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Savage Island Project Borehole Completion Report

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Summary

Three wells were drilled in 1990 and 1991 in support of Pacific Northwest Laboratory's Ground-Water Surveillance Project. These wells were intended to monitor the Rattlesnake Ridge interbed aquifer and the deeper portion of the unconfined aquifer to determine whether ground-water contamination emanating from the Hanford Site was migrating offsite through these aquifers. This report discusses well construction, lithologies encountered, and other data collected during drilling. At least three reports have been or are being prepared to discuss the results of this well monitoring project.

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Conversion Table

English units are used as the primary convention in the text, figures, and tables. The following conversion table may be used to convert English units to associated metric values.

Multiply	By	To Obtain
inches	2.540	centimeters
feet	0.3048	meters
miles	1.6093	kilometers
gallons	3.7854	liters
gallons/min	0.0631	liters/sec
cubic feet	0.0293	cubic meters

Introduction

In 1990 and 1991 three wells, 699-42-E9A, 699-42-E9B, and 699-32-22B, were constructed on and adjacent to the Hanford Site for the Pacific Northwest Laboratory's (PNL's) Ground-Water Surveillance Project (Figure 1). The construction of these wells was in support of the U.S. Department of Energy (DOE) Quality, Safety and Health Programs Division mission. Environmental surveillance is conducted by PNL to monitor the effects, if any, of DOE activities to onsite and offsite environmental and natural resources (DOE Order 5400.1). The primary objective in constructing these wells is to determine if chemical and radiological constituents resulting from operations at the Hanford Site are migrating offsite in the Rattlesnake Ridge interbed, an upper confined aquifer. A secondary objective is to determine the vertical gradient across the basalt unit confining the Rattlesnake Ridge interbed.

The uppermost confined aquifer is contained in the Rattlesnake Ridge interbed between two members of the Columbia River Basalt Group, the Elephant Mountain and Pomona Members. Two of the three wells, 699-42-E9B and 699-32-22B, were completed in the Rattlesnake Ridge interbed while the third well, 699-42-E9A, was completed in the sediments immediately above the basalt. Wells 699-42-E9A and 699-42-E9B are located approximately 100 ft apart, on the east side of the Columbia River near Savage Island and directly across the river from the highest reported concentration of tritium in the unconfined aquifer. Well 699-32-22B is located on the Hanford Site approximately 5 miles east of the 200 East Area. The location of this well is downgradient of reported contamination in the Rattlesnake Ridge hydrogeologic unit at wells 699-42-40C and 699-47-42 (Early et al. 1986; Jaquish and Bryce 1989). Well 699-32-22B is located approximately 50 ft south of well 699-32-22A, which monitors the uppermost unconfined aquifer discharging to the Columbia River. This location was chosen to take advantage of well 699-32-22A for analytical and water level comparisons between the two aquifers.

Scope

This report provides a summary of the drilling, well completion, well development, geology, geophysical logs, and analytical results of chemical and radiological analyses of ground-water samples collected during drilling. A companion report discusses the hydrologic testing of these wells and their results (Spane 1992).

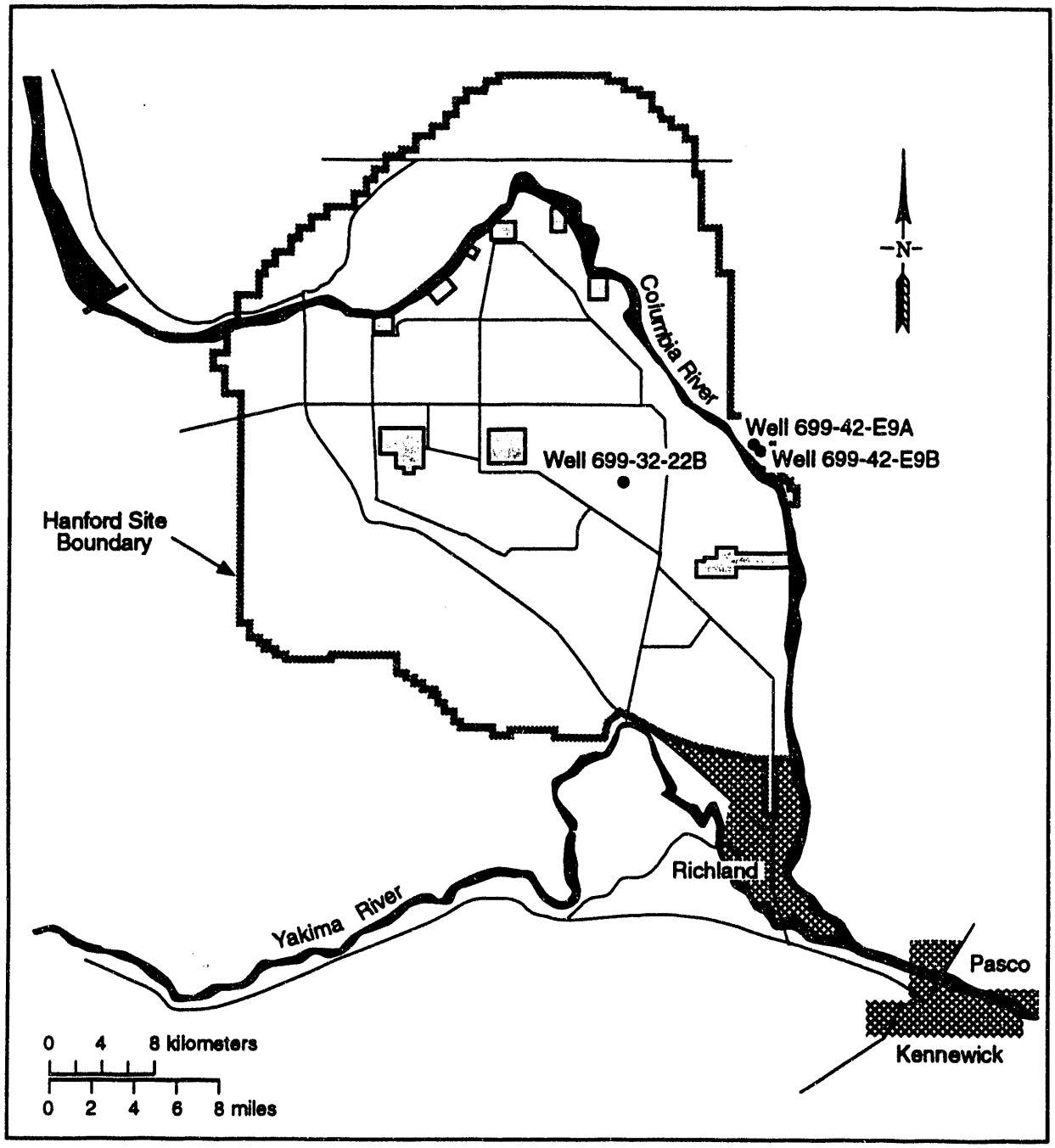

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Figure 1. Savage Island Well Location Map

Methodology

PNL supervised the drilling and installation of the wells and Kaiser Engineers Hanford (KEH) provided contract management of the drilling subcontractors. Under contract to KEH, Basin and Range Drilling Company of Spanish Fork, Utah, drilled and constructed well 699-42-E9A, and Jensen Brothers Drilling Company of Eugene, Oregon, drilled and constructed wells 699-32-22B and 699-42-E9B.

Geologic samples were collected and described in accordance with PNL procedures (PNL 1989). Geologic samples were collected from each well at 5-ft intervals or at major changes in lithology, and described on geologists' logs along with daily activities at the well site. These logs, the field as-built diagrams, and well-completion summaries are presented in Appendix A for each of the wells. Figure 2 provides a key to the computer-drawn as-built diagrams included with the discussion of each well. In addition to a field description of the lithology, two pint jars were collected at each sample depth for archival in the sample library at the 2101-M building in the 200 East Area of the Hanford Site. Geophysical logs were run on each of the wells to help identify geologic units, diameter of the borehole, and zones of water inflow. Table 1 lists the types of logs and the interval logged for each of the wells. The gross gamma and caliper logs are provided in Appendix A with their respective geologic logs. Table 2 provides a summary of well construction information for each of the wells, including 699-32-22A. Design Field Changes and Nonconformance Reports are provided in Appendix B.

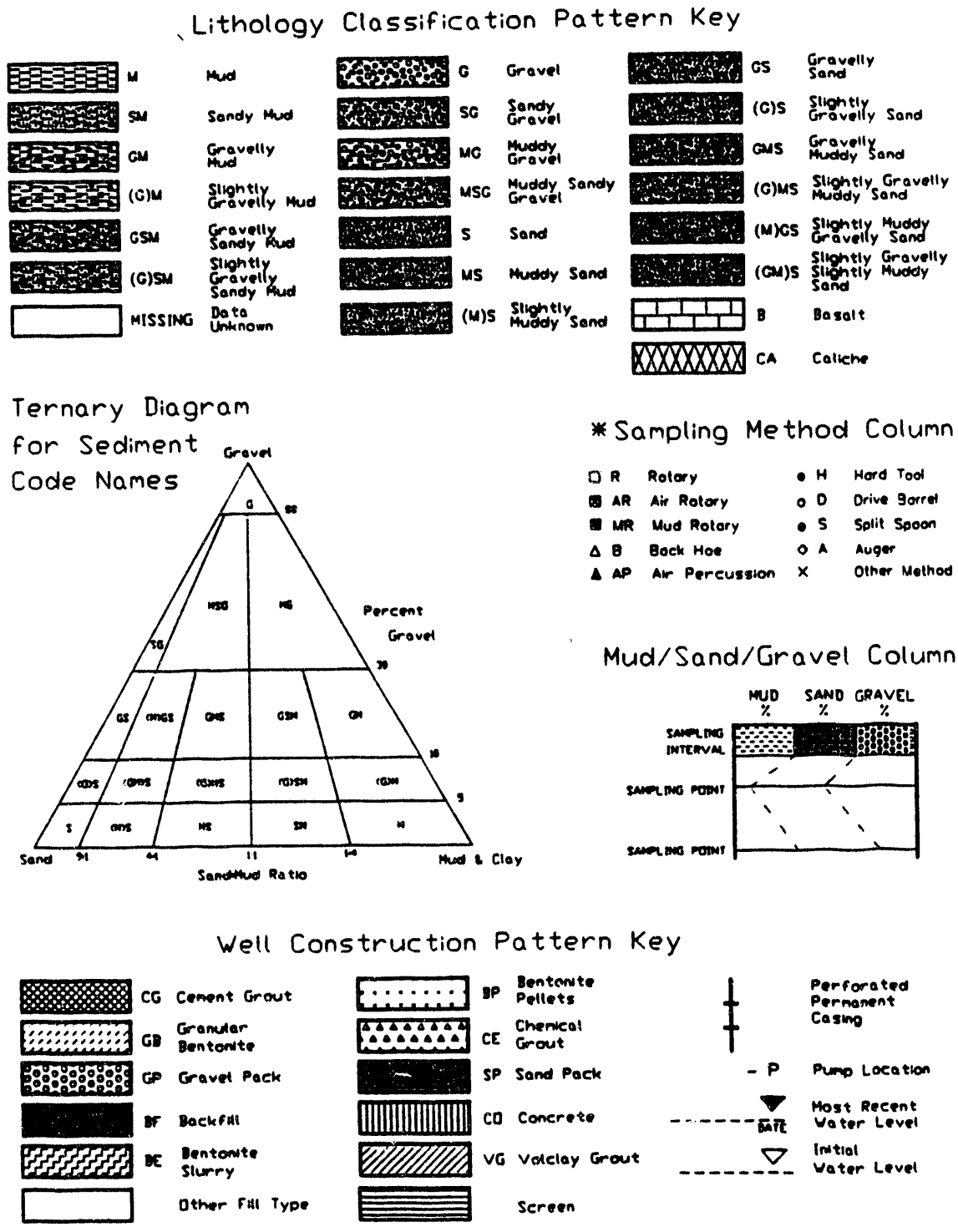


Figure 2. Key to Computer-Drawn As-Built Diagrams

Table 1. List of Geophysical Logs Run for Each Well

Well Number	Date	Probe Type	Interval Logged (ft)
699-42-E9A	12/4/90	GROSS GAMMA	0.5 - 138.3
"	12/13/90	GROSS GAMMA	1.0 - 230.6
"	12/14/90	TEMPERATURE	0.0 - 230.0
"	12/14/90	CALIPER	90.0 - 228.0
"	12/14/90	GROSS GAMMA	130.0 - 230.3
699-42-E9B	2/28/91	CALIPER	4.9 - 227.3
"	2/28/91	SP&R	0.0 - 227.0
"	2/28/91	GROSS GAMMA	0.0 - 227.0
"	2/28/91	SONIC BOND	30.0 - 222.0
"	2/28/91	TEMPERATURE	0.0 - 227.0
"	3/4/91	GROSS GAMMA	1.4 - 228.6
"	3/7/91	SONIC BOND	2.6 - 195.0
"	3/18/91	GROSS GAMMA	200.0 - 284.8
"	3/18/91	CALIPER	220.0 - 284.8
"	3/18/91	MAGNETIC	220.0 - 284.0
"	3/18/91	SP&R	220.0 - 284.1
"	3/25/91	CALIPER	0.0 - 353.0
"	3/25/91	SP&R	0.0 - 352.3
"	3/25/91	GROSS GAMMA	209.8 - 353.7
"	3/27/91	GROSS GAMMA	320.0 - 388.0
"	3/27/91	CALIPER	220.0 - 387.0
"	3/27/91	SP&R	225.0 - 387.4
"	3/27/91	MAGNETIC	215.0 - 387.1
699-33-22B	5/20/91	CALIPER	4.4 - 648.0
"	5/20/91	GROSS GAMMA	2.6 - 656.0
"	6/18/91	GROSS GAMMA	620.0 - 838.5
"	6/18/91	CALIPER	620.0 - 837.0
"	6/18/91	TEMPERATURE	500.0 - 837.0
"	10/18/91	GROSS GAMMA	2.6 - 831.0
"	10/18/91	CALIPER	4.1 - 829.0

Table 2. Summary of Well Construction Information

Well Number	Hanford Coordinates	Casing Elevation (ft)	Drilled Depth (ft)	Completed Depth (ft)	Initial Depth to Water	Well Diameter	Screened Interval	Comments
699-42-E9AO	N41,970 E8,350	387.13	233	41.55	28.01	2	21.13-41.55	
699-42-E9AP	N41,970 E8,350	387.13	233	0	26.67	3		Abandoned.
699-42-E9B	N41,775 E8,452	386.42	390	384	22	6	354-384	
699-32-22A	N32,003 W21,995	517.55	171	168	115	6	111-169	
699-32-22B	N31,935 W21,982	516.93	841.5	836	110	6	774.6-836	

Discussion

Well 699-42-E9A

Drilling Operations

Well 699-42-E9A was drilled using a Bucyrus Erie 22-W cable tool drilling rig using the drive barrel, split-spoon, and hard-tool methods. Drilling operations began on November 12, 1990, and continued until December 12, 1990. The well was drilled to a final depth of 233 ft below land surface (bls) at the top of the Elephant Mountain Member basalt. Temporary carbon steel 12-in. diameter casing was placed from the surface to a depth of 15.5 ft. Temporary 10-in. casing was placed from the surface to 139.7 ft, and temporary 8-in. casing was placed from the surface to 194.91 ft.

Sediment Sampling

Lithologic sediment samples were collected at 5-ft intervals in two pint jars from the surface to the final depth of the well. In addition, split-spoon sediment samples were collected over approximately 2-ft intervals in a few locations. The locations of the split-spoon samples are identified in the sampling method column in Figure 3. Split-spoon samples collected from this borehole were used for a variety of analyses and measurements including microbiology, hydraulic conductivity, sieve size, and background sediment chemistry.

Vertical Hydraulic Conductivity Measurements

Laboratory vertical hydraulic conductivity was determined for two split-spoon samples collected at 43.3 ft and from 149.5 to 151.2 ft. The upper sample was a sandy gravel, packed into the test cylinder at a density of 1.78 g/cm^3 and had an average hydraulic conductivity of 4.6 E-3 cm/sec. The lower sample was a sandy mud with 20% very fine sand that was tested within the sample collection tube and had an average hydraulic conductivity of 1.0 E-6 cm/sec.

Background Sediment Samples

To help determine background levels of various constituents in soil at the Hanford Site, soil samples were collected by Westinghouse Hanford Company personnel in the unsaturated zone. The results from these and other samples are provided in DOE (1992).

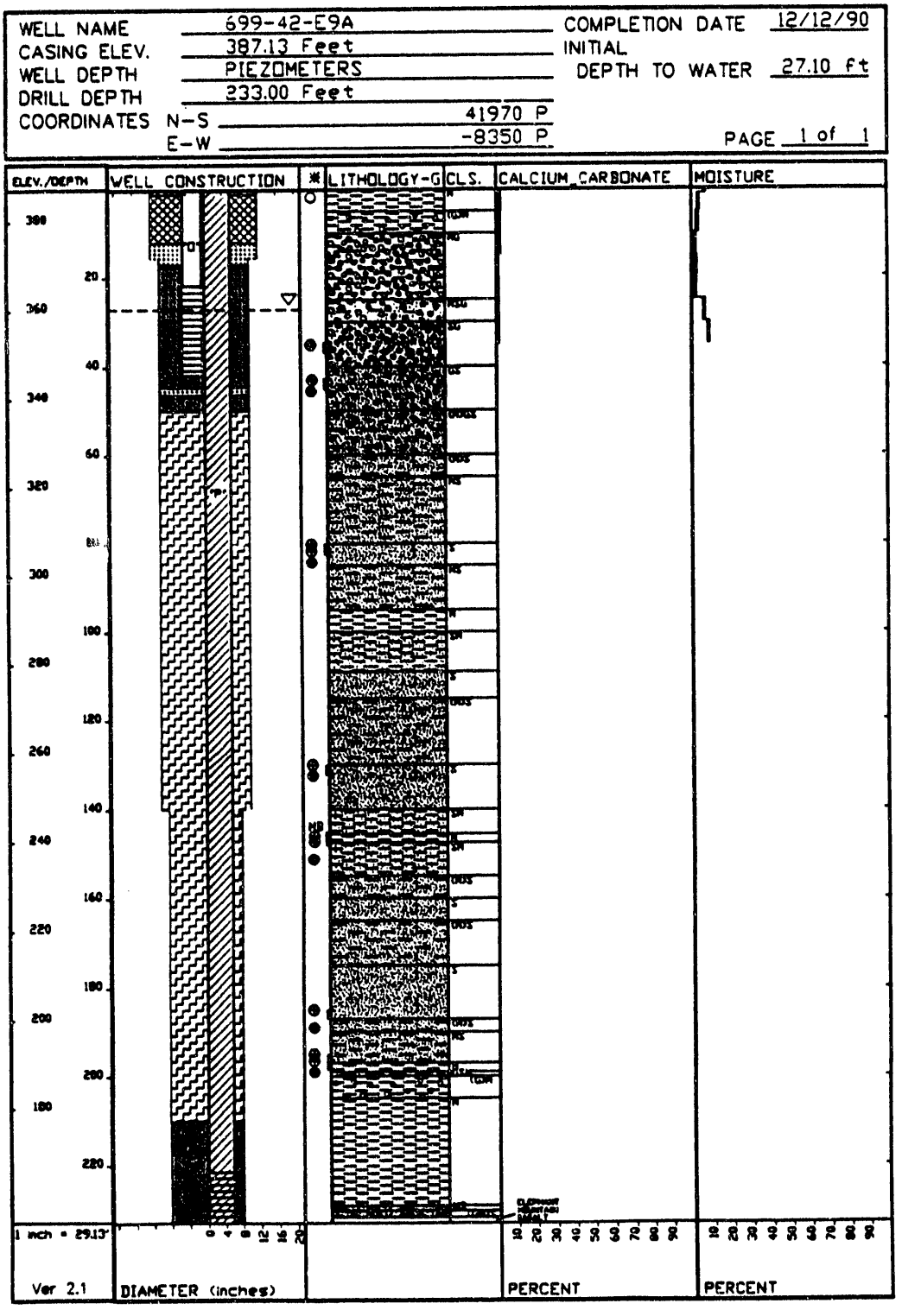


Figure 3. As-Built Diagram for Well 699-42-E9A

Microbiology Samples

Microbiologic sampling of two split-spoon samples was performed within the Ringold Formation. These sample locations are identified on Figure 3 by the "MB" in the sample method column. Special sampling procedures were followed to assure aseptic sampling conditions to reduce the risk of contaminating the samples with microbes. The results of these samples have not yet been documented.

Basalt Samples

Basalt samples were sent to Dr. Peter Hooper of Washington State University for X-ray fluorescence analysis and determination of basalt flow stratigraphy. All of the samples were identified as basalt from the Elephant Mountain Member.

Ground-Water Sampling During Drilling

During drilling, ground-water samples were collected for nitrate and tritium to determine whether contamination existed in the unconfined zone, and if so, to define the specific contaminated hydrogeologic unit(s). The results were also to be used to help determine the completion interval(s). These sample depths and results are presented in Table 3. No significant zones of elevated concentrations of either tritium or nitrate were identified. Because no contamination was observed, the secondary objective of determining the vertical gradient through the basalt unit was used in choosing the two completion intervals.

Completion

The well was initially completed at two intervals, one at the bottom of the borehole located just above the basalt surface (699-42-E9AP) and the other at the top of the unconfined water table (699-42-E9AO). For more detailed completion information, an as-built diagram of the well is shown in Figure 3, and the geologists' logs are provided in Appendix A. The deeper completion was constructed of 3-in. dia fiber glass casing and screen with a 0.08-in. wall thickness and a screened interval from 220.25 and 231.25 ft bls. The shallow completion was constructed of 2-in. dia PVC casing with a 20-slot screen set from 21.1 to 41.5 ft bls. The annular seals outside the two permanent casings are shown in Figure 3 and are specifically listed on the well completion summary in Appendix A. Each of the screened intervals was surrounded by sand pack and sealed off from the other by bentonite slurry and pellets. The annular seal meets the Washington State codes for monitoring wells (WAC 173-160). Protective casing and guardposts were installed at the surface, along with a locking well cap. A brass marker was installed in the concreted pad and was stamped with the well number, which was also stenciled on the protective casing.

Table 3. Ground-Water Analytical Results for Well 699-42-E9A

Date	Drill Depth (ft)	Open Interval (ft)	Nitrate (ppm) (a)	Tritium (pCi/L) (b)
11/15/90	44	43.5 - 44.0	1	<500
11/26/90	50	43.5 - 50.0	1.26	<500
11/27/90	85	43.5 - 85.0	1.26	<500
12/3/90	115	94.3 -115.0	1	<500
12/4/90	145	138.0 -145.0	0.4	<500
12/5/90	180	None	1.64	<500
12/10/90	205	195.0 - 205.0	0.4	<500
12/11/90	230	195.0 - 230.0	6	<500
12/13/90	239	195.0 - 239.0	6.4	<500

(a) Nitrate detection level is 0.2 ppm.
(b) Tritium detection level is 437 pCi/l.

Well development and a pumping test were attempted in the deeper completion. The water level rapidly drew down to the level of the pump intake and the pump stopped. Although the water level came back up after the pump stopped, the pump would not work. When efforts were made to pull the pump out of the well, it was found that the fiber glass casing had collapsed inward. There were at least two tight spots in the casing at 157 and 176 ft, and one hole in the casing was verified by a downhole camera at 157 ft. The pump used during the well development/pumping test could not be removed from the well because of the collapsed casing at 157 ft.

The manufacturer's specifications for the casing strength and size were rated to be compatible with this application. A Nonconformance Report (PNL-91-002) details the occurrence of the casing failure (Appendix B). The deeper completion (699-42-E9AP) was abandoned by pushing the pump down the well to 220 ft bls and the 3-in. casing was filled with volclay grout. The well was completed on January 10, 1991. The shallow completion (699-42-E9AO) remains as a functioning monitoring well at this site.

Development/Aquifer Tests

Following completion of the well, the shallow completion was developed by overpumping on January 23, 24, and February 5, 6, and 7. A Hydrostar pump was used for the well development. The discharge rate ranged from 5 to 7 gpm. The initial turbidity readings were off the scale of the turbidimeter at 100 NTU. A final turbidity reading of 14 NTU was reached following approximately 40 hours of pumping. The inability to clean the water to a lower NTU level resulted from the fine-grained nature of the sediment matrix over the screened interval.

Two aquifer tests were scheduled for the borehole: a slug test near the interval to be screened and a pumping test in the screened interval of the deeper completion. The slug test was performed in the open borehole over the 195- to 232-ft interval. The results are discussed in Spane (1992). The pumping test was not completed due to failure of the pump and collapse of the deeper completion's casing.

Well 699-42-E9B

Drilling Operations

Drilling of well 699-42-E9B began on February 14, 1991, and was completed on April 10, 1991. The well was drilled by Jensen Brothers using a Speedstar SS-15 III rotary drilling rig with both mud and air rotary and an air percussion hammer. Air rotary drilling and sampling was conducted from 0 to 40 ft and from 354 to 390 ft. Mud rotary drilling and sampling was conducted from 40 to 230 ft. The air percussion hammer was used to drill through the basalt, from 230 to 354 ft. The well was drilled through the Elephant Mountain Member into the top of the Pomona Member of the Columbia River Basalt Group at a depth of 390 ft. The well monitors the water-bearing zone between the two basalt flows. Ground water was initially encountered at 28 ft. Final depth to water was 22 ft. Aquifer tests were performed on the zone between the two Elephant Mountain flows (the interflow zone) between March 18 and 19, 1991, and on the completion interval (i.e., the Rattlesnake Ridge interbed/interflow zone) on April 18, 1991. The specific details and results of these tests are discussed in Spane (1992).

Sample Collection

Geologic samples were collected every 5 ft or at major changes in lithology. Sediment samples were collected from the air rotary and the air percussion discharge line with a sieve. Consequently, some of the finer-grained materials were probably lost by being washed through the sieve. A similar problem occurred with the mud rotary samples. During mud rotary drilling, the sediments were collected from the end of the shaker table, a large screen that the drilling mud flows across and through while the larger sediment particles fall off the far end. Most mud rotary samples had to be washed to remove excess drilling mud before the sediments could be viewed; this also removed some of the finer-grained sediment particles. On a few occasions, no sample was collected because of poor mud returns or because the sample was pulverized into such small particles that they washed through the sieve or shaker table. Samples are described in the geologists' logs in Appendix A, and are summarized in Figure 4.

Ground-water samples were collected as time series during the two aquifer tests performed on March 19 and April 18, 1991. Altogether, nine samples were analyzed for ICP metals, tritium, bicarbonate, carbon dioxide, and anions from the March test; the same constituents were analyzed for six samples collected in April (Table 4). The last sample from each aquifer test was also analyzed for iodine-129. Iodine concentrations are somewhat elevated compared

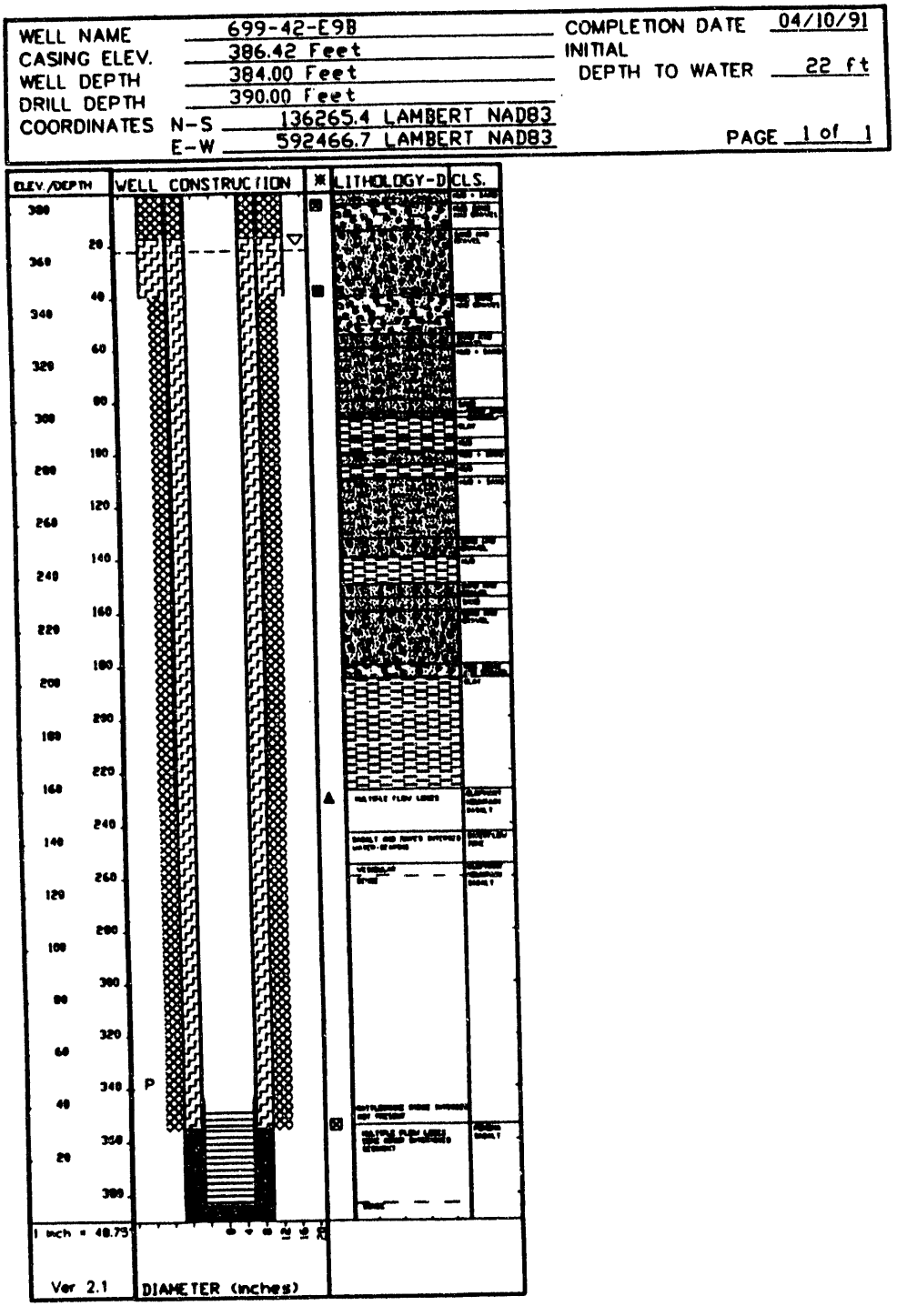


Figure 4. As-Built Diagram for Well 699-42-E9B

Table 4. Ground-Water Analytical Results for Well 699-42-E9B[a]

Time »	20:09	21:00	22:15	23:23	0:56	2:30	5:00	9:00	11:30	Detection
Date »	3/18/91	3/18/91	3/18/91	3/18/91	3/19/91	3/19/91	3/19/91	3/19/91	3/19/91	Limit
Nitrate (ppm)	<0.2	<0.2	<0.2	<0.2	<0.2	0.95	0.81	1.33	<0.2	0.2
Carbon Dioxide (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Bicarbonate (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.03
Boron (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Calcium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002
Chromium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Copper (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.002
Iron (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Sodium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2
Magnesium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.08
Manganese (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005
Nickel (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02
Potassium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.5
Barium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.001
Silver (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01
Cadmium (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005
Cobalt (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02
Molybdenum (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02
Lead (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05
Zinc (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02
Flouride (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2
Chloride (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2
Phosphate (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2
Sulfate (ppm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2
Iodine (E-6 pCi/L)	NA	NA	NA	NA	NA	NA	NA	NA	309.071(b)	
Tritium (pCi/L)	NA	NA	NA	NA	NA	NA	NA	NA	<500	500
Volatile Organics	All volatile organics were below detection limits.									

Time »	13:20	15:05	17:00	19:00	21:00	23:30	Detection
Date »	4/18/91	4/18/91	4/18/91	4/18/91	4/18/91	4/18/91	Limit
Nitrate (ppm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
Carbon Dioxide (mg/L)	10.5	6	4.8	7.3	5.3	8.8	0.01
Bicarbonate (mg/L)	143	147	150	145	150	142	0.03
Boron (mg/L)	0.05	0.12	0.12	0.05	0.1	0.09	0.01
Calcium (mg/L)	5.82	6.04	5.82	5.92	5.87	5.84	0.002
Chromium (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Copper (mg/L)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Iron (mg/L)	0.04	0.03	0.03	0.04	0.04	0.19	0.01
Sodium (mg/L)	77.4	80.4	78.8	81.3	80.1	78.5	0.2
Magnesium (mg/L)	1.3	1.37	1.39	1.42	1.4	1.39	0.08
Manganese (mg/L)	0.009	0.008	0.007	0.007	0.008	0.007	0.005
Nickel (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Potassium (mg/L)	10	10.4	9	8.7	10.7	9.3	1.5
Barium (mg/L)	0.014	0.014	0.014	0.012	0.014	0.014	0.001
Silver (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Cadmium (mg/L)	<0.05	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Cobalt (mg/L)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Molybdenum (mg/L)	0.04	0.05	0.05	0.05	0.05	0.05	0.02
Lead (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Zinc (mg/L)	0.08	<0.02	0.02	<0.02	<0.02	0.02	0.02
Flouride (ppm)	1.5	1.56	1.57	1.55	1.54	1.55	0.2
Chloride (ppm)	20.6	20	19.8	19.8	19.2	19.2	0.2
Phosphate (ppm)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
Sulfate (ppm)	44	43.7	43.6	43.7	43.6	43.7	0.2
Iodine (E-6 pCi/L)	NA	NA	NA	NA	NA	522.736	
Tritium (pCi/L)	NA	NA	NA	NA	NA	<500	500
Volatile Organics	All volatile organics were below detection limits.						

(a) Samples were collected over time during pumping tests.
(b) Duplicate sample result: 317.819.

to offsite confined aquifers. The source of the elevated concentrations is unclear and resampling is scheduled.

Completion

Figure 4 shows the as-built diagram for well 699-42-E9B, including construction information and geology. Copies of the well completion summary, field as-built diagrams, and geologists' logs are included in Appendix A. A summary of the well completion efforts is described here.

Temporary 16-in. carbon steel casing was placed to a depth of 39.6 ft. Permanent 10-in. carbon steel casing was placed to a depth of 231.45 ft and sealed in place with cement grout. This method involved attaching a float shoe to the bottom of the casing. Cement grout was pumped through this shoe and up the annulus to the surface, permanently cementing the casing in place and sealing off the unconfined aquifer. The unconfined aquifer had to be isolated before drilling any deeper to prevent communication between aquifers. The open borehole penetrating the basalt below the 10-in. casing was filled with cement grout twice and redrilled with a smaller bit to provide an additional seal against aquifer intercommunication. These cemented zones were from 205.6 to 285 ft, and 262 to 354 ft. Permanent 6-in. carbon steel casing was set at a depth of 354 ft. A telescoping stainless steel 10-slot screen with a 5-ft stainless steel blank with a packer on top and nominal diameter of 6 in. was placed from 354 to 384 ft.

The screened interval was surrounded by a sand pack. The remainder of the borehole was sealed with bentonite slurry and cement grout (see Figure 4 and Appendix A). To protect the well, a concrete pad 0.5 ft above ground to ground surface, an 8-in. protective casing, and four guardposts were installed. A brass marker was stamped with the well number, which was also stenciled on the casing.

Deviation surveys were run at approximately 110, 200, and 325 ft, and all were within the requirements of being no more than 1 degree/50 ft off of the vertical. The last deviation survey showed a deviation of 1.9 degrees over 325 ft. The well was considered completed and accepted on April 10, 1991.

Development/Aquifer Tests

After the screen and annular seal fill were installed, the well was developed using a 1 1/2-hp submersible pump with a check valve set at 80-ft depth pumping at approximately 30 gpm. The well was developed continuously for 3 hours in this configuration, and then periodically with the pump being turned off and on over 1 1/2 hours to surge the well. The water was discharged to the ground approximately 1000 ft to the south. The pump was then set at a depth of 350 ft, with a flow rate of from 43 to 45 gpm and pumped for a little over an hour, pumping a total of 2025 gal. Turbidity was measured during the development and went from a

high of over 15 NTU to 0.8 NTU. The development pump was pulled out, and the 3/4-hp submersible sampling pump was installed on February 19, 1992, with the inlet at 340 ft.

Well 699-32-22B

Drilling Operations

Well 699-32-22B was drilled using a Speedstar SS-15 III rotary drilling rig. The air rotary drilling method was used from depths of 0 to 101 ft and from 655.7 to 841.5 ft. The mud rotary drilling method was used from 101 to 655.7 ft. Drilling began on April 11, 1991, and continued until June 17, 1991, when a total depth of 841.5 ft was reached.

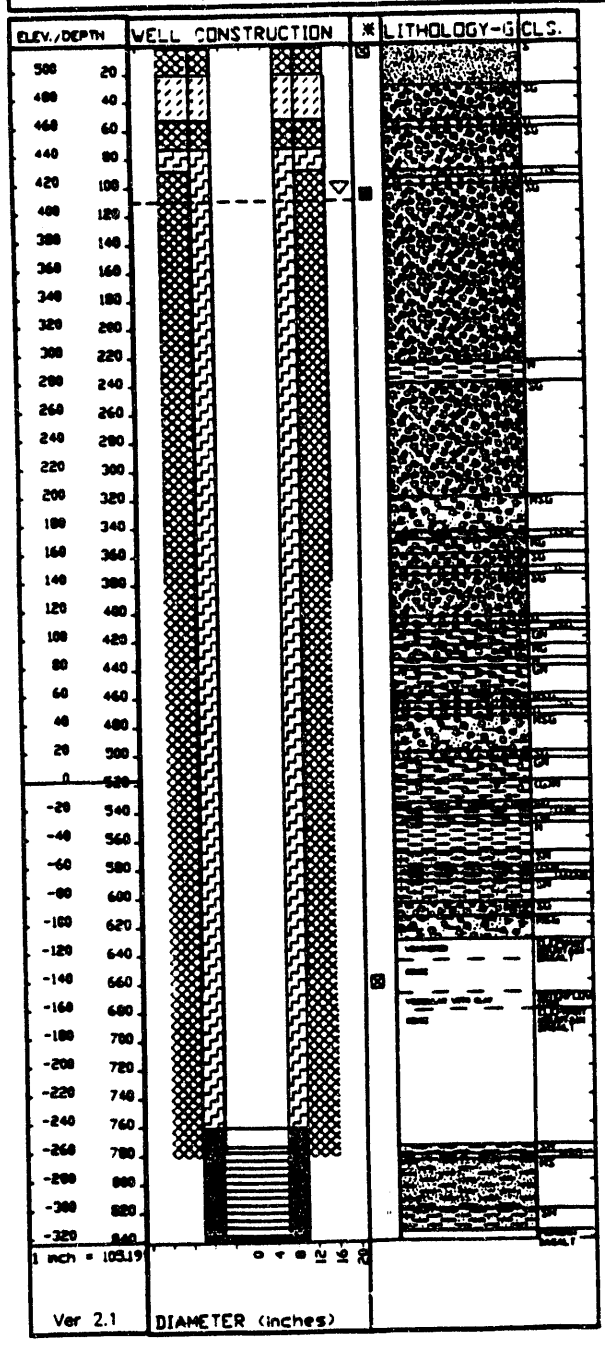
During drilling, a 16-in. carbon steel casing was used to a depth of 87.9 ft. No casing is needed when drilling with mud rotary because the mud is sufficiently dense to keep the borehole open. The borehole was advanced to a depth of 655.7 ft within the hard, dense portion of the Elephant Mountain Member. At this point, an unsuccessful attempt was made to remove the 16-in. carbon steel casing. A casing cutter was then used to cut the casing at 22.2 ft bls, and the upper portion of the casing was removed after installation of the 10-in. casing to ensure that a proper cement grout seal could later be installed. Permanent 10-in. carbon steel casing was installed from the surface to 655.4 ft and a float shoe was attached to the bottom of the casing. Cement grout was pumped through this shoe and up the annulus to the surface, permanently cementing the casing in place and sealing off the unconfined aquifer. The unconfined aquifer had to be isolated before drilling any deeper to prevent communication between aquifers. The zone penetrating the basalt and below the 10-in. casing was filled with cement grout and redrilled with a smaller bit to provide an additional seal against aquifer intercommunication.

Sample Collection

Sediment samples were collected from the air rotary discharge hose with a sieve. Consequently, some of the finer-grained materials were probably lost by being washed through the sieve. A similar problem occurred when sampling during mud rotary drilling. The finer-grained particles were lost through the shale shaker or when washed to remove drilling mud. Occasionally, no samples could be collected because of loss of air or mud circulation. Adding lost circulation material to the borehole during mud rotary drilling to prevent loss of mud to the formation also prevented sample collection. Lost circulation material that was used included cedar chips, cellophane, or paper. Samples are described on the geologists' logs (Appendix A) and included in Figure 5.

Time-series ground-water samples were collected during pump testing of the Elephant Mountain interflow zone at 686 ft bls. They were analyzed for nitrate and tritium. All results

WELL NAME	699-32-22B	COMPLETION DATE	08/06/91
CASING ELEV.	516.93 Feet	INITIAL DEPTH TO WATER	110 ft
WELL DEPTH	836.00 Feet		
DRILL DEPTH	841.50 Feet		
COORDINATES N-S	133240.3 LAMBERT NAD83		
E-W	583200 LAMBERT NAD83	PAGE	1 of 1



NOTE: ANNULAR SEAL IS SHOWN AS INITIALLY INSTALLED. PRESENT CONTACT BETWEEN SAND PACK AND BENTONITE SLURRY IS UNCERTAIN.

Figure 5. As-Built Diagram for Well 699-32-22B

Table 5. Ground-Water Analytical Results for Well 699-32-22B

Time »	8:15	10:20	14:00	17:30	10:10	13:50	Detection
Date »	6/1/91	6/1/91	6/1/91	6/1/91	6/13/91	9/30/91	Limit
Nitrate (ppm)	<0.2	<0.2	<0.2	<0.2	<0.2	NA	0.2
Flouride (ppm)	NA	NA	NA	NA	1.16	NA	0.2
Chloride (ppm)	NA	NA	NA	NA	23.9	NA	0.2
Phosphate (ppm)	NA	NA	NA	NA	<0.2	NA	0.2
Sulfate (ppm)	NA	NA	NA	NA	36.8	NA	0.2
Tritium (pCi/l)	<500	<500	<500	4110(a)	NA	<500	500
Iodine (E-6 pCi/L)	NA	NA	NA	138.504(b)	NA	NA	

(a) This result was due to an analytical problem. Well was resampled in September to confirm the result.
(b) Duplicate sample result: 143.868.

were below detection limits except for one tritium result (Table 5). The high amount of tritium is thought to be due to an analytical problem, since a resample on September 30, 1991, showed levels below detection limits. Iodine-129 was analyzed for in the last time-series sample. The levels detected are within the previously reported range for offsite confined aquifers; however, because of concern over concentrations observed at well 699-42-E9B, resampling has been scheduled. One sample was collected from within the lower Elephant Mountain flow at 712 ft bls where water appeared to be coming into the borehole from the contact between the entablature and colonnade. This sample was analyzed for anions but not for tritium. No samples were collected from the second pump test of the Rattlesnake Ridge interbed because the test was terminated early.

Completion

Figure 5 shows the as-built diagram for well 699-32-22B, including construction information and geology. A copy of the well completion summary, field as-built, and geologists' logs are included in Appendix A. A summary of the well completion efforts follows.

During the initial installation of the permanent 6-in. casing, a 699-ft-long section of casing and tremie pipe fell to the bottom of the hole. The cable that was suspending the casing in the well was attached to pairs of centralizers welded to the outside of the casing. The casing was dropped when one of the centralizers broke off. All of the casing was recovered, but 84 ft of tremie pipe could not be retrieved. The undamaged sections of casing were reused and the casing was reinstalled to a depth of 780.9 ft, where a tight spot in the borehole prevented deeper placement. A 5 7/8-in.-dia drill bit was used with air rotary to drill through this tight spot from 780.9 to 836 ft. During the redrilling, evidence of the lost tremie pipe was not seen until a depth of 836 ft was reached. The 6-in. permanent casing was installed down to the bottom of the basalt at a depth of 821 ft. A 5.5-in. (outside diameter) telescoping stainless steel 10-slot

screen was installed from 774.6 to 836 ft. A neoprene packer outside the top of the screen provided a seal against the inside of the permanent casing. The 6-in. casing was then backpulled to 778.7 ft to fully expose the screen.

Annular seal materials that were added included silica sand, bentonite slurry, cement grout, and bentonite crumbles (see Figure 5 and Appendix A). Annular seal materials (except granular bentonite) were placed in the well via a water slurry that was pumped down a tremie pipe located on the outside of the casing in the borehole annulus. A 5-hp submersible pump, set inside the carbon steel casing at a depth of 504 ft, pumped water from the well to facilitate settling of the sand pack and to mix with bentonite to make the bentonite slurry.

Silica sand was placed around the outside of the screen as a filter. The depth to the sand was difficult to measure during sand pack installation because of the depth and a possible restriction between the formation wall and the screen at approximately 806 ft. The sand pack was placed from 761 to 836 ft using a total of 11.80 ft^3 of silica sand. Water was pumped from the well at a rate of 20-30 gpm during installation of the sand pack. A small portion of this water (approximately 2 gpm) was recirculated back down the annulus via the tremie pipe to facilitate sand movement down to the bottom of the borehole. Approximately 20,000 gal were pumped from the well during installation of the sand pack. Water that was not recirculated back to the well was discharged to the ground surface at approximately 1000 ft from the well. In addition, approximately 9000 gal were pumped after placement of the sand pack and before installing the bentonite slurry seal in order to "settle" the sand pack. Typically, the water appeared turbid for a few minutes after the pump was turned on and then cleared.

To protect the well, a concrete pad, 10-in. protective casing, and four guardposts were installed. A brass marker was stamped with the well number, which was also stenciled on the well casing.

Deviation surveys were run approximately every 100 ft, and all were within the requirements of being no more than 1 degree/50 ft off the vertical.

Development/Aquifer Tests

The well was initially developed during placement of the annular seal materials, with approximately 29,000 gal of water pumped from the well during installation of the sand pack and another 600 gal pumped during placement of the bentonite slurry.

To further develop the well and to test the hydraulic properties of the aquifer, a constant discharge test was attempted on September 30, 1991. During the first 4 min of pumping, the water was a light green color, which was thought to result from greenish clays within the Rattlesnake Ridge interbed. After the first 4 min, the water became a very turbid light brown. After 30 min of pumping, the well stopped producing water. The pumping rate was

approximately 31 gpm for this portion of the test. The pump was restarted after 30 min but discharge was significantly reduced (8.6 gpm) and the water remained a brown color. This test was terminated due to the decrease in ground-water production and the presence of what appeared to be bentonite in the water. A total of 2125 gal were pumped during the entire test.

Further investigation confirmed the presence of some bentonite in the water. Although the cause has not been conclusively determined, the bentonite is thought to be caused by a downward migration of the bentonite slurry into the screened interval. This migration may have occurred by additional settling of the sand pack due to a possible bridge (void area) in the sand pack giving way. Because no bentonite was seen when the well was being pumped during and immediately after installation of the annular seal materials, the bridge may have broken during the pumping test, allowing the sand pack to settle and the bentonite to move down into the screened interval.

When all of the ground-water analytical results are reviewed, a decision will be made on whether this well can be monitored as is or whether remediation is required.

References

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Appendix A

Geologic and Geophysical Logs

WELL COMPLETION SUMMARY

Project Savage Island
Location N. of Ringold Fish Hatchery
Drilling Co. Basin + Range
Driller Robert Perry, Les Kunkle
Other (companies)
Geologist(s) T.L. Gilmore
MA Chamness
SS Teel

Well No. 69-42-E9A Temp. Well No.
Coordinates N41970 E8350
Elevation: Casing 387.13 Brass Marker 384.54

DRILLING METHOD

Drilling Method(s) cable tool
Drilling Fluid water from hatchery
Other DB 0-33' HT 33-233'

COMPLETION DATA

Drilled Depth 233'
Completed Depth "O" 41.55 "P" abandoned
Date Started 11/12/90
Date Completed 11/11/91
Static Water Level/Date 26.84' 11/26/90 * during drilling

OTHER (check if performed)

- ✓ Well Abandonment
- ✓ Well Development
- ✓ Aquifer Testing
- ✓ Geophysical Log(s)
- ✓ Lock and Cap
- ✓ Downhole TV Inspection
- Driller's Logs
- ✓ Pad
- ✓ Guardposts
- ✓ Protective Casing

SCREEN

Type	Outer Diameter	Length	Slot Size	Interval
"O" PVC	2"	20'	.20	21.13 - 41.55
"P" Fiberglass (abandoned"	3"	20'	10	221.2 - 232.2

TEMPORARY CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
Carbon Steel	12"		+0.75 - 15.5
Carbon Steel	10"		+2.5 - 139.7
Carbon Steel	8"		+4.1 - 194.91
			-

PERMANENT CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
"O" PVC	2"		+3.8 - 21.13
"P" Fiberglass (abandoned)	3"		+1.8 - 221.2

ANNULAR SEAL/FILL

Type	Interval	Quantity	Volume
Silica sand	212.8 - 233	9 50lb bags	
bentonite pellets	210.5 - 212.8	1 5gal bucket	
bentonite slurry	50 - 210.5	~750 gal	
silica sand 10-20 mesh	46.3 - 50	3 bags	
bentonite pellets	44.6 - 46.3	2/3 bucket (5gal)	
silica sand 10-20 mesh	17.0 - 44.6	15 1/2 50lb bags	

See back

PUMP

Type Depth to Inlet Date Set

ACCEPTANCE

Completed Well: Accept Conditionally Accept
Reject

* "O" S/W = 28.01' 1/24/91 "P" S/W = 26.67' 12/13/90

COMMENTS

"P" well casing broke, with a pump stuck in the well. The well was abandoned by pushing the pump down the hole + filling the casing with volclay grout.

