk in sub @ 3,629'								
		17		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd 12-1/4" and 8-3/4" mill nose cone and ten-1" pieces of junk @ 3,631.73								
		18		Bowen (Acme)	11-1/2"	Magnet Basket			Rec'd 4 pieces of junk in Magnet, 1 cup cement and 2 pieces aluminum junk in basket								
14				Smith	12-1/4"	DGHT	15-14-15	AW503	4,645	1012	25-1/4	3	70	1,400	65	3 3 0	Drld. cement & sand plug from 3,633'
			2	Globe	11-1/4"	Basket			4,645	Recov. 1 bit cone							
			3	Globe	11-1/4"	Basket			4,645	Recov. 2 pieces formation							
		19		Bowen (Acme)	11-1/2"	Magnet Basket			4,651	Recov. 17 bearings; 7 bolts							
15				Smith	12-1/4"	DGAT	15-14-14	AB899	4,686	36	4-1/2	20	65	1,400	64		Pulled to core
Core #2				Christensen	8-3/4"x4"	MC-20 Diamond		4545520	4686-4698	12	6-1/2	18	65				
16				Security	11	M-88	14/32	5881198	5,005	307	34-1/4	20	45	1,550	62	5 5 0 1/2"	
Rerun Core Bit #1				Christensen	8-3/4"x4"	MC-20 Diamond		4545257	5,007	2	4	20	42	800	24		
16	13	19	3														


MD - 5007' (KB)
MD - 4989' (GL)
TVD - 4985' (GL)
HORIZONTAL DISPLACEMENT 154' AT N 73° 36' W
TRUE NORTH
RRGE-1
SURFACE ZERO
N
S
E
W
4877'
4602'
4511'
4356'
4233'
4140'
3953'
3767'
3580'
3393'
3207'
3028'
2656'
2466'
2287'
1970'
1690'
1411'
1040'
160'
140'
120'
100'
80'
60'
40'
20'
10'
50'
40'
30'
20'
10'
10'
20'
RRGE - 1
SCALE 1" = 20'
RRGE - 1
HORIZONTAL PROJECTION