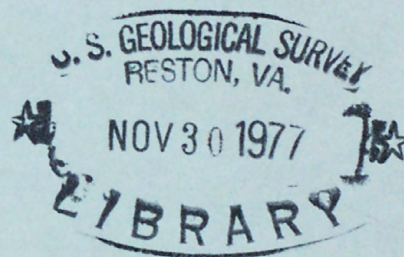


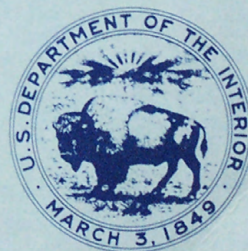
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RECORD OF GROUND-WATER EXPLORATION
AND DEVELOPMENT, 1975-76, MOEN, TRUK,
EASTERN CAROLINE ISLANDS

U.S. GEOLOGICAL SURVEY
OPEN-FILE REPORT 77-739



PREPARED IN COOPERATION WITH THE
TRUST TERRITORY OF THE PACIFIC ISLANDS
SEPTEMBER 1977



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RECORD OF GROUND-WATER EXPLORATION
AND DEVELOPMENT, 1975-76, MOEN, TRUK,
EASTERN CAROLINE ISLANDS

By Dan A. Davis ^{ial nthan} 1913- (LL)

✓ U.S. GEOLOGICAL SURVEY [Reports Open file series]

Open-File Report 77-739



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Prepared in cooperation with the
Trust Territory of the Pacific Islands

September 1977

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ILLUSTRATIONS

Figure 1. Map of Moen, Truk, Eastern Caroline Islands,
showing locations of test holes and wells

drilled in 1975-76 ----- In pocket

RECORD OF GROUND-WATER EXPLORATION AND DEVELOPMENT, 1975-76,
ON MOEN, TRUK ISLANDS, EASTERN CAROLINE ISLANDS

By Dan A. Davis

SUMMARY

The ground-water exploration and development program consisted of the drilling and testing of 22 test holes on the island of Moen and the conversion of 8 of the holes into producing wells. Records compiled in this report on the work include running descriptions of the drilling and testing of the test holes and details of the construction and testing of the finished wells. All test holes and wells were drilled in volcanic rock and weathering products of volcanic rock.

Depths of test holes ranged from 53 to 200 feet. Yields of water from the holes ranged from zero to about 60 gal/min (gallons per minute). Typically, drawdown of water level during pumping was large in the holes. In most, the specific capacities were 1 gal/min/ft (gallons per minute per foot) or less. The highest specific capacity was 8 gal/min/ft at a pumping rate of 48 gal/min.

Pumping-test rates among the completed wells ranged from 15 to 60 gal/min, and specific capacities from $3/4$ gal/min/ft at a rate of 35 gal/min to 6 gal/min/ft at 60 gal/min. The chloride concentration in water from one well was 120 milligrams per liter and less than 50 milligrams per liter in the other 7 wells.

INTRODUCTION

Scope of the exploration and development program.--The exploration for and development of ground water described in this report consisted of the drilling and testing of 22 holes and the conversion of 8 of the holes into production wells on the island of Moen, Truk Islands, in the period November 1975 to July 1976. Drilling and testing were done by Ted Lund Drilling and Supply, a company based on the island of Guam, under a contract administered by the headquarters office, Department of Public Works, Trust Territory of the Pacific Islands. The U.S. Geological Survey, under a cooperative agreement covering broad studies of water resources in the Trust Territory, gave assistance in selecting sites for drilling, in preparing the technical provisions of specifications covering the drilling and testing, in the collection of records as the work progressed, and in the compilation and presentation of the records in this report. The objective of the program was to find sources of water to provide an improved supply for the reservoirs and pipelines of the Moen water system.

Purpose and scope of report.--It is the intent in this report to preserve and present information on ground water in Moen that was collected during the drilling program on the island; to give information that will aid Public Works officials of Truk in the future operation and maintenance of the wells completed in the program; and to give information on drilling conditions and drilling methods and on construction and performance of wells that will be useful to engineers and contractors in the design and execution of future drilling projects in the Truk Islands, or in other islands having volcanic terranes similar to those of Moen.

The bulk of the report consists of records collected at the drilling sites during drilling and testing. Given for each test hole are a running description of the drilling operation, which, in some parts, are in considerable detail; a record of development of the hole; a record of each pumping test; and a log of the hole giving a summary description of rock units penetrated by the bit. For wells, there are records, where they are available, of the reaming of test holes to production-well diameter; data on such construction features as casing, screens, gravel pack, and grout seal; and records of pumping tests. In addition to the detailed information described above, tabular summaries give important features of construction and performance of each hole and well.

Locations and numbers of test holes and wells.--The map of figure 1 shows the locations of the test holes and wells on Moen. Records of the holes and wells give for each a brief locality description and provide space for eventual designation of location by map coordinates. Coordinates can be determined after an adequate map of Moen becomes available.

The test holes are numbered in the order that they are drilled. Numbers of wells were assigned by the Public Works Department of the Truk District and are the numbers used in the Department's files and drawings.

Conversion factors.--Listed below are factors for converting English units used in this report to metric units.

<u>Multiply English</u>	<u>By</u>	<u>To obtain metric unit</u>
foot (ft)	0.3048 . . .	meters (m)
inch (in)	25.4	millimeters (mm)
mile (mi)	1.609 . . .	kilometer (km)
square mile (mi ²)	2.590 . . .	square kilometer (km ²)
gallon (gal)	3.785 . . .	liter (L)
cubic foot (ft ³).	0.2832 . . .	cubic meter (m ³)
gallon per minute (gal/min)	0.06309	liter per second (L/s)

Acknowledgments.--The cooperation of the District Administrator of the Truk District, Mr. Mitaro S. Danis, and the various offices of his administration greatly helped in the work covered here. Mr. Tosiwo Irons, Land Management Officer of the Truk District, and his staff gave essential information and help regarding access to sites for drilling. The District Director of Public Works, R. D. Rustin, and William Miller, Chief of Utilities in Public Works, extended many courtesies and were continuously helpful in providing round-the-clock transportation and other necessary items of logistic support. The Geological Survey representative in Truk, Carmelo Sam, gave long hours of faithful service on the project in addition to the time required in his regular job of stream gaging in the Truk Islands. Special thanks go to Ted Lund, contractor and driller, and his assistants, Garrett Chapman and Bensy Ewar, for their help in the collection of good records, which they gave willingly and cheerfully, regardless of the hour of the day or the state of the weather.

At the headquarters office of the Department of Public Works, Louis F. Irving and Wilfred C. Gilbert gave useful advice and assistance in the preparation of specifications and in other planning phases of the drilling program and provided welcome counsel and oversight in the course of actual drilling and testing.

I am grateful to Joan A. Hirai and Violet Ansai for their careful work in the compilation and typing of this report.

CHARACTER OF THE ROCK OF MOEN

The dry-land area of Moen is about 7.2 square miles. The bulk of the island is composed of volcanic rock. It is mountainous and mostly in steep slopes that descend abruptly to sea level along most of the shore, except along the western side where the slope merges into a coastal flat a quarter to half a mile wide. The flat is underlain by alluvial deposits eroded from the mountain, calcareous beach deposits, and freshwater swamp deposits. The volcanic rocks are basalt, andesite, and volcanic breccia, which, in general, are in thick, dense, poorly permeable beds (Stark and others, 1958).

Except in quarries and other excavations and in the steepest slopes, the volcanic rock is deeply weathered and is concealed by thick covers of soil and vegetation. In a study in the Truk Islands in 1959, K. J. Takasaki (Valenciano and Takasaki, 1959) noted that the unweathered volcanic rock yielded little water to wells and springs because of the low permeability of the fresh material. He pointed out that the greatest yields of water are from weathered zones in the volcanic materials. The performance of test holes and wells in the work described here is consistent with Takasaki's observations.

TEST HOLES

Methods of drilling and testing.--All drilling was done by the hydraulic rotary method using a Failing Holmaster^{1/}drilling machine. Where possible, drilling was done without the use of commercial drilling mud, and cuttings were removed from the hole by compressed air or by air and water. Each test hole was begun with an 8-inch rotary rock bit and drilled to a depth suitable for installing a 6-inch conductor pipe, generally to a depth of about 20 feet. Below the 6-inch pipe, drilling proceeded with a 5-inch or 5-5/8-inch rotary rock bit to the total depth. The test holes were cleaned and developed with an airlift pump consisting of a 2-inch eductor pipe and a 1-inch exterior air line. Discharge of the pump could be controlled to some degree with a quick-opening valve at the top end of the eductor pipe and by varying the speed of the air compressor. Pumping tests on the test holes were made with the same airlift pump. Chloride concentrations in water were determined by the Mohr method at the drilling sites with serological pipettes and a standard solution of silver nitrate.

Definition of terms.--Materials penetrated by the test holes consist of volcanic rock, mostly lava flows, and of products of chemical decomposition brought about by weathering of the rock. In the records of test holes, the terms listed below are used to describe the materials penetrated by the bit, based on drilling characteristics and examination of cuttings recovered from the holes.

^{1/} Use of proprietary names is for identification only and does not imply endorsement by the Geological Survey.

basalt - The term "basalt" is a convenient one that is applied to all fresh, unweathered rock penetrated by the holes. In some holes the rock may be basalt or andesite or volcanic breccia made up of fragments of andesite or basalt; however, precise determination of the composition of the rock was not feasible at the drilling sites and was not necessary to the objectives of the drilling program. The fresh rock is hard, and the rate of drilling in it generally was slow. In rock of uniform structure and texture, the rotary rock bit commonly turned smoothly, but joints and other fractures in the rock caused the bit to bounce and chatter as it turned. Cuttings from basalt were generally sharp-edged chips or grains of dense and hard, black rock.

partly weathered basalt - Fresh rock cut by seams of clay and thin zones of weathering was called partly weathered basalt. Drilling generally was slow in the material and was accompanied by much bit chatter. Cuttings consisted mostly of chips of black rock. When the circulating fluid was water or air and water, the fluid commonly had a high turbidity caused by grinding of clay seams in the partly weathered rock.

weathered basalt - Weathered basalt is rock that is completely decomposed by weathering but still retains the relict texture and structure of the parent rock. Drilling rates in the material were moderate to fast, and bit chatter was common. Coarse cuttings often were rhombohedral fragments or angular chips that could be crushed between the fingers. Fine cuttings commonly had a gritty feel but could be rubbed to a clayey consistency. The material gave a high turbidity to drilling water. A large amount of overbreak was common in holes drilled in weathered basalt, especially during drilling with compressed air or with air and water. Drilling mud generally was necessary to maintain a stable open hole in the material.

clay - The term "clay" is applied to the ultimate product of weathering of the volcanic rock, which is reduced to a uniformly plastic material having no resemblance to the parent rock. Some clays penetrated by the holes were dry and stiff; others had high moisture content and flowed easily under the pressure of the rotary bit. The bit turned smoothly in drilling the clays. Cuttings rising from stiff clay generally were small rounded lumps; moist, highly plastic clays came up generally in larger chunks or were mixed as a heavy slurry in the drilling fluid. The clays were easily cut by the bit, but drilling rates in them occasionally were slow owing to the tendency of the clays to plug the discharge openings in the bit and retard the flow of the drilling fluid.

residual boulder - Residual boulders are isolated, rounded fragments of hard unweathered rock that are scattered through most sections of weathered basalt and in some clays. They are called boulders for convenience in the record, but they range widely in size from pebbles to large boulders. Small boulders cause rough bit chatter and, by caving, may cause overbreak in a hole. Cuttings from boulders are hard, sharp-edged, black chips or grains. Cuttings from the periphery of a boulder generally have a thin brown weathered layer on one surface.

Date: _____
 Loc: 12-14, 1973 by: _____
 at: _____ (feet): 35 _____
 Dr. A. Davis, Ted Lund, and Harry J. Burwell

RECORD OF DRILLING

RECORDS OF DRILLING AND TESTING OF TEST HOLES

TEST HOLE 1

Location:	Power Plant	Grid:
Date drilled:	Nov. 12-14, 1975	by Ted Lund Drilling & Supply
Altitude, ground surface (feet):	35	Depth (feet): 100
Observers:	D. A. Davis, Ted Lund, and Garrett Chapman	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Nov. 12 0950	-	Start drilling using compressed air and 8-in rotary rock bit.
1030	6	Start drilling at 6 ft below bottom of 6-in surface casing.
-	0-6	Weathered basalt with few fragments of fresh black rock.
1045	-	Connected stabilizer above 6-in bit.
1100	10	Shut down.
1315	10	Resumed drilling in soft to firm weathered basalt. Some fragments of fresh black rock in cuttings carried to surface by natural water and compressed air. Clayey fraction of rock comes up as mud.
-	17-18	Rock is harder. Less mud in cuttings.
1500	21	Hard rock. Considerable amount of cuttings carried to surface, probably eroded from wall of hole in soft section of rock by rising blast of air and water. Reduced flow of compressed air to reduce erosion of hole.
1730	32½	Shut down for day.

TEST HOLE 1

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 13 0810	32½	Measured depth with steel tape below ground surface. Depth to water, 8.1 ft below ground surface.
0830	-	Installed 6-in casing through section of soft weathered rock.
0945	32½	Resumed drilling with 5-5/8-in rotary rock bit using compressed air and natural water.
1000	-	Moderately hard black basalt.
1130	45	Added 15-ft section of drill pipe.
1345	61	Hard black basalt.
1545	71	Some gray to brownish gray clay.
1730	82	Shut down for the day. Chloride, 30 mg/L.
1735	82	Depth to water 9.0 ft below ground surface.
Nov. 14 0800	82	Depth to water 8.4 ft below ground surface.
0815	82	Resumed drilling. Hard basalt.
0920	86½	Hard basalt.
1015	91	Rock is somewhat softer.
1030	93	Some weathered basalt. Faster drilling.
1100	97	- - -
1110	98½	- - -

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 14		
1115	99	- - -
1120	100	Total depth.
1145	-	Began installing airlift pump in hole.
1230	-	Airlift pump installed to depth of about 90 ft.
1245	-	Depth to water, 9.27 ft below top of 6-in casing, measured with steel tape.
1250	-	Began cleaning and development of hole with airlift pump.
1310	-	Water almost clear.
1315	-	Pumping rate, Q, 5 gal in 98 sec = 3 gal/min.
1325	-	Began on-and-off pumping.
1400	-	Stopped pump.
1510	-	Depth to water 9.42 ft below top of 6-in casing.
1530	-	Began pumping test using airlift pump.
1730	-	Pumping stopped. Recovery of water level measured.
Nov. 15	-	Moved drilling equipment to test hole 2.

TEST HOLE 1

PUMPING TEST

Date: Nov. 14, 1975

Duration of test: 2 hours

Airlift pump installed to depth of about 90 feet. Pumping rate measured with 5-gallon container and stopwatch. Measuring point for water-level measurements, top of 6-inch casing.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Nov. 14					
1530	0	9.6	-	-	Start pump.
1532	2	67.2	6	-	
1535	5	-	4	-	
1545	15	78.5	-	-	
1547	17	-	3½	-	
1555	25	78.8	3	-	
1610	40	79.8	3	-	
1630	60	80.0	3	-	
1700	90	80.1	3	-	
1730	120	80.8	3	-	Stop pump.
	0	80.8	-	-	Recovery measurements timed with stopwatch.
	1	77.9	-	-	
	2	85.8	-	-	
	4	71.0	-	-	
	5	67.2	-	-	
	7	62.9	-	-	
	8	59.7	-	-	
	10	55.4	-	-	
	12	49.2	-	-	
	15	43.0	-	-	
	18	36.4	-	-	
Nov. 15					
1000	-	9.1	-	-	

TEST HOLE 1

LOG

Depth (feet)

Weathered basalt with cobbles and boulders of fresh black basalt.

0- 17

Partly weathered basalt becoming increasingly hard with depth.

17- 21

Hard black basalt, some weathered rock at about 71 ft.

21- 91

Moderately hard to hard black basalt.

91-100

Total depth.

100

TEST HOLE 2

Location:	Near Christopher Inn, Iras	Grid:
Date drilled:	Nov. 15-21, 1975	by Ted Lund Drilling & Supply
Altitude, ground surface (feet):	21	Depth (feet): 125
Observers: D. A. Davis, Ted Lund, and Garrett Chapman		

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Nov. 15		Moving equipment to site of test hole 2.
1330	-	Start drilling using 8-in rotary rock bit and compressed air.
-	0-2	Coralline rubble fill. Fill raises ground surface 2 ft.
-	2-4	Red soil.
-	4-7	Boulders in brown clay. Talus deposit. Slow, rough drilling.
1440	7	Through one boulder 1½ ft thick.
-	7-15	Boulders and brown clay.
1530	18	Light brown clay 15-18 ft.
1540	20	Light brown clay 18-20 ft. Stop drilling for installation of 6-in casing.
1600	-	Casing hangs up at depth of 5 ft.
1625	-	Removed casing and conditioned hole using 8-in rock bit and water. Try again to run casing. Pipe is stopped by boulder at about 8 ft.
1740	-	Shut down for day.

TEST HOLE 2

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Nov. 16		
0825	-	Pulled 6-in casing from hole. V notches cut in bottom end of pipe and sections bent in to form taper at end. Pipe hangs up again at about 9 ft.
0900	-	Removed casing. End of pipe almost closed by battering against boulder in hole.
0910	-	Reaming hole.
0940	-	Removed bit.
1030	-	Installed 6-in casing to 10 ft.
1040	-	Started drilling with 5-5/8-in rock bit inside 6-in casing.
-	-	6-in casing installed to about 18 ft, in 3 sections with telescoped joints.
1415	23	Started drilling, using 5-5/8-in rock bit and compressed air. Cuttings are pieces of dark, reddish brown, weathered basalt.
1435	28	Soft with occasional hard zone, but slow drilling. Some water in hole.
1445	34½	Amount of water coming up with air is small and increasing slowly. Clayey part of weathered rock coming up as mud.
1455	35	Shut down for day.
Nov. 17		
1500	35	Depth to water 10.7 ft below ground surface.
1510	35	Start drilling using 5-5/8-in bit and compressed air.
-	38	35 to 38 ft, soft but rough drilling.
1525	40	Drilling as above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 18		
0825	50	Depth to water, 11.9 ft.
0832	50	Start drilling, using 5-5/8-in bit and compressed air.
0855	54	Soft drilling in weathered basalt, but rate is kept low so that cuttings are fine enough to be lifted to surface by airlift.
1037	65	Continued drilling in weathered basalt from 54 ft. Some residual boulders or cobbles of black rock.
1040	66	Rigging up to use drilling mud to clear hole of cuttings.
1045	66	Clearing hole with compressed air and natural water. Hole has been enlarged to more than 6-in in some sections by erosion of wall by compressed air blast. Removal of cuttings is slow because of low air velocity in some sections of large diameter.
1113	66	Resume drilling. Brown weathered basalt.
-	81	Shut down for lunch.
1320	81	Resume drilling. Brown weathered basalt.
1340	85	- - -
1500	94	Harder drilling.
1530	95	Hard at 95 ft. Softer at 96 ft. Drilling in brown weathered basalt with residual boulders of fresh rock. Rough drilling.
1550	105	Fairly soft drilling. Few rough spots on residual boulders.

TEST HOLE 2

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 18		
1553	106	As above.
1558	108	As above.
1600	109	As above.
1606	110	As above.
1615	110	Until 1640, trying to clear hole to connect section of drill pipe. Casing is loose in hole and causes trouble.
1650	110	Mixing drilling mud (Baroid Quik-Gel).
1700	110	Finished pumping drilling mud into hole. Shut down for the day.
Nov. 19		
0730	110	Depth to water, 10.9 ft below ground surface.
0750	-	Mixing drilling mud.
0755	110	Start drilling using 5-5/8-in rock bit and drilling mud. Rough drilling on cobble caved to bottom of hole. No return of cuttings.
0759	111	No return of cuttings.
0803	112	As above.
0807	113	As above.
0812	115	As above.
0813	115	Stopped drilling.
0823	115	Resumed drilling.
0826	116	No return of cuttings.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 19		
0826	115-117	Sticky clay.
0831	118	Smooth drilling. No cuttings in returning mud.
0833	119	Stop drilling. Mixing drilling mud.
0839	119	Resumed drilling. No cuttings.
0842	120	No cuttings.
0845	121	No cuttings.
0848	122	No cuttings.
0851	122½	Stop drilling. Mixing mud.
0855	122½	Resumed drilling. No cuttings.
0857	123	No cuttings.
0901	124	No cuttings. Bit chatter, probably on residual boulder.
0905	125	As above.
0907	125	Stop drilling. Total depth.
0916	125	Start pumping air down, drill string to clear hole of mud and cuttings.
0920	-	Stop air. Caved cobbles or boulders above bit have locked tools in hole.
0928	-	Trying to pull bit past caved boulder.
0931	-	Hoisting cable on drill tools broke in a sheave.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 19		
0935	-	Mixing drilling mud and repairing cable.
1000	-	Cable repaired. Trying to loosen bit from caved boulder.
1015	-	Grinding upward on boulder. Circulating drilling mud. Bit at 120 ft.
1025	-	As above. Bit at 118 ft.
1055	-	As above. Bit at 112 ft.
1110	-	As above. Bit at 110 ft. Stop grinding for adjustment of hoisting cable.
1127	-	Resume grinding upward on boulder.
1130	-	Mixed mud.
1300	-	Bit out of hole.
1505	-	Began installing airlift pump in hole.
1650	-	Airlift pump installed. Depth to water, 10.43 ft below top of rotary table, which is 3 ft above ground surface.
1651	-	Start air compressor and cleaning of hole with airlift pump.
1653	-	Much mud and cuttings coming out of hole.
1700	-	Discharge less muddy, but large amount of cuttings.
1720	-	Depth to water 89 ft below top of rotary table. Q (pumping rate), 5 gal in 45 sec = 7 gal/min.
1740	-	Q, 5 gal in 45 sec = 7 gal/min. Pump stopped. Shut down for the day.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 20 0742	-	Depth to water, 15.6 ft below top of rotary table, which is 3 ft above ground surface.
0805	-	Started pumping water into hole from nearby stream.
0809	-	Stop pumping. Muddy water over top of 6-in casing.
0810	-	Start compressor and gentle surging of hole by filling hole with water and pumping it out with air. Much muddy water comes out of hole.
0825	-	Start straight airlift pumping.
0839	-	Q, 5 gal in 40 sec = $7\frac{1}{2}$ gal/min.
0842	-	Began gentle surging by pumping water into hole and pumping out slowly with airlift.
1010	-	Start straight airlift pumping. Q, 5 gal in 5 sec = 60 gal/min. Water is muddy but less so than at 0825. Much fine cuttings in water.
1020	-	Q, 5 gal in 39 sec = $7\frac{1}{2}$ gal/min. Depth to water, 88.6 ft below top of rotary table.
1030	-	Q, 5 gal in 38 sec - 8 gal/min. Depth to water, 89.0 ft below top of rotary table.
1032	-	Stop pump. Start alternately filling hole with water pumped from stream and pumping water out of hole with airlift.
1200	-	Shut down for lunch.
1330	-	Installed concrete vibrator in hole as an experiment in cleaning mud and cuttings from hole. Filled hole with water from stream and started vibrator.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 20		
1345	-	Stopped vibrator and began surging hole with on-and-off operation of airlift pump.
1400	-	Started straight airlift pumping. Much mud and cuttings come from hole.
1415	-	Water from hole almost clear. Q, 5 gal in 36 sec = 8 gal/min.
1420	-	Start filling hole with water.
1430	-	Start vibrator.
1442	-	Stop vibrator.
1443	-	Start compressor and raising and lowering water level with air.
1450	-	Start straight airlift pumping. Large amount of cuttings out of hole with muddy water.
1500	-	Water almost clear. Q, 5 gal in 33 sec = 9 gal/min.
1505	-	Q, 5 gal in 34 sec = 9 gal/min.
1508	-	Q, 5 gal in 35 sec = 8½ gal/min.
1510	-	Stop pumping and start filling hole with water.
1517	-	Water starts flowing over top of casing.
1518	-	Start vibrator.
1523	-	Stop vibrator.
1524	-	Start compressor and lowering water level in hole. Large amount of cuttings with many chips of black rock carried out of hole.
1528	-	Start straight airlift pumping.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 20		
1538	-	Q, 5 gal in 28.5 sec = 10 gal/min.
1543	-	Q, 5 gal in 33 sec = 9 gal/min.
1555	-	Q, 5 gal in 36 sec = $8\frac{1}{2}$ gal/min.
1558	-	Stop pumping and start filling hole with water.
1606	-	Water starts flowing over top of casing.
1607	-	Start vibrator.
1612	-	Stop vibrator.
1613	-	Start compressor.
1615	-	Start straight airlift pumping.
1635	-	Q, 5 gal in $34\frac{1}{2}$ sec = $8\frac{1}{2}$ gal/min.
1645	-	Q, 5 gal in 34 sec = 9 gal/min.
1650	-	Stop pumping. Shut down for the day. Cleaning and development completed.
Nov. 21		
0800	-	Start pumping test.

PUMPING TEST

Test made with airlift pump. Except as noted, water level measured with calibrated wire and float below top of rotary table on drilling machine, which was 3 feet above ground surface. Pumping rate measured with 5-gallon container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Nov. 21					
0751	-	15.5	-	-	Measurement with steel tape.
0756	-	15.8	-	-	Measurement with wire and float.
0800	0	-	-	-	Start compressor and airlift pump. Muddy water.
0805	5	-	-	-	Water is turbid.
0807	7	-	50	-	
0810	10	80.0	-	-	
0814	14	-	11	-	Water is almost clear.
0817	17	83.6	-	-	
0819	19	84.6	-	-	
0822	22	83.9	-	-	
0828	28	-	9	-	
0830	30	84.5	-	-	
0845	45	85.4	8½	-	
0900	60	85.7	9	-	
0915	75	85.7	8½	-	
0930	90	85.8	8½	-	
0945	105	86.0	8½	-	
1000	120	85.8	8½	-	
1030	150	85.4	8½	-	
1045	165	84.3	8	-	
1100	180	84.5	8½	-	
1115	195	84.3	8½	-	
1130	210	84.3	8½	-	
1154	234	84.2	8½	-	
1200	240	-	-	27	Water sample taken.
1215	255	84.6	8½	-	
1230	270	84.5	8½	-	

TEST HOLE 2

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 21					
1245	285	84.6	8½	-	
1300	300	84.4	8½	-	
1315	315	84.6	9	-	
1330	330	85.0	9	-	
1345	345	84.7	8½	-	
1400	360	84.5	8½	-	
1415	375	84.6	8½	-	
1435	395	84.8	8½	-	
1445	405	84.6	8½	-	
1500	420	84.7	8½	-	
1515	435	84.8	9	24	Water sample taken. Temperature of water, 81°F (27°C), at end of discharge line 15 ft from well. Air temperature, 84°F (29°C).
1530	450	84.7	9	-	
1545	465	-	8½	-	
1600	480	84.7	9	-	
1615	495	84.6	8½	-	
1630	510	84.6	8½	-	
1632	512	-	-	-	Pump stopped. Recovery measurements started using stopwatch to measure elapsed time since pumping stopped.

TEST HOLE 2

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 21	Elapsed time (min: sec)				
	00:25	82.6			
	01:00	79.5			
	01:30	76.7			
	02:00	73.4			
	02:30	69.6			
	03:00	66.9			
	03:30	63.7			
	04:00	60.0			
	04:20	58.7			
	04:45	56.6			
	05:05	54.6			
	05:30	52.6			
	06:00	50.1			
	06:30	47.7			
	07:00	45.1			
	07:30	43.0			
	08:00	42.3			
	08:30	42.0			
	09:00	41.5			
	09:40	40.6			
	10:05	40.1			
	10:30	39.9			
	11:00	39.7			
	11:30	39.2			
	12:00	38.6			
	12:30	38.1			
	13:00	37.7			
	13:30	36.8			
	14:00	36.1			
	14:30	35.6			
	15:00	34.9			
	15:30	34.5			

TEST HOLE 2

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 21	Elapsed time (min: sec)				
	16:00	33.8			
	16:30	33.1			
	17:00	32.3			
	17:30	31.3			
	18:00	30.7			
	18:30	29.8			
	19:00	29.5			
	19:30	29.0			
	20:00	28.4			
	21:00	27.7			
	22:00	27.1			
	23:00	26.3			
	24:00	25.4			
	25:00	25.0			
	27:00	24.1			
	28:00	23.8			
	29:00	23.4			
	30:00	23.0			
	33:00	21.5			
	36:00	20.1			
	39:00	20.3			
	42:00	20.1			
	45:00	20.0			
	48:00	19.6			
	51:00	19.5			
	54:00	19.3			
	57:00	19.1			
1732	60:00	18.8			Last measurement.
Nov. 22					
0747	-	15.84	-	-	Measurement with steel tape below top of rotary table, which is 3 ft above ground surface.

TEST HOLE 2

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Coralline rubble fill.	0 - 2
Red soil.	2 - 4
Basalt boulders in brown clay. Probably talus deposit.	4 - 15
Light brown clay.	15 - 20
Brown weathered basalt.	20 - 65
Brown weathered basalt with scattered residual boulders of basalt.	65 - 105
Weathered basalt and clay and scattered residual boulders of basalt.	105 - 125
Total depth.	125

TEST HOLE 3

Location:	Mizpah School	Grid:
Date drilled:	Nov. 22-24, 1975	by Ted Lund Drilling and Supply
Altitude, ground surface (feet):	60	Depth (feet): 74
Observers:	D. A. Davis, Ted Lund, and Garrett Chapman	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Nov. 22	-	Moving equipment to site of test hole 3.
Nov. 23 0845	-	Start drilling using 8-in rock bit and drilling mud.
-	0-1.5	Coralline rubble artificial fill.
-	1.5	Brown soil.
0910	6	Brown clay and boulders. Talus deposit. Stop drilling to connect 8-in bit welded on drill collar.
0932	6	Resume drilling.
0936	7	Brown clay.
-	7½	Boulder.
0946	8	Brown clay.
-	9	Boulder.
0955	10	Boulder in brown clay.
0958	11	Brown clay.
1002	12	Brown clay.
1004	13	Brown clay.
1010	14	Brown clay and boulder.

TEST HOLE 3

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 23		
1017	15	Brown clay and boulder. Boulders more frequent.
1027	15½	Hard, rough drilling.
1029	16	Boulders and brown clay. Rough drilling.
1032	17	Hard.
-	17½	Soft.
1035	18	Mostly clay, some hard spots on cobbles.
1036	18½	As above.
1039	19	As above. Top of bedrock under talus probably is between 17 and 19 ft. Some pieces of fairly hard, brown, weathered basalt in cuttings.
1046	19½	Hard and rough drilling.
1051	20	Stop drilling to condition hole and thin drilling mud.
1103	20	Resume drilling.
1112	21	Stop drilling. Lunch.
1210	21	Remove 8-in bit on drill collar and prepare to install 6-in casing.
1217	21	Start running 6-in casing; one 20-ft section and on 2½-ft section.
1225	21	Casing installed. Top is 1½ ft above and bottom is 21 ft below ground surface.
1230	21	Connecting 5-5/8-in bit.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 23		
1249	21	Start drilling using 5-5/8-in rock bit and compressed air. Seems to be no water in hole. Start adding water to hole slowly.
1300	22	- - -
1303	22	Stop drilling to remove portable mud pit and prevent flow of drilling mud into hole.
1319	22	Resume drilling.
1320	-	Casing is following bit down the hole.
1330	24	Soft.
1344	25	Drilling slowly to prevent casing from following bit down hole. Raining.
1350	25½	- - -
1440	30	Hard. Rough drilling. Raining.
1450	-	Added 15-ft section of drill pipe.
1457	32	Color of return fluid changed from reddish brown to dull brown. Hard, rough drilling above 32 ft, smooth just below.
1500	33	Cuttings are dull brown weathered basalt.
1515	-	Hard drilling. Residual boulder.
1517	-	Stop drilling to mix drilling mud.
1522	-	Resume drilling with light mud.
1610	43	Rough drilling. Stop drilling.
1615	43	Resume drilling.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 23		
1623	45	- - -
1635	-	Stop drilling to repair kelly bushing.
1709	-	Resume drilling.
1735	55	- - -
1738	55	Stop drilling. With airlift through drill pipe and bit removed most of mud from hole so that water level can be measured tomorrow. Shut down for the day. Rain most of the afternoon.
Nov. 24		
0800	55	Depth to water 1.9 ft below top of 6-in casing, which is 0.3 ft above ground surface.
0810	-	Start running tools into hole.
0815	-	Start drilling, clearing hole of caved boulders. Heavy rain.
0910	-	Resume drilling at bottom of hole at 55-56 ft. Rough drilling.
0912	57	Rain stopped.
0915	-	Stop drilling to mix drilling mud.
0917	-	Resume drilling.
0920	-	Stop drilling to clear mud out of compressed air receiver.
0924	-	Resume drilling.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 24 0925	59	- - -
0925	59-60	Clay with boulders.
0937	60	Boulder.
0943	60½	Boulder.
0948	-	Stop drilling to make repair to drive shaft on rotary table and to refuel machine.
1013	-	Resume drilling.
1020	61	Start conditioning hole.
1034	61	Add section of drill pipe.
1039	61	Resume drilling. Boulder.
1043	62	Clay.
1044	63½	Boulder.
1111	65½	Boulder or hard weathered basalt. Faster drilling than above.
1115	66	Soft but bit chatters.
1120	68	Clay or weathered basalt.
1122	69	Clay or weathered basalt.
-	70	Soft but bit chatters. Much medium brown clay in return fluid.
1125	71	Smooth drilling in brown clay.
-	71¼	Bit chatter.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 24 1125	71-3/4	Bit chatter. Dark grayish green to brown clay in fluid returns.
1135	73	Bit chatter.
1136	73	Stop drilling.
1141	73	Resume drilling. Fluid level in well did not drop below ground surface during 5-minute stop in drilling.
1151	74	Hard. Strong bit chatter. Stop drilling.
1255	-	Start pulling tools from hole.
1328	-	Start installing airlift pump in hole.
1356	-	Airlift pump installed to depth of 68 ft below ground surface.
1405	-	Water level, 5.67 ft below top of 6-in casing, which is 2 ft above ground surface. Measurement with steel tape.
1410	-	Start compressor for airlift pump.
1411	-	First water from airlift pump. Muddy.
1414	-	Q, 5 gal in 10 sec = 30 gal/min.
1416	-	Q, 5 gal in 90 sec = 3 gal/min.
1425	-	Q, 5 gal in 4 min 20 sec = 1 gal/min.
1445	-	Q, 5 gal in 5 min 30 sec = 0.9 gal/min. Stop pump.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 24 1500	-	Start airlift pump.
1510	-	Q, 5 gal in 1 min 35 sec = 3 gal/min.
1514	-	Q, 5 gal in 3 min 35 sec = 1 gal/min. Stop pump.
1517	-	Start pumping water from nearby stream into hole.
1522	-	Start airlift pump and begin alternating running water into hole and pumping it out with airlift. Cuttings of gray and brown clay, brown weathered basalt, and chips of fresh black basalt pumped from hole with water.
1635	-	Q, 5 gal in 3 min = 1½ gal/min.
1638	-	Pump stopped. Recovery measured.

TEST HOLE 3

Date Time	Elapsed time (min)	Depth to water (ft)	Remarks
Nov. 24 1638			Pump stopped.
	1	59.5	
	1½	59.0	
	2	58.8	
	2½	58.6	
	3	58.5	
	4	57.8	
	6	56.7	
	8	55.8	
	11	54.7	
	13	53.9	
	15	52.8	
	17	51.4	
	19	50.9	
	21	50.4	
	23	49.9	
	25	49.4	
	27	48.1	
	30	48.5	
	33	48.1	
	36	47.5	
	39	47.0	
	42	46.1	
	45	45.3	
	48	44.7	
	51	44.0	
	54	43.3	
	57	42.5	
	60	41.7	Last recovery measurement made at 1738 hrs.

Recovery of water level measured with float on calibrated wire line. Measuring point was top of rotary table on drilling machine 4.0 ft above ground surface. Elapsed time after pumping stopped measured with stopwatch.