Reviewed by [illegible] Date 12-4-92 Depths are below land surface unless noted.

seal fill continued

Type	Interval	Quantity	Volume
bentonite pellets	12.0 - 17.0	5 1/2 5gal buckets	
cement grout	1.0 - 12.0		
concrete pad	+0.3 - 1.0		

S-W-W

WELL INSPECTION REPORT

Well No. 699-42-E9AO Procedure DO-5 Rev. 0 Specification No. B-81113-C2 Rev. 0
Geologist(s) T. Gilmore, MA Chamness, SS Teel ECNs (list)

CLEANING/DECONTAMINATION	Inspection Method	Criteria	Accept	Reject	Date
Rig/Tools (initial)	Visual/Wipe (optional)	7.1	[illegible]	NA	11/12/90
Temporary Materials	Visual/Wipe (optional)	4.1	[illegible]	NA	12/18/90
Permanent Materials	Visual/Wipe (optional)	4.2.2	MAC	NA	1/9/91
Mtls Brought Onsite Later	Visual/Wipe (optional)			NA	
				NA	

MATERIAL STORAGE/PACKING	Inspection Method	Criteria	Accept	Reject	Date
Material Storage	Visual	7.5	MAC	NA	1/9/91
Material Packing/Seals	Visual	4.2, 7.5	MAC	NA	1/9/91
Other				NA	

LUBRICANTS/ADDITIVES/AIDS	Inspection Method	Criteria	Accept	Reject	Date
Lubricants	Visual	7.2	[illegible]	NA	11/12/90
Additives/Aids	Visual	7.4	[illegible]	NA	12/18/90

DRILLING METHOD	Inspection Method	Criteria	Accept	Reject	Date
Method	Visual	5.2	[illegible]	NA	12/18/90
Drilling Fluid	Visual	7.3	[illegible]	NA	12/18/90

STRAIGHTNESS TEST	Inspection Method	Criteria	Accept	Reject	Date
Well Straightness	Visual	7.3	SST	NA	12/13/90

COMPLETION	Inspection Method	Criteria	Accept	Reject	Date
Drilled Depth	Steel Tape # L300-16	G-W Mon. Plan	SST	NA	12/13/90
Completed Depth	Steel Tape # L300-16	G-W Mon. Plan	MAC	NA	1/9/91

PERMANENT SCREEN/CASING	Inspection Method	Criteria	Accept	Reject	Date
Screen Type/Slot/Length	Engineers Tape, Visual	4.2	MAC	NA	1/9/91
Screened Interval	Steel Tape # L300-16		MAC	NA	1/9/91
Casing Type/Size/Length	Engineers Tape, Visual	4.2	MAC	NA	1/9/91
Centralizers/Location	Engineers Tape, Visual	4.2	N/A	NA	
Other				NA	

FILTER PACK/ANNULAR SEAL	Inspection Method	Criteria	Accept	Reject	Date
Primary Filter Mtl/Place	Visual/Steel Tape# L300-16	4.2, 5.4	MAC	NA	1/9/91
Second Filter Mtl/Place	Visual/Steel Tape#	4.2, 5.4	NA	NA	
Annular Seal Mtl/Place	Visual/Steel Tape# L300-16	4.2, 5.4	MAC	NA	1/9/91
Install Annul Seal	Visual/Steel Tape#	4.2, 5.4	NA	NA	
Cement Type/Placement	Visual/Steel Tape#	4.2, 5.4	SST	NA	1/10/91
Overdrill Seal Method	Visual/Steel Tape#	N/A		NA	

WELL PROTECTION	Inspection Method	Criteria	Accept	Reject	Date
Surface Pad Mtl/Place	Visual/Engineers Tape	4.2	[illegible]	NA	1/10/91
Surface Casing Mtl/Place	Visual/Engineers Tape	4.2	[illegible]	NA	1/10/91
Cap/Hasp/Lock	Visual		[illegible]	NA	1/10/91

WELL SURVEYING/MARKING	Inspection Method	Criteria	Accept	Reject	Date
Well ID Stamped/Correct	Visual	4.2		NA	
Well Surveyed/Toler Met	Review Survey Data			NA	

PUMP INSTALLATION	Inspection Method	Criteria	Accept	Reject	Date
Pump Decon/Preparation	Visual	N/A	[illegible]	NA	
Installation/Placement	Visual/Engineers Tape	N/A	[illegible]	NA	
Pump Operational	Observed Running		NA	NA	

Technical Review Complete [illegible] Date 12-4-92

WELL INSPECTION REPORT

Well No. [illegible] Procedure DD-5 Rev. 0 Specification No. [illegible] Rev. [illegible]
Geologist(s) [illegible] ECNs (list)

CLEANING/DECONTAMINATION	Inspection Method	Criteria	Accept	Reject	Date
Rig/Tools (initial)	Visual/Wipe (optional)	[illegible]	[illegible]		11/12/90
Temporary Materials	Visual/Wipe (optional)	4.1	[illegible]		12/13/90
Permanent Materials	Visual/Wipe (optional)	4.2.2	[illegible]		3/7/91
Mtls Brought Onsite Later	Visual/Wipe (optional)				

MATERIAL STORAGE/PACKING	Inspection Method	Criteria	Accept	Reject	Date
Material Storage	Visual	7.5	[illegible]		3/7/91
Material Packing/Seals	Visual	4.2, 7.5	[illegible]		3/7/91
Other					

LUBRICANTS/ADDITIVES/AIDS	Inspection Method	Criteria	Accept	Reject	Date
Lubricants	[illegible]	7.2	[illegible]		11/12/90
Additives/Aids	[illegible]	[illegible]	[illegible]		[illegible]

DRILLING METHOD	Inspection Method	Criteria	Accept	Reject	Date
Method	Visual	5.2	[illegible]		[illegible]
Drilling Fluid	Visual	7.2	[illegible]		[illegible]

STRAIGHTNESS TEST	Inspection Method	Criteria	Accept	Reject	Date
Well Straightness	[illegible]	7.2	SST		12/13/90

COMPLETION	Inspection Method	Criteria	Accept	Reject	Date
Drilled Depth	Steel Tape # [illegible]	G-W Mon. Plan	SST		12/13/90
Completed Depth	Steel Tape # [illegible]	G-W Mon. Plan	MAC		

PERMANENT SCREEN/CASING	Inspection Method	Criteria	Accept	Reject	Date
Screen Type/Slot/Length	Engineers Tape, Visual	4.2	~~MAC~~ N/A	N/A	~~1/9/91~~
Screened Interval	Steel Tape # [illegible]		~~MAC~~ N/A	N/A	~~1/9/91~~
Casing Type/Size/Length	Engineers Tape, Visual	4.2	N/A	N/A	
Centralizers/Location	Engineers Tape, Visual	4.2	N/A	N/A	
Other Well Abandoned					

FILTER PACK/ANNULAR SEAL	Inspection Method	Criteria	Accept	Reject	Date
Primary Filter Mtl/Place	Visual/Steel Tape# L300-16	4.2, 5.4	~~MAC~~ [illegible]		~~1/9/91~~
Second Filter Mtl/Place	Visual/Steel Tape# L300-16	4.2, 5.4	[illegible]		1/2/91
Annular Seal Mtl/Place	Visual/Steel Tape# L300-16	4.2, 5.4	[illegible]		1/3/91
Install Annul Seal	Visual/Steel Tape# L300-16	4.2, 5.4			
Cement Type/Placement	Visual/Steel Tape#	4.2, 5.4	SST		1/10/91
Overdrill Seal Method	Visual/Steel Tape#		N/A	N/A	

WELL PROTECTION	Inspection Method	Criteria	Accept	Reject	Date
Surface Pad Mtl/Place	Visual/Engineers Tape	4.2	N/A	N/A	
Surface Casing Mtl/Place	Visual/Engineers Tape	4.2	N/A	N/A	
Cap/Hasp/Lock	Visual		N/A	N/A	

WELL SURVEYING/MARKING	Inspection Method	Criteria	Accept	Reject	Date
Well ID Stamped/Correct	Visual	[illegible]	N/A	N/A	
Well Surveyed/Toler Met	Review Survey Data				

PUMP INSTALLATION	Inspection Method	Criteria	Accept	Reject	Date
Pump Decon/Preparation	Visual	NA	N/A	N/A	
Installation/Placement	Visual/Engineers Tape	NA	N/A	N/A	
Pump Operational	Observed Running		N/A	N/A	

Technical Review Complete [illegible] Date 12-4-92

AS-BUILT DIAGRAM

Boring or Well Number 699-42-E7A Sheet 1 of 2
Location Savage Island Project

Logged by T Gilmore, S Teel, M Chamness
Reviewed by D L Mathison Date 12-4-92

Date Well Started 11/12/90
Date Well Completed 1/10/91

Well Construction Data: Description	Depth in Feet	Sample Method	Geologic/Hydrologic Data: Lithologic Description
Cement grout to	5	○	SILT
12" carbon steel casing to 15.5'	10	○	SLIGHTLY GRAVELLY SILT
Volclay pellets to 12.0'	15	○	SILTY GRAVEL
10-20 mesh Sand to 17 ft	20	○	" "
	25	○	MUDDY GRAVEL
	30	○	MUDDY SANDY GRAVEL
10" carbon Steel casing	35	○	SANDY GRAVEL
(+2.5' - 139.7')	40	⊕	SAND (starts at 37')
	45	⊕	-44' Gravelly Sand
	50	●	" "
	55	●	SLIGHTLY MUDDY GRAVELLY SAND (start @ 53.5')
	60	●	" " " "
	65	●	SLIGHTLY MUDDY SAND
	70	●	MUDDY SAND
	75	●	" "
	80	●	" " (to 80.5')
	85	●	SAND (starts @ 80.5')
	90	●	MUDDY SAND
	95	●	" " to 95'
	100	●	starts at 95' CLAYEY SILT TO SILTY CLAY
	105		missed sample
	110	●	SANDY MUD TO MUDDY SAND
	115	●	SAND
	120	●	SLIGHTLY MUDDY SAND
	125	●	" " "
	130	●	" " "
	135	●	Sand @ 130'
	140	●	"
	145	⊕	SANDY MUD
	150	⊕	MUD @ 147.5 SANDY MUD (starts @ 148.3)
	155	●	" "
	160	●	SLIGHTLY MUDDY SAND
	165	●	SAND

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

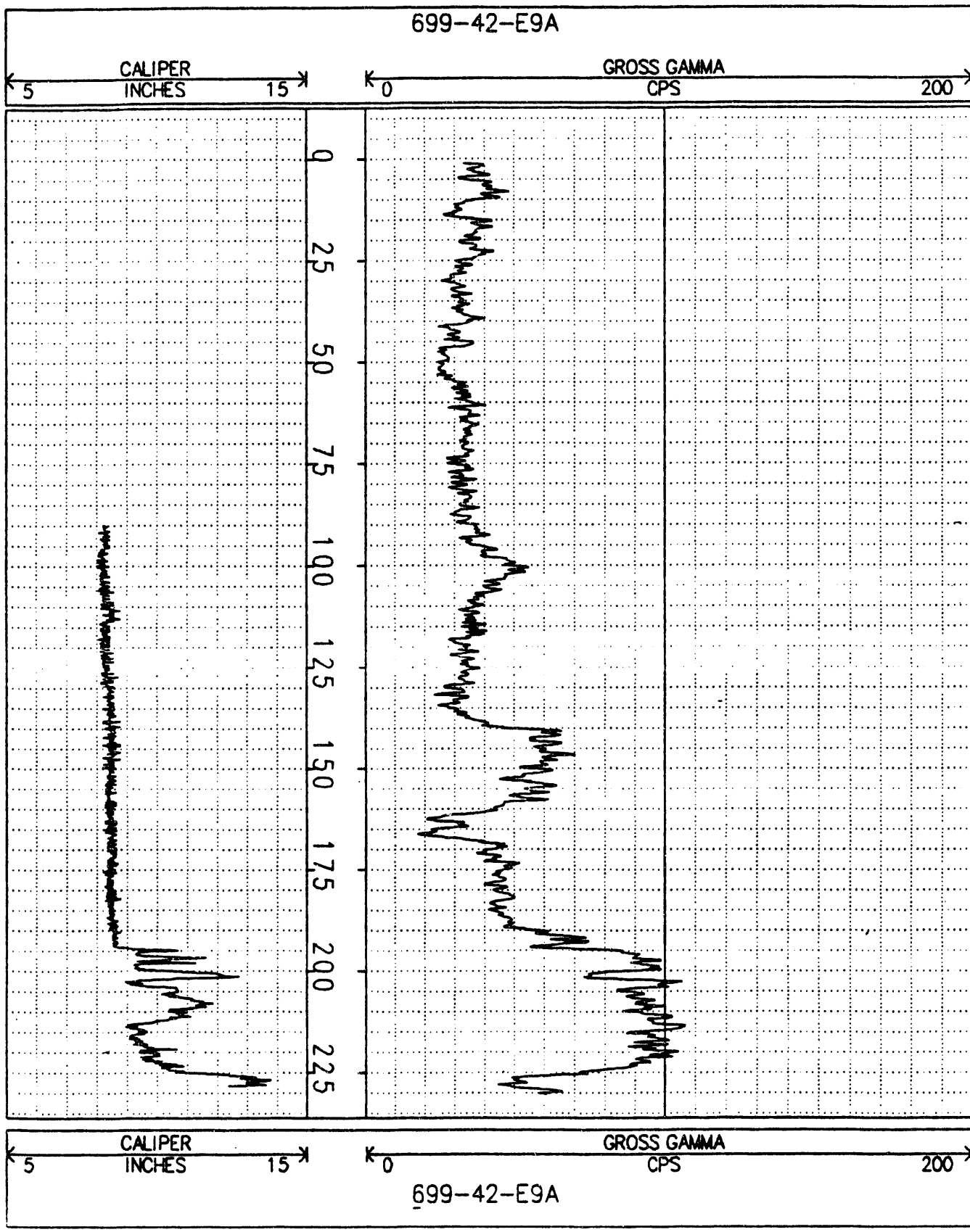
Boring or Well Number 699-42-E9A Sheet 2 of 2
Location Savage Island Project

Logged by
Reviewed by Date
Date Well Started 11/12/90
Date Well Completed

Well Construction Data		Depth in Feet	Geologic/Hydrologic Data		
Description	Construction Diagram (Drill Bit)		Sample Method	Lithologic Diagram	Lithologic Description
		165			
		170	●		SLIGHTLY MUDDY SAND
		175	●		" " "
8" temporary casing		180	●		SAND
(+4.1 – 194.91)		185	⊕		"
		190	●		SLIGHTLY MUDDY SAND
		195	⊕		SANDY MUD
		200	⊕ ●		GRAVELLY SANDY MUD
		205	●		SLIGHTLY GRAVELLY MUD
		210	●		MUD (predom. clay)
		215	●		" " "
		220	●		" (incr. in silt)
		225	●		" (more clay & color change @ 229')
		230	●		MUDDY SAND (starts at 229.5) SLIGHTLY GRAVELLY SLIGHTLY MUDDY SAND (230-231)
					Basalt (starts @ 231')
Total drill depth = 233'					

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)


699-42-E9A
CALIPER
INCHES
5
15
GROSS GAMMA
CPS
0
200
0
25
50
75
100
125
150
175
200
225
CALIPER
INCHES
5
15
GROSS GAMMA
CPS
0
200
699-42-E9A

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth Surface -5' Sheet 1 of 2
Location North of Ringold Fish Hatchery Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/12/90
Reviewed by V. L. McGHAN (Print) V L McGhan (Sign) Date 12-4-92
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable Tool BE 22W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Arrive at Site - Drillers setting up	1215			
							People on site - Sam Turney KEH Sadley				
							Ron Mitchell - WHC;				
							Drill Rig appears clean; All the				
							casing is clean except for one				
							piece of 10" - End of 10" has cement				
							in it - Driller agreed to cut end				
							w/ cement off				
							Chevron Poly FM Grease used for	1415			Calibrate HNU; using a
							Lubrication				10.2 eV Lamp
1'	Lith	2	PID (N-NA)	Ø ppm	Dry	Surface	SILT 20% Sand 80% Silt; 20% VFS,	1500			Drive Barrel
	Moist	1					80% Slt; vw srt, 2.5Y 7/2 ltgy				
							strong rxn in HCl; sl consol,				
5'	Lith	2	PID	Ø ppm	Dry	5'	SILT 10% Sand, 90% Silt; 10% VFS,	1515			
	Moist	1					90% Silt vw srt 2.5Y 7/2 ltgy				
							strong rxn in HCl similar to previous				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 10' Sheet 2 of 2
Location N of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/12/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment N/A

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable Tool drive barrel

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
10'	Lith	2	PID	Ø ppm	Dry	5'	SLIGHTLY GRAVELY SILT 5% Gravel,	1520			Drive Barrel
	Moist	1					5% Sand, 90% Silt, 2% UCP, 3% CP,				
							5% UFS, 90% Silt, Gravels rounded,				
							predom basalt; dry color 2.5Y 7/2 lt gy				
							strong rxn in HCL, no consol				
						10					
										16'4"	Add 16'4" of 12" Casing
											Surface Casing
							WHC is "Piggy Backing" on Project	1610			End of Day
							for background Samples for CERCLA				
							work. Ron Mitchell understands that				
							their work is not to impact the				
							objectives of the Savage Island				
							project.				
							PNL is Kaiser's Safety representative				
							in their absense at the site				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 10' - 20' Sheet 1 of 1
Location Not Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/13/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment N/A

Drilling Contractor Basin and Range
Driller Bob Perry
Rig/Method Cable tool BE 22W / Drive barrel

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
10'			PID	Ø ppm			Measured w/ HNU (PID) in breathing zone - No reading - Ø ppm	725		16'4"	Arrive at Site
											Calibrate HNU (PID) w/ Span Gas
							Gravel layer 1' Thick 10'-11' up to Medium cobbles	730			Drilling
15'	Lith	2	PID	Ø ppm	Dry		SILTY GRAVEL 35% Gravel	845			
	Moist	1					8% Sand; 57% Silt; 20% Cp, 5% Mp, 5% Fp, 5% vFp, 8% vFS, 57% Silt; poor Srt; Gravels: 70% BSLT 30% Felsic; rd-subrd; dry color 10YR 6/2 lt brnish gy Strong rxn in HCl, More Gravel than previous				
								915			RPT arrives at site; measures Spoil pile from 0'-15' no readings above background
20'	Lith	2	PID	Ø ppm	Dry		SILTY GRAVEL 40% Gravel, 10% Sand, 50% Silt, 15% Cp, 10% Mp, 10% Fp, 5% vFp, 3% vCS, 7% vFS, 50% Silt, vp Srt, Gravels: 75% BSLT, 25% Felsic, rd-sbrd 10YR 6/2 lt brn gy, Strong rxn in HCl No Consol Similar to previous	945			
	Moist	1									
							Drillers Quit for Day to attend Training Class	1115			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Depth 20-30'
Sheet 1 of 2
Location Savage Island (N of Ringold)
Project Savage Is.

Logged by MA Chamness (Print) MA Chamness (Sign) Date 11/14/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DC-1, DC-5
Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Basin + Range
Driller Robert Perry, Les Kunkle
Rig/Method core barrel / cable tool BE 22W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								730		16.1'	On site, cut 0.3' off of 12"
			LEL	20.8% O				755			casing, started drilling
			HNU	0							irrigated w/ sec. cutting, spun set
											@ 5.74, 10.2 cu Dump
						24		835			Driving casing
								845		11.1' (10")	Set 11.1' of 10" casing
25'	lith	2			dry		MUDDY GRAVEL - 50% gravel, 25% sand, 25%	1000			Sampled w/ core barrel, welding
	moist	1				25	mud. 5% cobbles, 15% vcg, 15% cg, 8% mg, 5%			+9.6'	on 9.6' of 10"
							fg, 2% vfg, 10% vcs, 5% cs, 3% ms, 2% fs,			28.7'	
							5% vfs, 25% mud. VP sorted. No rxn in 10% HCl.				
							Gravel - 50% basalt, 30% ign/metam, 20%				
							qtz/qtzite, VA-R. Sand - 30% basalt, 40% qtz,				
							qtzite, 30% rk frags, VA-SR. Dry color - 2.5Y 6/2				
							(lt. brownish gray). Unconsolidated. Becomes				
							more sandy at bottom.				
										1110	Started driving pipe.
			LEL	20.8% O						1340	Hit moist zone @ ~28'
30'	lith	2	HNU	0	wet	29	MUDDY SANDY GRAVEL - 60% gravel, 36% sand,			1415	Sampled w/ core barrel
	moist	1				30	4% mud. 1% ≤ cobbles, 10% vcg, 15% cg, 15% mg,				
							12% fg, 7% vfg, 6% vcs, 10% cs, 12% ms, 5% fs, 2% vfs,				
							4% mud. VP sorted. Gravel - 40% basalt, 20% qtz/				
							qtzite, 40% ign/metam, A-WR. Sand - 25% basalt,				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Depth 30'-35'
Sheet 2 of 2
Location Savage Island (N. of Ringold)
Project Savage Is

Logged by MA Chamness (Print) MA Chamness (Sign) Date 11/14/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Basin + Range
Driller Robert Perry, Les Kunkle
Rig/Method cable tool, BE-22W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							30' cont'd. - 50% qtz, 25% rk frags, VA-SR. Very slight rxn in HCL, wet color fines - 2.5Y4/2 (dk grayish brown). Unconsolidated.				
35'	lith	2			wet	34 35	SANDY GRAVEL - 50% gravel, 48% sand, 2% mud. 1% = cobbles, 10% vcg, 18% cg, 10% mg, 6% fg, 5% vfg, 3% vc, 10% cs, 20% ms, 10% fs, 5% vfs, 2% mud. VP sorted. Gravel - mostly unbroken, 25% basalt, 10% ign/metam, 15% qtz/qtzite, VA-WR. Sand - 15% basalt, 70% qtz, 15% rk frags, tr. biotite, VA-SR. Wet color fines - 2.5Y4/2 (dk grayish brown). Unconsolidated.			1445	Sampled 35'
	moist	1								1500	Tried measuring DB + DW, but no steel tape or e-tape, used nylon surveyors tape, and found hole had sloughed in to 27.4', w/water on top.
										1515	Changing to jaws for split tube sampler tomorrow.
										1545	Picking up, locking stuff away
										1600	Left site

A-1800-003 (05/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 1 of 2

Location Savage Island Project

Logged by MA Chamness (Print) MA Chamness (Sign) Date 11/15/90

Checked by (Print) (Sign) Date

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment L200-16 steel tape, 10997 e-tape

Drilling Contractor Bain + Paige

Driller Robert Perry + Lee Kuykle

Rig/Method cable tool - BE 22W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED (gal)	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Calibrated HNU w/ 150 C_4H_8 gas, span at 5.74	730		28.7' of	On site
			HNU	0				740		10"	Checked w/ HNU + LEL, both ok
			LEL	208%, 0							DB = 28.2' - 4' stickup + [illegible]
											27.3' w/ steel tape
											DW = 31.1' - 4' = 27.1' w/e tape
							"	750			Have to take jars back off to
											mud tank + get line cleaned
											out for split tube sample.
								830		+ 9.2'	Welding on 9.2' of 10"
										37.9'	
								915			Driving casing, making cable
								935			Drilling
								1035			Fixing rig
								1045	5		Drilling, added ~5 gal H_2O
											from fire hydrant
								1210	5		Driving casing, added 5 gal H_2O
			HNU	0				1250	5		Bailed, added ~5 gal H_2O
			LEL	208%, 0				1320	15		Changing to set up split tube
											sampler
								1350			Driving split tube sampler,
											pull blows w/ jaw + stem
35-36.5	Spoon	1				35 0.0.0.0 0.0.0.0 0.0.0.0 36.5	SANDY GRAVEL - same as 35' sample	1400			Sampled 35'-36.5'

W = wet, M = moist, D = dry

Used poly-fm as lubricant when changing tools, yesterday + today

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 1099-42-EGA Sheet 2 of 2

Location Savage Island (N. of Ringold) Project Savage Is.

Logged by MA Chamness (Print) MA Chamness (Sign) Date 11/15/90

Checked by _____ (Print) _____ (Sign) Date _____

Lithologic Classification Scheme Folk Procedure DO 1 Rev No. 1

Measuring Equipment 1200-16 steel tape

Drilling Contractor Basin + Range

Driller Robert Perry, Lee Kunkle

Rig/Method cable tool, CE 22 W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG 36.5	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						0.0.0.0				37.9	DW = 31.2' - 3.5 = 27.8' [illegible]
40	[illegible]	1				0.0.0.0 37	SANDY GRAVEL - same as 35' sample,	1420			Sampled 36.5'-37'
							@ ~36.5' is a thin (~1/2" thick) silt layer.				
	H^3	1					A lot of sand comes in at the top, either as	1430			Sampled water
	NO_3	1					stuff or through the weep hole.				
								1300		-0.2'	Cut off 0.2
										37.7'	Welding on 9.85'
										19.85'	
										47.55'	
								1340			Finished welding on [illegible]
											Still up.
								1400			Left site

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 40' Sheet 2 of 2
Location Not Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 11/15/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable tool BE 22W / Hardtool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
43.5'-	Nitrate	1					Bail Well for Water Sample	1600			Water Sample
44'	Tritium	1					Open hole from 43.5'- 44'				Clean site up / Team Rig down
							Chain of Custody # 111690				
							Rig torn down and moved to Ringold				
							Fish hatchery to leave over Holiday				
							next week (no drilling week of 11/18)				
											Depth approx 44'
								1500			End of Day

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A 35'-40' Sheet 1 of 2
Location N of Ringold (Savage Island) Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 11/16/90
Checked by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry, Les Kunkle (Helper)
Rig/Method Cable Tool BE 33 W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								720		47.55'	Arrive at Site
											Depth to Bottom 34.6' (bls)
											Depth to Water 30.4' (bls)
								740			Drive Casing
							Bob Bryce, Doug Hilkerbrant (DOE)	745			Drilling
							arrive on Site for surveillance				
							Calibrate HNU w/ iso Cu Hg gas				Calibrate HNU
34'			HNU	0 ppm			Span at 5.33	750			Check Site around drill Rig
40'	Lith	2	HNU	0 ppm	N/A	35' 40	SAND 5% Gravel, 5% Mud, 90% Sand;	1130			Sample
			pH Litmus paper	6.8			2% Fp, 3% UFp, 2% CS, 15% MS, 55% FS, 18% UFS,				
							5% Mud. Well sorted; Sands: 65% clr qtz				Lithology change at 36.5'
							35% Mafic (incl basalt, red volcanics?, grn vole)				Thin silt + layer then Sand
							Subang; wet color 5Y 4/2 olv gy, shown in				
						40	HCl; no consol; Flowing Sand; Lithology				
							change from previous; more sand, incr				
							in Silica-rich rocks				
							Note: Mud ≡ undifferentiated silt and Clay				
							Mud fraction is not cohesive and appears				
							to be predom. silt				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 41.7 - 44 Sheet 1 of 2 10
Location N of Ringold (Savage Is.) Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 11/26/90
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin + Range
Driller Robert Perry, Les Kunkle (helper)
Rig/Method Cable Tool (BE 22W)

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Well is sealed w/a welded cap (done on 11/15/90)	0950		47.55	Arrive onsite. Driller is already
											on site and is setting-up rig.
							HNU Span @ 5.80	1100			Calibrated HNU. 0ppm at borehole
								1102			21% O_2 / 0% LEL at borehole
							D/water = 30.24 - 3.4 = 26.84 b.l.s.	1105			
							D/bottom = 42.10 - 3.4 + 3.02 = 41.72				
								1115			Sample w/ split spoon
											16 blows / 1.5'; 10%
											recovery. Did not save.
42-44	Split Tube 43.3-44'	1	HNU	0 ppm		43.3 44	Gravelly Sand (15% gravel, 82% sand, 3% silt)	1130			Reattempted split spoon.
							4% CP, 5% MP, 4% FP, 2% VFP, 5% VCS, 10% CS,				100% recovery. 36 blows/1.5 ft
							52% MS, 10% FS, 5% VFS, 3% silt/clay.				Interval 42-44'
							Poorly sorted. (Gravel) - 35% basalt/mafics,				Bottom of casing @ 44.1'
							65% qtzite + Si-rich rock frags, SR-WR,	1140			Changing to Hard Tool
							(Sand) - 20% basalt/mafics, 80% qtz, qtzite, +	1155			Drilling w/ Hard Tool
							Si-rich rock fragments, A-R. Dry color;				
							5YR 6/1 (light gray). Unconsolidated.				
							No reaction to 10% HCL. Only saved the				
							lower 0.7 ft of the core - the upper				
							part did not seem representative. Sample				
							was collected in a bag and placed in the				
							core box.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 44' - 50' Sheet 2 of 2
Location N of Ringold (Savage Is.) Project

Logged by SS Teel (Print) SS Teel (Sign) Date 11/26/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L 300-16

Drilling Contractor Basin & Range
Driller Robert Perry, Les Kunkle (helper)
Rig/Method Cable Tool / 22W Hard Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						46.5					
47.5	Lith	2	HNU	Ø PPM			Gravelly Sand (15% gravel, 82% sand, 3% mud)	1320		47.55	Sample w/ Dart Bailer
			Litmus paper	6.8			6% MP, 6% FP, 3% VFP, 7% VCS, 10% CS, 50% MS,			9.60	
							10% FS, 5% VFS, 3% mud. Poorly sorted.			57.15	
							(Gravels) - 35% basalt/mafics, 65% qtzite +				
							Si-rich ig/met. rock fragments, A-R.				
							(Sand) - 15% basalt/mafics, 85% qtz, qtzite,	1330			Adding Casing. Added 9.6'
						47.5	+ Si-rich rock frags. A-R. Wet Color:				of 10"
							10YR 4/2 (dark grayish brown). Unconsol.			57.15	- Total Casing
							Very sim to previous sample.	1415			Driving Casing
								1420			12" casing has dropped ≈ 6"
											below ground surface. Digging-out
											and pulling up.
								1440			Driving casing. Casing is
											driving hard
								1500			Stop driving casing
								1505			Drilling w/ Hard Tool
50'	H^3	1					(Will describe sample tomorrow)	1630			Sample w/ Dart Bailer
	NO_3	1									D/Bottom = 52.45 + 3.02 - 7.5 = 47.97'
											(Hole may have heaved
											while bailing)
								1640			Collect Water Samples cofc # 699-42-E9A 112690
								1650		57.15	Leave Site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 50' - 60' Sheet 1 of 4
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/27/90
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry / Les Kunkle
Rig/Method Cable tool 22W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Depth to Bottom 46.8'	715		57.15'	Arrive at Site
							Depth to Water 43.3' (Plug in Well)	730			Measure water level
								735			Drilling
			PID	Ø ppm			Calibrate Photo ionizing detector (HNu)	740			Measure at Borehole w/ HNu and
			LEL	Ø%			Span at 5.6 to read 55 on 0-200 scale				LEL
			O_2	22%							
50'	Lith	2	PID	Ø ppm	N/A	45'	GRAVELY SAND 15% Gravel, 80% Sand,	745			Describe sample from 11/26
			pH (litmus)	6.5			5% Mud; 5% Fp, 10% VFp, 10% VCS, 15% CS;				
							40% MS, 10% FS, 5% VFS, 5% Silt; vp Srt;				
							Gravels: 60% Mafic (predom [illegible] 40% Felsic				
							(predom wht-clr qtz) Sa[illegible] 40% Mafic				
						50'	60% Felsic (predom qtz) Subang when				
							preserved v fragmented (Not representative)				
							10YR 4/1 dk gy (wet color) No rxn in HCl				
							sl consol				
55'	Lith	2	PID	Ø ppm	N/A	55'	SLIGHTLY MUDDY GRAVELLY SAND 15% Grav	1005			Driller suggested a change in
			pH litmus	6.8			70% Sand 15% Mud (pred cly) 5% Mp, 5% Fp,				Lithology at 53.5'
							5% VFp, 5% VCS, 5% CS, 20% MS, 25% FS,				
							15% VFS, 15% Mud (predom cly, cohesive)				
							Forms "cly balls"; vp srt; Sub angular				
							V fragmented; 10YR 5/4 yel brn; sl consol;				
							No rxn in HCl incr in Mud from previous Sample				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-43-E9A Depth 60'-70' Sheet 2 of 4
Location N of Ringold Project Savage Island

Logged by Tyler G. Gilmore (Print) Tyler Gilmore (Sign) Date 11/27/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cabletool / Hardtool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
60'	L,th	2	PID	0 ppm	N/A	55'	SLIGHTLY MUDDY GRAVELLY SAND	1030		57.15	Sample
			pH 1:1 mix	6.8			15% gravel, 70% Sand, 15% Mud; 10% Fp,				
							5% VFp, 5% VCS, 5% CS, 20% MS, 30% FS				
							10% VFS, 15% Mud (prod Cly, cohesive forms				
						60	cly balls) Subang, 10YR 6/3 yel brn,				
							No rxn in HCl, sl consol similar to				
							previous - Faster drilling				
65'	L,th	2	PID	0 ppm		65	SLIGHTLY MUDDY SAND 5% Gravel, 80% Sand	1150			Sample
			pH (1:1 mix)	6.8			15% Mud 5% Fp, 5% VCS, 5% CS, 15% MS, 30% FS				
							25% VFS, 15% Mud (50-50 Silt/Cly) some				
						70	"Cly balls" Sl cohesive, 10YR 6/3 yel brn				
							No rxn in HCl; less gravel than previous				
							Subang				
70'	L,th	2	PID	0 ppm			MUDDY SAND 5% Gravel, 70% Sand,	1208			Sample
			pH (1:1 mix)	6.8 ppm			25% Mud (50-50 cly/silt) 5% Fp, 5% CS,				
							10% MS, 30% FS, 25% VFS, 25% Mud, some				
							cohesive platy clay pieces, 10YR 6/3				
							yel brn; Subang sands No rxn in HCl;				
							Sl consol (~15' open hole) More Mud than				
							previous				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location N of Ringold
Depth 70' - 80'
Sheet 3 of 4
Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/27/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable tool BE 20W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
75'	Lith	2	PID	Ø ppm	N/A	70	MUDDY SAND 3% Gravel, 72% Sand, 25% Mud; 3% Fp, 5% CS, 15% MS, 25% FS, 27% VFS, 25% Mud (40-60 cly/silt) Up srt Sand; 50% Mafic 50% Felsic Subang; 10YR 6/3 yellow No rxn in HCL, sl consol (openhole) incr in silt content	1230		57.15	
			pH	6.8		75					
								1250			Stop drilling to Fix brace
								1305			Drilling
80'	Lith	2	PID	Øppm	N/A	80	MUDDY SAND 3% Gravel; 72% Sand, 25% Mud; 3% Fp 5% CS, 10% MS, 40% FS, 17% VFS, 25% Mud (30-70 cly/silt) Up srt; Sand 40% BSLT 60% Felsic; Sbang; 10YR 6/3 yellow no rxn in HCL sl consol (open hole)	1320			Sample
			pH	6.8							
								1325			Set up for split spoon Sample
											Poly FM Grease used to Change Tools
							Depth to Bottom 80'				Begin Split spoon Sampling 84 blows 1.5 ft

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Depth 80' - 85'
Sheet 4 of 4
Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign)
Date 11/27/90
Reviewed by (Print) (Sign)
Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cabletool BE22W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						80					
80'-81.5'	Split Spoon		PID	0 ppm	N/A		SILTY SAND 80-80.5' AA. SAND from	1405		57.15	Split Spoon
							80.5'-81' Abundant Mica w Srt;			+19.70	84 blows 1.5' 95% Recovery
							80% MS, 20% FS, 10YR 6/3 No rxn in			76.85'	Lithology change @ 80.5'
							HCl No visible Structures Massive				to Sand
							(1) MD (bolt) Abnt clr qtz grains				
						82.5					
81.5'-82.5'	Split Spoon		PID	0 ppm	N/A		81.5-82.5 SAND Some Gray (N4) Cly mottling in	1415			Split Spoon
							Sand Grains are predom qtz subang No				71 blows 1.5'
							rxn in HCl sl-no consol (Open hole ~27')				Switch to Hand tool
											Poly FM grease used
85'	Lith	2	PID	0 ppm	N/A	85'	SAND 95% Sand, 5% Silt; 10% MS, 60% FS;	1450			Sample (Hand Tool)
							25% VFS, 5% Silt; well srt; Subang;				
							30% Matrix, 70% Felsic (predom qtz)				
85'	Water	1	H_2S and Nitrate				10YR 4/6 No rxn in HCl; Abnt Mica;	1505			Water Samples (bail 4 times)
							Similar to 81.5-82.5 Split spoon Smpl				COC# 112790
			LEL	0%			sl-No consol (beginning to lose open hole)				Check hole w/ LEL - OK
			O_2	22%				1510		76.85'	Add 19.7' of 10" Casing
											Welding
								1610			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Depth 85'-90'
Sheet 1 of 1
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 11/28/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment Steel tape L300-06 / E-tape

Drilling Contractor Basin + Range
Driller Robert Perry / Les Kunkle (helper)
Rig/Method Cable Tool / BE22W / Hard Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0740		76.85	Arrive on site
							D/water = 50.0 - 23.7 = 26.3	0745			
							(meas. w/ E-tape)				
								0750			Driving Casing
								0820			Drilling w/ Hard Tool
								0830			Calibrate HNU - span set at
											5.82, Calb. w HNU cal. gas lot #
			LEL	0%							28627 (100 ppm ISOC_4H_8 / Air)
			HNU	0 ppm				0845			Checked borehole w/ HNU and
			O_2	21.8%							LEL/O_2 (10.2 eV - HNU)
90'	Lith	2	HNU	0ppm	N/A		SILTY SAND (1% gravel, 79% sand, 20% mud)	1010			Sample w/ Dart Bailer
			pH paper	6.5			1% FP+ VFP, 9% CS, 25% MS, 25% FS,				
							20% VFS, 20% mud. Mod. well sorted. 5% mafics,				
							5% mica, 40% qtz, 30% Fe-stained - highly				
							weathered rock fragments. A-R. Wet color:				
							2.5Y 4/4 (olive brown). No reaction to 10% HCL				
								1150			Preparing to add casing
			O_2	21%				1200			Check borehole w/ HNU - LEL
			HNU	0 ppm				1210			Drill rig starter fails -
			LEL	0%							attempting to fix
											Will be down until it is fixed
								1245			Welding cap on the borehole
								1315			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 89' Sheet 1 of 2
Location N. of Ringold Project Savage Island

Logged by SS Teel (Print / Sign) Date 11/29/90
Reviewed by (Print / Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-06

Drilling Contractor Basin + Range
Driller Robert Perry / Les Kunkle (helper)
Rig/Method Cable Tool / BE 22W / Hard Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1300		76.85	Arrive on Site. Driving
										+19.90	Casing. Driller replaced the
										96.75	starter earlier today and
											added 19.9' of 10" casing.
								1310			Casing drove down to ≈ 89'
											Will drill the plug out and
											then advance the hole to
											≈ 95' where a split-spoon
											will be collected for microbe
											analysis.
								1315			Drilling w/ Hard Tool bit
								1330			Microbiologists arrive on site.
								1335			Calibrate HNU. Span still
											set @ 5.82 - used same
											cal. gas as previous.
			HNU	0 ppm				1340			Check hole w/ monitoring equipment
			LEL	0%				1345			Bailing
			O_2	22%				1350			Drilling w/ Hard Tool
								1400			Brief L. Doremus and
											GW McClellan on the HASP +
											JSP.
								1430			Brief Jeff Gale on the HASP + JSP.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E94 Depth 90-94.5 Sheet 2 of 2
Location Project

Logged by SS Teel (Print) SS Teel (Sign) Date 11/29/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape

Drilling Contractor Basin & Range
Driller Robert Perry / Les Kunkle (helper)
Rig/Method Cable Tool / BE22W / Hard Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1430			Driving Casing
								1445			Drilling w/ Hard Tool
								1545			Ready to take microbial
											sample. However - there is
											not enough daylight to complete
											this - therefore the sample
											will be collected in the A.M.
											Driller reports bottom @
											94.5 - D/Bottom meas.
											W/tape = 93.5 - ∴ there
											may be ≈ 1 ft of slough
							Note: Jeff Gale, G. McClellan, L. Doremus				at bottom. D/water ≈ 57'
							and SS Teel were the only personnel				and is recharging very slowly.
							to enter the zone besides the				
							driller.				
								1615			Leave Site

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number: 699-42-E9A
Depth: 93.5' - 95'
Sheet 1 of 2
Location: North of Ringold
Project: Savage Island

Logged by: Tylar Gilmore (Print) Tylar Gilmore (Sign) Date: 11/30/90
Reviewed by: (Print) (Sign) Date:
Lithologic Classification Scheme: Folk
Procedure: DD-1
Rev No: 1
Measuring Equipment: Steel Tape C 580-16 and E-Tape 11034

Drilling Contractor: Basin and Range
Driller: Robert Perry
Rig/Method: Cable Tool BE222W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								720		96.75	Arrive at Site
							Depth to Water 57.7 ft (plug in well)	730			Depth to Water and Bottom
							Depth to Bottom 92.4'				
								740			Drilling out plug to 95'
							Microbiologists Jim Fredrickson, Todd	745			Calibrate HNU span @ 5.8
							Stevens and Llyn Brammins at Site				
							Also Greg McCellan (WHC) They are on				
							Site to sample w/ waterloo sampler for				
							Microbiological study				
						90					
95'	Lith	2	PID	ppm			MUDDY SAND 55% Sand 15% Mud; 20% MS,	750			
			pH	6.8			45% FS, 20% VFS, 15% Mud (70-30 Slt/Clay)				
							65% Si-rich Fabics 35% Bslt rich				
							mafics; Sl consol 2.5Y 4/4 olv Brn;				
							No rxn in HCl, Similar to previous				
						95	Hit Clay at ~95'				
							Set up Waterloo Sampler	900			Shut down Rig wait for
											Micro-people
							Weekly Safety Meeting	900			Safety Meeting
							Drive sampler / Cable broke / work on	1030			
							Cable / Drive Sampler again / total				
							160 blows drove sampler ~18"	1230			
							Try to Retrieve Sampler - Sampler stuck	1255			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 95'-99' Sheet 2 of 2
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 11/30/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method BE 22W / Cabletool / Hardtool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Work on Retrieving Sampler; building an adapter to connect a set of Jars on the Sampler assembly	1400			
							Freed up Sampler	1520			
							Remove from well	1530			
							Switch to Hardtool (Poly FM Grease used)				
								1345			Drilling
							Need 100' Sample on Monday approx 5' open hole - Hit clay at 95' Waterlen Sampler had brown clay in it				
								1615			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 99'-115' Sheet 1 of 2
Location N. of Ringold Project Savage Island

Logged by MA Chauncey (Print) MA Chauncey (Sign) Date 12/3/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, 0
Measuring Equipment E-tape 11034, steel tape L300-16

Drilling Contractor Basin + Range
Driller Robert Perry + Les Kunkle
Rig/Method cable tool BE 22W / hard tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			LEL	<det			Calibrated HNU to 100ppm ISO-C_4H_8/air,	735		96.75'	
			HNU	<det			span set at 5.76				
							Measured D/W at 77.3' w/ E-tape, tried	745			
							5 times w/ steel tape and couldn't get				
							good reading.				
						99		800			Drilling
100'	lith	2					CLAYEY SILT TO SILTY CLAY - (MUD) - difficult	805			Sampled 100' w/ dart bailer
						101	to tell proportions, can see fine dark				
						102	particles, so there must be some silt. Wet				
							color - 10YR5/4 (yellowish brown), unconsolidated				
							to slightly consolidated, maintains open				
							hole well, doesn't let water in. No rxn in HCl				
109'	lith	2					SANDY MUD to MUDDY SAND - tr gravel, 50% sand,	835			Overshot sampling depth.
							50% silt. tr. vfg. 1% vcs, 2% cs, 7% ms, 10% fs,				Sample is 102'-109', taken
						109	30% vfs, 50% mud. Gravel - VA. Sand - micaceous,				w/ dart bailer
							20% dk minerals, 80% lt. minerals. Wet color				
							10YR5/4 (yellowish brown). Unconsolidated. No rxn		in HCl		
115'	lith	2			115		SAND - tr. gravel, 98% sand, 2% mud. 1% vcs,	900			Sampled 115' with dart bailer.
	H_3	1					1% cs 46% ms, 35% fs, 15% vfs, 2% mud. well				D/W = 45' w/ e-tape.
	HO_3	1					sorted. Sand - 90% qtz + feldspar, 5% mica.	920			D/W = 34.5' w/ e-tape, coming in
							5% dk minerals. No rxn in HCl. Wet color -				slowly, took water samples
							10YR6/2 (lt brownish gray). Unconsolidated.				C of C # 69942E9A 12390

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 693-42-E9R Depth 115'-130' Sheet 2 of 2
Location Savage Island Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 12/3/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, 0
Measuring Equipment e-tape 11034, steel tape L300-16

Drilling Contractor Basin + Range
Driller Robert Perry + Les Kunkle
Rig/Method cable tool BE 22W / hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
120'	Lith	2			120		SLIGHTLY MUDDY SAND - 85% sand, 15% mud. 2% cs,	1010		90.75'	Sampled 120' w/ dart bailer.
							43% ms, 20% fs, 20% vfs, 15% mud. Mod. sorted.				
							Wet color 10YR5/3 (brown). 90% sand +				
							feldspar, 5% dk minerals, 5% mica. Very				
							runny. slightly consol. No rxn in HCl.				
125'	Lith	2			125		SLIGHTLY MUDDY SAND - similar to above, sand is	1050			Sampled 125' w/ dart bailer
							more 30% ms, 30% fs, 25% vfs, 15% mud.				
							Sl. consolidated, holding open hole.				
130'	Lith	2					SLIGHTLY MUDDY SAND - 90% sand, 10% mud.	1130			Sampled 130' w/ dart bailer
			LEL	<det			2% cs, 50% ms, 25% fs, 13% vfs, 10% mud. Well-	1155		+19.0'	Welding on 19' of 10" casing
			HNU	<det	130		mod. sorted. Sand - 85% qtz + feldspar, 13%	1300		115.75	Driving casing, hard to drive
							dk minerals, 2% mica. Sl. consolidated	1415		+17.0	Welding on 17' of 10" casing
							may not be holding open hole or well.	1500		132.75	Driving casing, still hard to drive
							No rxn in HCl. Some brown + yellow stained				Measured D/W after casing was
							minerals. Wet color 10YR5/3 (brown).				driven to ~111', @ ~30' w/ e-tape,
											may not be accurate due to sloughing
							Note: The gravel found in the 102-109' sample				of material into borehole
							is probably similar to the gravel found	1600			Started drilling, casing to ~126'
							@ ≈ 145'. There its at the top of	1615			Bailed
							a fining-upward sequence w/ well -	1620			Drilling
							rounded gravels floating in a clay. Probably	1630			Stopped for clay, did not drill
							dep. at beginning of the next fining-up				out hole but think hole is
							sequence.				cleaned out

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 130'-140' Sheet 1 of 1
Location North of Ringold Project SAVAGE Island

Logged by Tyler Gilmore (Print) [signature] (Sign) Date 12/4/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel tape L 300-16 E tape 11034

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cabletool BE 22W / mandrel and Split spoon

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								715		132.75	On site
							Depth to water 44.9 ft E-tape	725			Depth to Water / Bottom
							Depth to Bottom 127 ft Steel tape				
							Depth to Water suspect - Mud in well				
							may have cut water off - Depth to				
							bottom indicated soft mushy bottom				
								[illegible]			[illegible] Rig
							Jim [illegible]	[illegible]			[illegible] HNU [illegible] @ 5.5
							for [illegible]				
								745			Drill
			HNU	0 ppm		130'		[illegible]			[illegible]
130-							D/B 130.9' in Sand (w Steel tape)	915			Switch to Split barrel sampler
132.4			HNU	0 ppm			Split spoon 130.9'-132.4' (Heaving Sand)				(Food grade grease used)
			pH paper	6.8			Fine Sand - Medium Sand; quart mica	950			Split Spoon Sample
							Store in Aluminum liner				Switch tools
						132.4	Heaving Sands will drill past sand	1015			Drill
							to take next split spoon				
140'	Lith	2	HNU	0 ppm			SAND 100% Sand 20% MS, 70% FS, 10% VFS	1030			Sample
			pH paper	6.8			clean v w sort; shed-shaping; Sand is				
							75% qtz and felsics, 25% Mafics, Some Micas,				
							wet color 5Y 4/3 Olive Brown; No rxn in HCL				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location Not Ringold
Depth 140'
Sheet 2 of 2
Project Savage Island

Logged by Tyler Gilmore (Print) [signature] (Sign) Date 12/4/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment Steel Tape L300-16 E-Tape 11034

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method CME Tool BE 22W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						132.4					
							SAND Cont. No consol, sand is			132.75	
							heaving into casing. Similar to previous			15.0	
							Split spoon sample at 130.9'-132.4'			150.75'	
			LEL	0%			Check w/ LEL			-10.0	Weld 10' casing add 18.0'
						140		1050			
								1205		140.75	Drive Casing
								1310			Drill out slurff in casing
								1320			Logging Truck arrives
											Cut 10' casing off
							Log w/ Natural Gamma Probe	1420			Logging
							Incr in Cly content	1510			Drilling
149'	H_3	1					Water Samples	1600			COFC #0120490
149'	N	1						1610			End of Day
							Ended at 145' ~ 7' open hole				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 143.7' Sheet 1 of 1
Location SAVAGE ISLAND Project SAVAGE ISLAND

Logged by S. M. GOODWIN (Print) [signature] (Sign) Date 12/5/93
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme FOLK Procedure DO-1 Rev No 1
Measuring Equipment E. TAPE #11053, STEEL TAPE L300-16

Drilling Contractor BASIN & RANGE
Driller ROBERT PERRY & LES KUNKLE
Rig/Method CABLE TOOL BE 22W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
143.7							CLEANED OUT HOLE W/ DART BAILER;	1010		142.2'	BOTTOM OF 10" = 139.9'
							D/W = 48.9' BLS.	1015			DECON. SPLIT SPOON, CORE
							PLACED TRACER IN WHIRLPAC BAG				CATCHER, SPACER, & CUTTER
							BETWEEN CUTTER HEAD & SPACER.				HEAD.
							TRACER CONSISTS OF MSPHERES,				
							TUNGSTEN CARBIDE, & GLASS BEADS.				
								1020			REMOVING BIT FROM DRILL
											STRING & PLACING DRILLING
											JARS
								1049			BEGIN SPLITSPOON SAMPLING
								1051			41 BLOWS / 18"
							RECOVERED 1.8' OF CORE; TOP 8"	1055			
							APPEARS TO BE SAND & GRADES INTO	1100			CORE TAPED & PLACED IN
							A SANDY MUD. 143.7' - 145.5'				PLASTIC BAG FILLED W/
											ARGON
								1105			DECON. SPLITSPOON, ETC.
											TO PREPARE FOR 2ND SAMPLE
							SAME: TRACER AS ABOVE	1115			ADDING TRACER
								1123			BEGIN SAMPLING
							HAVING DIFFICULTY REMOVING SAMPLER	1126			89 BLOWS / 18"
							DUE TO TIGHT FM.	1135			CORE TAPED & PLACED IN
							RECOVERED 2.0' OF CORE (FROM				PLASTIC ARGON-FILLED BAG.

W = wet, M = moist, D = dry

145.5' - 147.5', APPEARS TO BE SIMILAR SANDY MUD AS ABOVE.

A-1800-003 (05/90)

DEEP MICROBIOLOGY CORE DATA LOG

Core Interval: 143.7-145.5 Logger: BJORNSTAD Date: 12/5/90

Depth Below Surface	Depth Below Bottom	Samples	Lithology	Class	Moisture	% Mafic	Sorting	Roundness (Range (Mode))	Wet Color	Consistency	Cementation	Structure	HCl Reaction	Range in Particle Size	Maximum Particle Size	Comments
			Tracer													Times in bag (broken)
143.7		133 120a		S	W	5-5	W-VW	A-SA (SR)	Grayish brown (10YR 5/2)	Uncon	N	H	N	20% fin-v fin sand 80% med. sand	MS	Micaceous
144		130 134		gM		G=50	W	G=SR-R	Brown (10YR 5/3)	Med-strong (recycled)				20% clay, 60% silt, 20% gravel	VCP	sharp contact clayey silt matrix, well rounded pebbles
.5	1	135 127 128 109 125 117 126 127	122a 105 108 107 106 104 103 102 101 121a	M	M	N/A	VW	N/A	Lt yellowish brown (10YR 6/4)					5% v.fn sand 95% silt	VFS	coarsening downward
145	110 132													20% v.fn. sand 80% silt		
.5	2															

RINGOLD FM

Rev. 3

DEEP MICROBIOLOGY CORE DATA LOG

Core Interval: 145.5-147.5 Logger: BJORNSTAD Date: 12/5/90

Depth Below Surface	Depth Below Bottom	Samples	Lithology	Class	Moisture	% Mafic	Sorting	Roundness (Range (Mode))	Wet Color	Consistency	Cementation	Structure	HCl Reaction	Range in Particle Size	Maximum Particle Size	Comments
	0	112		gmS	W	G=50	P	G= R-SR	Brown (10YR 5/3)	Uncon	N	N	N	20% gravel, 40% sand, 40% mud	MP	
1.16		111		SM	M	N/A	V(W)			WK-mod				40% v.fn. fn sand 60% silt	FS	Micaceous, coarsening downward
.5	1	234 233 241 245 217 209		MS										50% v.fn-fn sand 50% silt		
1.17		232 206 207 208 210 229 227 228 226 204				S≤5				WK						
		203 202 201		(m)S										70% v.fn. fn sand 30% silt		
.5	2															

RINFOLD FM

Rev. 3

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location Savage Island
Depth 145' - 148.3' Sheet 1 of 3
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 12/5/96
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment 2-tape 11053, steel tape 6300-lb

Drilling Contractor Basin & Range
Driller Robert Perry & Lee Kunkle
Rig/Method cable tool PE22W/hand tool, 5' split tube

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			LEL	<det			Calibrated HNU w/ ISO-C_4H_8/air (100ppm),	730		140.75'	@ 10"
			HNU	<det			span @ 5.64				
							D/W at 31.05' bgs, D/P @ 127.44', hole	745			
							apparently heaved in, D/W is probably				
							not very accurate				
							Driving casing ~2.5', bottom of 138.45'	815			
							Bailed hole, water does not seem to be	900		142.2'	Only 8' of casing was put off
							coming in, finish drilling out hole.				yesterday, actual casing is
							Water sample yesterday was collected at				142.2' driller thinks, which
							144' instead of 149'. The hole was only 145'				makes bottom of casing @ 135.5'
							deep according to driller.				
							Bailed hole, D/P is soft, but @ ~143.7' bgs,	1000			
						~145	D/W at 148.9' bgs				
145.5'	Lith	1				145.5	SAND/SILT - 20% vf, 80% mud. Some clay	1045			Used polyFM grease on tools
							No rxn in HCl, tr. mica. Moist color - 10YR5/4	1055			Start split spoon drilling
						~147	yellowish brown. Full description from sampler later.	1115			Taking core out, 143.7'-145.5'
147.5'	Lith	1				147.5	MUD - 10% vf, 90% mud. Some clay. No rxn	1120			Start split spoon drilling
							w/ HCl. tr. mica. Moist color - 10YR5/4 (yellowish	1145			Taking core out, 145.5'-147.5'
							brown) Both samples from shoe of sampler, very				Chamness Good with a tin
							coherent, full description of interval will come				Fixed rig, 2 hr, cleaning split tube
							from mineralogy description				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 169-42-E9A
Location Savage Island
Depth 148.3' - 160' Sheet 2 of 3
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 12/5/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-5 Rev No 1.0
Drilling Contractor Basin + Range
Driller Robert Perry + Les Kunkle
Rig/Method cable tool BE22W/hand tool + split tube
Measuring Equipment steel tape L2016, etape 11053

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						~148.0				142.2'	Hard to get sampler off tools.
147.5-148.3'	lith	1				148.3	SANDY MUD - 20% vk, 80% mud. Some clay.				135 blows/10", slowing in top
	sp.tube	1					No rxn in HCL. Moist color - 10YR 5/4 (yellowish				Cleaning out hole w/core barrel
							brown). Compacted, coherent, hole had	1230			+ bailer.
							sloughed in some from above, most of				Putting jaws back on.
							that ran out of split tube; sampled material	1250			
							from 144.5 on seems to be unsaturated or				
							at least not obviously water bearing, moist				
						~149.0	but not dripping wet. Sampled from shoe				
148.3-149.5	lith	1					SANDY MUD - similar to above. No rxn w/ HCL	1330			50 blows/10", 148.3'-149.5'
	sp.tube	1				149.5	10YR 5/4 (yellowish brown). Sampled from				
							shoe. Both this and next sample feel				
							wetter, more like they are saturated. May				
							be getting to another water bearing zone.				
						~150.8					Piston sampler - 1.7' w/ 10# blows.
150.5	lith	1					SANDY MUD - similar to above. Sampled from 5.4'				149.5'-151.2'
	sp.tube	1					shoe.				Drilling w/ hand tool.
								1410			Sampled 155' w/ split bailer.
							SANDY MUD - similar to above, same	1425			
155'	lith	2					color. All have been very [illegible]				Sampled [illegible]
							SLIGHTLY [illegible] 10%, 45% [illegible],	1450			Moist [illegible]
160'	lith	2					30% vk, 15% mud. [illegible]				
							80% qtz + lt. min, 10% [illegible]				
						160	Mud sorted well - 10YR 5/3 (brown)				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-EGA
Location Savage Island
Depth 160' - 180'
Sheet 3 of 3
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 12/5/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme USCS
Procedure LO-1
Rev No 1
Measuring Equipment steel tape L320 16, e-tape 1153

Drilling Contractor Basin & Range
Driller Robert Ferrell & Lee Kunkle
Rig/Method [illegible] hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						164					
165'	lith	2					SAND - [illegible]	[illegible]			[illegible]
							Well-mod sorted, wet - 10YR5/2, brown, 75%				Still holding open hole.
						165'	qtz + lt min, 15% dk + red [illegible] stained				
							min, 10% mica. [illegible]				
						169	open hole.				
170'	lith	2					SLIGHTLY MUDDY SAND - similar to 160'	1515			Sampled 170' w/dual [illegible]
							sample. Weakly consolidated.				
175'	lith	2					SLIGHTLY MUDDY SAND - [illegible], 40% [illegible],	1540			Sampled 175' w/dual [illegible]
							15% vfs, 10% mud. Other [illegible]				
						175'	previous sample [illegible]				
							& mineralogy.				
180'	lith	2					Will describe [illegible]	[illegible]			[illegible]
	H_2	2									Forced to take split tube sample
	NO_3	2									at 180', will do so before
											drilling any further.
											Collected Water Samples
											COFC # 699-42-EGA 12590
								1440			Left Site

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Sheet 1 of 1
Location Savage Island
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 12/6/90
Checked by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No. 1
Measuring Equipment steel tape L300-16

Drilling Contractor Basin-1 Range
Driller Robert Ferry + Lee Kunkle
Rig/Method cable tool BE77W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			LEL	0			HNU calibrated w/ same gas as before, span	1410		142.2' of 10"	Spend morning picking up 8" casing + repairing
			HNU	<det			@ 5.56				vehicles
							D/W = 28.85' bgs	1420			
							D/B = 165.81 bgs, bottom of casing @ 135.9',	1425			Unloading 8" casing, preparing
							have 25.91' of open hole.				to run down hole
							180' description from interim-				
180'						179	SAND - 50% MS, 30% FS, 15% VFS, 5% mud.				
							Well-mod. sorted. 60% qtz, 10% stained or				
						180'	dk min., 10% mica, color - 10YR5/3 (brown).				
							Weakly consolidated (?) slower in drill				
										20.7'	of 8", includes shoe
										120.7'	
										41.4	
								1540		120.3'	
										61.7'	
								1620			Quit for day, no H_2O sample
											taken since Folk will not
											be on site

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Sheet 1 of 2
Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/7/90
Checked by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No. 1
Measuring Equipment Steel tape L300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable tool BE22W Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Will be welding 8" casing today	730			Arrive at Site
			LEL	0%			Check hole w/ LEL & HNU	740			
			HNU	0 ppm			Calibrate HNU Span = 5.56				
							LEL at 22% O_2				
								750			Welding
							Casing Tally 20.7				
							20.7				
							20.7				
							19.7				
							17.9				
							18.2				
							20.3				
							20.9	1310			Drilling
							20.4				
							179.5 Total			179.5'	Total 8" casing
							Casing went down to ~171'				
							Bottom of hole 12:5 was 180' bottom				
							of 10" casing at 139.9'				
								430			Weekly Safety Meeting w/
							Hit some flowing sands at 180' could				Tom Navarro
							not split spoon sample w/ mud				
							until we find more consol sediments				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9H

