

GEOHERMAL BRANCH

INTER-OFFICE MEMORANDUM

SUBJECT: Alum Hole 21-30 Temperatures January 7, 1983
Alum Project, Esmeralda County, Nevada
cc: GT Files


TO: H. J. Olson, W. M. Dolan, H. D. Pilkington

FROM: J. E. Deymonaz

On December 10 a preliminary temperature log was run in Alum hole 21-30. The hole was completed on November 16 so temperatures in the upper portion of the hole may not as yet equilibrate. The gradient from 60-90 meters was 134°C/km and from 190-602 meters the gradient was 113°C/km. Bottom hole temperature was 90.89°C. These gradients agree well with nearby shallow gradient holes and indicate conductive heat transfer to temperatures in the 100°C or higher range over a substantial portion of the area.

The unusually straight line nature of the gradient reflects the relatively uniform bulk thermal conductivity of the shales and siltstones encountered. It also indicates a lack of any substantial lateral flow of groundwater in the section drilled. Assuming a conductivity of 5.0 in the upper 190 meters, an increase to 5.93 would be required deeper in the section which is a reasonable value for this rock type.

In hole 56-29, drilled to a depth of 1490 feet, 1.6 miles to the southeast, a 105-118°C convective hot water system was encountered. Hot water at 56-29 was contained in buried horst block of fractured Paleozoic siltstones. The Paleozoic rocks have considerable fracture permeability and are "capped" by the less permeable Tertiary Esmeralda formation. If the Paleozoic section acts as a similar reservoir beneath 21-30 and contains 105°C water, the top of the Paleozoic section would lie at approximately 2440 feet if the 113°C/km gradient continues to that temperature. This depth is in good agreement with depth to basement estimated from the gravity data.


J. E. Deymonaz

JED/c

(4199A)

Alum 21 - 30 Drill Summary

- 11/3 Parsons construction built drill pad, dug pits and bladed access road. H & H delivered BOP equipment.
- 11/4 Moved Superior drill rig to location, set up.
- 11/5 Completed rigging up, drilled 10 1/4" hole w/ air 0-206'.
- 11/6 Set 206' of 7" casing and cemented with 2.7 yards of 7 sack sand mix. Dig out 2 foot deep cellar.
- 11/7 Install and test BOPE. Fix rig lights and string new drawworks cable. Drill 6 1/4" hole 206'-880'. Encounter first water at 800'.
- 11/8 Drill with air and 6 1/4" hole 880-946, increasing amounts of water. Mix mud, attempt to control LC, POH, change bit, RIH, continue drilling 946-1256'. Mud temp: In 81 F, Out 92 F.
- 11/9 Drill from 1256-1436 with 6 1/4" soft fm. mill tooth bit, with 20-30'/hr penetration, formation change to shales at 1436', penetration 3'/hr. POH, change to 6 1/4" chisel tooth button bit, RIH, mix mud, haul water, drill from 1436-1486 with penetration 5-10'/hr. Mud temp: In 86 F, Out 96 F.
- 11/10 Penetration 3-6'/hr 1486-1587', clay rings forming above pit sticking pipe briefly twice. Solved problem by pulling Kelley up about every five feet to clean hole. Mud temp: In 89 F, Out 104 F.
- 11/11 Soft shales in hole raising vis to over 70, shut down, dig additional pits, haul water, mix low vis polymer mud, condition hole, resume drilling from 1587-1650', penetration 5-10'/hr. Mud temp: In 85 F, Out 102 F.
- 11/12 Drilling 1650-1734', penetration 3-6'/hr. Shut down for repairs to swivel, POH at end of shift. Mud temps: In 90 F, Out 105 F.
- 11/13 Change to 6 1/4" drag bit, RIH, bearings on Kelley swivel froze up, shut down for repairs.
- 11/14 Drilling with 6 1/4" drag bit 1734-1778', POH, change to 5 7/8" chisel tooth button bit, RIH, drill 1778-1818'.
- 11/15 Haul water, dig additional mud pits, mix low vis mud, drilling from 1818-2006' with penetration 15-22'/hr. Mud temp: In 96 F Out 104 F. Birdwell Geophysics arrived at 11:30 p.m.
- 11/16 Birdwell ran SP, gamma, induction, caliper, and 3-D sonic logs till 1 p.m. Crew removed BOPE, ran 2" tubing, built fence around pits, rigged down.

LITHOLOGIC LOG

Project: Atum

Hole: 21-30

Elevation: 4960

Date Drilled: 11/16/82

Location: NE 1/4 NW 1/4 NW 1/4 S30T1NR38 1/2E Method: rotary air/mud
 MDBM

Geologist: Deymonaz

Gamma: N/A

Depth ^{FT} (m)	Description
-------------------------	-------------

0-1295
(0-395)

Siltstones and Shales - Esmeralda Formation, light tan, yellow and pale green thinly bedded siltstone and sandy siltstones with lesser amounts of light colored shales and sandy shales. At surface beds dip 8-12° south and contain numerous veins of gypsum, generally following bedding planes and to a lesser extent following small fractures. The rock type remains very uniform from the surface. A few small hard zones (less than 2 feet thick) may have been thin silicified sandstone lenses but no cuttings were recovered. Considerable water encountered from 850-920 feet (259-280m) although no large fractures were identified. Drilling continued with high viscosity mud and L.C.M. below 920 feet (280m) and very few cuttings were recovered below that depth. Resistivity 2-12Ωm.

1295-1446
(395-441)

Shale and Siltstone - Esmeralda Formation, dark gray shale, thinly laminated shales and sandy shales, rare pyrite. Very poor sample recovery. Drill rate slowed to 30-40 feet/hour, resistivity dropped to about 1Ωm, borehole wall holding up well.

1446-1720
(441-524)

Shale - Esmeralda Formation, dark gray thinly laminated shales and sandy shales with minor thin yellow-brown siltstones. Similar to above interval except much softer, drilling rate 2-5 ft/hour, quickly increases mud viscosity and forms clay rings above bit. Caliper log shows this interval washed out to 7-8 inches with numerous small blocks of rock which have dislodged from borehole wall. Resistivity 1-6Ωm.

1720-2006
(524-612)

Shale and Siltstone - Esmeralda Formation, dark gray shale as above except harder with 10-15% interbedded yellow-brown sandy siltstone. Resistivity 1-2Ωm.

HOLE 21-30