TEST HOLE 3

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Coralline rubble artificial fill.	0 - 1.5
Boulders in brown clay. Talus deposit.	1.5-18
Weathered basalt, mostly brown, with numerous pockets of gray to brown clay and many residual boulders of fresh black basalt.	18 -74
Total depth.	74

TEST HOLE 4 (Converted to well 17)

Location:	Near South Field	Grid:
Date drilled:	Nov. 25-30, 1975	by Ted Lund Drilling and Supply
Altitude, ground surface (feet):	23	Depth (feet): 67
Observers:	D. A. Davis, Ted Lund, and Garrett Chapman	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975		
Nov. 25	-	Move drilling equipment to site of test hole 4.
1350	-	Start drilling with water and 8-in rock bit.
-	0-2	Black soil.
-	2-5	Brown clay.
1357	5-7	Reddish brown clay.
1400	7	Stop drilling to connect 8-in rock bit and stabilizer.
1419	7	Resume drilling with 8-in rock bit and using water for circulation.
1420	7½	Red clay.
1421	8	Brown clay.
1426	17	Reddish brown clay.
1433	20	Brown clay. Smooth drilling.
1436	-	Stop drilling for 1 minute.
1438	25	Medium to light brown clay. Soft.
1440	27	Somewhat harder. Stop drilling and prepare to install surface casing in hole. Hauling casing.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 25		
1613	27	Resume drilling. Soft reddish brown clay. Some bit chatter, probably on small boulder of fresh rock.
1615	29	- - -
1618	31	- - -
1624	34	- - -
1637	36½	Bit chatter on boulder. Brown clay.
1638	37	Brown clay. Bit chatter.
1639	38	Red to brown clay. Stop drilling to install surface casing.
1730	-	A 39-ft section of 6-in casing dropped in hole to about 37 ft, then pushed and driven to 38 ft. Bottom of casing is at 38 ft below ground surface, top is 1 ft above ground surface. Shut down for the day.
Nov. 26		
0735	-	Connect 5-5/8-in rotary rock bit and stabilizer on drill pipe in preparation for drilling below bottom of 6-in surface casing.
0740	-	Depth to water, 6.77 ft below top 6-in casing, which is 1.0 ft above ground surface. Measurement with steel tape.
0750	-	Start drilling. Bit is at 35½ ft on material inside lower part of 6-in casing. Using compressed air and natural water.
0754	38	Clearing hole of cuttings.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 26 0756	38½	Bit chatter on boulder.
0758	39	- - -
0804	40	Fairly good flow of water coming up with air.
0805	40½	Red clay. Smooth drilling.
0807	40½	Stop drilling to seal space at ground surface outside 6-in surface casing. Pipe is moving down the hole during drilling. Top of pipe is about 0.4 ft above ground.
0818	41½	Using water for circulating fluid.
0820	43	Weathered basalt with much brown clay. Stop drilling.
0826	42½	Resume drilling. Hole is caving and casing is moving down in the hole. Stop drilling to anchor casing. Top of casing is anchored with wire rope to frame of drilling machine.
0843	-	Start clearing hole with compressed air.
0846	43	Start drilling using compressed air and natural water. Some bit chatter. Return water is red.
0850	47	Return water is brown.
0853	48	Flow of water appears large. Stop drilling.
0900	48	Depth to water, 8.95 ft below top of 6-in casing, which is at ground surface. Measurement with steel tape.
0910	48	Depth to water, 8.72 ft below top of casing.
0918	-	Remove drilling tools from hole in preparation for pumping test.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 26		
0925	-	Start installation of airlift pump.
0945	-	Pump installed with intake of 44 ft below ground surface.
0949	-	Depth to water, 8.48 ft below top of 6-in casing, which is at ground surface and 11.12 ft below top of rotary table, which is 2.6 ft above ground surface. Measurements with steel tape.
0958	-	Depth to water, 10.3 ft below top of rotary table. Measurement with wire line and float.
1000	-	Start pumping test. See record of pumping test of November 26, 1975.
1800	-	Stop pumping. Start recovery measurements.
1845	-	Last recovery measurement. Shut down for the day.
Nov. 27	-	Thanksgiving Day.
0740	-	Depth to water, 11.51 ft below top of rotary table, which is 2.6 ft above ground surface. Measurement with steel tape.
0745	-	Start removing airlift pump from hole.
0805	-	Pump removed from hole.
0810	46½	Bit on bottom of hole at 46½ ft. Backfilled from original depth of 48 ft by cuttings and caved material.
0814	46½	Start drilling with compressed air and natural water and 5-5/8-in bit.
0816	-	Cable anchoring casing to drilling machine became wound around kelly and was broken.
0820	48	Slow drilling.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 27 0827	48	- - -
0833	48	Stop air and start pumping water down hole through drill string. No return circulation.
0845	48	No progress.
0850	48	No progress.
0900	48	Stop drilling. Tools removed from hole. Re-dressed rock bit connected yesterday is worn almost smooth. Replaced rock bit with partly worn one.
0909	48	Resume drilling.
0920	48+	Very slow progress. Hard black basalt.
0933	48½	Bit chatter.
0940	-	Almost at 49 ft. Bit chatter.
0943	49	Much bit chatter.
0945	49½	Penetrated through hard material into weathered basalt. Casing has moved down the hole below ground surface.
0950	-	Start air compressor and use of air and natural water for circulation.
0955	-	Faster drilling. Intermittent return of water with air in hole.
1000	51	Casing moved down hole. Top is about 8 ft below surface. Cuttings are weathered basalt and some black basalt. Stop drilling to mix drilling mud.
1020	51	Resume drilling, using mud. Bit chatter. No return circulation.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 27		
1023	52	Bit chatter. No returns.
1024	53	As above.
1025	53	Stop drilling to mix drilling mud.
1030	53	Resume drilling using mud. Strong bit chatter. No returns.
1034	53½	Stop drilling to repair mud deflector on bottom of rotary table.
1040	53½	Resume drilling.
1100	54	Bit chatter. No returns.
1102	-	Stop drilling. Circulating mud.
1200	54	Removed tools from hole and changed to new 5-in rotary rock bit.
1220	-	Mixed drilling mud.
1226	53	Resume drilling, using 5-in rock bit and mud. Bit chatter.
1234	54	Bit chatter.
1246	55	Rough bit chatter.
1257	56	Clay. Stop drilling to mix mud.
1301	56	Resume drilling.
1305	57	Bit chatter.
1308	58	Smooth drilling.
1309	59	Intermittent bit chatter.
1312	60	Clay. Smooth drilling. Stop drilling to mix mud.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 27		
1316	60	Resume drilling, using water for circulation.
1321	62	Intermittent chatter.
1322	-	Bit plugged and locked in hole.
1329	-	Bit loose. Stopped drilling to mix mud.
1332	62	Resume drilling. Boulders of fresh black basalt in gray clay. Bit chatter.
1335	63	Smooth drilling.
1339	64	Bit chatter.
1341	64½	Smooth drilling.
1342	65	Intermittent chatter.
1345	66	Clay. Stop drilling. Mix drilling mud.
1401	66	Resume drilling. Strong chatter. Cuttings are gray weathered basalt.
1415	66½	Hard drilling.
1422	66½	Hard basalt.
1433	66½	Hard basalt. No visible progress.
1443	67	Hard basalt. Stop drilling.
1445	67	Start removing tools from hole. Anchor on casing breaks and casing falls in hole.
1455	-	Bit is out of hole; badly worn.
1520	-	Casing recovered. Top of casing at ground surface.
1526	-	Start installing airlift pump for cleaning and developing hole. Pump intake at about 60 ft.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 27		
1552	-	Pump installed.
1555	-	Start pump. Much muddy water, large chips of weathered basalt, and small chips of fresh black basalt.
1600	-	Q, 5 gal in 8 sec = 37 gal/min.
1607	-	Q, 5 gal in 8 sec = 37 gal/min. Water level is 28 ft below top of rotary table.
1610	-	On-and-off airlift pumping. Large amount of cuttings coming out of hole with mud and water.
1650	-	Pump raised in hole. Intake is 44 ft below ground surface.
1655	-	Q, 5 gal in 10 sec = 30 gal/min. Bottom 20-ft section of 6-in casing separated from top section and dropped in hole. Top of lower section is about 25 ft below ground surface.
1700	-	Q, 5 gal in 10 sec = 30 gal/min. Water level is 22 ft below top of rotary table.
1710	-	Q, 5 gal in 10 sec. Depth to water, 23 ft.
1725	-	Stop airlift pump. Shut down for the day.
Nov. 28		
0800	-	Depth to water, 11.62 ft below top of rotary table, which is 2.5 ft above ground surface. Measurement with steel tape.
0900	-	Preparing to clean hole with drilling tools.
0905	-	Mixing drilling mud.
0912	64½	Drilling caved material out of hole.
0915	65	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 28		
0918	66	As above.
0922	67	Hard drilling.
0930	67	Stop drilling. Remove tools from hole.
0955	-	Start fishing to recover 6-in casing from hole. Top end of lost pipe is about 30 ft below ground surface.
1025	-	Casing out of hole.
1035	-	Start running drilling tools in hole to check depth and condition.
1055	67	Bit out of hole. Start installing airlift pump.
1112	-	Pump installed with intake at 65 ft below ground surface. Hole is full of drilling mud.
1113	-	Start cleaning and developing hole with airlift pump.
1113½	-	Pump discharging much mud and drill cuttings.
1120	-	Water very turbid.
1121	-	Pump blocked momentarily by cuttings.
1124	-	Q, 5 gal in 8 sec = 37 gal/min.
-	-	Pump blocked momentarily.
1131	-	Q, 5 gal in 9 sec = 33 gal/min. Depth to water, 28 ft below top of rotary table, which is 2.5 ft above ground surface.
1139	-	Q, 5 gal in 7½ sec = 40 gal/min.
1144	-	Q, 5 gal in 7 sec = 43 gal/min.
1147	-	Q, 5 gal in 7 sec = 43 gal/min. Depth to water 30.4 ft.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 28		
1150	-	Stop pump.
1315	-	Depth to water, 11.94 ft below top of rotary table. Measurement with steel tape.
1316	-	Start airlift pump.
1317	-	Much mud and cuttings in discharge.
1318	-	Q, 5 gal in 6 sec = 50 gal/min.
1325	-	Much mud and cuttings in discharge. Pump blocked briefly.
1332	-	Q, 5 gal in 7 sec = 43 gal/min.
1345	-	Depth to water 23.7 ft.
1350	-	Q, 5 gal in 7½ sec = 43 gal/min.
1358	-	Stop pump.
1403	-	Start pump. Much cuttings of hard black basalt.
1410	-	Q, 5 gal in 6 sec = 50 gal/min. Depth to water 23.0 ft.
1413	-	Pump stopped.
1419	-	Pump started.
1422	-	Q, 5 gal in 6 sec = 50 gal/min. Depth to water 22 ft.
1427	-	Pump stopped.
1434	-	Pump started. Some black cuttings.
1440	-	Using drill hoist, raise and lower pump in hole.
1442	-	Q, 5 gal in 6½ sec = 46 gal/min.
1445	-	Pump stopped.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 28		
1450	-	Pump started.
1455	-	Q, 5 gal in 6½ sec = 46 gal/min.
1457	-	Q, 5 gal in 7 sec = 43 gal/min.
1500	-	Pump stopped.
1503	-	Pump started. Fewer cuttings in discharge.
1514	-	Q, 5 gal in 6 sec = 50 gal/min.
1522	-	Depth to water, 20 ft.
1527	-	Pump stopped.
1537	-	Pump started. Pump blocked briefly. Pump raised and lowered and large amount of cuttings came out in discharge.
1543	-	Q, 5 gal in 6 sec = 50 gal/min.
1548	-	Pump stopped.
1551	-	Pump started.
1554	-	Q, 5 gal in 6 sec = 50 gal/min. Depth to water, 20.8 ft.
1602	-	Q, 5 gal in 7 sec = 43 gal/min. Depth to water, 22 ft.
1603	-	Pump stopped.
1609	-	Pump started. Small amount of cuttings in discharge.
1612	-	Raise and lower pump in hole. Very small amount of cuttings in discharge.
1613	-	Q, 5 gal in 6 sec = 50 gal/min.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Nov. 28 1627	-	Increasing speed of engine driving compressor did not cause increase in Q, which remained at 50 gal/min.
1630	-	Pump stopped. Shut down for the day.
Nov. 29 0630	-	Begin pumping test of Nov. 29-30.
Nov. 30 0630	-	End pumping test. Drilling and testing of test hole 4 completed.

TEST HOLE 4

PUMPING TEST

Date: November 26, 1975 Duration of test: 480 minutes

Depth of hole, 48 ft. Test made with airlift pump set with intake at 44 ft below ground surface. Water level measured with steel tape or with wire line and float, as noted. Measuring points were top of steel casing or top of rotary table, as noted. Pumping rate measured with 5-gallon container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride content by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975 Nov. 26 0900	-	8.95	-	-	Measuring point is top of 6-in casing, at ground surface. Measurement made with steel tape 7 minutes after drilling stopped at depth of 48 ft. Water level in hole had been drawn down an unknown amount by airlift removal of cuttings from hole during drilling.
0910	-	8.72	-	-	See note above.
0949	-	8.48	-	-	See note above.
0950	-	11.12	-	-	Measuring point, top of rotary table on drilling machine, 2.6 ft above ground surface. Measured with steel tape.
0950	-	11.3	-	-	Measuring point, top of rotary table through remainder of test. Measurements with wire line and float.

TEST HOLE 4

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 26					
0958	-	11.1	-	-	
1000	0	-	-	-	Start pump.
1002	1	19.0	-	-	Water is muddy.
1003	3	20.0	43	-	
1004	-	-	37	-	
1005	5	21.0	-	-	Water is clearing.
1008	8	21.5	33	-	
1010	10	-	33	-	
1017	17	-	33	-	
1020	20	-	-	14	
1033	33	-	-	-	Water is clearing.
1036	36	21.6	-	-	
1038	38	-	30	-	
1140	100	21.9	-	-	
1150	110	-	-	14	
1200	120	21.9	30	-	
1230	150	22.1	33	-	
1235	155	-	-	15	
1251	171	22.1	33	-	
1330	210	22.6	30	-	
1337	217	-	-	15	
1400	240	22.6	33	-	
1430	270	22.6	30	-	
1500	300	22.7	33	-	
1520	320	-	-	13	
1530	330	22.7	30	-	
1537	337	22.5	-	-	
1600	360	22.7	30	-	
1630	390	22.5	30	-	
1700	420	22.7	30	-	
1703	423	-	-	13	
1730	450	22.6	30	-	
1758	478	22.7	30	-	
1800	480	-	-	-	Pump off, recovery measurements started. Elapsed time since pumping stopped meas- ured with stopwatch.

TEST HOLE 4

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 26 1800	0	-			
	½	19.5			
	1	17.2			
	1½	15.8			
	2	15.0			
	2½	14.1			
	3½	13.6			
	4½	13.0			
	6	12.6			
	11	12.6			
	19	12.5			
	24	12.5			
	30	12.4			
	36	12.3			
	42	12.3			
1848	48	12.2			Last recovery measurement.

TEST HOLE 4

PUMPING TEST

Date: Nov. 29-30, 1975

Duration of test: 1440 minutes

Depth of hole, 67 ft. Test made with airlift pump set with intake at 65 ft below ground surface. Water level measured with wire line and float or steel tape, as noted, below top of rotary table, which was 2.5 ft above ground surface. Pumping rate measured with 5-gallon container and stop watch. Water-level and rate measurements by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975 Nov. 29					
0625	-	12.30	-	-	Static water level measured with steel tape below top of rotary table, which is 2.5 ft above ground surface.
0630	0	12.30	-	-	Start pump.
0634	4	-	-	-	Water is clear with very few small cuttings.
0637	7	19.5	37	-	- - -
0640	10	-	40	-	Decreased engine speed slightly.
0642	12	-	46	-	- - -
0643	13	21.4	-	-	
0645	15	21.7	43	-	
0650	20	22.1	43	12	
0655	25	22.2	43	-	
0700	30	22.5	43	-	
0705	35	23.0	43	-	
0710	40	22.8	43	-	
0715	45	22.9	43	-	
0720	50	23.6	43	-	
0725	-	-	-	-	Measurements from 0630 to 0720, made with a wire line and float. May be a foot or more in error.

TEST HOLE 4

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 29 0740	70	22.8	43	-	Measurement with steel tape. Owing to fluctuation of water level under airlift pumping, levels are read to nearest 1/10 foot.
0750	80	22.8	43	-	
0800	90	23.0	43	-	
0810	100	23.0	43	-	
0820	110	23.1	43	-	
0830	120	23.1	43	-	
0840	130	22.8	37	-	
0840	-	-	-	-	Increased engine speed small amount.
0850	140	23.0	43	-	
0900	150	23.0	43	-	
0910	160	23.0	43	-	
0920	170	23.0	43	-	
0930	180	23.1	43	-	
0940	190	23.1	43	-	
0950	200	23.1	37	-	
1000	210	23.1	43	-	
1020	230	23.2	43	-	
1030	240	-	-	12	Temperature of water 80½°F (27°C).
1040	250	23.3	43	-	
1100	270	23.3	37	-	
1120	290	23.4	37	-	
1140	310	23.4	37	-	
1205	335	23.4	43	-	
1225	-	-	-	12	
1230	360	23.5	43	-	
1300	390	23.6	43	-	
1330	420	-	43	-	Water level measure- ments not reliable, 1330 to 1600 hours.
1400	450	-	43	-	
1500	510	-	43	-	
1530	540	-	43	-	
1600	570	-	37	-	

TEST HOLE 4

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 29					
1630	600	23.8	37	-	
1700	630	23.9	40	-	
1735	665	24.0	40	-	
1800	690	24.0	37	-	
1830	720	24.0	37	-	
1831	-	-	-	-	Stop compressor and pump for 1 minute to increase engine speed and clear valves and activate generator.
1832	-	-	-	-	Start pump.
1900	750	23.6	37	-	
1930	780	24.2	37	-	
2000	810	24.3	37	-	
2015	825	24.2	37	-	
2030	840	24.3	40	-	
2100	870	24.3	37	-	
2130	900	24.3	37	-	
2200	930	24.4	37	-	
2230	960	24.4	37	-	
2300	990	24.5	37	-	
2330	1020	24.5	37	-	
2400	1050	24.5	37	-	No rain. Night is clear.
Nov. 30					
0030	1080	24.5	37	-	
0100	1110	24.6	37	-	
0130	1140	24.6	37	-	
0200	1170	24.6	37	-	
0230	1200	24.6	37	-	
0300	1230	24.7	37	-	
0330	1260	24.2	37	-	
0338	1268	24.3	37	-	
0400	1290	24.3	37	-	
0430	1320	24.4	37	-	
0500	1350	24.4	37	-	
0530	1380	24.5	35	-	
0600	1410	24.5	35	-	
0622	1432	24.5	-	-	

TEST HOLE 4

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Nov. 30 0630	1440	-	-	-	Stop pump. Start recovery measurements, using stopwatch to measure elapsed time after pumping stopped.
0630	0	-	-	-	
	1	23.8			Measured below top of rotary table, 2.5 ft above ground surface.
	2	20.2			
	5	17.5			
	6	17.3			
	7	17.2			
	8	17.1			
	9	17.0			
	10	16.9			
	11	16.8			
	14	16.7			
	17	16.5			
	20	16.5			
	23	16.4			
	27	16.3			
	30	16.2			
	36	16.2			
	39	16.1			
	42	16.1			
	45	16.1			
	55	16.0			
	65	15.9			
	82	15.8			
	100	15.7			
	110	15.7			
0830	120	15.6			
1805	695	14.6			
Dec. 1 0828	-	14.15	-	-	Depth to water below top of rotary table.

TEST HOLE 4

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Black soil.	0- 2
Brown clay.	2- 5
Reddish brown clay.	5- 7
Brown clay.	7-17
Reddish brown clay.	17-20
Red clay grading to brown clay, with scattered small boulders of fresh black basalt.	20-42
Weathered basalt with much brown clay.	42-48
Weathered basalt and scattered boulders of hard, fresh black basalt.	48-60
Boulders of fresh black basalt in gray clay.	60-64
Gray weathered basalt.	64-66
Hard basalt.	66-67
Total depth.	67

TEST HOLE 5 (Converted to well 18)

Location: Near South Field

Grid:

Date drilled: Dec. 1-6, 1975 by Ted Lund Drilling and Supply

Altitude, ground surface (ft): 9 Depth (ft): 110, backfilled to 75

Observers: D. A. Davis, Ted Lund, Garrett Chapman, and Carmelo Sam

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Dec. 1		Moving drilling equipment to site of test hole 5.
1327		Start drilling using 8-in rotary rock bit on kelly and compressed air.
-	1	Coralline rubble fill on swampy ground.
1355	8	Clay, light brown.
1410	8	Connecting 8-in rotary bit welded on short drill collar.
1428	8	Start drilling using compressed air and water pumped down hole with air.
1430	13	Brown clay.
1433	16	Brown clay.
1434	17	Bit chatter on boulder.
-	17½	Stop pumping water down hole, continue drilling with air and natural water.
1440	19	Bit chatter on boulder. Cuttings are weathered basalt and some chips of fresh black rock.
1450	19	Rough bit chatter on hard rock.
1455	19½	Bit chatter.
1458	20	- - -
1515	20	Stop drilling with 8-in bit.
1520	-	Start installing 6-in surface casing.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 1		
1525	-	20 ft of 6-in casing installed. Top of casing is 1 ft above ground surface.
1544	-	Connect 5-5/8-in rotary rock bit on drill collar.
1551	20	Start drilling at 20 ft with 5-5/8-in bit.
1600	22½	- - -
1604	23½	Hard.
1606	24	Hard.
1622	26	Hard.
1626	27	Hard. 7 ft in 35 min. Stop drilling to repair hoisting line.
Dec. 2		
0755	-	Remove 5-5/8-in bit and connect 5-in rotary rock bit for drilling in hard rock.
0827	22	Start drilling with 5-in bit, using compressed air. Cuttings backfilled hole to 22 ft.
0831	26	- - -
0834	27	Hard. Bit chatter. Some water rising from hole with air and cuttings.
0837	-	Water increasing. Casing moving down the hole.
0840	-	Stop drilling to anchor casing.
0854	-	Resume drilling. Casing anchored with top about at ground surface.
0856	30	- - -
0900	35	Much water coming out hole with air. Cuttings are large chips of fresh black basalt and some clay and weathered basalt. Rain.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 2 0950	35	Start installing airlift pump and preparing for pumping test.
1018	-	Start pumping. See record of pumping test of December 2, 1975, at 35-foot depth.
Dec. 3 0742	35	Depth to water, 5.0 ft below ground surface.
0837	35	Start drilling with 5-in bit, using compressed air and natural water.
0840	-	Stop drilling.
0843	-	Resume drilling.
-	39	Cuttings are chips of fresh black basalt and pieces of gray clay.
-	40	Hard gray rock.
0852	41	As above. Rough bit chatter.
0856	42	- - -
0901	43	- - -
0902	43½	- - -
0905	44	- - -
0912	45	- - -
0915	46	- - -
0920	47	Water from hole has gray turbidity.
0925	48	Chloride concentration in water from hole, 20 mg/L.
0931	49	- - -

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 3		
0943	49½	Water has brown turbidity. May be caused by caving clay.
0947	50	Hard.
0957	51	Hard.
0958	52	Some brown clay at 51½ ft.
1000	53	Stop drilling to add drill pipe.
1015	53	Resume drilling.
1019½	54	Gray turbidity in water.
1025	54	Thin gray turbidity in water.
1035	54½	Hard.
1041	55	Some increase in turbidity. Gray clay zone.
1042	56	- - -
1047	-	Thin gray turbidity.
1050	57	- - -
1053	57½	- - -
1054	58	- - -
1056	58½	Increase in gray turbidity.
1057	59	Clayey zone.
1058	60	Stop drilling to clear hole of cuttings with compressed air and natural water.
1100	-	Resume drilling.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 3		
1101	61	- - -
1123	64	- - -
1130	67	Heavy gray turbidity in water.
1131	68	Stop drilling to add section of drill pipe.
1140	69	- - -
1153	70	- - -
1153½	71	- - -
1154	72	- - -
1155	73	Gray turbidity in water from clay.
1156	74	As above.
1157	75	As above.
1158	76	As above.
1159	77	As above.
1201	78	Less turbidity.
1205	79	- - -
1208	80	Chloride concentration in water, 20 mg/L.
1212	83	Reddish turbidity in water in addition to gray.
1214	84	Stop drill to add section of drill pipe and to add oil to compressor and to repair broken valve in compressor.
1445	-	Depth to water, 5.1 ft below top of 6-in casing at ground surface.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 3 1454	-	Start removing water from hole by airlift through drilling tools.
1455	79	Start drilling. Hole backfilled with cuttings from depth of 84 ft to 79 ft.
1504	-	Brown turbidity in water.
1505	81	- - -
1508	82	Gray turbidity in water.
1513	-	Thin gray turbidity in water.
1515	83	As above.
1520	84	As above.
1521½	85	Bit chatter. Thicker turbidity, gray turning brownish.
1524	86	As above. Gray to brown turbidity.
1525	87	As above.
1527½	88	As above.
1529	89	As above.
1531½	90	As above.
1533	91	Dark gray turbidity in water.
-	92½	Brownish gray turbidity.
1535	93	As above.
1536	93½	Turbidity becoming brown.
1538	94	Turbidity becoming gray and thin.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 3 1539	-	Stop drilling to clear hole of cuttings and to add section of drill pipe.
1550	94	Resume drilling. Thin gray turbidity.
1555	95	Gray turbidity.
1559	96	Thin gray turbidity.
1604	97	- - -
1607	98	Chloride concentration in water, 42 mg/L.
1612	100	Heavy brown turbidity.
1615	101	As above.
1618	101½	Thin, light brown turbidity.
1627	102	As above.
1637	103	As above. Stop drilling.
1639	103	Resume drilling.
1642	103½	Thin brown turbidity.
1644	104	As above.
1650	105	As above.
1656	107	As above.
1659	109	As above.
1707	110	Stop drilling to clear hole of cuttings with compressed air.
1711	110	Water sample taken. Chloride concentration, 325 mg/L.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 3 1715	110	Removed tools from hole and shut down for the day.
Dec. 4 0750	110	Depth to water, 5.1 ft below top of 6-in casing at ground surface. Chloride concentration of water sample dipped from hole, 45 mg/L.
0755	-	Began installation of airlift pump in hole.
0900	-	Airlift pump installed with pump intake at about 104 ft below ground surface.
0909	-	Depth to water 5.2 ft below top 6-in casing at ground surface.
0920	-	Start pump.
0950	-	Depth to water, 38.6 ft below top of 6-in casing at ground surface.
0955	-	Chloride concentration in water, 150 mg/L.
1000	-	Depth to water, 39.7 ft.
1015	-	Depth to water, 40.4 ft.
1018	-	Q, 5 gal in 6 sec = 50 gal/min.
1020	-	Chloride concentration in water, 190 mg/L.
1035	-	Depth to water, 40.2 ft.
1040	-	Depth to water, 40.5 ft.
1043	-	Q, 5 gal in 5½ sec = 55 gal/min.
1050	-	Chloride concentration in water, 225 mg/L.
1108	-	Chloride concentration in water, 260 mg/L.
1125	-	Stopped pump.

TEST HOLE 5

RECORD OF DRILLING--Continued			
Record of Chloride Determinations at Depths from 0-110 ft, Dec. 2-4			
Date	Depth (feet)	Chloride (mg/L)	Conditions
Dec. 2	35	15	217 minutes after pumping test started.
Dec. 2	35	14	317 minutes after pumping test started.
Dec. 3	48	20	Sample taken of water rising from hole during drilling with compressed air.
Dec. 3	80	20	As above.
Dec. 3	98	42	As above.
Dec. 3	110	325	As above.
Dec. 4	110	45	Sample dipped from hole before pumping started.
Dec. 4	110	150	30 minutes after pumping started.
Dec. 4	110	187	65 minutes after pumping started.
Dec. 4	110	230	86 minutes after pumping started.
Dec. 4	110	250	105 minutes after pumping started.

TEST HOLE 5

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 4 1125	110	Removed airlift pump and prepared to backfill hole from depth of 110 ft to one of 70 or 80 ft. New depth selected on basis of salinity-depth relationship as shown by tabulation above.
1400	-	Preparing to install portland cement grout backfill in hole through 2-in pipe tremie.
1455	-	Four bags of neat cement grout poured in hole through tremie. Cement level in hole at 75-76 ft below ground surface, measured with "float" on wire line.
1502	-	Removed 2-in tremie from hole. Shut down for the day to allow cement to set.
Dec. 5 0720	-	Depth to water, 4.98 ft below top 6-in casing at ground surface.
0725	-	Start installing airlift pump.
0745	-	Pump installed. Depth of hole = top of cement-grout backfill, 75 ft below ground surface.
0807	75	Depth to water, 5.2 ft below top 6-in casing.
0810	-	Start airlift pump for pumping test.
0811½	-	First water. Chloride concentration, 19 mg/L. See record of pumping test of Dec. 5 at depth of 75 ft.

TEST HOLE 5

PUMPING TEST

Date: December 2, 1975 Duration of test: 342 minutes

Depth of hole, 35 ft. Test made with airlift pump. Water level measured from ground surface. Pumping rate measured with 5-gallon container and stopwatch. Water-level and rate measurements by D. A. Davis and Garrett Chapman. Field determinations of chloride content by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Dec. 2					
1015	-	10.2	-	-	Static water level.
1018	0	-	12	-	Start pump.
1035	17	-	11	-	
1037	19	17.0	-	-	
1050	32	17.0	11	-	
1115	57	17.1	11	-	
1350	212	16.7	10	-	
1355	217	-	-	15	
1400	222	-	-	-	Stop pump to add 5-ft section of pipe to airlift pump column.
1410	232	5.78	-	-	
1430	252	-	-	-	Start pump.
1435	257	-	14	-	
1437	259	-	14	-	
1443	265	18.3	-	-	
1510	292	18.6	-	-	
1535	317	18.6	12	14	
1555	333	18.6	12	-	
1600	342	18.6	-	-	Pump stopped. Started recovery measurements using stopwatch to measure elapsed time since pumping stopped.
1600	0	18.6	-	-	Pump stopped.
	$\frac{1}{2}$	15.9	-	-	

TEST HOLE 5

PUMPING TEST--Continued

Date: December 2, 1975 (continued)

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Dec. 2					
1600	1	13.6	-	-	
	2	10.5	-	-	
	2½	9.5	-	-	
	3	8.9	-	-	
	3½	8.5	-	-	
	4½	7.9	-	-	
	5	7.8	-	-	
	5½	7.5	-	-	
	6	7.4	-	-	
	7	7.1	-	-	
	8	7.0	-	-	
	9	6.9	-	-	
	10	6.8	-	-	
	11	6.7	-	-	
	12	6.6	-	-	
	15	6.4	-	-	
	18	6.3	-	-	
	21	6.1	-	-	
	24	6.0	-	-	
	27	5.9	-	-	
	30	5.9	-	-	
	36	5.8	-	-	
	42	5.7	-	-	
	48	5.6	-	-	
	54	5.5	-	-	
	60	5.5	-	-	
	66	5.4	-	-	
	72	5.4	-	-	
1718	78	5.4	-	-	Last recovery measure- ment.
Dec. 3					
0742	-	5.0	-	-	

TEST HOLE 5

PUMPING TEST--Continued

Date: December 5, 1975

Duration of test: 1430 minutes

Depth of hole, 75 ft. Test made with airlift pump. Water level measured from top of 6-in casing at ground surface. Pumping rate measured with 30-gal container and stopwatch. Water-level and pumping-rate measurements by D. A. Davis, Garrett Chapman, and Ted Lund. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Dec. 5					
0810	0	5.2	-	-	Start pump.
0811½	1½	-	-	32	First water from pump.
0814	4	29.6	-	-	
0816	6	-	38	-	
0818	8	30.5	36	19	
0822	12	31.4	37	20	
0826	16	-	-	15	
0830	20	31.4	35	15	
0835	25	32.8	36	-	
0840	30	33.1	34	-	
0843	33	-	-	17	
0845	35	33.2	35	-	
0847	37	-	-	17	
0850	40	33.5	35	-	
0855	45	33.5	35	-	
0900	50	33.5	33	16	
0910	60	33.5	34	-	
0915	65	-	-	15	
0922	72	-	-	16	
0925	75	33.7	34	-	
0945	95	-	-	16	
1015	125	-	-	17	
1020	130	33.4	34	-	
1035	145	33.4	33	-	
1045	155	-	-	16	
1105	175	33.4	34	-	
1115	185	-	-	15	
1135	205	33.5	34	-	
1200	230	33.8	34	17	
1230	260	33.6	34	-	

TEST HOLE 5

PUMPING TEST--Continued

Date: December 5, 1975 (continued)

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Dec. 5					
1300	290	33.6	34	15	
1330	320	33.6	34	-	
1400	350	33.6	34	15	
1430	380	33.7	34	-	
1500	410	33.6	34	-	Temp. water, 81°F (27.2°C).
1530	440	33.5	34	-	Pump off 1512 to 1514.
1600	470	33.6	34	15	
1630	500	33.6	34	-	
1700	530	33.6	35	-	
1730	560	33.6	34	-	
1800	590	33.7	34	15	
1830	620	33.7	34	-	
1900	650	33.7	34	-	
1930	680	33.8	35	-	
2000	710	33.8	33	15	
2030	740	33.8	35	-	
2100	770	33.8	34	-	
2130	800	33.8	34	-	
2200	830	33.9	34	15	
2230	860	33.7	34	-	
2300	890	33.8	35	-	
2330	920	33.8	35	-	
2400	950	-	-	15	
Dec. 6					
0130	1040	33.7	33	-	
0200	1070	33.9	33	-	
0230	1100	33.8	33	-	
0300	1130	33.7	34	-	
0330	1160	33.9	34	-	
0400	1190	34.0	33	-	
0430	1220	33.8	33	-	
0500	1250	34.0	33	-	
0530	1280	33.9	34	-	
0600	1310	33.9	34	-	
0615	1325	-	-	21	
0620	1330	-	-	20	
0630	1340	33.9	33	-	
0645	1355	-	-	21	

TEST HOLE 5

PUMPING TEST--Continued

Date: December 5, 1975 (continued)

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975					
Dec. 6					
0700	1370	33.8	33	-	
0715	1385	-	-	21	
0730	1400	34.0	34	22	
0755	1425	33.9	35	-	
0800	1430				Stop pump. Start recovery measure- ments using stopwatch to measure elapsed time since pumping stopped.
0800	0	-			
	$\frac{1}{2}$	29.76			
	1	18.23			
	$1\frac{1}{2}$	15.34			
	$2\frac{1}{2}$	13.39			
	$3\frac{1}{2}$	10.93			
	4	10.14			
	$4\frac{1}{2}$	9.62			
	5	9.14			
	$5\frac{1}{2}$	8.78			
	6	8.63			
	7	8.26			
	8	7.94			
	9	7.88			
	12	7.34			
	15	7.08			
	18	6.84			
	21	6.72			
	24	6.63			
	27	6.44			
	30	6.36			
	36	6.21			
	42	6.01			
	48	6.01			
	54	5.93			
	60	5.88			
	72	5.82			
	84	5.73			
0940	100	5.62			Last measurement.

TEST HOLE 5

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Coralline rubble fill.	0- 1
Light brown clay.	1- 8
Brown clay.	8- 17
Weathered basalt with scattered residual boulders of hard black fresh basalt.	17- 35
Weathered basalt with pockets of gray clay and scattered boulders of hard black fresh basalt.	35- 83
Mostly weathered basalt, gray, brown, and red, with few cobbles of hard black fresh basalt.	83-110
Total original depth.	110
Hole backfilled from 110 ft to 75 ft with neat cement grout. Final total depth.	75

TEST HOLE 6

Location: Power Plant	Grid:
Date drilled: Dec. 6-8, 1975 by Ted Lund Drilling and Supply	
Altitude, ground surface (feet): 30	Depth (feet): 79
Observers: D. A. Davis, Ted Lund, and Garrett Chapman.	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Dec. 6		Moved equipment from test hole 5 to site of test hole 6.
1215	-	Start drilling, using 8-in bit and water for circulating fluid.
-	1	Coralline rubble fill lying on brown clay.
1221	9	Brown clay.
1237	17	Rough bit chatter on boulder.
1240	18½	Stop drilling and prepare to install 6-in surface casing.
1305	-	Casing in place. Top is 1.2 ft above ground surface. Bottom is about 18 ft below ground surface.
1323	18½	Start drilling with 5-in rotary rock bit and compressed air. Rough bit chatter.
1327	19½	Bit chatter.
1328	19½	Small amount of water coming up with air.
1330	19-3/4	Cuttings are chips of hard black basalt and brown clay. Drilling in weathered basalt with residual boulders of fresh basalt.
1335	19-3/4	Stop drilling to replace worn 5-in bit with new 5-in bit. Depth to water, 15 ft below ground surface.
1344	19-3/4	Resume drilling, using new bit and compressed air. Rough bit chatter on hard rock.

TEST HOLE 6

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
1975		
Dec. 6		
1348	20	Rough bit chatter on hard residual boulder.
1349	20½	Broke through hard boulder.
1351	20-3/4	Soft, weathered basalt or clay with residual cobbles of fresh basalt.
1354	22	Soft.
1355	23	Soft, smooth drilling. Cuttings are pieces of brown weathered basalt and chips of black basalt.
1358	24	Soft, smooth drilling. Cuttings are brown weathered basalt.
1402	25	- - -
1409	26	Smooth drilling.
1418	27	Bit chatter. Small amount of water coming up with air.
1424	28	Bit chatter. Much brown weathered basalt and some black chips in cuttings.
1432	-	Stop drilling.
1445	28½	Resume drilling.
1500	29	Hard, smooth drilling.
-	34	Shut down for the day.
Dec. 7		
0700	-	Depth to water 8.3 ft below ground surface. Remove 6-in casing and prepare to ream hole with 8-in bit.
0845	-	Start reaming hole with 8-in rotary rock bit on short stabilizer, using drilling mud for circulating fluid. Start reaming at depth of about 19 ft. Depths shown below are those with 8-in bit during reaming.