Sheet 2 of 2

Location North of Rivanna

Project Gas Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/7/90

Checked by (Print) (Sign) Date

Lithologic Classification Scheme Folk

Procedure DO-1

Rev No. 1

Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range

Driller Robert Perry

Rig/Method Cable Tool BE 22 Wood

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Add 10.1' of 8" Casing	1450		179.5 10.1	Weld Casing New Total 189.6'
								1525		189.6'	Drill
							Casing following the Bit down				
							At 182' a possible lithology change				
							Trying to get open hole to				
							slug test Monday				
							Final Depth ~ 186'			1640	End of Day
							No water sampling Taken				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location
Depth 185' - 184.9' Sheet 1 of 3
Project

Logged by SS Teel (Print) SS Teel (Sign) Date 12/10/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape L300-1b

Drilling Contractor Basin & Range
Driller Robert Perry
Rig/Method Cable Tool Below Hard Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0750		189.6	Driller + Geol arrive on site
							D/water = 34.47 - 4.17 = 30.30	0810			
							D/Bottom = 178.6				
							Bottom of 8" @ 185.5				
							(≈ 7' of plug)				
							Span set @ 5.68	0825			Calibrated HNU
			HNU	0ppm			Check hole w/ HNU, LEL/O_2	0830			
			LEL	0%							
			O_2	21.8%							
								0835			Drilling w/ Hard Tool
							D/Bottom = 186.0 + 3.0 - 4.1 = 184.9	0850			
							(≈ 0.5 ft of plug)				
							Will go ahead and rig-up for split-spoon sampling				
								0925			Reamed split-spoon
							D/Bottom same as previous - not sure if this is real or if the tape is not finding the hole made by the split-tube	0930			
								0935			When driller lowered the split-tube to repeat sampling he found that the hole has heaved. Will have to change tools and drill-out

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location U of Ringold
Depth
Sheet 2 of 3
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign)
Date 12/10/90
Reviewed by (Print) (Sign)
Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin & Range
Driller Robert Perry
Rig/Method BE22W Cable Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
Assume 185-187	Split Spoon	1	HNU	0 ppm			SLIGHTLY MUDDY SAND 70 (assume 185-187')			189.6	
187'	Lith	2				185	SAND 90% recovery, 60 blows to advance	0950			Drilling w/ Hard Tool
						186	1.5 ft. Sample in lexan liner - Lithology	1020			Cannot maintain open hole -
							samples taken from shoe. Upper half of tube				will continue to drill ahead and
						187	is med-coarse sand - lower half is a finer				let casing follow.
							grained sand that may be slightly silty - appears				
			HNU	0ppm			to coarsen again at the very bottom of the tube.	1050			Will have to add casing. Check
			LEL	0%			Lith sample: 90% sand, 10% silt, 0% clay				borehole.
			O_2	21.8%			5% CS, 60% MS, 20% FS, 5% VFS, 10% silt,	1055		19.41	Adding 9.41' of 8" casing
							Mod- well sorted. 5% basalt, mafics, mica,			199.01	
							95% [illegible] A-SR				
							Wet color: 10YR 4/2 (Dark [illegible] brown). No	1150			Drilling w/ Hard Tool
							reaction to 10% HCL. Homogeneous structure,				
							uncemented, moderately consolidated				
						189'					
190'	Lith	2	HNU	0ppm			SLIGHTLY MUDDY SAND (4% gravel, 86% sand,	1245			Sample w/ Dart Bailer (190')
			pH	6.5			10% mud) 1% MP, 2% FP, 1% VFP, 8% CS, 65% MS,				
							17% FS, 6% VFS, 10% mud. Mod- well sorted.				
							(Gravel) - 30% basalt/mafics, 70% qtz, [illegible],				
							+ Si-rich rock fragments, Angular, (Gravel) -				
							- 5% mica, 5% Fe-stained [illegible] basalt				
							90% qtz, qtzite, + Si-rich. A-SR. Wet color:			199.01	
						190'	5Y 5/2 (olive). No reaction to 10% HCL. Similar to previous				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 3 of 3 36
Location N of Ringold Project

Logged by SS Teel (Print) SS Teel (Sign) Date 12/10/90
Checked by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin & Range
Driller Robert Perry
Rig/Method BE22W1 Cable Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Driller noticed a clump of clay and coarse	1345		199.01	
							pebble on the bit when he brought the bit out of the hole to				
							bail. Bailed material is still same as				
							previous however. Depth ≈ 194'				
								1405			Driving Casing - will drive to
											bottom of hole and then clean-out
											and get a split-spoon. Casing
						195'	(195-197')				is driving easy.
195-197	Split tube	1					SANDY MUD (30% sand, 70% mud)	1500			Split spoon 195-197'
	lith	2					Difficult to tell proportions & mineralogy				41 blows / 18" ; 80% recovery
							Wet color: 10YR 6/2 (light brownish gray)				
							No reaction to 10% HCL. Mod-strongly consol.				
							Homogeneous. No visable structure. V. well				
							sorted.	1530			Split spoon 197-199'
197-199	Split tube	1					SANDY MUD (197-199') same as above				100% recovery, 143 blows / 18"
	lith	2						1550			Drilling w/ Hard Tool
200'	lith	2					GRAVELLY SANDY MUD (10% gravel, 25%	1600			200' sample - collected
							sand, 65% mud) same as above except				by scraping mud off of bit
							10% gravel - up to CP size, well rounded				
205	lith	2					SLIGHTLY GRAVELLY MUD (5% gravel,	1620			205' Sample - collected by
							15% sand, 80% mud) similar to above				scraping mud off bit
H_2O	NO3 / H	2 / 2					- hard to tell exact proportions - seems	1630		199.01	Collected H_2O Samples
						205'	to have more clay and less gravel & sand than				
							previous				

W = wet, M = moist, D = dry

have ≈ 10' open hole

A-1800-003 (01/90)
C of C # 121090SI

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 1 of 3
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/11/90
Checked by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk [Cly ASTM] Procedure DO-1 Rev No. 1
Measuring Equipment Steel tape L302-16 E-tape 11034

Drilling Contractor Basin and Range
Driller Robert Perry / Les Kunkle (helper)
Rig/Method Cable tool BE 22W / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Clear cold day	730		199.01'	Arrive at Site
							D/B 202.5' (very soft) steel tape L302-16				
							D/W 31.0' E-tape 11034				
								740			Drilling
			LEL	0%			Calibrate HNu (10.2ev lamp) span = 4.90				Check drill site w/ HNu
			HNu	0 ppm							
210'	Lith	2	HNu	0 ppm		210	MUD 10% Sand, 90% Mud (predomcly)	0925			Sample
							3% MS, 5% FS, 2% VFS, 90% Mud (predom				
							cly; v cohesive sl soluble in water				
							W srt, Sand is subangular predom				
							qtz w/ some plty orng-yel mineral				
							wet color 10YR 6/3 pale brown, sl-mod				
						215	consol; No rxn in HCl - cly has				
							medium dry strength (breaks into chunks)				
							Medium toughness (takes a little to roll in thread)				
							Much more mud than previous (no gravel)				
						220					
215'	Lith	2	HNu	0 ppm			MUD 10% Sand, 89% Mud, 1% Gravel	1015			Sample
							3% MS, 5% FS, 2% VFS; 89% Mud (predom				
							cly, v cohesive, sl. soluble in water,				
							medium dry strength, Medium toughness; Trace				
						225'	(1%) Gravel coarse ESLT M pebbles;				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 2 of 3 38

Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/11/90

Checked by _____ (Print) _____ (Sign) Date _____

Lithologic Classification Scheme Folk [Cly ASTM] Procedure DO-1; DO-5 Rev No. 1.0

Measuring Equipment Steel tape L300-16

Drilling Contractor Basin and Range

Driller Robert Perry

Rig/Method [illegible] BE 220 / [illegible] and [illegible]

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							215' Cont. Sands subang, wet color				Sample cont.
							10YR 6/3 pale brown; No rxn in HCl				
							mod consol (hole staying open) similar				
							to previous; on preserved cly [illegible]				
							bit 4 here are about streaks and nodules				
							of Fe iron staining of orng - orng brn				
							Some have chlorite-like grn amoeba				
220'	Lith	2	HNU	0ppm			MUD 1% Gravel, 9% Sand; 90% Mud	1115			Sample
							(predom cly incr slt content) 1% Mg				
							3% MS, 3% FS, 3% VFS, 90% MUD;				
							sl soluble in water low dry strength;				
							low - mod toughness (incr in SILT),				
							10YR 6/2 pale brn, decr in Fe stn				
							no rxn in HCl more silt "dryer" [illegible]				
							than previous				
225	Lith	2	HNU	0ppm			MUD 1% Gravel 5% Sand 94% mud (predom	1215			Sample
							cly) 1% CD; 5% FS, 94% Mud (predom				
							cly) Mod dry strength; Mod toughness				
							few Fe stn "pockets" 10YR 6/3 [illegible]				
							No rxn in HCl mostly cly less silt than				
							before rr subrd pebble in clay				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-F9A Sheet 3 of 3

Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/11/90

Checked by _____ (Print) _____ (Sign) Date _____

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment Steel Tape L300-16

Drilling Contractor Basin and Range

Driller Robert Perry

Rig/Method BE 22W cable tool / Hand tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
229'	Lith	2	HNU	0ppm		225'	MUD 5% Sand 95% Mud;	1300			Sample
							5% FS, 95% Mud pred Cly,				
							High Strength High toughness "Fat Cly"				
							abnt Fe stn and mottling, Tr blk				
							"Coal" organic sen ?; N5 Gray w/				
						230	brn mottling, Sand predom bslt;				
							angular; No rxn in HCL, Mod consol;				
							bslt grns may indicate we are close				
							to bslt top				
229.5'	Lith	2	HNU	0ppm		230'	MUDDY SAND 70% Sand, 30% Mud;	1340			Hit Sand @ 229.5'
							15% CS, 30% MS, 20% FS, 5% VFS, 30%				
							Mud (slt + cly) Mod Sort wet color				
							10YR 5/4 brn Sand is 40% BSLT				
							60% Folk classification BSLT				
							is angular frag [illegible]				
							Subrd No rxn in HCL no consol				
230'	Water	2	H_3 Nitrate								Water Sample COC 121190
							Need to Build Bit up Spend rest	1340			
							of day training in bit				
								1600			End of Day

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 1 of 2

Location Project

Logged by SS Teel (Print) SS Teel (Sign) Date 12/12/90

Checked by (Print) (Sign) Date

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment Steel Tape L300-16 E-tape 11034

Drilling Contractor Basin & Range

Driller Robert Perry / Le[illegible]

Rig/Method EE 2[illegible] Cable Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0730		199.91	Driller on site - preparing
											to drill; replacing bit
							D/water = 31.0 - 4.10 = 26.9 (E-tape)	0755			
							D/Bottom = 230.0 + 3.0 - 4.1 = 228.9				Driller was able to "work"
							(very soft)				bit down to 230'
							Bottom of 8" casing @ 194.91	0807			Drilling w/ Hard Tool
			O_2	21.8%			Span set @ 5.43.	0810			Calibrated HNU / LEL - O_2
			HNU	0ppm				0815			Check borehole. HNU
			LEL	0%		230'	(230'-231')				battery is low.
231'	Lith	2					SLIGHTLY GRAVELY SLIGHTLY MUDDY SAND	0855			In much harder material now -
							5% gravel, 15% clay/silt chips, 80% sand.	0920			- part of the end of the bit
							Silt/clay chunks are probably carry-down from				was bent. Depth ≈ 231-232'
						231'	above. 3% FP, 2% VFP, 20% VCS, 30% CS,				Driller thinks now in basalt.
							20% MS, 5% FS, 5% VFS, (Gravel) - 4%	0930			Bailing drew water level down
							basalt, 1% qtzite (angular), (Sand) 35% basalt,				≈ 60 ft - recharging at
							50% qtz + qtzite, + Si-rich, 14% mudst., 1% min	0950			a rate of ≈ 1 ft/min.
							Sands are A-R. Wet color: 10YR 4/2 (dark grayish	1000			Will continue drilling and
							brown).				cleaning out the hole in order
											to get a good basalt-chip
											sample for dating.

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth ~234' Sheet 2 of 2
Location N. of Ringold Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 12/12/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No 1
Measuring Equipment Steel tape # L300-16 E-tape # 11034

Drilling Contractor Basin & Range
Driller Robert Perry / Les Kunkle
Rig/Method BE22W Cable Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
233	lith	2					Could not get a depth to bottom –	1330			Collect samples of
							tape kept sticking to sides of casing				basalt
H_2O	NO_3	1					Note: As a result of bailing, the	1400			Collect H_2O samples
	^3H	1					H_2O level dropped to ≈ 130'				Cofc # 121290
							– recharge rate was approx.				
							2 ft / minute.				
								1430			Leave Site
							(Final depth ~ 233')				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A
Location N of Ringold
Sheet 1 of 1 42
Project Savage Island

Logged by SS Teel (Print) SSTeel (Sign) Date 12/13/90
Checked by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16, E-tape #11034

Drilling Contractor Basin + Range
Driller Robert Perry / Les Kunkle
Rig/Method BE22W, Cable Tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0745			Arrive on site
							Tried to get D/Bottom - feels very soft -	0750			
							- can't tell where bottom is.				
							D/water = 30.77 - 4.1 = 26.67 (E-tape)	0755			
			HNU	0 ppm			Calibrate HNU and check borehole, Span is	0800			Bailing w/ Sand pump
			LEL	0%			set at 5.43.	0815			Logging truck arrives
			O_2	21.8%			D/Bottom = 233 + 3.0 - 4.1 = 231.9	0820			Brief SP Airhart and AW
							Driller can go 238' w/ both the bit and				Pearson on the Safety Plan
							the bailer - tape weight may not be				
							large enough. Bailer dimensions are	0840			Breaking-down rig.
							0.62' dia. and length is 21.6'. This				
							satisfies the straightness test.				
							Interval run is 1-230.6. Won't be	1100			Completed Natural Gamma Log
							able to run caliper log today - will do that				Driller welds plate on borehole
							first thing next week (along with temp)				
							Note: The depth given by the driller for TD				
							(238') may be off by 5'. D/Bottom meas.				
							w/steel tape and geophysical probe is ≈ 232'.				
							Driller thinks that the mix-up occurred at 230'				
							and the sample marked as "235'" is actually				
							a repeat of the 230' sample. The driller	1130			Leave Site
							will measure in next week to verify this.				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E94 Sheet 1 of 1 42

Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 12/18/90

Checked by _____ (Print) _____ (Sign) Date _____

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment _____

Drilling Contractor Basin and Range

Driller Robert Terry

Rig/Method Cobletool BE 250

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Driller set Rig back up after	730			
							leaving down over weekend				
											Mig at 6ppm Max H_2 <4ppm
							Slug test run by Jane Borghese to				no evidence of Volatiles which
							test lowest sand unit. This unit				drilling water can be discharged
							is approx 5 ft thick and had the				at the ground (No barrels needed)
							highest values of NO_3. If the				
							unit is above ~5 gal/ft/day we will				
							complete this zone				
							Slug dropped for Test	1020			Approx 110 ft^3/day
											Transmissivity
							Casing delivered - but no "O" rings				
							need to wait for delivery				
							Make lifting bail set up to run				
							casing in morning. Lay out				
							irrigation line				
								1500			End of Day

A-1800-003 (01/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Sheet 1 of 1
Project Savage Island

Logged by MA Chauners (Print) MA Chauners (Sign) Date 12/19/90
Reviewed by (Print) (Sign) Date
Measuring Equipment PNL L300-16 Steel Tape Procedure DO-1, DO-5 Rev No. 1.0

Drilling Contractor Basin and Range
Driller Robert Perry, Les Kunkel
Rig/Equipment BE 22W / Cable tool Rig

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
730												No work yesterday, blizzard
												On site, pulling water tank out, trying to
												thaw it out. "O" rings delivered
900												yesterday are 2 diff. sizes. Have to
												go to Pasco & pick some more up. Les
												is trying to warm up rig enough to
1055												start it.
												Back from Pasco w/ more "O" rings, rig
1150												is started + warm.
												One piece of screen is plugged on both ends,
												the other plugged on female end, so the male
												lifting bail we have will not work. Trying
												to make another one.
												WB = 231.8' bgs
												Based on nat & log, top of sand is @ 224.5'
												will use 20-40 mesh sand, to there, 120-100
1245	Fiberglass 10 slot	3"	10.85'	} removed								mesh sand to 221.5'
	casing	3'	20.04'									The 2 pieces don't fit together, the threads
												are different types. Took these 2 pieces
												back out, talked to Tom Neuzer +
1530												manufacturer, all new casing will be
												sent out.
												Left site after tearing down rig

DAILY BOREHOLE/WELL COMPLETION LOG

Sheet 1 of 2

Boring or Well Number 699-42-E9A

Location North of Ringold

Project Savage Island

Logged by Tyler Gilmore (Print) — Signature (Sign) — Date 1/2/91

Reviewed by (Print) (Sign) Date

Measuring Equipment Steel tape PNL L300-16 Procedure DO-1 Rev No. 1

Drilling Contractor Basin and Range

Driller Robert Perry

Rig/Equipment BE 22W Cable-tool

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
930												- Have been on standby since 12/20/90 after fiberglass casing was rejected, a new shipment of casing arrived and looks good
1000												- Rig will not run, run to town to pick up parts
												- Return w/ parts and work on Rig
1300												- Set Rig up
1315												- Casing is Thin walled - thinner than casing it replaced, also slots on screen look very small - openings may expand when casing is hung in well - took picture of screen - centralizers are stove type and they slide over casing, not epoxied or held in place by lip at joints
	Casing Tally											D/W 24.7 ft D/B 228.2'
	(1) 11' screen											drill tension up hole back to 232.0'
	(10) 20' casing											Measured (4) 20ft'ers all exactly 20'1/8"
	(1) 13' "											Casing does screw together -
	(2) 5' "											- Casing accepted
	234'											Casing in hole total 234.0'
												Depth inside 231.25 bls Casing
1500	Fiberglass	3"	234.0'	1.8'	232.2'	Colo Silica Sand 10-20	1 bag					

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Sheet 2 of 2
Project Savage Island

Logged by Tyler Gilmore (Print) [signature] (Sign) Date 11/3/91
Reviewed by (Print) (Sign) Date
Measuring Equipment PVC L300-16 Steel Tape Procedure D2-1 Rev No. 11

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Equipment Cable tool

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1525	Fiberglass	3"	~234'	1.8'	232'					228'	N/A	bottom at 8" 195.0'
						CSS 10-20	(100 lb) 1 bag			226.3'		Need sand to 217'-218'
						"	1 bag			226.0'		
1535						"	2 bags			223.2'		
						"	1 bag			221.5'		
						"	2 bag			219.0'		
						CSS-40-140	1 bag			217.3'		Some Sand may settle overnight
1630												End of Day
												Total (8) 100 lb bags 20-40 Sand
												(1) 100 lb bag 40-140 Sand

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A
Location North of Ringold
Sheet 1 of 1
Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 1/3/91
Reviewed by (Print) (Sign) Date
Measuring Equipment Steel Tape L 300-16 Procedure DO-1 Rev No. 1

Drilling Contractor Basin and Range
Driller Robert Perry / Les Kunckle
Rig/Equipment Gidetool BE 32W

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1000	Carbon Steel	8"	199.0'	4'	195.0'	Sand				213'	N/A	Driller needed to be badged 7:30-10:00
												Set up to settle out Sand: Will pump
												from inside 3" to settle filter Pack
												D/B Sand Com overnight 213' need at about
												217'
												Settling Pump 3" Submersible
1100												Turn Pump on - Pumped for ~4min
1150	[Note: Recharging very slow about 1'/min at 90']					Sand		After pumping		212.8'		went dry - Pump set at 100'
												let recharge then turned on again
						Volclay Tablets	1 bucket			210.5'		Total 2.3' Volclay
1310												Set up to run grout - mix grout in tub
1440												and tremmie down w/ mud pump
						Bentonite Crumbles	1 bag			—		Mix 1 load Grout (50lb bags)
1520						"	5 bags					Mix 2nd load Grout
1600												Grout came to top at 8" then
												settled down
												End of Day
1700												

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A Sheet 1 of 1
Location N. of Ringold Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 1-4-91
Reviewed by (Print) (Sign) Date
Measuring Equipment Steel Tape L 300-16 Procedure DO-1 Rev No. 1

Drilling Contractor Basin + Range
Driller Robert Perry / Les Kunkle
Rig/Equipment Cable Tool / BE-22W

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0800	Carbon Steel	8"	199.0'	4'	195.0'							Driller fetching water (fish hatchery)
0922							(50# bags)					Driller back on site
1000						8-20 crumbles	1/2					Added 1 batch of slurry (95 gal / 1/2 bag)
1010						"	2.5					" (95 gal / 2.5 bags)
1020						"	2.5					" (95 gal / 2.5 bags)
						"	2.5					"
						"	2					Mud level is ≈ 3' aboveground.
												Circulating mud in hole - mud wt
												is 9.5-9.6 but is not fully
												hydrated. The pump will not pump
												mud much thicker than this.
1120												Wt = 9.4
1145												Wt = 9.1 (appears to be fully hydrated)
												Removing tremie pipe
1215												Pulling casing. (Dead-pulling)
1430												Removed remaining 8" casing
1445												Pumped remaining slurry down hole
												(≈ 40 gal)
												Checked level of mud w/ mirror - appears to
												be ≈ 50' down. Added water to hole
1950												Welded plate on borehole.
1500						Bentonite Slurry				≈ 50'		Left site. Ready to start pulling 10" casing

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A Sheet 1 of 1
Location N. of Ringold Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 1-7-91
Reviewed by (Print) (Sign) Date
Measuring Equipment Steel Tape # L300-16 Procedure DO-1 Rev No. 1

Drilling Contractor Basin + Range
Driller Robert Perry / Les Kunkle
Rig/Equipment Cable Tool / BE22W

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
7 1130			142.2	(not		Bentonite Slurry	—					Driller on site - setting up jacks
1320				incl. puller								Begin pulling casing. Jacks are not
				head)								working very well because the oil level
												is low and because it is cold.
1340												Robert goes to town for oil. Continuing
												pulling w/ jacks.
1350										≈26'		Have pulled 8" so far
1450												Robert arrives - fill hydraulic res.
										≈60'?		D/w still ≈ 26 - very difficult to
												tell where bottom is - appears to be
												thicker starting at ≈ 60'. Have pulled
												≈ 2' so far.
1500												Pulling w/ Jacks
1505												Hydraulic hose broke - will be
												shut down for rest of day. No oil
												contacted the borehole. Spilled oil
												was scooped-up and placed in a drum.
1523												Have re-arranged the hoses so that the
												jacks can continue to run - Robert leaves
												for town to get another hose.
1615												Robert on site - removed filter - pulling much better
1645			132.75	6.9	125.9							Exposed 132.75' weld

End of Day

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A Sheet 1 of 1
Location N of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 1/8/91
Reviewed by (Print) (Sign) Date
Measuring Equipment steel tape L300-16 Procedure DO-1, DO-5 Rev No. 1, 0

Drilling Contractor Basin + Range
Driller Robert Perry + Les Kunkle
Rig/Equipment cable tool BE22W + hyd. jacks

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
730	CS casing	10"	142.2	7.1'	125.9	Bentonite slurry						On site, warming up rig, preparing to cut off casing
800												Ran out of O_2 + acetylene, will have to get more before finishing cutting casing
1050												Back w/ O_2 + acetylene, setting up
1120												Safety man, Ed Endlog (REH) came by, safety mtg
1140												D/B difficult, got stiff at ~103' bgs.
1150												HNU < det., LEL ok
1255		10"	115.75'	6.9'	108.9'	Bentonite slurry						Pulled back to expose 115.75' weld
												Mixed bentonite slurry, 2½ 50 lb bags bentonite crumbles mixed in ~90 gal. H_2O, reads 9.3 on mud balance, Robert says can't pump it much thicker. Put a 2nd batch of ~96 gal using same quantities.
							186 gal			~43'		
1330												Pulling back casing to expose 96.75' weld
1450		10"	96.75'	6.9'	89.9'					~50'		Mixed another batch, 2½ bags in ~90 gal @ 9.3 weight.
							90 gal			15'		
1640		10"	76.85'	7'	69.85'					29'		76.85' weld exposed
												Will pull a little more to let grout push out as much as possible over night
1655												Pulled ~4'-5', stopped for day.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-EGA Sheet 1 of 2
Location N of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 1/9/91
Reviewed by (Print) (Sign) Date
Measuring Equipment steel tape L300-16 Procedure DO-1 Rev No. 1

Drilling Contractor Basin & Range
Driller Robert Perry + Les Kunkle
Rig/Equipment cable tool BE 22W/hyd. jacks

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
730												On site, warming up rig,
745	c steel	10"	76.85									start pulling casing
905			57.15	6.2'	50.85	Bentonite				~50'		Exposed 57.15' weld, HNU <det, LEL ok
						slurry						
						silica sand	1 bag			50.7'		Added sand to help firm up bottom
						10-20 mesh	1½ bag			48.0'		
	Carbon steel	10"	57.15	9.2'	48.0'					48.8'		
1005							½ bag			47.3'		
			52.15'	5.5'	46.7'					48.5'		
			52.15	6.4	45.8					46.3'		
					44.3	volclay	2/3 5gal bucket		2.4'	44.7		have 1.6' of bentonite seal, will place
						pellets						sand on top + set screen at ~43'
			49.3'	5.2	44.1'							
	fiberglass	2"		5.2	230.0'				.5	44.6		
						silica sand	2 50lb					Talked to T. Gilmore, he wants bottom of screen
1155			49.3'	5.2'	44.1'	10-20 mesh	bags			40.3'		at ~40-41', 2' of sand above screen, ~4' of
					41.4'					41.7'		pellets (wetted), and then the cement grout
			47.55'	6'	41.55'	silica sand	½ bag			40.4		exposed 47.55' weld
	PVC, 20 slot	2"	10'5"									Screen was slotted by manufacturer, took
	" screen	"	10'									photos of screen + casing
	PVC casing		10'									Screen from 41.55 to 21.13'
			10'									
			5'									

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-EGA
Location N of Ringold
Sheet 2 of 2
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 1/9/91
Reviewed by (Print) (Sign) Date
Measuring Equipment L300-16 steel tape Procedure DO-1 Rev No. 1

Drilling Contractor Basin + Range
Driller Robert Perry + Les Kunkle
Rig/Equipment Cable tool BE72W/hyd. jacks

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1240	PVC	2"	Total 45	~3.8'	41.6'	silica sand	2½ bags		2.5	35.6		
						10-20 mesh						
1250	C steel	10"	47.55	7.9'	39.7	100 lb (bag)				36.6'		
			47.55	9.2'	38.35'	"	5 bags		"	25.8		
			37.9	6.7'	31.2'					28.4		Exposed 37.9' weld
						"	5½ bags			16.0		
			28.7'	6.5'	22.2'				"	18.7	3.5'	Pulled back to expose 28.7' weld
						"	1 bag		"	16.7		
					20.8					16.7		
1500					19.4					17.2		
		10'	23.1	5'	18.1'					17.7'		Cut off 5.6' of casing
					17.2"					17.0		Casing pulled up but there large open hole,
						volclay pellets	3½ buckets (5 gal)			12.2		apparently some slough came in
1540			23.1	6.6'	16.5'					12.7		
			23.1	9.5'	13.6'					13.8		
			23.1	9.5	13.6	"	1 bucket			12.3		
			19.1'	7.1'	12'					13.1		Cut off 4' of 10", pulled rest of 10" out
1615	C steel	12"	16.1'	3'	12.1'					13.1		+ helped pull 12" up.
1620					12.1	"	1 bucket			12.0		Filled open hole w/ bentonite pellets
												will pour cement grout tomorrow
1640												Moving jack off hole
1700												(Quit for day)

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A
Sheet 1 of 2
Location N. of Ringold
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 1-10-91
Reviewed by (Print) (Sign) Date
Measuring Equipment Engineers Tape Procedure DO-1 Rev No. 1

Drilling Contractor Basin & Range
Driller Robert Perry / Les Kunkle
Rig/Equipment BE 22W Cable Tool

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0800												Mixing Cement Grout
0820												Adding Cement Grout to borehole
0930												Removed 12" casing, will have to
												get more water for mixing additional
												cement - grout level is ≈5' b.l.s.
												When 12" casing was removed approximately
												1/2 bucket of bentonite pellets were stuck
												to the bottom inside of the casing.
						Cement Grout						Summary of Grout added so far
						Portland cement	6 bags	(94 lbs ea)				
						8-20 bentonite	2 bags	(50 lbs ea)				
						Water	80 gal					
						Gypsum	1.3 bags	(80 lbs ea)				
1020												Driller returns with water
1030												Mixing and pouring grout
1050												Teamsters arrive w/ pump column pipe. It
												has not been steam cleaned. They will take
												it back and return it when cleaned.
1100						Portland Cement	3 bags					Finished pouring cement grout. Grout
						8-20 Bentonite	1 2/3 bags					level is 0.5' b.l.s. It may settle
						Water	40 gal					some into the formation.
						Gypsum	1/2 bag					

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A

Sheet 2 of 2

Location N. of Ringold

Project Savage Island

Logged by S S Teel (Print) SS Teel (Sign) Date 1-10-91

Reviewed by (Print) (Sign) Date

Measuring Equipment Engineers Tape Procedure DO-1 Rev No. 1

Drilling Contractor Basin and Range

Driller Robert Perry / Les kunkle

Rig/Equipment BE 22 W

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1115												Cleaning-up site, preparing to dig post-holes.
1445												Concrete truck arrives - pouring cement pad and setting guard posts
1530												Cement truck leaves. Total concrete used was 1.0 yards.
												Protective casing is ≈ 3' above top of cement pad; 3" and 2" casings are 1.5' below the top of the protective casing. D/Grout is 1' b.l.s.
												End of Day. Well was capped and locked. Brass marker was set in pad.
												KEH delivered pump column pipe at 1430 hrs. Pipe was steam-cleaned and was delivered wrapped in plastic.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9A

Sheet 1 of 1

Location North of Ringold

Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 1/11/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1, Rev No. 1

Drilling Contractor Basin and Range

Driller Robert Perry / Les Kunkle

Rig/Equipment CE 22W Cable tool

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
740												Pump test Today
												Please see Aquifer test Notes
930												Set Pump
												Wait for static Water-level
												Start Pumping
												Pump for 30 min
												Pump Stopped
												Wait for Recharge
												Pump does not re-start
												Pull pump
												Pump Stuck at ~176'
1700												End of Day

A-1800-004 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth [illegible] Sheet 1 of 2
Location North of Road Project Savage Island

Logged by Ty[illegible] Gi[illegible] (Print) [illegible] (Sign) Date 1/12/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme N/A Procedure DO-1 Rev No 1
Measuring Equipment Steel Tape PNL 1300-16

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Pump stuck in well - pumping	800			All measurements from casing
							abruptly stopped yesterday. We then				casing stick up = 2.8'
							tried to pull pump out				
							- Pump stuck at ~ 176 ft				
							water level in Fiberglass casing at 49'				
							on 1/11/91 on 1/12/91 43.15'				
							water level inside pump column				
							was 28.0' on 1/12/91				
							Ran steel tape into pump column				
							to 175.5 ft - To check for bentonite				
							inside pump column. Ran a tube in to				
							try for a "core" sample [illegible]				
							of mud on Tape				
							Will collect sample at pump column	845			Collected (2) 125 ml samples
							water in case we lose well				from pump discharge line
							Set up sample hammer (acts as a set	925			
							of jars) to pump column to work				
							pump out of well - pulled one joint	950			
							of [illegible] [illegible]				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E94 Depth N/A Sheet 2 of 2

Location Nathan of Ringold Project Savage Island

Logged by Tyler Gilmore / Jane Borgese [illegible] Date 1/12/91

Reviewed by _____ Date _____

Lithologic Classification Scheme N/A Procedure DO-1 Rev No 1

Measuring Equipment PNL Steel Tape L300-16

Drilling Contractor Basin and Range

Driller Robert Perry

Rig/Method BF 2210 [illegible]

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							- Pulled third [illegible] of [illegible]	1030			
							pipe from [illegible], remove				
							tension - it was stuck				
							[illegible] cap, lower E-tape set at				
							20' from pump [illegible] broke				
							at 137' (1) E-tape probe left in hole				
							pulled last pipe set w/	1117			
							check valve filled with				
							sand - mica flakes - probably				
							not filter pack - pump				
							still in hole				
							Pump at 157' bls (w/ Steel Tape)				
							Water level inside 3" [illegible] 45.3'				
							Pump wire looks like it was hung-up				
							while pulling (Frayed etc.)				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth N/A Sheet 1 of 1
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 1/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1 Rev No 1
Measuring Equipment L300-16

Drilling Contractor Basin and Range
Driller Robert Perry / Les Kunkle
Rig/Method Cable tool BE 520W

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							WHC - Aaron Slotz on site to	830			
							Log well w/ camera. Need to log				
							at where pump is stuck				
							No log for 1/14/91 - Driller				
							picked up pipe and standby in				
							afternoon				
							Water 13.9 m (45.59 ft)	850			
							water very dirty - clean off lens				
							Camera hit something at 144.6 ft				
							felt like some resistance (casing debris?)				
							Steel tape showed 147.8 ft (144.8' bls)	930			WHC left site
							Sand on tape - Sounded in ~13 ft				
							(last measurement to top pump 157 ft)				
							Went for Sand pump and fishing	1020			
							tools				
							Collected tools by 1500	1500			End of Day

W = wet, M = moist, D = dry

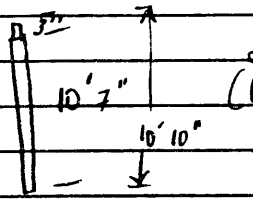
A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth N/A Sheet 1 of 2
Location North of Ringold Project Savage Island

Logged by Tylor Gilmore (Print) [signature] (Sign) Date 1/16/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure TI-1 Rev No 1
Measuring Equipment

Drilling Contractor Basin and Range
Driller Robert Perry
Rig/Method Cable tool BE520

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							D/B 147.3 ft from casing approx 0.4 ft	745			
							higher than on 1/15/91 approx 13.5 ft				
							above pump				
							Bob Jones WHC on Site				
							Wait for Perry to Show up	800			
							Run Sand pump in well	810			
							sand pump  2.5" dia pump				
							(1.5" dia stem)				
							10' 10" total length				
							Add water to 3" to raise hydraulic head	845			
							Water level to top of casing				
							Sand pump would not go down past	905			
							~25 ft				
							Run casing in; each length 9.85'	930			
							dia 2 3/4" (76 mm) to test fit, see				
							if fishing tools can be run in				
							at 4 lengths + 2.2' (38.6' bls) pipe hung up				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-[illegible]-[illegible] Depth N/A Sheet 2 of 2

Location [illegible] Project [illegible]

Logged by [illegible] (Print) [illegible] (Sign) Date 1/16/91

Reviewed by _____ (Print) _____ (Sign) Date _____

Lithologic Classification Scheme [illegible] Procedure DO-1 Rev No 1

Measuring Equipment _____

Drilling Contractor [illegible]

Driller [illegible]

Rig/Method [illegible]

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							[illegible]	[illegible]			
							[illegible]	[illegible]			
							[illegible]				
							[illegible]				
							[illegible]				
							[illegible]				
							[illegible]				
							Cuttings [illegible]				
							[illegible]				
							[illegible]				
							[illegible]				
							[illegible]				
							[illegible]				
								[illegible]			[illegible]

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth N/A Sheet 1 of 2
Location North of Field Project Source Island

Logged by Tyler Dilmore (Print) Tyler Dilmore (Sign) Date 1/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Basinant Range
Driller Robert Perry / Bob Jones (WHC)
Rig/Method Cable tool

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Technical Forum is starting	1500			All measurements below
							Concensus was to 1) run 1" pipe in well				Casing (unless noted)
							to jet sand out and circulate clean				
							water 2) Run TV camera in clean water				
							3) Stop and decide next action				
							- Basinant Range will be released after				
							today				
							- Measured in 2" well to determine	1220			
							status D/B 43.4 ft D/W 28.3 ft				
							took water sample - water looked dirty				
							lt brn but did not look like gray				
							wht bentonite. Well looks in good shape				
							D/B in 3" well is 145.7 ft. Sand	1250			
							came in ~ 1.6 ft since yesterday. The				
							steel tape has [illegible] bentonite on it				
							W/L 11'				
							Set up to run 1" pipe in well	1350			
							21'½" 21'½" 21'½" (Ave 21'½")				
							use (7) 21' + (1) 13' for total of 160'				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth N/A Sheet 2 of 2
Location N Pond Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 1/1/1
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme N/A Procedure DO-1 Rev No. 1
Measuring Equipment Eldapo - Steel tape L300-16

Drilling Contractor [illegible]
Driller [illegible]
Rig/Method [illegible]

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Circulate water out of hole; first batch	1400			Aaron Shatz showed up w/ TV Camera
							was dirty, looked like some bentonite				
							was in the water - Took break in				
							Circulating - W/L dropped to 22'; plug				
							of sand at pump broke loose - circulating				
							entire well now				
							Filled the water tank up again (1000 gal)	1540			Pull pipe
							and ran water through well; cleaned				
							up more of sand - water clean				
							enough for TV camera				
							Ran TV camera the water -				
							level was 24 ft A break in				
							the casing was observed at 152.2 ft				
							bentonite and sediment were entering				
							the casing at this point				
							(See video log)				
								1700			End of Day

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 1 of 2

Location North of Ringold Project Savage Island

Logged by John P. McDonald (Print) (Sign) Date 7/17/92

Checked by (Print) (Sign) Date

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment N/A

Drilling Contractor N/A

Driller N/A

Rig/Method N/A

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Re-description of the 197', 199', 200', and 205' samples for percentage breakdown. Samples originally collected on 12/10/90.				
197'	ST						Muddy SAND (70% sand, 30% mud) 10% fs, 60% vfs, 30% mud, well sorted. Sand: 5% mafic; 70% qtz, 25% other, 3% mica, 2% basalt. Dry color: lt. gray (10YR7/2). Some Fe staining.				
199'	ST						MUD (10% sand, 90% mud) 10% vfs, 90% mud, v. well sorted. Unable to distinguish sand well enough to determine composition. Dry color: white (10YR8/2).				
200'	HT						Gravelly Sandy MUD (15% gravel, 20% sand, 65% mud) 5% cp, 4% mp, 4% fp, 2% vfp, 5% fs, 15% vfs, 65% mud, mod. sorted.				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Sheet 2 of 2
Location North of Ringold Project Savage Island

Logged by John P. McDonald (Print) [signature] (Sign) Date 7/17/92
Checked by _____ (Print) _____ (Sign) Date _____

Drilling Contractor Basin + Range
Driller Robert Perry
Rig/Method Cable tool, BE22W

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment N/A

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							(200' cont.) Gravel: 60% basalt, 35% quartzite, 5% granite, A-SA. Sand: 25% mafic; 50% qtz, 30% other, 15% basalt, 5% micq. Dry color: lt. gray (10YR 7/2). Some Fe staining.				
205'	HT						Slightly Gravelly MUD (5% gravel, 10% sand, 85% mud) 3% fp, 2% vfp, 10% vfs, 85% mud, well to very well sorted. Gravel: 100% basalt; A-SA. Sand: 5% mafic; 90% quartz, 5% micq, 5% other; SA-SR. Wet color: lt. brownish gray (2.5Y 6/2). Dry color: lt. gray (2.5Y 7/2). Some Fe staining.				

W = wet, M = moist, D = dry

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WELL DEVELOPMENT LOG

Well Number 199-42-E9A
Location Savage Island
Procedure PNL-MA-567, GC-7, Rev. 0

Start Date/Time 1-23-91 1022
End Date/Time 1-23-91 1500
Page 1 of 1

Well Depth 41.8 TOC Pump Depth (Intake) 39' Initial Water Level _____

Date	Time	Flow Rate	Turbidity	Person Meas.	Person Rec.	Comments
1-23	1023	5+ gpm	NA			
"	1050	5 gpm	100%+			Very dirty Not in range of meter on 100
"	1100	—	—			Air cylinder changed off 5 min
"	1115	5 gpm	Not Readable			Very dirty yet set of samples taken "0"
"	1150	4.6 gpm				
"	1245	4.6 gpm	Not Readable			Some Air being pumped - recovery at about the pumping rate (still very dirty)
"	1358		"			water level ~29' TOC
"	1400	5 gpm	"			sample set taken "1"
"	1500	—	—			Terminated for today

Note: Unless otherwise noted, the following units are assumed:
Flow rate - gpm
Turbidity - NTU
Water Level - ft

Equipment:
Make: Hydrostar
Model: HS601
Serial #: _____

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WELL DEVELOPMENT LOG

Well Number 699-42-E9A
Location Rimpold Area (Sauvi Island)
Procedure PNL-MA-567, GC-7, Rev. 0

Start Date/Time 1-24-91 0930
End Date/Time 1-24-91 1515
Page 1 of 1

Well Depth 41.8 Pump Depth (Intake) 39 Initial Water Level 28.01

Date	Time	Flow Rate	Turbidity	Person Meas.	Person Rec.	Comments
1-24	0930	5+ gpm	N/A			Start pumping (water 28' TOC)
"	1000	~~5gpm~~				~~Start~~ Pump actuator froze up
"	1015	5gpm	Not (4:1) Readable			Restart 4:1 dilution still too turbid
"	1100		~~Not readable~~ (4:1) mix 70			5ml + 20ml D.I. reads ~70 on meter
"	1200	5gpm	4:1 mix reads 75			—
"	1300	5gpm	4:1 mix 95			—
"	1500	5gpm	4:1 dil 47			Sample set taken ('2')
"	1515	—	—			Terminated pumping for today

Note: Unless otherwise noted, the following units are assumed:
Flow rate - gpm
Turbidity - NTU
Water Level - ft

Equipment:
Make:
Model:
Serial #:

Development ~~DRILL~~ LOG	By Glover	Rig	Well Number 69-42-E9A Sov Island	Computer Number	Project or Work Order No.
	Date 2-5-91		Depth — To		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
—				Started pumping	0915	
				After much Air Compressor trouble	—	Flow ~4.2gpm
				Turbidity Sample taken 2:1 dil = 90 NTU	0940	Flow still low
				Pumping rate increased with different air cylinder		
				now up to ~5.5 gpm	1000	
				Turbidity Sample taken 2:1 dil.: 90 NTU	1130	Flow ~5 gpm
				Turbidity Sample taken No dilution = 85 NTU	1300	Flow ~5 gpm
				Turbidity Sample taken No dilution 100 NTU	1405	
				Sample Set taken	1415	
				Terminate Pumping		
				Pull pump	1420	

REMARKS:

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A-6000-021 (5-85)

Continuation

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DRILL LOG	By Glover	Rig	Well Number 699-42-E9A Sev. Island	Computer Number	Project or Work Order No.
	Date 2-6-91		Depth Well To Development		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				Start Pumping	0830	
				~ 5 gpm		
				75 strokes/min		
				Pumping rate increased to ~ 6 gpm	0845	
				Checked Sample for turbidity but could		
				not read without dilution 3:1 = 50 NTU	0935	
				Pumping rate increased to ~ 7 gpm this is the		
				max for Hydrostar.	1015	
				Sample for turbidity undiluted = 95 NTU	1045	
				Sample for turbidity undiluted = 63 NTU	1145	
				1045 sample saved and re-read just before		
				1145 sample and reading had dropped to 81 NTU		
			Note	the samples when initially taken seem to have a lot of		
				air mixed with the water - after standing they seem less		
				cloudy but no sediment is obvious on bottom of tube		
				Sampled for turbidity undiluted = 50 NTU	1245	
				Sampled for turbidity undiluted = 39 NTU	1345	
				Sampled for turbidity undiluted = 31 NTU	1430	
				Terminate for Day	1445	

REMARKS:

D. W. Glover

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A-6000-021 (5-85)

DRILL LOG

By	Rig	Well Number	Computer Number	Project or Work Order No.
Glover	Pump + Sample Truck	699-42-E9A		
Date: 2-7-91		Depth: Well Development		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				Start pumping ~ 7gpm	1030	
				First Sample for turbidity = undiluted 26 NTU	1048	
				Sampled for turbidity undiluted = 25 NTU	1200	
				Sampled for turbidity - undiluted = 24 NTU	1300	
				pumping rate ~ 7gpm	—	
				Sampled for turbidity - undiluted 20NTU	1400	
				Set of regular Samples taken	1415	
				Terminate pumping to make time to		
				order more sample bottles	1430	

REMARKS:

W. Glover

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A-6000-021 (5-85)

DRILL LOG	By Glover	Rig Pump + sample Trailer	Well Number 699-42-E9A	Computer Number	Project or Work Order No.
	Date 2-8-91		Depth Well development		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				Started pumping at ~ 7 gpm	0820	
				Pumping rate variable because of cold temp. and		
				high humidity (icing in valves) 4-7 gpm	0850	
				First sample of day 100% to clean Sampled for turbidity undiluted? - 12 NTU	0900	
				Sampled for turbidity - undiluted 12 NTU	1015	
				Pumping rate now stable at ~ 7gpm	1015	
				Sampled for turbidity undiluted 14 NTU	1115	
				Sampled for turbidity undiluted 14 NTU	1215	
				Sampled for turbidity undiluted 15 NTU	1330	
				Sampled for turbidity undiluted 14 NTU	1420	
				Take sample series	1430	
				Pull pump + Terminate		
				for day.		

REMARKS:

D.W. Glover

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A-6000-021 (5-85)

WELL COMPLETION SUMMARY

Project Savage Island
Location N of Ringold
Drilling Co. Jensen Bros
Driller Art Gwin, Joe Roach, Dennis Mingo
Other (companies)
Geologist(s) TJ Gilmore, MA Chamness, SS Teel

Well No. 699-42-69B Temp. Well No. N/A
Coordinates N 41,775 E 8,452
Elevation: Casing 386.42 Brass Marker 385.53

DRILLING METHOD

Drilling Method(s) Mud Rotary / Air Rotary
Drilling Fluid Bentonite and water / water
Other

COMPLETION DATA

Drilled Depth 390'
Completed Depth 384'
Date Started 2/14/91
Date Completed 4/3/91
Static Water Level/Date 22' 4/1/91

OTHER (check if performed)

- ___ Well Abandonment
- ✓ Well Development
- ✓ Aquifer Testing
- ✓ Geophysical Log(s)
- ✓ Lock and Cap
- ___ Downhole TV Inspection
- ___ Driller's Logs
- ✓ Pad
- ✓ Guardposts
- ✓ Protective Casing

SCREEN

Type	Outer Diameter	Length	Slot Size	Interval
6" Stainless Steel Telescoping Screen 10 Slot	5 9/16"	21.19	10 Slot	354 - 354
6" Stainless Steel Blank	5 9/16	5.02	N/A	354 - 349

TEMPORARY CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
Carbon steel w/ shoe	MAC ~~39~~ 16"		0 - 39.6
~~Carbon steel~~ TG	~~10"~~ TG		~~+1.5'~~ - ~~354~~ TG 4.1.91
			-
			-

PERMANENT CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
carbon steel	10"		0' - ~~232.45~~ 231.45 MAC 7/21/92
Carbon Steel	6"		+1.5 - 354

ANNULAR SEAL/FILL

Type	Interval	Quantity	Volume
Cement Grout (drilled-out)	0' - 232' / ~~205.63'~~ - ~~285'~~ / ~~202'~~ - ~~354'~~ SSS 4/18/91	900 gal / ~~320 gal~~	120 ft³ / ~~43 ft³~~
Colo. Silica Sand (20-40 mesh)	~~388.67'~~ - ~~348'~~ 355.6'	13.5 bags (100 lbs ea)	15.12 ft³
Colo. Silica Sand (40-100 mesh)	355.6' - ~~348'~~ 355 4/18/91 - 348.2	2 bags (100 lbs ea)	2.28 ft³
Bentonite Slurry	348.2 - 17'	915 gal (9.31 lb/gal av.)	122.32 ft³
Cement Grout	17' - 0'	40 gal (≈ 14 lb/gal)	5.35 ft³
~~Concrete pad~~	~~0'~~	~~+0.5'~~	

PUMP

Type 3/4 H.P. Submersible Depth to Inlet 340' Date Set 2/19/92

ACCEPTANCE

Completed Well: Accept [signature] 4/10/91 Conditionally Accept
Reject

COMMENTS

Reviewed by [signature] Date 8-19-92 Depths are below land surface unless noted.