TEST HOLE 6

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 7		
0850	21	Rough bit chatter.
0851	22	- - -
0856	23	- - -
0900	24	- - -
0904	25	- - -
0906	26	- - -
0925	26	Clearing hole, between 21 and 26 ft, of caved boulder.
0925	26	Mixing drilling mud.
0937	26	Resume reaming with 8-in bit and drilling mud.
0941	27	Very rough bit chatter.
0945	27½	Stop drilling to adjust pull down.
0947	26	Resume reaming, drilling out caved material. Rotation sometimes stopped by caved boulder locking bit in hole.
0951	27	Drilling out caved material.
0952	27½	As above.
0955	28	Reaming with 8-in bit.
0956	27½	Raised bit and resumed drilling on caved material at 27½ ft.
0956½	28	- - -
0957	-	Stop reaming.

TEST HOLE 6

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 7		
1003	28	Resume reaming.
1009	29	Bit chatter.
1018½	30	Reaming with 8-in bit.
1019	30	Stop drilling to clean cuttings from mud pit.
1035	30	Resume reaming with 8-in bit.
1037	30½	Rough bit chatter.
1043	31	As above.
1049	31½	As above.
1053	32	As above.
1054	32½	Softer reaming.
1059	33	Less bit chatter.
1100	34	Brown clay. Depth of hole drilled with 5-in bit, before start of reaming.
1101	35	Stop drilling. Clearing cuttings from mud pit and mixing mud. Dark red clay at 35 ft. Much black chips in cuttings from boulders drilled out during reaming.
1113	35	Resume drilling with 8-in bit and drilling mud.
1114	35½	Stop drilling to clean mud pit.
1121	35½	Resume drilling. Cuttings are hard black basalt.
1123	36	Stop drilling.
1300	36	6-in casing is installed to 36 ft.
1320	35½	Start drilling with 5-in rotary rock bit and compressed air.

TEST HOLE 6

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Dec. 7		
1321	36	- - -
1322	37	No cuttings come from hole with air.
1325	38	Smooth drilling.
1327	-	Adding water to hole with compressed air. Cuttings are mostly dark red clay, some chips of black basalt.
1328	39	As above.
1332	40	As above.
1338	42	As above.
1341	44	Smooth drilling. Drilling without water. Very little water coming from hole with air.
1349	46	- - -
1355	47	Red clay.
1357	48	- - -
1359	49	Stop drilling. Red clay and black chips.
1402	-	Add section of drill pipe.
1406	49	Resume drilling with 5-in bit and compressed air.
1407	50	- - -
1412	52	- - -
1412½	52½	Bit chatter.
1413	53	- - -
1415	54	Red clay. Smooth drilling.
1418½	56	As above.

TEST HOLE 6

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Dec. 7		
1421	57	As above.
1424½	58	As above.
1425	58½	Bit chatter.
1427	-	Mud pit began to leak into hole. Stop drilling to make repair.
1431	58½	Resume drilling with 5-in bit and compressed air. Smooth drilling.
1436	59	Bit chatter.
1440	60	Red clay. Smooth.
1443	61	Cuttings of green clay with some red. Smooth.
1448	62	Cuttings mostly dark gray clay, some red and green clay. Smooth.
1452	62½	Bit chatter. Harder drilling.
1457	63	As above.
1501	63½	Smooth and softer drilling. Small amount of water coming up hole with air.
1501½	64	Bit chatter. Small amount of water. Stop drilling to add section of drill pipe.
1517	-	Resume drilling with 5-in bit and compressed air.
1523	66	Cuttings are chips of dark gray basalt.
1525	67	As above.
1526	69	As above.
1527	70	Cuttings are chips of dark gray to black basalt, few green chips.

TEST HOLE 6

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Dec. 7		
1532	72	As above.
1535	73	As above.
1537	74	As above.
1540	75	As above.
1541	75½	Harder drilling.
1549	76	Hard. Cuttings are chips of dark gray to black chips.
1556	76½	Hard drilling, as above.
1603	77	As above. Stop drilling, prepare to pump water into hole to improve removal of cuttings.
1628	77	Resume drilling with 5-in bit, using compressed air and water.
1652	79	Hard. Shut down for the day.
Dec. 8		
0740	79	Depth to water 16.8 ft below top of 6-in casing, which is 1.5 ft above ground surface. Depth to water in annular space outside casing is 8 ft below ground surface. Start installation of airlift pump.
1055	-	Depth to water, 7.2 ft below ground surface.
1100	-	Start airlift pump. Pump intake is at 72 ft below ground surface.
1101	-	Discharge is muddy water with large amount of cuttings.
1106	-	As above.
1110	-	As above.

TEST HOLE 6

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
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Dec. 8
1200

-

Stop pump.

Hole abandoned because of low yield and difficulty in drilling.

TEST HOLE 6

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Coralline rubble fill.	0- 1
Brown clay.	1-17
Brown clay and weathered basalt with scattered residual boulders of fresh black basalt.	17-23
Brown weathered basalt and scattered residual boulders of fresh black basalt.	23-35
Red clay and brown weathered basalt and scattered residual boulders of fresh basalt.	35-54
Red clay with few residual boulders of basalt.	54-61
Red, green, and gray clay.	61-63
Basalt, dark gray to black, partly weathered to fresh.	63-79
Total depth	79

TEST HOLE 7

Location:	Nob Hill	Grid:
Date drilled:	Dec. 9-15, 1975, Jan. 14, 1976	
By:	Ted Lund Drilling and Supply	
Altitude, ground surface (feet):	77	Depth (feet): 172
Observers:	D. A. Davis, Ted Lund, and Garrett Chapman	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1975 Dec. 9	-	Move equipment to site of test hole 7.
1248	-	Start drilling with 8-in rotary rock bit using compressed air.
1255	-	Brown clay and boulders.
1300	4	Rough bit chatter on hard boulder.
1315	-	Stop drilling. Rollers on bit locked by fine cuttings.
1326	-	Resume drilling.
1330	7	Stop drilling to change to 8-in rotary rock bit on short stabilizer. Install mud pit and start mixing drilling mud.
1406	7	Resume drilling with 8-in bit and drilling mud.
1409	8	Drilling in brown clay and residual boulders of fresh basalt. Large chips of black rock in cuttings. Probably talus deposit.
1412	9	As above.
1415	10	As above.
1417	10	Stop drilling. Bit locked in hole by boulder caved from above.
1418	10	Bit free. Start mixing mud.
1426	10	Resume drilling with 8-in bit using mud. Bit chatter.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 9		
1429	11	Bit chatter. Hard. Some brown clay.
1434	12	- - -
1445	16	Bit chatter. Boulders in brown clay.
1450	17	As above.
1454	18	As above.
1455	19	As above. Stop drilling because of caved boulder above bit.
1525	19	Resume drilling with 8-in bit using mud.
1528	20	Much brown clay.
1533	21	Boulder and brown clay. Soft drilling.
1534	22	Soft as above.
1536	23	Brown clay. Soft, smooth drilling.
1537½	24	As above.
1539	25	As above.
1542	26	As above. Stop drilling because of caved boulder above bit.
1605	-	Add section of drill pipe.
1612	25½	Resume drilling. Rough bit chatter. Rough drilling on boulder caved from above.
1617	26	- - -
1618	27	Brown clay. Soft, smooth drilling.
1619	28	As above.
1620	29	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 9		
1622	30	As above, but somewhat slower drilling below 30½ ft.
1624	31	As above.
1627	32	As above, probably weathered basalt and clay.
1631	33	As above.
1634	34	Rough bit chatter. Large chips of fresh black basalt in cuttings.
1641	35	Rough bit chatter. Hard.
1645	36	As above. Stop drilling and remove tools from hole to install 6-in surface casing.
-	-	Shut down for the day.
Dec. 10		
0835	-	Hole is full of drilling mud. Six-inch surface casing installed to 36 ft below ground surface.
0900	36	Start drilling casing 5-in rotary rock bit and compressed air. Drilling mud is air lifted out of hole.
0905	37	- - -
0910	39	Smooth drilling.
0911	40	- - -
0912	41	Rough bit chatter. Boulder in brown clay.
0914	42	Smooth. Brown clay. Rain.
0920	45	Smooth.
0933	49	Hard. Rain.
0937	50	Thin soft zone at 50 ft. Hard below.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 10		
0946	51	Hard. Stop drilling to add section of drill pipe. Drilling delayed by boulders on bit caved from above.
1010	-	Clearing caved material from hole, using 5-in bit and compressed air.
1100	-	Five-inch bit is in hole at 50 ft.
1107	50	Stop compressor.
1113	50	Depth to water 21.0 ft below ground surface.
1117	50	Depth to water 20.8 ft below ground surface, 10 min after compressed air stopped.
1118	50	Resume drilling using 5-in bit and compressed air. Heavy rain from 0930 until after noon interfered with drilling operation and record keeping.
1430	65	Installing mud pit. Hole has ravelled so much during drilling with compressed air, airlift cannot carry out the drill cuttings.
1455	-	Depth to water, 20.3 ft below top of 6-in casing which is 1.5 ft above ground surface.
1500	-	Running drill tools in hole with 5-in rotary rock bit. Mixing drilling mud. Bit became plugged with clay cutting at first attempt to drill.
1555	-	Bit cleaned; start drilling out caved material in hole with 5-in bit, using drilling mud.
1605	-	Continue drilling out caved material.
1700	-	Bit locked in hole at 59 ft by caved material.
1725	-	Attempting to drill, but caved materials continue to lock bit. Start grinding upward out of hole.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 10 1735	-	Joint between kelly and first section of drill pipe drilled up to ground surface. Shut down for the day.
Dec. 11 0730	-	Raining. Hole is full of drilling mud.
0745	-	Start mixing heavy mud to use in stabilizing wall of hole.
0830	-	From 0745, mixing mud, rotating bit at depth of about 65 ft and circulating mud to clear hole. Stop at 0830 for repair to kelly hoist.
0845	-	Resume circulating drilling mud.
0850	-	Mixing drilling mud.
0855	-	Circulating mud. Very large chips of black rock rising in mud.
0900	-	Clearing hole. Bit at about 65 ft. Add section of drill pipe.
0910	-	Bit is plugged. Heavy rain showers since 0730.
0920	-	Bit still plugged.
0930	-	Removed tools from hole and connected new 5-in rotary rock bit.
0940	-	Bit at 63 ft in hole on backfill of cuttings and caved material.
0945	65	Hard drilling. Cuttings are black basalt.
0955	66	As above.
1005	67	As above.
1008	68	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 11 1011½	68½	- - -
1012	-	Bit chatter.
1014	69	Smooth drilling.
1021	70	As above.
1030	71	Hard drilling, occasional chatter.
1036	72	As above.
1045	73	As above.
1051	73½	As above.
1058	74	As above.
-	75½	Top of gray clay.
1105	76	Gray clay. Smooth drilling.
1110	77	As above.
1111	78	Gray and dark red clay. Smooth drilling.
1112	79	As above.
1113	79½	Bit chatter on boulder.
1114	80	Gray clay. Smooth drilling. Stop drilling.
1215	80	Resuming drilling with 5-in bit, using drilling mud. Gray clay, smooth drilling.
-	92	Hard drilling.
-	93	Gray clay, smooth drilling.
1239	95	Gray clay, smooth drilling. Stop drilling.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 11		
1251	95	Resume drilling. Light brown clay. Smooth drilling.
1254	96	As above.
1256	98	As above, but harder at about 98½ ft.
1257	99	As above, but some bit chatter.
1259	100	- - -
1300	100½	Gray and dark red clay. Harder drilling.
1302	101	As above. Some bit chatter.
1312	102	Harder drilling. Cuttings are gray and brown weathered basalt.
1317	103	As above.
1321	104	As above.
1323	105	As above.
1332	107	As above. Some bit chatter.
1349	108	As above.
1356	109	As above.
1400	110	Cuttings are gray to reddish brown weathered basalt, gritty with few unweathered mineral grains. Stopped drilling to add section of drill pipe.
1412	110	Resumed drilling with 5-in bit, using drilling mud. Smooth drilling. Cuttings as above.
1420	111	As above.
1424	112	As above.
1426	113	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 11		
1430	114	As above.
1432	115	As above.
1435	116	As above.
1438	117	As above.
1444	119	As above.
1446	120	As above.
1450	121	As above.
1452	122	As above.
1455	123	As above.
1501	124	As above.
1506	125	As above. Stop drilling to add section of drill pipe and for lubrication and inspection of equipment.
1530	125	Resume drilling.
1534	126	Gray and brownish red clay.
1538	128	As above.
1541	129	As above.
1544	130	As above.
1549	132	As above.
1551	133	As above.
1554	134	As above.
1556	135	As above.
1559	136	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 11		
1603	137	As above. Amount of red clay increasing.
1608	138	As above. Some bit chatter at 138½ ft.
1610	139	As above.
1612	140	As above. Stop work for the day.
Dec. 12		
0815	-	Start running tools in hole.
0840	-	Mixing drilling mud.
0848	140	Start drilling with 5-in bit using drilling mud; clay. Smooth drilling.
0850	141	Clay. Smooth drilling.
0854	142	As above.
0856	143	As above.
0859	144	As above.
0906	147½	Harder drilling. Bit chatter.
0909	148	Stop drilling to mix drilling mud.
0915	148	Resume drilling. Bit chatter at about 148½ ft. Below about 147½ ft, hole is in partly weathered to fresh basalt.
0918	149	As above.
0925	150	Stop drilling to mix drilling mud.
0938	150	Resume drilling with 5-in bit, using drilling mud.
0940	151	Bit chatter, partly weathered basalt.
0945	152	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 12		
0947	153	As above.
0949	154	As above.
0950	155	As above.
0955	155	Stop drilling to add section of drill pipe and to mix drilling mud.
1011	155	Resume drilling.
1016	156	Bit chatter on fresh or partly weathered basalt.
1018	157	As above.
1021	158	As above.
1025	159	As above.
1027	160	As above.
1036	163	As above.
1041	164	As above.
1045	165	As above.
1048	166	As above.
1055	168	As above.
1100	169	As above.
1105	170	Stop drilling.
1110	172	Measured depth of hole.
1115	172	Start clearing hole of drilling mud with water pumped down drill pipe to bottom of hole at bit.
1130	-	Remove drilling tools from hole.
1309	-	Airlift pump installed in hole.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Dec. 12 1315	-	Depth to water, 15.6 ft below top of 6-in casing, 1.5 ft above ground surface.
1320	-	Start airlift pump. Pump intake at 109 ft below ground surface.
1330	-	Q, 5 gal in 7 sec = 43 gal/min.
1332	-	Depth to water, about 50 ft below top of 6-in casing.
1336	-	Q, 5 gal in 13 sec = 23 gal/min.
1340	-	Q, 5 gal in 14 sec = 21 gal/min.
1350	-	Depth to water, about 50 ft. Shut down for the day.
Dec. 13 0800	-	Begin pumping test of Dec. 13-15, 1975.
Dec. 15 0804	-	End pumping test of Dec. 13-15, 1975.
1976 Jan. 24 1535	-	Airlift pump installed with intake at 109 ft. Prepare to clear hole by pumping. Depth to water, 22.0 ft below top 6-in casing, 1.5 ft above ground surface
1538	-	Start pump.
1540	-	First water has reddish turbidity.
1544	-	Water has heavy red turbidity.
1550	-	Q, 30 gal in 80 sec = 22 gal/min. Water is clearing.
1605	-	Depth to water, 71.3 ft.
1610	-	Shut down for the day.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 25 0800	-	Start pumping test of Jan. 25, 1976.
1830	-	End pumping test of Jan. 25, 1976.

PUMPING TEST

Date: Dec. 13-15, 1975

Duration of test: 2581 minutes

Test made with airlift pump set with intake at 109 ft. Pumping rate measured with 30-gal container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, Garrett Chapman, and Carmelo Sam. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1975 Dec. 13					
0500	-	21.14	-	-	Depth to water measured below top of 1-in PVC pipe, even with top of 6-in casing and 1.5 ft above ground surface.
0800	0	-	-	-	Start airlift pump.
0801	1	40.4	37	-	- - -
0803	3	46.1	-	17	- - -
0804	4	-	37	-	
0817	17	-	-	17	
0820	20	64.5	-	-	
0825	25	-	25	-	
0828	28	-	21	-	
0831	31	-	23	-	
0832	32	66.4	-	-	
0845	45	-	-	17	
0850	50	-	22	-	
0852	52	66.9	-	-	
0900	60	-	21	-	
0905	65	67.3	-	-	
0930	90	68.2	21	-	
1000	120	-	20	-	
1005	125	69.5	-	-	
1010	130	-	-	17	
1030	150	-	20	-	
1035	155	69.7	-	-	
1045	165	-	-	-	Temperature of water 81½°F (27½°C).
1100	180	70.3	19	-	
1130	210	70.6	20	-	

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Dec. 13					
1200	240	70.4	19	-	
1230	270	70.8	19	-	
1300	300	71.5	18	17	
1330	330	71.5	18	-	
1400	360	71.9	18	-	
1430	390	72.3	18	-	
1500	420	72.3	18	-	
1520	450	72.6	18	-	
1600	480	73.0	18	-	
1630	510	73.3	17	-	
1700	540	74.3	17	-	
1730	570	74.2	17	-	
1800	600	72.7	17	-	
1830	630	72.6	18	-	
1900	660	72.3	18	-	
1930	690	72.1	18	-	
2000	720	71.9	18	-	
2030	750	71.4	18	-	
2100	780	71.1	18	-	Water has had some turbidity since about 1930.
2130	810	71.2	19	-	
2200	840	71.1	19	-	
2230	870	71.2	19	-	
2300	900	71.1	19	-	
2330	930	70.9	19	-	
2400	960	70.9	19	-	
Dec. 14					
0030	990	70.9	19	-	
0100	1020	70.9	19	-	
0130	1050	71.0	19	-	
0200	1080	70.8	19	-	
0230	1110	71.0	19	-	
0300	1140	70.9	20	-	
0330	1170	70.9	19	-	
0400	1200	71.0	20	-	
0430	1230	71.1	19	-	
0500	1260	70.8	20	-	

TEST HOLE 7

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Dec. 14					
0530	1290	71.0	19	-	
0600	1320	70.9	19	17	
0630	1350	71.2	19	-	
0700	1380	71.6	19	-	
0800	1440	73.1	18	-	
0830	1470	72.3	18	-	
0900	1500	72.2	18	-	
0930	1530	72.3	18	-	
1008	1560	74.2	18	-	
1030	1590	74.4	18	-	
1100	1620	74.2	18	-	
1130	1650	74.2	18	-	
1200	1680	73.7	18	-	
1230	1710	72.0	18	-	
1300	1740	72.0	18	-	
1330	1770	72.5	18	-	
1400	1800	72.8	18	-	
1500	1860	72.4	18	-	
1530	1890	73.0	18	-	
1600	1920	73.3	18	-	
1630	1950	73.4	18	-	
1700	1980	73.2	18	-	
1730	2010	75.0	16	-	
1800	2040	74.5	16	-	
1830	2070	74.7	16	-	
1900	2100	75.6	16	15	
1930	2130	75.7	17	-	
2000	2160	-	-	16	
2030	2190	73.7	18	-	
2100	2220	73.7	18	15	
2130	2250	73.4	18	-	
2200	2280	73.6	18	-	
2210	2290	-	-	15	
2230	2310	73.9	18	-	
2240	2320	-	-	15	
2300	2340	73.5	18	-	
2321	2361	-	-	-	Water slightly turbid.
2330	2370	73.4	18	-	
2400	2400	73.3	18	-	

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Dec. 15					
0030	2430	73.5	18	-	
0100	2460	73.3	18	17	
0130	2490	73.2	18	-	
0200	2520	73.1	18	-	
0240	2560	73.1	18	-	Heavy rain interferes with measurement.
0340	2620	73.5	18	-	
0350	2630	-	-	15	
0400	2640	73.3	19	-	
0500	2700	73.0	18	-	
0600	2760	73.3	-	-	
0625	2785	-	-	-	Temperature of water, 81°F (27°C).
0630	2790	75.0	16	16	
0700	2820	75.6	16	-	
0730	2850	75.5	-	17	
0731	2851	-	-	-	Stop pump. Start re- covery measurements.
0731	0	-	-	-	Elapsed time since pumping stopped meas- ured with stopwatch.
	½	69.1			
	1	62.7			
	1½	56.9			
	2	56.0			
	2½	53.5			
	3	51.2			
	3½	49.3			
	4	48.5			
	4½	47.7			
	5	47.1			
	6	45.9			
	7	44.9			
	8	43.8			
	9	42.6			
	12	40.1			
	15	37.8			

TEST HOLE 7

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Dec. 15					
	18	33.9			
	21	31.3			
	24	30.1			
	27	29.5			
	30	29.4			
0804	33	28.1			Last measurement of recovery.

PUMPING TEST

Date: Jan. 25, 1976

Duration of test: 600 minutes

Test made with airlift pump set with intake at 109 ft. Pumping rate measured with 30-gal container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, Garrett Chapman, and Carmelo Sam. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Jan. 25					
0800	0	25.3	-	-	Start airlift pump.
0807	7	45.0	-	-	
0809	9	50.0	-	-	
0811	11	60.0	-	-	
0813	13	65.0	-	-	
0820	20	69.9	-	-	
0824	24	70.4	-	-	
0832	32	71.3	-	-	
0835	35	71.3	-	-	
0839	-	-	21	-	Slight turbidity in water.
0846	46	71.8	-	-	
0900	60	72.6	-	-	
0905	65	-	21	-	Water is almost clear.
0920	80	72.8	-	-	
0930	90	72.8	-	-	
0935	95	-	19	-	
0948	108	73.5	20	-	
1015	135	73.3	19	-	
1045	165	73.8	19	-	
1055	-	-	-	17	
1100	180	74.5	19	-	
1130	210	74.6	18	-	
1200	240	74.7	19	-	
1230	270	75.0	18	-	
1300	300	75.1	18	-	
1330	330	75.1	19	-	
1400	360	75.3	19	-	
1410	370	75.4	-	-	
1430	390	75.3	18	-	
1500	420	75.5	18	-	
1530	450	75.4	18	-	

TEST HOLE 7

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Jan. 25					
1600	480	76.0	18	-	
1612	492	75.8	-	-	
1622	502	76.0	-	-	
1630	510	76.0	17	-	
1640	520	76.1	-	17	
1650	530	76.0	-	-	
1700	540	76.1	17	-	
1712	552	76.2	-	-	
1723	563	76.1	-	-	
1730	570	76.3	17	-	
1740	580	76.4	-	-	
1755	595	76.2	17	-	
1800	600	-	-	-	Stop pump. Start recovery measurements.
1800	0				Elapsed time since pumping stopped measured with stopwatch.
	1	67.4			
	1½	59.3			
	2	56.9			
	2½	54.0			
	3	52.3			
	3½	51.3			
	4	50.0			
	5	50.0			
	5½	48.9			
	6	48.2			
	6½	46.5			
	7½	45.4			

TEST HOLE 7

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Jan. 25					
	8	44.5			
	9	43.5			
	10	42.3			
	11	41.4			
	12	40.5			
	13	38.9			
	14	36.9			
	15	35.5			
	16	34.6			
	17	33.9			
	18	33.4			
	19	33.2			
	20	32.8			
	22	32.6			
	23	32.5			
	24	32.4			
	25	32.3			
	26	32.2			
	27	32.2			
	28	32.1			
	29	32.0			
	30	32.0			
1831	31	31.9			Last measurement of recovery.
Jan 26					
0740		27.2			
0755		27.2			
0800		27.2			

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay with scattered boulders of fresh to partly weathered basalt. Probably talus deposit.	0-30
Weathered basalt with scattered residual boulders of fresh, black basalt. Weathered rock generally brown and clayey; boulders are of hard, dense rock.	30-65
Basalt, ranging from fresh, hard black rock to partly weathered softer rock, with clayey layers and seams.	65-76
Clay, gray in upper part of section, becoming dark red to brown in lower part.	76-100
Weathered basalt, gray and brown, with a few scattered residual boulders and cobbles of fresh black rock.	100-125
Clay, varicolored, mostly gray to reddish brown.	125-148
Basalt, ranging from fresh, hard black rock to softer partly weathered rock, with clayey seams.	148-172
Total depth.	172

TEST HOLE 8

Location: Pou Bay

Grid:

Date drilled: Jan. 27-Feb. 4, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 70 Depth (feet): 200

Observers: D. A. Davis, Ted Lund, Garrett Chapman, and Carmelo Sam

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Jan. 27	.	Setting up drilling equipment at site of test hole 8.
1605	-	Mixing drilling mud in preparation to drill.
1614	-	Start drilling with 8-in rotary rock bit, using drilling mud. Coral fill.
1615	2	Boulder. Rough drilling.
1621	3	As above.
1623	4	Weathered basalt. Smooth drilling.
1625	5	As above.
1626	6	As above.
1628	7	As above. Stop drilling to connect 8-in rotary rock bit on drill collar.
1703	7	Resume drilling with 8-in bit, using drilling mud. Soft, smooth drilling.
1705	-	Heavy rain and wind for 5 minutes.
1708	11	Brown clay, soft. Smooth drilling.
1709	12	As above.
1710	14	As above.
1711	17	As above.
1711½	18	As above. Stop drilling to clean mud pit.
1715	20	Clay, plastic, light red.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 27		
1716	21	As above.
1717	22	As above.
1718	23	As above.
1719	24	As above.
1720	25	Clay, as above, with some gray streaks.
1721	26	Stop drilling. Shut down for the day.
Jan. 28		
0750	26	Start drilling with 8-in bit. Brown clay, soft. Smooth drilling.
0752	28	As above.
0753	28½	As above, with bit chatter on small boulder.
0754	29	As above. Smooth.
0754½	30	As above. Smooth.
-	32	As above, with some dark brown and gray clay.
0757	33	As above.
0800	34	As above.
0800½	35	As above.
0802	36	As above. No mud mixed since drilling started at 0750. Natural clay from hole and added water are sufficient for circulating fluid.
0804	37	Slight bit chatter. Little slower drilling but still soft.
0809	38	As above.
0811	39	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 28		
0816	41	As above.
0819	42	As above. Stop drilling to add section of drill pipe and to clear hole by circulating fluid.
0836	42	Resume drilling with 8-in bit, using natural clay from hole and added water as circulating fluid. Soft drilling.
0837	43	As above.
0838	44	As above.
0840	45	As above.
0841	46	Clay, brown and gray mottled. Soft.
0844	48	As above.
0846	49	Stiff clay, mostly brown. Soft drilling.
0848	50	As above.
0851	51	As above.
0853	52	As above. Stiff plastic clay is forced from hole during drilling in about the same way tooth paste is squeezed from a tube, and is cut off in sections at ground surface with a shovel.
0856	53	Clay, as above.
0856	55	Clay, as above, very soft.
0857	56	As above.
0859	56	Clay, brown, very soft. Stop drilling. Clear hole by circulating fluid. Add section of drill pipe. Clean mud pit and add water to natural mud for drilling fluid. No commercial mud used.
0919	57	Resume drilling with 8-in bit.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 28		
-	58	Clay, very soft.
0921	59	Clay, very soft. Rain.
0923	60	As above.
0924	61	As above.
0925	62	As above.
0927	63	As above.
0929	64	As above.
0930	65	As above. Rain.
0931	65½	Bit chatter. Smooth at 66 ft.
0940	70	Clay, soft. Smooth drilling.
0942	71	Stop drilling. Clear hole of cuttings. Add section of drill pipe. Clean mud pit.
1010	71	Resume drilling with 8-in bit. Clay, soft.
1014	75	Clay, as above.
1016	79	As above.
1019	80	Bit chatter. Harder drilling.
1021	80	Bit chatter. Hard. Slow drilling on residual boulder of fresh black basalt.
1025	80	As above.
1030	80¼	Smooth drilling. Hard, as above.
1049	80½	As above.
1100	80½	As above. Heavy shower. Intermittent rain since about 0920.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 28		
1112	81	Bit chatter. Softer drilling.
-	82	Clay, soft.
1115	83	Clay, soft. Smooth drilling.
1116	84	Clay, soft. Some bit chatter.
1123	85	Smooth drilling. Harder than above.
1127	86	Clay. Smooth drilling. Slow, because clay plugs fluid-outlet openings in bit.
1135	87	As above.
		No record from January 28 at 1135 hours to January 31 at 1300 hours.
Jan. 31		
1300	163	Cleaning hole with airlift pump.
1425	-	Depth to water, 98.2 ft below top of rotary table, which was 3.5 ft above ground surface. Correction for electric tape used to measure water level was -3.0 ft. To obtain approximate depth of water level below ground surface, sub- tract 6.5 ft from each water-level figure.
1430	-	Q, 30 gal in 75 sec = 24 gal/min.
1450	-	Depth to water, 98.1 ft.
1455	-	Q, 30 gal in 72 sec = 25 gal/min.
1500	-	Chloride concentration of water, 11 mg/L.
1522	-	Stop pump to add additional pipe to airlift pump. About 41 ft of pipe added. Depth of pump intake is about 158 ft below ground surface.
1534	-	Start airlift pump. Water very muddy.
1540	-	Airlift eductor pipe plugged by cuttings. No pumping.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Jan. 31		
1600	-	Remove pump from hole to clear eductor pipe.
1705	-	Pump installed with intake at about 158 ft below ground surface. Start pump.
1706	-	Water is thick with mud and cuttings.
1715	-	Water is muddy but thinner.
1722	-	Q, 30 gal in 123 sec = 15 gal/min.
1728	-	Depth to water, 110.1 ft.
1730	-	Q, 30 gal in 131 sec = 14 gal/min.
1734	-	Q, 30 gal in 132 sec = 14 gal/min.
1736	-	Depth to water 110.5 ft.
-	-	Stop air for 15 sec.
1739	-	Air on. Muddy water and numerous fragments of weathered basalt discharged.
1755	-	Q, 30 gal in 132 sec = 14 gal/min.
1756	-	Depth to water, 98.0 ft.
1805	-	Chloride concentration in water, 10 mg/L.
1810	-	Depth to water 98 ft.
1813	-	Q, 30 gal in 132 sec = 14 gal/min.
1830	-	Shut down for the day.
Feb. 1		
0800	163	Start pumping test of Feb. 1, 1976.
1404	-	Stop pumping.
1544	-	Last recovery measurement.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 2 0755	-	Depth to water, 35.7 ft.
1407	-	Depth to water, 33.0 ft.
1430	-	Prepare to deepen hole to about 200 ft.
1437	160½	Start drilling with 5-in rotary rock bit. Circulating water for drilling fluid. Hole is backfilled from 163 ft with caved material. Rough bit chatter on caved boulder.
1442	161	Smooth drilling.
1445	163	Smooth drilling. Stop drilling to plug leak of drilling fluid from mud pit into hole.
1450	-	Resume drilling. Drilling out caved material.
1500	163	Smooth drilling.
1501	164	As above. Stop drilling to repair leak in mud pit.
1505	-	Resume drilling caved material.
1506	164	Smooth drilling.
1511	165	As above.
1513	-	Stop drilling. Attempts to prevent leak in mud pit and return of drilling fluid hole alternating with attempts to drill, 1513 to 1620. Depth reached 168 ft.
1620	-	Removed portable mud pit and dug a new mud pit in ground near hole.
1627	-	Resume drilling using water for circulation and dug mud pit.
1628	168	Smooth drilling.
1630	169	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 2		
1631	170	As above.
1632	171	As above.
1634	172	Stop drilling to clear hole of cuttings and add section of drill pipe. Drilling in brown and blue clay or very thoroughly weathered basalt.
1640	172	Resume drilling with 5-in bit. As above.
1641	173	Slight bit chatter.
1643	174	As above.
1646	176	As above.
1648	177	As above.
1649	178	Smooth drilling.
1650	179	As above.
1651	180	As above.
1653	181	Mostly smooth, some light chatter.
1655	182	As above.
1656	183	As above.
1658	184	As above.
1659	185	As above.
1700	186	As above.
1701	187	As above. Stop drilling to clear hole of cuttings and add section of drill pipe.
1706	187	Resume drilling with 5-in bit using water for circulation.
1710	188	Mostly smooth drilling, some chatter.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 2		
1712	189	As above.
1714	190	As above.
1715	191	As above.
1717	192	As above.
1719	193	As above.
1720	194	Increased bit chatter. Slower drilling.
1726	196	Rough bit chatter, slow drilling.
1737	197	As above, somewhat smoother.
1741	199	Very rough bit chatter.
1745	200	As above.
1749	200½	Smoother.
1751	-	Began clearing hole of cuttings.
1814	-	Tools removed from hole. Shut down for the day.
Feb. 3		
0900	200	Installing airlift pump to clean and develop hole before pumping test.
1000	-	Depth to water, 26.9 ft below top of rotary table.
1100	-	Airlift pump installed. Depth of pump intake, about 190 ft. Start cleaning hole with airlift pump.
1210	-	Depth to water, about 140 ft below top of rotary table. From 1100 to 1210 hours, muddy water and cuttings removed by on-and-off operation of airlift pump. From 1210 to 1324, pump operated continuously.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 3		
1324	-	Depth to water, 145.0 ft below top of rotary table. Stop pumping.
1340	-	Depth to water 85.0 ft.
1341	-	Start pump.
1355	-	Q, 30 gal in 95 sec = 19 gal/min. Depth to water, 132.3 ft below top of rotary table.
1407	-	Q, 30 gal in 148 sec = 12 gal/min. Depth to water, 142 ft below top of rotary table.
1535	-	Chloride concentration in water, 12 mg/L.
1700	-	Q, 30 gal in 146 sec = 12 gal/min. Depth to water, 143 ft. From 1410 to 1700 hours pump was operated on and off to clear mud and cuttings from hole. Mud was formed by mixing of clay penetrated by bit with natural water during the drilling process.
1710	-	Shut down for the day.
Feb. 4		
0755	-	Depth to water, 41.5 ft below top of rotary table, which is 3.5 ft above ground surface. Correction for electric tape was -3.0 ft. To obtain corrected depth below ground surface, subtract 6.5 ft from each water-level figure.
0800	-	Start pumping test of February 4, 1976, at depth of 200 ft.
1400	-	Stop pump. Start recovery measurement.
1542	-	Last measurement. Test completed.
Feb. 5	200	Depth to water, 42.8 ft below top of rotary table.