WELL INSPECTION REPORT

Well No. 699-42-E9B Procedure DO-1, 5 Rev. 1, 0 Specification No. KEH 5236 Rev. 0
Geologist(s) TJ Gilmore, MA Chamness, SS Teel ECNs (list)

CLEANING/DECONTAMINATION	Inspection Method	Criteria	Accept	Reject	Date
Rig/Tools (initial)	Visual/Wipe (optional)		TJD		2/12/91
Temporary Materials	Visual/Wipe (optional)		TJD		2/25/91
Permanent Materials	Visual/Wipe (optional)		TJD		2/12/91
Mtls Brought Onsite Later	Visual/Wipe (optional)		TJD		4/1/91

MATERIAL STORAGE/PACKING	Inspection Method	Criteria	Accept	Reject	Date
Material Storage	Visual	2.1	TJD		4/1/91
Material Packing/Seals	Visual	2.1	TJD		4/1/91
Other					

LUBRICANTS/ADDITIVES/AIDS	Inspection Method	Criteria	Accept	Reject	Date
Lubricants (Well Guard)	Visual	3.7	TJD		4/1/91
Additives/Aids	Visual	3.7	TJD		4/1/91

DRILLING METHOD	Inspection Method	Criteria	Accept	Reject	Date
Method	Visual	3.3	TJD		2/25/91
Drilling Fluid	Visual	3.3, 3.7	TJD		2/14/91

STRAIGHTNESS TEST	Inspection Method	Criteria	Accept	Reject	Date
Well Straightness	Deviation surveys	3.6.1	TJD		4/1/91

COMPLETION	Inspection Method	Criteria	Accept	Reject	Date
Drilled Depth	Steel Tape #500', no #	G-W Mon. Plan	MAC		3/27/91
Completed Depth	Steel Tape #500', no #	G-W Mon. Plan	SST		3/29/91

PERMANENT SCREEN/CASING	Inspection Method	Criteria	Accept	Reject	Date
Screen Type/Slot/Length	Engineers Tape, Visual	2.1.7, 3.3	MAC		3/29/91
Screened Interval	Steel Tape # unmarked 500'		SST		3/29/91
Casing Type/Size/Length	Engineers Tape, Visual	2.1.7, 3.3	MAC		3/28/91
Centralizers/Location	Engineers Tape, Visual		MAC		3/28/91
Other					

FILTER PACK/ANNULAR SEAL	Inspection Method	Criteria	Accept	Reject	Date
Primary Filter Mtl/Place	Visual/Steel Tape#	2.1.2, 3.3	TJD		4/2/91
Second Filter Mtl/Place	Visual/Steel Tape#	2.1.2, 3.3	TJD		4/2/91
Annular Seal Mtl/Place	Visual/Steel Tape#	2.1.2, 3.3	TJD		4/1/91
Install Annul Seal	Visual/Steel Tape#	2.1.2, 3.3	TJD		4/1/91
Cement Type/Placement	Visual/Steel Tape#	2.1.2, 3.3	TJD		4/1/91
Overdrill Seal Method	Visual/Steel Tape#	N/A			

WELL PROTECTION	Inspection Method	Criteria	Accept	Reject	Date
Surface Pad Mtl/Place	Visual/Engineers Tape	2.1.2, 3.3	TJD		4/1/91
Surface Casing Mtl/Place	Visual/Engineers Tape	2.1.2, 3.3	TJD		4/1/91
Cap/Hasp/Lock	Visual		TJD		4/1/91

WELL SURVEYING/MARKING	Inspection Method	Criteria	Accept	Reject	Date
Well ID Stamped/Correct	Visual		MAC		7/21/92
Well Surveyed/Toler Met	Review Survey Data		MAC		7/21/92

PUMP INSTALLATION	Inspection Method	Criteria	Accept	Reject	Date
Pump Decon/Preparation	Visual		EH		2/19/92
Installation/Placement	Visual/Engineers Tape				
Pump Operational	Observed Running				

Technical Review Complete [signature] Date 8-19-92

AS-BUILT DIAGRAM

Boring or Well Number 699-42-E9B Sheet 1 of 3
Location N. of Ringold Project Savage Island (Sitewide)

Logged by MA Chamness, TJ Gilmore, SS Teel
Reviewed by [illegible] Date 8-19-92

Date Well Started 2/14/91
Date Well Completed 4/2/91

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Geologic/Hydrologic Data: Lithologic Description
			5			MUDDY SAND
16" carbon steel casing - 0-39.6'			10			MUDDY GRAVEL ? @ 8'
			15			" " ?
			20			SANDY GRAVEL
			25			" "
			30			" "
			35			" "
			40			GRAVELLY SAND ?
			45			SANDY GRAVEL
10" carbon steel casing - 0'-231.45'			50			SAND, some gravel
			55			SAND, some gravel
			60			SAND, very little gravel
			65			SAND & SILT
6" carbon steel casing +1.6'-354'			70			" "
			75			" "
			80			" "
			85			SAND, hit GRAVEL @ 84'
bentonite slurry 17'-348.2'			90			CLAY @ 88'
			95			"
			100			CLAYEY SILT 99' incr drill rate
10" carbon steel casing cemented in place w/ cement grout			105			SILTY SAND
			110			SILT
			115			"
			120			SILTY SAND
			125			" "
			130			" "
			135			" "
			140			GRAVELY SAND @ 133'
			145			CLAYEY SILT
			150			" "
			155			" "
			160			SAND
						GRAVELY SAND

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-42-E9B Sheet 2 of 3
Location N. of Ringold Project Savage Island

Logged by MA Chinness, TJ Gilmore, SS Teed
Reviewed by [illegible] Date 8-19-92

Date Well Started 2/14/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Lithologic Description
			165			GRAVELLY SAND
			170			" "
			175			SL. GRAVELLY SAND
			180			SANDY GRAVEL
			185			GRAVEL, SAND & SILT BALLS
			190			SL. GRAVELLY CLAY
			195			GRAVELLY CLAY
			200			" "
			205			" "
			210			" "
			215			SL. SANDY CLAY
			220			" " "
			225			SL. GRAVELLY CLAY
10" carbon steel casing 0'-231.45'			230			Basalt @ 226', dense, nonvesicular
			235			@ 232, vesicular, oxidized red
open hole, cemented + drilled out			240			Basalt - dense, fresh
			245			@ 243' interflow zone, vesicular
6" carbon steel casing +1.6'-354'			250			Basalt, more dense
			255			" "
			260			Basalt, dense
bentonite slurry 17'-348.2'			265			" "
			270			Basalt, dense + green clay
			275			Basalt, dense
			280			" "
			285			" " , colonnade/platy zone?
			290			" "
			295			" "
			300			" "
			305			" "
			310			" "
			315			" "
			320			" "
			325			" "

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-42-E9B Sheet 3 of 3
Location N. of Ringold Project Savage Island

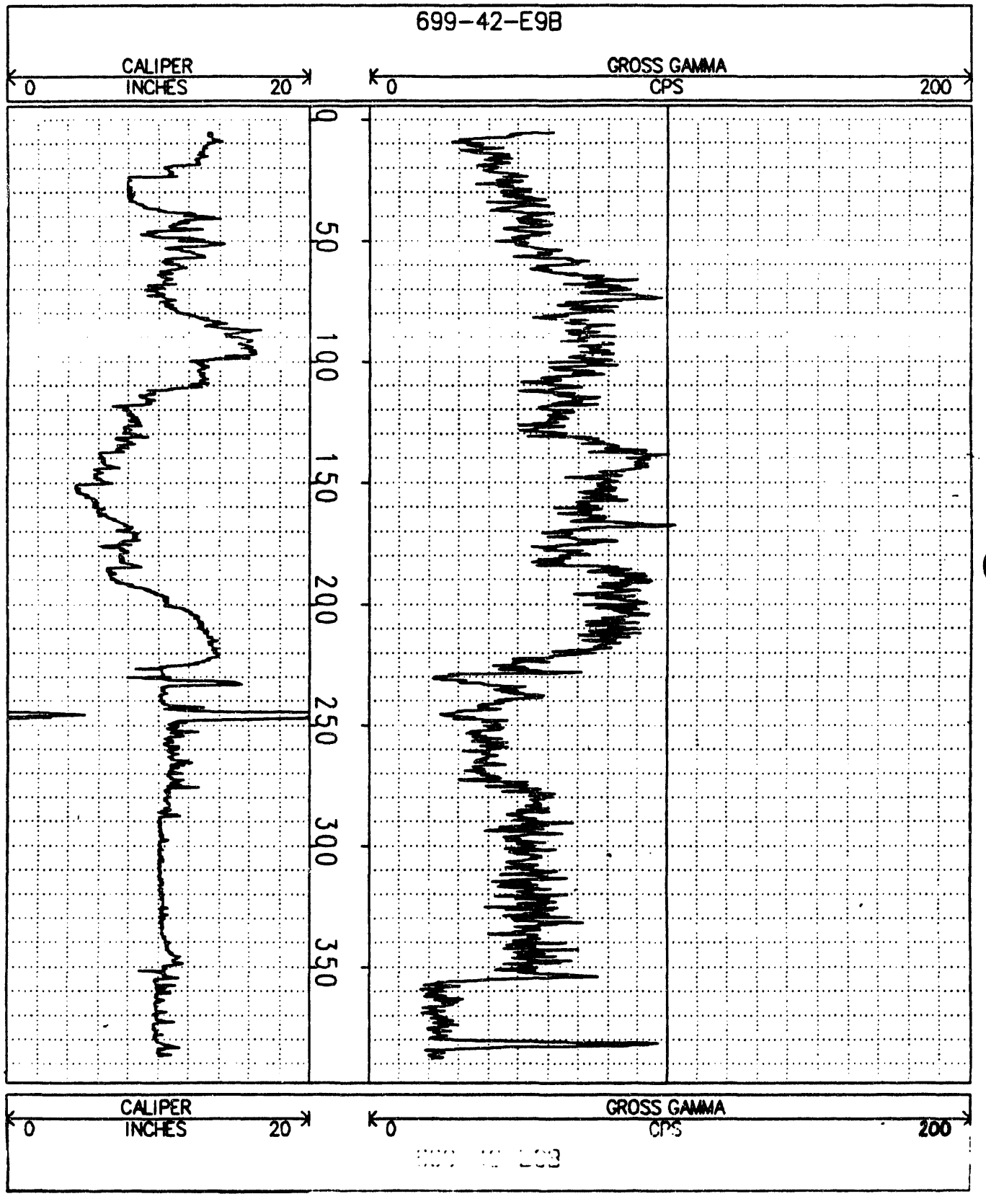
Logged by MA Chamness, TJ. Gilmore, SS Teel
Reviewed by [illegible] Date 8-19-92

Date Well Started 2/14/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Geologic/Hydrologic Data: Lithologic Description
16" carbon steel casing +1.6' - 354'		▲	330	▲		Basalt, dense
open hole, cemented to 354' and		▲	335	▲		" "
drilled out		▲	340	▲		" "
bentonite slurry 17' - 348.2'		▲	345	▲		" "
neoprene packer 342.48' - 342.97'		▲	350	▲		" "
telescoping 5" st steel blank 342.97' - 347.99'		⊠	355	⊠		Vesicular basalt @ 354'
telescoping 16" 10 slot st. steel screen		⊠	360	⊠		Red brown vesicular basalt @ 359'
347.99' - 384.2'		⊠	365	⊠		Hard dense basalt @ 360' Red brown vesicular basalt @ 364'
Sand pack from 348.2' - 388.67'		⊠	370	⊠		Basalt, dense, phyric
		⊠	375	⊠		" " "
		⊠	380	⊠		Vesicular basalt, dk gray/black
		⊠	385	⊠		Vesicular basalt & sandstone
			390			Basalt, dense
	TD = 388.67'					

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)


699-42-E9B
CALIPER
INCHES
0
20
GROSS GAMMA
CPS
0
200
0
50
100
150
200
250
300
350
CALIPER
INCHES
0
20
GROSS GAMMA
CPS
0
200

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B

Sheet 1 of 2

Location SAVAGE ISLAND Lampson Crane Yard

Project Sav Is

Logged by Lyn Doremus (Print) (Sign) Date 2-12-91

Checked by MA Chamness (Print) MA Chamness (Sign) Date 7/21/92

Lithologic Classification Scheme N/A

Procedure DO-1, DO-5

Rev No. 1

Measuring Equipment N/A

Drilling Contractor Jensen Brothers

Driller

Rig/Method Rotary Rig, and Pipe

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCl., ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1310			Geologist arrives at Lampson, Steam cleaning of drill rig underway
											Temp = 180° F
											Pressure = 2500 psi
								1330			Finish steam cleaning
											Inspect drill rig
											Tower, plat form and drilling apparatus clean
								1350			Wait on truck with drill pipe arrive for cleaning and inspection.
								1430			Pipe truck on location
							(4) 20' lengths 16" dia casing w/shoe				Steam clean
							(1) bit connecter				Temp = 180° F
							(2) rotary bits				Pressure = 2500 psi
							(5) - 30' length 6" dia screw connecting casing				
						17					
						7	(26) 20' lengths 4" dia screw connecting casing				
						2					

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth N/A Sheet 2 of 2
Location SAVAGE ISLAND Lampson Crane yard Project Sav Is

Logged by Llyn Doremus (Print) [signature] (Sign) Date 2-12-91
Reviewed by MA Chamness (Print) MA Chamness (Sign) Date 7/21/92
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1
Measuring Equipment N/A

Drilling Contractor Jensen Brothers
Driller David Cortley
Rig/Method Rotary Rig and Pipe

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DISTRIBUTION, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							(1) ~10' length 4" dia screw connecting casing				
							(1) ~25' length 4" dia screw connecting casing				
							(7) ~15' length 4" dia screw connecting casing				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth Surface - 5'
Sheet 1 of 2
Project Savage Island

Logged by Tyler Gilmore (Print) MA Chamness (Sign) MA Chamness
Date 2/4/91
Reviewed by (Print) (Sign)
Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method Mud rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Safety Meeting at Site	730			
							KEH safety personnel went over				
							safety plan and site safety				
							Jensen drilling Co, PNL personnel				
							and WHC people were in attendance				
							RPT checked the site and	830			RPT check
							found nothing above background				
							Drill Crew is working on Mud pumps				
								1200/1230			lunch
											Mud Pump model # FXNDMA
											Liner 7 1/4, stroke 16 in.
							Put Starter casing in using hammer			19.83	Preparing to install starter
						0	and air circulation Starter casing			of 16"	casing
							is temporary	1425			Begin Drilling
-1	lith	2			D		MUDDY SAND - 45% mud, 40% vfs, 15% fs,	1530			Sample taken using air rotary
							SI-M rxn in HCl. 10YR 6/3 lt brown				
						5	unconsolidated				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 1699-42-E9B Depth 5'-14' Sheet 2 of 2
Location North of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 2/14/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment DA

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Mud rotary/air - Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
8							Hit gravels, seem to be large, sediments				Drilling slowed down
							changed color from brown to gray				considerably
10'	Lth	2			D		MUDDY GRAVEL? - Not representative,	1555			Pulverizing gravel
							comes out as mud-sized particles.				
							No rxn in HCl. 5Y6/1 (gray) Unconsol.				
								1720			Quit for day, at 14'

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 14' - 16'
Sheet 1 of 2
Project Savage Island

Logged by MA Chamness T Gilmore MA Chamness (Print / Sign) Date 2/15/91
Reviewed by (Print / Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Brothers
Driller Art Gwin
Rig/Method Mud/air rotary Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologists and Drillers on Site at 7:00	710		19.83'	Calibrated HNU to 100 ppm
							Driller finish paperwork			of 16"	Isobutylene/air w/span @ 7.23
											Can't monitor borehole until
											the air hammer is removed
							Start Drilling, will work starter	755			Drilling
							casing through gravels				
								820			Stopped drilling, driller going with
											water truck to fish hatchery
							Drilling Hard through gravel	920			Start Drilling
15'	lith	2					MUDDY GRAVEL (?) Sample not representa-	940			
							tive; Very fine powder from air rotary				
							v sl rxn in HCL 5YR 6/1 Gray				
							Drilling hard ~ 40min/ft				
							Filling Mud tanks with water in	945			
							preparation to mud up; Water is being				
							hauled in Water truck rented from				
							Acme Concrete Co. Water source is				
							Ringold fish hatchery stand pipe	1050		- 3.13'	Got to 16' w/16" casing, will
										16.7'	Switch to mud rotary now.
							Tyler Lift w/ Pat Collier	1150		of 16"	Cutting off extra 16".
								1405			KEH deliverable annular seal material.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 116' Sheet 2 of 2
Location North of Kingold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 2/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method mud rotary Speedstar SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1445		16.7' of 16" casing	Broke tools apart, put rotary bit on w/ Well Guard.
								1650			Mixing cement grout to pour 7.5' deep seal around 16" casing.

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 16' Sheet 1 of 2
Location N. of Ringold Project Savage Island

Logged by SS Teel / TJ Gilmore (Print) SS Teel (Sign) Date 2/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Mud/Air Rotary, Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0700			Arrive on site, Starting equipment
											Span gas Lot 28734, 100 ppm
											ISO C_4H_8/Air
								0730			Calibrate HNU. Span is set
											@ 3.19 to read 55 ppm w/10.2 eV probe
			HNU	0 ppm			Inspect Sand and Bentonite delivered to	0750			[illegible] site w/ HNU & LEL; Background
			LEL	.0%			the site on Friday:				Welding part of Well head
			O_2	20.9%			(10) bags 40-100 Mesh Sand				
							(~12) bags 20-40 Mesh Sand				
							(~20 bags 40 Mesh Sand Reject				
							(~190) bags 8-20 Mesh Bentonite Crumbles				
							There were 10 bags Sand broken				
							open and ~5 bags bentonite broken				
							open. We need to send back				
							the 20 bags of 40 mesh sand and				
							have replaced with 20-40 Mesh, also				
							replace some of the broken sand bags.				
							The bags are also not well marked.				
								1030			Still loading-up. Well Guard
											used as tool lubricant.
											Pat Collier (KEH) on site.

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 16' Sheet 2 of 2
Location Not Ringold Project Savage Island

Logged by SS Teel / TJ Gilmore (Print) SS Teel (Sign) Date 2/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method Mud/Air, Rotary Speedstar, SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Materials delivered: protective casing &	1100			Truck arrives to deliver materials
							locking cap, guard posts, telescoping stainless				
							Steel screen (wrapped in plastic), and tremie				
							pipe (also wrapped in plastic).	1115			Truck leaves site. Driver &
											laborer did not enter the zone
								1140			Pat Collier leaves site
								1200/1230			Lunch
								1345			Adding drill rod
								1430			Can't get the drill string
											through the drill collar - it is
											too small. Will have to use a
											different size stem.
								1520			Calibrate HNU + Zero +
											calibrate LEL/O_2 meter.
											HNU span set @ 3.28
			HNU	0ppm				1525			
			LEL	0%			Cleaning-up site. Bit and sub is 8.1' long,	1720			
			O_2	20.9%			drill pipe is 27.1' long. Total length of stem				
							& bit is 35.2'. Still need to attach mud				
							discharge hose and finish mixing mud before				
							starting to drill				
								1730			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 16' – ~18'
Sheet 1 of 1
Project Savage Island

Logged by Tyler Gilmore / Mickie Chamness (Print) (Sign) MA Chamness Date 2/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-5
Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Mud/Air Rotary Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologists and Drillers at Site	700		16.7'	Arrive
16'			HNU	Øppm			HNU span at 2.9 for Benzene Span Gas	710		of 16"	Calibrate HNU and LEL/O_2
			LEL/O_2	20.9%O_2			Lot 28734 100ppm $IsoC_4H_8$/Air – 10% evpole				
							Casing delivered includes	830			Hook up Mud lines
							(12) 20' 10" Carbon Steel [240 ft]	930			Build guards for Mud Tanks
							(18) 20' 6" Carbon Steel [360 ft]	1030			Hook up Mud controls on Rig
							(1) 10' (1) 20' 10 slot Screen Stainless Steel	1045			Mud wt 8.7 Vis 43
							All material is Covered w/ plastic and off the ground				(will add ~10 more sacks of Hydrogel)
											Fix Pump Swivel Seal
								12-1230			Lunch
							Lost ~ 3500 gal	1245			Drilling Pump Pressure 400
							Losing Mud to hole; Stop drilling and	1310			Lost Circulation
							make Water runs; drilled approx 4'				Stop Drilling
							D/B ~ 19', lost	1500			Mixing more Mud
							Will try to drill again with thicker	1615			Mud wt 8.6 Vis 163
							Mud				
							Losing circulation	1620			Started drilling again
							Lost ~ 3500 gal	1645			Stop drilling
							Mix more Mud; anticipate mud in well				
							will gel tonight	1730			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 1699-42-EGB Depth ~18'-21' Sheet 1 of 1
Location N. of Ringold Project Swans Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 2/20/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure LO-1, LO-5 Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Mud rotary Speedstar SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0			Calibrated HNU 10.2 ev probe w/ 100ppm	800			Decided to case top 40' of hole,
			LEL/O_2	ok			ISO C_4H_8/air span @ 3.9				which means pulling everything
							Put some mud down the hole to try to	1020			out of hole + starting over
							hold hole open after the 16" casing				again.
							is pulled out. No measurement of				
							wt. or viscosity, but was too thick				
							to go through funnel. Pulled casing out,				
							putting 1000 gal mud in while pulling	1130			8.6+ mud wt., 7.5 viscosity
							back.	1145			NO in well 1699-42-EGA @ 28.12' bgs
								1215			lunch
			HNU	0				1250		20.04'	Getting 16" casing w/ shoe ready
			LEL/O_2	ok							to set in hole
								1445			Started drilling using air, w/ a
											little water to keep dust down
								1500			Casing went in 22.0', preparing to
										+ 9.54	weld on 9.54 of 16" casing
								1720		39.58'	Cleaning up site, ready to
											drill again in the morning

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 21'-22' Sheet 1 of 3
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 2/21/91
Reviewed by ____ (Print) ____ (Sign) Date ____
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud / Air Rotary SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0 ppm			Calibrate HNU 10.2eV probe w/ 100 ppm isoC4H10	700		39.58'	
			LEL	ok			-air calibration gas span @ 3.9				
							Air Compressor arrived on site. New	715			
							Compressor is rated for 750 CFM one on				
							Rig is rated 500 CFM for total of 1250 CFM				
							Air flow - Driller indicated the compressor				
							oil was the approved vegetable oil - call	800			Drilling
							Pat Collier for verification				
22'	Auth	2	HNU	0			SANDY GRAVEL ?) Samples not representative	900			Sample
			LEL	ok			very fragmented cuttings producing m-c sand				
			GM	Bkgnd			size 60% BSAT [illegible] fine [illegible] clr qtz,	915			Ed Euler KEH safety at
							Fe stn qtz, grn volcanics) Ang - Sub Ang.				Site
							wet color N5 dk gy, v sl reaction HCl, no				
							consol, v hard drilling				
								935			RPT checked site and
							Compressor oil is not Food grade and may be petroleum				Smpls 5', 10', 15' and 22' all
							base - will switch to Food grade oil.				bkgrd
							Fix valve and diaphragm on Compressor line	940			Stopped drilling for Rig repair
								1120			Drilling

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9A Depth 22'-30' Sheet 2 of 3
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 2/21/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud/Air Rotary Speedstar SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
25'	Lith	2			N/A		SANDY GRAVEL(?) Very fragmented Sand	1145	10gal		Water added to keep dust down
							largest preserved grain is Mp 5% Mp				(Injected w/ air)
							10% Fp, 15% VFp, 20% VCS, 15% CS, 10% MS				
							10% FS, 5% VFS, [Not representative] 65% Mafic				
							(incl 45% BSLT, 30% Grn volcanics, 15% Gray Vol,				
							10% other) 35% Felsic (incl 50% wht-cl qtz				
							+ qtzite, clast, other) No rxn in HCl				
							No consol, better recovery than 22' Sand				
							wet color N 3-4 dk gy (Air Rotary)	1215-			Lunch
								1240			Work on Compressor line
								1310			Drilling
30'	Lith	2	HNU	0			SANDY GRAVEL(?) very fragmented	1330			Sample
			LEL	ok			largest preserved grain Cp (~25mm)				
							75% Mafic (predom bslt w/ an orng-tan				
							vol? also grn vol) Sand fraction				
							has ~65% Mafic Felsic fraction is				
							predom qtz, No rxn in HCl wet color				
							N3 dk gy - sl coarser grained than				
							previous No consol (Air Rotary)				Mud in Pits is:
											8.6 wt 85 vis will use mud
											next wk

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 30'-40' Sheet 3 of 3
Location North of Ringold Project Savage Is

Logged by T Gilmore (Print) T Gilmore (Sign) Date 3/21/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure De-1, De-5 Rev No 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Rotary Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
35'	Lith	2			N/A		SANDY GRAVEL (?) Fragmental - not representative, largest grain cp subrd - rd when preserved 65% Mafic, 35% Felsic Mafic incl porphyr basalt w/ abnt volcaniclastics of various colors, overall wet color N3 dk gy, no rxn in HCl No consol similar to previous, more volcaniclst. (Air Rotary)	1355			Drill rate increased at ~ 28' (water table)
40'	Lith	2			N/A		GRAVELY SAND (?) Fragmented more coarse sand and less pebble fractions fining up from previous; preserved grains are subrd, 60% Mafic 40% felsic; abnt multicolored volcaniclastics lace in wht and blk qtz monzonites slightly more qtz than previous no rxn in HCl (Air Rotary) Note: There was a trace of oil on the mud from the sample. Assy to from compressor oil. — Pat Collier called requesting verbal approval for Jensen Drilling to use a food grade oil in the new compressor - Stuart L called for approval. The new oil is a synthetic petroleum base. Okd by Stuart L.	1450 1455		An MSDS was sent to Pat Collier.	Lithology change at 35' to finer grained material and silt Prepare to cement casing at surface End of Day 1600

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 40'-50 Sheet 1 of 3
Location North of Ringold Project Savage Island

Logged by T Gilmore / M A Chamness (Print) MA Chamness (Sign) Date 2/25/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, 2
Measuring Equipment N/A

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Geologist and Drilling Crew at the Site	700			At site
							Switch over to Mud rotary - change				
							out the Air hammer (Well Guard				Switch to Mud rotary
							Lubricant used)				
			HNU	0 ppm			Calibrate HNU 10.2ev Probe w/ 100ppm	715			Calibrate HNU, LEL
			LEL	0%			iso C_4H_8 / Air Calibration gas Spare				
							Mit Chamness on Site	850			
			LEL	0%				1000			Weld on well head
							Ed Enlow KEH safety visits Site	1130			KEH Safety
								12-1230			Lunch
								1230			Run drill string in hole
							Mud too thick - running over shale-shaker	1400			Drilling Mud wt 8.6 vis 80
							need to thin it out				
							Replace 40 mesh sand w/ 20-40 mesh	1415			New delivery of sand
45	Wth	2					Sandy Gravel - ~40% basalt, 60% granitic,	1420			Sampled from possum belly,
							qtzite etc. Sample not representative				Some nylon fibers, rat's nest?
50'	Wth	2					Sand, some gravel - ~40% basalt, 60%	1430			Sampled from shale shaker
							qtz rich. Samples not representative.				
											9½ mud for 45'-50'
											pumping at 100 gpm

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 50'-65' Sheet 2 of 3
Location North of Ringold Project Savage Island

Logged by MA Chamness / T Gilmore (Print) MA Chamness (Sign) Date 2/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme FOLK Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gusin
Rig/Method Mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
55'	lith	2					Sand, some gravel, color change from gray (last sample to brown). Some "mud balls" or little chunks of silt, brown. Samples not representative. ~25% basalt, 75% qtz rich.	1445			Sampled from shale shaker
								1458			Pipe connection
											Work drill stem and circulate
							Hydraulic hose broke on kelly - Absorbent material placed below leak to capture spill - very little hit the ground - none went in borehole	1515			Hydraulic hose broke
							Cleaned-up spill and now circulating mud in well	1627			Circulating, thinning mud
											Make connection
								1655			Start drilling, 250 psi, 100 vis
60'	lith	2					Sand, very little gravel, similar color to above. Still some "mud balls". Seems to be more silt maybe. Samples not representative	1700			Sampled from shale shaker
											Driller noted easier drilling, prob silt @ 57'
65'	lith	2					Sand + silt. Similar color to above, "mud balls", feels heavier for the amount of sediment.	1710			Started drilling really easy driller says it could be sand or silt
											Sampled from shale shaker.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 65-85' Sheet 3 of 3
Location N. of Ringold Project Savage Island

Logged by MA Chamness/A Gilmore (Print) MA Chamness (Sign) Date 2/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme FOLK Procedure DO-1, DO-5 Rev No 1,0
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Gurin
Rig/Method mud rotary CME 15 II

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
70	lith	2					Sand + silt. Seems to be more silt than before, more "mud balls". Still brown. Samples not representative	1715			Sampled from shale shaker
75	lith	2					Sand + silt, same as above, samples not representative	1720			Sampled from shale shaker
80'	lith	2					Sand + silt, same as above, even heavier, samples not representative	1728			Sampled from shale shaker
85'	lith	2					Sand, micaceous, qtz-rich, obviously different + much coarser than previous samples, vc + c sand abundant. Color ↓'d to grayish-brown. Driller says he hit gravel at 84'	1735			Sampled from shale shaker
											Mud coming up around 16" casing, will get a sump truck to pump it into trucks to work into the mud pits.
								1800			quit for day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 85'-90' Sheet 1 of 7
Location N. of Ringold Project Savage Island

Logged by MA Chamness SS Teel (Print) MA Chamness SS Teel (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method mud rotary CS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								700			Geologists + drillers at site
								0730			Calibrate HNU. Span is set at
			HNU	0 ppm			Check borehole	0750			8.16 to read 55 ppm. Same span
			O_2	20.8%							gas as prev. LEL/O_2 also
			LEL	0%			Screen on shale shaker was changed				calibrated. Waiting for sump
							to coarser mesh so that more mud	1000			grinding sharp edges off of
							will go through + more sample will				new drill stem
							slide off (hopefully).	1020			Started drilling
87'	lith washed gravel	2 / 1					Sandy Gravel - assume there's sand, most	1035			Sampled from shale shaker
							of the sample is gravel. Mud balls are				mud wt - 9
							free of gravel + are probably from				started out w/ vis @ ~50
							above. Gravels up to vc-c size, rounded,				
							qtzite abundant. Sample not representative				
90'	lith	2					Δ at 88' to clay, getting clay balls,	1100			Sampled from shale shaker
							color of clay 10YR5/3 (brown). Gravel +				lowering vis to ~40 because
							sand are probably caving down from				of clay. Drilling slowly
							above. Sample not representative.				
								1155			Mud wt 8.7; vis = 38. Mark
											shows 95' will wait a little for
											lag time to collect sample.
											Seems to be drilling a little
											faster. Mud pressure 500

W = wet, M = moist, D = dry

Stroke-rate: 76

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 90' - 110' Sheet 2 of 7
Location N. of Ringold Project Savage Island

Logged by MA Chamness SS Teel (Print) MA Chamness SS Teel (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, D
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Owen
Rig/Method Mud rotary [illegible]

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
95'	lith	2					CLAY - Same as above, brown (10YR5/3)	1200			Sampled from shale shaker
							sand + gravel are probably cavings-				Still drilling slowly, 5'/hr
							down from above. Sample not -				
							representative				
								1205			Quit for lunch, Ed Enloe
											on site
								1247			Drilling, Ed left
100'	lith	2					CLAYEY SILT TO SILT - much cleaner	1315			Sampled from shale shaker
							samples, much less gravel, sand etc				Big increase in drill rate
							from above, did not wash samples.				at 99'
							Color 2.5Y5/2 (grayish brown)				
105'	lith	2					SILTY SAND TO SANDY SILT - pieces of	1320			Sample from shale shaker
							vc-c sand + maybe vfg. Since that				
							sample was so clean, I assume this is from				
							this horizon. Brown. Sample not washed				
							much, not representative. 10YR5/3				
110'	lith	2					SILT - less sand than above, relatively	1325			Sample from shale shaker
							clean, did not wash much 10YR5/3				Drilling [illegible]
							(brown)	1332			Stopped drilling. Preparing
											to run straightness tool.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N of Ringold
Depth 110'-125' Sheet 3 of 7
Project Sample Hood

Logged by MA Chamness, SS Teel (Print) MA Chamness SSTeel (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Mud Rotary SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0ppm				1350			Check Borehole (inside of
			O_2	OK							drill rods) w/A-1 sure shot
			LEL	OK							looks good & straight
								1430			Adding drill rod
								1500			Started drilling
115'	Lith	2						1507			
120'	Lith	2					SILTY SAND TO SANDY SILT, similar to 105' sample, 10YR5/3 (brown). Sample not washed, not representative	1512			Sampled from shale shaker
125'	Lith	2					SILTY SAND, some gravel, mud balls probably from above, samples not washed. 10YR5/4 (yellowish brown). Samples not representative	1517			Sampled from shale shaker

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 125'-140 Sheet 4 of 7
Location N. of Ringold Project Savage Island

Logged by MA Chamness SS Teal (Print) MA Chamness SSTeal (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Irwin
Rig/Method mud rotary SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
130'	Lith	2					SANDY SILT TO SILTY SAND, some gravel, possibly from above. Sample not washed, not representative.	1521			Sampled from shale shaker
135'	Lith	2					Gravels started at 135', GRAVELLY SAND? Gravels up to veg size, rounded to well rounded, ~20% basalt, abundant igneous (monzonite, diorite) Sample washed, not representative.	1525			Sampled from shale shaker
	Washed Gravels	1									
								1535			reaming hole
								1540			added joint on drill rod
								1600			started drilling
140'	Lith	2					GRAVELLY SAND - still some mud balls from above. Sample washed, not representative. Predominately Sand	1610			Sampled from shale shaker

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N. of Ringold
Depth 140 - 160 Sheet 5 of 7
Project Savage Island

Logged by MA Chamness CS Teel (Print) MA Chamness (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure EO-1, EO-5 Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method mud rotary SS 15 TH

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
145	lith	2					SILTY CLAY OR CLAYEY SILT, some gravel, possibly from above. "Mud balls" are very stiff when pressure is applied. Brown. Washed, not representative	1615			76 strokes/min = 107.5 ft/min annular velocity
150'	lith	2					SILT, some clay (CLAYEY SILT?), similar to above sample. Washed, not representative	1619			Sampled from shale shaker
155'	lith	2					CLAYEY SILT, 10% gravel (carry down?) some stiff clay balls. Same color as previous. Washed, not representative	~1623			Sampled from shale shaker
160'	lith	2					SAND - micaceous, glauconitic, silt, gravel + mud balls, prob. from above. Washed, not representative	1628			Sampled from shale shaker

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 1699-42-E9B Depth 160-180' Sheet 6 of 7
Location N. of Ringold Project Savage Island

Logged by MA Chauncey, CS Teel MA Chauncey (Sign) Date 3/26/91
Print Sign

Reviewed by _____ Date _____
Print Sign

Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, 0

Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Gunn
Rig/Method mud rotary CME 75

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1650			Drilling
165'	lith	2					GRAVELLY SAND - m-vfg, sand	1652			Slightly washed, sampled
							similar to above, [illegible] silty, micaceous.				from shale shaker
							Gravel up to 5". Sample washed, not				
							representative. Still some mud balls.				Driller says it's drilling at
											a constant rate
170	lith	2					GRAVELLY SAND - similar to above,	~1655			Sampled from shale shaker
							Hard to say whether gravel, sand, or				
							mud balls are from above. Sample not				
							washed, not representative.				
											165 vis, 9.5 mud wt
175'	lith	2					SAND - qtz rich, micaceous. Some	~1658			Sampled from shale shaker
							gravel, mostly broken, not as much				
							as above. Some mud balls, also not				
							as much. Sample not washed, not				
							representative.				
180	lith	2					SANDY GRAVEL - [illegible] very abundant,	1701			Sampled from shale shaker
							sand micaceous [illegible] gravel [illegible]				
							basalt, the rest qtzite [illegible]				Started [illegible] shoe @
							Sample not washed, not representative				18[illegible]'

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N. of Ringold
Depth 180-185
Sheet 7 of 7
Project Savage Island

Logged by MA Chamness SS Teel (Print) MA Chamness SS Teel (Sign) Date 2/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme FOLK
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Larson Bros
Driller Art Gunn
Rig/Method mud rotary CS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
185'	Lith	2					GRAVEL, SAND, + SILT BALLS, Gravels	1709			Sampled from slide slater
	Gravel	1					are up to vcg sized, qtzite, porphyries,				
							very little basalt. Sample not washed,				
							not representative				
								1715			reaming out last hole
								1730			quit for day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 185-200' Sheet 1 of 4
Location North of Ringold Project Savage Island

Logged by T Gilmore/S Teel (Print) [signature] (Sign) Date 2/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud rotary / Speedstar 95-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologists and Driller at Site	700			
							Prepare to switch out a hydraulic hose				
							Deviation Survey on 2/26/91 @ ~100'				
							was less than ½° off				
							Span set @ 8.86 to read 55ppm.	0600			Calibrate HNU + LEL/O_2
							Same span gas as previous				
			LEL	0%				0820			Check outside of borehole
			O_2	20.8%			On 2/26/91 the drilling crew carried	0850			Circulating Mud
			HNU	0ppm			the soil contaminated drill [illegible]	0905			Making Connection
							fluid from 2/25/91 - I also picked up				
							Small oil and hydraulic leaks from other				
							places on site. The absorbent material used				
							on 2/25 was put in plastic bags. The				
							drum is marked w/ contents, date and				
							origin				
190'	lith	2					CLAY Lt Brn sl water soluble	935			Sample
							~10% vcp BSLT and qtzite in clay				
195'	lith	2					CLAY A/A w/ 10% Gravel v Slicky	939			Sample
							gummy clay No rxn in HCl				
200'	lith	2					CLAY A/A w/ 10% Gravel - 20-30mm -	943			Sample
							Size, rnd - sbrd 50-50 mafic/felsic 10YR 5/2				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 200'-225' Sheet 2 of 4
Project Savage Island

Logged by T Gilmore / S Teel (Print) — (Sign) Date 2/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
205'	Lith	2					CLAY A/A (as above)	0950			Sampl
							Still Drilling fast - gravels in clay keep				Mud 9.6wt 120 Vis
							bit from balling up - mud vis going up				
210'	Lith	2					CLAY A/A still contains gravels	0954			Sample
								1003			Circulating before connection
							Deviation Survey at 200'; 1° off	1122			preparing to run dev. survey
							(within Contract Specs of 1°/50')				
											Make Connection
							Adding water to cut viscosity in Mud	1132			Circulating
								1133			Drilling
215'	Lith	2					CLAY Lost most Gravels ~10% CS	1138			Sample
							cly sl soluble in H_2O 10YR 5/2 no rxn				Drill Rate slowed down
							in HCL				
220'	Lith	2					CLAY A/A 10YR 5/2	1145			Sample
225	Lith	2					CLAY Change in color to N5 Gray,	1157			Sample Hit change @ 223'
							lost most of the gravels ~5% Bslt				Drilling Slower
							gravels, ang-subrd - Sampled again				BSLT @ 226'
							and found decomposition in BSLT clips				
							angular bslt w few vesicules, cly in				
							this sample has a blue clr but is still	12-1230			Lunch
							N5 dk gy	1240			Drilling

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 225 - 232' Sheet 3 of 4
Project Sunny Island

Logged by T Gilmore / S Teel (Print) (Sign) Date 2/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1, DO-3 Rev No 1.0
Measuring Equipment

Drilling Contractor Jensen Drilling Co
Driller Art Gomez
Rig/Method Mud rotary / Sprinstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
227	Lith	1					Bslt - approx 80% of smpl bslt, rest is considered carry down; bslt is dense (not vesicular) predom blk w/ some gry and orng coloring, A vular looks "fresh" not weathered	1300			Driller says it is "a lot firmer" at about 226'
								1314			Sample
							Will drill to ~232 and stop to cement, will give us 5+ ft of good bslt				De-sanding mud to condition mud before pulling drill rod
								1325			Mud wt 9.0 ; 56 vis
							Tim Young of KEH stopped by to label and number the drums (2) drums involved 91-6-1 and 91-6-2. Drum waste is designated non-regulated	1340			Stopped drilling - tightening seal on the kelly - bentonite is leaking out.
								1345			Drilling
232'	Lith	2					BSLT red brn 10R 3/3 Dusky red w/ abnt mineral filled vesicules very vesicular, cavity fillings are orng to yellow to gyns, abnt pale brn cly filling the cavities, vesicules are about 5mm across, no rxn w/ HCl	1431			Sample Lith change @ 232' Drill mud has red brn streaks
								1431			Mud @ 8.7wt 53 Vis Sweep hole w/ 6 bags gel Circulate and work hole

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location Nat Ringold
Depth 232'
Sheet 4 of 4
Project Sev Island

Logged by Tyler Gilmore / Steve Teel (Print) [signature] (Sign) Date 2/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Condition well for Gamma	1430			Pat Collier EEH at site
								1520			Collier left site
								1555			Start to remove drill rod
								1735			Pulled Casing out
							Set to Geophysically Log well in Morning				End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 232 Sheet 1 of 1

Location N. of Ringold Project Savage Island

Logged by Alan Pearson (Print) Alan Pearson (Sign) Date 2/28/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme NA Procedure NA Rev No NA

Measuring Equipment NA

Drilling Contractor Jensen Bros.

Driller Art Gwin

Rig/Method mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Hole was geophysically logged all day. Ran caliper, gross gamma, temperature, SP+R, & sonic probes down hole				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E7B Depth 232' Sheet 1 of 1
Location N. of Rinaldi Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/4/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme NA Procedure NA Rev No NA
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Guin
Rig/Method Mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								700			Picking up after wind storm
			HNU	0			checked around site, HNU calibrated	735			
			LEL/O_2	ok			to same gas as before, span @ 8.04				
								745			Start tripping in tools again,
											wing valve found on joints
								950			Start conditioning hole
								1040			Ed Enloe on site, left @ 1105
								1110			Bob Jones on site
								1150			Pat Collier + Vern on site
								1210/	1245		lunch, safety mtg, letting mud
							Driller was asked to use environmentally				circulate + clean out cuttings
							safe/non-petroleum based grease in lube	1255			Mud has cleaned up enough,
			HNU	0			gun.	1510			tripping out. Vis @ 72
			LEL/O_2	ok			Tyler called, wants 10" set 2'-3' off bottom	1520			
							to allow for cement integrity check. When I				
							told this to driller, he was concerned w/				
							breaking the seal. Called back to office,				
							had ~ ½ hr standby until decision				
							was made to set 10" approx. 1' off bottom,				
							will try to drill 6" into cement grout + then				
							test it.	1630			Preparing to weld first thing tomorrow
								1730			quit for day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 232' Sheet 1 of 1
Location Not Ringold Project Savage Island

Logged by T Gilmore (Print) Jeffrey Dilmore (Sign) Date 3/5/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure NA Rev No NA
Measuring Equipment NA

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Discuss work for the Day	700			
							Need to dispose of the current batch of				
							Mud before we drill into the Rattlesnake				
							Ridge				
			HNU	0ppm			Calibrate HNU w/ Benzene Calibration	735			Check site and bore site
			LEL	ok			Gas Span reads 56ppm at 7.48 span				
							Run 10" Casing in - Will list pipe	800			Welding
							Tally after casing run in well				
							[will add water to inside casing while				
							placing casing in well]				
							Tab centralizers placed every 30 ft				
							(bottom) 21.5 w/Shoe	12-1230			Lunch
			HNU	0ppm			20.253 20.221	1300			KEH switched expansion bottles
			LEL	ok			20.096 20.250				
							20.255 20.056				
							20.272 (Top) 20.345 (10.5' stickup)				
							20.078 243.453 Total	1720			Finish last weld
							20.050 − 10.5 stickup				Cement 10" in Leveling
							20.055 232.953 in ground	1730			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 232 Sheet 2 of 3
Location North of Ring'd Project Savage Island

Logged by T Gilmore (Print) (Sign) Date 3/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure Grouting Procedure developed for project Rev No N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Mud Rotary / Speedster 55-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Run Drill rod in well; will circulate	830			
							mud before running cement				
							Spill hydraulic fluid on ground	940			
							from grout pump; capture most				
							of spill with absorbent material,				
							Barrel rest in already prepared				
							barrels				
							Try Pump will not work	1030			
							Bob Jones (WHC) is checking to bring				
							a backup, found a pump at another				
							site – Drillers shut down until pump				
							can arrive				
								12-1230			Lunch
							New Pump arrives	1315			
							Test Pump – getting returns in well				
							Mix Grout 3 bags Bent	1325			
							3 bags $CaCl_2$				
							900 gal water				
							13,300 lb cement				
							Grout Weight after mixing for 15 min 14.6	1355			Mix Grout
							Looking for 14.7 wt (lb/gal)				
							Weight Grout 14.6 wt before pumping	1410			Pump Grout

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 232' Sheet 1 of 3
Location N of Richland Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 3/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure N/A Rev No N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary / Speedstar SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Total length of 10" in well	700			Drillers and Geologist on site
							243.453' - 10.5 (stickup) = 232.953				
							will cut off ~ 7' to leave 3' stickup				
							will also pull up 1.5' off bottom to				
							allow room for an integrity test after				
							cement placed in well				
			HNU	0ppm			Calibrate HNU w/ Benzene Span	710			Check site and borehole
			LEL	~23% O_2			gas span @ 8.50; Calibrate LEL				
				0% LEL							
							Note: Depth to bottom is 232.95'				
							as measured w/ 10' tape, approx 0.9'				
							deeper than calculated w/ casing stick-up				
							Cement will use Portland type III				
							cement, 2% Bentonite, an accelerator				
							Calcium chloride at 2%				
							Cut off 8'; weld tabs on casing 1.5'				
							above where casing rests on surface casing				
							depth will be 231.45'				
							Set Rig down on casing to prevent				
							casing from floating up when setting				
							cement				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 232 Sheet 3 of 3
Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 3/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure Grouting Procedure developed for project Rev No N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Mud rotary / Sprayster SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Pump cement grout to surface	1455			Grout at Surface
							Continuous circulation during pumping	1435			Clean up
							Pumped approx 1.4X hole volume				
							(almost all the grout) ~90 gal				
							Trip out of hole	1515			
							Clean up Site	1630			
								1730			End of Day
							Note: Please see also "Field Activity Report - Cement Calculation"				
							Will switch to Air hammer to drill cement and Bolt - all mud to be disposed of - only hydrogel used to mix mud all water from Ringold fish hatchery				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

FIELD ACTIVITY REPORT – CEMENT CALCULATIONS

Date	Well Number	Continuation of Report No
3/6/91	699-42-E98	

1.0 CEMENT STAGE VOLUME CALCULATIONS

1.1 Cement Volume – Open Hole/Casing

14 3/4" ID of casing or diameter of hole, inches = D

_____ feet × 0.0408 × _____ D^2 = _____ Gallons of cement required

_____ feet × 0.005454 × _____ D^2 = _____ Cubic feet of cement required

1.2 Cement Volume – Annular Spaces

- ☐ Between Tubing and Hole (D = Hole diameter, inches; d = OD of Tubing, inches)
- ☒ Between Casing and Hole (D = Hole diameter, inches; d = OD of Casing, inches)
- ☐ Between Tubing and Casing (D = ID of Casing, inches; d = OD of Tubing, inches)
- ☐ Between Casings (D = ID of outer Casing, inches; d = OD of inner Casing, inches)

D = 14 3/4" d = 10 3/4" n = Number of tubing strings

232 feet x 0.0408 × [217.5 D^2 – (115.5 d^2 x 1 n)] = 964.8 Gallons of cement required

232 feet x 0.005454 × [217.5 D^2 – (115.5 d^2 x 1 n)] = 129 Cubic feet of cement required

2.0 SLURRY MIX CALCULATIONS

2.1 Calculate Sacks of Cement Type: 1 & 2 lbs/sack: 94 ft³/sack (mixed): 1.36

129 ft³ (cement – from 1.0) ÷ 1.36 ft³/sack (mixed) = 94.8 sacks

94 sacks + 48 sacks excess (50 % required) = 142 Total sacks required

(13,348 lbs) Truck has 13,300 lbs

2.2 Calculate Mix Water

142 Total sacks cement × 6.5 gallons water/sack = 923 gallons of mix water required

2.3 Calculate Additive Amounts

Type Bentonite 142 Total sacks × 94 lbs/sack × 2 % = 267 lbs. required
Cement Additive Additive

Type $CaCl_3$ 142 Total sacks × 94 lbs/sack × 2 % = 267 lbs. required
Cement Cement Additive Additive

High Yeild 85% = 227

3.0 DISPLACEMENT VOLUME CALCULATIONS

3.1 Balanced Plug Displacement

N/A ft. (top of cement) – N/A ft. (water level) = _____ feet to be displaced

100 ft. (to be displaced) × 0.499 gal/ft. = 49.9 gallons of displacement water required

4.0 REMARKS

Acme Cement Truck delivered 13,300 lbs cuy Portland type 1 and 2 Cement
Will mix additives at site

Report By T Grimes
Title _____
Signature _____

Reviewed By _____
Title _____ Date _____
Signature _____

DISTRIBUTION: White – File Custodian Yellow – Group Files Pink – Project Coordinator Goldenrod – Team Leader

BC-6000-279 (02/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 232' Sheet 1 of 1

Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 3/11/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DO-1; DO-5 Rev No 1.0

Measuring Equipment N/A

Drilling Contractor Jensen Drilling Co

Driller Art Gwin

Rig/Method Air Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologist at Site - waiting on	700			
							drillers				
							No Drilling Today - Hydraulic oil for	900			
							Air Hammer did not arrive, Drillers not				
							on site				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E98 Depth 232 Sheet 1 of 1
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 3/12/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologist on Site	700			
							Driller's Truck broke down in Portland				Note: no HNU reading hole is
							will be late				plugged w/ cement and
							Drillers show up	935			water
							Check water level in well - the 10"	940			
							casing was filled up to within 0.1' of				Unload new material in prep
							the top w/ water on 3/6 - waterlevel				to switch to Downhole hammer
							today 0.65' from top of casing				
							Cement plug in casing at ~190', will				
							have to drill out				
								12-1230			Lunch
							Compressor oil is: AEON 6000 FG	1235			Change Compressor oil
							"Rotary screw compressor Food grade				
							Synthetic Lubricant" Industrial Machinery				
							Div. Gardner - Denver				
							1800 Gardner Expressway, Quincy Il 62305 9004				
							Need parts for compressor on Rig will need	1530			End of Day
							to go to town				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Depth 190' (cement plug) Sheet 1 of 2
Location N of Ringold
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 3/13/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Driller is working on rig	0710			Geologist on site
							D/water = 0.72' below top of casing	0805			
							Bottom of 10" @ 231.45' b.l.s.				
							Total 10" casing = 235.45'				
							Want to drill to 232.0' and then run				
							integrity test.				
							D/Bottom inside 10" = 193.5 + 2.4 - 4' = 191.9	0950			
							Driller meas. bottom @ 198 - 4' = 194'				
							(he has a heavy weight on his tape)				
							The bottom feels very soft - the driller				
							speculates that the check valve on the shoe				
							may have leaked some bentonite through.				
								1000			Adding drillstring
								1040			P. Collier + V. Chamberlin arrive
								1045			Blow water out of well
								1050			Drilling w/ air rotary
								1100			Stop drilling - talking to P. Collier
								1130			Adding section of drill pipe
							Driller says hit cement @ 219'	1137			Drilling
								1145			P. Collier, V. Chamberlin leave site
							Adding drill pipe. Hole depth now ≈ 224'	1148			
								1200/1230			Lunch

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N. of Ringold
Depth 232'
Sheet 2 of 2
Project Savage Is. - Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 3/13/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment e-tape 11053

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1300			Drilling
							Penetrate float shoe. Stop drilling.	1345			
							Add water to hole for integrity test	1400			
							D/water = 148.25 (from top of casing)	1412			
							meas. w/ 200' E-tape. Will wait 1 hr.				
							for recovery.				
							D/water = 146.8 - not sure if first meas. was	1425			Recharge rate = 0.11 ft/min
							inaccurate (the casing was very wet and it				
							was difficult to meas.) or if water is coming in.	1445			Wapato Fruit tank truck arrives
											to haul drill mud
							D/water = 145.55	1447			Recharge rate = 0.06 ft/min
							D/water = 144.85	1505			Recharge = 0.04 ft/min
							D/water = 144.62	1511			Recharge = 0.04 ft/min
							D/water = 144.25	1527			Recharge = 0.02 ft/min
							Truck was about 1000 gal short of emptying	1535			Wapato truck leaves
							the tank - it will have make a 2nd load				
							D/water = 143.55	1540			Recharge = 0.05 ft/min
							D/water = 143.33	1546			" = 0.04 ft/min
							D/water = 142.9	1557			
							D/water = 141.55	1630			
								1645			Leave site. Drillers will stay
											until Wapato truck comes back

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 232' - 233' Sheet 1 of 2
Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 3/4/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure Do-1, Do-5 Rev No 1.0
Measuring Equipment E-Tape 11253

Drilling Contractor Jensen Drilling Co
Driller Art Gwin
Rig/Method Air rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologist and Drillers at Site	700			
							Measure depth to water 109.3'	710			
							from Top casing w/ E Tape				
							Call GW Lab for Tech Forum	710			Drillers on Standby
							Calibrate HNU w/ Span Gas Span @ 38	715			
							Let instrument warm-up and try again				
							Casing leaking ~ 1qt/min; Decision reached	735			Go ahead to Drill
							that will continue to drill - next cement				
							seal (in 100') we will bring cement up into				
							10" casing to re-seal, also final casing will				
							have Bent grout around it for additional seal				
							Crew is also cleaning out Mud Tanks				
							to move to other site				
								815			Drilling
							Need Safety Submittals for Paddy and	820			Ed Enloe KEH Safety on-site
							other new guy; Cannot go in Zone				
							Ed giving safety briefing				

W = wet, M = moist, D = dry

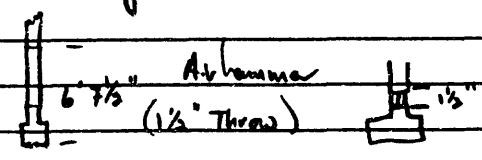
A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 233-233 Sheet 2 of 2
Location N. of Ringold Project Savage Island

Logged by Tyler Gilmore (MA Chamness) Print — Tyler Gilmore (MA Chamness) Sign Date 3/4/91
Reviewed by Print Sign Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Air Rotary / Speedstar 515-III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNu	0ppm			Drilled ~1' more cement before we				
			LEL	0%			hit basalt - basalt drilling slow				
							Switch to Air Hammer	950			Stop Drilling
							Trip out of hole				
							All pipe out	1022			
							Rodney Nordquist and Scott MacKinnon are	1050			KEH safety approves Training
							approved to work in Control Zone				
							Only oils and Lubricants approved were				
							used to switch tools (RDN [Rock drilling oil]				
							and well guard)				
								1140			Run well with Drill string
											
							All casing 20' long				
							MA Chamness arrives	12-1230			Lunch
											Wait on Compressor
								1410			Drill
								1415			Stopped drilling, adjusting compressor
								1425			Drilling
								1430			Stopped, water hose leak
							Air hammer stopped because of great chips	1455			Started drilling
							falling in from drill stem	1500			Air hammer stopped, have to pull tools back out of hole

W = wet, M = moist, D = dry HNU 0ppm LEL 0%

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 233-250 Sheet 1 of 4
Location North of Ringold Project Savage Island

Logged by SS Teel / MA Chamness (Print) SS Teel (Sign) MA Chamness Date 3/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin, Rod Nordquist
Rig/Method Air Hammer / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0715			On-site. Drillers cleaning
											air hammer
							Span set @ 4.70 to read 56 ppm	0730			Calibrate HNU & LEL/O_2 meter
			HNU	0 ppm				0850			Check borehole
			LEL	0%				0900			Hammer is cleaned-out. Starting
			O_2	20.8%			Note: Air compressor discharge rate is				to trip-in. Well guard or
							250 psi (1250 cfm) and no surfactants				RDN oil used on tool joints.
							are being used.	1025			Drilling
240'	lith	2				240	Basalt - purplish black, fresh, slightly vesicular,	1038			Sampled from air discharge.
							microphenocrysts. Water is still somewhat rust-				Driller says some water is coming-
							colored. Small vesicles filled w/ green/blue				in - more water can be seen in the
							(5G4/2 to 5BG5/1 grayish green to bluish				discharge than he is adding
							gray) clay, chlorophaeite (?). Fine-grained				
245	lith	2				243	Hit interflow zone at 243', dk brown to	1043			Sample from air discharge hose
							reddish brown, glassy, vesicular, with most				Water-bearing zone @ 243',
							vesicles filled w/ . Pieces of				drills very easy
							baked, siliceous sediment or precipitate.				
						245	Microphyric.	1045			Adding drill stem
								1116			Drilling
250	lith	2					Still interflow zone, more dense basalt	1125			Sampled from air discharge
							pieces, may be getting into more solid basalt				
							fine-grained.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 250-260' Sheet 2 of 4
Location North of Ringold Project Savage Island

Logged by SSTeel / MA Chamness (Print) SSTeel (Sign) Date 2/15/90
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin, Rod Nordquist
Rig/Method Air Hammer / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							250 cont'd vesicle fillings + baked sed.				
							chunks are more blue/green, whereas last				
							sample ranged from white to blue green,				
							w/ gray-green sed. chunks.				
255'	Lith	2					Basalt - some is still reddish brown, most	1120			Sampled from air discharge
							is purplish black, pieces of siliceous sed./				Driller estimates water flow
							precipitate are 5G-6/2 (pale green), becoming				at 40-50 gal/min out of hole,
							less common. Purplish basalt is denser, small				is only adding 2 gal/min.
							vesicles, fine-grained microphanc, not glassy. The	1125			Stopped to adjust rig + air discharge
							redder, more vesicular basalt may be				
							carried down from above.				
								1150			Rocks have fallen in on top of
											air hammer, can't move it
											up, stopped for lunch
								1230			Drilling, getting hammer free.
260'	Lith	2					Basalt, black to greenish black, some pieces	1240			Sampled from air discharge,
							are vesicular, others are solid, vesicular pieces				drilling slower
							have green/blue clay filling vesicles. Some				
							blue/green clay material + reddish				
							basalt probably from above. Microphanocrystalline,				
							fine-grained.				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N of Pingold
Depth 260 - 280
Sheet 3 of 4
Project Savage Island

Logged by SS Teel / MA Chamness (Print) SS Teel (Sign) MA Chamness Date 3/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA
Procedure DO-1, DO-5
Rev No 1.0
Measuring Equipment e-tape 11053

Drilling Contractor Jensen Bros.
Driller Art Gwin, Rod Nordquist
Rig/Method air hammer SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
265	lith	2				265	Basalt - probably still black to greenish black, fresh, dense to slightly vesicular. There is a lot of material from above mixed in though, so sample is not very representative.	1250			Sampled from air discharge, driller reamed hole just before getting sample, so there is a lot of material from above. Drilling harder, measuring water, coming in ~5'/15 sec.
							D/W @ 36' below casing top, stickup 4', still rising, but more slowly. ∴ DW = 32'	1314			
270'	lith	2				270	Basalt - sample ~ 1/2 slightly vesicular, black, fresh, fine-grained w/ microphenocrysts, the other 1/2 is 5G6/2 (pale green) clay. Apparently have hit another pocket of clay material since it drills so easily + there is great increase in amount of clay	1322			Sampled from air discharge, started drilling very easy @ 266.5'
275'	lith	2				275	Basalt - dense, slightly vesicular in some pieces, much less green clay. Black, fine-grained w/ microphenocrysts. Many of the vesicles are empty.	1327			Sampled from air discharge starts drilling harder @ 277', hardest so far
280'	lith	2					Basalt, dense, fresh, fine-grained w/ micro-phenocrysts. Fracture surfaces (bad) slightly some clay. Black. No clay, all rock. There is a little or no contam.	1342			Sampled from air discharge, drilling hard

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 280' - 285' Sheet 4 of 4
Location N. of Ringold Project Savage Island

Logged by SS Teel / MA Chamness (Print) SSTeel MA Chamness (Sign) Date 3/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment e tape 1653

Drilling Contractor Jensen Bros.
Driller Art Gwin, Rod Nordquist
Rig/Method air hammer CS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
285							Missed 285' sample. Driller is now at the	1415			
							end of his drill rod and the hole is cleaned-out.				
							Will have to get 285' sample when drilling				
							begins again after grouting the Elephant Mtn.				
							interflow zone. There does not appear to be a				
							change in lith. from the 280' sample.				
			HNU	0 ppm				1455			
			LEL	ok				1520			DTW 31.75' from top of casing
											4' stickup = 27.75' bgs.
							D/water @ well 699-42-E9A = 27.6 - 2.55 =	1525			Tripping-out tools from hole
							25.05' below top of pad.				
							D/water 699-42-E9B =	1638			
							29.6 - 4.0 = 25.6' b.l.s.				
							D/water 699-42-E9A =	1645			
							27.65 - 2.55 = 25.10' below pad				
								1720			Leave Site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 285' Sheet 1 of 3
Location N of Ringold Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 3/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure GL-1, GL-3, GL-7, GL-8, GL-11 Rev No 0, 0, 0, 0
Measuring Equipment 500' tape L500-16 e tape 11053

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air Hammer

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							SS Teel + AW Pearson arrive on site	0708			
							D/water = 26.7 - 4.0' = 22.7 w/	0730			
							E-tape # 11053				
							D/Bottom = 286.5 + 2.83 - 4.0' = 285.33'				
							w/ PNL 500' tape # L500-16				
								0755			Begin Natural Gamma Logging
							Calibrate HNU + LEL/O_2. HNU span set	0756			
							@ 8.17 to read 56 ppm.				
			HNU	0 ppm				0820			Check borehole
			LEL	0%			Interval 284.8 - 200.0'	0822			Completed Natural Gamma Log
			O_2	20.6%				0915			Begin Caliper Log
								0922			Ed Grloe on Site
							Interval 284.4 - 220.0'	0940			Completed caliper log
								1010			Begin Magnetic log. Ed leaves site.
							Interval 284.0 - 220.0'	1030			Completed Magnetic log
								1115			Begin SP + R Log
							Interval 284.1 - 220.0'	1150			Complete SP + R Log
							Span set @ 9.08 to read 56 ppm (different	1300			Calibrate HNU + LEL/O_2
							probe than previously used				Bob Jones + Dennis Minyle on
			HNU	0 ppm							site
			LEL	0%				1308			Check Borehole
			O_2	20.6%							

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 285' Sheet 2 of 3
Location N of Ringold Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 3/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure AT-6 Rev No 0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air Hammer

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Tyler Gilmore / Jane Borghese on Site	1400			
							Set up to run Slug test; Slug and Pump on site; run irrigation line (~1000') out away from Rig				
							For aquifer test see Aquifer test logs 3/18/91				
							Note on Sediments from interflow zone Many chunks of basalt are rounded, weathered, very vesicular filled w/clay; pieces of basalt 2" across survived bit; Zone appears very "rumbly"				
							After Slug test will develop well for water samples	1400			Slug Test
							Pump is Grundfos type 255 Stage Model number 224303700x4	1430			Run discharge line out
							Set pump at 82' bls; (4) 21' pipe + 2.5' to intake	1650			Set pump

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-43-E9B Depth 285' Sheet 3 of 3
Location North of Ringold Project Savage Island

Logged by Tyler Gilmore (Print) Tyler Gilmore (Sign) Date 3/18/91 3/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure AT-6 Rev No 0
Measuring Equipment Campbell Scientific Transducer system

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Air Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							(1) borehole Volume = ~1000gal H_2O				Static 32ft D/B 295 = 263' X 4.08gal/ft =
							Take samples at 3 borehole volume (BHV)				1000gal
							[Test Plan] 6 BHV				
							(may vary) 9 BHV	1715			Test Pump - works
							12 BHV				Set up Flow meter
							See Aquifer test notes 25 BHV				
							50 BHV				
							75 BHV				
							100 BHV				
							+ End of Test				
							Will Monitor Turbidity, pH and Cond.				
							to determine when done				
							Test Starts	1816			Start Development Test
							Pump rate 40 gpm still drawing down	1830			
							slowly				
							Alan Pearson / Steve Teel arrive	1530			
							to run test up until 1200 MN				
							Steve Aylant / Terrell Lawrence				
							Arrive to run test until 0700 3/19	1200			New Day 3/19/91
							Seven water samples collected by				
							0700				
							T Gilmore / Jane Bonjiose Arrive	0700			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Depth 285
Sheet 1 of 1
Location North of Ringold
Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 3/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gavin
Rig/Method Air Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Ran Aquifer test/Development Test All	700			Testing Interval Zone
							night Jane Bonghese/Tyler Gilmore				
							Arrive to Relieve S Airhart/D Newcomer				
							Drillers on Site	700			
							KBolsen on Site				
							Water Samples each Suite includes –				
							I-129; H_3; Icpmetals; Blank; Alkalinity; Blank;				
							Anions – Samples taken at				
							Time / Depth / Depth to water / GPM				
							2008 4.5 = 1500 gal 41.2 42	1130			Turn Pump off
							2100 8 41.6 42	1205			Recovery Test
							2215 10 42.23 37	1210			Pull equipment out
							2323 12 42.5 37	1215			Pull pump out of well
							0056 18 42.85 37				D/B 285.5 ft bls
							0230 22 43.14 37				(Did not lose any hole)
							0506 28 43.55 33	1245			Run Tremmie for grout
							0910 34 44.12 33	1345			Tremmie In
							1130 45 45,310 gal (Total) 44.3 42	1430			Mix Cement (See Cement Notes)
							Add 180 gal (1.2 x volume needed to 230')	1500			Finish Cement
							Weight was 14.6 lb/gal –				
							water-level rose to 10' bls then quickly back	1510			Pull 50' of Tremmie Pipe
							to static 26' bls in about 15 min				
								1.30			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

FIELD ACTIVITY REPORT – CEMENT CALCULATIONS

Date	Well Number	Continuation of Report No.