PUMPING TEST

Date: Feb. 1, 1976

Duration of test: 364 minutes

Test made with airlift pump at 163-ft depth. Water level measured with electric tape below top of rotary table of drilling machine, which was 3.5 ft above ground surface. Tape correction was 3.0 ft. To obtain depth below ground surface, subtract 6.5 ft from recorded depth. Pumping rate measured with 30-gal container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, Garrett Chapman, and Carmelo Sam. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Feb. 1 0745	-	35.1	-	-	Water level measured below top of rotary table, 3.5 ft above ground surface. Electric tape correction is -3.0 ft. Subtract 6.5 ft from recorded water level to obtain depth below ground surface.
0800	0	-	-	-	Start pump.
0800½	½	-	-	-	Water clear, then turbid.
0805	5	90.0	27	-	Water very turbid.
0807	7	100.0	-	-	
0810	10	105.0	18	-	Water less turbid.
0815	15	110.0	15	-	Water less turbid.
0820	20	-	14	-	Water less turbid.
0825	25	-	14	-	Water almost clear.
0830	30	-	14	-	
0833	33	-	-	12	
0835	35	111.0	-	-	
0840	40	-	14	-	
0843	43	111.0	-	-	
0850	50	-	14	-	
0853	53	111.0	-	-	
0900	60	-	14	-	
0905	65	111.5	-	-	
0915	75	-	14	-	

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 1					
0918	78	-	14	-	
0920	80	111.6	-	-	
0930	90	-	14	-	
0935	95	111.8	-	-	
0943	103	-	-	12	
0945	105	-	14	-	
0948	108	111.9	-	-	
1000	120	112.0	14	-	
1015	135	112.0	-	-	
1030	150	-	14	-	
1035	155	112.0	-	-	
1045	165	112.0	14	-	
1100	180	111.7	14	-	
1115	195	-	14	-	
1120	200	112.0	-	-	
1130	210	111.9	14	-	
1145	225	111.9	14	-	
1200	240	-	14	-	
1204	244	112.6	-	-	
1215	255	112.8	14	-	
1300	300	112.4	14	-	
1315	315	112.5	14	-	
1330	330	-	14	-	
1334	334	112.6	-	-	
1345	345	112.7	14	-	
1400	360	112.4	13	12	
1404	-	-	-	-	Stop pump. Start measurement of water-level recovery.
1404	0	-	-	-	Stopwatch used to measure elapsed time after pumping stopped.
	2½	102.5			
	3	97.5			
	3½	94.8			
	4	92.9			
	4½	91.0			
	5	88.9			
	5½	85.9			

TEST HOLE 8

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 1					
	7	79.3			
	8	72.8			
	9	67.8			
	10	63.2			
	11	61.6			
	12	60.0			
	13	58.3			
	14	56.7			
	15	55.2			
	18	51.2			
	21	48.6			
	24	45.2			
	27	44.0			
	30	43.0			
	39	40.1			
	42	39.8			
	48	39.0			
	54	38.6			
	60	38.3			
	66	37.9			
	72	37.5			
	78	37.1			
	84	36.9			
	90	36.6			
	96	36.4			
1544	102	36.3			Last measurement of recovery.
Feb. 2					
0755	-	35.7			
1407	-	33.0			

PUMPING TEST

Date: Feb. 4, 1976

Duration of test: 360 minutes

Test made with airlift pump at 200-ft depth. Water level measured with electric tape below top of rotary table of drilling machine, which was 3.5 ft above ground surface. Tape correction was 3.0 ft. To obtain depth below ground surface, subtract 6.5 ft from recorded depth. Pumping rate measured with 30-gal container and stopwatch. Water-level and rate measurements by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Feb. 4					
0755	-	41.5	-	-	
0800	0	-	-	-	Start pump.
0801	1	-	-	-	Water is clearing.
0804	4	80.0	-	-	
0805	5	-	43	-	
0806	6	105.0	-	-	
0811	11	131.1	18	-	
0815	15	136.9	-	-	
0820	20	-	13	-	
0822	22	141.4	-	-	
0825	25	-	13	-	
0830	30	141.3	-	-	
0840	40	-	12	12	Water almost clear.
0844	44	141.5	-	-	
0850	50	-	12	-	
0854	54	141.3	-	-	
0900	60	141.7	12	-	
0915	75	-	12	-	
0919	79	141.7	-	-	
0930	90	142.2	12	-	
0945	105	142.5	13	-	
1000	120	142.9	13	-	
1010	130	-	-	12	
1020	140	142.7	12	-	
1040	160	143.0	13	-	
1055	175	142.9	13	-	
1110	190	143.4	12	-	

TEST HOLE 8

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 4					
1120	200	143.6	-	-	
1130	210	-	-	11	
1140	220	143.4	12	-	
1200	240	143.5	13	-	
1220	260	143.3	12	-	
1240	280	143.2	12	-	
1255	295	-	-	-	Temperature of water, 80°F (26.7°C).
1300	300	144.0	13	-	
1320	320	144.1	12	-	
1325	325	-	-	12	
1340	340	143.4	12	-	
1355	355	-	12	-	
1357	357	143.7	-	-	
1400	360	-	-	-	Stop pump. Start re- covery measurements.
1400	0	-	-	-	Elapsed time since pumping stopped meas- ured with stopwatch.
	$\frac{1}{2}$	143.3			
	1	140.1			
	$1\frac{1}{2}$	138.9			
	2	136.5			
	$2\frac{1}{2}$	134.0			
	3	131.9			
	$3\frac{1}{2}$	129.6			
	4	127.4			
	$4\frac{1}{2}$	125.0			
	5	123.5			
	$5\frac{1}{2}$	120.3			
	6	118.2			
	$6\frac{1}{2}$	115.9			
	7	114.4			
	$7\frac{1}{2}$	111.6			
	8	110.1			
	$8\frac{1}{2}$	108.7			
	9	106.2			
	$9\frac{1}{2}$	103.3			

TEST HOLE 8

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 4	10	100.8			
	11	95.6			Noise in hole.
	12	90.9			
	13	86.3			
	14	85.0			
	15	81.3			
	16	79.0			
	18	75.2			
	19	73.2			
	20	68.7			
	21	69.0			
	22	67.0			
	23	65.6			
	24	63.7			
	25	59.2			
	26	58.4			
	27	56.6			
	28	54.3			
	29	52.8			
1430	30	51.5			
	33	48.5			
	36	47.3			
	39	46.2			
	42	45.4			
	45	44.9			
	48	44.6			
	51	44.4			
	54	44.4			
	57	44.3			
1500	60	44.2			
	66	44.1			
	72	43.9			
	78	43.8			
	84	43.8			
	90	43.7			
	96	43.6			
1542	102	43.5			Last measurement.

TEST HOLE 8

PUMPING TEST--Continued

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 5 0745		42.8			
1075					
1080					
1085					
1090					
1095					
1100					
1105					
1110					
1115					
1120					
1125					
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TEST HOLE 8

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Coral fill.	0 - 2
Weathered basalt with residual boulders of basalt.	2 - 11
Soft brown clay.	11 - 20
Soft light red clay.	20 - 26
Soft brown clay with zones of gray clay.	26 - 80
Brown clay with zones of gray and blue clay and scattered residual boulders of gray clay.	80 - 200
Total depth	200

TEST HOLE 9 (Converted to well 12)

Location: Truk High School, at old cafeteriaGrid:

Date drilled: Feb. 5-11, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 22 Depth (feet): 80

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 5	-	Drilling equipment set up before noon.
1330	-	Mixing drilling mud.
1355	-	Start drilling with 8-in rotary rock bit on kelly. Red clayey soil.
1357	1	Bit chatter.
1359	3	Smooth drilling in red clay.
1400	5	As above.
1401	7	As above. Stop drilling to connect stabilizer and 8-in rotary rock bit.
1414	7	Resume drilling.
1415	7½	Rough bit chatter on boulder in red clay. Some gray clay.
1419	8	As above.
1420	9	Smoother drilling, mostly in gray clay.
1422	10	Rough bit chatter.
1424	11	Smoother drilling.
1427	12	As above in reddish clay.
1429	13	As above in red clay.
1431	14	As above.

TEST HOLE 9

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 5 1433	15	As above.
1434	16	As above.
1435	17	As above.
1437	18	As above.
1440	19	As above.
1442	20	As above.
1444	21	Smooth drilling in dark red to brown clay with some pale red clay.
1446	22	As above.
1448	23	Smooth drilling in dark red clay.
1449	24	As above.
1451	25	As above.
1453	26	As above. Stop drilling to add section of drill pipe and to clear hole of cuttings by circulation of drilling mud.
1513	26	Resume drilling. Some bit chatter.
1524	27	Smooth drilling. Somewhat faster.
1525	28	Smooth drilling in brown clay.
1527	29	As above.
1529	31	As above.
1530	32	As above.
1534	33	As above.
1534½	34	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 5		
1535	35	As above. Some bit chatter at 35 ft.
1536	36	Smooth drilling in brown clay.
1537	37	As above.
1539	40	As above.
1540	41	As above.
1541	42	As above. Stop drilling to add section of drill pipe and to clear hole of cuttings.
1550	42	Cleaning mud pit and adding water to drilling mud. No commercial mud has been added since that mixed before drilling started. Natural clay cut by bit has mixed with original mud to form a heavy slurry.
1555	42	Resume drilling. Smooth drilling in brown clay.
1557	43	As above.
1559	44	As above.
1600	45	As above.
1601	46	As above.
1602	47	Smooth drilling in dark brown clay.
1604	48	As above.
1605	49	As above.
1607	50	Mostly smooth drilling, but slower and with some slight chatter. Probably entering weathered rock.
1609	51	As above.
1610	52	As above.
1612	53	As above.

TEST HOLE 9

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 5		
1614	54	As above.
1615	55	Mostly smooth drilling in weathered rock and brown clay.
1617	56	As above.
1620	57	As above. Stop drilling to add section of drill pipe and to clear hole of cuttings.
1638	57	Resume drilling. As above.
1642	58	As above.
1645	59	Smooth drilling in weathered rock.
1646	60	As above.
1647	61	As above.
1648	62	As above. Slight bit chatter.
1649	63	As above.
1650	64	As above.
1652	65	As above.
1653	66	As above.
1654	67	As above.
1655	68	As above.
1657	69	As above.
1659	70	Rough bit chatter. Black chips from basalt boulder among cuttings.
1700	71	Smoother drilling.
1705	72	Rough bit chatter. Black chips in cuttings. Stop drilling to clear hole of cuttings.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 5 1712	72	Shut down for the day.
Feb. 6 0805	72	Resume drilling with 8-in bit. Very rough bit chatter.
0810	72½	As above.
0818	73	As above.
0838	74	As above. Tight hoist line caused an increase in drilling time in interval from 0805 hrs.
0841	75	Rough bit chatter.
0846	75½	Stop drilling. Remove tools from hole to change from 8-in to 5-in bit.
0935	75	Resume drilling with 5-in rotary rock bit, using natural water and clay for circulating fluid.
0941	75½	Rough bit chatter.
0954	76	Rough bit chatter. Slow drilling.
1032	77	As above.
1056	78	As above.
1109	79	As above.
1120	80	As above. Stop drilling.
1340	80	Three 20-ft sections of 6-in casing installed. Casing is held suspended in hole by cable anchored to frame of drilling machine.
1340	-	Start installing 1-in and 2-in pipe of airlift pump.

TEST HOLE 9

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 6		
1422	-	Start airlift pump for cleaning and development of hole.
1423	-	Much mud discharged by pump.
1428	-	Mud in discharge decreasing.
1440	-	Depth to water, 22.6 ft below top of 6-in casing, 0.8 ft above ground surface.
1443	-	Q, 5 gal in 5 sec = 60 gal/min.
1444	-	Start on-and-off pumping at irregular intervals from 1444 to 1640 hrs.
1449	-	Water is beginning to clear.
1450	-	Chloride concentration in water, 70 mg/L.
1505	-	Depth to water 23.2 ft. Q, 30 gal in 31 sec = 58 gal/min.
1510	-	Chloride concentration, 55 mg/L.
1515	-	Depth to water 23.3 ft. Q, 30 gal in 31 sec = 58 gal/min.
1520	-	Chloride concentration, 53 mg/L.
1540	-	Depth to water, 23.3 ft. Q, 58 gal/min. Chloride concentration 51 mg/L.
1620	-	Depth to water, 23.2 ft. Q, 58 gal/min. Chloride concentration, 52 mg/L.
1640	-	Stop airlift pump. Shut down for the day.
Feb. 7		
1605	-	Depth to water, 9.9 ft below top of 6-in casing.

TEST HOLE 9

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 9 0750	-	Depth to water, 9.9 ft.
0800	-	Drilling machine moved to site 75 ft south of test hole 9 to drill observation hole for measurement during pumping test of test hole 9.
0927	-	Start drilling observation hole.
1311	-	Depth to water, 10.0 ft below top of 6-in casing, 0.8 ft above ground surface.
1344	-	Depth to water, 10.1 ft.
1404	-	Depth to water, 10.1 ft.
1415	-	Start airlift pump in observation hole.
1454	-	Stop pump in observation hole.
1505	-	Depth to water, 10.9 ft.
1530	-	Depth to water, 10.3 ft.
1555	-	Start installation of airlift pump in test hole 9.
1610	-	Pump installed with intake 73 ft below ground surface.
1613	-	Depth to water 10.1 ft below top of 6-in casing.
1614	-	Start pump. Muddy water discharge.
1622	-	Q, 30 gal in 30 sec = 60 gal/min.
1625	-	Water is clearing.
1632	-	Stop pump. Shut down for the day.
Feb. 10 0800	-	Start pumping test of Feb. 10-11, 1976, in test hole 9.

PUMPING TEST

Date: Feb. 10-11, 1976

Pumping test made with airlift pump set with intake at 73 ft below ground surface. Water level measured with electric tape. Pumping rate measured with 30-gal container and stopwatch. Water-level and pumping-rate observations made by Ted Lund and Garrett Chapman. Field determinations of chloride concentration by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Feb. 10					
0734	-	9.8	-	-	Water level measured below top of 6-in casing, 0.8 ft above ground surface.
0800	0	-	-	-	Start airlift pump.
0802	2	19.7	60	-	
0805	5	20.8	60	-	
0810	10	21.4	60	-	
0815	15	21.9	58	-	
0820	20	22.3	58	55	
0825	25	22.4	58	-	
0830	30	22.6	58	-	
0840	40	22.8	56	-	
0850	50	22.9	56	-	
0900	60	23.0	56	50	
0915	75	23.2	58	-	
0930	90	23.3	56	50	
0945	105	23.4	56	-	
1000	120	23.5	56	-	
1015	135	23.4	58	-	
1030	150	23.4	56	-	
1045	165	23.5	56	-	
1105	185	23.5	56	-	
1115	195	23.5	55	-	
1131	211	23.5	56	-	
1133	213	23.5	-	50	
1150	230	23.6	58	-	
1155	235	23.6	-	-	

TEST HOLE 9

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 10					
1204	244	23.6	56	-	
1207	247	23.6	-	-	
1219	259	23.6	58	-	
1231	271	23.6	56	-	
1252	292	23.7	56	-	
1254	294	23.6	-	-	
1303	303	23.7	56	-	
1330	330	23.6	55	50	
1350	350	23.6	55	-	
1400	360	23.7	56	-	
1430	390	23.6	55	-	
1449	409	23.7	56	-	
1503	423	23.6	56	50	
1522	442	23.7	55	-	
1534	454	23.7	56	-	
1550	470	23.7	56	-	
1607	487	23.7	56	-	
1620	500	23.7	56	-	
1633	513	23.8	56	-	
1640	520	23.7	-	-	
1650	530	23.8	56	-	
1700	540	23.7	56	-	
1724	564	23.7	56	-	
1732	572	23.8	56	-	
1745	585	23.7	55	-	
1800	600	23.7	55	-	
1830	630	23.5	56	-	
1900	660	23.5	56	-	
1930	690	23.6	55	-	
2000	720	23.6	56	-	
2030	750	23.6	56	-	
2100	780	23.7	56	-	
2130	810	23.6	55	-	
2200	840	23.7	56	-	
2230	870	23.7	55	-	
2300	900	23.7	56	-	
2330	930	23.7	55	-	
2400	960	23.7	55	-	

TEST HOLE 9

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 11					
0030	990	23.7	56	-	
0100	1020	23.7	56	50	
0130	1050	23.7	55	-	
0200	1080	23.7	56	-	
0230	1110	23.7	56	-	
0300	1140	23.7	56	-	
0330	1170	23.7	56	-	
0400	1200	23.7	55	-	
0430	1230	23.8	56	50	
0500	1260	23.8	55	-	
0530	1290	23.8	56	-	
0600	1320	23.8	56	-	
0630	1350	23.8	56	-	
0700	1380	24.0	56	-	
0730	1410	24.1	56	-	
0755	1435	-	56	-	
0800	1440	-	-	-	Stop pump.

Observation Hole 75 ft south of test hole 9

Date drilled: Feb. 9, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 22 Depth (feet): 66

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976		
Feb. 9		
0927	-	Start drilling observation hole using 5-in rotary rock bit.
0928	2	Smooth drilling in brown clay.
0929	5	As above.
0930	7	Mostly smooth drilling, some bit chatter, in brown to gray clay.
0931	8	Rough bit chatter on boulder.
-	9	As above.
0933	10	Smooth drilling in light brown clay and weathered basalt.
0936	13	As above.
0937	15	As above.
0939	18	As above, but softer.
-	19	As above.
0940	20	As above.
0941	21	As above in gray clay. Stop drilling to add section of drill pipe.
-	-	No record, 21 to 42 ft.

Observation hole at test hole 9

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 9		
1037	42	Smooth drilling in gray weathered basalt.
1041	45	As above.
1042	46	As above.
1044	47	Rough bit chatter.
1045	48	As above.
1046	49	As above.
1047	51	As above. Stop drilling to clear hole of cuttings and to add section of drill pipe. Chips of fresh black basalt in cuttings cleared from hole.
1051	51	Resume drilling. Rough bit chatter. Chips of black basalt in cuttings.
1101	53	Rough bit chatter.
1104	54	Very rough chatter. Chips of black basalt from boulder.
1106	54½	As above.
1109	55	As above. Hard drilling.
1111	56	Smooth. Softer drilling.
1111½	57	As above.
1114	58	As above.
1115	59	As above. Some chatter.
1116	60	Mud hose broken. Stop drilling to repair.
-	-	No record, 60 ft to 66 ft.
1245	66	- - -

Observation hole at test hole 9

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 9		
1311	66	Remove drilling tools from hole.
1335	-	Start installing airlift pump in hole.
1400	-	Pump installation completed.
1415	-	Start airlift pump. Discharge is very muddy water.
-	-	On-and-off pumping from 1415 to 1454 hrs.
1441	-	Q, 35 gal in 42 sec = 43 gal/min.
1442	-	Depth to water, 20.9 ft below ground surface.
1446	-	Q, 35 gal in 40 sec = 45 gal/min.
1454	-	Water almost clear. Stop pump.
1455	-	Remove pump from hole.
1528	-	Install 21-ft section of 3-in standard pipe in hole as casing.
1544	-	Depth to water, 10.5 ft below top of 3-in casing, 1.0 ft above ground surface.

Observation hole at test hole 9

PUMPING TEST

Date: Feb. 10-11, 1976

Observations by D. A. Davis and Carmelo Sam. Water-level measurements made with steel tape below top of 3-in casing, 1.0 ft above ground surface.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Feb. 10					
0720	-	10.1	-	-	
0800	-	-	-	-	Start pump in test hole 9.
0801	1	10.1	-	-	
0802	2	10.6	-	-	
0803	3	11.1	-	-	
0804	4	11.4	-	-	
0806	6	11.7	-	-	
0808	8	12.0	-	-	
0809	9	12.1	-	-	
0810	10	12.3	-	-	
0811	11	12.4	-	-	
0813	13	12.4	-	-	
0814	14	12.7	-	-	
0815	15	12.8	-	-	
0820	20	13.1	-	-	
0825	25	13.4	-	-	
0830	30	13.6	-	-	
0840	40	13.9	-	-	
0850	50	14.1	-	-	
0900	60	14.3	-	-	
0915	75	14.4	-	-	
0930	90	14.5	-	-	
0946	106	14.6	-	-	
1000	120	14.6	-	-	
1015	135	14.7	-	-	
1030	150	14.8	-	-	

Observation hole at test hole 9

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 10					
1045	165	14.8	-	-	
1048	168	14.8	-	-	
1100	180	14.8	-	-	
1115	195	14.8	-	-	
1130	210	14.8	-	-	
1145	225	14.8	-	-	
1200	240	14.9	-	-	
1213	253	14.9	-	-	
1227	267	14.9	-	-	
1245	285	14.9	-	-	
1259	299	14.9	-	-	
1315	315	14.9	-	-	
1330	330	15.0	-	-	
1345	345	15.0	-	-	
1400	360	15.0	-	-	
1417	377	15.0	-	-	
1430	390	15.0	-	-	
1445	405	15.0	-	-	
1500	420	15.0	-	-	
1515	435	15.0	-	-	
1530	450	15.0	-	-	
1545	465	15.0	-	-	
1600	480	15.1	-	-	
1615	495	15.1	-	-	
1630	510	15.1	-	-	
1645	525	15.1	-	-	
1700	540	15.1	-	-	
1734	574	15.1	-	-	
1800	600	15.1	-	-	
1830	630	15.2	-	-	
1900	660	15.2	-	-	
1930	690	15.3	-	-	
2000	720	15.3	-	-	
2030	750	15.3	-	-	
2100	780	15.3	-	-	
2130	810	15.3	-	-	
2200	840	15.4	-	-	
2230	870	15.3	-	-	

Observation hole at test hole 9

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 10					
2300	900	15.3	-	-	
2330	930	15.4	-	-	
2400	960	15.4	-	-	
Feb. 11					
0030	990	15.3	-	-	
0100	1020	15.3	-	-	
0130	1050	15.3	-	-	
0200	1080	15.4	-	-	
0230	1110	15.4	-	-	
0300	1140	15.4	-	-	
0330	1170	15.4	-	-	
0400	1200	15.4	-	-	
0430	1230	15.4	-	-	
0500	1260	15.4	-	-	
0530	1290	15.4	-	-	
0600	1320	15.4	-	-	
0630	1350	15.4	-	-	
0700	1380	15.5	-	-	
0730	1410	15.5	-	-	
0755	1435	15.5	-	-	
0800	1440	-	-	-	Stop pump in test hole 9.
					Elapsed time after pumping stopped measured with stopwatch.
0800	0	-	-	-	
	1	15.4			
	2	15.1			
	3	14.8			
	4	14.5			
	5	14.3			
	6	14.1			
	7	13.9			
	8	13.8			
	9	13.6			

Observation hole at test hole 9

PUMPING TEST--Continued					
Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 11	10	13.5			
	11	13.3			
	12	13.3			
	15	13.0			
	18	12.8			
	21	12.6			
	24	12.4			
	27	12.3			
	30	12.2			
	36	12.0			
	42	11.8			
	48	11.7			
	54	11.6			
	60	11.5			
	66	11.4			
	72	11.3			
	78	11.3			
	85	11.2			
	90	11.2			
	96	11.1			
0942	102	11.1			Last measurement.

TEST HOLE 9

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Red clayey soil.	1 - 3
Red clay.	3 - 7
Red and gray clay with scattered residual boulders of basalt.	7 - 21
Red and brown clay.	21 - 28
Brown clay.	28 - 50
Weathered basalt and brown clay.	50 - 59
Weathered basalt.	59 - 70
Weathered basalt with scattered residual boulders of basalt.	70 - 75
Basalt.	75 - 80
Total depth.	80

TEST HOLE 10 (Converted to well 8)

Location: Truk High School

Grid:

Date drilled: Feb. 11-13, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 39

Depth (feet): 66

Observers:

D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 11	-	Drilling equipment set up at site of test hole 10.
1340	-	Start drilling with 8-in rotary rock bit, using water for circulating fluid.
1345	4	- - -
1350	5	Bit chatter. Drilling on boulders in brown clay.
1355	6	Less bit chatter.
1356	7	Stop drilling to connect 8-in bit and stabilizer.
1410	-	Stop leak from mud pit into hole.
1425	7	Resume drilling with 8-in bit. Bit chatter.
1427	7	Stop drilling to dig mud pit.
1500	7	Resume drilling. Rough bit chatter.
1520	-	Mixing commercial drilling mud.
1527	-	Resume drilling. Rough bit chatter.
1530	8	Smooth drilling.
1531	9	Smooth, soft drilling in clay.
1533	10	As above.
1534	13	As above.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 11		
1536	14	As above.
1537	15	As above.
1539	16	Soft drilling, slight bit chatter.
1541	17	Smooth, soft drilling.
1546	18	Smooth drilling in stiff brown clay.
1551	19	As above.
1553	19½	Stop drilling to clear hole of cuttings.
1600	19	Resume drilling.
1602	20	Smooth drilling as above.
1604	21	As above.
1605	23	As above.
1607	24	As above.
1609	25	As above.
1610	26	As above.
1611	27	Stop drilling to clear hole of cuttings and to add section of drill pipe.
1621	27	Resume drilling with 8-in bit. Smooth, soft drilling in brown clay.
1626	28	As above.
1627	29	As above.
1629	30	As above.
1630	31	Smooth, soft drilling in light brown clay.
1632	34	As above.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 11 1644	42	Stop drilling to clear hole and to add section of drill pipe. Smooth, soft drilling, 34 to 42 ft.
1657	42	Some bit chatter.
1658	43	Some bit chatter.
1700	44	As above, in clay and weathered basalt.
1701	45	As above.
1702	47	As above.
1703	48	As above.
1704	49	As above.
1705	51	As above.
1707	52	As above, but more bit chatter.
1709	53	As above, increasing chatter at 53 ft.
1715	54	Mostly rough bit chatter in weathered basalt. Stop drilling to clear hole of cuttings and install 6-in surface casing.
Feb. 12 0745	-	Removed 6-in casing installed last night, and prepare to drill ahead with 5-in bit.
0800	53	Start drilling with 5-in roller rock bit. Rough chatter in weathered basalt.
0801	54	Rough chatter in weathered basalt. Rain.
0804	55	As above.
0806	56	As above.

TEST HOLE 10

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 12		
0807	57	Hard drilling, with rough bit chatter in fresh black basalt.
0815	58	As above.
0820	59	As above.
0829	60	As above.
0834	61	As above.
0840	62	As above.
0850	63	As above.
0858	64	As above.
0906	65	As above.
0914	66	As above. Stop drilling to clear hole of cuttings and to install airlift pump.
1030	66	Airlift pump installed, ready for cleaning and developing hole.
1033	-	Start airlift pump. Discharge is mud.
1037	-	Mud is becoming thinner.
1042	-	Q, 5 gal in 9 sec = 33 gal/min.
1050	-	Depth to water, 35 ft below ground surface.
1115	-	From 1050 hrs, surging by off-and-on pumping. Much mud and cuttings and fragments of weathered basalt discharged by pump.
1127	-	Continued pumping. Depth to water, 37 ft. Q, about 30 gal/min.

TEST HOLE 10

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 12 1200	-	Stop pumping.
1300	-	Depth to water, 22 ft, 1 hr after pumping stopped. Start pump. Q, 30 gal/min.
1310	-	Surging hole by off-and-on pumping. Depth to water, 37 ft.
1321	-	Q, 27 gal/min. Depth to water, 38 ft.
1340	-	Chloride concentration in water, 150 mg/L.
1425	-	Chloride concentration, 150 mg/L.
1435	-	Depth to water, 40.1 ft. Q, 30 gal/min.
1455	-	Depth to water, 40.2 ft. Q, 27 gal/min.
1500	-	Shut down for the day.
Feb. 13 0732	-	Depth to water, 14.06 ft below top 6-in casing, 2 ft above ground surface.
0750	-	Chloride concentration in water dipped from hole, 40 mg/L.
0800	-	Start pumping test of Feb. 19, 1976.

TEST HOLE 10

PUMPING TEST

Date: Feb. 13, 1976

Depth of hole, 66 ft. Observers, D. A. Davis, Ted Lund, and Garrett Chapman. Water level measured with electric tape below top of 6-in casing, 2 ft above ground surface, except as noted. Pumping rate measured with 30-gal container and stopwatch. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Feb. 13					
0732	-	14.06	-	-	Static water level measured with steel tape.
0732	-	17.12	-	-	Static water level measured with electric tape. Tape correction, -3.05 ft. Corrected depth to water, 14.07 ft.
0750	-	-	-	40	Sample dipped from hole before pumping started.
0800	0	-	-	90	Start pump.
0803	3	27.6	-	-	
0804	4	-	37	-	
0806	6	31.1	-	-	
0810	10	-	35	-	
0815	15	34.0	33	145	
0824	24	35.4	31	-	
0830	30	35.6	30	150	
0840	40	36.6	30	-	
0850	50	36.8	30	-	
0900	60	37.5	-	-	
0920	80	38.2	29	140	
0940	100	38.6	27	-	
1005	125	39.1	27	-	
1020	140	38.9	26	150	
1040	160	39.5	26	-	
1100	180	39.6	25	-	

TEST HOLE 10

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 13					
1120	200	39.9	26	145	
1140	220	40.0	25	-	
1200	240	40.0	25	-	
1220	260	40.2	25	-	
1235	275	-	-	150	
1245	285	40.4	25	-	
1300	300	40.5	25	-	
1320	320	40.6	24	150	
1340	340	40.6	24	-	
1400	360	40.7	24	-	
1420	380	40.7	24	150	
1440	400	40.9	23	-	Temp. of water, 81°F (27°C).
1500	420	41.0	24	-	
1520	440	41.0	23	150	
1540	460	41.1	23	-	
1550	470	-	-	140	
1555	475	41.1	23	-	
1600	480	-	-	-	Stop pump. Start measure- ment of water-level recovery.
1600	0	-			Elapsed time after pump- ing stopped measured with stopwatch.
	$\frac{1}{2}$	38.5			
	1	36.1			
	1½	34.3			
	2	33.3			
	2½	32.3			
	3	31.7			
	4	31.0			
	5	30.6			
	6	30.4			
	7	30.1			
	8	30.0			
	9	29.8			

TEST HOLE 10

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 13					
	12	29.5			
	15	29.0			
	18	28.8			
	21	28.6			
	24	28.4			
	27	28.2			
	30	28.0			
	36	27.7			
	42	27.4			
	48	27.1			
	54	26.8			
	60	26.5			
	66	26.2			
	72	25.9			
	78	25.6			
	84	25.4			
	90	25.2			
	96	24.9			
	102	24.7			Last measurement.

Feb. 14

0715 - 14.7

Measured with steel tape
below top of 6-in casing,
2 ft above ground surface.

TEST HOLE 10

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay with scattered boulders of fresh basalt.	0- 8
Brown clay, soft.	8-17
Stiff brown clay.	17-27
Brown clay, soft.	27-42
Brown clay and weathered basalt.	42-53
Weathered basalt.	53-57
Fresh basalt, black, hard.	57-66
Total depth.	66

TEST HOLE 11 (Converted to well 10)

Location: Land Management Office	Grid:
Date drilled: Feb. 14-17, 1976 by Ted Lund Drilling and Supply	
Altitude, ground surface (feet): 12	Depth (feet): 67
Observers: D. A. Davis, Ted Lund, and Garrett Chapman.	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 14		Moved equipment to site of test hole 11.
0953	-	Start drilling with 8-in rotary rock bit on kelly, using water for drilling fluid. Drilling in reddish brown clay.
0955	3	Smooth drilling in brown clay.
0956	4	Smooth drilling as above.
0957	5	As above, with slight bit chatter at 5 ft.
0958	8	Smooth drilling in very soft clay.
1000	10	As above.
1001	12	As above.
1002	13	As above, with slight bit chatter.
1006	18	Smooth drilling in soft red and gray clay.
1007	20	Stop drilling to add section of drill pipe and 8-in rotary rock bit on stabilizer.
1018	20	Resume drilling.
1019	21	Harder drilling in weathered basalt.
1027	23	As above.
1030	24	Slow drilling in stiff reddish brown clay.

TEST HOLE 11

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 14 1032	26	As above.
1036	28	As above.
1039	30	As above.
1041	-	Stop drilling to clear hole of cuttings.
1042	-	Resume drilling.
1045	32	As above.
1046	33	As above.
1049	34	As above in stiff gray to brown clay.
1050	35	As above.
1051	36	As above.
1053	38	Softer drilling in clay.
1055	39	- - -
1059	41	As above.
1100	42	Stop drilling to clear hole and to add section of drill pipe.
1115	42	Resume drilling in clay with 8-in bit.
1116	43	As above.
1117	44	Drilling in weathered basalt.
1118	46	As above.
1120	48	As above.
-	49	Light reddish brown clay.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 14		
1121	50	Weathered basalt.
1124	51	Weathered basalt. Some bit chatter.
1126	52	Rough chatter in weathered basalt. Stop drilling to clear hole of cuttings and to replace 8-in bit with 5-in bit.
1232	52	Resume drilling with 5-in rotary rock bit. Rough bit chatter.
1235	53	Rough bit chatter on residual boulder of fresh basalt in weathered basalt.
1236	53½	Through boulder. Smooth drilling in brown clay.
1237	55	Smooth drilling in brown clay.
1239	57	Some bit chatter. Slower drilling.
1240	58	As above in weathered basalt and some gray clay.
1242	59	As above. Heavy chatter.
1244	61	Blue and gray clay.
1249	62	Rough chatter on residual boulder of basalt.
1250	62	Stop drilling to clear hole of cuttings and to add water to mud pit. No commercial drilling mud used for circulation. Natural clay penetrated by bit mixes with water and forms a fairly heavy and satisfactory drilling fluid.
1258	62	Resume drilling with 5-in bit. Rough chatter and hard drilling.
1302	63	Very rough bit chatter and hard drilling.
1308	64	As above.
1314	65	As above.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 14		
1320	66	As above.
1327	67	As above. Total depth of test hole, 67 ft. Stop drilling to clear hole of cuttings and to install airlift pump for cleaning and development of the hole.
1335	67	Removed drilling tools from hole and began installation of 6-in surface casing.
1350	-	A 20-ft section of 6-in casing installed in hole. Began installing airlift pump.
1409	-	Start airlift pump.
1410	-	Mud rising out of hole over top of 6-in surface casing.
1416	-	Hole cleared of mud. Washing mud off walls of hole with clear water poured into hole outside 6-in casing.
1423	-	Depth to water, 23.4 ft below top of 6-in casing, 1 ft above ground surface. Q, 5 gal in 6 sec = 50 gal/min.
1427	-	Depth to water, 23.0 ft. Q, 50 gal/min.
1430	-	Start on-and-off pumping with airlift pump, together with raising and lowering of pump, to surge hole.
1442	-	As above. Depth to water, 23.0 ft. Q, 43 gal/min.
1455	-	Surging as above. Depth to water, 22.8 ft. Q, 50 gal/min. Much muddy water and cuttings discharged by pump.
1455	-	Chloride concentration in water, 15 mg/L.
1503	-	Depth to water, 22.8 ft. Q, 50 gal/min.
1535	-	Chloride, 15 mg/L.

TEST HOLE 11

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 14 1542	-	Depth to water, 22.9 ft. Q, 55 gal/min.
1555	-	Depth to water, 23.0 ft. Stop airlift pump. Shut down for the day.
Feb. 16 0700	-	Depth to water, 5.47 ft below top of 6-in casing, 1.0 ft above ground surface.
0730	-	Start pumping test of Feb. 16-17, 1976.
Feb. 17 0730	-	Stop pumping test of Feb. 16-17, 1976.

PUMPING TEST

Date: Feb. 16-17, 1976

Test made with airlift pump. Depth to water measured with electric tape, except as noted, below top 6-in casing, 1.0 ft above ground surface. Correction for electric tape = -3.2 ft. Subtract 3.2 ft from electric-tape measurement to obtain correct depth of water level below top of casing. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Feb. 16					
0700	-	5.97	-	-	Steel-tape measurement.
0730	0	-	-	-	Start airlift pump.
0732	2	-	50	-	
0735	5	21.8	50	-	
0740	10	22.2	-	-	
0746	16	22.9	50	15	
0755	25	22.7	50	-	
0800	30	22.7	50	-	
0810	40	22.8	43	-	
0814	44	-	50	-	
0815	45	22.8	50	-	
0830	60	22.9	-	14	
0845	75	22.9	50	-	
0900	90	23.0	50	-	
0920	110	23.0	50	-	
0940	130	23.2	50	-	
1000	150	23.2	50	15	
1020	170	23.2	50	-	
1040	190	23.3	50	-	
1100	210	23.3	50	-	
1120	230	23.3	50	-	
1140	250	23.4	50	-	
1200	270	23.4	50	-	
1220	290	23.4	50	-	
1240	310	23.5	50	-	
1250	320	20.3	-	-	Steel-tape measurement.

TEST HOLE 11

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 16					
1300	330	23.5	48	-	
1320	350	23.5	50	-	
1340	370	23.5	50	-	
1400	390	23.5	50	-	
1420	410	23.5	50	15	
1440	430	23.5	50	-	
1500	450	23.6	50	-	
1520	470	23.6	50	-	
1540	490	23.6	50	-	
1600	510	23.7	50	-	
1620	530	23.7	50	-	
1640	550	23.7	50	-	
1700	570	23.7	50	-	
1720	590	23.7	49	-	
1740	610	23.8	50	-	
1800	630	23.7	50	-	
1820	650	23.8	50	-	
1845	675	23.8	50	-	
1900	690	23.8	50	-	
1920	710	23.8	50	-	
1940	730	23.8	50	-	
2000	750	23.9	49	-	
2020	770	23.9	50	-	
2030	780	-	-	15	
2040	790	23.9	49	-	
2100	810	23.9	50	-	
2120	830	24.0	49	-	
2140	850	24.0	49	-	
2200	870	24.0	50	-	
2220	890	24.0	50	-	
2240	910	24.0	49	-	
2300	930	24.0	50	-	
2330	960	24.0	49	-	
2400	990	24.1	49	12	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 17					
0030	1020	24.1	49	-	
0100	1050	24.1	49	-	
0130	1080	24.1	49	-	
0200	1110	24.1	49	-	
0230	1140	24.1	49	-	
0300	1170	24.2	49	-	
0330	1200	24.2	49	-	
0400	1230	24.2	50	-	
0430	1260	24.3	49	-	
0500	1290	24.3	49	-	
0530	1320	24.3	49	-	
0600	1350	24.3	49	15	
0630	1380	24.3	49	-	
0700	1410	24.4	50	-	
0715	1425	-	-	14	
0725	1435	24.4	49	-	
0730	1440	-	-	-	Stop pump. Start recovery measurements.

TEST HOLE 11

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 17 0730	0	-	-	-	Elapsed time after pumping stopped measured with stopwatch. Depth measure- ments with electric tape.
	1	16.8			
	2	14.4			
	3	13.3			
	4	12.6			
	5	12.3			
	6	12.0			
	7	11.9			
	8	11.8			
	9	11.7			
	10	11.6			
	12	11.5			
	15	11.4			
	18	11.3			
	21	11.2			
	24	11.2			
	30	11.1			
	36	11.0			
	42	11.0			
	48	10.9			
	60	10.9			
	72	10.8			
	84	10.7			
	96	10.7			
0918	108	10.6			
0922	-	7.67	-	-	Measurement with steel tape.

LOG

Log compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Reddish brown to brown clay, with few scattered small boulders of fresh or partly weathered basalt. Very soft, 8-18 ft.	0-18
Red to gray soft clay.	18-21
Weathered basalt.	21-24
Reddish brown stiff clay. Slow drilling.	24-38
Reddish brown to gray soft clay.	38-44
Weathered basalt, with few scattered residual boulders of fresh basalt. Some light reddish brown clay at 49 ft.	44-52
Weathered basalt with numerous scattered residual boulders of fresh basalt. Zones of brown to gray clay at 54, 58, and 61 ft.	52-62
Mostly hard fresh black basalt. Few thin zones of weathered basalt.	62-67
Total depth	67

TEST HOLE 12A

Location: Near South Field Grid:

Date drilled: Feb. 17, 1976 by Ted Lund Drilling and Supply.

Altitude, ground surface (feet): 13 Depth (feet): 32

Observers: D. A. Davis, Ted Lund, Garrett Chapman. Test hole 12A was the first of two holes drilled at the site designated as test hole 12. Hole 12A was abandoned because of hard drilling in basalt and because of the poor water-bearing quality of the section penetrated by the hole, and the drilling equipment was moved to the site of test hole 12B, 150 ft north.

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 17		Moving drilling equipment to and setting up at site of test hole 12.
1540	-	Start drilling with 8-in rotary rock bit on kelly.
1545	3	Soft brown clay. Bit chatter at 3 ft on boulder.
1548	4	Brown clay, some bit chatter.
1552	7	Stop drilling to connect 8-in rotary rock bit on stabilizer.
1605	7	Resume drilling with 8-in bit.
1609	10	From 7 ft drilling in very soft light brown clay.
1610	13	Bit chatter on boulder.
1611	15	Smooth drilling in light brown clay.
1612	16	Drilling in weathered basalt.
1612	20	As above, some bit chatter.
1614	22	Soft drilling in clay pocket.
1616	25	Mostly weathered basalt. Some clay pockets. Stop drilling to clear hole of cuttings and to add section of drill pipe.
1617	-	Clearing boulders caved in hole.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 17		
1625	24	Resume drilling on caved boulder. Bit chatter.
1628	25	As above.
1629	26	Drilling in very soft clay.
1630	28	Bit chatter on basalt boulder.
1631	29	Drilling in soft clay.
1632	31	Smooth drilling in stiff brown clay.
-	31½	Rough chatter on basalt boulder.
1637	32	Stop drilling to replace 8-in bit with 5-in rotary rock bit.
1653	31½	Resume drilling with 5-in bit.
1655	32	Very hard. Stop drilling.
1658	32	Start pulling drilling tools from hole.
1703	-	Start installing airlift pump to clean hole.
1725	-	Start pump.
1730	-	Yield of hole under pumping very low.
1733	-	Depth to water, 16.2 ft below ground surface.
1741	-	Depth to water, 16.1 ft below ground surface. Shut down for the day.
	-	Hole abandoned because of hard drilling in fresh basalt and low yield of hole during pumping.

TEST HOLE 12A

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 18		
-	-	Drilling equipment moved to new site, 150 ft north of test hole 12A.
1005	-	Depth to water, 7.4 ft below ground surface.
1350	-	Depth to water, 7.5 ft. Chloride concentration in sample of water dipped from hole, 20 mg/L.

LOG

Log compiled from observations by D. A. Davis and Ted Lund.

	Depth (feet)
Soft brown clay, with scattered residual boulders of basalt.	0- 7
Light brown clay, residual boulder at 13 ft.	7-16
Weathered basalt, with pockets of clay scattered residual boulders of basalt.	16-26
Soft brown clay.	26-29
Stiff brown clay.	29-31
Very hard basalt, possibly a residual boulder.	31-32
Total depth.	32

TEST HOLE 12B (150 ft north of test hole 12A)

Location: Near South Field

Grid:

Date drilled: Feb. 18-19, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 13

Depth (feet): 80

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 18	-	Moved drilling equipment to site of test hole 12B, 150 ft north of test hole 12A.
1010	-	Start drilling test hole 12B with 8-in rotary rock bit on kelly.
1012	3	Brown clay with few residual boulders of hard basalt.
1014	4	Smooth drilling in soft brown clay.
1015	6	As above. Bit chatter at 6 ft.
1016	6	Stop drilling to connect 8-in rotary rock bit on stabilizer.
1024	6	Resume drilling with 8-in bit.
1025	7	Smooth drilling in soft brown clay. Some bit chatter at 7 ft.
1026	8	As above.
1029	10	As above.
1030	12	As above.
1031	13	Very rough bit chatter.
1042	18	From 13 ft, alternating smooth drilling in soft clay and rough bit chatter on residual boulders.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 18 1044	19	Probably weathered basalt from 18 ft.
1059	25	As above. Stop drilling to clear hole of cuttings and to add section of drill pipe.
1117	25	Resume drilling with 8-in bit. Bit chatter in weathered basalt.
1119	26	Smooth drilling.
1122	28	Rough bit chatter in hard rock.
1126	28	Stop drilling to replace 8-in bit with 5-in rotary rock bit.
1248	28	Resume drilling with 5-in bit. Hard drilling with rough bit chatter.
1250	28½	Very hard. Rough bit chatter.
1307	29	As above.
1311	29½	As above.
1316	30	As above.
1320	30½	As above.
1321	30½	Bolt sheared off in pull-down chain. Stop drilling to make repairs.
1400	30½	Resume drilling. Very hard.
1435	32	As above.
1441	33	Broke through boulder.
1445	35	Softer drilling, 33-35 ft. Hard at 35 ft.
1446	35	Stop drilling to clear hole and add section of drill pipe.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 18		
1500	35	Resume drilling. Very rough chatter.
-	35½	Smooth drilling in soft brown clay.
1501	36	As above.
1502	38	As above.
1503	39	As above.
1504	41	As above.
1505	42	Rough chatter.
1506	42½	Smooth drilling.
1507	43	As above.
1509	44	Smooth drilling in weathered rock.
1510	45	As above.
1513	47	As above, some bit chatter at short intervals.
1514	48	Smooth drilling.
1515	50	As above. Stop drilling to clear hole of cuttings and to add section of drill pipe. Caved boulders in hole cause trouble in lowering tools into hole. Removed added section of drill pipe and resumed drilling at 30 ft to clear hole of caved boulders.
1544	50	Resumed drilling. Bit chatter on caved boulder.
1545	51	Smooth drilling in bluish gray clay.
1548	54	As above.
1558	56	From 54½ ft, drilling in weathered basalt with pockets of clay and numerous residual boulders. Smooth drilling with rough bit chatter at short intervals.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 18		
1605	60	As above. Start smooth drilling at 60 ft.
1609	63	Smooth drilling in clay.
1616	65	Alternating smooth drilling in clay and light to rough bit chatter in weathered basalt and residual boulders. Stop drilling to clear hole, add section of drill pipe, and clean mud pit.
1630	65	Resume drilling. Very rough bit chatter.
1635	66	Mostly hard drilling with rough bit chatter.
1640	67	As above.
1641	68	Mostly smooth drilling in stiff, brown to greenish gray clay.
1644	70	As above.
1646	71	As above.
1647	72	As above.
1648	73	As above.
1649	74	As above, mostly in greenish gray stiff clay.
1652	75	As above.
1653	76	As above, somewhat harder.
1655	77	As above.
1656	78	As above.
1658	79	As above.
1700	80	As above. Stop drilling to clear hole of cuttings and remove drilling tools from hole.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 18 1720	-	Installed one 20-ft section of 6-in surface casing.
1725	-	Start installing airlift pump.
1800	-	Airlift pump installed with intake at 73 ft below ground surface.
Feb. 19 0750	-	Depth to water in hole, 6.9 ft below top of 6-in casing, 1.5 ft above ground surface.
0753	-	Start cleaning and development of hole with airlift pump.
0755	-	Heavy mud slurry discharged from hole.
0758	-	Slurry is becoming thinner.
0800	-	Running clear water down casing to wash mud off walls of hole below casing.
0818	-	Q, 26 gal/min.
0820	-	On-and-off pumping.
0825	-	Q, 24 gal/min.
0840	-	Depth to water 40.0 ft below top 6-in casing.
0900	-	Q, 22 gal/min. Began surging hole with on-and-off pumping and raising and lowering of pump in hole. Water level in hole during pumping is more than 40 ft below top of 6-in casing.
0912	-	Depth to water, 46.9 ft below top of 6-in casing.
0945	-	On-and-off pumping since 0900. Q, 23 gal/min. Depth to water, 47.3 ft.
0950	-	Chloride concentration in water, 12 mg/L.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 19 1025	-	Q, 22 gal/min. Depth to water, 47.9 ft.
1035	-	Stop pump to let water level in hole recover before starting pumping test.
1300	-	Start pumping test of Feb. 19, 1976.

TEST HOLE 12B

PUMPING TEST

Date: Feb. 18, 1976

Test made using airlift pump. Water-level measurements made with electric tape. Pumping rate measured with 30-gal container and stopwatch. Observations by Ted Lund, D. A. Davis, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Feb. 19					
1245	-	8.69 11.75			Steel-tape measurement. Electric-tape measurement. Measurements made below top of 6-in casing, 1.5 ft above ground surface.
1300	0	-	-	-	Start airlift pump.
1305	5	31.7	25	-	Electric tape measurements.
1310	10	38.8	23	-	
1315	15	44.0	-	-	
1317	17	44.9	25	14	
1320	20	45.1	25	-	
1325	25	45.3	25	-	
1330	30	45.6	24	-	
1340	30	45.8	24	-	
1350	50	46.0	24	-	
1400	60	46.1	24	-	
1416	76	46.2	23	-	
1430	90	46.3	24	-	
1445	105	46.3	24	-	
1455	115	-	-	12	
1500	120	46.3	24	-	
1515	135	46.4	24	-	
1530	150	46.4	23	-	
1545	165	46.5	23	-	
1600	180	46.6	23	-	End of test.

TEST HOLE 12B

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
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Water-level measurements in test hole 12A, 92 ft south of test hole 12B, on Feb. 19, during pumping test at test hole 12B.

Feb. 19

1259	-	7.8	-	-	Steel-tape measurements.
1300	0	-	-	-	Airlift pump started in test hole 12B.
1320	20	7.8	-	-	
1325	25	7.8	-	-	
1330	30	7.9	-	-	
1340	40	8.0	-	-	
1350	50	8.2	-	-	
1400	60	8.2	-	-	
1424	84	8.4	-	-	
1430	90	8.4	-	-	
1445	105	8.4	-	-	
1500	120	8.5	-	-	
1515	135	8.5	-	-	
1530	150	8.5	-	-	
1545	165	8.6	-	-	
1602	182	8.6	-	-	
1615	195	8.6	-	-	
1640	220	8.6	-	-	
1713	253	8.6	-	-	
1754	290	8.5	-	-	
1758	294	8.4	-	-	
1800	300	8.4	-	-	

TEST HOLE 12B

LOG

Log compiled from observations by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay with scattered residual boulders of basalt.	0-18
Weathered basalt with numerous residual boulders of basalt.	18-67
Brown to greenish gray stiff clay.	67-74
Greenish gray stiff clay.	74-80
Total depth.	80

TEST HOLE 13

Location: Near South Field	Grid:
Date drilled: Feb. 20-22, 1976 by Ted Lund Drilling and Supply	
Altitude, ground surface (feet): 7	Depth (feet): 65
Observers: D. A. Davis, Ted Lund, Garrett Chapman.	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 20		
0830	-	Setting up equipment to drill at site of test hole 13.
0905	-	Start drilling with 8-in rotary rock bit on kelly. Using water and natural clay penetrated in hole to drill.
0909	2	Gray and brown clay.
0911	6	As above.
0913	9	Soft gray to brown clay.
0915	19	As above, very soft. Stop drilling to connect stabilizer and 8-in rotary rock bit.
0935	19	Resume drilling with 8-in bit. Bit chatter on boulder.
0943	22	Rough bit chatter. Boulder.
0945	23	Smooth drilling in brownish gray clay.
0946	24	- - -
0950	24	Hard drilling.
0951	25	Hard drilling on boulders in brown clay.
0952	26	As above.

TEST HOLE 13

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 20 0954	27	As above. Stop drilling to clean cuttings from mud pit.
0957	27	Resume drilling.
0958	28	Hard drilling on boulders in brown clay.
1002	29	As above.
1006	30	As above. Stop drilling to clear cuttings from hole and from mud pit.
1009	30	Resume drilling.
1011	31	Smooth drilling.
1013	32	Smooth drilling in brown clay.
1014	33	As above.
1015	35	As above.
1016	36	As above.
1017	37	As above.
1018	38	As above.
1020	39	As above. Some bit chatter at 39 ft.
1021	39	Stop drilling to clear hole of cuttings.
1024	-	Drilling on boulders caved from above.
1030	39½	Stopped drilling to install 6-in casing in hole.
1245	-	Two 20-ft sections of 6-in casing in hole. Bottom of casing at about 35 ft. Start running 5-in bit on drill pipe to clear casing and hole of cuttings.

TEST HOLE 13

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 20 1256	-	Bit at bottom of casing. Circulating mud through drill pipe and hole to clear hole and allow casing to move down.
1403	39	Bottom of casing at 39 ft. Resume drilling using 5-in roller rock bit. Bit chatter on caved boulder.
1404	40	Drilling in soft gray clay.
1405	42	As above. Stop drilling to add water to mud pit and thin drilling fluid.
1417	42	Resume drilling.
1421	46	Light bit chatter on fractured black rock.
1425	46½	Hard drilling; rough bit chatter.
1426	47	As above.
1428	48	As above.
1430	49	As above.
-	49½	Softer drilling in weathered basalt or in clay.
1431	50	Stop drilling to clear hole of cuttings, to add section of drill pipe, and to install packing in annular space around top of 6-in casing.
1450	50	Resume drilling with 5-in bit.
1458	52	Drilling in black basalt with seams of gray clay. Rough bit chatter.
1510	53	As above. Very hard at 53 ft.
1523	54	As above.
1529	54½	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 20		
1533	55	As above. Cuttings are chips of dense hard basalt.
1536	55½	As above. Rough bit chatter.
1540	56	As above.
1545	56½	As above. Seams of clay in the basalt.
1549	57	Rough bit chatter. Drilling in black basalt.
1552	57½	As above.
1555	58	As above. Cuttings are chips of hard black basalt with some lumps of gray clay from clay seams.
1559	58½	As above. Rough bit chatter.
1603	59	As above.
1605	59½	As above.
1616	60	Very hard drilling and very rough bit chatter.
1620	60½	As above. Cuttings are chips of hard black basalt and few lumps of soft gray clay.
1628	61	As above.
1630	61½	As above.
1632	62	As above.
1639	63	As above.
1644	63½	As above.
1701	65	As above. Stop drilling to remove tools and install airlift pump for cleaning and developing the hole.
1730	65	Airlift pump installed, with intake at about 63 ft below ground surface.
1743	-	Start airlift pump to clean hole.

TEST HOLE 13

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 20		
1746	-	Heavy mud lifted from hole.
1755	-	Mud is becoming thinner. Q, 45 gal/min.
1757	-	Washing down walls of hole with clear water poured into top of 6-in casing.
1804	-	Start on-and-off pumping.
1805	-	Water is clearing, but still very turbid.
1806	-	Q, 43 gal/min.
1818	-	Q, 40 gal/min.
1832	-	Q, 39 gal/min.
1844	-	Q, 39 gal/min. Depth to water 30 ft below ground surface.
1853	-	Q, 39 gal/min.
1858	-	Q, 38 gal/min. Shut down for the day.
Feb. 21		
0720	-	Depth to water, 4.27 ft below top of 6-in casing, 0.5 ft above ground surface.
0725	-	Chloride concentration in water dipped from hole, 55 mg/L.
0745	-	Start airlift pump.
0746	-	Chloride concentration of water, 20 mg/L.
0747	-	Chloride, 70 mg/L.
0754	-	Chloride, 90 mg/L.
0800	-	Chloride, 90 mg/L.
0805	-	Chloride, 80 mg/L.

TEST HOLE 13

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 21 0817	-	Chloride, 80 mg/L.
0825	-	Chloride, 75 mg/L.
0833	-	Chloride, 80 mg/L.
0855	-	Chloride, 80 mg/L.
0930	-	Chloride, 75 mg/L.
1005	-	Chloride, 75 mg/L.
1045	-	Chloride, 50 mg/L.
1050	-	Chloride, 50 mg/L.
1115	-	Chloride, 15 mg/L. Stop pump.
1305	-	Start pump.
1306	-	Chloride, 17 mg/L.
1314	-	Q, 23 gal/min.
1315	-	Chloride, 40 mg/L. Stop pump. The hole apparently has penetrated two water-bearing zones. The upper zone probably is largely sealed off by the 6-in casing, though some water enters the casing through openings in the pipe and at the bottom of the pipe at about 39 ft. Raised casing about 1 ft to permit water to enter the hole from the upper zone.
1330	-	Start pump. Much mud and cuttings discharged by pump.
1344	-	Q, 47 gal/min.
1350	-	Q, 47 gal/min. Chloride, 78 mg/L.
1404	-	Q, 45 gal/min. Chloride, 75 mg/L.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 21 1426	-	Q, 42 gal/min. Numerous well rounded pebbles and coralline fragments are discharged by the pump. Apparently marine deposits of beach gravel and reef material were penetrated by the hole in the section above 39 ft, the depth at which the bottom of the 6-in casing was first seated. Raising the casing allowed the gravel and coralline material to move down past the bottom of the casing into the 5-in hole, where the airlift pump picked them up.
1430	-	Pump is plugged by gravel.
1430	-	Pump cleared. Q, 45 gal/min.
1455	-	Chloride, 60 mg/L.
1456	-	Stop pump. Casing raised about 14 in.
1501	-	Start pump.
1506	-	Q, 47 gal/min. Depth to water, 20 ft below top of casing, 2 ft above ground surface.
1510	-	Q, 50 gal/min.
1515	-	Q, 50 gal/min. Chloride, 75 mg/L.
1528	-	Q, 50 gal/min.
1535	-	Depth to water 22.1 ft below top of casing. Chloride, 75 mg/L.
1541	-	Q, 51 gal/min.
1551	-	Q, 47 gal/min.
1553	-	Depth to water, 21.8 ft.
1554	-	Q, 51 gal/min.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 21 1556	-	Depth to water 21.9 ft.
1558	-	Chloride, 75 mg/L.
1607	-	Q, 51 gal/min.
1610	-	Depth to water, 22.1 ft.
1616	-	Q, 51 gal/min. Depth to water 20.0 ft. Chloride, 70 mg/L.
1630	-	Shut down for the day.
Feb. 22. 0745	-	Depth to water 8.2 ft below top of 6-in casing, 2 ft above ground surface.
0800	-	Start pumping test of Feb. 22, 1976.

PUMPING TEST

Date: Feb. 22, 1976

Test made with airlift pump with intake set at about 63 ft below ground surface. Water level measured with steel tape, except as noted, below top of 6-in casing, 2.0 ft above ground surface. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Feb. 22					
0745	-	5.9	-	-	
0800	0	-	-	70	Start pump. Chloride concentration determined from sample of first flow of water.
0805	5	-	55	-	
0808	8	16.0	-	-	
0812	12	-	53	-	
0815	15	-	53	-	
0820	20	18.2	51	-	
0820	20	21.0	-	-	Electric tape measurement.
0825	25	18.3	53	70	
0830	30	18.4	53	-	
0840	40	19.0	51	-	
0840	40	22.0	-	-	Electric tape measurement.
0850	50	18.9	51	-	
0855	55	22.0	-	-	Electric tape measurement.
0900	60	19.0	50	70	
0910	70	19.4	51	-	
0920	80	18.3	-	70	
0928	88	21.4	-	-	
0930	90	18.5	53	70	At 0930 water became highly turbid and pump brought up mud and calcareous algae and other limy fragments probably caved from upper part of hole above bottom of 6-in casing.

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 22					
0940	100	18.7	53	-	
0950	110	18.7	53	-	
1000	120	18.8	53	-	
1010	130	18.8	51	-	
1020	140	18.9	51	-	
1030	150	19.1	51	-	
1040	160	19.2	51	70	Water from pump is now almost clear.
1050	160	19.6	51	-	
1100	180	18.7	53	-	Water somewhat turbid.
1110	190	18.9	53	-	
1120	200	18.9	53	-	Water almost clear, then became turbid at 1120 hrs.
1140	220	19.0	53	-	
1200	240	18.6	53	-	
1240	280	19.0	53	-	
1300	300	19.2	53	-	
1305	305	-	-	65	Water has some turbidity.
1320	320	19.2	-	-	
1342	342	20.3	50	-	Water is turbid with black organic matter.
1348	348	18.7	-	-	
1350	-	-	-	-	Water is clearing.
1355	355	18.7	-	-	
1400	360	18.7	53	-	
1411	371	-	30	-	Water became very turbid.
1430	390	-	-	-	From 1411 hrs trying to clear pump of debris by on-and-off pumping.
1630	-	-	-	-	Stop pump. Pumping was continuously interrupted by plugging of airlift pump by material caving from walls of hole, apparently above bottom of 6-in casing. It was concluded during the pumping that water from the upper water-bearing zone has relatively high chloride

TEST HOLE 13

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 22 1630 (Cont.)					concentration and prob- ably is polluted by swamp water. Lower water-bearing zone has low salinity, but yield of water is very small. Site of test hole 13 was abandoned as a place for a production well.
Feb. 23 0719	-	5.99	-	-	Measured with steel tape below top of 6-in casing, 2.0 ft above ground sur- face.

LOG

Log compiled from observations by D. A. Davis and Ted Lund.

	Depth (feet)
Gray and brown clay with scattered residual boulders of hard fresh basalt. Probably talus deposit.	0-35
Rounded pebbles of basalt and fragments of calcareous algae and coral. Probably marine beach deposits. /_Note: Depth to bottom of talus deposit and top of beach deposit could not be determined from drilling characteristics and cutting returns in drilling fluid; hence, it is estimated._/	35-39
Clay and weathered basalt.	39-50
Weathered basalt grading downward into hard fresh basalt cut by seams of clay or weathered rock.	50-65
Total depth.	65

TEST HOLE 14

Location: Peniesene near Wichen River Grid:

Date drilled: Feb. 23-24, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 25 Depth (feet): 70

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 23		
1215	-	Setting up of drilling equipment at site of test hole 14.
1305	-	Start drilling with 8-in rotary rock bit on kelly.
1306	1	Soft brown soil.
1307	2	Soft brown clay.
1308	3	As above.
1310	4	As above.
1311	5	As above.
1312	6	As above, with slight bit chatter.
1313	-	Stop drilling to connect 8-in rotary rock bit and stabilizer.
1320	-	Resume drilling with 8-in bit.
1321	7	Brown clay.
1324	8	Rough chatter on residual boulder of basalt.
1327	9	Alternating smooth drilling and bit chatter.
1331	10	As above.
1335	11	As above. From 9 ft probably in weathered basalt.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 23		
1337	12	Smooth drilling in stiff pink clay.
1340	13	Smooth drilling in pale reddish brown clay.
1341	14	As above. Short interval of strong chatter at 14½ ft.
1345	16	Smooth drilling in clay.
-	16½	Rough bit chatter.
1346	17	Less bit chatter. Smooth at 17½ ft.
1351	18	- - -
1354	19	Stop drilling to install 6-in surface casing in hole.
1405	-	Casing seated at 19 ft below ground surface.
1415	19	Resume drilling with new 5-in rotary rock bit. Some bit chatter.
1418	20	Bit chatter. Weathered basalt, 16 to 20 ft.
1418½	21	Light red clay.
1419	22	As above.
1419½	24	Soft light brown clay.
1420	30	Very soft, light brown clay from 24 ft.
1421	36	Very soft, gray clay from 30 ft. Stop drilling at 36 ft to clear hole of cuttings and to add section of drill pipe.
1445	36	Resume drilling with 5-in bit.
1453	40	Soft gray clay from 36 ft.
-	42	Bit chatter.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 23 1455	44	Firm gray clay.
-	44½	Rough bit chatter.
1456	45	Smooth drilling at 45 ft; below, increasingly rough chatter.
1500	46	Hard drilling. Rough bit chatter.
1505	47	As above.
1507	48	As above. Hard black basalt.
1513	49	As above.
1517	50	Stop drilling to add section of drill pipe and to check engine on drilling machine.
1529	50	Resume drilling. Rough chatter as above.
1535	51	Rough chatter. Drilling in hard black basalt.
1536	51½	Stop drilling. Service engine.
1550	51½	Resume drilling.
1553	52	Drilling in hard black basalt. Rough bit chatter.
1556	53	As above.
1600	54	As above.
1605	55	As above.
1610	56	As above.
1617	58	As above.
1621	59	As above.

TEST HOLE 14

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 23		
1626	60	As above.
1632	61	As above.
1638	62	As above.
1645	63	As above.
1651	64	As above.
1654	65	As above.
1657	66	As above. Stop drilling to add section of drill pipe and to clear hole and mud pit of cuttings.
1716	66	Resume drilling. Hard black basalt. Rough bit chatter.
1724	67	As above.
1728	68	As above.
1740	69	As above. Hard. Stop drilling at 1731 for 1 min.
1747	70	As above. Stop drilling and remove tools from hole.
1800	70	Shut down for the day.
Feb. 24		
0820	70	Depth to water, 4.4 ft below top of 6-in casing, which is 1.0 ft above ground surface.
0820	-	Start installing airlift pump.
0840	-	Airlift pump installed with intake at 64 ft below ground surface.
0841	-	Start airlift pump in cleaning and development of hole. Heavy mud flowing from hole.

TEST HOLE 14

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 24		
0847	-	Start filling hole with clear water to backwash.
0850	-	Clear water at surface of ground.
0851	-	Start pump.
0900	-	Q, 5 gal/min.
0910	-	Depth to water, 53.8 ft below top of 6-in casing, 1.0 ft above ground surface.
0914	-	Depth to water, 54.0 ft.
0915	-	Start filling hole with clear water.
0917	-	Hole full of water. Start pump. Alternating on- and-off pumping, filling mud pit with water from hole, then allowing water to flow from mud pit back into well.
0929	-	Start pumping to waste.
0935	-	Q, 1½ gal/min.
0940	-	Depth to water, 55.0 ft.
0953	-	Q, 1 gal/min. Depth to water, 55.4 ft.
0957	-	Depth to water 55.3 ft. Chloride concentration in water, 20 mg/L.
1000	-	Stop pump. Abandon hole owing to low yield. No pumping test made.

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown soil.	0- 1
Soft brown clay with residual boulders of basalt.	1- 9
Weathered basalt.	9-12
Stiff pink clay.	12-13
Pale reddish brown clay with scattered residual boulders of basalt.	13-16
Weathered basalt.	16-20
Pale red clay.	20-24
Soft light brown clay.	24-30
Very soft gray clay.	30-44
Firm gray clay.	44-46
Mostly hard fresh black basalt.	46-70
Total depth.	70

TEST HOLE 15

Location: Pou Bay

Grid:

Date drilled: Feb. 24 - 26, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 33

Depth (feet): 137

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 24	-	Setting up drilling equipment at site of test hole 15.
1456	-	Start drilling with 8-in rotary rock bit on kelly, using water and natural clay from hole as drilling fluid.
-	1	Rough bit chatter on residual boulder of basalt.
1514	2	Smoother drilling.
1517	3	Boulder in brown clay.
1520	4	Very rough bit chatter on boulder.
1521	5	Smooth drilling in brown clay.
1522	6	As above.
1523	-	Stop drilling to clear hole of cuttings and to connect 8-in rotary rock bit and stabilizer. Caved boulder obstructs hole.
1543	6	Resume drilling. Smooth drilling in brown clay.
1546	-	Stop drilling to service mud pump.
1553	-	Resume drilling in light brown clay.
1555	8	Smooth drilling in stiff, light brown clay.
1558	9	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 24 1559	10	As above. Rough chatter at 10½ ft.
1602	11	Smooth drilling in stiff, light brown clay.
1603	-	Stop drilling.
1605	-	Resume drilling.
1606	12	Smooth drilling as above.
1608	13	As above.
1610	14	As above in very stiff clay.
1612	15	As above. Stop drilling.
1619	15	Resume drilling.
1620	16	Smooth drilling in soft brown clay.
1620½	17	As above.
1621	20	As above.
-	21	As above.
-	22	As above. Some light chatter at 22½ ft.
1624	23	Smooth but slower drilling in very stiff light brown clay at 24 ft.
1625	25	Very soft clay.
1625½	26	As above. Stop drilling to clear hole of cuttings, to add section of drill pipe, and to clean mud pit.
1655	26	Resume drilling.
1656	29	Mostly smooth drilling in clay. Some bit chatter at 29 ft.
1658	30	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 24 1659	31	Smooth drilling in clay.
1700	32	As above. Slight bit chatter at 33 ft.
1701	34	As above.
1702	35	As above.
1704	38	As above.
1705	40	As above.
1706	41	Stop drilling to clear hole of cuttings.
1710	41	Shut down for the day.
Feb. 25 0730	-	Clearing hole to 41 ft.
0736	41	Start drilling with 8-in rotary rock bit. Rough chatter at 41 ft, probably on caved boulder.
0737	42	Smooth drilling on light brown clay.
0739	43	As above.
0741	50	Smooth, fast drilling in soft clay.
0742	52	Smooth, slower drilling in stiff clay.
0744	53	Bit chatter on boulder.
0748	54	Smooth drilling in clay.
0750	55	As above. Some bit chatter at 55½ ft.
0754	56	As above. Some bit chatter at 56 ft. Stop drilling to clear hole of cuttings, to add section of drill pipe. Replace 8-in bit with 5-in rotary rock bit. Emptied mud pit.

TEST HOLE 15

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 25 0828	56	Resume drilling with 5-in bit in clay and black boulders.
0831	57	As above. Some bit chatter.
0834	57½	- - -
0836	58	Harder drilling. Bit chatter. Black basalt.
0837	58½	As above.
0839	59	As above.
0844	60	As above.
0845	61	As above.
0847	62	As above. Some gray clay.
0849	63	Weathered basalt with gray clay and some black basalt.
0851	64	As above.
0853	66	As above. Stop drilling to clear hole of cuttings, to add section of drill pipe and to empty mud pit.
0910	66	Resume drilling.
0912	67	Weathered rock with some gray clay and basalt boulders.
0914	68	Gray clay with black boulders.
0920	70	As above.
0921	71	Soft gray and red clay.
0922	72	As above.
0925	73	As above with partly weathered basalt.

TEST HOLE 15

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 25		
0929	74	Partly weathered basalt.
0932	75	As above.
0934	76	As above.
0939	78	As above.
0944	79	As above.
0949	80	As above. Harder drilling.
0952	81	Stop drilling to clear hole and add section of drill pipe.
0956	81	Resume drilling.
1002	82	Bit chatter. Probably in fresh basalt.
1006	83	As above.
1010	84	As above.
1014	85	As above.
1019	86	As above.
1022	87	As above.
1024	88	Partly weathered basalt with seams of gray clay.
1026	89	As above.
1027	90	As above.
1030	91	As above.
1035	92	As above. Harder drilling.
1042	93	Hard black basalt.

TEST HOLE 15

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 25		
1051	94	As above.
1058	96	As above. Stop drilling to add section of drill pipe.
1109	96	Resume drilling.
1111	97	As above.
1114	98	- - -
1119	100	As above. Some gray clay.
1120	101	Much gray and brown clay.
1124	102	Black basalt. Harder drilling.
1129	103	As above.
1144	105	As above. Stop drilling
1225	105	Resume drilling.
1240	107	As above. Very rough bit chatter.
1249	108	As above.
1254	109	As above, with seams of gray clay.
1259	110	As above. Gray clay at 110½ ft.
1301	112	Gray clay. Stop drilling to clear hole and to add section of drill pipe.
1329	112	Resume drilling. Gray and brown clay seams at 113-114 ft.
1332	114	Black basalt with seams of gray and brown clay.
1335	115	As above.
1337	116	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 25		
1340	117	As above.
1342	119	Beginning at 118 ft, smooth drilling in gray to dark gray clay.
1344	120	As above.
1345	121	As above.
1352	122	Rough bit chatter. Drilling in basalt with clay seams.
1356	123	As above.
1403	124	As above. Hard drilling.
1409	125	Drilling in mostly black basalt with some clay seams. Rough bit chatter.
1411	126	Smooth drilling in very dark gray clay.
1413	127	As above, in medium to dark gray to dark brown clay. Stop drilling to add section of drill pipe and to empty mudpit.
1438	127	Resume drilling. Smooth.
1440	128	Smooth drilling in mostly dark brown, stiff clay containing much gritty material.
1445	129	Smooth drilling in dark gray clay.
1452	130	Beginning at 129½ ft, mostly hard black basalt. Very rough bit chatter.
1500	131	Hard black basalt. Very rough bit chatter.
1506	132	As above. Seam of gray clay at 131½ ft.
1512	133	As above.

TEST HOLE 15

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 25		
1518	134	As above.
1525	135	As above.
1539	136	As above.
1549	137	As above. All cuttings are small chips of hard dense basalt. Stop drilling. Remove tools from hole.
1605	137	Tools out of hole. Bit badly worn by drilling in basalt.
1700	-	Airlift pump installed in preparation for cleaning and developing hole. Start pump.
1725	-	From 1700 hrs, mud and muddy water pumped from hole. Depth to water, about 75 ft below ground surface. Q, 18 gal/min.
1730	-	Q, 19 gal/min.
1735	-	Q, 19 gal/min. Depth to water, 80 ft. Chloride concentration in water, 12 mg/L.
1737	-	Stop pump. Shut down for the day.
Feb. 26		
0725	-	Depth to water, 22.0 ft below top of ring in mud pit, 0.5 ft above ground surface.
0744	-	Start airlift pump to continue development.
0753	-	Back pressure too great for pump to function.
0755	-	Start removing pump from hole. Airline plugged with clay at pumping element.
0855	-	Pump reinstalled in hole. Start pump.
0858	-	Discharge is muddy water, changing to thick mud, then to muddy water.

TEST HOLE 15

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 26		
0905	-	Q, 20 gal/min.
0920	-	Q, 19 gal/min. Start pouring clear water down hole to wash mud from walls of hole. Continue pumping.
1009	-	Depth to water, 82 ft.
1012	-	Q, 16 gal/min.
1030	-	Depth to water, 83 ft.
1035	-	Q, 17 gal/min.
1100	-	Chloride, 10 mg/L.
1115	-	Q, 14 gal/min.
1117	-	Stop pump to install 1-in plastic conductor pipe for measurement of water level.
1158	-	Depth to water measured in 1-in pipe, 35.3 ft below top of pipe, 4.1 ft above ground surface.
1201	-	Depth to water, 35.0 ft.
1203	-	Start airlift pump.
1211	-	Depth to water, 60.0 ft.
1212	-	Q, 20 gal/min.
1215	-	Depth to water, 84.0 ft.
1223	-	Q, 16 gal/min. Depth to water, 87.0 ft.
1228	-	Stop pump.
1427	-	Depth to water 29.0 ft below top of 1-in pipe, 4.1 ft above ground surface.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 26 1430	-	Start pumping test of Feb. 26, 1976.
2142	-	End pumping test.
Feb. 27 0715	-	Depth to water, 37.3 ft below top of 1-in pipe, 4.1 ft above ground surface.

TEST HOLE 15

PUMPING TEST

Date: Feb. 26, 1976

Test made with airlift pump. Water-level measurements made with electric tape, except as noted. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Feb. 26					
1427	-	29.0	-	-	Steel-tape measurement.
1430	0	-	-	-	Start airlift pump.
1435	5	58.7	44	-	Water is muddy.
1440	10	84.2	20	-	
1445	15	89.4	17	-	
1450	20	76.2	13	-	Water is muddy. Change in water level and rate caused by obstruction in pump. Cleared obstruction by raising and lowering pump in hole.
1455	25	86.5	18	-	
1500	30	88.0	17	-	
1505	35	89.9	16	-	
1510	40	90.2	15	-	
1515	45	88.9	15	-	
1520	50	-	15	-	
1528	58	89.0	-	-	
1530	60	-	15	-	
1540	70	90.9	15	10	
1550	80	-	14	10	
1553	83	91.2	-	-	
1600	90	91.8	14	-	
1610	100	91.9	14	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 26					
1620	110	92.2	14	-	Water is almost clear.
1630	120	92.7	14	-	
1645	135	92.6	14	-	
1700	150	92.5	14	-	
1715	165	92.6	14	-	
1730	180	92.8	14	-	
1745	195	93.0	14	-	
1800	210	93.4	14	-	
1815	225	-	14	-	
1820	230	93.1	-	-	
1830	240	93.0	14	-	
1845	255	93.1	14	-	
1900	270	93.1	14	-	
1915	285	93.0	13	-	
1930	300	93.1	14	-	
1945	315	93.1	14	-	Water is turbid.
2000	330	91.2	15	-	
2001	331	92.4	-	-	
2003	333	-	14	-	
2004	334	92.8	14	-	
2015	345	92.8	13	-	
2025	355	93.4	13	-	
2030	360	-	-	-	
					Stop pump. Start measure- ment of water-level recovery.
2030	0	-	-	-	Elapsed time after pump- ing stopped measured with stopwatch.
	$\frac{1}{2}$	89.0	-	-	
	1	83.2	-	-	
	$1\frac{1}{2}$	78.3	-	-	
	2	74.3	-	-	
	$2\frac{1}{2}$	68.9	-	-	
	3	64.4	-	-	
	$3\frac{1}{2}$	60.6	-	-	
	4	56.2	-	-	
	$4\frac{1}{2}$	53.4	-	-	

TEST HOLE 15

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Feb. 26	5	51.5	-	-	
	5½	50.1	-	-	
	6	48.8	-	-	
	7	46.7	-	-	
	8	45.2	-	-	
	9	44.2	-	-	
	10	43.3	-	-	
	11	42.9	-	-	
	12	42.7	-	-	
	15	41.9	-	-	
	18	41.1	-	-	
	21	39.7	-	-	
	24	39.4	-	-	
	27	38.8	-	-	
	30	38.1	-	-	
	36	37.0	-	-	
	42	36.2	-	-	
	48	35.7	-	-	
	54	35.2	-	-	
	60	34.8	-	-	
	66	34.5	-	-	
2142	72	34.1	-	-	Last recovery measurement.