1.0 CEMENT STAGE VOLUME CALCULATIONS

1.1 Cement Volume – Open Hole/Casing 10 ID of casing or diameter of hole, inches = D

55 feet × 0.0408 × 100 D^2 = 224 Gallons of cement required

55 feet × 0.005454 × 100 D^2 = 30 Cubic feet of cement required

1.2 Cement Volume – Annular Spaces

☐ Between Tubing and Hole (D = Hole diameter, inches; d = OD of Tubing, inches)

☐ Between Casing and Hole (D = Hole diameter, inches; d = OD of Casing, inches)

☐ Between Tubing and Casing (D = ID of Casing, inches; d = OD of Tubing, inches)

☐ Between Casings (D = ID of outer Casing, inches; d = OD of inner Casing, inches)

D = _____ d = _____ n = Number of tubing strings

_____ feet x 0.0408 × [_____ D^2 – (_____ d^2x ___n)] = _____ Gallons of cement required

_____ feet x 0.005454 × [_____ D^2 – (_____ d^2x ___n)] = _____ Cubic feet of cement required

2.0 SLURRY MIX CALCULATIONS

2.1 Calculate Sacks of Cement Type: I & II lbs/sack: 94 ft^3/sack (mixed): 1.36

30 ft^3 (cement – from 1.0) ÷ 1.36 ft^3/sack (mixed) = 22.0588 sacks

22 sacks + 5.5 sacks excess (25 % required) = 27.5 Total sacks required

2.2 Calculate Mix Water (@ 5% Bent.)

27.5 Total sacks cement × 6.5 gallons water/sack = 178.84 gallons of mix water required

2.3 Calculate Additive Amounts

Type Bent 27.5 (Cement) Total sacks × 94 (Cement) lbs/sack × 2 (Additive) % = 51.7 (Additive) lbs. required

Type $CaCl_2$ 27.5 (Cement) Total sacks × 94 (Cement) lbs/sack × 2 (Additive) % = 51.7 (Additive) lbs. required

85% = 43.9

3.0 DISPLACEMENT VOLUME CALCULATIONS

3.1 Balanced Plug Displacement

230 ft. (top of cement) – 22 ft. (water level) = 208 feet to be displaced

208 ft. (to be displaced) × 0.1632 gal/ft. = 33.9 gallons of displacement water required

4.0 REMARKS

Cement delivered dry in truck and mixed at Site

weight 14.6 lb/gal

Report By T. Belmore 3/19/91	Reviewed By Bob Jones (WHC)
Title	Title Date 3/19/91
Signature	Signature

DISTRIBUTION: White – File Custodian Yellow – Group Files Pink – Project Coordinator Goldenrod – Team Leader

BC-6000-279 (02/90)

181 50

DRILL LOG

By	Rig	Well Number	Computer Number	Project or Work Order No.
T Gilmore [illegible]	Speedster SS-15	699-43-E9B	N/A	Savage Island
Date 3/20/91		Depth 285' To 285'		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				D/B 146.2 bls w/ Steel Tape L300-16	800	Bob Jones and Drillers on
				D/W 26.2 from casing w/ E-Tape		Site
				Cement truck on the way with same amount of cement		
				as yesterday ~2,078 lbs for 69' of cement		
				interflow zone at 244-277 need about 3 more feet to		
				get out of interflow		
				Same mix as 3/19/91 wt 14.6 lb/gal	1030	Cement Truck Arrives
				Pump Grout	1040	
				Water-level come to top of casing - appears to be		
				holding	1115	Clean up
				Let Grout harden for 24 hrs (CaCo3 used)	1130	

REMARKS:

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A-6000-021 (5-85)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Depth Cement seal @ 205.63 - 260
Sheet 1 of 3
Location N. of Ringold
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 3/21/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure N/A
Rev No. N/A
Measuring Equipment Steel Tape # L500-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air Rotary - Hammer

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0930			Geologist + HPT on site,
											Drillers and Ed Enloe (KGH)
											already on site.
							(HPT also checked truck tires - they were OK)	0940			Ed Enloe leaves. HPT checks
											area - no readings above
											background.
								0950			HPT leaves.
							D/cement = 208.0 + 2.83 - 5.2 = 205.63	1000			
							Bottom of 10" casing @ 231.45, ∴				
							25.82' of overlap.	1005			Drillers removing tremie pipe
								1030			Adding drill pipe
							Span is set @ 9.06 to read 56 ppm	1040			Calibrate HNU + LEL/O_2
							Will wait til later to check hole since it is plugged				
							with cement grout.				
								1150			Blowing-out hole
								1205			Stop for lunch.
							Grout has set-up very well - driller says	1325			Drilling w/ air hammer
							it is drilling hard.				
							Depth now ≈ 231 (Bottom of casing)	1343			Adding drill rod
								1355			Drilling. Miakie arrives
								1415			Adding drill rod
								1425			Drilling

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 260' - 285' Sheet 2 of 3
Location N. of Ringold Project Savage Is.

Logged by SS Teel MA Chamness (Print) MA Chamness (Sign) Date 3/21/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure N/A Rev No. N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Can see pieces of interflow material coming	1435			(90% grout, 10% interflow
							out with grout pieces. Driller est. that				material out of hose)
							about 20 gal/min of water is being produced.				
							Depth ≈ 260'. Call Tyler and let him				
							know.	1445			Adding Drill rod. Depth ≈ 270'
							≈ 275' 50% grout / 50% interflow	1455			
278	lith	2					≈ 278' Almost all interflow material	1505			
285	lith	2					Basalt, dense, black, somewhat coarser-	1524			Sampled from air discharge
							grained than previous samples, fracture				
							surfaces have blue clay(?) + black clay.				
							Basalt is microphyric. Primary fracture				
							surfaces more common than before.				
								1540			Stop drilling
							Tyler called - Tech. Forum decided to	1545			
							continue to drill until the drill rate noticibly				
							increases - the goal is to stop just short of				
							the Rattlesnake Ridge Interbed. Then we will				
							pressure grout and then drill while the cement				
							is still "green" to keep the bit from skipping				
							off to the side.				
			HNU	0 ppm				1555			Check borehole
			LEL/O_2	OK				1600			Adding Drill pipe

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 285'~306' Sheet 3 of 3
Location N of Ringold Project

Logged by SS Teel (Print) MA Chamness (Sign) Date 3/21/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure N/A Rev No. N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 TTI

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1620			Drilling w/Air hammer
290'	lith	2					Basalt, dense, black, very sim. to	1630			Sample from discharge hose
							285' sample except probably not as fractured				
							– sample chunks are a lot smaller – clay				
							surfaces not as common. Still has felty				
							tex.				
295'	lith	2					BASALT dense, black, same as prev.	1655			Sample from hose
							Still shows good felty texture; still				
							drilling fairly slow.				
300'	lith	2					BASALT dense, black, matrix appears to	1715			Sample from hose
							be coarser, still has microphenocrysts,				
							microvesicles/diktytaxitic tex with				
							black clay and minor rusty-red clays.				
							Sim. to prev.				
305	lith	2					Basalt - similar to above, dense, black,	1740			Sampled from air discharge
							microvesicles contain black/green clay,				
							alteration product.				
								1751			Added drill rod, started drilling
								1800			Quit for day

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location N of Rivgold
Depth 306-325
Sheet 1 of 3
Project Savage Island

Logged by T Gilmore / MA Chemnness (Print) MA Chemnness (Sign) Date 3/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No. 1, 0
Measuring Equipment e-tape 11053

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar 33-15 III / Air Rotary Hammer

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0ppm			Drillers and Geologists on site	700			
			LEL	ok			Calibrate HNU span set at 9.6				
							to read 56ppm				
								705			Drillers replacing gasket on Compressor
											D/W = 28.7' from top of casing
											Casing stickup 3.95' from land surface
								815			Drilling
310	Lith	2				310	Basalt - fresh, dense, black, slightly	830			Sampled from air discharge
							finer-grained matrix than above,				
							microphyric, little of the alteration				
						315	clay spots seen above. Some green or				
							black clay on primary fracture surfaces,				
							altho fewer fractures than above.				
315	Lith	2					Basalt - black, dense, fresh. similar to	855			Sampled from air discharge
						320	above, coarser-grained slightly.				
320	Lith	2					Basalt - black, dense, coarser-grained,	940			Sampled from air discharge
							microphyric. A few pieces of baked	1000			Air hammer not working efficiently
						325	clay, may be from above.				because of amount of water
325	Lith	2					Basalt - black, dense, fresh, some fracture	1030			in hole; making drilling
							surfaces obvious. Microphyric, w/ somewhat				slower.
							course-grained matrix				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 325-345 Sheet 2 of 3
Location N. of Ringold Project Savage Island

Logged by TJ Gilmore / MA Chamness (Print) MA Chamness (Sign) Date 3/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Bros
Driller Art Gwin, Dennis
Rig/Method SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1035			Set up to run borehole
											straightness test
								1155			Hole is ~1.9° off vertical
								1245			Adding on drill rod
								1254			Drilling
330'	Lith	2				330	Basalt - dense, fresh, black. Some pieces	1319			Sampled from air discharge
							are more phyric w/ microphenocrysts than				
							others, difficult to say whether some				
							pieces are from above or from this depth.				
						335	Some fractures, w/ dk green lining.				
335'	Lith	2					Basalt - dense, fresh, black, diktytaxitic,	1357			Sampled from air discharge,
							similar to above.				driller says we're going thru
											softer + harder zones. More
340'	Lith	2				340	Basalt - dense, fresh, black / to dk gray. Mod.	1420			phyric may be the softer ones.
							phyric w/ microphenocrysts. Some clay				Sampled from air discharge
							lined fracture surfaces, clay green/black.				
							Matrix slightly coarser, diktytaxitic.				
345'	Lith	2				345	Basalt - dense, fresh, black / dk gray, matrix	1505			Sampled from air discharge.
							similar to above, doesn't appear to be				
							diktytaxitic. Some pyrite on fracture surfaces,				
							along w/ black/green clay.	1510			Adding drill rod

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Depth 345'-354'
Sheet 3 of 3
Location N. of Ringold
Project Savage Island

Logged by TJ Gilmore / MA Chauncey (Print) MA Chauncey (Sign) Date 3/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA
Procedure DO-1, DO-5
Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gusin, Dennis
Rig/Method air hammer SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1517			Drilling
							Appears water discharge decreased and samples are coming out more pulverized possible "lost" or low circulation zone fractured zone? Drilling slower				
350'	lith	2					Basalt - dense, black/dk gray, coarser-grained matrix, microphyric, black/green clay on fracture surfaces, some pyrite in places. Platy appearance	1600			Sampled from air discharge, still drilling slow
354	lith	2					Basalt - weathered very vesicular elongated vesicles 1-3mm across up to 30 mm long, clay in cavities, red-brn to blk bslt some chill zones fine-medium grn matrix	1633			Very "soft" drilling Hit Top Rattlesnake?
								1634			Stopped Drilling at 354' Pull drill pipe out of hole
								1730			End of Day

W = wet, M = moist, D = dry

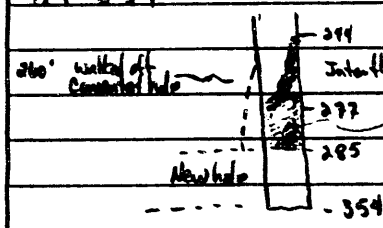
A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 354 Sheet 1 of 2
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) Tefa Gilmore (Sign) Date 3/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 GL-1, GL-3, GL-7, GL-8 Rev No. 1,0 0,0,0,0
Measuring Equipment

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air Hammer

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
			HNu	open			Drillers Art Gwin, Dennis Mingo on Site	700			
			LEL	0%			Geologist on Site w/ Bob Jones WHC				
							Logging Truck arrives w/ Steve Richard and Alan Pearsons	755			Geophysical Logging
							D/W 28.4' from casing casing 3.9' above				
							land surface Hole open to formation				Caliper, Gamma, SP and R
							partly at 260 (in interflow) to bottom	800			Set up to Grout
							at 354				
								830			Ed Eulce KEH Safety on Site
							Log from 230'-354' -SP, Gamma, Caliper				
							Then cement from ~240'-354'				
							The hydrostatic pressure at 354' (w/				
							static at 25') is 142.9 psi. A cement				
							mixture w/ 8% Bent and 2% $CaCl_2$ the				
							curing time should be at least 8 hours				
							to be over 135 psi at 18 hours it will				
							be 520 psi (from Halliburton Cement				
							Guide)	1230			Done Logging

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-43-59B Depth 354 Sheet 2 of 2
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 3/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1; DO-5 Rev No. 1.0
Measuring Equipment e. tape 11053

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							See form for Grout calculations	1235			Set up for cement
							will use 3% Bent. 2% $CaCl_2$				
							set up time will be 18 hours				
							w/ 3% Bent; psi strength at 18 hrs				
							is about 412				
								1300			D/W 28.4
							Flow meter at 4562 to start count				
							Tryed to circulate water in borehole	1325			
							to determine approx amount of cement				
							we might lose to formation, pumped				
							~100gal raised w/L to 15' below				
							casing				Mix Grout
							Water Level came up slowly for ~600gal	1415			Pump Grout (Grout wt 13#/gal)
							then faster (= rate pumping)				
							Water-level dropping very slowly in	1500			Stopped pumping grout
							well				
							Having problem w/ pump can't pump				
							displacement water to chase cement				
							Tremmie at 202' - Circulate cement above	1615			
							202 out of hole - cement sealed off formation				
							Pull Tremmie out	1700			
								1730			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

FIELD ACTIVITY REPORT – CEMENT CALCULATIONS

Date	Well Number	Continuation of Report No
3/25/91	699-42-E9B	

1.0 CEMENT STAGE VOLUME CALCULATIONS

1.1 Cement Volume – Open Hole/Casing

10" ID of casing or diameter of hole, inches = D

124 feet × 0.0408 × 100 D^2 = 505.92 Gallons of cement required

124 feet × 0.005454 × 100 D^2 = 67.62 Cubic feet of cement required

1.2 Cement Volume – Annular Spaces

- ☐ Between Tubing and Hole (D = Hole diameter, inches; d = OD of Tubing, inches)
- ☐ Between Casing and Hole (D = Hole diameter, inches; d = OD of Casing, inches)
- ☐ Between Tubing and Casing (D = ID of Casing, inches; d = OD of Tubing, inches)
- ☐ Between Casings (D = ID of outer Casing, inches; d = OD of inner Casing, inches)

D = _____ d = _____ n = Number of tubing strings

_____ feet × 0.0408 × [_____ D^2 – (_____ d^2 × ___^{n})] = _____ Gallons of cement required

_____ feet × 0.005454 × [_____ D^2 – (_____ d^2 × ___^{n})] = _____ Cubic feet of cement required

2.0 SLURRY MIX CALCULATIONS

2.1 Calculate Sacks of Cement

Type: I & II lbs/sack: 94 ft^3/sack (mixed): 1.36 cu ft (1.455)

676 ft^3 (cement – from 1.0) ÷ 1.36 ft^3/sack (mixed) = 49.7 (46.46) sacks

50 (46) sacks + 45.7 (48.5) sacks excess (105 % required) = 95 Total sacks required

2.2 Calculate Mix Water

95 Total sacks cement × 6.5 (7.15 at 1%) gallons water/sack = 617.5 (679.25) gallons of mix water required

2.3 Calculate Additive Amounts

Type Bent 95 (Cement) Total sacks × 94 (Cement) lbs/sack × 2 (3%) (Additive) % = 178 (267 lbs) (Additive) lbs. required

Type $CaCl_2$ 95 (Cement) Total sacks × 94 (Cement) lbs/sack × 2 (Additive) % = 178 (151 lbs) (85%) (Additive) lbs. required

3.0 DISPLACEMENT VOLUME CALCULATIONS

3.1 Balanced Plug Displacement

_____ ft. (top of cement) – _____ ft. (water level) = _____ feet to be displaced

_____ ft. (to be displaced) × _____ gal/ft. = _____ gallons of displacement water required

4.0 REMARKS

Report By _____	Reviewed By _____
Title _____	Title _____ Date _____
Signature _____	Signature _____

DISTRIBUTION: White – File Custodian Yellow – Group Files Pink – Project Coordinator Goldenrod – Team Leader

BC 6000-279 (02/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Depth 354'
Sheet 1 of 4
Location North of Ringold
Project Savage Island

Logged by T Gilmore (Print) (Sign)
Date 3/26/91
Reviewed by (Print) (Sign)
Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No. 1, 0
Measuring Equipment L300-16 Steel Tape

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar 35-15III Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologist and Drillers; Art Gwin and	700			
							Dennis Mingo on Site				
							Depth to Cement 202' b/s	705			
							No LEL or HNU readings because bore-				
							hole is cemented				
							Switch to tri-cone bit to drill cement	710			
							Tri-cone should stay in borehole better				
							than Air-hammer (Well Guard used				
							as Lubricant)				
							Note: An iridescence on water in borehole				
							Some hydraulic fluid from pump?				
							Talked to driller and Pat Collier (KEH) to				
							switch out Grout pump. The pump on				
							site has had problems each time we				
							grout and leaks hydraulic fluid				
								1019			Drilling
							Cement coming up is slightly "green" it				
							is not fully set up. chips are soft can				
							be crushed, not hard and brittle				
							~ 1000 psi				

A-1800-003 (05/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 354' Sheet 2 of 4
Location N of Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 3/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment L 300-16 Steel tape

Drilling Contractor Jensen Drilling
Driller Art Guiles
Rig/Method Speedstar 55-15TT / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							At 265' still drilling cement - water	1100			
							is not coming in and no trace of either				
							cement or bslt in discharge				
							At 270' picked up 10% Bslt w/Grn cly	1145			
							in discharge, very slight increase in				
							water - Drilling slower				
							At 275' approx 25% Bslt in discharge	1200			
							approx < 1 gal/min				
							At 285' add wt to drill string, bit	1244			
							went back into original borehole all				
							discharge was cement - no bslt				
							Water discharge increased at about	1320			
							315' to 5gpm				
							At 355' Measured in w/ Steel Tape	1425			
							to double check				
							At 355' drilled out of cement and into				Drilling slow
							bslt - very weathered, vesicular, greasy				
							dk gy, Tr brn grn clay and lt gy cly fillings				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 354-375 Sheet 3 of 4
Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 3/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No 1.0
Measuring Equipment 300-16 Steel Tape

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE, SORT., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							At 369' pick up rd-brn, vesicular rubbly bslt - water changed color	1448			
360'	Lith	2					Welded Tuff? - very hard drills like basalt dk gray N/4 granular w/ clasts of clr gren mineral (olivine) alteration clys, Fe stn minerals, Formation producing some more water ~5gpm				Change in lith 360' ☆ Actually basalt MAC 7/21/92
				Rattlesnake ?		360					
						365	Vesicular Bslt at 364' 20-30gpm	1517			Hit more water at 365' Lith change at 365'
365	Lith	2					Basalt - Rd brn, very vesicular vesicules from 2mm up to 10mm across, vesicules not clay filled formation contains water, granular matrix, some gren mineral grns (olivine)				
						370					
370	Lith	2					Basalt - Black (tr red brn), coarse grained some clr - milky wht crystals in cavities up to 3mm long (Smectite?) Some vesicules various sizes,	1558			
375	Lith	2					Basalt - Blk w/ shades of grn; granular w/ visible olivine and plagiclase crystals drilling hard producing some amount of water as previous	1638			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B
Location North of Ringold
Depth 375-390
Sheet 4 of 4
Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 3/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A
Procedure DO-1, DO-5
Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							375' cont, drilling slow with not good returns				
380	Lith	2			380		Basalt - Blk, abnt vesicles w/ grn cly filling sotter drilling,	1650			
					390						
385	Lith	2					Basalt and Sandstone 65% Bslt, 35% brwn and orng sandstone fine grn well srt - Bslt is vesicular w/abnt vesicules green cly filling - Fast drilling	1700			Lith change 382'
390	Lith	2			390		Basalt Black to dkgy, Fine grain no vesicules, fairly dense, no visible phenocrysts				
							TD well at 390'	1740			
								1800			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 388.67' Sheet 1 of 2
Location N. of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment e-tape 11053, 500' steel tape, no #

Drilling Contractor Jensen Bros
Driller Art Gwin, Dennis Mingo, Joe Rauch
Rig/Method SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								700			Pulling drill rod + bit out of hole.
							Calibrated HNU w/ same gas as before to 5 ppm @ 9.6 span	745			
								820			
			HNU	0 ppm			Alan Pearson logging borehole w/ nat. γ,	825			
			LEL	ok			caliper, SP+R, + magnetic probes. Nat. γ				
							indicates kicks (vesicular / interbed?) at 252'-				
							256' + 380'-384'.				
							DW = 29.8' from top of casing, 3.93' stickup	910			
							DW = 25.87 bgs				
							Finished running caliper probe, hole usually	1010			The "welded tuff" at 360' yesterday
							9.75" in diam., 12.5" @ ~375' is largest dia.				is actually coarse-grained, phyric
							Finished running magnetic probe, not much	1110			basalt. Red brown vesicular
							shown				basalt at 259' may be its flow
							Finished running SP+R, running camera thru	1210			top. Next Pomona flow top prob.
							interbed zone				@ 305' at red brown vesicular
							DB 390' from top of casing + 2.6' (tape) -	1320			zone. Possibly another flow
							3.93' stickup = 288.67' bgs				begins @ 382' w/ the sandstone
							DW = 29.5' - 3.93' = 25.57' bgs	1325			fragments incorporated w/ vesicular
								1330			basalt.
			HNU	0 ppm				1340			Preparing to weld 6" casing, OD
			LEL	ok							= 6.6". Making landing plate.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 388.67' Sheet 2 of 2
Location Not Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/27/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Brothers
Driller Art Gwin, Dennis Mingo, Joe Roach
Rig/Method SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1540		20.2'	Starting to weld casing, 6" dia
										20.8'	
								1730		20.85'	Got the first 3 pieces welded,
										20.85'	quit for day, total 61.85'
										20.1'	
										20.85'	These will be added
										19.9'	tomorrow)

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B
Sheet 1 of 2
Location N. of Ringold
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/28/91
Reviewed by (Print) (Sign) Date
Measuring Equipment e-tape 11053 Procedure DO-5 Rev No. 0

Drilling Contractor Jensen Brothers
Driller Art Gwin, Dennis Mingo, Joe Roach
Rig/Equipment SS15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
720	carbon steel w/centralizers on each piece	6"	61.85'									Calibrated HNU w/ same gas as before, 56 ppm w/ span @ 8.84. HNU = 0ppm, LEL ok
730	carbon steel w/ centralizer	6"	20.85'									Welding 6"
	"	"	20.1'	✓								
	"	"	20.85'	✓								
	"	"	19.9'	✓								
	"	"	19.9 20.7'	✓ ✓								
	"	"	20.7'	✓								
	"	"	20.85'	✓								
	"	"	20.7'	✓								
1130	"	"	19.85'	✓								Casing is tight @ ~280'-285', have to push it;
	"	"	20.9'	✓								this is where bit wandered drilling out cement
1155	"	"	21'	✓								RPT came by, surveyed samples from
	"	"	20.95'									295'-350'
1200	"	"	19.95'									lunch.
												Will hold off putting sand for backfill in until
												casing is at 354', in case pieces of cement fall
												in while pushing casing down.
1255												D/W = 24.8' bgs, may not have equil. yet
1300												HNU = 0ppm LEL ok
1305												calling around for generator for pumping
												tomorrow

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B Sheet 2 of 2

Location N of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/28/91

Reviewed by (Print) (Sign) Date

Measuring Equipment steel tape (500', no ft) Procedure DO-5 Rev No. 0

Drilling Contractor Jensen Brothers

Driller Art Gwin, Dennis Mango, Joe Raach

Rig/Equipment SS 15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1400	carbon steel	6"	355.6'		354			1.6'				Finished welding 349.05' of casing, will measure 6.55' of casing to total 355.60' 1.55' of stickup. Still looking for generator. Will set casing to 354', put 2 sacks of 20-40 sand in, + let it settle for the night.
1610												DB = 387.2 + 2.6' (tape) = 389.8' - 1.6 = 388.2
1625						20-40 sand (Colorado silica)	2½ 100# bags					
1715												quit for day

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B Sheet 1 of 2
Location N. of Ringold Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 3/29/91
Reviewed by (Print) (Sign) Date
Measuring Equipment 500' steel tape, no # e. tape 11053 Procedure DO-5 Rev No. 0

Drilling Contractor Jensen Brothers
Driller Art Gwin, Dennis Mingo, Joe Roach
Rig/Equipment CS 15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
750												HNU calibrated, 56ppm @ 8.6 span
												HNU Ø ppm, LEL ok
												Art went to steam clean 5' st. steel
												blank that was shipped in.
								1.6	2.6	383.8		DB below ground surface
												DW = 24.1' bgs
940												Art back, preparing to cut packer off
	st. steel blank	5" ID 5 9/16 OD	5.02'									of screen w/ a grinder
	10/10 slot st. steel	"	10.45'	15.96'								
	screen + neoprene	~6 1/16" ID	0.49'									
	packer											
1045	st. steel screen,	5" ID										welding packer onto blank + blank onto
	10 slot	5 9/16 OD	20.25	120.25								short screen section
1130				36.21'	total screen assembly							making hook for lifting bail
1245												Running screen down hole, used some
												Well Guard lubricant around outside of
												packer to keep it from catching on welds
1250												HNU = Ø ppm, LEL ok
1515												Bottom inside 2" tremmie =
												387.2 + 2.6 - 5.6 = 384.2' bls
	st steel screen				384.2							Bottom of screen @ 384.2'

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B
Sheet 2 of 2
Location N. of Ringold
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 3/29/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure N/A Rev No. N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1600												Tried to meas. D/Bottom in the annulus
												between the 6" and borehole wall.
												Tape kept hanging-up @ 257'. Tried
												several times to get past this - tape
												gets stuck at 257.' Call GV Last
												to involve tech. forum. The consensus
												was to pull the tape tight and go ahead
												and pour sand. If we keep pulling on
												the tape and it breaks it could cause the
												sand to bridge.
1615												Pulling tremie pipe.
1640						20-40 Sand	11 bags					Adding 20-40 sand - adding sand
												with a mason jar.
1725							1 bag					Adding 40-100 sand.
												Sand is Colorado Silica Sand, 100 lb bag
1735												Completed pouring sand; seal borehole
												with drill tools.
1740												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 388' Sheet 1 of 4
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 4/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Completion Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment Steel tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Drillers - Art Gwin, Joe Roach and	700			
							Dennis Mines on Site				
							Steel tape left in well from Friday 3/29				
			HNu	0ppm			Calibrate HNU				
							Fish for steel tape down hole	710			
							Pull tape out; secure on Rig				Tape stuck at about 257'
							Prepare to run 1" Tremmie Pipe				
							(So we can run steel tape through it				
							and be in a position to grout through				
							tremmie)				
							While moving tremmie in, Steel tape fouled	910			Steel tape out of hole
							Tremmie can not go past 257'				
							(Tremmie is 1" OD w/ 1½" couplings)				
							Measure through tremmie w/ steel				
							tape, made it to 281.6' - this is				
							right at the dogleg in the well. This				
							also indicates Sand went past this				
							dogleg.				
							Will free 6" from 10" to maneuver	946			
							around to allow tremmie down past				
							tight spot (Put rags in well to catch				
							slag from cutting torch)				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 388 Sheet 2 of 4
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 4/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Completion Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar 55-15 III / Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Calculate top of sand to be at 345.7'				
							Top of screen at ~354'				
								1045			Ed Enloe (KEH Safety) on Site
							Still cannot move tremmie down to far - catches at 279' - decide to				
							run pump in well and pump to				
							settle sand pack (pump is ½ horsepower)	1109			Run pump in well
							Call office for tech forum - talk to Stewart				
							Luttrell - need to verify level of sand and				
							cannot measure w/ steel tape options are				
							1) Geophysical log inside 6" 2) Smaller tremmie				
							pipe 3) add more sand to ensure above screen				
							1) we don't have sonic log - gamma logs etc are		Note: If there was a bridge, moving 6" casing		
							being used on RCRA wells 2) Smaller tremmie		would have broken it		
							will not fit - steel tape can't go past 281'				
							3) add more sand and there is a bridge below				
							281' it compounds problems				
							The pump will settle sand and if				
							there is a bridge it may break it.				
								1205			Start Pump

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E9B Depth 388 Sheet 3 of 4
Location North of Ringold Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 4/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Completion Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15TH / Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							28' Topof Casing (ToC) Time 0	1205			Pumping
							39' ToC 1.5 min				Pump at 80' b/s
							47' ToC 5 min	1210			42 gpm pump rate
							49.5' ToC 10 min	1215			
							52.2' ToC 35 min	1255			53' at 50 min
							After 35 min water clear can see bottom of a				Stop pump
							5 gal Bucket				
							water was slightly Turbid initially,				
							had a greenish color to it -				
							Retry running steel tape through 1"				
							made it to bottom - measure 351.9' b/s	1325			
							(bottom of casing 354')				
							With pump in well circulate water to	1330			
							transmite sand in - Circulate extra 15 min				
							Add (1) 100 lb sack 40-100 Colo Silica Sand				
							Measure depth to bottom 346.4	1420			Sand still settling
							" " " 348.2	1450			
							Mix Grout with well water				
							will pump well for mix water				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B

Location North of Bingold

Sheet 4 of 4

Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 4/1/91

Reviewed by (Print) (Sign) Date

Measuring Equipment ~500- Procedure DO-1, DO-5 Rev No. 1.0

Drilling Contractor Jensen Drilling

Driller Art Gwin

Rig/Equipment Speedstar 55-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1440	Carbon Steel	6"		1.6	354'							
	Stainless Screen	6" (Tele)	~30'		384.2							
						40-100 Silica Sand	1 bag	1.6	2.7	348.2'	N/A	Sand @ 348.2' Add slurry to 18' bls
1530						Bent. Slurry	50gal			~329.1'	N/A	Slurry 9.4 lb/gal used 8-20 Bent Crumbles
1550						"	30gal	(9.4 lb/gal)		~317'		Mix water was from well itself
1605						"	30gal	(9.4 lb/gal)		~305'		50gal = 6.68 ft³ or 19.1' in 10 1/4" annulus 0.3549 ft³/ft
						"	40gal	(9.2 lb/gal)		~289'		1gal = .1336 ft³
							60gal	(9.2 lb/gal)		~266'		- Use Hydrogel
							90gal	(9.3 lb/gal)		~231'		
												Note: depths of slurry Calculated
1810												End of Day
												Total Sand (1) 100 lb 40-100
												8-20 Bent. 150 gal
												Hydrogel 150 gal

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-42-E9B
Location N of Ringold
Sheet 1 of 1
Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 4/2/91
Reviewed by (Print) (Sign) Date
Measuring Equipment Steel Tape L-300 Procedure DO-1, DO-5 Rev No. 1, 0
Most depths are calculated because of Grout

Drilling Contractor Jensen Drilling
Driller Art Gwin (Dennis Mingo and Joe Roach)
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	~~Overlap~~ N/A	Comments
700						Slurry (4/1)				~241		Measure w/ Steel Tape approx 241'
												Prepare to mix more grout
												No D/W because pump in the way
	Note: Pumping water from well while mixing Slurry											No HNu needed w/ grout in well
	Start pump at 730 (approx 30 gpm) at 10:30											Calculated depths; Pump slurry before
740						Cement Slurry Hydrogel	50 gal	(wt 9.3 lb/gal)		~221		fully hydrated
800						Slurry	75 gal	(wt ~9.3 lb/gal)		~192		Pull 42' of Tremmie out now at ≈231'
810												
825						Slurry	75 gal	(wt 9.3 lb/gal)		~163		
835						Slurry	95 gal	(wt 9.5 lb/gal)		~126		
845						Slurry	80 gal	(wt 9.3 lb/gal)		~95		Pull Tremmie out now at 105'
848												
900						Slurry	80 gal	(wt 9.3 lb/gal)		~64 76'		measure w/ Steel Tape
910												
925						Slurry	80 gal	(wt 9.4 lb/gal)		~45'		measure w/ Steel Tape
935						Slurry	80 gal	(wt 9.4 lb/gal		17'		Prepare to mix Cement Grout
1035												Grout returned to Surface
1040						Cement Grout	40 gal	(wt ~14 lb/gal)		Surface		Clean Equipment - Jane Borghese on Site
												to Direct Development Test - Please see
												Aquifer Test notes this date

A-1800-004 (05/90)

WELL DEVELOPMENT LOG

Well Number 699-42-E9B
Location Spike Island
Procedure PNL-MA-567, GC-7, Rev. 0

Start Date/Time 7/2/91 1354
End Date/Time 1439 [illegible]
Page 1 of 1

Well Depth 384.2 (from [illegible])
Pump Depth (~~Intake~~ bottom) 349
Initial Water Level 26.35 from TOC

Date	Time	Flow Rate	Turbidity	Person Meas.	Person Rec.	Comments
7/2	1323			JTR		[illegible] to 0-50 NTU [illegible] standard [illegible] 12.5 NTU
	1354	5 gal/6.6 min				
	1355		15			Sample for Turbidity
	1410		3.5			Sampled [illegible]
						unable to measure [illegible]
						at thirties [illegible]
						[illegible]
						[illegible]
						[illegible]
						[illegible]
			1.2 x 2 = 2.4			1410 sample
	1419		1 x 2 = 2			1419 [illegible]
	1424	5 gal/6.9 min				
	1434		.4 x 2 = .8			Sample

Note: Unless otherwise noted, the following units are assumed:
Flow rate - gpm
Turbidity - NTU
Water Level - ft

Equipment:
Make: HACH
Model: 16250
Serial #: 00090340H

Jane V. Bonham 7/2/91

Casing 354 - [illegible] start 354
bottom of pump 349'

DRILL LOG	By Borghese	Rig Jensen's	Well Number 699-42-E9B	Computer Number	Project or Work Order No.
	Date 4/2/91		Depth To		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				Information for Well Development		
				4/1 pump set @ 30' [illegible]		
				mid of the day @ ~300 gpm		
				WL prior to pump start 23' [illegible]		
				w/ E-tape		
				using Grundfos 1½ hp pump		
				with check valve		
				Top of casing 1.6' above ground		
				D/B screen 334.2' from ground surface		
				Bottom of casing at 354' -		
				will set pump at 350 for development		
				need to measure WL prior to pump on		
				+ while pumping, change rate, grab turbidity		
				samples - wait for turbidity drops below		
				5 NTU, then pump off - [illegible]		
				recovers -- [illegible]		

REMARKS:

[illegible] 4/2/91

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

DRILL LOG	By Brohose	Rig Jensen's	Well Number 699-42-59B	Computer Number	Project or Work Order No.
	Date 4/2/91		Depth ____ To ____		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				note. pump was running		
				continuously from 4/1/91 7:30 to		
				10:30 — then [illegible]		
				to clean equipment ~~from~~ for		
				about 1½ hrs — Broke for		
				Lunch — 1205 to 1245		
				began setting additional pump stand	1245	
				needed to get to 350		
				WL 26.35	1338	measurements are
				from TOC 26.32	1348	only accurate within .05 - water
				pump on @ 1354 47.50	1358	steel tape was graduated in .10
				flow rate @ 1354 (5 gal/6.6 sec) 45.4 gpm 49.70	1401	
				51.0	1407	
				51.95	1419	
				flow rate @ 1424 (5 gal/6.9 sec) 43.5 52.30	1424	
				52.70	1434	
				32.00	1441	

REMARKS:

Jim Brohose 4/2/91

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

A 6000 021 (5 85)

DRILL LOG	By Boyhere	Rig Jensen	Well Number 699-42-E9B	Computer Number —	Project or Work Order No.
	Date 4/2/91		Depth ___ TO		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				WL — 30.3	1444	
				30.0	1446	
				28.95	1449	
				28.70	1450	
				At 6/4 to have trailer repaired		
				drillers will pull pump and		
				secure well when he returns		
				@ ~4:30		
				E-tape stuck @ about 26'		
				below TOC — drillers will		
				remove when pulling pipe.		
				volume pumped 45 gal/min x 45 min = 2025 gal		
				NOTE: rota was reading 35 gpm when we measured		
				45 gpm		

REMARKS:

Jane Boyhere
4/2/91

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

DAILY BOREHOLE LOG

Boring or Well Number 699-42-E7B
Sheet 1 of 1
Location North of Ringold
Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 4/10/91
Checked by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure N/A Rev No. N/A
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller N/A
Rig/Method N/A

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Inspect well site, Well site	1430			Inspect site w/ Pat Collier
							has been Graded and spoils spread over				(EEH)
							site. All gravel from pad spread on				
							road. The four protective posts have				
							been placed, pad poured w/ brass				
							cap.				
							Still need to paint bottom of protective				
							casing and drill a drain hole				
							Otherwise site has been approved				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

WELL COMPLETION SUMMARY

Project: Savage Island
Location: SE 8f 200 E
Drilling Co.: Jensen Drilling
Driller: Art Gurn
Other (companies):
Geologist(s): TJ Gilmore, SS Teel, MA Cramness, AW Pearson

Well No. 699-32-22B Temp. Well No.
Coordinates N31935 W21982
Elevation: Casing 516.93 Brass Marker 514.53

DRILLING METHOD

Drilling Method(s): air / mud rotary
air 0-101' 655.7'-841.5' mud 101'-655.7'
Drilling Fluid: 200E water, hydrogel (bent.) mud
Other: cedar chips, cellophane, paper

COMPLETION DATA

Drilled Depth: 841.5
Completed Depth: 836.0
Date Started: 4/11/91
Date Completed: 8/6/91
Static Water Level/Date: 110.0 8/2/91

OTHER (check if performed)

___ Well Abandonment	___ Downhole TV Inspection
✓ Well Development	✓ Driller's Logs
✓ Aquifer Testing	✓ Pad
✓ Geophysical Log(s)	✓ Guardposts
✓ Lock and Cap	✓ Protective Casing

SCREEN

Type	Outer Diameter	Length	Slot Size	Interval
6" telescoping st. steel screen		61.4	10	774.6 - 836

TEMPORARY CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
carbon steel	16"		22.17' - 0'
~~carbon steel~~ MAC 8/14/91			

PERMANENT CASING

Type	Nominal Diameter	Max. Outer Diameter	Interval
carbon steel	16"		22.17' - 87.9'
carbon steel	10"		0' - 665.4'

(OVER)

ANNULAR SEAL/FILL

Type	Interval	Quantity	Volume
silica sand (20-40 + 40-100)	760.8' - 836'		
backfill (slough)	836' - 841.5'		
bentonite slurry	73' - 760.8'		
cement grout	53' - 73'		
bentonite crumbles	21' - 53'		
cement grout	2' - 21'		

(OVER)

PUMP

Type: Depth to Inlet: Date Set:

ACCEPTANCE

Completed Well: Accept ___ Reject ___ Conditionally Accept MAC 12/8/92

COMMENTS

Will accept well if ground water samples and purpose/use of well is unaffected by bentonite in the well. If there is an adverse effect, the well may be changed or abandoned.

Reviewed by [signature] Date 12-4-92 Depths are below land surface unless noted.

Permanent Casing

carbon steel 6" - 778.68'

Annular Seal/Fill

Concrete -0.5' - 2' 13 bags

Cement grout (filled hole + reaulled) 0 - 772.65'

WELL INSPECTION REPORT

Well No. 699-32-22B Procedure DO-5 Rev. 0 Specification No. KEH-5236 Rev. 0
Geologist(s) TJ Gilmore, SS Teel, MA Chamness ECNs (list)

CLEANING/DECONTAMINATION	Inspection Method	Criteria	Accept	Reject	Date
Rig/Tools (initial)	Visual/Wipe (optional)		SST		4/3/91
Temporary Materials	Visual/Wipe (optional)		SST		4/4/91
Permanent Materials	Visual/Wipe (optional)		SST		7/31/91
Mtls Brought Onsite Later	Visual/Wipe (optional)		SST		7/31/91

MATERIAL STORAGE/PACKING	Inspection Method	Criteria	Accept	Reject	Date
Material Storage	Visual	2.1	SST		7/31/91
Material Packing/Seals	Visual	2.1	SST		7/31/91
Other					

LUBRICANTS/ADDITIVES/AIDS	Inspection Method	Criteria	Accept	Reject	Date
Lubricants	Visual	3.7 Food Grade Lubricants	JD		4/15/91
Additives/Aids	Visual	3.7			

DRILLING METHOD	Inspection Method	Criteria	Accept	Reject	Date
Method	Visual	3.3	SST		7/18/91
Drilling Fluid	Visual	3.3, 3.7	MAC		7/18/91

STRAIGHTNESS TEST	Inspection Method	Criteria	Accept	Reject	Date
Well Straightness	Deviation survey every 100'		SST		7/18/91

COMPLETION	Inspection Method	Criteria	Accept	Reject	Date
Drilled Depth (Measured w/ logging truck and/or drill rig)	Steel Tape # N/A	G-W Mon. Plan	~~SST~~ JD		6/17/91
Completed Depth	Steel Tape # N/A	G-W Mon. Plan	AWP		7/26/91

PERMANENT SCREEN/CASING	Inspection Method	Criteria	Accept	Reject	Date
Screen Type/Slot/Length	Engineers Tape, Visual	2.1.7, 3.3	SST		7/18/91
Screened Interval	Steel Tape #				
Casing Type/Size/Length	Engineers Tape, Visual		SST		7/18/91
Centralizers/Location	Engineers Tape, Visual		N/A		
Other					

FILTER PACK/ANNULAR SEAL	Inspection Method	Criteria	Accept	Reject	Date
Primary Filter Mtl/Place	Visual/Steel Tape#	Measured w/ drill rig	SST		7/31/91
Second Filter Mtl/Place	Visual/Steel Tape#	Measured w/ drill rig	SST		7/31/91
Annular Seal Mtl/Place	Visual/Steel Tape#	2.1.2, 3.3	AWP		8/2/91
Install Annul Seal	Visual/Steel Tape#	2.1.2, 3.3	AWP		8/2/91
Cement Type/Placement	Visual/Steel Tape#	2.1.2, 3.3	AWP		8/5/91
Overdrill Seal Method	Visual/Steel Tape#	N/A			

WELL PROTECTION	Inspection Method	Criteria	Accept	Reject	Date
Surface Pad Mtl/Place	Visual/Engineers Tape	2.1.2, 3.3	MAC		8/9/91
Surface Casing Mtl/Place	Visual/Engineers Tape	2.1.2, 3.3	MAC		8/9/91
Cap/Hasp/Lock	Visual		MAC		8/9/91

WELL SURVEYING/MARKING	Inspection Method	Criteria	Accept	Reject	Date
Well ID Stamped/Correct	Visual				
Well Surveyed/Toler Met	Review Survey Data		MAC		5/10/92

PUMP INSTALLATION	Inspection Method	Criteria	Accept	Reject	Date
Pump Decon/Preparation	Visual	N/A	N/A		
Installation/Placement	Visual/Engineers Tape	N/A	N/A		
Pump Operational	Observed Running		N/A		

Technical Review Complete [signature] Date 12-4-92

AS-BUILT DIAGRAM

Boring or Well Number 699-32-22B Sheet 1 of 5
Location SE of 200 E Project Savage Island

Logged by TJ Gilmore, JS Teel, WA Cummings
Reviewed by [illegible] Date 12-4-92

Date Well Started [illegible]
Date Well Completed 8/6/91

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Geologic/Hydrologic Data: Lithologic Description
concrete -0.5-2'		same as sample method	5			SAND
cement grout 2'-21'			10			"
			15			"
16" Ø carbon steel casing			20			"
22.17 to 87.9 ft			25			"
(Removed [illegible] ft)			30			"
			35			SANDY GRAVEL [illegible]
bentonite crumbles 21'-53'			40			"
			45			"
			50			"
			55			"
cement grout 53'-73'			[illegible]			" (lost circulation @
			[illegible]			" [illegible]
			70			"
Cement Grout 0'-772.65'			75			"
			80			"
			85			GRAVEL
hole drilled w/ 14 3/4" bit			90			SANDY GRAVEL
			95			BASALT BOULDER? 88'-101'
10" Carbon Steel Casing			100			" switch to mud rotary @ 101'
0'-665.4'			105			SANDY GRAVEL
			110			" "
6" carbon steel casing to 778.65'			115			" "
			120			SANDY GRAVEL? (poor cuttings returns)
			125			" " "
bentonite slurry 73'-760.8'			130			" " "
			135			" " "
			140			" " "
			145			" " "
			150			" " "
			155			" " "
			160			" " "
			[illegible]			" " "

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-32-22B Sheet 2 of 5
Location SE of 200E Project Savage Is.