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay with scattered residual boulders of basalt.	0- 5
Light brown clay.	5- 8
Stiff light brown clay.	8- 16
Soft light brown clay with scattered zones of stiff clay.	16- 52
Clay with numerous residual boulders of basalt.	52- 58
Basalt with scattered seams of gray clay.	58- 63
Weathered basalt with scattered seams of gray clay and numerous residual boulders of fresh basalt.	63- 68
Gray clay with numerous residual boulders of basalt.	68- 74
Partly weathered basalt.	74- 82
Basalt.	82- 88
Partly weathered basalt with seams of gray clay.	88- 93
Hard basalt.	93- 98
Hard basalt with seams of gray and brown clay.	98-102
Hard basalt.	102-109
Hard basalt with numerous seams of gray and brown clay.	109-118
Gray and dark gray clay.	118-122

TEST HOLE 15

LOG--Continued

	Depth (feet)
Basalt with seams of gray clay.	122-126
Dark gray and dark brown clay.	126-130
Hard basalt with few seams of gray clay.	130-137
Total depth.	137

TEST HOLE 16 (Converted to well 14)

Location: High School	Grid:
Date drilled: Feb. 27- Mar. 2, 1976 by Ted Lund Drilling and Supply	
Altitude, ground surface (feet): 22	Depth (feet): 75
Observers: D. A. Davis, Ted Lund, and Garrett Chapman.	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Feb. 27 1250	-	Setting up drilling equipment at site of test hole 16.
1312	-	Start drilling with 8-in rotary rock bit on kelly.
1320	5	Reddish brown clay.
1324	7	Stop drilling to connect 8-in rotary rock bit on stabilizer.
1334	7	Resume drilling with 8-in bit.
1337	10	Reddish brown clay.
1340	13	Clay, as above, grading downward into weathered basalt.
1348	20	Reddish brown weathered basalt with few small residual boulders of fresh basalt. Rain.
1403	25	As above.
1410	27	Stop drilling and shut down for the day because of heavy rain.
Feb. 28 0745	26	Start drilling on caved boulder. Bit chatter.
0747	27	Light bit chatter.
0749	28	Brown clay and hard weathered basalt.

TEST HOLE 16

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 28		
0750	29	As above.
0751	30	As above.
0752	31	As above.
0753	32	As above.
0754	33	As above.
0755	34	As above. Some red clay. Some chatter at 34½ ft.
0757	35	As above.
0758	36	As above.
0759	37	As above.
0800	38	As above. With some reddish brown clay, somewhat harder and more bit chatter.
0801	39	As above, but somewhat softer.
0802	41	As above.
0803	42	As above, somewhat harder. Some reddish clay. Stop drilling to clear hole of cuttings and add section of drill pipe.
0810	-	Caving boulders prevent drilling. Tools removed from hole, then rerun into hole to drill out caved material. Mud pit cleaned.
0838	41	Resumed drilling. Bit chatter on caved boulder.
0841	42	Drilling in weathered basalt. Soft at 42½ ft.
0843	43	As above. Soft at 43½ ft.
0844	44	As above.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 28 0845	47	Soft drilling in brown clay from 44 ft.
0846	48	Some bit chatter. Brown weathered basalt.
0847	49	As above.
0849	50	As above. Bit chatter.
0851	51	Weathered basalt with small residual boulders of basalt. Bit chatter.
0854	52	As above.
0856	53	As above.
0858	54	As above. Somewhat harder.
0900	55	As above. Rough chatter at 55½.
0901	56	As above.
0903	57	Harder drilling. Stop drilling to clear hole, add section of drill pipe, and clean mud pit.
0918	57	Resume drilling. Rough bit chatter.
0922	58	Rough bit chatter. Drilling in hard black basalt.
0925	59	As above. Stop drilling to replace 8-in bit with 5-in rotary rock bit.
0950	59	Resume drilling with 5-in bit.
0951	59	Rough bit chatter on hard black basalt.
0956	60	As above.
0958	61	As above.
0959	62	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 28		
1001	63	As above.
1004	64	As above.
1006	65	As above. Thin zone of weathered rock at 65 ft.
1015	66	As above. Stop drilling to add section of drill pipe.
1025	66	Resume drilling with 5-in bit.
1027	67	Hard drilling in black basalt. Rough bit chatter.
1031	68	As above. Softer zone of weathered basalt at 68 to 68½ ft.
1039	69	As above.
1045	70	As above.
1053	71	As above.
1101	72	As above.
1114	73	As above.
1125	74	As above. Thin zone of clay seams at about 73½ ft.
1135	75	Hard black basalt. Rough bit chatter. Stop drilling.
1140	75	Remove tools from hole and prepare to install 6-in surface casing in hole.
1155	-	Tools removed from hole.
1310	-	Start installing casing.
1325	-	Six-inch casing run to depth of about 40 ft. Casing suspended in hole by cable sling anchored to frame of drill rig.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Feb. 28		
1330	-	Start installing airlift pump for cleaning and developing hole.
1340	-	Pump stopped by obstruction in hole at about 55 ft.
1355	-	Remove pump from hole.
1410	-	Start running drilling tools with 5-in bit into hole.
1416	-	Start drilling on caved boulder at about 55 ft.
1424	-	Hole drilled clean to bottom at 75 ft.
1432	-	Tools removed from hole. Start installing airlift pump.
1450	-	Start airlift pump.
1453	-	Muddy water and cuttings rising from hole.
1515	-	Q, 52 gal/min.
1520	-	Q, 52 gal/min.
1521	-	Pump off for 4 min.
1525	-	Resume pumping.
1527	-	Q, 54 gal/min.
1530	-	Chloride concentration in water, 25 mg/L.
1533	-	Depth to water 23.5 ft below top of 6-in casing at ground surface.
1553	-	Q, 53 gal/min. Water is clear.
1555	-	Q, 53 gal/min.

TEST HOLE 16

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Feb. 28 1605	-	Chloride, 23 mg/L.
1610	-	Q, 52 gal/min.
1625	-	Depth to water, 24.2 ft.
1630	-	Q, 53 gal/min.
1640	-	Chloride, 24 mg/L.
1656	-	Shut down for the day.
Mar. 1 0732	-	Depth to water, 7.96 ft below top of 6-in casing, measured with steel tape; 8.06 ft measured with electric tape.
0800	-	Start pumping test of Mar. 1-2, 1976.
Mar. 2 0910	-	End pumping test of Mar. 1-2, 1976.

PUMPING TEST

Date: Mar. 1-2, 1976

Test made with airlift pump. Water level measured with electric tape, except as noted, below top of 6-in surface casing at ground surface. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Mar. 1					
0732	-	7.96	-	-	Steel tape.
0732	-	8.06	-	-	Electric tape.
0800	0	-	-	-	Start airlift pump.
0803	3	19.4	60	-	
0805	5	21.6	54	-	
0808	-	-	-	24	
0810	10	22.1	53	-	
0815	15	22.5	53	-	
0820	20	22.6	54	-	
0825	25	22.8	53	-	
0830	30	22.9	54	-	
0835	35	22.9	54	-	
0840	40	23.0	53	-	
0845	45	23.1	53	-	
0950	50	23.2	53	-	
0955	55	23.2	53	-	
0900	60	23.3	51	-	
0903	63	-	-	22	
0920	80	23.4	51	-	
0940	100	23.6	52	-	
1000	120	23.7	53	-	
1020	140	23.8	51	-	
1040	160	23.8	51	-	
1100	180	23.9	53	-	
1120	200	24.0	51	-	
1140	220	24.1	51	-	
1200	240	24.2	50	-	
1220	260	24.2	51	-	
1240	280	24.3	51	-	

TEST HOLE 16

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 1					
1300	300	24.5	50	-	
1305	305	-	-	24	
1315	315	24.5	-	-	
1320	320	24.5	49	-	
1340	340	24.5	51	-	
1400	360	24.4	50	-	
1420	380	24.5	51	-	
1440	400	24.5	51	-	
1500	420	24.6	50	-	
1520	440	24.6	50	-	
1540	460	24.7	50	-	
1600	480	24.7	51	-	
1620	500	24.7	50	-	
1640	520	24.7	50	-	
1700	540	24.8	50	-	
1712	-	-	-	-	Stop pump to speed up engine and clear valves. Start pump.
1714	-	-	-	-	
1720	560	24.6	51	-	
1740	580	24.9	51	-	
1800	600	24.9	50	-	
1820	620	25.0	51	-	
1830	630	-	-	22	
1840	640	25.0	50	-	
1900	660	25.0	50	-	
1920	680	25.0	49	-	
1940	700	24.9	51	-	
2000	720	24.7	49	-	
2004	724	24.4	50	-	
2020	740	-	48	-	
2030	750	25.1	49	-	
2040	760	25.1	50	-	
2100	780	25.3	51	-	
2120	800	25.3	50	-	
2140	820	25.1	50	-	
2200	840	25.2	50	-	
2220	860	25.1	50	-	
2240	880	25.2	50	-	

TEST HOLE 16

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 1					
2300	900	25.2	50	-	
2330	930	25.2	50	-	
2340	-	-	-	21	
2400	960	25.2	50	-	
Mar. 2					
0030	990	25.3	50	-	
0100	1020	25.2	50	-	
0130	1050	25.2	50	-	At some time before 0130 hours, the quick-opening valve on the discharge line of the pump had closed slightly owing to vibration. The valve was opened to full width immediately after the measurement at 0130 hours.
0200	1080	25.3	51	-	
0230	1110	25.3	50	-	
0300	1140	25.3	49	-	
0330	1170	25.3	50	-	
0335	1175	-	-	21	
0400	1200	25.3	50	-	
0430	1230	25.4	49	-	
0500	1260	25.4	50	-	
0530	1290	25.4	50	-	
0600	1320	25.4	50	-	
0605	1325	-	-	21	
0630	1350	25.4	50	-	
0700	1380	25.5	50	-	
0724	1404	25.5	50	-	
0730	1410	-	-	-	Stop pump. Start recovery measurements.
0730	0				Stop pump. Elapsed time after pumping stopped measured with stopwatch.

TEST HOLE 16

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 2 0730	0				Stop pump. Elapsed time after pumping stopped measured with stopwatch.
	1	18.0			
	2	15.3			
	3	13.7			
	4	13.1			
	5	12.8			
	6	12.5			
	7	12.4			
	8	12.2			
	9	12.1			
	10	12.0			
	15	11.8			
	20	11.6			
	25	11.3			
	30	11.3			
	35	11.3			
	40	11.2			
	45	11.1			
	50	11.1			
	55	11.0			
	60	10.9			
	65	10.9			
	70	10.9			
	75	10.8			
	80	10.8			
	85	10.7			
	90	10.7			
	95	10.7			
	100	10.6			Last measurement.

TEST HOLE 16

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Reddish brown clay.	0-13
Reddish brown clay grading downward into weathered basalt.	13-20
Brown weathered basalt with scattered residual boulders of basalt and zones of brown and red clay.	20-44
Brown clay.	44-48
Brown weathered basalt with scattered residual boulders of basalt.	48-59
Hard black basalt with a few thin zones of weathered basalt and seams of clay.	59-75
Total depth.	75

TEST HOLE 17

Location: Airfield at 2000-3000-ft marker Grid:

Date drilled: Mar. 2-3, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 10 Depth (feet): 53

Observers: D. A. Davis and Ted Lund.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976		
Mar. 2	-	Moved drilling equipment from test hole 16 to site of test hole 17. Drilled to 8 ft with rotary rock bit on kelly.
-	4	Brown clay.
-	8	Weathered basalt.
Mar. 3		
0746	7	Start drilling with 8-in rotary rock bit on stabilizer.
0850	7	Stop drilling to haul load of water for drilling fluid.
0816	7	Resume drilling using water for circulation. Drilling in partly weathered basalt.
0820	7½	As above.
0823	8	As above. Bit chatter.
0825	9	As above.
0827	10	Drilling in partly weathered basalt, as above. Cuttings are black basalt and pieces of clay.
0830	11	As above.
0832	12	As above.
0835	13	As above.

TEST HOLE 17

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 3		
0838	14	As above.
0840	15	As above.
0842	16	As above. Larger amount of clay in cuttings.
0844	16½	Stop drilling to adjust machine and to clear hole of cuttings.
0849	16½	Resume drilling in partly weathered basalt.
0850	17	As above.
0852	18	As above.
0855	19	As above.
0858	20	As above. Cuttings are fine chips of basalt and some red clay.
0902	21	As above. Only fine cuttings are carried out of hole by drilling fluid. Coarse chips remain in hole suspended in rising fluid.
0903	21	Stop drilling to clear hole of cuttings. Much large chips of basalt carried out of hole. Haul load of water.
0926	21	Continue circulating fluid to clear the hole.
0928	21	Resume drilling.
0932	22	- - -
0933	22	Stop drilling to install 6-in surface casing and to replace 8-in bit with 5-in bit.
1000	-	One 20-ft section of 6-in casing installed in hole.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 3 1013	22	Resume drilling with 5-in rotary rock bit. Note: From depth of 4 ft the rock seems to be a breccia having a brown to dark reddish brown fine-grain matrix and containing small and large boulders of fresh basalt, which are the sources of the black chips in the drill cuttings. The rock seems to be partly weathered and has seams of brown to red clay in it.
1017	23	- - -
1020	24	Cuttings are mostly black chips of basalt. Probably a boulder in the breccia described above.
1023	25	As above.
1026	26	As above.
1030	27	Cuttings are chips of basalt and of the brown matrix of the breccia.
1034	28	As above.
1036	29	As above.
1038	30	As above.
1043	32	As above.
1045	33	As above but harder drilling.
1054	34	Bit chatter. Cuttings are fine black chips of hard basalt.
1059	35	As above.
1102	37	Cuttings as above, but in much smaller amount. Stop drilling to clear hole and to add section of drill pipe.
1119	37	Resume drilling.

TEST HOLE 17

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 3		
1120	38	Cuttings are of reddish rock and black basalt.
1121	39	As above.
1123	40	As above.
1125	41	As above.
1127	42	Much reddish brown firm weathered rock in cuttings.
1128	43	As above.
1129	44	As above.
1131	45	As above with red clay. Stop drilling.
1229	45	Resume drilling.
1231	46	Cuttings are chips of hard basalt and a reddish brown softer rock.
1236	47	As above, but harder drilling and with less reddish brown cuttings.
1240	47½	Rough bit chatter.
1244	48	As above.
1253	49	As above.
1257	49½	Rough bit chatter.
1258	50	Cuttings are mostly black chips of basalt; some hard brown rock.
1303	51	As above.
-	51½	Many chips of brown rock, and some fragments of white waxy clay in cuttings.

TEST HOLE 17

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 3 1311	52	As above.
1315	52½	Cuttings are black chips of hard basalt.
1317	53	As above. Stop drilling to clear hole of cuttings and to install airlift pump for cleaning and development of hole.
1359	-	Start airlift pump.
1402	-	Hole emptied of water.
1405	-	Chloride concentration in water, 28 mg/L. Yield of hole to airlift pump is too small to be measured. No further work done; hole abandoned. Moved drilling equipment to site of test hole 18 at Sapuk.

TEST HOLE 17

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay.	0- 4
Fragmental rock having brown to reddish brown matrix and numerous boulders of hard black basalt. Partly weathered in places. Scattered seams of red, brown, and white clay.	4-53
Total depth.	53

TEST HOLE 18

Location: Or village, Sapuk

Grid:

Date drilled: Mar. 4-5, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 40

Depth (feet): 90

Observers: D. A. Davis, Ted Lund, and Garrett Chapman.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976		
Mar. 4		
0740	-	Start setting up equipment to drill at site of test hole 18.
0811	-	Start drilling with 8-in roller rock bit on kelly. Drilling in soft light brown clay. Using water for circulation.
0815	7	Rough bit chatter. Boulder in brown clay.
0825	8	Smoother drilling. Stop drilling to connect 8-in rotary rock bit on stabilizer.
0842	8	Resume drilling with 8-in bit. Drilling with water. Cuttings are fragments of firm weathered basalt.
0849	9	As above.
0853	9½	Very rough bit chatter.
0900	10	As above.
0904	11	As above, except soft, smooth drilling from 10½ to 11 ft.
0918	12	Hard drilling with rough bit chatter from 11 ft.
0925	13	As above; thin soft streak at 12½ ft.
0931	14	Smooth drilling in brown weathered basalt.
0939	15	Stop drilling, owing to caved boulders and to install 6-in surface casing.
0945	-	Drilling out caved boulders.

TEST HOLE 18

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 4 1000	-	Start installing 6-in casing.
1015	-	Casing installed with bottom at 13½ ft below ground surface. Top end of casing cut off just below rotary table.
1027	-	Laid down mast to work on connection at bottom of kelly.
1104	15	Start drilling with 5-in rotary rock bit.
1115	16	Cuttings are mostly hard black chips of basalt.
1120	17	As above. Thin seam of clay at 17 ft.
1137	19	Cuttings are mainly hard black chips of basalt with numerous olivine grains. Some chips have weathered faces.
1146	20	As above.
1201	22	Stop drilling to add section of drill pipe.
1237	22	Resume drilling. Cuttings as above.
1246	23	As above.
1253	24	As above.
1300	25	As above.
1306	26	As above.
1315	27	As above.
1321	29	As above.
1334	30	As above.
1341	31	As above.

TEST HOLE 18

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 4		
1350	32	As above.
1358	33	As above.
1409	34	As above.
1416	35	As above.
1430	36	Cuttings are mostly black chips of hard basalt.
1442	37	Stop drilling, to convert to compressed air for removal of cuttings from hole, to remove mud pit, and to add section of drill pipe.
1506	37	Resume drilling using compressed air.
1514	38	- - -
1524	39	Considerable amount of clay rises from hole with black chips of basalt carried in air and water. Probably clay comes from weathered zones along joints in basalt.
1534	40	Hard basalt with seams of clay.
1542	41	As above.
1551	42	As above.
1605	43	As above. Water discharged from hole with air sinks rapidly into ground near the hole and probably is recirculated during the drilling.
1626	44	Cuttings are black chips of hard basalt and fragments of firm brown weathered basalt, and considerable clay dispersed in water. Weathered rock and clay. Probably are zones that follow joints in basalt.
1654	45	As above, but harder drilling.
1656	45	Shut down for the day.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 5 0740	-	Depth to water, 4.6 ft below top of casing, which is 1 ft above ground surface. Chloride concentration in water dipped from hole, 15 mg/L.
0813	45	Start drilling with new 5-in rotary rock bit, using compressed air. Cuttings are black chips of hard basalt, fragments of firm yellow to brown weathered basalt, and much clay dispersed in water.
0826	46	As above. Air rises to ground surface in a circular area having a radius of about 2½ ft around hole.
0833	47	As above.
0848	48	As above.
0854	49	As above. Softer drilling.
0901	50	As above. Water comes up with air from hole in surges at intervals of 1 to 3 minutes.
0911	51	As above.
0916	52	As above. Stop drilling to add section of drill pipe.
0927	52	Resume drilling. Rough bit chatter. Note: Cuttings from below depth of about 48 ft may not be completely representative of the section of rock cut by the bit, owing to possible recirculation of cuttings down outside the 6-in casing to the open hole below the casing and up with air and water inside the casing.
0935	53	Softer drilling. Partly weathered basalt.
0940	54	As above.
0941	55	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 5		
0945	56	Harder drilling. Basalt.
0951	57	As above. Rough bit chatter.
0956	58	As above.
1008	59	As above.
1019	60	As above.
1029	61	As above.
1040	62	As above.
1048	63	As above.
1054	64	As above. Rough bit chatter at 64 ft.
1105	65	As above.
1108	-	Softer drilling just below 65 ft.
1110	67	Stop drilling to clear hole of cuttings and to add section of drill pipe.
1130	67	Resume drilling. Smooth drilling in compact, dry, gray clay.
1133	68	As above. Smooth drilling.
1136	69	As above.
1139	70	Some bit chatter. Cuttings are hard gray clay and black chips of basalt.
1140	71	As above.
1144	72	As above. Occasional rough bit chatter. Slower drilling.
1151	73	As above.
1156	75	As above. Stop drilling.

TEST HOLE 18

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 5		
1259	79	Hard drilling in basalt.
1311	82	Stop drilling to add section of drill pipe.
1316	82	Resume drilling.
1332	84	Strong bit chatter. Drilling in basalt.
1335	85	As above.
1345	86	As above.
1355	88	As above.
1409	90	As above. Stop drilling to clean hole with airlift and make a pumping test.
1440	-	Airlift pump installed with intake at 87 ft below ground surface. Depth to water, 12.2 ft below top of 6-in casing, 1.0 ft above ground surface.
1443	-	Start pumping test of Mar. 5, 1976.
1635	-	End pumping test.
Mar. 6		
0727	-	Depth to water, 6.7 ft below top of 6-in casing.

TEST HOLE 18

PUMPING TEST

Date: Mar. 5, 1976

Test made with airlift pump set with intake at 87 ft below ground surface. Depth to water measured with steel tape below top of 6-in casing, 1.0 ft above ground surface. Pumping rate measured with 5-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Mar. 5					
1443	0	12.2	-	-	Start airlift pump.
1446	3	-	18	-	
1450	7	68.2	-	-	
1452	9	-	4	-	
1453	10	69.1	-	-	
1455	12	68.4	-	-	
1456	13	-	3	-	
1457	14	-	-	16	
1505	22	-	4	-	
1506	23	68.4	-	-	
1512	29	-	3	-	
1514	31	68.7	-	-	
1520	37	68.7	-	-	
1522	39	-	4	-	
1532	49	69.6	-	-	
1533	50	69.6	-	-	
1535	52	-	3	-	
1545	62	69.8	-	-	
1547	64	-	3	-	
1555	72	69.6	-	-	
1559	76	-	3	-	
1600	77	-	-	15	
1612	89	69.5	-	-	
1615	92	-	3	-	
1628	105	69.6	3	-	
1635	112	69.7	3	-	Last measurement. End of pumping test.

TEST HOLE 18

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 6 0727	-	6.7			Depth below top of 6-in casing, 1.0 ft above ground surface.

TEST HOLE 18

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Soft, light brown clay, residual boulder of basalt at 7 ft.	0- 8
Brown weathered basalt with scattered residual boulders of basalt.	8-16
Basalt with seams of clay.	16-19
Basalt with numerous grains of olivine, some weathered zones along joints in rock.	19-36
Hard basalt.	36-39
Hard basalt with seams of clay.	39-44
Hard basalt with zones and seams of brown weathered basalt and clay.	44-53
Basalt, mostly partly weathered and soft.	53-56
Hard basalt.	56-67
Firm gray clay, with few residual boulders of basalt in lower part of section.	67-79
Hard basalt.	79-90
Total depth.	90

Note: At ground surface in vicinity of test hole 18 are numerous boulders and cobbles consisting of aggregates of pebbly iron ore. The pebbles of iron ore are firmly cemented together to make up very permeable masses that form the boulders and cobbles. The depth of the material below the ground surface is not known. It could not be identified in cuttings from the test hole.

TEST HOLE 19

Location: Courthouse

Grid:

Date drilled: Mar. 6-7, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 50

Depth (feet): 85

Observers: D. A. Davis and Ted Lund.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Mar. 6 0730	-	Start drilling using water with 8-in rotary rock bit on kelly. Brown and red clay.
0815	7	Stop drilling to connect 8-in bit on stabilizer.
0824	7	Resume drilling with 8-in bit using water. Rough bit chatter on residual boulder in brownish red clay.
0826	8	Brown weathered basalt.
0827	9	As above.
0830	11	Firm brown weathered basalt.
0834	15	As above. Bit chatter on boulder.
0835	16	As above. Rough bit chatter.
0837	17	As above.
0840	18	As above, with very rough chatter.
0841	19	Smooth drilling in soft brown clay.
0842	20	As above.
0844	21	As above.
0846	23	As above.
0847	25	As above, with some gray clay.
0848	26	Stop drilling to clear hole of cuttings.

TEST HOLE 19

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 6		
0900	26	Resume drilling.
0901	27	Bit chatter on caved boulder.
0902	28	Smooth drilling in reddish brown clay.
0904	30	Somewhat harder drilling on small cobbles of basalt in clay.
0905	32	As above.
0906	35	As above.
0910	37	Bit chatter on small boulder.
0912	39	Smooth drilling in brown clay.
0913	40	As above.
0914	41	Slower drilling in firm weathered basalt. Slight bit chatter. Stop drilling to add section of drill pipe and to clean mud pit.
0922	40½	Resume drilling on caved boulder.
0924	41	- - -
0925	42	Drilling in firm weathered basalt.
0926	43	As above.
0927	44	Smooth drilling in weathered basalt. Occasional bit chatter on small boulder.
0928	45	As above.
0929	46	As above.
0930	47	As above.
-	47½	Rough chatter on boulder.

TEST HOLE 19

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 6		
0931	48	As above.
0932	49	As above.
0934	50	Rough bit chatter. Cuttings are fragments of clay and weathered basalt and black chips of basalt.
0935	51	As above.
0937	52	As above.
0938	52	Stop drilling. Caved boulder is above bit and may be principal cause of rough bit chatter. Hauling load of water and drilling mud.
1015	-	Mixing drilling mud.
1017	51½	Resume drilling, using drilling mud for circulating fluid, on caved boulder.
1019	52	As above.
1023	53	Very rough chatter.
1025	54	Cuttings are fragments of light brown clay and black chips of basalt. Bit chatter.
1027	55	Rough bit chatter on residual boulders in clay.
1029	56	As above. Stop drilling to clear hole of cuttings and to install 6-in surface casing.
1055	-	Six-inch surface casing installed to depth of about 40 ft.
1110	56	Resume drilling with 5-in rotary rock bit.
1114	57	Smooth drilling in soft red clay.
1115	60	As above.

TEST HOLE 19

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 6		
1117	64	Smooth drilling in gray and brown clay.
1120	66	Some bit chatter in gray and brown clay. Stop drilling to clear hole, add section of drill pipe and mix drilling mud.
1246	66	Resume drilling.
1249	67	Drilling in weathered basalt. Some light bit chatter.
1250	70	Smooth drilling in weathered basalt.
1251	71	Smooth drilling in brown clay.
1252	72	As above.
1254	76	As above.
1256	77	Drilling with light bit chatter in weathered basalt.
1259	78	Weathered basalt, some gray clay and black chips of basalt in cuttings.
1301	79	As above.
1304	80	As above. Less clay in cuttings.
1308	81	As above. Stop drilling to clear hole, add section of drill pipe and mix drilling mud.
1320	81	Resume drilling.
1323	82	Drilling in partly weathered basalt. Some bit chatter.
1325	82½	Stop drilling to mix drilling mud.
1332	82½	Resume drilling.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 6 1334	83	Cuttings are fragments of weathered basalt and black chips of basalt.
1340	84	Hard drilling with rough chatter. Cuttings are mostly black chips of basalt.
1350	85	Hard drilling with rough chatter in basalt.
1354	85	Stop drilling to mix drilling mud and clear cuttings from hole.
1359	-	Caved boulders lock bit in hole.
1400	-	Bit free. Resume circulation to clear hole.
1415	-	Tools removed from hole. Start installation of airlift pump.
1435	-	Start airlift pump to clean and develop hole.
1445	-	Q, 12 gal/min.
1447	-	Raising and lowering pump in hole. Large amounts of mud and cuttings discharged by pump.
1458	-	Start on-and-off pumping and raising and lowering of pump in hole.
1525	-	Q, 12 gal/min.
1527	-	Chloride concentration in water, 35 mg/L.
1530	-	Pump removed from hole to remove obstruction in intake.
1630	-	Pump reinstalled with intake at 77 ft below ground surface.
1632	-	Start pump.
1640	-	Q, 17 gal/min.

TEST HOLE 19

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 6 1650	-	Q, 15 gal/min.
1655	-	Q, 14 gal/min. Chloride, 40 mg/L.
1700	-	Depth to water, 51.0 ft below top of 6-in casing 0.5 ft above ground surface.
1707	-	Q, 15 gal/min.
1725	-	Q, 14 gal/min. Depth to water 51.5 ft. Shut down for the day.
Mar. 7 0700	-	Depth to water, 28.1 ft below top 6-in casing.
0800	-	Start pumping test of Mar. 7, 1976.
1542	-	End of pumping test.

TEST HOLE 19

PUMPING TEST

Date: Mar. 7, 1976

Pumping test made with airlift pump set with intake at 77 ft below ground surface. Water level measured with electric tape, except as noted, below drilling-tool opening in mud pit, 0.6 ft above ground surface. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Garrett Chapman. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
Mar. 7					
0700	-	28.1	-	-	Steel-tape measurement.
0745	-	28.6	-	-	Electric-tape measurement.
0752	-	28.6	-	-	
0757	-	28.6	-	-	
0800	0	-	-	-	Start airlift pump.
0805	5	48.5	21	-	
0810	10	50.9	16	-	
0815	15	51.4	15	-	
0820	20	51.4	15	-	
0825	25	51.5	15	-	
0830	30	51.5	15	-	
0835	35	51.6	15	-	
0840	40	51.6	15	-	
0850	50	51.6	15	-	
0855	55	51.6	15	-	
0900	60	51.6	15	-	
0910	70	51.6	15	-	
0920	80	51.9	15	-	
0925	85	-	-	35	
0930	90	51.7	15	-	
0940	100	51.6	14	-	
0950	110	51.6	15	-	
1000	120	51.6	14	-	
1020	140	51.6	14	-	
1040	160	51.8	14	-	
1100	180	51.8	14	-	
1120	200	51.9	14	-	
1140	220	51.9	-	-	
1200	240	51.9	14	-	

TEST HOLE 19

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 7					
1220	260	51.9	14	-	
1240	280	51.8	14	-	
1300	300	51.9	14	-	
1320	320	51.9	14	-	
1325	325	-	-	32	
1337	337	-	-	-	Temp. of water 82°F (28°C).
1340	340	52.2	14	-	
1357	357	52.2	14	-	
1400	360	-	-	-	Stop pump. Start measure- ment of water-level recovery.
1400	0	-	-	-	Elapsed time after pump- ing stopped measured with stopwatch.
	1	49.4			
	2	44.4			
	4	40.1			
	5	38.2			
	6	37.0			
	7	35.8			
	9	33.6			
	10	32.8			
	11	32.2			
	12	31.8			
	13	31.4			
	14	31.1			
	15	30.8			
	18	30.3			
	21	30.0			
	24	29.7			
	30	29.6			
	36	29.5			
	42	29.5			
	48	29.5			
	54	29.4			
	60	29.4			
	72	29.4			
	85	29.3			
	100	29.3			
1542	102	29.3			Last measurement.

TEST HOLE 19

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown and red clay; residual boulder of basalt at 7 ft.	0- 8
Brown weathered basalt, with scattered residual boulders of basalt.	8-18
Brown and gray clay with scattered residual boulders of basalt.	18-41
Firm weathered basalt with scattered residual boulders of basalt.	41-50
Weathered basalt with numerous seams of brown and gray clay and scattered residual boulders of basalt.	50-64
Gray and brown clay.	64-67
Weathered basalt.	67-71
Brown clay.	71-77
Weathered basalt with seams of gray clay and scattered residual boulders of basalt.	77-84
Hard basalt.	84-85
Total depth.	85

TEST HOLE 20 (Converted to well 13)

Location: High School

Grid:

Date drilled: Mar. 8-9, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 38

Depth (feet): 85

Observers: D. A. Davis and Ted Lund.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 Mar. 8		
1430	-	Setting up drilling equipment at site of test hole 20.
1500	-	Start drilling with 8-in rotary rock bit on kelly. Light brown clayey soil. Drilling with water.
1501	1	- - -
1502	2	Bit chatter on boulder.
1503	7	Soft, fast drilling and no return circulation. Stop drilling to connect 8-in rotary rock bit on stabilizer.
1515	7	Resume drilling with 8-in bit.
1516	9	Soft, fast drilling and no return circulation.
1517	10	As above.
1518	12	As above. Lost fluid in mud pit. Stop drilling.
1526	12	Start drilling with hose from water tank connected directly to suction of mud pump. Rough chatter. No return circulation.
1528	13	Soft, fast drilling. No returns.
1530	19	As above.
1531	21	Drilling in stiff clay.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 8		
1540	23	Stopped drilling to haul load of water.
1600	23	Resumed drilling, water is fed from tank directly into mud pump. Drilling in stiff clay.
1604	26	Stop drilling to add section of drill pipe.
1616	26	Resume drilling. Soft. No returns.
1617	28	As above.
1619	30	As above.
1621	32	Stiff clay.
1624	34	As above.
1625	41	As above. Stop drilling to add section of drill pipe and to haul a load of water.
1701	41	Resume drilling.
1703	42	Drilling in stiff clay. No return circulation.
1706	43	Hard stiff clay.
1707	44½	As above. Little return of drilling fluid to surface. No cuttings.
1709	45	As above. No cuttings.
1712	46	As above. Small return of water to surface but no cuttings.
1714	46½	Stop drilling to haul water.
1731	46½	Resume drilling in hard stiff clay. No returns.
1732	47	As above. No returns.
1734	48	As above. No returns.
1739	49	As above. No returns. Smooth drilling thus far in hole.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 8		
1740	50	As above.
1741	51	As above. No returns.
1745	52	Small return of water into mud pit from hole. No cuttings. Smooth drilling as above.
1746	53	As above.
1747	-	Little harder drilling.
1748	53½	Stop drilling to add section of drill pipe and haul a load of water.
1814	53½	Resume drilling.
-	54	Some bit chatter. No returns.
1815	55	Occasional bit chatter, but mostly smooth drilling. No returns.
1817	56	As above.
1819	57	As above.
1821	58	As above.
1822	58½	Strong chatter.
1823	60	Stop drilling.
1827	-	Fast operation of mud pump causes water to rise from hole into mud pit.
1830	-	Shut down for the day.
Mar. 9		
0715	-	Depth to water, 21.2 ft below top of rim of drill- tool opening in mud pit, 0.5 ft above ground surface.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 9 0825	-	With bit out of hole, wall of hole was inspected using sunlight reflected by mirror. Seen at about 12 ft below ground surface was an electrical cable projecting from wall of hole. Hence, to a depth of at least 12 ft, material drilled in test hole 20 is artificial fill placed probably during construction of the Truk High School buildings in the vicinity. Seen also were boulders and heterogeneous material of the fill, which appeared to have high permeability and may be the cause of the loss of drilling fluid and lack of return circulation during drilling.
0830	-	Preparing to install 6-in surface casing in hole. About 60 ft of 6-in casing, three 20-ft sections, installed in hole. Last 6 ft of pipe pushed down into hole using kelly and pulldown on drilling machine.
0939	57	Resume drilling using 5-in roller rock bit. During installation of casing hole was backfilled to 57 ft. Using compressed air to drill.
0940	61	Cuttings are weathered basalt. Top of weathered rock estimated to be at about 54 ft.
0941	63	Harder drilling.
0945	65	Somewhat softer.
0949	66	Stop drilling to add section of drill pipe.
0956	66	Resume drilling, using air.
0957	67	Smooth drilling. Strong flow of water with air from hole.
-	67-3/4	Rough bit chatter.
0958	68	- - -
0959	65	Intermittent rough bit chatter.

TEST HOLE 20

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
Mar. 9		
1000	70	As above. Cuttings are fragments of firm weathered basalt.
1001	71	As above.
1002	72	Rough bit chatter.
1004	73	- - -
1005	74	- - -
1008	75	- - -
1009	76	- - -
1012	76½	- - -
1012½	77	- - -
1013	78	From 72 ft, alternating zones of hard and soft drilling in weathered basalt, with intermittent rough bit chatter.
1016	79	Very rough bit chatter in mostly hard black basalt, with some weathered zones.
1024	79-3/4	Stop drilling to repair seal outside top of 6-in surface casing and to add section of drill pipe.
1040	79-3/4	Resume drilling. Rough bit chatter as above.
1044	80	As above.
1048	81	As above. Water rising from hole with air is almost clear. Flow of water seems to be increasing.
1054	82	Hard drilling and rough bit chatter in basalt. Water rising from hole is somewhat turbid from clay seams in basalt.
1100	82½	Stop drilling to level up drilling machine.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
Mar. 9 1106	82½	Resume drilling.
1111	83	Hard drilling and rough bit chatter in basalt.
1121	84	As above.
1138	85	As above. Stop drilling. Install airlift pump and prepare to clean hole and make pumping test.
1405	-	Depth to water, 24.6 ft with electric tape, 24.4 ft with steel tape, below top of 6-in surface casing, 0.4 ft above ground surface.
1410	-	Start pumping test of Mar. 9, 1976. Hole was clean owing to use of compressed air during drilling.

PUMPING TEST

Date: Mar. 9-10, 1976

Test made with airlift pump. Depth to water measured with electric tape, except as noted, below top of 6-in surface casing 0.4 ft above ground surface. Pumping rate measured with 30-gal container and stopwatch. Observations by D. A. Davis and Carmelo Sam. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 Mar. 9					
1405	-	24.6	0	-	Measurement with electric tape.
		24.4	0	-	Measurement with steel tape. Both measurements made from top of 6-in surface casing 0.4 ft above ground surface. Time of measurements was about 150 min after airlift removal of cuttings during drilling operation stopped at total depth of hole, 85 ft.
1410	0	-	-	-	Start airlift pump.
1411	1	27.3	-	-	
1412	2	29.6	-	-	
1413	3	-	50	-	
1414	4	29.8	-	-	
1415	5	29.8	49	-	
1416	6	29.9	-	-	
1417	7	29.9	50	-	
1418	8	30.0	-	-	
1419	9	30.0	-	-	

TEST HOLE 20

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar. 9					
1420	10	30.1	46	-	
1425	15	30.2	46	20	
1430	20	30.3	49	-	
1435	25	30.4	46	-	
1440	30	30.5	48	-	
1443	33	-	-	17	
1448	38	-	-	-	Temp. water, 81½°F (28°C).
1450	40	30.6	48	-	
1455	45	30.6	46	-	
1500	50	30.7	46	-	
1508	-	-	-	16	
1510	60	30.7	46	-	
1511					Stop pump. Pumping stopped owing to mal- function of engine driving the air com- pressor. Started measurement of re- covery of water level.
1511	0	-	-	-	Elapsed time after pumping stopped measured with stop- watch.
	½	27.1			
	1	26.3			
	1½	26.1			
	2	25.9			
	2½	25.8			
	3	25.8			
	3½	25.7			
	4	25.6			
	4½	25.6			
	5	25.5			
	6	25.5			
	7	25.4			

TEST HOLE 20

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
Mar 9	8	25.4			
	9	25.4			
	12	25.3			
	15	25.3			
	36	25.0			
	39	25.0			
	45	24.9			
	51	24.9			
	57	24.8			
	63	24.8			
1626	75	24.8			Last measurement.
Mar. 10 0803	-	24.0	-	-	

TEST HOLE 20

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Artificial fill consisting of brown clay soil from surface to depth of 2 ft and soft but mostly unidentified materials from 2 ft to about 20 ft. Included in fill were fragments of cable and pipe and a few boulders.	0-20
Stiff clay.	20-54
Weathered basalt.	54-79
Basalt with some zones of weathered basalt.	79-85
Total depth.	85

TEST HOLE 21

Location: West side, High School grounds Grid:

Date drilled: July 20-21, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 38 Depth (feet): 66

Observers: D. A. Davis and Ted Lund.

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 July 20		Move drilling equipment to site of test hole 21. Start drilling at about 1530 hrs with 5-in bit, using compressed air.
1605	16	Brown clay from surface to 16 ft.
-	16½	Bit chatter on boulder.
1606	17	Brown clay.
1607	18	Brown clay with residual boulder of basalt.
1608	19	Weathered basalt.
1610	20	Weathered basalt with residual boulders of basalt.
1611	21	As above. Bit chatter on residual boulders.
1614	21½	As above.
1616	22	As above.
1618	23	As above.
1622	24	As above. Stop drilling to clear hole of cuttings.
1628	25	As above.
1630	25½	As above.

TEST HOLE 21

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 20		
1635	27	As above. Some water rising from hole with cuttings and air.
1643	28	As above.
1649	28½	As above. Stop drilling.
1651	28½	Resume drilling. Hard drilling in basalt.
1705	28½	Stop drilling. Shut down for the day.
July 21		
0830	-	Connecting new 5-in rotary rock bit for drilling.
0843	-	Run drilling tools into hole and start compressor to clear cuttings from hole.
0857	-	From 0843 removing cuttings from hole using drilling tools and compressed air.
0900	28½	Start drilling on bottom of hole.
0907	29	- - -
0911	30	- - -
0915	31	- - -
0918	32	Stop drilling to clear hole of cuttings.
0921	32	Resume drilling.
0926	33	From 28½ ft drilling in fresh basalt.
0929	34	As above.
0933	35	As above.
0936	36	As above. Stop drilling to clear hole.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 21 1020	36	From 0936 hrs clearing hole of cuttings and material caved from soft sections of rock above depth of about 28 ft. At 1020 hrs resume drilling at bottom of hole at 36 ft in basalt.
1023	37	As above.
1024	37½	As above.
1028	38	As above. Hard drilling in basalt.
1032	38½	As above.
1034	39	As above.
1036	39½	As above.
1040	40	As above.
1042	-	Stop drilling to clear hole of cuttings using compressed air.
1043	-	Resume drilling.
1044	40½	Hard drilling in basalt.
1046	41	As above.
1050	42	As above.
1054	43	As above.
1058	44	As above.
1102	45	As above.
1106	46	As above.
1108	47	As above.
1110	47½	Stop drilling.
1111	47½	Resume drilling. As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 21		
1113	48	At 48 ft bit entered clay.
1114	51	From 48 ft, soft clay. Stop drilling to clear hole of cuttings.
1130	-	From 1114 hrs, clearing hole of cuttings and caved material and adding section of drill pipe. Stop work.
1300	-	Depth to water, 14.8 ft below ground surface.
1315	-	Resume work on clearing hole, using compressed air.
1322	50½	Resume drilling, using compressed air.
1327	52	- - -
1328	53	- - -
1330	54	- - -
1332	55	From 48 ft drilling in clay. At 55 ft bit chatter, as bit entered weathered basalt. Stop drilling to clear hole of cuttings.
1333	55	Resume drilling, in weathered basalt.
1335	56	As above.
1337	56½	Very rough bit chatter. Drilling in hard basalt with zones of weathered basalt.
1338	57	As above.
1339	57	Stop drilling to clear hole of cuttings using compressed air.
1341	57	Resume drilling using compressed air in basalt.
1344	58	Softer drilling in weathered basalt.
1346	59	Very rough chatter in weathered basalt and residual boulders of basalt. Very little water rising with air from hole.

RECORD OF DRILLING--Continued		
Date Time	Depth (feet)	Description of material drilled and work done
July 21		
1350	60	Stop drilling to clear hole.
1351	60	Resume drilling in hard basalt with zones of weathered basalt and seams of clay.
1353	61	As above.
1355	62	As above.
1356	63	As above. Stop drilling to clear hole.
1357	63	Resume drilling. As above.
1401	64	As above. Stop drilling to clear hole.
1408	64	Resume drilling in hard basalt.
1415	66	As above. Stop drilling to clear hole of cuttings with compressed air.
1420	66	Work on hole stopped. Yield of water during drilling with compressed air diminished, with time and depth of hole, almost to zero. Hole abandoned.

TEST HOLE 21

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay.	0-16
Brown clay with residual boulders of basalt.	16-18
Weathered basalt with scattered residual boulders of basalt.	18-28
Basalt.	28-48
Clay.	48-55
Weathered basalt.	55-57
Basalt with zones of weathered basalt and few seams of clay.	57-64
Basalt.	64-66
Total depth.	66

TEST HOLE 22 (Converted to well 15)

Location: Truk High School Gymnasium	Grid:
Date drilled: July 22-23, 1976 by Ted Lund Drilling and Supply	
Altitude, ground surface (feet): 15	Depth (feet): 70
Observers: D. A. Davis, Ted Lund, and Bensy Ewar.	

RECORD OF DRILLING

Date Time	Depth (feet)	Description of material drilled and work done
1976 July 22 0910	-	Start drilling with 5-5/8-in rotary rock bit on kelly using air. Artificial fill to 1 ft.
0913	3	Brown clay.
0920	5	Brown clay.
0925	6	Light bit chatter in brown clay.
0929	7	Increasing bit chatter in light brown clay.
0932	8	Smooth drilling in light brown clay.
0936	10	As above. Stop drilling to clear hole of cuttings.
0939	10	Resume drilling. In light brown clay.
0941	11	As above. Light bit chatter at 11 ft.
0949	12	Stop drilling to connect 5-5/8-in bit on stabilizer and to clear hole.
1006	12	Resume drilling using compressed air.
1008	13	Smooth slow drilling in light brown clay. Pressure from compressed air pumped into hole causes ground to rise slightly around hole in a 3-ft radius. Because of slow rise of cuttings to surface, stop drilling to change drilling fluid from compressed air to water.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 22 1022	13	Resume drilling in light brown clay with 5-5/8-in bit using water.
1023	14	Drilling in light brown clay.
1024	16	As above.
1025	18	As above. Bit chatter on residual boulder at 18 ft.
1026	20	As above.
1027	23	As above. Light bit chatter at 23 ft.
1029	24	As above.
1031	25	Smooth drilling in brown clay and zones of weathered basalt.
1032	26	As above.
1037	29	As above.
1040	30	As above. At depth between 25 and 30 ft rate of penetration by bit was slowed by keeping tension on drill hoist line so that drill cuttings could be cleared from hole as drilling progressed.
1042	31	Bit entered red clay between 30 and 31 ft. Stop drilling to clear hole and add section of drill pipe.
1053	31	Resume drilling with 5-5/8-in bit using water.
1055	33	Drilling in red and brown clay. Some bit chatter at 32 ft.
1058	34	Smooth drilling in red and brown clay.
1100	35	Smooth drilling in stiff bluish gray clay.
1103	36	As above.
1106	37	As above.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 22		
1107	38	As above.
1108	39	Smooth drilling in brown and gray clay.
1109	40	As above.
1111	42	As above.
1112	45	Smooth drilling in brown and red clay.
1113	46	As above. Stop drilling to clear hole and add section of drill pipe.
1121	46	Resume drilling. As above.
1122	47	Soft, smooth drilling.
1123	48	As above.
1124	49	As above.
1127	51	As above.
1130	52	Brown and gray clay. Slower and harder drilling than above.
1132	53	Stiff brown and gray clay.
1134	54	As above.
1137	56	As above.
1140	57	As above.
1142	58	Brown and gray clay. Softer than above.
1145	59	As above.
1146	60	As above.
1148	61	As above. Stop drilling to clear hole of cuttings and add section of drill pipe.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 22		
1320	61	Resume drilling.
1325	62	Smooth drilling in clay.
1329	63	As above.
1331	64	As above.
1339	64½	Bit chatter. Much harder drilling.
1341	65	As above. Cuttings are gray clay and chips of hard basalt.
1343	65½	As above.
1346	66	As above.
1350	67	As above.
1355	68	As above.
1409	69	Drilling in basalt.
1418	69½	As above.
1427	70	As above. Stop drilling. Prepare to clean hole for pumping test.
1429	-	Start pumping air down drill pipe to remove mud from hole by airlift.
1434	-	Large flow of water from hole with airlift.
1500	-	Drilling tools removed from hole. Depth to water 7.4 ft below ground surface.
1510	-	Start installation of airlift pump.
1540	-	Pump installed. Start pump.
1553	-	Water is turbid. Chloride concentration in water, 32 mg/L.

RECORD OF DRILLING--Continued

Date Time	Depth (feet)	Description of material drilled and work done
July 22		
1605	-	Pump intake is at about 27 ft below ground surface.
1612	-	Q, 40 gal/min. Depth to water, 30.1 ft, measured from ground surface.
1617	-	Q, 33 gal/min.
1620	-	Depth to water, 32.5 ft. Chloride, 34 mg/L.
1627	-	Q, 33 gal/min. Depth to water, 32.4 ft.
1633	-	Q, 33 gal/min. Depth to water, 32.5 ft.
1635	-	Start on-and-off pumping to clean and develop hole.
1710	-	Q, 32 gal/min. Depth to water, 32.3 ft.
1715	-	Chloride, 32 mg/L.
1721	-	Shut down for the day.
July 23		
0755	-	Depth to water, 6.7 ft.
0800	-	Start pumping test of July 23, 1976.
1430	-	Stop pumping test.

PUMPING TEST

Date: July 23, 1976

Test made with airlift pump set with intake at about 67 ft below ground surface. Depth to water measured with electric tape, except as noted. Pumping rate measured with 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 23					
0755	-	6.7	-	-	Steel-tape measurement.
0800	-	0	-	-	Start airlift pump.
0804	4	28.3	-	-	
0805	5	-	35	-	
0810	10	-	-	36	
0813	13	30.2	33	-	
0819	19	-	-	33	
0820	20	30.5	33	-	
0835	35	-	-	33	
0840	40	31.1	32	-	
0850	50	-	-	33	
0900	60	31.2	32	34	
0915	75	31.4	32	33	
0930	90	31.5	33	33	
0945	105	31.5	32	32	
1000	120	31.6	32	33	
1020	140	31.7	32	32	
1033	153	-	-	-	Temp. of water 82°F (28°C).
1040	160	31.7	32	31	
1100	180	31.7	32	33	
1120	200	31.8	32	32	
1140	220	31.9	32	32	
1200	240	31.9	31	33	
1220	260	32.0	31	32	
1240	280	32.0	31	-	
1300	300	32.4	32	32	

TEST HOLE 22

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 23					
1320	320	32.4	32	-	
1340	340	32.5	32	33	
1413	373	32.5	32	-	
1420	380	32.5	-	-	
1430	390	32.5	32	33	Stop pump. Start measure- ment of recovery of water level.
1430	0	-	-	-	Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	1	31.6			
	2	25.6			
	3	22.2			
	4	21.1			
	5	20.3			
	6	19.8			
	9	18.8			
	12	18.3			
	15	18.0			
	18	17.7			
	24	17.4			
1500	30	17.1			Last measurement.

LOG

Compiled from records kept by D. A. Davis and Ted Lund.

	Depth (feet)
Brown clay.	0- 6
Light brown clay with few scattered residual boulders of basalt.	6-25
Brown clay with zones of weathered basalt.	25-33
Red and brown clay.	33-35
Stiff bluish gray clay.	35-39
Brown and gray clay.	39-45
Red and brown clay.	45-52
Brown and gray clay.	52-65
Basalt with seams of gray clay.	65-70
Total depth.	70

SUMMARY OF RECORDS OF TEST HOLES

Summary of records of test holes drilled on Moen, Truk, 1975-76

[Altitudes given are approximate heights above mean sea level of ground surface at the test holes.
All depths are measured below the ground surface. Date of completion is date of completion of pumping test.]

Test hole No.	Date completed	Altitude (ft)	Depth (ft)	Depth to water (ft)		Pumping rate (gal/min)	Draw-down (ft)	Specific capacity (gal/min/ft)	Chloride concentration (mg/l)	Remarks
				Static level	Pumping level					
TH-1	11-14-75	35	100	10	81	3	71	0.04	30	
TH-2	11-21-75	21	125	13	82	8	69	.1	25	
TH-3	11-24-75	60	74	-	-	1	-	-	-	Abandoned before testing because of low yield.
TH-4	11-30-75	23	67	10	22	37	12	3	12	Converted to well 17.
TH-5	12- 4-75	9	110	5	40	55	35	1	260	Chloride concentration increased from 50 to 260 mg/l in 2 hrs of pumping. Hole was backfilled with neat cement to depth of 75 ft.
	12- 6-75	9	75	5	34	34	29	1	20	Converted to well 18.
TH-6	12- 8-75	30	79	7	-	-	-	-	-	Hole abandoned before testing because of low yield.
TH-7	1-25-76	77	172	24	74	17	50	.3	17	
TH-8	2- 1-76	70	163	32	109	14	77	.2	12	Hole deepened to 200 ft for further testing.
	2- 4-76	70	200	35	137	12	102	.1	12	
TH-9	2-11-76	22	80	9	23	56	14	4	50	Converted to well 12.
TH-10	2-13-76	39	66	12	39	23	27	.9	140	Converted to well 8.
TH-11	2-17-76	12	67	5	20	50	15	3	15	Converted to well 10.
TH-12B	2-19-76	13	80	7	45	23	38	.6	14	
TH-13	2-22-76	7	65	4	-	-	-	-	-	
TH-14	2-24-76	25	70	3	55	1	52	.02	20	Hole abandoned without testing.
TH-15	2-26-76	33	137	29	93	13	64	.2	10	
TH-16	3- 2-76	22	75	8	25	50	17	3	21	Converted to well 14.
TH-17	3- 3-76	10	53	-	-	<1	-	-	-	Abandoned before testing because of low yield.
TH-18	3- 5-76	40	90	6	69	3	63	.04	15	
TH-19	3- 7-76	50	85	28	52	15	24	.6	35	
TH-20	3- 9-76	38	85	24	30	48	6	8	16	Converted to well 13.
TH-21	7-21-76	38	66	15	-	-	-	-	-	Abandoned before testing because of low yield.
TH-22	7-23-76	15	70	7	32	32	25	1	33	Converted to well 15.

PRODUCTION WELLS

Methods of construction and testing.--Test holes that were converted to production wells first were enlarged; then completed with casing, screen, gravel pack, and grout seal. These holes were then cleaned and developed.

A 12-inch rotary reamer or hole opener was used to enlarge the holes. Casing used was 8-inch standard steel pipe and the screen installed was stainless steel of the shutter type. Casing and screen joints were welded. The gravel pack consisted of quartzose gravel poured from the surface into the annular space outside screen and casing in 5-gallon increments. The pack extends from near the bottom of the casing up to about the level of the water table. Above the gravel pack the annular space was filled up to the ground surface with grout of neat portland cement. The airlift pump was used to clean and develop the cased well. Pumping tests on the wells were made with an electric-powered submersible pump.

Definitions that applied to terms used in records of test holes, as listed in pages 7 to 10, apply also to terms used in the records of production wells.

Logs of the wells included in the records were adapted from logs of the test holes from which the wells were converted.

WELL 8 (Converted from test hole 10)

Location: Road intersection at Court House Grid:

Date constructed: June 19-26, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 39 Depth (feet): 65

Casing diameter and depth: 8-in standard steel pipe, ground surface to 30.5 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 30.5 to 54.5 ft below ground surface.

Gravel pack and grout: Quartzose gravel pack from 16 ft to 50 ft below ground surface. Neat portland cement grout, ground surface to 16 ft.

Observers: D. A. Davis, Ted Lund, and Betsy Ewar.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976		
June 19	-	Test hole 10 previously enlarged to 12-in diameter from ground surface to 53 ft.
1315	-	Preparing to clean 5-in hole from 53 to 60 ft using 5-in rotary rock bit on drill pipe.
1343	-	Bit at bottom of 12-in hole.
1346	-	Drilling in 5-in hole on boulders caved from above. Bit chatter.
1415	-	At 60 ft with 5-in bit. Remove drilling tools from hole.
1500	-	Airlift pump installed. Start pump.
1645	-	From 1600 hrs pumping mud and cuttings from hole. Pump is frequently plugged by clay. Shut down for the day.
June 21		
0750	-	Depth to water, 3.8 ft below ground surface.
1000	-	Airlift pump removed from hole.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 21 1030	-	Start cleaning hole with 8-in rotary rock bit using water for circulation.
1045	-	Bit at 53 ft. Circulating water to clear cuttings from hole.
1100	-	Eight-inch bit replaced by 5-in rotary rock bit on drilling tools.
1122	-	Start drilling with 5-in bit at 53 ft below ground surface, using water.
1155	-	Cleared hole to 60 ft with 5-in bit.
1330	-	Drilling tools removed and airlift pump installed with intake at 53 ft.
1332	-	Start airlift pump.
1520	-	From 1332 hrs cleaned well with airlift pump.
1545	-	Pump removed from hole.
1710	-	Started installation of 8-in casing and screen. All joints welded by Ted Lund.
1800	-	Casing and screen installed with bottom of screen seated at 53 ft below ground surface and top of casing at 1.7 ft above ground surface. Lengths and depths of casing and screen are as follows:

	<u>Length (ft)</u>	<u>Depth intervals (ft)</u>	
		<u>Below ground surface</u>	<u>Below top of casing</u>
Solid-wall casing	29 (30.7)	0 -29.0	0 -30.7
Screen	24	29.0-53.0	30.7-54.7
Open hole	7	53 -60	

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 21 1800	-	Shut down for the day.
June 22 0820	-	Depth to bottom of annular space outside 8-in casing and screen, 50 ft.
0825	-	Start placement of gravel pack in annular space. Gravel poured into space in 5-gal increments.
1211	-	From 0825 to 1211 hrs, 340 gal of gravel, about 45 cu ft, placed in annular space. Bottom of gravel pack at 50 ft and top at 13.4 ft below ground surface.
1350	-	With 5-in rotary rock bit on drilling tools, and using compressed air, start cleaning hole below bottom of 8-in screen at 53 ft.
1410	-	Some gravel-pack material carried up by air and water. Casing has sunk about $\frac{1}{2}$ ft.
1437	-	Bit is about $1\frac{1}{2}$ ft above original 60-ft depth of 5-in hole. Large fragments of weathered basalt carried from hole by air and water. Casing has sunk further about $\frac{1}{2}$ ft.
1520	-	Drilling tools removed and airlift pump installed.
1525	-	Start airlift pump.
1535	-	Casing is sinking.
1600	-	Stop pump. Welded 1.4-ft section of 8-in casing on top end of casing in hole.
1720	-	Start airlift pump.
1750	-	Depth to top of gravel in annular space, 16.4 ft below ground surface.
1755	-	Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done			
June 23 0806	-	Start airlift pump. From 0806 to 1730 hrs well pumped and surged with on-and-off operation of pump to clean and develop the well.			
1503	-	Start placing neat portland cement grout in annular space. From 1503 to 1703 hrs, 26 bags of cement placed as grout in the space. Bottom of grout at 16 ft and top at 3 ft below ground surface.			
1728	-	Shut down for the day.			
June 24		Following tabulation shows revised lengths and depths of casing and screen after development and grouting operations:			
			<u>Depth intervals (ft)</u>		
			<u>Below ground surface</u>	<u>Below top of casing</u>	
		<u>Length (ft)</u>			
		Solid-wall casing	30.5(32.1)	0 -30.5	0 -32.1
		Screen	24.0	30.5-54.5	32.2-56.2
		Open hole	10	54.5-65	56.2-66
0805	-	Depth to water, 11.5 ft below top of 8-in casing, 1.6 ft above ground surface.			
June 25	-	Preparing to clear hole below bottom of screen with 5-in rotary rock bit.			
0825	-	Start drilling at 56 ft using air and water. Very rough bit chatter.			
0837	-	At 61 ft. Rough bit chatter. Returns are muddy water with chips of basalt and gravel from gravel pack.			
0853	-	Bit at 62 ft.			

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 25 0900	-	Bit at 63 ft.
0925	-	Bit at 65 ft. Returns are black chips of basalt and gravel from pack.
0930	-	Drilling out caved boulder.
0950	-	Bit at 65 ft. Stop drilling.
1315	-	Measured depth of hole, 53 ft. Hole below bottom of screen is filled with cuttings and gravel from pack.
1340	-	Airlift pump installed for cleaning hole.
1623	-	From 1340 hrs, pump operated at rate of about 20 gal/min.
June 26 0800	-	Start pumping test of June 26, 1976.
1807	-	Stop test.

PUMPING TEST

Date: June 26, 1976

Test made with electric-driven submersible deep-well turbine pump. Depth to water measured with electric tape below top of 8-in casing, 1.6 ft above ground surface. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
June 26					
0755	-	12.2	-	-	
0800	0	-	-	-	Start pump.
0810	10	-	16	-	
0816	16	18.6	-	-	
0820	20	19.1	15	-	
0840	40	20.8	15	-	
0900	60	21.9	15	-	
0920	80	22.8	15	-	
0940	100	23.5	15	-	
1000	120	24.2	15	-	
1020	140	24.7	15	-	
1040	160	25.1	15	-	
1100	180	25.4	15	-	
1120	200	25.8	15	-	
1140	220	26.2	15	-	Temp. water, 86°F (30°C).
1200	240	26.4	15	120	
1220	260	26.7	15	-	
1240	280	26.9	15	-	
1300	300	27.2	15	-	
1320	320	27.4	15	-	
1340	340	27.6	15	-	
1400	360	27.8	15	-	
1420	380	28.0	15	120	
1440	400	28.1	15	-	
1500	420	28.3	15	-	
1520	440	28.5	-	110	
1540	460	28.7	15	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 26					
1600	480	28.8	15	-	
1620	500	29.0	15	-	
1640	520	29.1	15	-	
1649	529	-	-	-	Stop pump. Start measure- ment of water-level recovery.
1649	0	-	-	-	Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	$\frac{1}{2}$	26.7			
	1	25.9			
	$1\frac{1}{2}$	25.3			
	2	24.8			
	$2\frac{1}{2}$	24.5			
	3	23.9			
	$3\frac{1}{2}$	23.5			
	4	23.1			
	$4\frac{1}{2}$	22.8			
	5	22.6			
	$5\frac{1}{2}$	22.3			
	6	22.1			
	7	21.8			
	8	21.5			
	9	21.2			
	10	20.9			
	11	20.7			
	12	20.6			
	15	20.0			
	18	19.6			
	21	19.1			
	24	18.8			
	27	18.6			
	30	18.3			
	36	17.9			
	42	17.6			
	48	17.3			
	54	17.0			
	60	16.8			
	66	16.6			
	72	16.3			
1807	78	16.2			Last measurement.

WELL 8

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 27 0815	-	13.0			Measured below top of 8-in casing, 1.6 ft above ground surface.
June 28 0740	-	13.1			As above.
June 28 0753	-	13.2			
0815	10	13.2	15	8.25	1
0830	20	13.2	15	8.25	2
0845	30	13.2	15	8.25	3
0900	40	13.2	15	8.25	4
0915	50	13.2	15	8.25	5
0930	60	13.2	15	8.25	6
0945	70	13.2	15	8.25	7
1000	80	13.2	15	8.25	8
1015	90	13.2	15	8.25	9
1030	100	13.2	15	8.25	10
1045	110	13.2	15	8.25	11
1100	120	13.2	15	8.25	12
1115	130	13.2	15	8.25	13
1130	140	13.2	15	8.25	14
1145	150	13.2	15	8.25	15
1200	160	13.2	15	8.25	16
1215	170	13.2	15	8.25	17
1230	180	13.2	15	8.25	18
1245	190	13.2	15	8.25	19
1300	200	13.2	15	8.25	20
1315	210	13.2	15	8.25	21
1330	220	13.2	15	8.25	22
1345	230	13.2	15	8.25	23
1400	240	13.2	15	8.25	24
1415	250	13.2	15	8.25	25
1430	260	13.2	15	8.25	26
1445	270	13.2	15	8.25	27
1500	280	13.2	15	8.25	28
1515	290	13.2	15	8.25	29
1530	300	13.2	15	8.25	30

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 10.

	Depth (feet)
Brown clay with scattered boulders of fresh basalt.	0- 8
Brown clay, soft.	8-17
Stiff brown clay.	17-27
Brown clay, soft.	27-42
Brown clay and weathered basalt.	42-53
Weathered basalt.	53-57
Fresh basalt, black, hard.	57-65
Total depth.	65

WELL 10 (Converted from test hole 11)

Location: Land Management Office

Grid:

Date constructed: June 12-17, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 12

Depth (feet): 57

Casing diameter and depth: 8-in standard steel pipe, ground surface to 22.8 ft and 46.8 to 51.8 ft below ground surface. Open hole 51.8 to 57 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 22.8 to 46.8 ft below ground surface.

Gravel pack and grout: Quartzose gravel pack from 17 to 51 ft below ground surface. Neat portland cement grout, ground surface to 17 ft below ground surface.

Observers: D. A. Davis, Ted Lund, and Betsy Ewar.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 June 12		In conversion to well 10, test hole 11 has been previously enlarged to a 12-in diameter, to a depth of 51 ft below the ground surface. Below the 12-in hole, a 5-in hole extends to a depth of about 57 ft below the ground surface.
1030	-	Airlift pump installed in well with intake at 50 ft below ground surface.
1045	-	Start pump to clean well.
1050	-	Depth to water, 14.4 ft below ground surface.
1052	-	Q, 38 gal/min.
1053	-	Depth to water, 14.4 ft.
1055	-	Q, 45 gal/min. Depth to water, 14.8 ft.
1120	-	Q, 40 gal/min.
1135	-	Q, 40 gal/min. Depth to water, 17.2 ft.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done			
June 12 1200	-	Chloride concentration in water, 18 mg/L. Lowered pump in hole so that intake was at about 57 ft below the ground surface at the bottom of the hole. Airlift pumping removed cuttings and mud to bottom of hole.			
1215	-	Stop pump.			
1310	-	Depth to water, 4.1 ft.			
1345	-	Began assembly and installation of 8-in casing and screen.			
1620	-	Casing and screen installed with bottom end seated at 51.8 ft below ground surface and top end at 3.2 ft above ground surface. All joints welded by Ted Lund. Lengths and depths of casing and screen are as follows:			
			<u>Depth intervals (ft)</u>		
		<u>Length (ft)</u>	<u>Below ground surface</u>	<u>Below top of casing</u>	
		Solid-wall casing	22.8 (26.0)	0 -22.8	0 -26.0
		Screen	24.0	22.8-46.8	26.0-50.0
		Solid-wall casing	5.0	46.8-51.8	50.0-55.0
		Open hole	5.0	51.8-57	-
1620	-	Start installing 54 ft of 1-in pipe to tremie neat cement grout around bottom of 8-in casing at about 52 ft.			
1745	-	About 3/4-cu ft grout placed around bottom of casing.			
1800	-	Poured about 2 cu ft of gravel on top of grout. Shut down for the day.			

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 14 0820	-	Depth to water 6.9 ft below top of 8-in casing, 3.2 ft above ground surface.
0825	-	Start installing airlift pump.
0855	-	Start pump.
0906	-	Q, 36 gal/min.
0912	-	Depth to water, 20.4 ft below top 8-in casing.
0922	-	Start placement of gravel pack outside 8-in casing and screen.
1021	-	Between 0922 and 1021 hrs, placed 155 gal of gravel, about 20 cu ft, in annular space outside 8-in casing and screen. Bottom of gravel pack is at about 51 ft below ground surface; top is at about 17 ft below ground surface.
1055	-	Start placement of neat cement grout in annular space above gravel pack.
1205	-	Eighteen bags of portland cement placed in annular space.
1210	-	Airlift pumping continuous since 0855 hrs. Q, 33 gal/min. Depth to water, 21.1 ft.
1340	-	Depth to top of grout in annular space, 3 ft below ground surface.
1352	-	Two bags of cement placed in annular space, filling it to ground surface.
1530	-	Start on-and-off operation of airlift pump to clean and develop well. Turbidity of water decreased as pumping progressed. Some volcanic material, from open hole below bottom of casing, discharged with water, together with fine material from gravel pack.

WELL 10

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 14 1730	-	Stop pump. Shut down for the day.
June 15 0735	-	Depth to water 6.7 ft below top of 8-in casing.
0742	-	Start airlift pump and on-and-off pumping to clean and develop well.
0940	-	Q, 39 gal/min. Depth to water 19.9 ft.
1344	-	Stop pump. On-and-off pumping operation continued from 0742 to 1344 hrs. Q at end of period was 41 gal/min.
1443	-	Airlift pump removed and submersible deep-well turbine installed in well.
June 16 1045	-	Depth to water, 6.9 ft below top of 8-in casing.
1100	-	Start pumping test of June 16, 1976.
2400	-	End pumping test.

PUMPING TEST

Date: June 16, 1976

Test made with electric-driven submersible deep-well turbine pump. Depth to water measured with electric tape below top of 8-in casing, 3.2 ft above ground surface. Pumping rate controlled with valve in discharge line of pump and measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976 June 16					
1045	-	6.9	-	-	
1100	0	-	-	-	Start pump.
1105	5	-	51	-	Adjusting pumping rate.
1106	6	30.0	-	-	
1108	8	-	47	-	
1110	10	28.8	-	-	
1112	12	28.7	-	-	
1113	13	-	46	-	Adjusting rate.
1116	16	30.9	51	-	
1121	21	30.4	-	-	
1123	23	-	48	-	
1127	27	30.9	47	-	
1132	32	31.2	49	-	
1138	38	31.5	50	-	
1155	55	30.7	48	-	
1203	63	31.9	-	-	
1220	80	31.4	49	-	
1233	93	31.7	49	-	
1237	-	-	-	-	Temp. of water, 83°F (28°C).
1240	100	31.2	49	-	
1250	110	31.6	50	-	
1300	120	32.2	49	-	
1320	140	32.8	51	-	
1325	-	-	-	13	
1340	160	32.7	50	-	
1400	180	33.5	50	-	
1420	200	33.6	51	-	
1440	220	33.4	50	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 16					
1500	240	33.6	51	16	
1520	260	33.8	51	-	
1540	280	-	50	-	
1600	300	33.3	51	-	
1620	320	33.8	50	-	
1640	340	34.3	51	-	
1705	365	34.0	51	-	
1720	380	34.0	51	-	
1721	381	-	-	-	Pump off for 2 min for adjustment.
1745	-	-	-	16	
1750	410	34.1	51	-	
1800	420	34.2	50	-	
1820	440	33.5	50	-	
1830	450	33.3	49	-	
1900	480	33.5	50	-	
1930	510	33.4	49	-	
2000	540	33.1	49	-	
2030	570	34.2	50	-	
2100	600	34.1	50	-	
2130	630	34.1	49	-	
2200	660	33.9	49	-	
2230	690	33.9	49	-	
2250	710	33.8	49	-	
2300	760	-	-	-	Stop pump. Start measurement of recovery of water level.
2300	0	-	-	-	Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	$\frac{1}{2}$	27.6			
	1	22.8			
	$1\frac{1}{2}$	18.7			
	2	15.8			
	$2\frac{1}{2}$	13.7			
	3	11.7			
	$3\frac{1}{2}$	11.3			
	4	10.6			
	$4\frac{1}{2}$	10.1			

WELL 10

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 16	5	9.8			
	6	9.4			
	7	9.2			
	8	9.0			
	9	8.9			
	12	8.6			
	15	8.5			
	18	8.4			
	21	8.4			
	24	8.3			
	31	8.2			
	36	8.2			
	42	8.1			
	48	8.1			
	54	8.0			
2400	60	8.0			Last measurement.
June 17					
0830	-	7.2			Measured below top of 8-in casing.

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 11.

	Depth (feet)
Reddish brown to brown clay, with few scattered small boulders of fresh or partly weathered basalt. Very soft, 8-18 ft.	0-18
Red to gray soft clay.	18-21
Weathered basalt.	21-24
Reddish brown stiff clay. Slow drilling.	24-38
Reddish brown to gray soft clay.	38-44
Weathered basalt, with few scattered residual boulders of fresh basalt. Some light reddish brown clay at 49 ft.	44-52
Weathered basalt with numerous scattered residual boulders of fresh basalt. Zones of brown to gray clay at 54 ft.	52-57
Total depth.	57

WELL 12 (Converted from test hole 9)

Location: Old cafeteria, Truk High School Grid:

Date constructed: June 28-July 2, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 22 Depth (feet): 74

Casing diameter and depth: 8-in standard steel pipe, ground surface to 48.4 ft below surface and 72.1 to 73.6 ft below surface.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 48.4 ft below ground surface to 72.1 ft below surface.

Gravel pack and grout: Quartzose gravel pack from 23 ft below ground surface to 72 ft below surface. Neat portland cement grout from ground surface to 23 ft below ground surface and from about 73 ft to 74 ft below surface at bottom of casing.

Observers: D. A. Davis, Ted Lund, and Bensy Ewar.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 June 28	-	Test hole 9 has previously been enlarged to 12-in diameter to 72 ft below ground surface using 12-in rotary hole opener.
1010	-	Running drilling tools into hole with 12-in hole opener.
1035	-	Start drilling at 72 ft. Rough bit chatter.
1046	-	Bit at 74 ft. Stop drilling.
1200	-	Drilling tools removed from hole.
1238	-	Airlift pump installed in hole. Start pump.
1255	-	From 1238 hrs, pumping mud from hole. Stop pump.
1540	-	Start pump. Intake of pump is at 65 ft. Start lowering pump in hole.
1830	-	From 1540 hrs, cleaning hole by airlift pumping. Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done			
June 29					
0735	-	Start airlift pump.			
0900	-	From 0735 hrs, cleaning hole by airlift pumping. Intake of pump is at 72 to 73 ft and will not go deeper. Stop pump. Shut down for repair to drilling equipment.			
1345	-	Began assembly of casing and screen for installation in 12-in hole.			
1515	-	Start installation of 8-in casing and screen in hole. All joints welded by Ted Lund.			
1655	-	Casing and screen installed in hole with bottom end seated at 72.6 ft below ground surface and top end at 2.2 ft above ground surface. Lengths and depths of the casing and screen are as follows:			
			<u>Depth intervals (ft)</u>		
			<u>Below</u>	<u>Below</u>	
			<u>ground</u>	<u>top of</u>	
			<u>surface</u>	<u>casing</u>	
		<u>Length</u>			
		<u>(ft)</u>			
		Solid-wall casing	46.9 (49.1)	0 -46.9	0 -49.1
		Screen	23.7	46.9-70.6	49.1-72.8
		Solid-wall casing	2.0	70.6-72.6	72.8-74.8
1700	-	Shut down for the day.			
June 30					
0810	-	Start running 7-7/8-in rotary rock bit into hole on drilling tools.			
0830	-	Bit stopped at about 71½ ft.			
0839	-	Start drilling with 7-7/8-in bit using compressed air.			