Logged by MA Chamness, TJ Gilmore, SS Teel
Reviewed by [illegible] Date 12-4-92

Date Well Started 4/11/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Geologic/Hydrologic Data: Lithologic Diagram	Lithologic Description
		same as sample method	170	■		SANDY GRAVEL ? (poor cuttings returns)
			175	■		" "
			180	■		" "
			185	■		" "
			190	■		(Decrease in grain size or % of gravel @ 188')
			195	■		" "
10" carbon steel casing 0'-665.4'			200	■		" "
			205	■		" "
			210	■		" "
Cement Grout 0'-772.65'			215	■		" "
			220	■		" "
hole drilled w/ 14 3/4" bit			225	■		" "
			230	■		BLUE CLAY (starts @ 228' ?)
			235	■		
			240	■		
			245	■		SANDY GRAVEL (starts @ 244')
			250	■		" "
6" carbon steel casing to 778.68'			255	■		" "
			260	■		" "
			265	■		" "
			270	■		(265-270' decrease in gravel size)
bentonite slurry 73'-760.8'			275	■		SANDY GRAVEL
			280	■		" "
			285	■		" "
			290	■		" "
			300	■		" " (Lost circ. @ 300')
			305	■		" " MUDDY SAND 302'-304'
			310	■		SANDY GRAVEL
			315	■		" "
			320	■		MUDDY SANDY GRAVEL
			325	■		" " "
			330	■		" " "
			335	■		" " "

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-32-22B Sheet 3 of 5
Location SE of 200 East Project Source Is

Logged by TJ Gilmore, SS Teel, MA Chamness
Reviewed by [illegible] Date 12-4-92

Date Well Started 4/11/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Geologic/Hydrologic Data: Lithologic Description
		same as sample method	340	■		MUDDY SANDY GRAVEL
			345	■		" " "
			350	■		GRAVELY SANDY MUD
			355	■		MUDDY GRAVEL
			360	■		" "
			365	■		SANDY GRAVEL
10" Carbon Steel Casing			370	■		GRAVEL
0'-665.4'			375	■		SANDY GRAVEL
			380	■		" "
Cement Grout 0'-772.65'			355	■		" "
			390	■		" "
			400	■		" "
			405	■		" "
			410	■		GRAVEL
6" carbon steel casing to 778.68'			415	■		MUDDY SANDY GRAVEL
			420	■		GRAVELY CLAYSTONE
			425	■		CLAYEY GRAVEL
			430	■		CLAYSTONE
			435	■		"
bentonite slurry 73'-760.8'			440	■		CLAY
			445	■		GRAVELY CLAY
			450	■		" "
			455	■		" "
			460	■		MUDDY SANDY GRAVEL
			465	■		" " "
hole drilled w/ 14 3/4" bit			470	■		SANDY GRAVEL
			475	■		GRAVEL
			480	■		MUDDY SANDY GRAVEL
			485	■		" " "
			490	■		" " "
			495	■		" " "
			500	■		" " "
			505	■		SANDY GRAVEL

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-32-22B Sheet 4 of 5
Location SE of 200 E Project Savage Island

Logged by SS Teel, MA Chamness, TJ Gilmore
Reviewed by [illegible] Date 12-4-92

Date Well Started 4/11/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Drill Bit	Depth in Feet	Sample Method	Lithologic Diagram	Geologic/Hydrologic Data: Lithologic Description
			505'			
			510'	■		GRAVELLY MUD (starts @ 508')
			515'	■		"
Cement grout 0'-772.65'			520	■		" "
			525	■		SLIGHTLY GRAVELLY MUD
10-in. Carbon Steel			530	■		" " "
Casing 0'-665.4'			535	■		" " "
		Same as sample method	540	■		MUDDY GRAVEL
			545	■		SL. GRAVELLY MUD
			550	■		GRAVELLY MUD
			555	■		MUD
			560	■		"
6" carbon steel casing to 778.68'			565	■		"
			570	■		"
			575	■		SANDY MUD
hole drilled w/ 14 3/4" bit			580	■		SL. SANDY MUD
			585	■		GRAVELLY MUDDY SAND
			590	■		SL. GRAVELLY SANDY MUD
			595	■		Mixed Sample
			600	■		SANDY MUD
			605	■		" "
bentonite slurry 73'-770.8'			610	■		SANDY GRAVEL
			615	■		" "
			620	■		MUDDY SANDY GRAVEL
			625	■		" " "
			630	■		" " " @ 631'
			635	■		BASALT (weathered)
			640	■		" "
			645	■		BASALT (Less weathered 645-650')
			650	■		BASALT (fresher)
			655	■		" "
grouted + redrilled w/ 10" bit			660	☒		BASALT (fresh)
665.4'-781'			665	☒		BASALT
			670	☒		BASALT ? (no sample - incr. in drill rate @ 668'

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)

AS-BUILT DIAGRAM

Boring or Well Number 699-32-22B Sheet 5 of 5
Location SE of 200E Project Savage Is

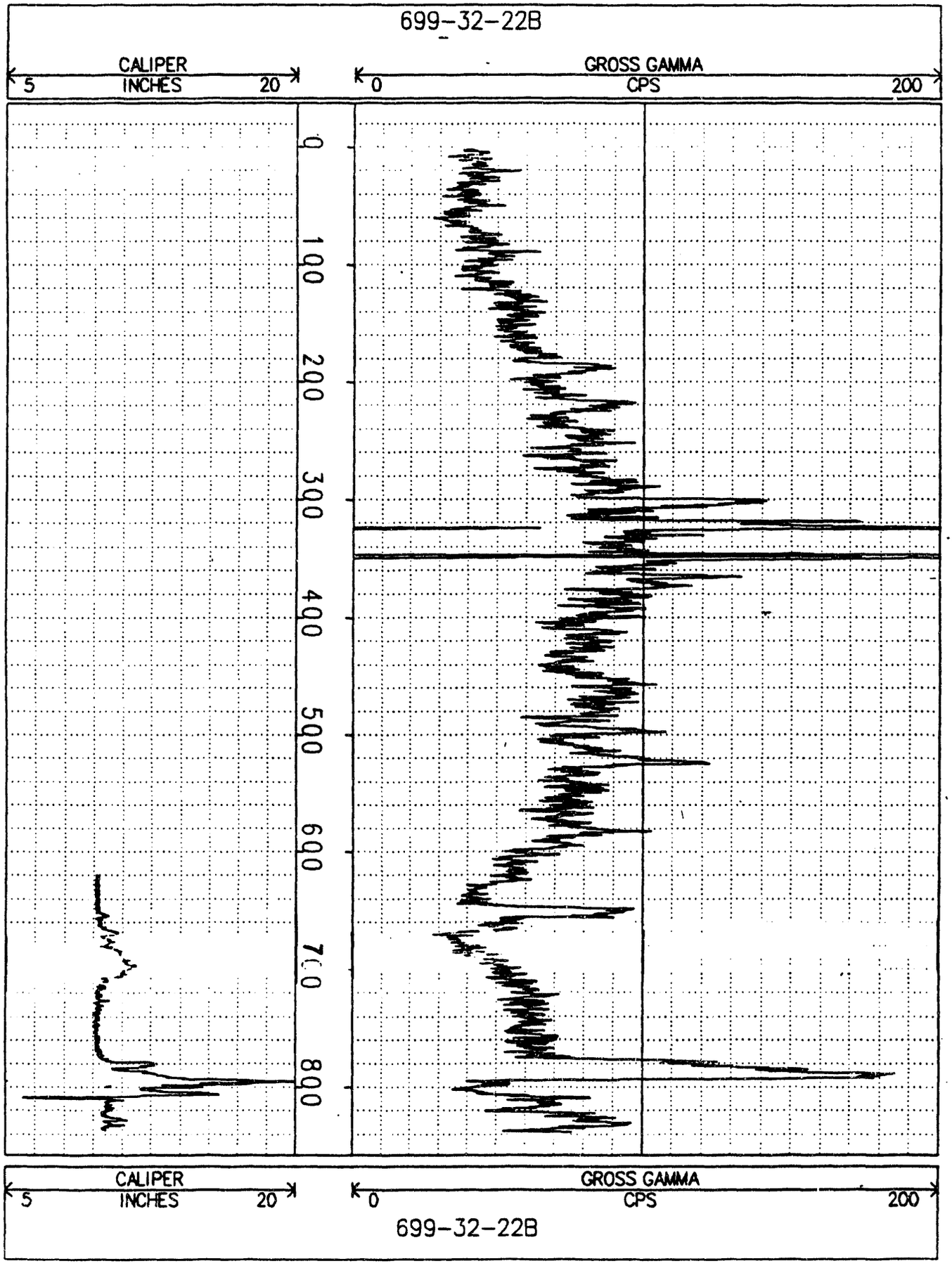
Logged by SS Teel, MA Chamness, TJ Gilmore
Reviewed by [illegible] Date 12-4-92

Date Well Started 4/11/91
Date Well Completed

Well Construction Data: Description	Construction Diagram	Depth in Feet	Geologic/Hydrologic Data: Sample Method	Lithologic Diagram	Lithologic Description
		670			
		675	☒		BASALT (vesicular w/abondant clay)
		680	☒		No sample
		685	☒		BASALT (fine gr, fresh)
		690	☒		" "
		695	☒		" "
		700	☒		" "
6" carbon steel casing to 778.68'		705	☒		" "
		709	☒		BASALT (slightly coarser + lighter color)
		715	☒		BASALT (colonade?) water @ 712'?
		720	☒		BASALT
bentonite slurry 73'-760.8'		725	☒		"
		730	☒		"
		735	☒		BASALT - med grained
		740	☒		BASALT
		745	☒		"
		750	☒		" (coarser gr. and pyrite on fract. surf. @ 751')
		755	☒		BASALT
		760	☒		" (med. crystalline @ 761')
40-100 silica Sand to 760.8'		765	☒		"
		770	☒		"
neoprene packer		775	☒		" (slightly coarser)
		781	☒		BAKED CLAYEY TUFF/PUMICE (starts @ 776?)
		785	☒		SILTY SAND
		790	☒		" "
		795	☒		" "
6" telescoping steel screen, 10 slot 774.6'-836'		800	☒		" "
		805	☒		" "
		810	☒		CLAYEY SILTY SAND
		815	☒		" " "
20-40 silica sand to ~764'		820	☒		SILTY SAND
		825	☒		CLAYSTONE
		830	☒		SILTSTONE
		835	☒		SANDSTONE/SILTSTONE
		840	☒		BASALT (hit @ 838')

Drill Bit/Sample Method Used:
☐ Rotary ☒ Air Rotary ■ Mud Rotary ▲ Air Percussion △ Back Hoe ◇ Auger ○ Drive Barrel ● Hard Tool ⊕ Split-Barrel

A-1800-186 (05/90)


699-32-22B
CALIPER
INCHES
5
20
GROSS GAMMA
CPS
0
200
0
100
200
300
400
500
600
700
800
CALIPER
INCHES
5
20
GROSS GAMMA
CPS
0
200
699-32-22B

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth — Sheet 1 of 1
Location — Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/3/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar 35-15 III / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Arrive at Lampson yard. Drillers arrived	1200			Lampson employees take
							here ≈ 10:00. Have almost completed steam				lunch break 1200 - 1230
							cleaning of rig. Cleaning is being done by				
							Lampson employees.				
							Unloading flat bed truck w/ drill pipe,	1300			
							tremie, bits, etc. so it can be spread-out				
							and cleaned.				
							Completed cleaning rig. Visually inspect	1345			
							the rig; cleaning is approved.				
							Begin cleaning pipe, etc.	1400			
							End of Day. Almost done steam-cleaning.	1630			
							Drillers arrive to take rig out on site.				
							Will finish cleaning rest of pipe tomorrow.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth — Sheet 1 of 1

Location Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/4/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DU-1 Rev No. 1

Measuring Equipment N/A

Drilling Contractor Jensen Bros

Driller Art Gwin

Rig/Method Speedstar SS-15 III / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers arrive at Lampson yard.	0715			
							Complete Steam cleaning, begin loading truck.	0745			
							Completed loading truck; preparing to go out to site. Will not begin drilling until next week.	0900			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 0 Sheet 1 of 1
Location SE of 200E Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/10/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment Engineers Tape

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Drill rig is set up, preparing to begin	1520			Geologist on site
							drilling. Rig and equipment was steam-				Driller is Art Gwin; helper
							cleaned on 4/4/91.				is Dennis Mingle
							Set starter casing (20.12' of 16" carbon	1600			
							steel casing w/shoe)				
							A PNL HPT checked the site earlier today -				
							- no measurements found above background	1620			Joe Mango on site
							Ready to begin drilling - will start first	1730			
							thing tomorrow.				
								1745			Leave site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 0-15' Sheet 1 of 4

Location SE of 200 E Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/11/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No. 1.0

Measuring Equipment N/A

Drilling Contractor Jensen Drilling

Driller Art Swin - Driller, Dennis Mingle - helper

Rig/Method Speedstar SS-15 III, rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Bit is 14 3/4" OD, tri-cone type	0700		20.12	On site
						5'		0750			Drilling w/ Air rotary
5'	lith	2			Dry		SAND (99% sand, 1% gravel) 1% VFP, 9% MS	0755			Sample from air hose
							50% FS, 40% VFS, trace silt. Very well sorted,				
							25% mafics, 75% qtz + si-rich. Unconsol.				
							2.5Y 6/2 light brownish gray. Strong reaction to				
							10% HCL, Well representative				
						15'					
10'	lith	2			Dry		SAND (98% sand, 2% gravel) 1% VFP+FP,	0800			Sample from air hose
							1% MP, 10% VCS, 30% CS, 40% MS, 13% FS,				
							5% VFS, trace silt. Mod-well sorted. 50%				
							mafics + basalt, 50% qtz + Si-rich. Unconsol.				
							2.5Y 5/2 (grayish brown). No HCL reaction				
15'	lith	2			Dry		SAND (98% sand, 2% gravel) 1% VFP+FP,	0805			Sample from air hose
							1% MP, 5% VCS, 13% CS, 40% MS, 30% FS,				
							10% VFS, trace silt, 40% mafics, 60% qtz/Si-rich				
							Unconsol. Mod-well sorted very sim to prev,				
							2.5Y 5/2, no HCL reaction. Well-rep.				
							Span is set @ 8.82 to read 56 ppm w/ 10.2eV	0815			Calibrate HNU
			LEL	0%			lamp. Span gas is 100ppm ISO. C_4H_8 / Air				
			O_2	20.8%			Lot 28734				
			HNU	0ppm			Check Borehole				Stopped drilling to add casing

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 15' - 39' Sheet 2 of 4
Location SE of 200E Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/11/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment Engineers Tape

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Adding 19.21' of 16" casing			20.12	16" Casing
								1005		+19.21	Drilling
						20				39.33	
20'	lith	2			Dry		SAND, Same as previous sample.	1007			Sample from air hose
							Also trace mica. Well-representative.				
25'	lith	2			Dry		SAND trace VCS, 15% CS, 70% MS, 15% FS	1008			Sample from air hose
							Very well sorted. 50% basalt/mafics, trace mica				
							50% qtz + Si-rich. 2.5Y 4/2 (dark grayish brown)				
							No reaction to 10% HCl. Unconsol., sim				
							to previous. Well representative sample				
						30.5					
30'	lith	2			Dry		SAND trace MP and FP, 5% VCS, 20% CS,	1012			sample from air hose
						30.5	65% MS, 10% FS, trace VFS and silt.				
							Mod-well sorted, 50% basalt/mafics, 50%				Hit gravel @ 30.5'
							qtz-Si-rich, trace mica, 2.5 5/2 (grayish brown)				Slow drilling
							Unconsolidated. No reaction to 10% HCl.				
							Well representative sample				
35'	lith	1			Dry		SANDY GRAVEL. Bit is grinding gravels				Sample from air hose
							up into rock flour. Samples are not				
							representative. Driller est. max size of				
							gravels are 10-12" dia.				
						39					

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 39'-55' Sheet 3 of 4 (6)
Location SE of 200 E Project Sitewide

Logged by SS Teel (Print) SS Teel (Sign) Date 4/:/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment Engineers Tape

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1100		39.33	Pat Collier + Laborers on site
										+19.50	to deliver jars + eye wash
								1105		58.83	Stop drilling to add casing
			HNV	0 ppm							Check Borehole
			LEL	0%							Adding 19.5' of 16"
			O_2	20.8%				1200/1230			Lunch
						39		1350			Drilling w/air rotary,
40	Lith	1			Dry		Sandy Gravel. Grain sizes not representative	1400			Sample from air hose.
							Gravels are ground to powder size.				
45'	—	—			Dry		Sandy Gravel. Same as previous. No	1440			
							sample collected.				
						55					
50'	Lith	2			Dry		SANDY GRAVEL. Grain sizes not rep. - hower	1525			Driller says that it is drilling
							was able to get some good gravel samples.				"hard". Max orig. grain sizes of
							50% coarse + fine-grained basalt + volcanics,				gravels appears to be CP to VCP
							50% qtzite, granite/monzonite, and Si-rich.				Driller can drill up to 3' ahead
							Original surfaces are sub-angular to well rounded				but can only drive casing ≈1'
55'	Lith	2			Dry		SANDY GRAVEL. Grain sizes not rep.	1605			Gravel is consolidated?
							More basalt than prev. 70% basalt (fine-gr),			58.83	(but not cemented?)
							and volcanics (incl. porphyry), 30% qtzite,				
							granite, + Si-rich. No evidence of cementation.				
							Gravels are rounded to well-rounded on orig. surf.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 55'-55.5' Sheet 4 of 4

Location Project

Logged by SS Teel (Print) SSTeel (Sign) Date 4/11/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0

Measuring Equipment N/A

Drilling Contractor Jensen Drilling

Driller Art Gwin

Rig/Method Speedstar SS-15 TT / Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOWS/CONS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1615		58.83	Stop drilling
								1625			Drilling w/ air rotary
								1630			Bit is stuck
								1640			Bit is free
											Loosing air circulation @ 55'
											- also easier to drill.
							Apparent lithology change @ 30.5,	1710			Ready to add casing -
							49', and 55.5, based on drill rate				will clean-up site and add
											casing first thing tomorrow

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 55.5' Sheet 1 of 1
Location SE of 200 E Project Savage Island

Logged by MA Chauness (Print) MA Chauness (Sign) Date 4/12/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Mod. Folk Procedure DO-1, DO-5 Rev No. 1, D
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gusin, Dennis Mingo
Rig/Method air rotary, SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	Øppm			calibrated HNU w/same gas as before,	730		58.83'	of 16" casing
			LEL	ok			516 ppm @ span of 6.32				
								800			Cleaning out casing, preparing
										+ 6'	to weld 6'
								930		64.83'	Pat Collier stopped by
								1040			Drilling
								1055			Air is going out into formation,
											letting seds. fall on top of bit.
											Tools are hung up & sprang
											hydraulic leak.
								1200 1235			lunch
			HNU	Øppm				1240			replacing hydraulic line
			LEL	ok				1430			Geologist leaving site, no
											drilling for the rest of the
											day.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22 B Depth 60' Sheet 1 of 4
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 4/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1; DO-5 Rev No. 1.0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin (Drl) w/ Joe Roach and Denis Mingo
Rig/Method Speedstar 33-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Geologist and Drillers on Site	700		64.83'	64.83
							The hydraulic line was Fixed on Friday				19.4
							and approx 3' was drilled 60' Sample				84.23
							collected and described below				Note: using 14 3/4 Tri-cone
											Bit w/ 1200 CFS Air compressor
			HNU	Ø ppm			HNU calibrated to span gas A/A span	710			
			LEL	0%			at 7.89. No detectable contaminants				
							in borehole (left closed in overweekend)				
60	LHA	2				60 65	GRAVEL 87% Gravel, 10% Sand, 3% Silt;	730			
							poor srt, Gravels: 75% Bslt, 25% Felsic,				
							sbrd when preserved, Sands: 75% Bslt,				
							25% Felsic, sbang, No rxn to HCl, uncons.				
							very little returns lost some air circul-				
							ation				
							Burn hydraulic fluid off of casing and then	740			
							rinse; Spots of fluid got on 16" casing				
							Prepare to fill Mud Tanks w/ water	750		84.23'	Weld 16" Add 19.4'
							water is from standpipe East of 200 E				
							Area				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22b Depth 60'-80' Sheet 2 of 4
Location SE of 300 East Project Savage Island

Logged by T Gilmore (Print) John Gilmore (Sign) Date 4/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15TII / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								950		84.25'	Drilling
								955			Stop to Connect Drill pipe again
								1050			Drilling
							No returns — Sediment may be very	1110			
							gravely No 65' Sample				
71'	Lith	2	HNU	0 ppm		70 ?	SANDY GRAVEL 65% Gravel, 33% Sand,	1130			Drilling easy 71' on
							2% Silt, 10% VCP, 46% MP, 10% FP,				
							15% VCS 10% CS, 5% FS, 3% VFS, 2% Silt				
							Gravels: 65% BSLT, 35% Felsic sbrd				
							when preserved, SANDS: 75% BSLT, 25%				
							Felsic subang, N5 dk gy, no consol				
							No rxn in HCl				
75'	Lith	2	HNU	0 ppm			SANDY GRAVEL A/A 65% Gravel,	1140			
							33% Sand 2% Silt, "Blk Sands and				
						80	Gravel" Felsics incl abnt qtz, amorphous				
							qtz (qtzite, agate etc.) Tr blk and wht				
						?	granites, Rd volcanics				
80'	Lith	2	HNU	0 ppm			SANDY GRAVEL 65% Gravel, 34% Sand	1155			
							1% Silt, 25% MP, 35% FP, 5% VFP, 15% VCS				
						85	15% CS, 4% FS, 1% Silt, psort, 65% BSLT,				
							35% Felsic Gravels subrd when preserved,				
							Sands sbang, No rxn in HCl unconsol	12-1230			Lunch

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 80'-80' Sheet 3 of 4
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 4/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment Steel-Tape 300-16

Drilling Contractor Jenson Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0ppm			Water in hole	1230		84.23	Prepare to weld
			LEL	0%			Measure D/W 53' bls w/ E-Tape	1235		19.10	Take water sample
							water-level stable; Take water sample			103.33	
							in glass - water recharged over lunch				
							after discharging water from well				
							Call Stuart Luttrell for Technical Forum	1330			Tech Forum
							request RPT to check samples,				
							will weld casing while awaiting decision			103.33'	Add 19.10'
							from Tech Forum				
							Will blow water out and watch	1515			Note: not much water came out
							recovery stickup 23' Static 52.4'				possible bridge of sediment?
							Min Depth				No Perched water?
							1:30 53.3'				
							4:00 53.2'				
							water did not come out of discharge,				
							E-Tape reads 53.2'; Steel tape goes to				
							80' bls (bottom) tape comes back very muddy				
							Sediment may not circulate out of well				
							and forms bridge at drill collars				
							Continue to drill No cuttings coming				
							out - Difficult drilling little gravels				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 80' Sheet 4 of 4
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) Jeffrey Gilmore (Sign) Date 4/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jenson Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
90'	Lith	2	HNu	0ppm			SANDY GRAVEL 50% Gravel 50% Sand	1625			
							20% Mp, 25% Fp, 5% vFp, 10% vCS, 15% Cs				
							20% MS, 5% FS, psort, 65% BSLT, 35% Felsic				
							Sands have large % of wht-clr qtz as				
							felsic fraction subrd when preserved very				
							fragmented unconsol no rxn in HCl				
							NS dk gy	1650			Stop Drilling / Change Fuel Filter
								1710			Drill
							No 85' smpl - no returns drilled like				
							large rocks				
								1730			End of Day

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22 B
Depth 90' - 90'
Sheet 1 of 2
Location SE of 200 East
Project Savage Island

Logged by T Gilmore (Print) (Sign) Date 4/16/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin (Driller) w/ Joe Roach, Dennis Mingo
Rig/Method Speedstar SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
90'							Geologist and Drillers on Site	655		103.33'	
							Calibrate HNU w/ Span Gas 100ppm iso-C_4H_8	725			Drilling
			HNU	0 ppm			and Air (Lot 27447) Span reads 7.51				
			LEL	0%			No water come out of discharge line,				
							hole does not appear to have water in it				
							(casing too high to measure in w/ E-Tape)				
							Sediment coming out and very wet (water is				
							added to drill) Approx 2' open hole in				
							course gravels	755			Stop Drilling
						100	Casing not advancing past 89' probable	840			Pull Bit
						88	boulders/cobbles at that depth)				
							Driller talking w/ home office to determine			-10.3'	Cut off 10.3' of 16"
							if they want to pull casing and Grout now			93.03'	of 16" carbon steel
							Pull bit to see if it is dull and needs changing	930			MA Chamness to replace Tyler
							Tyler thinks it may be material	945			DW 60.4' from ground surface
							accumulating in hole because we lose				DB 77.5' from ground surface
							too much circulation out to formation				
						92		1030			Finished changing bits, are now
											straightening out hydraulic lines
								1210 1240			lunch
								1315			Started drilling, poor returns
							Looks like a little oil was on the water, flushed out water trough + refilled.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 90'-101' Sheet 2 of 2
Location SE of 200 East Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 4/16/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1,0
Measuring Equipment NA

Drilling Contractor Jensen Bros
Driller Art Gavin, Dennis Minge, Joe Raach
Rig/Method air rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0 ppm				1330			Oil in water is not the special
			LEL	ok		95					oil used in lg. air compressor
95'	lith	2					BOULDER? Driller thinks he hit basalt	1500			Sampled from air discharge,
							boulder at 88' + is still in it. Drills				drilling slow.
							consistently hard. Sample is Gravelly Sand				
							mostly f-vfg + vc-c Sand. This may be				
							washed down from above. 65% basalt,				
							20% qtz/qtzite (some Fe-stained), 15% other	1530			Mud is being mixed w/ soda
							rk frags. Probably lg. cobbles? Not rep.				ash + hydrogel bentonite
100'	lith	1					GRAVEL or BOULDER - Driller thinks	1610			Sampled from air discharge,
							he's still in the same boulder; I think				losing some circulation, poor
						101	it may be large cobbles and gravel.				return of seds. Still drilling
							There are more, larger pieces of rk frags				hard
							+ qtzite than above. 50% basalt, 25%				
							qtz/qtzite (some Fe stained), 25% other rk				Still some oil coming through
							frags. Sample not rep.				to sample
								1625			Driller says he went out of
											Boulder at 101' into cobbles
							11' drilled today, all in afte. noon.	1630			Preparing to run straightness
							1° off vertical @ 101'	1735			test.

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 101' Sheet 1 of 1
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 4/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment L300-16, etape 11053

Drilling Contractor Jensen Bros.
Driller Art Gwin, Dennis Mingo, Joe Raach
Rig/Method air/mud rotary SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Driller + crew have been setting up to				
							switch to mud rotary all morning.				
							Laborers dropped off 28 lengths of 10" Ø				
							casing, ~560' worth + bentonite crumbles.				
							One of the seals for the rotating head was				
							lost, Art has gone into town to see if he				
							can find something that will do				
			HNU	0ppm			HNU calibrated w/ same gas as before,	1340			
			LEL	ok			span @ 7.05 reading 56ppm.				
							Water was probably added yesterday during	1415			DW = 91.4' bgs
							drilling, sitting on top of cuttings.				DB = 95.25' bgs
							No hole will be drilled today, should be				
							ready to start drilling tomorrow morning.				

A-1800-003 (05/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 101' – 105' Sheet 1 of 2
Location SE of 200 E Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 4/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen drilling
Driller Art Gwin, Dennis Mingo, Joe Roach
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers have made a seal for the rotating head –	0830			Geologist on site
							– preparing to run drill rod in hole			93.03	Total 16" casing
							Span set @ 7.52 to read 56 ppm of 100 ppm	0845			calibrate HNU + LEL/O_2
							I-80: C_4H_8 / Air Lot # 27447.				
								0915			Adding drill rod. Using Well-
											Guard as tool lubricant
			HNU	0ppm				1105			Check Borehole (inside of
			LEL	0%							drill rod)
			O_2	20.8%							Ed Enloe visits site, delivers
											new LEL/O_2 meter
								1115			Ed leaves.
							Casing was wrapped w/ tarp. 5" screen				Truck arrives w/ 6" Carbon-
							is wrapped in plastic.				Steel Casing and 5"
											Telescoping Screen.
								1125			Unloading Truck
								1200			Truck unloaded; stop for lunch
						101		1345			Drilling w/ Mud Rotary
105'	Lith	2					SANDY GRAVEL Grain sizes not rep – don't	1355			bit is same as prev. –
							have much of the < 2 mm portion. Driller est				14 3/4" tri-cone
							max dia of cobbles is 1'. Gravel comp 40%				Sample from shale shaker
						105	basalt/volcanics, 60% qtzite + Si-rich				84 vis mud
							ig/met rocks.				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth 110' - 115'
Sheet 2 of 2
Location SE of 200 E
Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 4/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1,5
Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Bros.
Driller Art Gwin / Dennis Mingle / Joe Ranch
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						105					
110'	Lith	2					SANDY GRAVEL Can't tell % of sand & silt	1403			Sample from shale shaker
							Gravel comp same as prev. Angular gravel frags				
							are up to MP size. Trace red volcanic and				
							porphyry.				
115'	Lith	2				115	Sandy Gravel. Can't tell Sand & Silt %.	1410			Sample from shale shaker
							Same comp. as prev. Appears to be a				Seems to be drilling easy.
							decrease in gravel grain sizes - abundant	(≈ 30%)			
							whole, well-rounded MP size gravels. ∴				
							unconsolidated.				
								1415			Stop drilling to add rod.
											Mud tanks are empty - will
											try to mix it thicker to retain
											more mud.
								1630			Have decided to wait until
											LCM is on site before starting
											to drill. Drillers will pick
											up LCM at WHC stab-yard
											tomorrow morning.
								1650			Leave site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 115'-117' Sheet 1 of 3
Location SE of 200 East Project Sunge Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 4/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar 55-15TH/Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers picked-up Lost Circulation	7-9			Mix Mud and LCM
							Material and are mixing New				
							batch of Mud				
							Geologist arrives on site	830			
							yesterday lost mud at rate of				
							1"/min. in 5000 gal Mud Tank				
							Started losing as soon as drilling				
							started at 101'; stopped at 115'				
			HNU	0ppm			Calibrate HNU to Span Gas (same as	910			
			LEL	0%			previous gas) Span at 7.5				
							Mud is made only w/ water from				
							200 East Standpipe and Hydrogel;				
							LCM added is Ground paper, and wood				
							fiber				
								1015			Circulate Mud
								1020			Drill
								1025			Connection
							Drill collar down - stop and change	1050			Drill
							rotating head	1105			Stop to change rotating head

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 117'-155 Sheet 2 of 3
Location 3E of 200 East Project

Logged by T Gilmore (Print) [signature] (Sign) Date 4/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure Do-1 Rev No. 1
Measuring Equipment Steel Tape L 300-16

Drilling Contractor Jensen
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1120			Drill
120'	N/A					120	No Sample w/ LCM in Mud we are	1125			
							Bypassing Shale Shaker - drilling like				
							gravels 115'-120' (Rig bouncing around)				
						125	Smoother drilling 120'-125'				
						130	Mud seems to be holding steady, not	1130			Vis 170
							losing noticeable amount				wt 8.7
						135	Drill rod sticking at 127' - Drilling				PP 450 psi
							cobbles?	12-1240			Lunch
						140					
125'	N/A						No Sample LCM in mud bypass	1245			Drilling
							Shaker - Drilling like gravels				
						145					
							Lots of wood fiber returning in mud				
130'	N/A					150	No Sample Drilling easier	1310			
135'	N/A						No Sample	1319			
						155		1330			Circulate work drill string
140	N/A						No Sample By-Pass Shaker	1354			Connection
145'	N/A						No Sample " " "	1400			
150'	N/A						No Sample Begin to send mud over	1408			
155'	N/A						shaker and drop out LCM	1412			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 155' Sheet 3 of 3
Location SE of 200E Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 4/19/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment Steel Tape L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
						155		1425			Circulate and make connection
						160	PNL video crew on site to film operations	1430			
							Pat Collier and KEH safety on site	1450			Drilling
							Drill rod sticking	1458			
170'	N/A					165	No Sample - hard material dropping out of mud slowly	1515			
						170	Cobbles at 168'-171'	1524			Mud hose broke / stop drilling
							Safety Inspectors require: individual drinking cups; eye wash at geol table; Acetylene and O_2 20' apart - Safety leaves	1510			
							Video people leave	1540			
							No more drilling today - work on rig				
							Fix hose and start mud pumping	1625			Fix hose
							Circulate and lift drill string	1715			End of Day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22 B Depth 170'-182' Sheet 1 of 1
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) (Sign) Date 4/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers on Site - Re-mix Drilling	700			
							Mud				
							Geologist on Site	815			
							Drillers working on hose (Mudline)				
							Circulate to condition hole	855			Circulate
							Calibrate HNU w/ New span Gas	905			Mud vis 102
							100ppm I-C_4H_8 and Air Lot 30434				wt
							Alphagaz Cambridge, MD 21613				Pump Press 570psi
							Reading 63ppm w/ Span at 7.51	910			Drilling
			HNU	0 ppm			Readings at shale shaker				
			LEL	0%							
175'	N/A					170	No Sample Still too much LCM in Mud				
							cannot get a good Sample. Drilling				
							like Sandy Gravels, Drill stem is not	952			Stop Drilling / Make connection
							bouncing around too much	1032			Drilling
						182'		1039			Hose broke on Mud line
											Stop Drilling
							Geologist leaves for office and wait for	1115			
							call when new hose arrives				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 182'-195' Sheet 1 of 5
Location SE of 200 G Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 4/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method Speedstar SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0700			Drillers on site - fixing hose
								0750			Geologist on site
							HNU Span set @ 7.44 to Read 56ppm	0820			Calibrate instruments
							Span gas same comp as prev; Lot # 30434				
								0855			Circulating
						182'		0900			Drilling w/ Mud
185'	N/A						Sandy Gravel ? Still bypassing shaker -	0910			
							Lots of wood chips still in mud. No sample				
							taken.	0925			Vis = 115 ; wt = 9.0
											Drilling smoother @ 188'
10'						195'	Drill rate change @ 188' - drills smoother -	0928			Increase in drill rate @ 188'
							- don't see any cuttings larger than sand				Bob Taylor KGH arrives
							size. Still lots of LCM material in mud				
							no sample taken.				
195'							Don't see any pieces larger than FP (angular)	0943			
							in cuttings. Appears to be dom sand.				
							Gravelly Sand ? Now putting cuttings over				
							shaker but still lots of wood chips. No				
							sample taken.				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 195'-219' Sheet 2 of 5
Location SE of 200E Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 4/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Driller says slight increase in gravel content				
							@ 196'. Don't see any change in cuttings.				
								0955			Circulating, Taping hose
						195'		1045			Adding drill rod. B. Taylor leaves
			HNU	0 ppm				1046			Check Borehole
			LEL	0%				1050			Drilling
200'	N/A		O_2	20.8%				1055			
205'	N/A						195-205' No change in cuttings - largest	1058			Still partially bypassing
							is angular FP - appears to be dom by				shaker because of LCM
						205'	sand size material - drilling fairly rapid.				Helper went to get water -
							Still lots of wood in mud. No samples taken.				need to thin mud more.
210'	N/A						Still Gravelly Sand? No change in cuttings.	1118			
							No sample taken. Comp of cuttings is roughly				
							50% basalt/volcanics, 50% qtz - Si-rich frags.				188-210' Drills "smooth"
											Driller thinks we are still in
											dom. small-size gravels.
								1200			Stop for Lunch
						205'		1300			Drilling w/ Mud
215'	lith	1					Sandy Gravel. Angular gravels (fragments) up to MP	1310			Sample from shaker - still
							size. 50% basalt/volcanics, 50% qtzite				partially bypassing
							+ Si-rich rock fragments. Partial jar filled.	1320			Stopped drilling
						219'					Preparing to run dev. survey

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 219'-235' Sheet 3 of 5
Location SE of 200E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 4/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Bros.
Driller Art Gwin
Rig/Method Speedstar SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
			HNU	0ppm				1335			Check Borehole
			LEL	0%				1357			Survey complete. Meas, i's
			O_2	20.8%							1.1° from true @ 200'
								1400			Adding drill rod.
								1420			Drilling w/ Mud
220'	—					219'	Same as prev.	1421			
225'	Lith	2					SANDY GRAVEL same as prev	1423			Drilling Fast @ 219',
											No 220' sample
											Sample 225' from shaker
						228'					
						228					
230'	Lith	2					BLUE CLAY (5G 4/1) ≈ 25% sand &	1425			Sample from shaker
							VFP (carry-down?) 15-20% silt?				Clay starts ≈ 228.?
						235'					
235'	Lith	2					BLUE CLAY Same as prev. less	1430			Sample from shaker
							amount of sand. Tends to form				Vis = 74, wt = 9.2
							more "clay balls".	1435			Cleaning hole
											Adding Rod

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 235'-255' Sheet 4 of 5
Location SE of 200E Project Savage IS

Logged by SS Teel (Print) SS Teel (Sign) Date 4/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment

Drilling Contractor Jensen Bros
Driller Art Gwin
Rig/Method Same as prev.

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1453			Drilling w/ Mud
240'	Lith	2				235'	CLAY (5GY 4/1) Somewhat "tougher"	1455			Sample from shaker
							than previous, contains 15-20% sand				
							and FP-VFP, also contains 1-2mm				
							thick consolidated siltstone/claystone				
							(ash?) beds.				
					244'						
245'	Lith	2					SANDY GRAVEL Contains abundant	1508			Sample from shaker
							clay - this is probably carry-down				Gravel starts @ 244'
							from above.				
						250'					
250'	Lith	2					SANDY GRAVEL 55% basalt and volcanics,	1523			Sample from shaker
							trace red volcanics, don't see much met or				Driller est cobble size is
							porphyry. All pieces are angular. Still some				4" to 10" dia.
							blue clay carry-down from above. 45% qtzite				
							and microxal qtz. Grain sizes not rep.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 255' - 258' Sheet 5 of 5
Location SE of 200 E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 4/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG 255	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
255'	Lith	2					SANDY GRAVEL 35% basalt/volcanics,	1545			Sample from shaker
							65% qtzite and other Si-rich rock fragments -				Joe calc. lag time as ≈
							- don't see any granite or porphyry. Si-rich				108 ft/min
							fraction dom by qtzite. Contains angular				
						258	Frags up to cp size - orig max grain size				
							is probably cobble size. Some rounded FP	1600			Stop drilling
							size gravels, Grain sizes not rep.				
							Overall sim to prev. except < % of basalt				
								1700			Need to replace a hose,
											No drilling until tomorrow.
								1710			Leave site

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 258'-275' Sheet 1 of 3
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 4/24/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method Speedstar SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0700			Drillers on site.
											Fixing hose and mixing mud
								0755			Geologist arrives
								0825			Circulating - cleaning out hole
								0835			Adding Drill rod
						258'		0845			Drilling
260'	Lith	2					SANDY GRAVEL. Same as previous, still	0855			Sample from shaker
							see LCM in sample. Grain sizes not rep.	0901			Stop drilling
								0902			Drilling
265	Lith	2			265'		SANDY GRAVEL. Big incr. in drill rate @ 265'	0908			Sample from shaker
							Driller thinks it is due to a transition from				
					270'		cobbles to pebble-size gravels. Sample is				
							same as prev. except for also has trace				Drill rate slows down again
							green porphyry. Grain sizes not rep.				@ 270'
270'	Lith	2					SANDY GRAVEL All pieces are angular -	0920			Sample from shaker
						275'	size range from VFP to MP. Same comp as				
							prev. Grain sizes not rep.				
275'	Lith	2					SANDY GRAVEL. Angular gravel fragments	0947			
							range from VFP - MP size. Also includes				
							≈ 10% rounded MP size gravels. 35% basalt				
							+ volcanics (trace red volcanic) 65% Si-rich				
							rock frags (Dom by qtzite). Grain sizes not rep.				
							Very sim to prev. sample				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 275'- Sheet 2 of 3
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 4/24/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No. 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller same as prev.
Rig/Method same as prev.

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1030			Working on rig
						275'		1120			Drilling
280'	Lith	2					SANDY GRAVEL Sim to prev. Gravel comp	1124			Sample from shaker
							55% basalt, porphyry (v. small phenocrysts)				Increase in drill rate
							and other volcanics. 35% Si-rich (dom qtzite)				
285'	Lith	2					SANDY GRAVEL (65% gravel, 35% sand)	1132			Sample from shaker
							5% CP, 40% MP, 10% FP, 10% VFP, 10% VCS,				Allowed 2min for lag
							15% CS, 5% MS, 5% FS & VFS. (Gravel) -				
							- 65% basalt, volcanics, & fine gr porphyry, 35%				
							dom qtzite. Angular except for occ. rounded MP.				
							(Sand) - same comp as gravels. Most				
						295'	grains are angular - some rounded MS - CS				
							Grain sizes not rep				
290'	Lith	2					SANDY GRAVEL Same as prev.	1141			Sample from shaker
							Grain sizes not rep.				Allowed 2 min for lag
295'	Lith	2					SANDY GRAVEL Same as prev. Also	1150			Sample from shaker
							see red volcanic and trace coarser-size porphyry				Allowed for lag
							in gravels, Grain sizes not rep.				vis = 94; wt = 9.3

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 295'-295' Sheet 3 of 3
Location _____ Project _____

Logged by SS Teel (Print) SS Teel (Sign) Date 4/24/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Same
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1210			Lunch
								1300			Changing drill line and
											block to handle tool-string wt,
								1410			Bob Bryce and Doug Hildebrand
											visit site
								1430			B. Bryce + D. Hildebrand (DOE)
							Will be down for rest of day. Need to	1435			leave site
							fix the brake on rig and then will begin				
							changing drill line and block. Joe will				
							use this opportunity to re-pack the bearings				
							on one of the mud pumps.				
								1450			Leave site for day. Will not
											be drilling until tomorrow.

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 295'-310 Sheet 1 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 4/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gwin, Dennis Mingo, Joe Raach
Rig/Method SS 15 III, mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								800			Geologist on site, drillers still
											changing block
							Calibrated HNU to 100ppm gas, same as	1000			
							before 56ppm @ span of 7.04	1155			Circulating mud
			HNU	0ppm				1200			
			LEL	ok							
300'	with	2			30		SANDY GRAVEL - Most gravel broken, some	1308			Sampled from shaker.
							were up to vcp size. Muscovite abundant				
							as pieces up 2-3 mm across. Basalt ~35%,				
					30		rk frags 55%, 10% qtz, lith ~ minor. Blobs				
							of blue-gray muddy sand, micaceous start				Δ at 302', slower drilling
							showing up at ~302', Samples washed,				
							not representative. @	1255			lost ~ 1/2 tank of mud, added
							Back into gravel at ~304'				2 bags of paper to prevent
											lost circulation
305'	none						Apparently still in fine-grained seds,	1330			
							can't take sample w/ lost circulation				
							mat. in mud.				
310'	none						More gravel, some whole pieces up to 6p,	1405			Added cedar chips, 1 bag, +
							others broken from larger pieces. Still too				1/2 bag cellophane
							much lost circulation mat. for samples.				
							Gravels have more basalt than before.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 310' - 323' Sheet 2 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 4/25/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Bros.
Driller Art Gwin, Dennis Minga, Joe Roach
Rig/Method SS 15 III, mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
315'	none					?	SANDY GRAVEL(?) - lots of broken gravel to vcs particles mixed w/ paper + wood chips. ~40% basalt, qtzite/qtz maybe up to 30%, rk frags 30%	1435			Still too much lost circulation not to collect samples
								1445			Stopped drilling to work on mud pump
								1525			Started drilling
								1555			Preparing to run straightness test, off by 1.75° at 318'
								1630			Adding drill rod.
								1637			Drilling
320'	lith	1					SANDY GRAVEL TO SAND: Gravel is 40% basalt, 10% qtz-rich, 50% dk rk frags, mostly ign., some dk red porphyries. There are abundant pieces of sand clumps, cl. muddy vf-f sand, 5G4/1 dk greenish gray. 1 piece of old wood, to small to try to do anything with. Note that most of the rk frags are dk, unlike most previous samples w/ lt. ign. rks.	1655			Sampled from shaker, still a lot of LCM, but washed most of it out.
											Total for day - 25'
								1720			Conditioning hole for night
								1730			Quit for day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 323'-335' Sheet 1 of 3
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 4/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment L300-16

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Speedstar SS-15III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers on Site - Art Gwin, Dennis Mugg and Joe Roach	700			
							Geologist on site	745			
								755			Drill
325	Lith	1	HNu	0 ppm		325 330 335	MUDDY SANDY GRAVEL 35% Gravel, 45% Sand, 20% MUD (mud = silt and cly) 15% Mp, 15% Fp, 5% Fp, 10% vcs, 10% cs 10% Ms, 15% FS 20% Silt and Cly, cly present indicated by ductability; forms cly balls, water soluable, mixed w/ fine sand sand and Gravel very broken up stand when preserved N4 dkgy No consol drills like it alt gravel and sand — Samples poor lots of LCM	810			
330	No Sampl						No Sample ? Muddy SAND drilled smoothly and fast Too much LCM	820			No Sample too much LCM
335	Lith	1	HNu	0 ppm			MUDDY SANDY GRAVEL 45% Gravel, 35% Sand, 20% Mud; 10% Mp, 25% Fp, 10% VFp, 8% vcs, 7% cs, 10% Ms, 10% FS, 20% Silt w/ Tr Cly - Clng in clr to 25Y 4/4 olv brn Smaller gravel sizes	833			Color change at ~335 pick-up more clys
								845			Circulate

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22 B
Location SE of 2 East
Depth 335'-355' Sheet 2 of 3
Project Savage Is

Logged by T Gilmore (Print) T Gilmore (Sign) Date 4/26/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Work on broken Mud hose				Make connection
								930			Hose broke - Fix hose
						335	MSG				
340'	L4h	1	HNu	Ø ppm			SLIGHTLY MUDDY SANDY GRAVEL 65% Gravel,	1050			Drilling
							25% Sand, 10% Mud (silt and Cly),				Mud Vis 95
							10% Cp, 20% Mp, 30% Fp, 5% VFp,				wt 9.2
							3% VCS, 7% CS, 5% MS, 10% FS, 10%				PP 800-900 psi
							Mud, p srt, 70% BSLT, 30% Felsic				Drilling more gravels at ~338
						340	and other sl rd when preserved,				
							2.5Y 4/2 dk gy brn, sl rxn in HCl,				Alternating layers of gravel
							no consol - Still lots of LCM in Smpl				Sand - Cly fining up sequences
345'	L4h	1	HNu	Ø ppm			MUDDY SANDY GRAVEL 50% 55% Gravel,	1110			on the order of 5'-10"
							30% Sand, 15% Mud (silt and Cly)				
						345	10% Mp, 20% Fp, 20% VFp, 3% VCS, 2% CS,				Drill rate incr at 348'
							8% MS, 12% FS, 10% VFS, 15% Silt and				
					35%		cly - fairly co-hesive cly, wk ductile,				
							water soluble - contains Sand 2.5Y 4/2				
350'	L4h	1	HNu	Ø ppm			GRAVELY SANDY MUD 20% Gravel,				
							20% Sand, 60% MUD (silt and cly)				
							lots of cly Low Plasticity, Med Toughness				
							Some silt in cly drills fast not very				
							water sol brown 2.5Y 4/2 no rxn in				
							HCl				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22 B Depth 355'-360' Sheet 3 of 3
Location SE of 200E Project Sewage Is

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 4/26/91
Reviewed by _____ (Print) _____ (Sign) Date _____
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment _____

Drilling Contractor Jensen Drilling
Driller Art Gaudin
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
355	Lith	1					MUDDY GRAVEL 30% Gravel, 20%	1200			
							Sand, 50% MUD (silt and Cly) Gravel	1205			Circulate (Stop Drilling)
							Sbrd, 60% BSLT, 40% other, Sand sbang	1230			Lunch
							50% BSLT 50% other, 5% MP 15% Fp,				
							10% vFp, 10% MS, 10% FS, 50% MUD				
						355	cly is Mrd tough Low Plasticity,				
							No rxn in HCl 2.5Y 4/2 Drills Fast				
							Depth ~ 357'	1240			Drill
								1315			Break another mud hose
							Circulate and work drill string	1340			Circulate
360	Lith	1				360	MUDDY GRAVEL 30% Gravel 20% Sand				Drill
							50% MUD silt and cly 5% Mp, 15% Fp,				
							10% vFp, 10% MS 10% FS, 50% MUD				
							cly med tough Low Plas No rxn 2.5Y 4/2				
							Pull drill string to change bit	1400			

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number: 699-32-22B Depth: 360-360' Sheet 1 of 1
Location: SE of 200 E Project: Savage Is.

Logged by: SS Teel (Print) SS Teel (Sign) Date: 4/29/91
Reviewed by: (Print) (Sign) Date:
Lithologic Classification Scheme: N/A Procedure: DO-1.5 Rev No. 1.0
Measuring Equipment: N/A

Drilling Contractor: Jensen drilling
Driller: Art Gwin / Dennis Mingo / Joe Roach
Rig/Method: Speedstar SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0700			Drillers on site -
											pulling drill rod to change
							(Bit is wore-out)				bit
								0945			Geologist on site - all rod is
											out of hole - changing bits
											KEH personnel are expanding
											mud pit w/ backhoe.
								1000			Art Collier arrives
			HNU	0ppm			Span is set @ 7.14 to read 56 ppm	1015			Calibrate HNU + check
			LEL	0%							borehole
			O_2	20.8%							
							Bit will not arrive until tomorrow - the	1030			
							bit Co. sent it 2nd day air instead of				
							overnight. No drilling until tomorrow				
								1100			KEH personnel complete
											mud pit.
											Put barricade around pit
							4/30/91 Receive word that bit will not				
							arrive until tonight. Will run the bit				
							in the hole first thing tomorrow (5/1/91)				

W = wet, M = moist, D = dry

A 1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 360-365 Sheet 1 of 4
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 5/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Mud Rotary / Speedstar SS-KIII

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Art Gwin, Dennis Mingo, Joe Roach on				Put on New Bit; 14 3/4"
							Site. Prepare new bit to run in well				Tri-cone (no jets installed)
							Geologist on site; Running Bit in well	930			
							Contracted Stuart Luthvell to set up				
							a technical Forum to discuss the				
							upcoming cement job Questions on				
							pulling 16" casing and potential				
							decisions points in cement operation				
			HNU	0 ppm			Calibrate HNU w/ span @ 7.5 reads 56 ppm	1105			Drilling
			LEL	0%							
360	Lith	1					SANDY GRAVEL (1 smpl because LCM in	1115			Change in color and lithic
							Mud not good smpls) 55% Gravel, 40%				fragments
							Sand, 5% Silt, Gravels 45% BSLT,				
							65% other, Subrd (flat) when preserved				
							Sands, 45/65, sub ang, about rd				
							and grn volcanics yellowish amorphous				
							silica (qtzites) color 2.5Y 5/4 dk brn				
							no rxn in HCl; no carbs				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 365-380 Sheet 2 of 4

Location SE of 2 East Project Savage Is.

Logged by T Gilmore (Print) [signature] (Sign) Date 5/1/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1

Measuring Equipment N/A

Drilling Contractor Jensen

Driller Art Guin

Rig/Method Mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
370	Lith	1				360	SANDY GRAVEL 65% Gravel, 35% Sand,	1135		N/A	
							U frag not very largest gravel appears tube				
							cp, Gravel 65% BSLT, 35% other subrd				
							Sand 65/35 same (Traces of w srt				
							fg sand w/ grn dy matrix) mostly p srt				
						365	about rd-grn volcanics yellowish siliceous				
							rich material sl rxn in HCl (especially in				
							Sand and grn clay) color A/a				
375	Lith	1					GRAVEL 95% Gravel, 5% Sand,	1155			Drilling slowed at ~ 373'
							Gravel 15% cp, 40% Mp, 30% Fp, 15% vFp,	12-1230			Lunch
						370	5% rd when preserved 65% Bslt, 35% other	1250			Drill - drill rate picked-up
							about grn-rd volcaniclastics, about silica,				at ~ 375'
							Traces grn-blu cly in smpl Mod-p srt	1300			Connection
							N 4 gy, No rxn in HCl no consol	1300			Drill
						375	more gravel than previous				
380	Lith	1					SANDY GRAVEL 80% Gravel 20% Sand	1310			
							70% BSLT 30% other subrd, very				
							fragmented p srt N 4 dk gy, no rxn				
							in HCl No consol sl more sand than				
						380	previous				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 380' - Sheet 3 of 4
Location SE of 3 East Project Savage Island

Logged by T Gilmore (Print) Tyler Gilmore (Sign) Date 5/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DD-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen
Driller Art Gwin
Rig/Method Mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
385	Lith	1					SANDY GRAVEL (as above)	1315			Mud wt is 7.8
390	Lith	1					SANDY GRAVEL 75% Gravel 25% Sand	1325			wt 8.9
							20% Mp, 45% Fp, 10% VFp, 5% VCS, 15% CS,				Drilling very fast
							5% MS, p sort, 70% BSLT, 30% other				
							predom matrix N4 dkgy no rxn in				
							HCl				
395	Lith	1					SANDY GRAVEL (as above)	1335			Drill Bit sticking at ~396'
400	Lith	1					SANDY GRAVEL 70% Gravel 25% Sand	1340			(Gravels?)
							5% Mud (med cly) 15% Cp, 25% Mp,				Tr Grn/Gy cly w/ Sand
							20% Fp, 10% Fp 10% VCS, 5% CS, 7% MS				
							p sort rd-subrd when preserved,				LCM is almost gone from MUD
							5Y 5/1 (Tr of grn) sl rxn in HCl				go back to 2 Lith smpls per
							No consol - some grn/gy cly mixed				interval after 400'
							w/ f sands forms cly balls in smpl				
											~375 - 400 high matrix traces
											of cly mixed w/ fg sand
							Driller call office	1355			Circulate
							Weld hose clamp back on Rig	1415			
							Note 4 sacks of Soda Ash added to				
							the mud since the begining of the well				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 405'-418' Sheet 4 of 4
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) [signature] (Sign) Date 5/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen
Driller Art Gruh
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
						400		1516			Circulate
								1520			Drill
405	Lith	2				405	SANDY GRAVEL 80% Gravel, 20% Sand	1530			
							10% VCp, 30% Cp, 25% Mp, 15% Fp,				
							10% VCs, 5% Cs, 5% Ms Mod-pSrt,				
						410	50% BsLT 50% Other incl Grn-				
							yel/gy/grn volcanics, subrd,				
						415	N5 gy slightly larger gravels				
410	Lith	2					GRAVEL 85% Gravel, 15% Sand	1540			
							25% VCp, 30% Cp, 25% Mp, 5% Fp,				
							8% VCs, 7% Cs, Mod Srt, 5% BsLT				
							5% Other A/A subrd-rd N5				
							Coarser grain uniform gravel				
415	Lith	2					MUDDY SANDY GRAVEL 70% Gravel; 25%	1550			Drilling slowed down at 415
							Sand; 5% Mud; 15% VCp, 20% Cp, 20%				(Cly ?)
							Mp, 15% Fp, 8% VCs, 7% Cs, 10% Ms, 5%				
							Mud (gy/grn silt and cly w/ M sands)	1700			Note: Geologist agreed to
							soluble in H_2O VL strength & ductability,				Run Straightness Test 1st thing
							sl rxn in HCl, sb rd VpSrt,				A.M. will hold tool at 400'
							st s/1				Total Drilled Today 58'

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-32B Depth 415'-425' Sheet 1 of 4
Location SE of 200 East Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/2/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Bros
Driller Art Gwilm, Dennis Mungo, Joe Roach
Rig/Method Mud Rotary SS15III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
			HNU	Ø ppm			Calibrated HNU w/ gas, 56 ppm @ 7.08	745			Circulated mud, adding new
			LEL	ok			span.				drill rod
								750			Started drilling
								815			Preparing to run straightness test
								850			Hole is ~1.1° off, straighter
											than at 300'
								855			Welding on hose brackets
								1010			Started drilling, Joe is cleaning
											shaker screen, can't get 420'
											sample
421'	Lith	2			421		GRAVELLY CLAYSTONE? Primarily [illegible] (cemented?)	1015			Sampled from shaker
							pieces up to 3cm long of [illegible] green (5BG4/1)				mud wt = 9.0
					422		clay frags, can scratch w/ fingernail, brittle, no				vis 80+ (he's adding H_2O now)
							rxn when damp in HCl, Gravels are vf-cp, sr-r, many are broken. Gravel may be	1020			Drilling easier @ 423'
								1025			Hose leaking mud, stopped to fix
							coming from ~422', drilling rate increased				
							there. Gravel - 25% basalt, 20% qtz/qtzite, 55%				
							rk frags (ign mostly). Samples not washed.	1100			Drilling again
425'	Lith	2			425		CLAYEY GRAVEL - Gravels c-vf, 25% basalt,	1105			Sampled from shaker.
							15% qtz/qtzite, 60% primarily dk rk frags,				
					426		many ign. Clay is dk greenish gray (5G4/1)	1115			Ed Enloe picked up logs
							+ soft, w/ silt + vf sand in pieces, VSL to no	1120			Main mud hose broke, fixing
							rxn in HCl. Samples not washed				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 425'-440' Sheet 2 of 4
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/2/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mings, Joe Roach
Rig/Method Mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
430'	lith	2			430		CLAYSTONE w/ gravel — primarily pieces	1150			Sample from shaker
							of mod. consolidated clay, can scratch	1145			Started drilling
					431		easily w/ fingernail, brittle. Gravels are				
							~35% of sample; m-vf, R-A, 40% basalt,				
							30% qtz/qtzite, 30% variety of rk frags,				
							mostly ign. Samples not washed, drilling				
							easy	1215 1230			lunch
			PAM	bkgd				1250			RPT's came by everything ok
			GM	bkgd							
435'	lith	2	HNU	0ppm	435		CLAYSTONE w/ gravel - similar to above,	1305			Sampled from shaker
			LEL	ok			but there are 2 colors of claystone (wet -				Drilling slower again because
					436		5Y6/1 (gray) + 5G4/1 (dk greenish gray))				of clay.
							also some pliable clay. Gravels ~40% of	1310			Stopped to fix another hose leak.
					437		sample, m-vf, R-A, 20% basalt, 55% ign	1350			Started up + another hose
							+ others, 25% qtz/qtzite. Clay does not				started to leak.
							react w/ HCl. Samples washed.	1415			Started drilling, drilling slow
437'	none						Increase in clay content, very soft, ~5-10%				
							gravel, clay 5G5/1 (greenish gray)				
440'	lith	2					CLAY, slight amt (3%) gravel. Clay is	1520			Sampled from shaker
							greenish gray, 5G5/1 when wet. Soft,				
							pliable. Samples were washed since.				Started drilling faster @ 442'

W = wet, M = moist, D = dry

A-1800 003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Location SE of 200E
Depth 440'-470' Sheet 3 of 4
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/2/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. L, D
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mungo, Joe Roach
Rig/Method SS 15 III mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
445	lith	2					GRAVELLY CLAY - 20% gravel, R-A, most not broken, variety of lithologies. Clay has some sand, 5G4/1 (dk greenish gray) when wet, pliable, soft. Samples washed some	1544			Sampled from shaker Drilling rate still increasing
450'	lith	2					GRAVELLY CLAY - more gravel, silt + sand than above, but still primarily clay, slight color change to 5Y5/1 (gray), still pliable, soft. Washed samples	1549			Sampled from shaker
455	lith	2					GRAVELLY CLAY - similar to above, still increasing gravel content, gravels up to cp, mostly m-fp, wr-A. Color similar to above, samples not washed.	1604			Sampled from shaker Drilling slow at 452', hit gravel at 454'
460'	lith	2					MUDDY SANDY GRAVEL - increased sand + gravel, mud is still mostly clay. Samples not washed.	1620			Sampled from shaker
465'	lith	2					MUDDY SANDY GRAVEL - similar to above. Samples not washed	1625			Sampled from shaker
470'	lith	2					SANDY GRAVEL - a few chunks of brown to gray mud. Gravel ~ 75% basalt simple or more, 45% basalt + 50% igneous lithics, 5% glass. Most gravels are dk colored, + m cf.	1630			Sampled from shaker

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth 470' - 478'
Sheet 4 of 4
Location SE of 200E
Project Sewage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/2/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA
Procedure DO-1, DO-5
Rev No 1, 0
Measuring Equipment NA

Drilling Contractor Jensen drilling
Driller Art Gunn, Lenny Mingo, Joe Rauch
Rig/Method SS15TII mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
478'	lith	2					GRAVEL - nearly 100% gravel came over shaker, almost 75% of it is vc-mp, WR-A, ~30% basalt, 15% qtz/qtzite, 55% dk yn/metam rks.	1610			sampled from shaker.
								1700			Drilled to ~478' & another hose sprang a leak. Art thinks more hoses will pop tomorrow & they don't have any more replacements, so there will be no drilling tomorrow.
								1725			Picking up to leave for weekend. Total 63' today

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 478'-490' Sheet 1 of 3
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print / Sign) Date 5/6/91
Reviewed by (Print / Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Guth / Dennis Mingo / Joe Roach
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Switch out Mud hose	700			
							Make connections work drillstring back in hole	850			Circulate
											Note: No Drilling 5/3/91 – Broken hose
							Calibrate HNu	950			Drilling
480'	Lith	2	HNu	Ø ppm		480	MUDDY SANDY GRAVEL 35% Gravel, 40%	955			
							Sand, 25% MUD 5% Cp, 10% Mp, 15% Fp				
							5% vFp, 5% vCS, 15% CS, 15% MS, 5% FS, 25%				
							MUD/Clay sbrd 45% BSLT, 55% other				
							2.5Y 5/6 Gy brn no rxn in HCl sl consol				
485'	Lith	2				490	MUDDY SANDY GRAVEL A/A	1005			
490'	Lith	2					MUDDY SANDY GRAVEL 50% Gravel, 40%	1020			Mica in Sample – no mica added
							Sand, 10% MUD (less Clay) very frag				to Mud as LCM (Some cellaflake
							gravel not representative Sand also				was)
							very fragmented, 55% BSLT, 45% other				
							abnt grn volcanics Color N3 vdkgy				
							No rxn in HCl, sl consol, less cly than previous				
								1020			Mud Hose broke / Stop Drilling
								1130			Drill
495'	Lith	2					MUDDY SANDY GRAVEL 40% Gravel, 45%	1140			
							Sand, 15% MUD, very fragmental not representative				
							50% BSLT 50% other N4 dkgy no rxn, sl consol	12-1230			Lunch

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-33-22 B
Location SE of 200 East
Depth 490'-510
Sheet 2 of 3
Project Savage Island

Logged by T Gilmore (Print / Sign)
Date 5/6/91
Reviewed by (Print / Sign)
Date
Lithologic Classification Scheme Folk
Procedure DO-1
Rev No 1
Measuring Equipment N/A

Drilling Contractor Jensen
Driller Art Gwin
Rig/Method Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drilling rate slow 498'-500' Slow	1300			Drill
							steady drilling - consolidated?	1305			Circulate for connection
								1333			Drill
500'	Lith	2					MUDDY SANDY GRAVEL 60% Gravel, 30% Sand, 10% MUD, very fragmented, not representative, formation may be consolidated and bit is grinding sediment up, 40% BSLT 60% other (predom grn volcanics) 5Y 4/2 olv gy, Traces of wht cly - v strong rxn in HCl sl-mod consol more grn volcanics than previous + appearance of wht clys	1337			Hard Formation Trace caliche? Mud 98 vis 9 wt
505'	Lith	2					SANDY GRAVEL 50% Gravel, 45% Sand 5% MUD very fragmented not representative 50% BSLT 50% other 5Y 4/2 sl-mod consol No rxn in HCl, similar to previous sample Tr less mud	1450			
510'	Lith	2					GRAVELY MUD 25% Gravel 5% Sand, 70% MUD (some cly chunks) ductile low strength Gravels 50/50 Bslt/other, Sand 5Y 5/2 olv gy Mud is both cly and silt sl consol slow drilling Bit balling up No rxn in HCl	1540			505' lith chng to Clays

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-32B Depth 510-515' Sheet 3 of 3
Location SE of 1E Project Sewage Ts

Logged by T Gilmore (Print) (Sign) Date 5/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk/ASTM Procedure DO-1 Rev No. 1
Measuring Equipment N/A

Drilling Contractor Jensen
Driller Art Gusch
Rig/Method Mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1635			Stop Drilling / Work on Mud Pump
							No more Drilling				Replace a seal
								1730			End of Day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Location SE of 200E
Depth 510'-520' Sheet 1 of 3
Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 5/7/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0700			Drillers on site
								0730			Drilling
						510'					
515'	lith	2					GRAVELLY MUD (30% gravel, 5% sand, 65% mud - ~~dom clay~~ SST silt/clay?) 5GY 5/1, Gravels are dom MP-CP and are rounded - WR on orig surf. 50% basalt, 50% qtzite, V. sim to 510'.	0730			Sample from shaker
								0740			Stop drilling, get ready to run straightness test.
								0830			Dev. survey complete - 1.0° @ 500'
								0840			Circulating
								0845			Drilling
								0847			Bit @ 520' - will wait 5min. for lag
520'	lith	2					GRAVELLY MUD (20% gravel, 5% sand, 25% mud - ~~dom clay~~ SST silt/clay?) very sim to prev. except slightly less gravels. Gravels FP-MP size. 5GY 5/1. clay is water sol.	0852			Sample from shaker

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 520'-535' Sheet 2 of 3
Location SE of 200 E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 5/7/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
						520'		0904			Bit @ 525'
525'	lith	2					SLIGHTLY GRAVELLY MUD (10% gravel, 2% sand,	0909			Sample from shaker
							88% silt + clay). 5GY 4/1. Less gravel than				
							prev. Gravel - 40% basalt, 60% white + orange				
							qtzite, gravels are angular (from bit?) and				
							ranges from VFP - MP. Clay is water sol.				
						535'		0934			Bit @ 530'
530'	lith	2					SLIGHTLY GRAVELLY MUD (10% gravel, 2% sand,	0939			Sample from shaker
							88% silt + clay - dom silt?). Color change to				
							5Y 4/1 (more brown). Gravels are angular,				
							2% CP, 1% MP, 5% FP, 2% VFP. Sand is				
							FS-VFS w/ trace MS-CS. Gravels 35% basalt,				
							65% yellow, orange + white qtzite, trace monzonite,				
							green metased. Gravel grain sizes prob. not rep.				
							Sim to prev. except color change.				
								1010			Bit @ 535'
535'	lith	2					SLIGHTLY GRAVELLY MUD (10% gravel, 2% sand,	1017			Sample from shaker
							88% silt + clay). More clay than prev.				
							Also color change - 5Y 3/2. See more "clay balls"				
							- also see one green clay ball. 5G 4/1.				
							Otherwise same as prev.				
								1030			Stop drilling - conditioning hole

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth 535'- 535'
Sheet 3 of 3
Location SE of 200 E
Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 5/7/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk
Procedure DO-1,5
Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Same
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1035			Mud hose breaks - no one hurt.
											Waiting for drill rod to
											arrive. Fixing hose.
								1100			Drill rod is in 3000 Area
											being steam cleaned. Should
											arrive around 1:00.
							Bearings on main drillshaft have gone out,	1130			
							Will be down for the next 2-3 days.				
								1150			Leave site.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 535'-545' Sheet 1 of 2
Location SE of 200E Project

Logged by SS Teel (Print) SS Teel (Sign) Date 5/14/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1, 5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method Mud Rotary / Speedstar SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Note: Rig has been down since 5/7/91	1030			Geol. on site. Drillers
											making final repairs to rig
											Ike Spivey, KEH also on
											site
								1050			Spivey leaves site
							HNU span set @ 6.48. Same span gas as prev.	1055			Calibrate instruments
								1515			Pat Collier on site
								1545			Circulating
								1600			Adding drill rod
			HNU	0 ppm							Check borehole
			LEL	0%							
			O_2	20.8%		540'					
								1607			Drilling
							MUDDY GRAVEL (35% gravel, 15% sand,	1608			Bit @ 540'
540'	Lith	2					50% mud). Gravels same comp as	1612			Collect sample
							prev. 5Y 4/1 (dark gray)				Pat Collier leaves
								1615			Bit @ 545'
545	Lith	2				545'	SLIGHTLY GRAVELLY MUD (5% gravel,	1620			Collect sample
							5% sand, 90% mud). Mud portion				
							seems to have more clay than silt (plastic).				
							Very sim. to 535' sample. 5Y 4/1 dark gray				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 545-565' Sheet 2 of 2
Location Project

Logged by SS Teel (Print) SS Teel (Sign) Date 5/14/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1624			Bit @ 550'
550'	Lith	2				550'	GRAVELLY MUD (10% gravel, 5% sand, 85% mud). Mud portion has more silt than clay - 65:35? Gravels are angular and are dom. qtzite. Silt is beginning to look consolidated. 5Y 4/1 dark gray.	1629			Collect Sample - 550' Bit @ 555'
											Increase in drill rate @ 550'
555	Lith	2					MUD. Dominated by silt. Thinly bedded? - find compacted chunks 5-10 mm thick mod-well consolidated 5Y 4/1 dark gray, Silt/Clay ratio 80:20? None - trace gravel.	1634 1636			Collect sample - 555' Bit @ 560'
560'	Lith	2				565'	MUD. Same as prev. Still Mod-well cons., thinly bedded, and dom by silt 5Y 4/1 dark gray	1640			Collect sample - 560'. Bit @ 565' Vis = 126. Everything is going over shaker.
565'	Lith	2					MUD. Same as prev.	1645 1650'			Collect sample - 565' Driller put drill rod on backwards - will have to switch before adding rod.
								1700 1730			Cleaning-up site Drillers leave site

Total of 30'

A-1800-003 (05/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 565'-585' Sheet 1 of 4
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gunn, Dennis Nungo, Joe Roach
Rig/Method CS 15 III, mud stang

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Calibrated HNU to standard gas, span	700			Picking up water truck
							@ 6.94 w/ reading of 56 ppm	805			Geologist on site
			HNU	0 ppm				835			
			LEL	ok				845			Water truck here, changing test
											Drill rod, guiding [illegible]
											Penetration rate ~ 105'/min
								945			Start drilling
570'	lith	2			570		MUD - lg. chunks of dk gray (5Y4/1) mod. rxn in HCl	1000			Sampled from shaker
					572		mud w/ abundant pieces of sandy silt no rxn in HCl	1005			Chris Eastley, KEH safety on
							10YR2/1 (black). The latter makes mud look				site. Black sandy silt may
							dk brown ~ 3% vf-f gravel, SA-SR, variety				be organic rich?
							of lithologies. Samples washed slightly.				
					575		SANDY MUD - dk greenish gray (5BG5/1),	1011			Sampled from shaker
							~45% vfs, 55% mud. Unconsolidated. No gravel.				
					579		Samples washed slightly. Strong rxn in HCl	1020			Chris left
580'	lith	2			580		SLIGHTLY SANDY MUD - ~25% vfs, 75%	1021			Sampled from shaker
					582		mud, 5G4/1 (dk greenish gray). Unconsol-				vfs of ~50, wt 8.9
							idated. No gravel. Samples washed slightly. Mod-st. rxn in HCl				
585'	lith	2			585		GRAVELLY MUDDY SAND - 25% gravel	1028			Sampled from shaker
					587		(mostly vf-m), 40% sand, 35% mud (some				
							clay probably), 5B6-4/1 (dk greenish gray)				
							Samples washed slightly, [illegible]	1055			Pulling drill, [illegible]

W = wet, M = moist, D = dry

Mod. rxn in HCl

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 585' - 610' Sheet 2 of 4
Location SE of 200E Project Savage Island

Logged by MA Chalmers (Print) MA Chalmers (Sign) Date 5/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mingo, Lee Kosch
Rig/Method Mud rotary, CF 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
					590			1104			Drilling
590'	lith	2					SLIGHTLY GRAVELLY SANDY MUD - 5%	1112			Sampled from shaker
					592		gravel (mostly vf-f), 35% vf-mc, 60%				
							mud. Dk greenish gray (5G4/1). Un-				
							consol. Samples washed slightly, sl. rxn in		HCl		
					600						
600'	lith	2					SANDY MUD - 35% vf-fg, 65% fines	1130			Samples from shaker
					602		Two separate colors - 5Y4/1 (dk gray) in				
							small sl. coised chunks, + 5BG4/1				
							(dk greenish gray) in slightly coarser				
							sandier chunks. Very little gravel. Samples				
							washed slightly, sl. rxn in HCl.				
					605						
605'	lith	2					SANDY MUD - similar to above but only	1145			Sampled from shaker
			HNU	Ø ppm	607		1 color - lt bluish gray (5B4/1). Unconsol.				
			LEL	Ok			Samples washed slightly. No rxn in HCl	1200/1245			Stopped for lunch
610'	lith	2			610		SANDY GRAVEL - [illegible] shaker is	1257			Sampled from shaker
							mostly vf-mg, SA-sr. 15% basalt, 30% gneiss				hit gravel @ ~610'
					612		granite, 55% tan/metam. vk frags. Some				
							sandy mud clumps mixed in. Samples				
							washed slightly. No rxn in HCl				Apparently I missed a
											sample in this drill hole.
											I believe it was the 595
											sample & I've numbered
											accordingly.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 610' - 635 Sheet 3 of 4
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gunn, Dennis Mungo, Joe Roach
Rig/Method Mud rotary CF15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1322			Adding drill rod, driller forgot straightness test, will do after this joint is down.
615'	lith	2			615		SANDY GRAVEL - similar to last sample. Samples washed some. No rxn in HCL.	1334			Sampled from shaker
620'	lith	2			620		MUDDY SANDY GRAVEL to SANDY GRAVEL. Similar to above, seems to be outlier. Gravels slightly larger vf-cg. Samples washed some.	1338			Sampled from shaker
625'	lith	2			625		Same as above, increase in lt-cg. Samples washed some, sl. increase in basalt.	1342			Sampled from shaker
6[illegible]	lith	2			631		MUDDY SANDY GRAVEL ? - mostly m-vcg coming across shaker, some of it broken, the rest SA-R. 15% basalt, 15% glt/glstite, 70% ign/metam. rk frags.	1350			Sampled from shaker
635'					635		Basalt ?? - Drill like hard by jumping around, but the basalt pieces look very similar to our cuttings. ~80% basalt, most of it angular, microphyric, coarse-grained a few vesicles but not really vesicular, some blue green clay in some vesicles.	1410			Started drilling slower @ ~633' Sampled from shaker mud wt 9.2 vis 65

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 635'-640 Sheet 4 of 4
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/15/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1,0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mungo, Joe Kosch
Rig/Method Mud rotary SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
640'	bth	2					GRAVEL? or BASALT - 60% basalt chunks,	1555			Sampled from shaker
							40% various types of vc-vfg. Will have to				
							drill a little deeper to see if the gravel				
							is wash down from above. Gravel are				
							mostly broken, were SA-WR.	1615			Preparing to run straightness
								1650			test. Very close to 0°.
											Will add on another drill rod
											tomorrow + drill a little
											deeper
											Total of 75' drilled

W = wet, M = moist, D = dry

A-1800-003 (05/90)

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DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 640'-645' Sheet 1 of 2
Location SE of 200E Project

Logged by SS Teel (Print) SSTeel (Sign) Date 5/16/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method Speedstar - SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0700			Drillers tripping-out 3 sections
							Upon further examination of the 645' sample				of rod - will add a short
							SSTeel + MAChamness have decided that it is				piece, and then trip-in
							BASALT rather than gravel. There is a lot of "rotten				again.
							basalt material in the matrix. Gravels are carry-	0854			Drilling
						640'	down from above BASALT SST 5/23/91	0945			Bit @ 645'
645'	Lith	2					~~MUDDY SANDY GRAVEL~~. Difficult to tell	0951			Collect sample from shaker
							% of mud + sand - appear to be getting a				
							lot of carry-down from above mud units. Gravels				
							are rounded - well rounded on orig. surf. and				
							appear to have a max grain size of at least CP,				
						645'	See several whole or nearly whole MP gravels.				
							Gravels are 40% basalt, 60% qtzite and meta-				
							sed, trace red. qtzite. Well-consolidated -				
							drilling very slow. Wet color of mud - 5Y 4/1	1010			Stopped drilling to tighten
							(dark gray).				seal.
								1012			Drilling
							Note: Checked samples about every 1-ft	1017			Mud hose breaks - stop
							between 640 and 645' - think that it				drilling
							is gravel rather than basalt. Looks very				Vis = 102 ; wt = 9.4
							sim. to 645'.				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 645'-655.7' Sheet 2 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 5/16/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment

Drilling Contractor Same
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1050			Drilling
								1153			Sample from shaker
											(allow 6 min for lag)
											635' SC
640'	Lith	2					BASALT - Black, coarse-grained, green				Basalt started @ ~~644'~~ ? 5/23/91
							phenocrysts (biotite alt to chlorite), see one vessicular				Drill rate decreases
							piece - vessicles are unfilled. See qtz cement				Washed sample
							on edge of some fragments - fracture				
							fillings? Some carry down of gravel + mud.				
							Sample is 80% basalt fragments. Bluish-	1200/1240			Lunch
							gray (5B5/1) coatings on some surfaces and	1240			Drilling
							vessicles.	1300			Stop drilling - blown seal
								1330			Drilling
								1350			Seal blows - stop drilling
								1422			Drilling
											wt = 9.0, vis = 65
								1613			Bit @ 655'
655'	Lith	2					BASALT. black, med xal., large pheno-	1620			Sample from shaker
							crysts of plag. and biotite. Some biotite is	1715			Circulating thick wt mud
							alt to chlorite. No vessicles. Some evidence				
							of fracture-fillings. Some carry-down material				
							in sample	1800			Leave Site

Total of 15.7'

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth 655.7' - 655.7' Sheet 1 of 1
Location SE of 200E
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/20/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Grin, Dennis, Mingo, Joe Roach
Rig/Method CS 15 III, mud rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Calibrated HNU to 56 ppm w/ span @ 6.62	715			Bob Jones on site, circulating
			HNU	0 ppm				725			mud to flush & condition hole
			LEL	ok				740			vis = 130
								815			Started tripping out, vis ≅ 90
								910			Hard to pull drill rod out @
											~390'
							Caliper & natural gamma logs will be	1040			Alan Pearson on site to log
							run				hole once rod is out
								1110			Chamness left site
								1410			Finished tripping out, starting
											to log hole
								1615			Gamma log shows high spikes
											at 345'-352' (~375 cpm), 317'-325' (~275 cpm) both very abrupt
											& sharp. Unsure whether it's
											natural or contamination
								1735			Cleaning up & quitting for day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7 Sheet 1 of 1

Location SE of 200E Project Savage Is.

Logged by SS Teel MA Chamness (Print) SS Teel MA Chamness (Sign) Date 5/21/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1.0

Measuring Equipment NA

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach / Dennis Mingo

Rig/Method SS-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Drillers will trip-in and then trip-out today	0700			Preparing to trip-in
							to clean-out the hole in preparation for				
							adding the carbon steel casing.				
							Span is set @ 6.54 to read 56 ppm	0730			Calibrate instruments
			HNU	0 ppm				0735			Check Borehole
			LEL	0%							
			O_2	20.8%				0745			Tripping-in
								0755			Christine Bartley (KEH safety)
											arrives and delivers a new
											LEL / O_2 meter.
								0800			Christine Bartley leaves.
								0850			Bob Jones (WHC) on site
								0930			Bob Jones leaves site
								1130			Bit at bottom of hole -
											- circulating
								1255			MA Chamness taking over for
											Steve Teel, start tripping out
								1325			
			HNU	0 ppm				1610			Finished tripping out
			LEL	ok				1655			Removed rotating head, rigging
											up casing cutter
								1725			Quit for day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7 Sheet 1 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 5/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 TH / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0700			Drillers on site
								0750			Begin lowering casing cutter,
								0752			cutting casing (16")
											Cutter blades are set at 22'2"
											below ground surface
							HNU span set @ 6.55 to read 56 ppm - same	0808			calibrate Instruments
							cal. gas as prev.				
							Cutter has not yet cut through 16" casing. Driller	1130			
							pulls it up to inspect it - blades are				
			HNU	0 ppm			dull and one arm is broken-off	1138			Check Borehole
			LEL	0%				1140			Will pull on casing to see if
			O_2	20.8%							it will break
							Driller was able to pull 16" casing - because he	1155			
							didn't have to use too much force he thinks	1200			Stop for lunch
							it is the 22' section rather than the whole	1240			Preparing to add casing (10")
							length of casing.				

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7 Sheet 2 of 2
Location SE of 200E Project Savage Is

Logged by SS Teal (Print) SS Teal (Sign) Date 5/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method CC-15 III / Mud Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							21' 8 1/4" (21.69) (w/cement stab-shoe)	1334			Adding 10" Carbon Steel
							20' 3 1/4" (20.27)				Casing
							20' 3" (20.25)				
							20' 1 1/2" (20.12)				
							20' 2 3/4" (20.23)				
								1630			Welding ears on casing
											Pat Collier on site
			HNU	0 ppm				1650			Check borehole
			LEL	0%			20' 1" (20.08)	1710			Adding casing
			O_2	20.8%			20' 1 1/2" (20.12)				
							20' 3 1/2" (20.29)				
							20' 3" (20.25)				
							20' 2 1/4" (20.19)				
							203.49 = Total casing added today				
								1930			Leave site

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7' Sheet 1 of 2
Location SE of 200E Project Savage Island

Logged by MA Chaunnes (Print) MA Chaunnes (Sign) Date 5/22/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure LD-1, LD-5 Rev No. 1.0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gunn, Dennis Hinga, Joe Garcia
Rig/Method CE 15 III, rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
										203.49'	of 10" casing
								900			Prepare to change casing line
			HNU	0 ppm			HNU calibrated w/ 100 ppm w/	950			Geologist on site
			LEL	ok			span at 6.22				
							CHANGE IN GEOLOGIC DESCRIPTION	955			Finished w/ casing line
							After looking at samples at 645', 650', 655'			20.31'	
							and between, have decided [illegible]			20.31'	
							descriptions should be as follows:	10[illegible]		20.31'	
						⇒	640' - Somewhat rotten basalt, more than at	1000		20.13'	
							635', med - coarse grained, varying to green	1115		20.31'	
							+ orange (rotten) diff. alteration [illegible] between			20.08'	
							stronger + weaker between 640' + 645'	1200		224.94'	Stopped for lunch
			HNU	0 ppm		→	645' - Similar to above, moderately rotten	1240		21.15	
			LEL	ok			abundant orange-red alteration products.			21.13	
							Revision [illegible] rotten between 645' + 650'			21.15	
						→	650' - Less rotten, some microvesicles, some			21.15	
							of these have black shiny clay(?) in			21.15	
							them. Coarse-grained, micro-[illegible] black	1500		21.17	
						→	655' - Continued to become finer, [illegible]			21.17	
							little orange [illegible]			172.01	
							still microvesicular w/ black clay, med.-				
							coarse-grained.			1615	[illegible]

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7' Sheet 2 of 2
Location SE of 700E Project Savage Island

Logged by MA Chambers (Print) MA Chambers (Sign) Date 5/23/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme USA Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment USA

Drilling Contractor Jensen Drilling
Driller Art Guin, Lewis Hinton, Joe Lovick
Rig/Method SS15 III, rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
										473.01	
										20.31	
										20.31	
										20.25	
								1800		20.08	
										20.31	
										20.08	
										5/25	
								1930			leave for day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7' Sheet 1 of 1
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/24/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mango, Joe Knoch
Rig/Method SS 15 III, rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								705		594.25'	Geologist on site
			HNU	0ppm			HNU calibrated to 5ppm w/ span @ 6:33	715		+20.25	Welding ears on casing
			LEL	ok				755		20.27	Welding casing
										20.13	
										654.9'	of 10" carbon steel casing
											Should be just about the
											right amount.
								845			unshed out inside of 4000
								940		3.5'	gal water tank w/ 200 E H_2O
										657.4'	
								1015			Running drill rod in hole, 661'
								1205			lunch
								1230			waiting for cement trucks
								1420			Mixing grout, 1st batch wt @
											14.7, used CFR2 friction reducer;
											batch ~1800 gal.
								1505			Start pumping 1st batch, 2nd batch
							Casing is sitting on bottom of hole, at				wt of 14.65.
							~655.4.	1615			Grout coming up thru annulus,
											used ~3450 gal of grout
								1645			Pulled 16" out, cut at 22'
							Pulling out drill rod	1715			below ground
								1940			Quit for day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7 Sheet 1 of 1
Location SE of 200 E Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 5/28/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method Air Rotary / SS-15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1700			Drillers on site. Grout has
											slumped ≈7ft around the
											annulus of the bore hole.
											Drillers add grout
							Add 7 bags portland cement, 6 gal H_2O				
							per bag to seal annulus. D/grout ≈ 1.5	ft			
											Welding Rotating head.
							Geologist on site	1145			Preparing to add drill rod.
								1200/1230			Lunch
							Span is set @ 5.33 to read 56 ppm	1245			Calibrate HNU
			HNU	0 ppm				1250			Check Borehole
			LEL	0%							Adding drill rod. Bit is
			O_2	20.8%							tri-cone
							Will not drill until tomorrow - still need	1515			Bit at bottom of hole. There
							to rig up discharge pipe and fix injector				is 3 ft of cement at the
							pump for the air system.				bottom of the hole.
							Joe estimates the liquid volume of material				
							in the mud tanks @ ≈ 3000 gal.				
								1700			Geologist Leaves site

A-1800-003 (05/90)

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 655.7'-660' Sheet 1 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/29/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme UA Procedure LO-1, LO-5 Rev No. 1, 0
Measuring Equipment HNU

Drilling Contractor Jensen Drilling
Driller Art Gwin, Lewis Hudson, Joe Prock
Rig/Method CME 15 III, air rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Calibrated HNU to 56ppm w/ span @	715			Geologist on site.
			HNU	0ppm			6.06	730			Driller fixing drill rig.
			L.L.	ok				804			Pushing water added after
											grouting out of hole.
								825			Start drilling out grout +
											float shoe.
							Have gotten virtually no returns, fine-	1000			Told Art the use of MUS-1
							toothed tri-cone rock bit is grinding basalt				foaming agent would be ok.
							into very small pieces and this is sticking				
							to the tools instead of blowing out.				
	none						BASALT - only got a few chips, dk gray	1050			Finally got ~10 chips up to
							med. coarse grained, microvesicular to				2 mm in diam. Returns very
							diktytaxitic, microphyric. Fresh.				poor. Will use an extra pump
											to put more water in, ~25
											gal/min instead of 5 gal/min
								1120			Start drilling. H2O hose leaks,
											stop to replace.
								1130			Laborers bring unit aquifer
											test equipment. Looks ok
								1145			Start drilling, little water,
											no chips or returns
								1200			lunch

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 660' – 687' Sheet 2 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 5/29/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure LD-1, DD-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Same
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								1245			Drilling
665'	none						Presumedly still basalt.	1340			No returns
670'	none						Presumedly basalt; started drilling much	1358			No returns
							faster at 668', bit bounces a little.	1405			Sampled from air discharge
675'	lith	2					BASALT - black, fine-grained to glassy,	1408			Stopped drilling to measure
							vesicular, abundant pieces of grayish			→	water discharge; ~17 gal/min
							green (5G5/2) clay, some of it as vesicle				
							fillings	1425			Start drilling
~7'	none						Basalt?	1500			No returns
684'	lith	2					BASALT - black, fresh, fine-grained w/	1545			Sampled from air discharge
							microphenocrysts. Some fracture surfaces				Drilling slower again, more
							have dk greenish gray (5BG4/1), as do				solid dense basalt.
							some of the few vesicles. Vesicles are				
							not very common, most are very small.	1555			Turned off water, letting hole
											flush itself out
							Drill bit is 9 7/8" dia.	1615			Tripping out
								1805			Quitting for day, 30' of
											drill rod still in hole.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 686.2 Sheet 1 of 1
Location SE of 200E Project Savage Island

Logged by SS Teel (Print) SS Teel (Sign) Date 5/30/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1,5 Rev No. 1,0
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0730			Geologist on site
							Span is set @ 5.82 to read 56 ppm.				Calibrate Instruments
			HNU	0 ppm				0737			Check Borehole
			LEL	0%							
			O_2	20.8%							
							D/water = 113.7 - 3.0 = 110.7 b.l.s. w/tape	0745			
							D/Bottom = 686.2 meas. w/ geophysical	0845			
							logging truck.				
								0850			D. Newcomer arrives to
											perform slug test.
								1016			Begin Slug injection test
			HNU	0 ppm			Check Borehole	1240			Withdrawl slug rod
			LEL	0%				1340			Pull transducer from well.
			O_2	20.8%							Waiting on driller to return
											From getting generator.
								1430			Driller returns w/generator
								1500			Setting Pump
											D. Newcomer leaves
							5 HP pump is set - bottom of pump	1620			Flowmeter @ 76050 (Hemet McCrometer)
							is at 299 Ft. Connecting discharge pipe +				
							flowmeter.	1730			Driller tried to get generator going -
											need plug for pump wiring -

W = wet, M = moist, D = dry

A-1800 003 (05/90)

Will start aquifer test tomorrow

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 686.2 Sheet 1 of 1
Location SE of 200E Project

Logged by SS Teel (Print) SS Teel (Sign) Date 5/31/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0700			Drillers on site - waiting for
											plug for generator
								1100			Art Gwin arrives with plug
											- attaching to pump wires
								1120			Pump ready to go - D. Newcomer
											setting up equipment
								1130			SS Teel on site
								1150			SS Teel delivers mud sample
											to 183KE Lab
								1250			SS Teel on site
								1320			Pump on
								1345			Pump Keeps kicking-out
											- will not run for more than
											5min. Bad control box?
								1400			Pat Collier on site
							Calibrate instruments - span set @ 5.15	1405			Pat leaves to get another box
							to read 56 ppm				
			HNU	0 ppm				1410			Check Borehole
			LEL	0%				1500			Pat cannot find a box -
			O_2	20.8%			Note: Foam has arrived - MLS no 1,				Art goes to town to get one.
							Mitchell, Lewis and Stauer CO	1700			Art on site w/ Box
							9935 SW Commerce Circle, Wilsonville OR, 97070	1900			Leave site - pump is working OK

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 686.2 Sheet 1 of 1
Location SE of 200C Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/1/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment see aquifer test logsheets

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							DR Newcomer + SS Teel on site to	0715			Drillers not on site
							perform constant discharge test of				
							Elephant Mtn. interflow. Also				
							collecting water samples for chem.				
							analysis. See aquifer test sheets				
							for details.				
								0930			Calibrate instruments
			HNU	0 ppm				0935			Check borehole
			LEL	0%							
			O_2	20.8%				1730			Leave site

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 686.2 Sheet 1 of 1
Location 3G of 200E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/3/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DC-1, 5 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0700			Drillers on site - pulling pump.
							Span is set @ 5.54 to read 56 ppm	0915			Calibrate instruments
			HNU	0 ppm			Check borehole	0930			Pump is out - preparing to add tremie pipe for grouting
			LEL	0%							
			O_2	20.8%				0945			Adding tremie pipe
							Tremie set at ~682'	1145			Tremie set
											Preparing for grouting
								1200/1230			Lunch
							Batch consists of	1245			Mixing grout
							5 - 94 lb bags Type I & II Portland Cement				
							1/4 - 50 lb bag "Dowflake" Process grade				
							77-80% Calcium Chloride				
							25.5 gal H_2O	1308			Pumping Grout
							Batch # 2	1310			Mixing 2nd Batch
							5 - 94 lb bags cement				
							1/4 bag Dowflake CaCl				
							30 gal H_2O	1320			Pumping Grout
							Batch # 3 (same as prev. except 6 bags cement)	1340			Pumping 3rd Batch
							Calc. displacement is 116 gal				Pumping displacement water
								1350			Pulling tremie to 565'
							Circulating - cleaning-out tremie pipe	1405			
								1430			Leave Site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth 1886.2' - 700' Sheet 1 of 2
Location SE of 200E
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 6/4/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA
Procedure DO-1, DO-5 Rev No. 1, D
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gunn, Dennis Minge, Joe Roach
Rig/Method SS15 III, rotary w/ foam

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								700			Driller tagged 18 of grout,
											@ 654' bgs, pulling out
			HNU	0 ppm			Calibrated HNU to gas @ 50ppm w/	730			tremie pipe.
			LEL	ok			span @ 5.7				
								855			Running drill rod in
								1055			Cleaning out hole, starting to
											drill out grout, foaming agent
											added to drill water
								1108			Adding drill rod
							Apparently drilling along edge of hole;	1112			drilling
							~90% grout, 10% basalt	1148			Back down to bottom of hole
								1152			Drilling
			HNU	0 ppm				1200/1246			lunch / safety mtg w/ Ed Enloe
			LEL	ok				1245			Drilling
690'	lith	2			690		Basalt - black, fresh, fine-grained w/	1302			Sampled from air discharge
							microphenos's, sparse vesicles, some w/ thin				Drilling slow
							coating of blue-green clay.				
695'	none				695		BASALT Only got a few chips, the rest is being	1345			Still drilling slow
							ground up to into sand. Similar to above,				
							some fracture surfaces with blue-green clay	1415			Dan Berg on site for video
700'	lith	1			700		Basalt - still coming out in sand sizes,	1423			
							can't get much for sample. Chips look				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 700' - 712' Sheet 2 of 2
Location SE of 700E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 6/4/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1, 0
Measuring Equipment NA

Drilling Contractor Same
Driller Same
Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							similar to above, few or no vesicles.				
705	none				705		BASALT - only got a few chips, slightly coarser matrix, more microphenos than before, no vesicles. At ~703' abundant fractures w/ blue-green clay. Apparently not as many here. Black fresh.	1510			I will try to take samples wherever there is enough returns &/or the pieces are large enough.
709'	Lith	1			709		BASALT - grained to m-c sand size. Probably came from fractures; slightly coarser, slightly lighter, some pieces with blue-green specks.	1550			Sampled from air discharge.
								1630			Preparing to run straightness test - finished. off by 0.9°
								1703			
								1710			Drilling
							Driller thinks we hit water at ~712'	1720			
							will check water level in the morning.				
							Got some big chunks out when cleaning out hole, will look at it tomorrow.	1730			Quit for day

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 712' – 730' Sheet 1 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 6/5/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment e-tape

Drilling Contractor Jensen Drilling
Driller Art Gwin, Dennis Mingo, Joe Roach
Rig/Method Rotary (air), SS 15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							DW 111.4' bgs. Cannot tell right now	715			
							whether water is from interflow zone				
							above or a new zone at 717'.				
			HNU	0ppm*			Calibrated HNU to 56ppm w/span	725			* Reading ~1 ppm @ discharge,
			LEL	ok			at 6.2				probably due to high air velocity
											from discharge
								735			Drilling
715'	lith	1					BASALT - pulverized to sand size + finer	750			Sampled from air discharge
							Probably colonade based on coarser texture				
							and lighter color of pieces collected				
							at ~717' yesterday.				
	lith	1					BASALT - pulverized to sand + finer	840			Sampled from air discharge
											Drilling slow but smoothly
								920			Roto-Rooter man here to take
											mud to Pit 10 near 300 Area
725	lith	1					BASALT - same as above, too fine to	930			Sampled from air discharge
							tell much				Drilling rougher in places
750	lith	1					BASALT - same as above, too fine to	1011			Sampled from air discharge
							see much				
								1043			Hydraulic hose broke, cleaning
											up any that spilled
								1315			Started drilling again

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 730'-750' Sheet 2 of 2
Location SE of 200E Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 6/5/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme NA Procedure DO-1, DO-5 Rev No. 1,0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller same
Rig/Method same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
735'	lith	1					BASALT - Got some chips at 735', med.-grained microphyric, dk grayish black, some fracture surfaces w/ greenish black lining seen.	1440			sampled from air discharge
740'	lith	1					BASALT - pulverized to sand + silt. Can't tell much from this. NOTE - The sample collected from interflow zone has apparently oxidized. The blue-green clay has become olive green and there are now red areas on the basalt where there were none before. Must be anaerobic at depth?	1510			Sampled from air discharge. Drilling slow + smooth
745'	none						BASALT - ground to f-vfs + silt size, didn't get enough returns to be worth collecting. A lot of metal chips, either from bit or from stainless steel weight dropped in hole a few days ago.	1605			
750'	lith	1					BASALT - ground to sand + silt.	1714			
751	none						BASALT chips, letting air clean out hole; dk grayish-black, coarse-grained, microphyric, pyrite on some fracture surfaces.	1720			
								1720			Quit for day

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 750-765' Sheet 1 of 3
Location SE of 200 E Project Savage Jr.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller: Art Gwin / Joe Roach / Dennis Mingo
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								0730			Draining water from hole
							No water level taken - driller says water	0745			Drilling w/air rotary
							was pretty high - probably same as yesterday				
							Span set @ 5.36 to read 56ppm	0830			Calibrate instruments
			HNU	0ppm				0835			Check discharge pipe
			LEL	0%							
			O_2	20.8%		750'					
755'	—	—					BASALT - no samples - no good returns-	0845			
							- still drilling slow.				
760'	Lith	1					BASALT - VFS - silt size fragments	0937			Sample @ discharge pipe
							5Y 2.5/2 (black) - wet ; 5Y 4/1 dry color				
761'	Lith	1					BASALT - cleaning out hole - was able to	0955			Sample at discharge pipe
							get some bigger chips. Dry color N4/	1000			Adding drill rod
							(dark gray) med. xalline, looks rel. "fresh"				
							plag. phenocrysts, also black "spots"				
							(alt products? - clay?).				
765'	—	—					BASALT - ground to VFS - silt size				No sample collected
							Dry color : 5Y 4/1 (dark gray)				Still drilling @ 5'/hr.
							Wet color : 5Y 2.5/1 (black)				
						765'					

W = wet, M = moist, D = dry

A-1800 003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 765'- 781' Sheet 2 of 3
Location SE of 200 E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Note: Submersible pump previously used				
							was a Grundfos 8822 type 25S				
						765'	25 USGPM @ 519'.				
770'	Lith	1					BASALT - ground to VFS - silt size	1150			Consistent drill rate ~ 5'/hr.
							wet color - 5Y 2.5/1 (black)				Sample at discharge pipe
							dry color - 5Y	1210/1240			Lunch
								1245			Drilling
											Aquifer is producing ~ 10 gal/min.
			HNU	0ppm				1255			Check discharge pipe
775'	Lith	1	LEL	0%			BASALT - slightly coarser than 761'	1400			Sample from discharge pipe
			O_2	20.8%			sample, still dark gray, rel. fresh,				still drilling @ 5'/hr
							med xalline, black "spots", very sim to				
							761' sample.				
							(Dry color N6.5)				
781'	Lith	2				776'	CLAYEY PUMICE/TUFF: 5Y 4/1 to 5GY 5/1 (wet)	1410			Sample from discharge pipe
							Pumice & Tuff with abundant 5G 5/1 (greenish gray)				Big increase in drill rate @
							"sticky" clay. Pumice/tuff is very light in density				776' - drilled from 776 to
							and has abundant small vessicles and is very				781 in about 2 min.
						781'	coarse-grained. Sample also contains trace	1430			Pulling drill rod in prep. for
							fresher-looking, denser pieces of basalt				grouting
							with 2-3 mm size clay-filled vessicles				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 779.3 Sheet 3 of 3
Location SE of 200 E Project

Logged by SS Teel (Print) SS Teel (Sign) Date 6/6/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment Logging truck HU-16-2985

Drilling Contractor same
Driller same
Rig/Method same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							D/Bottom meas. w/logging truck =	1650			
							779.3' b.l.s.				
							Will add 4 bags Colo. Silica sand				
							- 3 bags of 20-40 mesh				
							- 1 bag of 40-100 mesh				
								1745			Leave site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 779.3 Sheet 1 of 2
Location SG of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/7/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0
Measuring Equipment Logging truck HO-IG-2985

Drilling Contractor Jensen Drilling
Driller Art Gwin / Dennis Mingo / Joe Roach
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Measuring D/Bottom w/ geophys. logging	0730			
							truck to check height of sand backfill				
							D/Bottom = 772.65	0800			
							D/water = 117.65 - 3.75 = 113.9'				
							meas. w/ E-tape #11053	0830			Adding tremmie pipe for grout
								0900			Bob Jones, Ed Enloe on site
								0915			Bob & Ed leave
							LEL/O_2 meter that Ed dropped off today	0930			calibrate instruments
							doesn't work - called him for replacement				
			HNU	0ppm				0935			Check Borehole
							Tremmie pipe for cement set @ 771' b.l.s.	1015			
								1130			Ed delivers another meter
							Acme cement truck arrives - truck is	1238			
							loaded w/ 6250 lbs of cement (66 sacks)				
							Will mix 6.0 gal / sack (400 gal)				
							Added 1-50 lb bag CFM (additive)				
							1% CaCl (60 lbs)				
							1% Hydrogel (60 lbs)				
							Total water added was ~ 403 gal	1320			
							Cement wt = 14.7				
								1330			Pumping grout

W = wet, M = moist, D = dry

A-1800 003 (05/90)

80

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth — Sheet 2 of 2

Location SE of 200E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/7/91

Reviewed by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DO-1.5 Rev No. 1.0

Measuring Equipment N/A

Drilling Contractor Same

Driller Same

Rig/Method Same

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Water level is rising as grout is poured	1330			
							Water is running out of discharge pipe	1340			
							Grout is poured	1350			
							Pumping displacement water (130 gal)				
								1358			Pulling tremie pipe
			LEL	0%				1400			Check borehole
			O_2	20.8%				1530			Tremmie out of hole
			HNU	0ppm				1540			Adding drill rod
								1730			Leave Site

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Location SE of 200E
Sheet 1 of 1
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 6/8/91
Checked by (Print) (Sign) Date
Lithologic Classification Scheme NA
Procedure DO-1, DO-5 Rev No. 1.0
Measuring Equipment NA

Drilling Contractor Jensen Drilling
Driller Art Gunn, Dennis Mingo, Joe Roach
Rig/Method Air rotary, SS15 III

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								745			Geologist on site, driller's just finished running drill rod in.
								750			Start drilling, using new bit,
			HNU	0ppm			Calibrated HNU to 50ppm w/ span @	755			slightly larger than old one
			LEL	ok			4.4 using same gas as before.				
							Drilling smoothly through grout, top of	805			
							grout was at 6'14' bgs.				
								840			Started drilling out into basalt
											at ~684', getting a little inter-
											flow material
							Hole is almost entirely in basalt now. We	915			Stopped drilling, stopped adding
							are trying to decide whether to grout				water, hole is making ~7 gal/min
							today or monday.				TB = 691'
							Decided to grout today, wait for air	1020			
							hammer t/a new tri-cone bit, try drilling				
							it out on Tuesday June 12.	1045			Art went to get more cement.
			HNU	0ppm				1325			Art back, will place grout thru
			LEL	ok							drill rod.
											Mixed 20 100 lb bags Portland
											Type I + II + type IP cement
											w/ 120 gal of water, displaced
							Picking up site, quitting for day, back Tues.	1700			w/ ~50 gal water

W = wet, M = m[illegible] D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Sheet 1 of 1
Location SE of 200E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/11/91
Checked by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1.15 Rev No. 1.0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Method Speedstar SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
								1330			Onsite. Still waiting for bit to arrive. Driller is building-up bit guides.
							Span is set @ 4.08 to read 56 ppm	1340			Calibrate HNU / LEL
			HNU	0 ppm			- same span gas as prev.	1345			Check borehole
			LEL	0%				1530			Bit has arrived - however it is a 10 1/4" OD and will not fit inside the 10" casing and therefore it is unusable.
			O_2	20.8%							
							A bit has been located in Portland - it will be shipped by air tonight and will be onsite first thing tomorrow.	1615			
								1625			Geologist leaves site - drillers will stay and continue welding bit guides.
							Note: Drillers were not on site yesterday - they took this day off because they worked on Sat. (6/8)				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Location SE of 200 E
Sheet 1 of 1
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/12/91
Checked by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1.0
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Method Speedstar SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
							Bit is tri-cone, 9 7/8 OD, "rock-bit" (mill-tooth)	0830			Bit is on site - preparing to run down hole
							Span is set @ 4.08 to read 56 ppm -	0900			Calibrate instruments
			HNU	0ppm			- same spangas as prev.	0915			Check borehole
			LEL	0%				1015			Adding drill rod
			O_2	20.8%				1100-1105			Ed Enloe on site
								1320			Drilling w/ air rotary
							Depth = 660' - 100% grout returns	1330			
							660-690' - 100% grout - no water	1430			
							705' - 75% grout - 25% basalt - no water	1500			Driller has to hold back on the brake quite a bit in order to have a smooth hole because it is biting into the basalt.
							705-715' much more basalt - 50-60%. Slower drilling				
							Depth = 716' - still ≈ 50% basalt - driller thinks we are 1/2 in and 1/2 out of original hole	1720			Cleaning-out hole
							Can't tell if water is in hole or not - - will take a WL measurement tomorrow morning.	1800			Leave site

V = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B

Sheet 1 of 2 84

Location SE of 200E

Project Savage Island

Logged by S S Teel (Print) S S Teel (Sign) Date 6/13/91

Checked by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0

Measuring Equipment

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Method Speedster SS-15 TH / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0700			Drillers on site
								0725			Preparing to run straightness test
							Straightness test complete: 1° @ 700'	0830			
							D/W = 132 ft - water is coming in -	0835			
							probably from ≈ 712' - call MA				
							Chamness to notify Tech. Forum	0840			Waiting for Tech Forum decision
							Tech. forum has decided to drill to just above	0905			
							the Rattlesnake Ridge and then stop for the				Note: Air compressor has been
							weekend. Work will begin again on Monday				loosing oil into the air stream.
							and drilling will continue through the RR				It has lost a total of approximately
							to total depth. The idea is to limit the				5-gal over the past week or
							amount of time that the aquifers are connected.				two. This oil is an approved
							The WL this morning suggests that flow will				synthetic oil (non-petroleum)
							be upwards from the Rattlesnake Ridge				
							anyway - so even if they are connected it				
							shouldn't be a problem. Will collect water				
							sample when drilling starts - waiting for				
							bottles to be brought out.				
								0945			Water Bottle arrives
								1010			Collect Water Sample

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Location SE of 200E
Sheet 2 of 2 85
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/13/91
Checked by (Print) (Sign) Date
Lithologic Classification Scheme N/A Procedure DO-i,5 Rev No. 1,0
Measuring Equipment N/A

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Method SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Air compressor is low on oil - drilling	1015			Compressor oil is AEON
							cannot continue until it is filled - no				6000 FG Food grade synthetic
							more oil is on site - more will have to				lubricant, Part # 28H35
							be brought in. Waiting on word from				Manufactured and formulated
							drilling company as to when oil will arrive.				for Gardner - Denver - Joy
											1800 Gardner Expressway
											Quincy, Ill 62305-4024
							Oil will arrive this evening - no drilling	1330			Geologist leaves site.
							until tomorrow morning. Drillers				
							will weld centralizers, fill mud tanks				
							with H_2O, and then return water truck				

W = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B

Sheet 1 of 1 86

Location SE of 200E

Project Savage Is.

Logged by S S Teel (Print) S S Teel (Sign) Date 6/14/91

Checked by (Print) (Sign) Date

Lithologic Classification Scheme N/A Procedure DO-1,5 Rev No. 1,0

Measuring Equipment E-tape

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Method Speedstar SS-15 III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOIS-TURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID ETC.) CASING	
							Waiting for driller to arrive w/	1120			Geologist on site
							synthetic compressor oil				
							Driller arrives - oil has not been	1230			
							shipped from factory yet - hopefully				
							it will arrive Sun night and drilling can				
							resume on Monday (6/17).				
							D/water = 111' b.l.s. w/ E-tape	1300			
								1310			Leave site

V = wet, M = moist, D = dry

A-1800-003 (01/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B
Depth (Repeat) 712' - 785' Sheet 1 of 5
Location SE of 200 East
Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 6/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 DO-5 Rev No 1.0
Measuring Equipment Logging Truck

Drilling Contractor Jensen
Driller Art Gwin / Joe Roach
Rig/Method Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Arrive at Site	715			
							Drillers adding new compressor oil				
							to Air compressor Oil used was				
							AEON 6000 FG - Food grade Synthetic				
							oil manufactured for Gardner-Denver				
							Note: Foaming Agent still being added				
							Run drill rods in hole	735			
							Drilling - D/B 712' Drilling through	740			Drill
							grout back to interbed at ~776				
							Drilling up approx 50% Grout/50% Bolt				
							Slowly add weight	840			Add weight to drill string
							Moved back into hole Drilling mostly				
							Grout				
							Depth 736'	920			Connection
							Depth 762'	1100			Connection
							KEH Safety Stopped by (Ed Enlow)				
							Drilling ~100% Cement Grout				
							Hit silica sand (added) just below grout	1136			Hit change Drill bit dropping

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 785' - 790' Sheet 2 of 5
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) (Sign) Date 10/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 DO-5 Rev No 1, 0
Measuring Equipment

Drilling Contractor Jensen
Driller Art Gruen
Rig/Method Air Rotary / Speedstar 55-15TT

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Lag time for sand to reach surface	1148			Discharge water cleared up
							was [7 min.] measured at discharge line				
						780 cement					
785	Lith	2					SILTY SAND - 55% Grn Sand, 35% BSLT, 10%	1150			Sample Interbed
						Silica Sand	Added Silica Sand - Grn Sand is 60% UFS				
					Included	785	40% Silt, V well srt, predom qtz, Tr of F-spar				
							(orng specks) wet color 5GY 3/1 dk greenish				
						790	gray, no rxn in HCl mod consol, Sands				
							mod friable - Traces of added silica				
							Sand in Sample				
							Water flow at discharge increased	1200			
							Producing ~ 5-10 gpm	1210-1230			Lunch
								1300			Drill
							The Sample is so fine most of it lost	1310			Sample
							in discharge line				
790	Lith	2					SILTY SAND 85% UFS, 15% Silt, predom				
							qtz Sand Tr of bslt and F-spar, Some				
							grn cly intraclasts, sbang ?, wet color				
							N5 dk gy No rxn in HCl, no consol				
							cly gone more sand v well srt				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 785'-880' Sheet 3 of 5
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 6/12/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 DO-5 Rev No 1, 0
Measuring Equipment

Drilling Contractor Jensen
Driller Art Sm
Rig/Method Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
795	Lith	1				795	SILTY SAND A/A Almost no returns	1325			
800	Lith	1				800	SILTY SAND Predom qtz UWsrt, NS, no rxn	1335			
805	Lith	1					SILTY SAND Incr in Grn cly, plty	1345			At ~810' drill rate slowed - Lith change?
						805	predom qtz Sand 55% Sand 10% Silt +				
							cly stone fragments NS no rxn in HCl no cons				
810'	Lith	1				810	CLAYEY SILTY SAND 10% Cly/Ash, 15%	1350			
					?Ash		Silt, 75% Sand, Traces of clr crystals				
						815	Sanidine?; incr in Cly; 5GY 5/1; sl rxn				
							in HCl; sl consol; Traces of buff				
						820	colored Ash/Tuff				
815	Lith	1					CLAYEY SILTY SAND 25% Cly, 15% Silt,	1414			
						825	60% Sand, w srt, Sub/prod qtz,				
							Tr bslt and other, Cly; dk grn-buff				
						830	sl rxn in HCl, sl consol				
820	Lith	1					SILTY SAND 5% Cly 15% Silt 80% Sand	1420			
						835	prod clr qtz Traces of another clr mineral				
							Sanidine? high reflectance tabular, bri,				
							fresh surfaces common, sl-no rxn in				
							HCl				
830'	Lith	1					CLAYSTONE Sample is 50/50 mix of grn	1433			
							Cly and buff-brn cly (5GY 4/1 and				
							10YR 6/2 lt brn gy) Altered Ash? Soft				

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 830' - 840' Sheet 4 of 5
Location SE of 300 East Project SAVAGE Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 6/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1; DO-5 Rev No 1, 0
Measuring Equipment

Drilling Contractor Jensen
Driller Art Grim
Rig/Method Speedstar SS-15III / Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							825 Cont, blocky shapes, sl consol,				Soft fast drilling at
							no rxn in HCl no change in drill				829'
							rate - "not as mushy" v well srt				
							change in color and texture from				
							previous				
830'	Lith	1					SILTSTONE Coarser grained less gray more	1445			
							gy some v f sand in siltstone				
							no rxn in HCl coarser grn than				
							previous				
35	Lith	1					SANDSTONE/SILTSTONE v w srt,	1500			
							~60% silt ~40% sand, gy NS; No rxn				
							in HCl sl-mod consol, sl coarser grained				
							than previous				
							Still in Interbed and out of drill rod	510			Stop Drilling
							need to find subs to adapt to diffrent				
							size rod				
								1610			Drill
840	Lith	1					Basalt dense blk, sm: o grn clystone				Change in Drill rate 838'
							few vesicles, some cly lined, micro-				Lith change - Basalt
							xtalline drills fractured				

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 840-841.5 Sheet 5 of 5
Location SE of 200 East Project Savage Island

Logged by T Gilmore (Print) T Gilmore (Sign) Date 6/17/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 DO-5 Rev No 1.0
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller Art Gruin
Rig/Method Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.) CASING	
							Hit basalt at 838' will drill to about				
							843' and end hole.				
							TD at 841.5'	1655			
							Circulate then pull a couple				
							rods				
											End of Day

W = wet, M = moist, D = dry

DAILY BOREHOLE LOG

Boring or Well Number 699-32-22B Depth 841.5 Sheet 1 of 1
Location SE of 200 East Project Savage Island

Logged by A W Pearson (Print) Alan Pearson (Sign) Date 6/18/91
Reviewed by (Print) (Sign) Date
Lithologic Classification Scheme Folk Procedure DO-1 DO-5 GL-7, GL-3, GL-2 Rev No 1.0 0.0.0
Measuring Equipment

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Method Air Rotary

DEPTH	SAMPLES TYPE	SAMPLES NO.	CONTAMINATION INSTRUMENT	CONTAMINATION READING	MOISTURE	GRAPHIC LOG	LITHOLOGIC DESCRIPTION (PARTICLE SIZE DIST., SORTING, MINERALOGY, ROUNDNESS, COLOR, REACTION TO HCL, ETC.)	TIME	H_2O ADDED	CASING	DRILLING COMMENTS (DRILLING RATE, DOWN TIME, BLOW COUNTS, WATER LEVEL, DRILL FLUID, ETC.)
								0730			Geologist on site
											Preparing to Geophysically
											Log borehole; Drillers pulling
											drill stem
							Logged 838.5'-620.0' (GL-7 Rev.0)	0900			Begin Gross Gamma Log
							Logged 837.0'-620.0' (GL-3 Rev.0)	1100			Begin Caliper Log
							Logged 500.0'-837.0' (GL-2 Rev.0)	1230			Begin Temperature Log.
							Waiting for instruction from	1345			Drillers preparing to
							Project Manager for completion details				Complete borehole
							D/W = 120.9'-3.5' G.U. = 117.4' H.S @ 1230				
							D/B = 838.5' H.S W/ Gross Gamma Tool @ 0900				
							Will run 6" Carbon Steel Casing to	1500			Received word from Mickie
							Bottom of Elephant Mtn Basalt @				Chamness that 30' additional
							~776' Screen will extend 55' below				screen will arrive tommorrow
							this to 831'	1515			Drillers Preparing to run
											Casing
								1700			No Casing Welded today
											End of Shift.

W = wet, M = moist, D = dry

A-1800-003 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2

Location SE of 200 East Area Project Savage Island

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 6/19/91

Reviewed by (Print) (Sign) Date

Measuring Equipment Procedure DO-5 Rev No. 0

Drilling Contractor Jensen Drilling Company

Driller Art Gwin

Rig/Equipment Speedstar SS-15III

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Geologist and Drillers on site
0710												Calibrated HNU Span 5.7 read 55ppm
0715												Check borehole HNU=0ppm, O_2%=20.8, LEL=0%
0730	Carbon Steel	6"	20.74'									Add 20.74' of Permanent 6" C.S. Casing
0805	" "	6"	40.68'									Add 19.94' of " " " "
0830	" "	6"	60.62'									Add 19.94' of " " " "
0900	" "	6"	80.24'									Add 19.62' of " " " "
0920	" "	6"	100.20'									Add 19.96' of " " " "
0950	" "	6"	121.01'									Add 20.81' of " " " "
1010												Pat Collier (KEH) visits site: informs
												driller that well must be completed
												by July 1, 1991 to meet DOE Milestone
1020	" "	6"	140.80'									Add 19.79' of " " " "
1040	" "	6"	161.37'									Add 20.57' of " " " "
1055	" "	6"	181.97'									Add 20.60' of " " " "
1110	" "	6"	201.80'									Add 19.83' of " " " "
1130	" "	6"	221.04'									Add 19.24' of " " " "
1200	" "	6"	242.07'									Add 21.03' of " " " "
1215												Lunch
1245												Resume Welding
1315	" "	6"	263.01'									Add 20.94' of " " " "
1340	" "	6"	283.71'									Add 20.70' of " " " "

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2

Location SE of 200 East Area Project Savage Island

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 6/19/91

Reviewed by (Print) (Sign) Date

Measuring Equipment Procedure DO-5 Rev No. 0

Drilling Contractor Jensen Drilling Company

Driller Art Gwin

Rig/Equipment Speedstar SS-15III

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1400												Moved Casing
1430	Carbon Steel	6"	305.29'									Added 21.58' Permanent 6" CS Casing
1450	" "	6"	325.37'									Added 20.08' " " " "
1520	" "	6"	345.50'									Added 20.13' " " " "
1550	" "	6"	365.59'									Added 20.09' " " " "
1630	" "	6"	388.57'									Added 22.98' " " " "
1650	" "	6"	407.78'									Added 19.21' " " " "
1710	" "	6"	428.02'									Added 20.24' " " " "
1730												End of Shift
												Well Guard was used as a
												lubricant on threads of the
												tremie pipe.

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of

Location SE of 200 East Area Project Savage Island

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 6/20/91

Reviewed by (Print) (Sign) Date

Measuring Equipment Procedure DO-5 Rev No. Ø

Drilling Contractor Jensen Drilling Company

Driller Art Gwin

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Drillers & Geologist on site
0705												Calibrate HNU=55 ppm w/span @ 5.7
0715												Monitor borehole HNU=0ppm, 21.8% O_2 &
												0% LEL w/OVA
	Carbon Steel	6"	448.17									Added 20.15' of 6" C.S. Casing Yesterday
0750	" "	6"	468.41									Added 20.24' of 6" C.S. Casing
0830	" "	6"	488.43									Added 20.02' of " " " "
0850	" "	6"	508.60									Added 20.17' of " " "
0910	" "	6"	529.64									Added 21.04' of " " "
0930	" "	6"	550.74									Added 21.10' of " " "
0955	" "	6"	571.82									Added 21.08' of " " "
1020	" "	6"	592.72									Added 20.90' of " " "
1040	" "	6"	613.68									Added 20.96' of " " "
1125												Mickie Chamness replacing Alan Pearson
1135	" "	6"	633.76									Added 20.08'
1305	" "	6"	654.28									" 20.52'
1330	" "	6"	677.10									" 22.82'
1400	" "	6"	699.02									" 21.92' Alan Pearson Replacing Mickie Chamness
1430												Centralizers hobbling casing broke-
												Casing & Tremie pipe fell to bottom
												of well.
1615		Top of 6"		Casing @ ~42 meters bLs								Arron Chatz (WHC) TV surveys well
1730												End of Shift

Will fish for tremie & Casing tommorrow

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2

Location SE of 200 E Project Savage Is.

Logged by S S Teel (Print) SS Teel (Sign) Date 6/21/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0800												Drillers on site w/casing spear
												fabricating a plate to measure top of 6"
												casing
0840												Geologist on site
0910												Calibrate instruments (HNV & LEL)
												and check borehole - it is OK
0915												Drillers are using the plate, connected to the
												sand line, with a nylon tape to meas.
	Top of 6" casing				142.95							D/top of 6" casing = 142.95, ∴ bottom
	Bottom of 6" casing				841.9'							of casing is at 841.9' (based on length
												of casing before being dropped).
												Preparing to run spear down hole.
1100												Adding spear & drill rod. MA Chamness on site
1200/1230												Lunch - MAC leaves site.
1330												Casing is successfully speared. - Pulling
												casing w/casing line. The casing came
												up ~ 8' before tightening-up. Pull an
												additional 10' using the casing line in
												conjuction with raising and lowering the
												rig's hydraulic leveling jacks. Casing is tight.
1415												Ike Spivey / Vern Chamberlin on site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 2 of 2

Location SE of 200E

Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/21/91

Reviewed by (Print) (Sign) Date

Measuring Equipment Procedure Rev No

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
1420												Hydraulic pump seals are leaking –
												– shut down.
												Drillers place an absorbant to catch spill
												– only a small amount leaks and none
												goes down hole.
												Ike Spivey / Vern Chamberlin leave site
1440												Pump is removed – drillers secure hole
1525												Leave site. Work will resume when the
1535												pump is fixed.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Location SE of 200 E
Sheet 1 of 1
Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/25/91
Reviewed by (Print) (Sign) Date
Measuring Equipment Procedure Rev No.

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
												Note: Drillers worked yesterday
												without notifying PNL, Pat Collier (KEH)
												was on site for part of the day. They
												were able to pull the casing 40 more ft,
												The top of the casing is now at a depth
												of approximately 80 ft.
1000												Geologist on site - the drillers are waiting
												for a crane to arrive - the drilling rig
												cannot pull any more without risking
												breaking something.
												Geologist Leaves site.
												Talk to Art Gwin via phone. A crane
												will not be available until Thur. - the
												drillers have decided to move the rig and
												set up the jacks beginning tomorrow.
	Top of 6" casing				~80'							

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-S2-22B

Sheet 1 of 2

Location SE of 200 E

Project

Logged by SS Teel (Print) SS Teel (Sign)

Date 6/26/91

Reviewed by (Print) (Sign)

Date

Measuring Equipment N/A

Procedure DO-1,5

Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Ewin / Joe Roach

Rig/Equipment Speedstar SS-15 III / 100-Ton Cap. Hydraulic Jacks

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Drillers on site - breaking-down rig and moving off of hole so hydraulic jacks can be set up.
0745												Rig is off of hole and is moved forward ~3 ft. Calibrate HNU + LEL/O_2 Span is set @ 4.20 to read 56 ppm
0750												Check borehole - it is OK
0805												Placing jacks over borehole + blocking and setting-up rig.
1022												Pulling casing w/ Jacks
1030												Slip collar is bending - will have to stop until it is reinforced. Have pulled about 1.5' so far - it is pulling fairly easy. Drillers will go to town to get some used heavy steel plate to use for reinforcing.
1300												Geologist back on site.
1315												Drillers arrive
1315/1345												Lunch
1400												Check borehole - OK
												Welding reinforcement plate
1455												Pulling Casing

A-1800 004 (05/90)

100

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2

Location SE of 200 E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 6/26/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure PO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15III / 100-Ton Hydraulic Jacks

Time	Casing/Screen					Annular Fill					Over-lap	Comments
	Type	Diam-eter	Length	Stickup	Depth	Type	Quan-tity	Stickup	Add-on	Depth		
1645												Pat Collier on site
1715												Pat Collier leaves site
1830												Pulled top of 6" casing to ~
												3' above ground surface. Don't see
												the tremmie pipe yet.
1845												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 3

Location SE of 200 E Project Savage Is

Logged by SS Teel (Print / Sign) Date 6/27/91

Reviewed by (Print / Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III / 100-Ton Hyd. Jacks

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Drillers on site - changing over to
												6"-casing collar + slips
0800												Calibrate instruments - span is set @
												4.20 to read 56ppm.
0805												Check borehole - OK
0815												Pulling casing w/ Jacks
0845												Cutting off casing spear + removing
												drill rod.
0940												Pulling casing w/rig - pull approx
												10' - hear part of tremmie fall
												down well. 677' weld exposed
0950												Removing casing from spear
1050												Pulling casing w/rig
1100												654' weld exposed
1106												633' weld exposed
1125												613' weld exposed
1135												592' weld exposed
1150												571' weld exposed
1300												550' weld exposed
1305												529' weld exposed
1312												508' weld exposed
1321												488' weld exposed

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 2 of 3
Location SE of 200 E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/27/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 TII Rotary

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
1332												Check Borehole w/HNU-LEL. - OK
1336												Exposed 468' weld
1344												Exposed 448' weld
1352												Exposed 428' weld
1400												Exposed 407' weld. Pat Collier on site
1408												Exposed 388' weld
1415												Exposed 365' weld
1440												Exposed 345' weld Pat Collier leaves site
1445												Exposed 325' weld
1453												Expose 305' weld
1500												Expose 283' weld
												Moving Jacks; stacking casing
1600												Expose 263' weld
1608												Expose 242' weld
1616												Expose 221' weld
1621												Expose 201' weld
1628												Expose 181' weld
1634												Expose 161' weld
1700												Expose 140' weld
1705												Expose 121' weld
1710												Expose 100' weld

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 3 of 3

Location SE of 200 E

Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 6/27/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
1715												Expose 80' weld
1723												Expose 60' weld (casing is bent)
1730												Expose 40' weld (casing is bent)
1738												Remove last 20' section
												All 6" casing recovered from hole,
												All tremmie is still down-hole-
												- will fish for it tomorrow.

A-1800-004 (0[illegible])

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 1
Location SE of 200 East Area
Project Savage Isl.

Logged by AW Pearson (Print) Alan Pearson (Sign) Date 6/28/91
Reviewed by (Print) (Sign) Date
Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Reach
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
0700												Calibrate instruments span set @ 3.90
												to read 55 ppm
0715												Check borehole - ok
0720												Begin fishing for tremie pipe =>
0735												Measure D/tremie w/ 2" pipe attached
												to sand line = 191.4'
0800												Begin making fishing tool out of a 3'
												piece of 6" C.S. Casing
345												Begin fishing for tremie pipe
115												Have successfully grabbed tremie
												=> pull out
150												Safety inspection
150												Resume fishing tremie
1700												Have retrieved (29) 21' lengths of
												tremie pipe (4) 21' lengths remain
												in bottom of borehole
1710												Cover borehole
1715												Clean site
1730												End of Shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 1

Location Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/1/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen					Annular Fill					Over-lap	Comments
	Type	Diam-eter	Length	Stickup	Depth	Type	Quan-tity	Stickup	Add-on	Depth		
												Drillers renewing security badges,
												picking-up materials for fabricating
												fishing-tools.
1015												Geologist on site.
1125												Driller's arrive - preparing to build
												fishing tool.
1300												Building fishing tool.
1600												Will finish building tool for the rest
												of the day - no work will be done
												in the borehole until tomorrow.
1610												Geologist leaves site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 1

Location _____ Project Savage I3

Logged by SS Teel (Print) SS Teel (Sign) Date 7/2/91

Reviewed by _____ (Print) _____ (Sign) Date _____

Measuring Equipment N/A Procedure DO-[illegible] Rev No. 1.0

Drilling Contractor Jensen Drilling

Driller Art Gwin

Rig/Equipment Speedstar SS-15-III Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700		(Fishing tool will consist of a			ft piece of 6" casing that							Driller on site - welding on
		is flared to 10"-dia on one end. The casing will have 3										tool.
0910		baffles welded into it - hopefully the tremmie will thread										Geologist arrives
0930		itself through the baffles and become lodged there. The										Joe Roach arrives with 1000' cable
		casing will be lowered into the hole using the sand line).										for the sand line on the rig.
1037												Calibrate instruments - span set @ 3.68
												to read 56 ppm - same span gas as prev.
1042												Check borehole w/ LEL/O2 + HNU - OK
1100												Alan Pearson takes over for SS Teel
[illegible]												Finish fabricating fishing tool.
[illegible]												Begin changing out sand line
1430												Begin fishing for tremie pipe
1500												Top of tremie appears to be
												@ ~772' bls
1700												Take D/B w/ Geophysical Logging
												truck = 797.2' ⇒ hole has sloughed
												in.

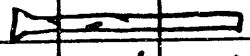
A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 1
Location SE of 200 E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/3/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedster - SS-15 III Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Driller on site
0730												Using magnet to fish for tremie
0830						←	Fishing tool					Calibrate instruments - span set @
			1 — 20' — 1				baffles @ 4', 6', + 8'					4.0 to read 56 ppm.
0845												Check Borehole - OK
0900		Driller has decided to weld the 6" casing with the baffles to a section										
		of drill rod - will go down and try to force the tremie into										
0930		the fishing tool.										Lampson Crane arrives to move pump
												and mud tanks off-site. Equip. was
												released by PNL HPTs yesterday.
0950												Trucks arrive - begin loading
												Art leaves site to get supplies
1200												Crane and trucks leave with pump and
												mud tanks
1230												Art arrives on site - preparing to
												attach fishing tool to drilling rod.
1530												Geologist leaves site. Driller will be
												welding for rest of day - will not
												be working in the bore hole until
												Monday

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DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 1 of 1

Location SE of 200E

Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 7/8/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
0700												Drillers on site - welding on fishing tool
0730												Geologist on site
0745												Calibrate instruments - HNU is
												set @ 4.30 to read 56 ppm.
0755												Check borehole w/ LEL + HNU - OK
1000												Moving rig back over borehole
1100				(Well-Guard used as tool lubricant)								Adding fishing tool and drill rod
1400												Check borehole w/ HNU + LEL/O_2 - OK
1434												Drill rod is resting on tremmie
1445												Add another section of drill rod -
												rotate and go down an additional 20'
												- hopefully the tremie is now inside
												the tool.
1530												Tripping - out of hole
1730												Stop for the day
1740												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 1
Location SE of 200 E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/9/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Drillers on site - pulling drillrod
0730												Calibrate instruments - span of HNU
												set @ 4.30 to read 56 ppm - same
												span gas as previous.
0755												Check borehole w/ HNU + LEL/O2 - OK
0810												Scott McKinnon, Jensen Drilling, arrives on site
0830												Drillrod and fishing-tool out of hole -
												- all tremie is still down-hole.
0840	(waiting for direction as to what approach to take next)											Driller calls his boss to see what to do next
0900												SS Teel informs tech forum
1240												Check borehole w/ HNU + LEL/O2 - OK
												Drillers attaching piece of 10" casing for
												casing hammer to rest on
1430												Attaching casing hammer to rig.
1520	Tech. Forum has decided to go along with the drilling company's recommendation to											Tech Forum reaches decision
1530	cease fishing for the tremie and instead to go ahead and start adding the 6" dia											Preparing to start adding casing
1710	casing. A 5 7/8" dia mill-tooth bit will be used as needed to clean the hole.											Clean-up site
	Informed the driller that we had three main concerns - (1) that the hole be straight											
1745	(a straightness test will be performed at the bottom) (2) that the hole be large enough											Leave site
	to allow as much sand pack as possible around the screen to avoid silting-in, and											
	(3) that the rig and the methods used to lift and hold the casing are adequate.											

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2

Location SE of 200 East Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 7/10/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												All personnel on site
0710												Calibrate HNU to 55 ppm w/ Span set a 3.4
0725												Monitor borehole → OK
0740												Weld on 0.45' long, 0.63' OD drive
												shoe on end of 6" C.S. Casing
												Helper is beveling casing
0815	Carbon Steel	6"	21.09'									Add 21.09' of 6" C.S. Casing w/ Shoe
0845	" "	6"	41.01'									Add 19.92' " " " " w/ Extra Ears
0935	" "	6"	61.11'									Add 20.10' " " " "
1010	" "	6"	82.04'									Add 20.93' " " " "
1030	" "	6"	102.88'									Add 20.84' " " " "
1100	" "	6"	123.80'									Add 20.92' " " " "
1130	" "	6"	143.73'									Add 19.93' " " " "
1200	" "	6"	163.85'									Add 20.12' " " " "
1205												(15) 20' lengths of 6" C.S. Casing
												Delivered to site. Steam Cleaning
												Was witnessed by SS Teel.
												~1000' of 1" tremie pipe also
												delivered.
1300	" "	6"	183.83'									Add 19.98' of 6" C.S. Casing
1410	" "	6"	203.87'		Driller began using casing elevators							Add 20.04' " " " "
1500	" "	6"	223.95'		instead of ears to lift the casing							Add 20.08' " " " "

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2

Location SE of 200 East Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 7/10/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin

Rig/Equipment Speedstar SS-15III Rotary

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1530	Carbon Steel	6"	243.99'									Add 20.04' of 6" Carbon Steel Casing
1600	" "	6"	264.01'									Add 20.02' " " " " "
1630	" "	6"	284.07'									Add 20.06' " " " " "
1650	" "	6"	304.13'									Add 20.06' " " " " "
1710	" "	6"	324.17'									Add 20.04' " " " " "
1730	" "	6"	344.23'									Add 20.06' " " " " "
1750												End of Shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number: 699-32-22B Sheet 1 of 1

Location: SE of 200 East Project: Savage Is.

Logged by: A.W. Pearson (Print) Alan Pearson (Sign) Date: 7/11/91

Reviewed by: (Print) (Sign) Date:

Measuring Equipment: NA Procedure: DO-1,5 Rev No. 1,0

Drilling Contractor: Jensen Drilling Co.

Driller: Art Gwin / Joe Roach (H)

Rig/Equipment: Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Calibrate HNU to 55 ppm w/span 3.4
												& Drillers arrive
0710												Check borehole w/ HNU & LEL => OK
0730												Resume welding joint from yesterday
0800												Welding ears on (7) pieces of casing
0850	Carbon Steel	6"	364.27'									Add 20.04' of 6" C.S. Casing
0910	" "	6"	384.34'									Add 20.07' " " " "
0930	" "	6"	404.35'									Add 20.01' " " " "
0945	" "	6"	424.39'									Add 20.04' " " " "
1120												Weld ears on casing
1130	" "	6"	444.43'									Add 20.04' of 6" C.S. Casing
1150	" "	6"	464.48'									Add 20.05' " " " "
1300	" "	6"	484.53'									Add 20.04' " " " "
1325	" "	6"	504.58'									Add 20.06' " " " "
1430	" "	6"	527.48'									Add 22.90' " " " "
1550	" "	6"	546.61'									Add 19.13' " " " "
1650	" "	6"	566.78'									Add 20.17' " " " "
1715	" "	6"	586.95'									Add 20.17' " " " "
1730												End of Shift.

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number: 699-32-22B
Sheet 1 of 2
Location: SE of 200 E
Project: Savage Is.

Logged by: SS Teel (Print) SS Teel (Sign) Date: 7/12/91
Reviewed by: (Print) (Sign) Date:
Measuring Equipment: N/A Procedure: DO-1.5 Rev No. 1.0

Drilling Contractor: Jensen Drilling
Driller: Art Gwin / Joe Roach
Rig/Equipment: Speedstar SS-15 II / Rotary

Time	Casing/Screen Type	Diameter	Length total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700	Carbon Steel	6"	586.95									Drillers on site
0751	" "	"	607.63									Add 20.58 of 6" C.S. Casing
												Calibrate instruments - HNU span set
												@ 3.71 to read 56ppm.
0840												Check borehole w/ HNU & LEL/O2 - OK
												Ed Enloe on site
												PNL HPTs on site to survey trash'
0855												Ed Enloe / HPTs off site
0900	Carbon Steel	6"	628.09									Add 20.46 of 6" C.S. casing
0940	" "	"	650.86									Add 22.77' of 6" C.S casing
1031	" "	6"	670.80									Add 19.94' of 6" C.S. casing
1130	" "	"	691.58									Add 20.78' of 6" C.S. casing
												Scott McKinnon on site
1150	" "	"	712.48									Add 20.90' of 6" C.S. casing
1245	" "	"	732.48									Add 20' of 6" C.S. casing
1345	" "	"	753.46									Add 20.98 of 6" C.S. casing
												Pat Collier / Vern Chamberlin visit
												site
1410	" "	"	774.48									Add 21.02' of 6" C.S. Casing
1435	" "	"	794.56									Add 20.08' of 6" C.S. Casing

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 2 of 2

Location SE of 200 E

Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 7/12/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach / Scott McKinnon

Rig/Equipment Speedstar SS-15 III Rotary

Time	Casing/Screen Type	Diameter	Length total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1515			794.56									Casing will only go down to 780.86
			-20.08									Will cut off 20.08 and then trip-in
	Carbon Steel	6"	774.48									with drilling tools
1530												Replacing rig's air hoses
1642												Adding drill rod
1730												End of Shift

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 1
Location SE of 200E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 7/15/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III, Rotary

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
	Carbon Steel	6"	774.48									
0705												Art Gwin on site
0715												SS Teel on site
0730												Calibrate instruments - HNU span set
												@ 3.50 to read 56 ppm
0800												Joe Roach arrives
0820												Check borehole w/ HNU + LEL/O_2 meter - OK
1000	Driller needs a special sub in order to trip-in with the drill rod because of											Tripping-in. Bit is new, heavy-duty
	the casing hammer. Call WHC pipe yard to see if they have one, - they don't.											5 7/8" dia, mill-tooth type.
1305	Driller will have one flown-in - it will arrive at 1:30. In the mean time he											Driller leaves for airport
	can begin running drill-rod, but he will need the sub in order to finish.											
1445												Driller returns with sub
1500												Tripping-in
1740												End of shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 2
Location SE of 200 E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/16/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III / Rotary

Time	Casing/Screen Type	Diameter	Length total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
	Carbon Steel	6"	774.48									
1045			+ 20.04									Drillers on site
			794.52									Fixing air hose
1145												Adding casing & drillrod. Added
	" "	"	794.52									20.04 of 6" C.S. casing. Total drill
												rod now ~ 798'.
1255												Calibrate instruments - span set @ 13.50
												to read 56 ppm.
1300												Check borehole w/ HNU + LEL/O2 → OK
1400												Determining how to hold casing during
												drilling
1515												Welding ears on casing
1580												Pat Collier / Vern Chamberlin on site
1550			(Discharge water has a sulfur smell)									Blowing-out hole w/air
1608												Drilling w/air rotary
1620												Casing is advanced to ~ 798' - no sign
												of metal so far. Preparing to weld
	" "	"	794.52									casing.
	" "	"	21.06									Adding 21.06' of 6" C.S. casing
1813	" "	"	815.58									Drilling w/air rotary
												Drive casing 800 - 806' - tight spot at
	" "	"	815.58									~803' that sealed off the water - driller
												thinks its clay.

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/16/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III / Rotary

Time	Casing/Screen Type	Diameter	Length total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
	Carbon Steel	6"	815.58									792 - 806' - no evidence of contact
												w/ tremie pipe
1830												Stopped drilling to move casing elevator
												806 - 810' - casing drops under its own
												weight.
1842												Drilling w/ air rotary
1853												Stop drilling.
												Bottom of 6" casing now @ ~ 813.6
												Have drilled out to ~ 820'
												(Bit can drill ~ 7' ahead of casing)
												No evidence of contact w/ tremie pipe
1915												Leave site

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DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2

Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/17/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar 55-[illegible]

Time	Casing/Screen Type	Diameter	Length Total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700	Carbon Steel	6"	815.58									Drillers on site. Preparing to add
			+20.91									casing.
0745			836.49									Calibrate instruments - HNU span set at
												3.78 to read 56 ppm.
0750												Check borehole - OK
0830												Blowing-out borehole w/air
0835												Cleaning-out borehole
0845	" "	"	836.49									Adding casing and drill rod. Adding 20.91'
			-13.30									of 6"-dia. C.S. Casing
0945			823.19									Drilling w/air rotary
												Casing seems to be stopped @ ~821'
												Bit can drill ~5' ahead of casing
												Driving casing - casing is not moving
												Cycling air flow / Raising & lowering bit
1044												Will cut off stick-up and then drill out
												hole to TD. Don't think drill bit has
												contacted any metal yet, but don't know
												why casing is not following.
1130			823.19									Cut off 13.3' of casing
1143												Blowing-out borehole w/air
1145												Drilling w/air rotary
1150												Appear to be hitting tremie @ 836'
1200												Lunch

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 2 of 2

Location SE of 200 E

Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/17/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen					Annular Fill					Over-lap	Comments
	Type	Diam-eter	Length	Stickup	Depth	Type	Quan-tity	Stickup	Add-on	Depth		
1330												Driller leaves site to attend pre-job meeting for another project. He plans to be back on site around 1630 hrs to perform deviation survey
1630												Geologist on site
1730												Geologist leaves site - driller does not arrive.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SSTeel (Sign) Date 7/18/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Equipment Speedstar SS-15 TH

Time	Casing/Screen Type	Diameter	Length total	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700	Carbon Steel	6"	823.19	2.7	820.49							Drillers on site
												Preparing to run dev. survey
0830												Deviation survey – 0.5° @ 815'
												Spooling line
0930												Tripping-out drill rods
0950												Calibrate instruments – HNU set
												@ 3.80 to read 56 ppm – same span
												gas as prev.
1000												Check borehole – OK
1135									~	836.5		All drill rod out of hole
1145						20-40 Sand	2 bags					Adding 20-40 mesh Colo Silica Sand
												(100-lb bags)
1330										832.2		D/ Sand meas. w/ logging truck
1407										829.4		" " "
1422										829.0		
1430												Welding tabs on screens
1445	10-slot	.42 ID	20.29	(w/bottom plate)								Setting screen. Screens are continuous
	Stainless-steel	.46 OD										wire wrap, threaded joints with
	Screen		20.04									O-rings. OD of packer is 0.52 ft.
			10.04									
			11.0	(w/neoprene packer)								Packer is 0.25' wide, screen starts
												0.6' from top of packer.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2

Location SE of 200E Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 7/18/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Guin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
												Total Screen = 61.32
1640												Screen is set. Removing bail hook
1720												Bail hook out of well. Measuring
												D/Bottom of screen
1750	10-slot screen				829.5							D/screen = 829.5
1805												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Location SE of 200E
Sheet 1 of 2
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/19/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700	Carbon Steel Casing	6"	823.19	2.7	820.49							Drillers on site
0730												Measuring O/screen w/ logging truck
0800	10-slot screen	5"	61.37		829.9							Top of screen is at 768.53
0805												Installing tremie pipe to hold down screen while backpulling casing.
			(Want to have a minimum of 5' overlap between the									
0840			casing and the screen. Therefore want to pull casing									Calibrate instruments. HNU span is set
			to 775' Need to pull casing 45.5'									@ 3.80 to read 56 ppm.
0845												Check borehole - OK
0905												Tremie is installed. 200' of 2" tremie
												attached to the sand line is resting at the
												bottom of the hole.
0950												Pulled casing 1.3', screen has dropped
												to ~ 833.1
												Pull to 817.09; screen @ 832.1
	Casing	6"			816.09							Pull to 816.09', screen @ 831.1
1130												Lunch - let screen stabilize -
												hopefully the hole will backfill below
												the screen
1230												Lowering tremie to hold screen
1316	Carbon steel	6"	815.58	2.2	813.38							Pull casing
1390		6"	815.58	3.3	812.28							Pull casing

A-1800 004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 2 of 2

Location

Project Savage Is.

Logged by SS Teel (Print) SS Teel (Sign) Date 7/19/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
	Carbon Steel Casing	6"	815.58	3.3	812.28							
	10-slot screen	5"	61.37		827.4							Meas. D/screen
												Screen is coming up with the casing.
												Will install a full length of tremie to hold
												it down.
1442												Adding tremie pipe
1620												All tremie in.
1630												Try to pull casing - screen appears
												to be sand-locked to the 6" casing.
1640												Stop and evaluate options
1730												Tentative plan is to use the drill rods to tap
												or hold the top of the screen in conjuction
												with jetting water through the screen.
												Will begin this on Monday
1740												Leave site.

A-1800 004 (05/90)

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DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699 - 32-22B Sheet 1 of ____

Location SE of 200E Project Savage Is.

Logged by AW Pearson / SS Teel (Print) Alan Pearson / SS Teel (Sign) Date 7/22/91

Reviewed by ____ (Print) ____ (Sign) Date ____

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen drilling

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0730	C.S. Casing	6"	815.58	3.3	812.28							SS Teel + Joe Roach on site
0800	S.S. Screen	5"	61.37		827.4'							Art Gwin on site
	Top of Screen @				766.03'							Removing tremie pipe
0945												Tremie removed. Building a nozzle to
												jet the screen to loosen the sand-hitch.
1100												Calibrate instruments. Span set @
												3.58 to read 56 ppm.
1115												Check borehole - OK
1145												AW Pearson arrives on site to relieve
												SS Teel
1300												Attach (5238) of 2" tremie pipe to
												bottom of drill rod, will be used
												to jet screen clear if required
1345												Begin running drill rod (25') lengths
												+ 0.41' adapter (IIII IIII II) = 300.41'
1450												Begin running drill rod (20') lengths)
												(IIII IIII IIII IIII IIII) + 1.4' adapter = 481.40
												Total Drill rod 781.81'
												Top of Screen @ 766.03'
												Should contact Top of Screen when
												s.u. of drill rod = 15.78'
1650					767.50'							Did not feel like rod contacted screen

61.1
60.05
15.78

15.7
3.5
12.3

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2

Location SE of 200 East Area Project Savage Is.

Logged by A. W. Pearson (Print) Alan Pearson (Sign) Date 7/22/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
1655												Contacted top of screen @ 767.5
1700												Try to backpull casing
1730												Have backpulled ~20' of 6" casing
												will measure tommorrow am.
												Screen seems to be staying in
												place.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number: 699-32-22B
Sheet 1 of 1
Location: SE of 200 East Area
Project: Savage Is.

Logged by: A.W. Pearson (Print) Alan Pearson (Sign) Date: 7/23/91
Reviewed by: (Print) (Sign) Date:
Measuring Equipment: NA Procedure: DO-1.5 Rev No. 1.0

Drilling Contractor: Jensen Drilling Co.
Driller: Art Gwin
Rig/Equipment: Speedstar SS-15111

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Calibrate HNU 55 ppm w/span @ 3.6
0715												Resume Backpulling 6" C.S. Casing
0830	Carbon Steel	6"	794.58'	2.8'	791.78'							Cut 21.0' of 6" C.S Casing
0920	Top of Screen	5"	61.37'	NA	772.6'							Tag top of Screen w/ Drill Rod
	Bottom of Screen	5"	61.37	NA	833.97'							∴ Set D/R 6" Casing @ 777.6'
1015	Carbon Steel	6"	779.88	2.2'	777.68							Cut 14.7' of 6" C.S. Casing
1045												Begin pulling drill rod.
1400												Try to run TV Camera to
												inspect screen => Water is too turbid
1430												Run Geophysical Logging tool down
	Top of Screen	5"			772.0'							borehole. Tagged Top of Screen
	Bottom of Screen	5"			833.1							& bottom of Screen = Measurements
												may be slightly off.
1510												Talked w/ Mickie Chamness =>
												decided to run 3/4" tremie on
												outside of the 6" C.S. Casing
												then examine screen w/ Camera
												tomorrow am
1545												Begin running 3/4" tremie pipe
1730												End of Shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22 Sheet 1 of 1

Location SE of 200 East Area Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 7/24/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1, 5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0710												Calibrate HNU 55ppm w/Span @ 3.1
0720												Check borehole OK
0725												Prepare to run TV Camera
0800												Water is still too turbid to
0815	Tremie Pipe	3/4"	672'	2.0	670'							view w/ TV Camera
	Top of screen	5"	61.37	NA	772.6							(32) pieces of 21' long 3/4 in
	Bottom of screen	5"	61.37	NA	833.97							tremie pipe have been placed
	Carbon Steel	6"	779.88	2.2	777.68	(5.1' overlap)						in annulus = 652' total
0900												Preparing to set submersible pump
0930												SS Teel on site, AW Pearson leaves
1000												Setting submersible pump - same
												pump that was previously used.
												(5HP Gruntos, 25 stage)
1200												Pump is set @ 504'
												Attempt to meas. down tremie -
												rod is too thick - change to 5/8"
												rod
1400												Can only get down to 700' - stuck
												on a centralizer - will move
												casing to free it
1730												Probe and line are out of hole.
												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2
Location SE of 200E Project Savage Is

Logged by AW Pearson / SS Teel (Print) Alan Pearson / SS Teel (Sign) Date 7/25/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Joe Roach
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0800	Tremie Pipe	3/4"	672'	2.0	670.0							Driller picking-up cable at Columbia
	Top of screen	5"	61.37	NA	772.6							Rigging Co.
0900	Bottom of screen	5"	61.37	NA	833.97							Driller on site - changing sand line
	Carbon steel	6"	779.88	2.2	777.68	(5.1' overlap)						to use 3/16" dia cable. We will use this
	5HP Pump	NA	NA	NA	504'							line instead of the logging truck to
												measure in with. The cable on the logging
												truck has a tendency to kink too easily.
1000												Calibrate instruments. Span is set at
												2.18 to read 56 ppm. Span gas lot # 28627
1005												Check borehole w/ HNU + LEL/O_2 - OK
1030												Measuring-in sand line
1115	Bottom of hole					—				806.5		D/Bottom = 806.5
1135	(measurable)											Sand line out of hole - preparing to
												add sand.
1326												Pump on (Flowmeter 82420)
												20 gpm
1334												D/water 150'
1335						Sand 20-40	8 bags			—		Adding Sand (pumping 15 gpm)
												(Colo. Silica Sand, 100 lb bags)
1430												Alan Pearson takes over for SS Teel
1500												Increase PUMP rate to 20 gpm
1610												Finished adding Sand

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699 - 32 - 22B Sheet 2 of 2

Location SE of 200 East Area Project Savage Is.

Logged by AW Pearson (Print) Alan Pearson (Sign) Date 7/25/91

Reviewed by (Print) (Sign) Date

Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Ewin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1655												Tried to take D/W=? Tape was
												sticking to sides of tremie pipe
1650										756.0		take D/B = 756.0' (Sand may
												have bridged
1700												Increase pump rate to 35 gpm
1705												Will pump @ 30 gpm & run
												water down tremie until end
												of shift then take D/B tommorow
												AM.
1730												Shut off pump 86980 gal.
												End of shift.

A-1800 004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22 Sheet 1 of 2

Location SE of 200 East Area Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 7/26/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Casing/Screen Diameter	Casing/Screen Length	Casing/Screen Stickup	Casing/Screen Depth	Annular Fill Type	Annular Fill Quantity	Annular Fill Stickup	Annular Fill Add-on	Annular Fill Depth	Overlap	Comments
0700												Calibrate HNU @ 55 ppm w/ Span @ 2.95
0710												Check borehole => 0ppm w/ HNU &
												21.8% O_2 & 0% LEL w/ MSA
0715												Take D/W = 113.0' b/s
0800										744.0		Take D/B = 744.0' b/s => Bridge!
0820												Take D/B = 776.0 b/s => Sand @
												Top of Interbed - Sand was not
												bridged but had difficulty getting
												weight past the centralizers
0845												Move 6" C.S. casing up & down to free
												any sand that may be caught in annulus
0850												Start pump / flow meter not attached
												~30 gpm
0905								2.6'	0.0'	790.0		Take D/B = 790.0'
0925												Attach flow meter 86980 gal (25 gpm)
0930						20-40 mesh	(3) bags					Add (3) 100 lb. bags sand
1010												Finished adding sand - Let settle.
1040												Increase pump rate to 35 gpm
1050												Move casing up & down to help sand
												settle
1130												Take D/B 763.5
1140												Move Casing up & down

A-1600-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22 Sheet 2 of 2

Location SE of 200 East Area Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 7/26/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin / Joe Roach

Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1240												Try to take D/B, cannot get weight to bottom
1305												Move casing up & down
										759.5		Take D/B = 759.5' bls
1445	S.S. Screen	5"	61.37'		836.0'							Take D/B inside screen = 836.0'
1525												Take D/W = 250.6 (Have been pumping continuously for 6.5 hrs @ ~35 gpm
												Water appears to have cleaned up considerably since this AM.
1550										764.4'		Take D/B = 764.4' bls sand settled
1600	Carbon Steel	6"	779.88	1.2'	778.68							Drop 6" C.S. Casing 1.0' to give extra overlap w/ screen.
1630												Turn off Pump.
1700												End of shift.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/29/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Driller getting badge for helper
0845												Measure D/sand
0900		(There is a big difference between the D/sand measured										D/sand ~ 815'
0910		today and Friday. Sand must have been bridged at ~ 809'										D/sand ~ 803.5'
		and over the weekend it worked down past the tight spot										
		there as shown on the caliper log. Will add 3 more bags of										
		sand).										
						80-40 Sand	—			803.5		
0940	Top of screen	5"	61.37	—	774.63	"	3 bags					Adding sand; pumping @ 20gpm
	Carbon Steel	6"	779.88	1.2	778.68							Water was initially dirty but cleared
	10-Slot Screen	5"	61.37	—	836.0							up to be visually clear. Will allow
												sand to settle for an hr and then
												remeasure.
1055												Increase to 30 gpm
1115												D/sand ~ 735' - must be bridged
1120												Pump off
1125												Calibrate HNU + LEL/O_2 - span set
												@ 1.80 to read 56 ppm
1130												Check Borehole - OK
1200												D/sand ~ 770'
1315												D/sand = 770'
1316												Pump on

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 2
Location SE of 200E Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/29/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin
Rig/Equipment Speedstar SS-15 III

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
	Top of screen	5"	61.37	—	774.63							Water is slightly turbid but contains no
	Carbon steel	6"	779.68	1.2	778.68							sand.
	10-Slot screen	5"	61.37	—	836.0							
												Cannot get to bottom
1350												Pump off
1410												Pump on
1425												Cannot get past 750' - will move
												casing 0.1 ft to try to break bridge
1615												Still cannot get past 750'
												Preparing to meas. D/Bottom of screen
1530	10 slot screen	5"	61.37	—	833.5							D/Bottom of screen ~ 833.5
1610												D/sand ~ 760?
1720												D/sand = 760?
												Will measure again in the morning
1730												Leave site

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 1
Location SE of 200E
Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 7/30/91
Reviewed by (Print) (Sign) Date
Measuring Equipment drill rig sand line Procedure DO-1, DO-5 Rev No. 1, 0

Drilling Contractor Jensen Drilling
Driller Art Gwin, Rod
Rig/Equipment SS 15 III, rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
710												Geologist on site
725						sand pack				772.2'		Want sand pack at 768' or above
735												Calibrated HNU w/span at 3.4 to 55 ppm,
745						20-40 silica sand	1 bag					0 ppm reading, LEL ok
915												Totalizer on flow meter [illegible] accurate, will have to assume flow rate is a max of 37.5 gal/min measured w/ 5 gal bucket. Probably 10-15 gal/min less when running water down borehole
920												Tried several times to tag top of sand, sand is slowed up at 750', like yesterday. Will add some fine sand and probably let it settle the rest of the day.
945						40-100 silica sand	~1/2 bag					
1040												Will let sand sit for rest of day, measure top first thing in morning.
1050												Geologist left site.

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 1 of 2
Location SE of 200 E
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/31/91
Reviewed by (Print) (Sign) Date
Measuring Equipment Drilling sand line Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Rod Nordquist
Rig/Equipment SS-15 III, rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Drillers on site
0730						40-100 sand	—	—	—	760.8		D/sand = 760.8 - preparing to mix bentonite slurry.
0805												Calibrate HNU + LEL/O_2. Span for HNU set @ 3.04 to read 56 ppm
0810												Check Borehole - OK
0845						crumbles 8-20	1-50lb Bag	—	—	—		Pump 1 batch slurry, wt = 9.0 lb/gal
						water	35 gal			—		
0915						Hydrogel	80 lbs					Pump Bentonite slurry, wt = 8.8 lb/gal
						water	70 gal					(using well water to mix slurry)
1000						Hydrogel	70 lbs					Pump slurry, wt = 8.8 lb/gal
						water	70 gal					
1045						Hydrogel	70 lbs					Pump slurry, wt = 8.8 lb/gal
						water	70 gal					
												Note: well was pumped yesterday from 7:30 to 2:30 and 4:30 to 5:30 to settle the sand pack.
1130						Hydrogel	70 lb					Pump slurry; wt = 8.8 lb/gal.
						water	70 gal					
1200						Hydrogel	70 lb					Pump slurry; wt = 8.9 lb/gal
						water	70 gal					
1230												Remove 2 joints of tremie

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B
Sheet 2 of 2
Location SE of 200G
Project Savage Is

Logged by SS Teel (Print) SS Teel (Sign) Date 7/31/91
Reviewed by (Print) (Sign) Date
Measuring Equipment N/A Procedure DO-1, 5 Rev No. 1.0

Drilling Contractor Jensen Drilling
Driller Art Gwin / Rod Nordquist
Rig/Equipment SS-15 III, rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
												SHP pump off @ 1235
1350	Tremie pipe	3/4"	630'	2.7	627.3	Hydrogel	70 lbs	(Wt = 8.8)				Pumping slurry. D/water inside annulus
						Water	70 gal					was 121.3 and recharging before pumping
												slurry. D/water inside annulus was ~100'
												after pumping slurry. When SHP pump
												was turned on, WL began dropping again.
1445						Hydrogel	70 lbs	(wt. = 8.9)				(Using Moyno pump to pump slurry. SHP
						Water	70 g[illegible]					pump is being used to supply make-up
												water.)
1500												SHP Pump on
1510												SHP Pump off
1515	Tremie	3/4"	567'									Remove 3 lengths of tremie
1540						Hydrogel	70 lbs					Pump slurry, wt = 8.9
						Water	70 gal					
1600	Tremie	3/4"	441'									Remove 6 lengths of tremie
1645						Hydrogel	70 lbs					Pump slurry; wt. = 8.8
						Water	70 gal					
1650	Tremie	3/4"	399'									Remove 2 lengths of tremie
1700												Pumping water to clean-out tremie
1715												Leave site

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 3

Location SE of 200 E Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 8/1/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin / Rod Nordquist

Rig/Equipment Speedstar SS-15III, rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0700												Calibrate HNU=55ppm w Span @ 2.90
0705												Check borehole - OK
0715												Take D/w = 114.5' bls
0720												Take D/w in annulus = 116.5' bls
0730												Begin mix slurry / use H_2O from Water Tank
0805						Hydrogel	70 lbs					Pump slurry; wt. = 8.9 D/w before 116.5'
						Water	70 gal					D/w after = 92.5'
0830						Hydrogel	70 lbs					Pump slurry; wt = 8.8 D/w before = 104.6'
						Water	70 gal					D/w after = 77.1'
0850						Hydrogel	70 lbs					Pump slurry; wt = 8.9 D/w before = 90.9'
						Water	70 gal					D/w after = 62.0'
0905						Hydrogel	70 lbs					Pump slurry; wt = 8.8 D/w before = 70.0'
						Water	70 gals					D/w after = 47.4'
0925						Hydrogel	35 lbs					Pump slurry; wt = 9.0 D/w before = 58.7'
						Water	35 gal					D/w after = 50.7 only pumped ½ batch
												(slurry too thick)
0940						Hydrogel	60 lbs					Pump slurry; wt = 8.8 D/w before = 55.7'
						Water	60 gal					D/w after = 34.4'
1000						Hydrogel	70 lbs.					Pump slurry; wt = 8.9 D/w before = 45.7'
						Water	70 gal					D/w after = 21.0'

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 2 of 3
Location SE of 200E Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 8/1/91
Reviewed by (Print) (Sign) Date
Measuring Equipment NA Procedure DO-1,5 Rev No. 1,0

Drilling Contractor Jensen Drilling Co.
Driller Art Guin / Rod Nordquist
Rig/Equipment Speedstar SS-15 III, Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1020						Hydrogel	70 lbs					Pump Slurry; wt=8.8 D/W before=29.5'
						Water	70 gal					D/W after=5.0'
1040						Hydrogel	70 lbs.					Pump Slurry; wt=8.8 D/W before=21.0'
						Water	70 gal.					D/W after=Water to surface ~after
												1/2 batch pumped
1110						Hydrogel	70 lbs.					Pump Slurry; wt=8.8 D/W before=10.5'
						Water	70 gal					D/W after=surface
1135						Hydrogel	70 lbs					Pump Slurry; wt=8.8 D/W before=10.8'
						Water	70 gal.					D/W after=surface
1155						Hydrogel	70 lbs.					Pump Slurry; wt=8.9 D/W before=5.0'
						Water	70 gal					D/W after=surface
1320	tremie	3/4"	210"									Remove (9) pieces of 3/4" tremie
1335						Hydrogel	70 lbs.					Pump Slurry; wt=8.8 D/W before=18.0'
						Water	70 gal.					D/W after=surface
1355						Hydrogel	70 lbs					Pump Slurry; wt=8.9' D/W before=3.3'
						Water	70 gal.					D/W after=surface
1410						Hydrogel	70 lbs					Pump Slurry; wt=8.8' D/W before=2.5'
						Water	70 gal.					D/W after=surface
1425						Hydrogel	70 lbs					Pump Slurry; wt=8.8 D/W before=2.0'
						Water	70 gal					D/W after=surface
1445						Hydrogel	70 lbs					Pump Slurry; wt=8.8 D/W before=3.0'
						Water	70 gal					D/W after=Surface

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 3 of 3

Location SE of 200E Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 8/1/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.

Driller Art Gwin / Rob Nordquist

Rig/Equipment Speedstar SS-15III, Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1505						Hydrogel	70 lbs.					Pump Slurry; wt=8.9 D/W before=3.0'
						Water	70 gal.					D/W after = Surface
1540						Hydrogel	70 lbs.					Pump Slurry; wt=8.8 D/W before=4.1'
						Water	70 gal.					D/W. after = Surface
1555						Hydrogel	70 lbs.					Pump Slurry; wt=8.8 D/W before=0.0'
						Water	70 gal.					D/W after = Surface
1610						Hydrogel	70 lbs.					Pump Slurry; wt=8.9 D/W before=0.0'
						Water	70 gal.					D/W after = Slurry to surface
												Will let slurry settle then pump
												cement grout tommorrow.
1715												Take D/Tag of Slurry = 2.0'
1720												Take D/W inside 6" = 103.0'
1730												End of Shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number: 699-32-22B
Sheet 1 of 1
Location: SE of 200E
Project: Savage Is

Logged by: A.W. Pearson (Print) Alan Pearson (Sign) Date: 8/2/91
Reviewed by: (Print) (Sign) Date:
Measuring Equipment: NA Procedure: DO-1.5 Rev No. 1.0

Drilling Contractor: Jensen Drilling Co.
Driller: Art Gwin / Rod Nordquist
Rig/Equipment: Speedstar SS-15III, Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
1510												Take D/W = 110.0'
1525												Take D/top of Slurry = 20.5'
1530	Tremie	3/4"										Remove tremie (10) 21' pieces.
												Clean slurry out of (1) 21' pieces
												of 3/4" tremie - Will be used
												for cement grout
1630						Type I & II						Mix cement grout
						Portland						
						Cement	(6) 94	lbs. bags				
						Water	(45) gal					
						Hydrogel	12 lbs					
1700												Pour Grout
1710												Take D/B Grout ~ 14.0' grout must
												have settled slightly into slurry
1720												No additional cement on site will
												have to finish grouting on
												Monday
1730												End of Shift

A-1800-004 (05/90)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B Sheet 1 of 1
Location SE of 200E Project Savage Is.

Logged by A.W. Pearson (Print) Alan Pearson (Sign) Date 8/5/91
Reviewed by (Print) (Sign) Date
Measuring Equipment NA Procedure DO-1.5 Rev No. 1.0

Drilling Contractor Jensen Drilling Co.
Driller Art Gwin
Rig/Equipment Speedstar SS-15III / Rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
0900												Take D/B = 53.0' Will add 8-20 mesh
												Bentonite Crumbles to fill annulus
												to ~20' bls
0910						8-20 mesh	(11) bags			21.0'		Add Crumbles (53.0'-21.0')
0930						Type I&II						Mixing Cement grout
						Portland						
						Cement	(5) 94 lb. bags					
						Water	(55) gal.					
						Hylrogel	(10) lbs.					
0935												Take D/W = 110.0' bls.
1000												Pour Grout
1025												Take D/Top of Grout 0.7' It
												may settle more (will check D/G
												again before pouring surface pad.
1045												Geologist off site - Driller will
												break down rig & clean site the
												rest of the day.

A-1800 004 (05/90)

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DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 1 of 1

Location SE of 200E

Project Savage Island

Logged by MA Chamness (Print) MA Chamness (Sign) Date 8/9/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure DO-1, DO-5 Rev No. 1,0

Drilling Contractor Jensen Drilling

Driller Art Guin

Rig/Equipment SS 15 III, rotary

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Stickup	Add-on	Depth	Overlap	Comments
												Geologist didn't find out until today that the concrete pad was poured on 8/6/91. All information is from the driller.
						Premix concrete	19.5 gal			2'		Filled to depth of ~2', poured pad. Set 10" protective casing in concrete, placed brass marker in pad.
						Premix concrete	16 gal					Set posts in concrete.

A-1800-004 (05/90)

DRILL LOG	By: D.R. Newcomer	Rig	Well Number: 699-32-22B	Computer Number	Project or Work Order No.
	Date: 17 Oct 91		Depth: To		Subcontract No.

Total Casing	Depth	Drill Method	Wet/Dry Sample	LITHOLOGIC DESCRIPTION % Each Grain Size, Color, Roundness, Caliche, Etc.	Time	Drilling Comments
				Arrived at Well Site 699-32-22B	1300	
				Begin pulling pump out of hole	1305	2 Kaiser drillers removed pump → one is Kelly Olsen
				Sample of water in discharge line (7th ~~20~~ 21-ft DRN length)	1330	Water is greenish-brown color
				Driller said pump is coming out fine		Water came out of 4th riser pipe (Check valve on pump)
				A little bit of Green mud on outside of 8th length of riser pipe	1338	
				10 lengths of ~~20~~ 21-ft DRN pipe have been removed thus far	1350	
				Greenish mud is visible at ~~each~~ some of the DRN pipe joints		
				21 lengths of 21-ft pipe + pump pulled	1445	All pipe is black
				Pump looks clean, greenish-black mud sample taken from 2nd to last	pipe length	
				Leave site (cap put on well)	1450	
				Pump was set at 21×21 + 5 = 446' below top of casing		
				Dark Greenish-colored mud was on some of the pipe joints below the water level in the well.		
				Appears to have been a stringer of mud down the last 2 or 3 pipe lengths, (i.e. mud on one		
				side of pipe down DRN most of its length). Mud was ~~[illegible]~~ DRN on other pipe lengths above,		
				however, was very minor amounts (not enough to obtain a sample). Most of the mud sample was		
				taken from 2nd to last pipe. Used jar lid to scrape it off pipe. It appears that most of		
				the pipe was clean. Pump was very clean with no visible sediment or green mud.		

REMARKS:

D - Drive Barrel H - Hard Tool L - Large M - Medium S - Small VC - Very Coarse C - Coarse F - Fine VF - Very Fine ____ Standing Water

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DAILY BOREHOLE /WELL COMPLETIONLOG

Boring or Well Number 699-32-22B. Sheet 1 of 1

Location

Project Savage Island

Logged by Alan W. Pearson (Print) Alan Pearson (Sign) Date 10/18/91

Reviewed by (Print) (Sign) Date

Lithograph Classification Scheme NA Procedure GL-3, GL-7, GL-12 Rev No. ØØØ

Measuring Equipment NA

Drilling Contractor Jensen Drilling

Driller Art Gwin

Rig/Equipment

Time	Casing/Screen Type	Diameter	Length	Stickup	Depth	Annular Fill Type	Quantity	Depth	Overlap	Comments
1030										Arrive at site set-up
1045										Begin TV Survey GL-12 Rev.Ø
										0-120' (depth is 1.0' high on
										Video Tape)
										Too Turbid to see into water.
										Begin Gross Gamma Logging
1130										D/R = 831.0' Logged 831.0'-2.6'
										Bentonite Slurry on tool & Centalizer
										Begin Caliper Logging
1330										D/R = 831.0'
										Logged 829.0' - 750.0'
										829.0' - 520.0'
										630.0' - 4.0'
										Tool hung up going down
										@~772 (packer above screen)
										Bentonite on Tool.
1545										End Caliper Logging - Clean-up
1610										Leave site.

A-1800-004 (10/89)

DAILY BOREHOLE/WELL COMPLETION LOG

Boring or Well Number 699-32-22B

Sheet 1 of 1

Location

Project Savage Island

Logged by Alan W. Pearson (Print) Alan Pearson (Sign) Date 10/21/91

Reviewed by (Print) (Sign) Date

Measuring Equipment NA Procedure GL-15 Rev No. Ø

Drilling Contractor Jensen Drilling

Driller Art Gwin

Rig/Equipment

Time	Casing/Screen					Annular Fill					Over-lap	Comments
	Type	Diameter	Length	Stickup	Depth	Type	Depth	Stickup	Quantity	Add-on		
1030												Arrive at site - set up
1100												Sample 115'
1130												Sample 620'
1200												Sample 820' Noticed a
												small piece of green
												bentonite-looking stuff
												on sample after 820'
												Sample was taken.
												Sampler was rinsed twice
												w/ DI Water before
												each sample was taken.
1230												Leave site.

Appendix B

Design Field Changes and Nonconformance Reports

DESIGN FIELD CHANGE		DFC No. Savage Island-2
TASK NO. 5	PROJECT TITLE Ground-Water Surveillance\ 11246 Savage Island Well Installation Activity	FINAL APPROVAL DATE

DOCUMENTS AFFECTED - Geologist's logs.

DESCRIPTION OF CHANGE - The DO-1 procedure will not be followed in all ways for the two mud/air rotary wells being drilled for the Savage Island Project.

1. The depth to bottom and the depth to water cannot be measured every day because the drilling heads and/or mud block access to the borehole. Depth to bottom is estimated using the length of the drill tools until then.
2. The cuttings are not being surveyed for hazardous or radioactive constituents, although the borehole is surveyed twice a day for hazardous constituents and once a week for radioactive constituents.
3. Sedimentary structures and odor cannot be detected and described. Mineralogy, roundness, color, HCl reaction, and/or consolidation can only be described sometimes.

DISTRIBUTION
RW Bryce
MA Chamness
TJ Gilmore
GV Last
SP Luttrell
DL Stewart
SS Teel

JUSTIFICATION - The mud rotary drilling method uses a rotating bit to grind up sediments, and mud or air is used to bring the cuttings to the surface. The mud is used instead of casing to prevent the sides of the borehole from collapsing. It also prevents water from entering the borehole, and is too thick to measure depth to bottom through. The drilling process makes the samplesnot representative for several parameters normally detected and described. Where possible, the samples will be described fully.

REMARKS - This Design Field Change does not affect the quality of the data collected. It is meant to indicate those areas where a procedure cannot be followed due to the method of drilling.

INITIATOR/AUTHOR	PHONE	ORGANIZATION	DATE
M. A. Chamness MA Chamness	376-1964	Site Assess.	3/6/91

APPROVALS

PROJECT MANAGER	QAD REPRESENTATIVE
TJ Gilmore TJ Gilmore	DL Stewart D. L. Stewart 3/13/91
SENIOR TECHNICAL REVIEWER GV Last GV Last	

DEFICIENCY REPORT

1. DR #:	2. Date:	3. QA Plan #:
91-047	6/26/91	EES-059
4. Impact Level:	**5. Project/Activity #:**	**6. Section #:**
II	11246/WBS05	D7081

7. PROJECT/ACTIVITY TITLE:
Ground-Water Surveillance Project/Confined Aquifer Off-Site Migration Well Installation-Well 699-32-22B

7a. CLIENT NAME:
DOE

8. REQUIREMENT AND SOURCE OF REQUIREMENT:
(Document #, Revision, and Title)
KEH-5236, General Requirements for contract number KEH-5236
Two characterizations wells at Savage Island and 600 Area Hanford Site.

9. DESCRIPTION OF DEFICIENCY: During installation of 6-inch casing into the open borehole, an attachment to the casing, by which the casing is held and lowered into place, broke. As a result, the casing string dropped to the bottom of the borehole. This 6-inch casing was not to be dropped nor set to the bottom of the borehole. Further, the casing may have been damaged.

10. NCR Required? Yes ___ No ___

NCR # To be determined

11. [signature] 6/27/91
Originator's Signature/Date

12. EVALUATION AND CORRECTIVE ACTION:
a. CAUSE OF DEFICIENCY:
Insufficient strength of casing support, resulting in the support breaking off.

13a. Criteria #	13b. Def. Code	13c. Cause Code	13d. Sig. Category
7	W	X	IV

12b. EFFECT OF DEFICIENCY ON VALIDITY AND INTEGRITY OF RESULTS:
[ ] None [X] Unknown [ ] Some [ ] Significant

Explain:
It has not been determined if the casing was damanged when it hit the borehole bottom.

12c. IF SOME, SIGNIFICANT, OR UNKNOWN EFFECT; IDENTIFY RESULTS EFFECTED (or potentially effected):

Casing may have been bent, or weld(s) may have been broken

12d. ACTION TO CORRECT DEFICIENCY: Casing will be removed and inspected, borehole will be inspected with either a camera or caliper log, and non-damaged casing will be reinstalled.

12e. ACTION TO PRECLUDE RECURRENCE: Drilling subcontractor will be required to provide an improved method to support the casing or take additional necessary precautions to prevent recurrence.

Expected Completion Date: July 30, 1991

12f. CONTACT CLIENT? Yes [X] No [ ]

If Yes:

Contacted: R. D. Hildebrand (Name) On: 6/24/91 (Date)

By: R. W. Bryce (Name)

CLIENT'S RESPONSE:
Client requested to be kept up to date with progress.

12g. [signature] 7/2/91
Cognizant Manager Signature/Date

12h. [signature] 7/8/91
PQD Representative Signature/Date

14. Closeout/Corrective Action Complete:
Comments:

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PQD Rep.
Cog. Mgr.

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7/9/93