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 30		
0855	-	Top of 8-in casing has moved down about 1.5 ft.
1000	-	Drilling tools removed from hole.
1025	-	Depth of hole, 74 ft below top of 8-in casing, which is 0.7 ft above ground surface.
1030	-	Start installing 1-in pipe in annular space outside 8-in casing and screen to use for tremie in placing grout seal around bottom end of casing.
1150	-	One bag of portland cement placed as neat grout around bottom of casing. Depth to top of cement, 73.3 ft.
1155	-	About 1 cu ft of gravel placed on top of cement grout.
1320	-	Depth to top of gravel in annular space at bottom of casing, 71.8 ft. Start installation of airlift pump.
1340	-	Pump installed with intake at about 74 ft.
1400	-	Start airlift pump.
1413	-	Start placing gravel pack in annular space outside casing and screen. Gravel is poured down space in 5-gal increments.
1657	-	Placement of gravel completed. Gravel placed was 310 gal, about 40 cu ft. Depth to top of gravel, 23 ft below ground surface.
1710	-	Stop airlift pump.
1800	-	Submersible pump installed for pumping test. Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 1 0830	-	Start pumping test of July 1, 1976.
2250	-	Stop test. Depth to top of cement grout placed during pumping, 8 ft below ground surface.
July 2 0800	-	Start pumping test of July 2, 1976.
1130	-	Stop test. Ten bags of portland cement placed as grout outside 8-in casing. Depth to grout 2 ft below ground surface.

Following tabulation shows revised lengths and depths of casing and screen after development caused movement of the casing. Top of casing is 0.7 ft above ground surface.

	<u>Length (ft)</u>	<u>Depth intervals (feet)</u>	
		<u>Below ground surface</u>	<u>Below top of casing</u>
Solid-wall casing	48.4 (49.1)	0 -48.4	0 -49.1
Screen	23.7	48.4-72.1	49.1-72.8
Solid-wall casing	2.0	72.1-74.1	72.8-74.8

PUMPING TEST

Date: July 1, 1976

Test made with electric-powered submersible deep-well turbine pump. Depth to water measured with electric tape below top of 8-in casing, 0.7 ft above ground surface. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with a 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 1					
0823	-	9.3	-	-	
0830	0	-	-	-	Start pump.
0834	4	15.0	60	-	
0840	10	15.0	60	-	
0900	30	17.2	60	-	
0930	60	18.0	60	-	
1000	90	18.3	60	-	
1030	120	18.6	60	-	
1055	145	-	-	45	
1100	150	18.5	60	-	
1130	180	18.6	60	-	
1205	215	18.7	60	-	
1230	240	18.7	60	-	
1240	250	-	-	46	
1300	270	18.7	60	-	
1330	300	18.7	60	-	
1400	330	18.8	60	-	
1430	360	18.8	60	-	
1500	390	18.8	60	-	
1530	420	18.8	60	-	
1600	450	18.9	60	-	
1630	-	-	-	-	Start placement of grout.
1634	484	18.9	-	-	
1700	510	19.0	60	45	
1730	540	19.1	60	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 1					
1800	570	19.1	60	-	
1830	600	19.1	60	-	
1900	630	19.1	60	-	
1930	660	19.2	60	-	
2000	690	19.2	60	-	
2030	720	19.2	60	-	
2100	750	19.2	60	-	
2130	780	19.2	60	-	Stop pump. Start measure- ment of recovery of water level.
2130	0				Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	1	14.9			
	2	14.2			
	3	13.8			
	4	13.4			
	5	13.1			
	7	12.7			
	9	12.3			
	12	12.0			
	15	11.7			
	18	11.5			
	21	11.3			
	24	11.2			
	27	11.1			
	30	10.9			
	33	10.9			
	36	10.8			
	39	10.7			
	42	10.6			
	46	10.5			
	48	10.5			
	51	10.4			
	54	10.4			
	60	10.3			
2236	66	10.2			Last measurement.
July 2					
0725	-	9.4			Measured below top of 8-in casing, 0.7 ft above ground surface.

PUMPING TEST

Date: July 2, 1976

Test made with electric-powered submersible deep-well turbine pump. Depth to water measured with electric tape below top of 8-in casing, 0.7 ft above ground surface. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with a 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 2					
0725	-	9.4	-	-	
0800	0	-	-	-	Start pump.
0805	5	15.4	60	-	
0810	10	16.3	60	-	
0815	15	16.8	60	-	
0820	20	17.2	60	-	
0830	30	17.7	60	-	
0900	60	18.3	60	-	
0930	90	18.6	60	-	
0955	115	-	-	45	
1000	120	18.8	60	-	
1030	150	18.9	60	-	
1059	179	19.0	-	-	
1100	180				Stop pump. Start measurement of recovery of water level.
1100	0				Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	1	14.7			
	2	14.1			
	3	13.7			
	4	13.3			
	5	13.0			
	6	12.8			
	9	12.3			

WELL 12

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 2	12	11.9			
	15	11.6			
	18	11.4			
	21	11.2			
	24	11.1			
	27	11.0			
1130	30	10.8			Last measurement.
1423	-	9.8			
1524	-	9.7			

WELL 12

LOG

Log compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 9.

	Depth (feet)
Red clayey soil.	1 - 3
Red clay.	3 - 7
Red and gray clay with scattered residual boulders of basalt.	7 - 21
Red and brown clay.	21 - 28
Brown clay.	28 - 50
Weathered basalt and brown clay.	50 - 59
Weathered basalt.	59 - 70
Weathered basalt with scattered residual boulders of basalt.	70 - 74
Total depth.	74

WELL 13 (Converted from test hole 20)

Location: Principal's office, Truk High School Grid:

Date constructed: July 7-12, 1976, by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 38 Depth (feet): 80

Casing diameter and depth: 8-in standard steel pipe, ground surface to 39 ft, 47 to 60 ft below ground surface, and 76 to 79 ft below ground surface. Open hole, 79 to 80 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 39 to 47 ft below ground surface and 60 to 76 ft below ground surface.

Gravel pack and grout: Quartzose gravel pack from 23 ft below ground surface to 74 ft below surface. Neat portland cement grout from ground surface to 23 ft below surface.

Observers: D. A. Davis, Ted Lund, and Betsy Ewar.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 July 7 1500	-	Preparing to enlarge test hole 20 and convert it into a well. Pulled 6-in temporary casing from hole.
1623	-	Start drilling with 12-in hole opener.
1720	-	Hole reamed to 12-in diameter to depth of 55 ft. Shut down for the day.
July 8 0828	-	Resume drilling with 12-in hole opener, using water for circulating fluid.
1210	-	Stop drilling with 12-in hole opener at 78 ft below ground surface. From 55 ft to 78 ft drilling was hard with much rough bit chatter and very little return circulation.
1347	-	Start circulating water to clear hole.
1420	-	Drilling tools removed from hole and airlift pump installed to 68 ft. Bottom of pump is on backfill of cuttings or caved material.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 8 1750	-	Clearing hole with airlift pumping. Large amount of mud and cuttings raised from hole. Shut down for the day.
July 9 0810	-	Start airlift pump with bottom of pump at 70 ft.
0850	-	From 0810 hrs, continued pumping to clean hole. Bottom of pump at 78 ft.
0937	-	Continued pumping from 0850 hrs. Pump at 78½ ft. Remove pump from hole.
1330	-	Began assembly and installation of 8-in casing and screen. All joints welded by Ted Lund.
1545	-	Casing and screen installed with bottom end at 79.0 ft below ground surface and top end at 2.0 ft above ground surface. Lengths and depths of casing and screen are as follows:

		Depth intervals (ft)	
		Below ground surface	Below top of casing
	Length (ft)		
Solid-wall casing	39 (41)	0-39	0-41
Screen	8	39-47	41-49
Solid-wall casing	13	47-60	49-62
Screen	16	60-76	62-78
Solid-wall casing	3	76-79	78-81
Open hole (approx.)		79-80	

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 10		
0800	-	Airlift pump installed in hole with intake at 76 ft below ground surface.
0814	-	Start pump.
0919	-	From 0814 hrs on-and-off operation of pump to surge and clean hole.
0940	-	Start placing gravel pack in annular space outside 8-in casing and screen. Airlift pumping continued. Depth to bottom of annular space before placement of gravel, 74 ft below top of casing. Gravel poured into annular space in 5-gal increments.
1135	-	Gravel pack installed. Gravel placed, 175 gal, about 23 cu ft. Depth to top of gravel in annular space, 25 ft below top of casing, or 23 ft below ground surface.
1155	-	Stop pump.
1320	-	Start pump and start placing neat cement grout in annular space above gravel pack.
1500	-	Nineteen bags of portland cement placed as neat grout. Bottom of grout at 23 ft; top at ground surface.
1530	-	From 1500 hrs, on-and-off operation of airlift pump. Depth of pump intake (bottom of pump) lowered during pumping from 76 to about 1 ft below bottom of 8-in casing at bottom of hole.
1600	-	Submersible deep-well pump installed in hole. Shut down for the day.
July 12		
0850	-	Depth to water, 22.6 ft below top of 8-in casing, 2.0 ft above ground surface.

WELL 13

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 12 0900	-	Start pumping test of July 12, 1976.
2100	-	End test.
July 13 0800	-	Depth to water, 22.8 ft below top of 8-in casing.

PUMPING TEST

Date: July 12, 1976

Test made with electric-powered submersible deep-well turbine pump set with intake at about 67 ft below ground surface. Depth to water measured with electric tape below top of 8-in casing, 2.0 ft above ground surface. Pumping rate controlled with plug valve in discharge line of pump and measured with 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 12					
0750	-	22.6	-	-	
0850	-	22.6	-	-	
0900	0	-	-	-	Start pump.
0908	8	30.9	-	-	
0915	15	31.8	60	-	
0920	20	32.0	60	-	
0925	25	32.4	60	-	
0930	30	32.5	60	-	
1000	60	33.1	60	17	Temp. water, 83°F (28°C).
1030	90	33.6	60	-	
1100	120	33.8	60	-	
1130	150	34.0	60	-	
1200	180	34.2	60	-	
1230	210	34.3	60	-	
1300	240	34.4	60	-	
1400	300	34.5	60	-	
1430	330	34.6	60	-	
1500	360	34.7	60	-	
1530	390	34.8	60	-	
1600	420	34.9	60	-	
1630	450	34.8	60	-	
1700	480	35.0	-	-	
1730	510	35.2	60	-	
1800	540	35.3	60	-	
1830	570	35.4	60	-	

WELL 13

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 12					
1900	600	35.6	60	-	
1930	630	35.5	60	-	
2000	660	35.5	60	-	
2030	690	35.4	60	-	
2055	715	35.3	60	-	
2100	720	-	-	-	Stop pump. Start measure- ment of water-level recovery.
2100	0				Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	1	27.2			
	2	26.1			
	3	25.7			
	4	25.5			
	5	25.4			
	6	25.2			
	7	25.2			
	8	25.2			
	9	25.0			
	10	25.0			
	11	24.9			
	12	24.9			
	15	24.8			
	18	24.7			
	21	24.6			
	24	24.5			
	30	24.4			
	36	24.2			
	48	24.1			
	60	23.9			Last measurement.
July 13					
0800	-	22.8			Measured below top of 8-in casing, 2.0 ft above ground surface.

WELL 13

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 20.

Depth (feet)

Artificial fill consisting of brown clay soil from surface to depth of 2 ft and soft but mostly unidentified materials from 2 ft to about 20 ft. Included in fill were fragments of cable and pipe and a few boulders.

0-20

Stiff clay.

20-54

Weathered basalt.

54-79

Basalt with some zones of weathered basalt.

79-80

Total depth.

80

WELL 14 (Converted from test hole 16)

Location: Girl's dormitory, Truk High SchoolGrid:

Date constructed: July 2-6, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 22 Depth (feet): 74

Casing diameter and depth: 8-in standard steel pipe, ground surface to 37.9 ft and 61.9 to 63.9 ft below ground surface. Open hole, 63.9 to 74 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 37.9 ft below ground surface to 61.9 ft below surface.

Gravel pack and grout: Quartzose gravel pack from 16 ft to 55 ft below ground surface. Neat portland cement grout from ground surface to 16 ft.

Observers:

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 July 2 1500	-	Setting up drilling equipment for enlarging test hole 16 to 12-in diameter.
1605	-	Start drilling with 12-in rotary hole opener.
1715	-	Hole enlarged to 38 ft below ground surface. Shut down for the day.
July 3 0750	-	Resume drilling with 12-in hole opener.
1000	-	Stop drilling with 12-in bit at about 59 ft below ground surface. Remove 12-in hole opener and replace it with 5-in rotary rock bit for deepening hole.
1025	-	Start drilling with 5-in bit at about 60 ft below ground surface.
1035	-	Stop drilling; 5-in bit at 75 ft below ground surface. Remove drilling tools from hole.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 3		
1328	-	Airlift pump installed in hole with intake at about 60 ft below ground surface and 15 ft above bottom of 5-in hole. Bottom of pump is on cuttings filling 5-in hole.
1335	-	Start pump.
1525	-	Stop pump. Pump is unable to clear mud and cuttings from hole below a depth of about 60 ft. Remove pump.
1600	-	Drilling tools in hole with 5-in rotary rock bit at 60 ft below ground surface.
1620	-	Start drilling with 5-in bit using water to clear hole of cuttings and caved material below depth of 60 ft. Hole quickly cleaned to 74 ft.
1655	-	Drilling tools removed from hole and airlift pump installed.
1700	-	Start pump.
1745	-	From 1700 hrs, removing mud and cuttings from hole by airlift. Intake of pump at 74 ft below ground surface.
1755	-	Stop pump. Shut down for the day.
July 5		
0730	-	Start airlift pump.
0741	-	Water clearing. Stop pump.
0800	-	Remove pump and prepare to install casing and screen.
1130	-	Start installation of 8-in casing and screen. All joints welded by Ted Lund.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done			
July 5 1210	-	Casing installed with bottom of casing at about 64 ft below ground surface and top at 2.4 ft above ground surface. Lengths and depths of casing and screen are as follows:			
			<u>Depth intervals (ft)</u>		
		<u>Length (ft)</u>	<u>Below ground surface</u>	<u>Below top of casing</u>	
		Solid-wall casing	37.9 (40.3)	0 -37.9	0 -40.3
		Screen	24.0	37.9-61.9	40.3-64.3
		Solid-wall casing	2.0	61.9-63.9	64.3-66.3
		Open hole (approx.)	10	64 -74	
1455	-	One bag of portland cement placed as neat grout by tremie, in annular space at bottom of casing. About 1 cu ft of gravel placed on cement. Depth to top of gravel, about 55 ft below ground surface. Air-lift pump installed in hole.			
1545	-	Start airlift pump and start placement of gravel pack in annular space outside 8-in casing and screen.			
1645	-	Gravel pack in place, poured into annular space in 5-gal increments. Total gravel placed, 155 gal, about 20 cu ft. Bottom of gravel at about 55 ft below ground surface and top at 16 ft below surface.			
1700	-	Two bags of portland cement placed as neat grout on top of gravel. Shut down for the day.			
July 6 0717	-	Depth to water 9.3 ft below top of 8-in casing, 2.4 ft above ground surface.			
0800	-	Start pumping test of July 6, 1976.			
2100	-	Stop test.			

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 7 1015	-	Airlift pump installed. Start placing neat cement grout in annular space outside 8-in casing. Depth to top of grout and gravel in space, 13 ft.
1053	-	Twelve bags of portland cement placed as neat grout.

PUMPING TEST

Date: July 6, 1976

Test made with electric-driven submersible deep-well turbine pump. Depth to water measured with electric tape below top of 8-in casing, 2.4 ft above ground surface. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Betsy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 6					
0717	-	9.26	-	-	
0800	0	-	-	-	Start pump.
0805	5	20.9	60	-	
0810	10	22.5	60	-	
0815	15	23.1	60	-	
0831	31	23.7	60	-	
0840	40	24.7	60	-	
0900	60	25.2	60	-	
0920	80	25.5	60	-	
0940	100	25.7	60	-	
1000	120	25.9	60	-	
1025	145	-	-	-	Temp. water, 82°F (28°C).
1030	150	26.2	60	-	
1104	184	26.4	60	-	
1140	220	26.6	60	-	
1200	240	26.7	60	-	
1240	280	26.9	60	-	
1320	320	27.0	60	-	
1400	360	27.2	60	-	
1440	400	27.3	60	-	
1500	420	27.4	60	-	
1520	440	27.5	60	-	
1600	480	27.6	60	-	
1630	510	27.7	60	-	
1700	540	27.8	60	-	
1730	570	27.9	60	-	
1750	-	-	-	19	

WELL 14

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 6					
1800	600	28.0	60	-	
1830	630	28.0	60	-	
1900	660	28.1	60	-	
1930	690	28.1	60	-	
1955	715	28.2	60	-	
2000	720	-	-	-	Stop pump. Start measure- ment of recovery of water level.
2000	0				Elapsed time since pumping stopped measured with stopwatch.
	1	16.5			
	2	14.6			
	3	14.1			
	4	13.8			
	5	13.5			
	6	13.3			
	9	13.0			
	12	12.8			
	15	12.6			
	18	12.4			
	24	12.2			
	30	12.1			
	36	12.0			
	42	11.9			
	48	11.8			
	54	11.7			
2100	60	11.6			Last measurement.
July 7					
0630	-	10.1			Measured below top of 8-in casing.

WELL 14

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 16.

	Depth (feet)
Reddish brown clay.	0-13
Reddish brown clay grading downward into weathered basalt.	13-20
Brown weathered basalt with scattered residual boulders of basalt and zones of brown and red clay.	20-44
Brown clay.	44-48
Brown weathered basalt with scattered residual boulders of basalt.	48-59
Hard black basalt with a few thin zones of weathered basalt and seams of clay.	59-74
Total depth.	74

WELL 15 (Converted from test hole 22)

Location: Truk High School Gymnasium Grid:

Date constructed: July 23-27, 1976 by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 15 Depth (feet): 68

Casing diameter and depth: 8-in standard steel pipe, surface to 26.6 ft, 34.4 to 43.5 ft, and 67.2 to 67.7 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 26.6 to 34.4 ft, and 43.5 to 67.2 ft below ground surface.

Gravel pack and grout: Quartzose gravel pack from 14 to 66 ft below ground surface. Neat portland cement grout, surface to 14 ft.

Observers: D. A. Davis and Ted Lund.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 July 23 1500	-	Preparing to enlarge test hole 22 from 5-5/8-in diameter to 12 in. using 12-in rotary hole opener.
1533	-	Start drilling with 12-in hole opener, using water for circulating fluid.
1644	-	Depth of 12-in hole, 55 ft below ground surface. Shut down for the day.
July 24 0742	-	Resume drilling with 12-in hole opener at 55 ft.
0855	-	Depth of 12-in hole, 68 ft. Stop drilling and prepare to clean hole for installation of casing and screen.
0950	-	Airlift pump installed. Start pump. From 0950 to 1200 hole was cleaned with airlift pump, removing mud and cuttings produced by reaming.
1200	-	Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 25 0915	-	Start airlift pump.
0945	-	Water from pump almost clear.
1310	-	Began assembly of 8-in casing and screen for installation in hole.
1430	-	Start installing casing and screen. All joints are welded by Ted Lund.
1610	-	Casing and screen installed, with bottom end of pipe seated at 67.7 ft below ground surface and top end of pipe 1.5 ft above ground surface. Lengths and depths of the 8-in pipe and screen are as follows:

	<u>Length (ft)</u>	<u>Depth intervals (ft)</u>	
		<u>Below ground surface</u>	<u>Below top of casing</u>
Solid-wall casing	26.6 (28.1)	0 -26.6	0 -28.1
Screen	7.8	26.6-34.4	28.1-35.9
Solid-wall casing	9.1	34.4-43.5	35.9-45.0
Screen	23.7	43.5-67.2	45.0-68.7
Solid-wall casing	0.5	67.2-67.7	68.7-69.2

July 26 0810	-	Start installing airlift pump for cleaning and developing well, to be started with installing of gravel pack.
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RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done	
July 26 0915	-	Start placement of quartzose gravel pack in annular space between 8-in casing and screen and wall of nominal 12-in hole. Gravel poured into space in 5-gal increments. Following tabulation shows timing of increments of gravel and depths to top of gravel backfill below top of 8-in casing. Given also are notes relative to pumping well by airlift.	
	<u>Depth to gravel (ft)</u>	<u>5-gallon increment</u>	<u>Cumulative gravel, in gallons</u>
0915	60.5	1	5
-	60.3	2	10
0926	59.3	3	15
0930	57.8	4	20
0933	56.2	5	25
0940	-	Start airlift pump. Fragments of weathered basalt and black chips of basalt from residual boulders, and some gravel-pack material carried up by water.	
0955	-	Raised pump intake, 2 ft.	
1000	-	Q, 44 gal/min.	
1014	55.2	5	25
1016	54.0	6	30
1018	52.4	7	35
1019	50.6	8	40
1020	-	Q, 40 gal/min.	
1021	48.4	9	45
1023	46.7	10	50
1025	44.4	11	55
1027	42.0	12	60
1028	39.7	13	65

RECORD OF CONSTRUCTION--Continued

Date Time	Depth to gravel (ft)	5-gallon increment	Cumulative gravel, in gallons
July 26			
1031	37.5	14	70
1032	35.4	15	75
1034	33.0	16	80
1036	31.0	17	85
1038	29.2	18	90
1040	27.6	19	95
1041	25.9	20	100
1042	24.5	21	105
1044	23.4	22	110
1047	21.7	23	115
1048	20.2	24	120
1049	19.3	25	125
1050	18.7	26	130
1052	18.2	27	135
1055	16.7	28	140
1057	15.6	29	145
1058	13.9	30	150
1100	13.6	31	155
1100	-	About 20 cu ft of gravel pack installed.	

	<u>Depth (feet)</u>	<u>Description of work done</u>
1112	-	Q, 36 gal/min.
1300	-	Started on-and-off operation of airlift pump in cleaning and developing the well. From 1500 to 1735 hrs, pump was operated on 2 min and off 20 sec. At beginning of on-and-off pumping, water had high turbidity and carried up much fine material from weathered basalt penetrated by the well and grit from gravel-pack material. During the operation the amount of granular material in water and turbidity of water decreased gradually. At 1700, granular material was negligible, but some turbidity continued to show in the water.
1735	-	Stop airlift pump and prepare for pumping test. Seven bags of portland cement placed in annular space as neat cement grout.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 27 0800	-	Start pumping test of July 27, 1976.
1715	-	One bag of portland cement mixed as neat grout and placed around casing.
2100	-	End pumping test.

WELL 15

PUMPING TEST

Date: July 27, 1976

Test made with electric-powered submersible deep-well turbine pump set with intake at 61 ft below ground surface. Depth to water measured with electric tape below base of rotary table on drilling machine, 2.9 ft above ground surface. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with 25-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 27					
0740	-	9.78	-	-	
0800	0	-	-	-	Start pump.
0802	2	-	36	-	Adjusting pumping rate.
0807	7	-	35	-	Adjusting rate.
0808	8	-	37	-	Adjusting rate.
0810	10	28.9	-	-	
0812	12	-	37	-	
0815	15	30.0	37	-	
0820	20	30.0	37	-	
0825	25	30.0	37	-	
0830	30	30.8	37	-	
0835	35	31.5	37	-	
0840	40	31.9	37	-	
0847	47	32.2	37	-	
0851	51	32.3	-	-	
0900	60	32.5	37	-	
0910	70	32.8	37	-	
0920	80	33.0	37	-	
0930	90	33.1	37	-	
0940	100	33.1	37	-	
0950	110	33.3	37	-	
1003	123	33.4	37	-	
1010	130	33.5	37	-	
1020	140	33.6	37	-	
1030	150	33.7	37	-	
1040	160	33.7	37	-	
1050	170	33.7	37	-	
1100	180	33.8	37	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 27					
1115	195	33.8	37	-	
1130	210	33.9	37	-	
1145	225	34.0	37	33	
1200	240	34.0	37	-	
1215	255	34.0	37	-	
1230	270	34.1	37	-	
1245	285	34.1	37	-	
1300	300	34.1	37	-	
1311	311	34.2	-	-	Pump in well 9 started.
1315	315	34.2	-	-	
1325	325	34.2	37	-	
1327	327	-	-	-	Pump in well 7 started.
1330	330	34.2	-	-	
1340	340	34.2	37	-	
1400	360	34.3	37	-	
1404	-	-	-	33	
1405	365	34.3	-	-	
1420	380	34.4	37	-	
1438	398	34.5	37	-	
1445	405	34.5	-	-	
1500	420	34.6	37	-	
1520	440	34.7	37	-	
1540	460	34.8	37	-	
1600	480	34.8	37	-	
1610	-	-	-	33	Temp. of water 84°F (29°C).
1620	500	34.9	37	-	
1640	520	35.0	37	-	
1700	540	35.0	37	-	
1722	562	35.1	37	-	
1740	580	35.1	37	-	
1747	-	-	-	32	
1800	600	35.2	37	-	
1820	620	35.2	37	-	
1840	640	35.3	37	-	
1900	660	35.3	37	-	
1920	680	35.3	37	-	
1940	700	35.4	37	-	
1955	715	35.4	37	-	
2000	720	-	-	-	Stop pump. Start measurement of recovery of water level.

WELL 15

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 27 2000	0	-	-	-	Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	1	25.9			
	2	21.8			
	3	19.5			
	4	18.2			
	5	17.4			
	6	16.7			
	9	15.4			
	12	14.7			
	15	14.2			
	18	13.9			
	21	13.6			
	24	13.5			
	27	13.4			
	30	13.1			
	36	12.9			
	42	12.7			
	48	12.6			
	54	12.5			
2100	60	12.4			Last measurement.

WELL 15

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 22.

	Depth (feet)
Brown clay.	0- 6
Light brown clay with few scattered residual boulders of basalt.	6-25
Brown clay with zones of weathered basalt.	25-33
Red and brown clay.	33-35
Stiff bluish gray clay.	35-39
Brown and gray clay.	39-45
Red and brown clay.	45-52
Brown and gray clay.	52-65
Basalt with seams of gray clay.	65-68
Total depth.	68

WELL 17 (Converted from test hole 4)

Location: Near South Field	Grid:
Date constructed: July 14-19, 1976,	by Ted Lund Drilling and Supply
Altitude, ground surface (feet): 23	Depth (feet): 47
Casing diameter and depth: 8-in standard steel pipe from ground surface to 21.7 ft below ground surface and from 45.3 to 47.3 ft below ground surface.	
Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen from 21.7 ft below ground surface to 45.3 ft below surface.	
Gravel pack and grout: Quartzose gravel pack from 14 ft below ground surface to about 47 ft below surface. Neat portland cement grout, ground surface to 14 ft below surface.	

Observers:

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 July 14 0950	-	Setting up to enlarge test hole 4 and convert it to well 17.
1015	-	Start reaming with 12-in hole opener.
1200	-	Stop drilling with 12-in hole opener at about 45 ft below ground surface.
1340	-	Resume drilling.
1435	-	Stop drilling at 47½ ft below ground surface.
1516	-	Remove 12-in hole opener and start drilling with 5-in rotary rock bit at 48½ ft. Bottom of 12-in hole is at 47½ ft. The 5-in bit lands on shelf at that depth.
1535	-	Stop drilling. Five-inch bit at 67 ft.
1600	-	Start clearing hole of cuttings and drilling caved boulders out of hole.
1730	-	Hole cleared of boulders to about 65 ft.
1745	-	Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 15 0740	-	Start clearing hole of cuttings. Five-inch bit on drilling tools.
0758	-	Removed 5-in bit from hole. Bit is worn almost smooth.
0830	-	Airlift pump installed in hole with intake at 54 ft.
1140	-	From 0800 hrs, cleaning hole with airlift pump. Stop pump.
1530	-	Remove pump from hole.
1540	-	Start installation of 8-in casing and screen. All joints welded by Ted Lund.
1617	-	Casing and screen installed with bottom end at 47.3 ft below ground surface and top end at ground surface. Lengths and depths of casing and screen are as follows:

		<u>Depth intervals (ft)</u>	
		<u>Below ground surface</u>	<u>Below top of casing</u>
<u>Length (ft)</u>			
Solid-wall casing	21.7	0 -21.7	0 -21.7
Screen	23.6	21.7-45.3	21.7-45.3
Solid-wall casing	2.0	45.3-47.3	45.3-47.3

As casing and screen were installed, bottom of 2-ft solid-wall section of casing caught on shelf at bottom of 12-in section of hole at 47 ft. When rotated, the casing dropped and bottom end was seated in the 8-in hole below bottom of the 12-in hole. From bottom of 8-in casing at about 47 ft to depth of about 67 ft, 5-in hole is filled with quartzose gravel that leaked from gravel pack around screen.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 15 1640	-	One-inch pipe installed in annular space outside 8-in casing and screen to 47½ ft below ground surface as tremie for cement grout.
1655	-	One bag of portland cement grout placed around casing at bottom of 12-in hole. Shut down for the day.
July 16 0910	-	Install airlift pump in preparation for placing gravel pack in annular space.
1007	-	Start placing gravel pack. Gravel poured into annular space in 5-gal increments.
1428	-	Gravel placed in hole, 265 gal, about 35 cu ft. Depth to top of gravel pack about 15 ft below top of casing.
1510	-	From 1428 hrs, on-and-off pumping by airlift. Some gravel from pack brought up by pump. Stop pump. Depth to top of gravel pack, 16 ft.
1555	-	Drilling tools installed with 8-in bit. Start drilling at 47½ ft with water.
1630	-	Bit at 64 ft.
1650	-	Start drilling with compressed air to clear cuttings from hole below bottom of casing. Much gravel from pack discharged with air and water. Gravel has leaked below bottom of casing into open hole.
1716	-	Drilling tools removed from hole and airlift pump installed to 43 ft below ground surface, probably on top of gravel fill that settled after drilling with air stopped.
1725	-	Start airlift pump. Gravel discharged with muddy water. Level of gravel in hole lowered by pumping to 47 ft below ground surface. Shut down for the day.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
July 17 0745	-	Depth to bottom of hole, 47.5 ft below ground surface, which is about bottom of casing. Hole below bottom of casing filled with gravel leaking from pack above 47.5 ft.
0818	-	From 0801 hrs, placed 45 gal of additional gravel in annular space, about 5 cu ft. Depth to gravel, 14 ft below ground surface.
0827	-	Start airlift pump.
1325	-	From 0827, on-and-off operation of airlift pump to clean hole and gravel pack. Stop and remove airlift pump.
1340	-	Depth to bottom of hole inside 8-in casing, 47.3 ft below top of 8-in casing.
1510	-	Submersible deep-well pump installed with intake at about 38 ft below top of casing.
1530	-	Three bags of portland cement placed as neat grout on top of gravel pack in annular space.
-	-	Shut down for the day.
July 19 0742	-	Depth to water, 13.83 ft below top of 8-in casing.
0800	-	Start pumping test of July 19, 1976.
1636	-	Start placing neat portland cement grout in annular space outside 8-in casing and screen.
1722	-	Placement of grout completed. Total of 12 bags placed since 1636 hrs.
2106	-	Stop pumping test.

PUMPING TEST

Date: July 19, 1976

Test made with electric-powered submersible deep-well turbine pump set with intake at about 38 ft. Pumping rate controlled with 1-in plug valve in discharge line of pump and measured with 25-gal container and stopwatch. Depth to water measured with electric tape from top of 8-in casing at ground surface. Observations by D. A. Davis, Ted Lund, Carmelo Sam, and Bensy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
July 19					
0747	-	13.8	-	-	
0755	-	13.6	-	-	Start pump.
0800	0	-	-	-	
0805	5	21.0	37	-	
0810	10	21.4	-	-	
0820	20	21.7	37	-	
0830	30	21.9	37	-	
0840	40	22.0	37	-	
0850	50	22.1	37	-	
0900	60	22.1	37	-	
0920	80	22.4	37	-	
0940	100	22.5	37	-	
1000	120	22.6	37	-	
1020	140	22.7	37	-	
1040	160	22.8	37	-	
1100	180	22.8	37	-	
1120	200	22.9	37	-	
1140	220	23.0	37	11	
1200	240	23.0	37	-	
1230	270	23.1	37	-	
1300	300	23.2	37	-	
1330	330	23.2	37	-	
1400	360	23.3	37	-	
1430	390	23.4	37	-	
1500	420	23.5	37	11	
1530	450	23.5	37	-	
1540	460	-	-	-	Temp. water, 82°F (28°C).

WELL 17

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
July 19					
1600	480	23.6	37	-	
1630	510	23.7	37	-	
1700	540	23.7	36	-	
1730	570	23.8	37	-	
1750	-	-	-	14	Temp. water, 82°F (28°C).
1800	600	23.8	36	-	
1830	630	23.9	-	-	
1900	660	23.9	37	-	
1930	690	24.0	37	-	
1955	715	24.1	37	-	
2000	720	-	-	-	Stop pump. Start measure- ment of recovery of water level.
2000	0	-	-	-	Pump off. Elapsed time since pumping stopped measured with stopwatch.
	1	18.2			
	2	17.1			
	3	16.7			
	4	16.6			
	5	16.4			
	6	16.3			
	9	16.1			
	12	16.0			
	18	15.8			
	24	15.7			
	30	15.6			
	42	15.5			
	54	15.6			
2106	66	15.4			Last measurement.
July 20					
0955	-	14.3			Measured below top of 8-in casing at ground surface.

WELL 17

LOG

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 4.

	Depth (feet)
Black soil.	0- 2
Brown clay.	2- 5
Reddish brown clay.	5- 7
Brown clay.	7-17
Reddish brown clay.	17-20
Red clay grading to brown clay, with scattered small boulders of fresh black basalt.	20-42
Weathered basalt with much brown clay.	42-48
Weathered basalt and scattered boulders of hard, fresh black basalt.	48-60
Boulders of fresh black basalt in gray clay.	60-64
Gray weathered basalt.	64-66
Hard basalt.	66-67
Total depth.	67

WELL 18 (Converted from test hole 5)

Location: Near South Field

Grid:

Date constructed: May 17-June 18, 1976, by Ted Lund Drilling and Supply

Altitude, ground surface (feet): 9

Depth (feet): 75

Casing diameter and depth: 8-in solid-wall standard pipe ground surface to 24.0 ft and 48.0 to 53.0 ft. Below 8-in casing, 5-in open hole, 53-75 ft.

Screen, type, diameter, and depth: 8-in stainless steel shutter-type screen, 24.0 to 48.0 ft below ground surface.

Gravel pack and grout: Quartzose gravel pack from about 16 to 50 ft below ground surface. Neat portland cement grout ground surface to 16 ft.

Observers: D. A. Davis, Ted Lund, and Betsy Ewar.

RECORD OF CONSTRUCTION

Date Time	Depth (feet)	Description of work done
1976 May 17	-	Test hole 5 had previously been enlarged to 12-in diameter, and airlift pump had been installed with intake at about 69 ft below ground surface.
0945	-	Start airlift pump.
1230	-	From 0945, on-and-off pumping with airlift to clean drilling mud and cuttings from 12-in hole in preparation for installation of casing and screen. Intermittent heavy showers all morning. Stop work at 1230 hrs.
1330	-	Work suspended on hole owing to approach of Typhoon Pamela toward Truk.
May 19 0915	-	Removed airlift pump from hole. Began assembly of casing and screen.
0940	-	Depth to water, 2.7 ft below ground surface.
0950	-	Work stopped because of accident.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done			
June 9					
1315	-	Began assembly and installation of 8-in casing and screen. All joints welded by Ted Lund.			
1500	-	Casing and screen installed with bottom end of casing seated at 53 ft below ground surface and top end of casing 1.8 ft above ground surface. Lengths and depths of the 8-in casing and screen are as follows:			
			Depth intervals (ft)		
		Length (ft)	Below ground surface	Below top of casing	
		Solid-wall casing	24.0 (25.8)	0 -24.0	0 -25.8
		Screen	24.0	24.0-48.0	25.8-49.8
		Solid-wall casing	5.0	48.0-53.0	49.8-54.8
		Open hole (approx.)	22	53.0-75	-
1530	-	Start installation of airlift pump.			
1600	-	Shut down for the day.			
June 10					
0805	-	Airlift pump installed with intake at about 73 ft below ground surface.			
0815	-	Depth to water 4.45 ft below top of 8-in casing, 1.8 ft above ground surface.			
0850	-	Start airlift pump.			
1020	-	From 0850 hrs continuous pumping to clean hole. Q, 19 gal/min. Depth to water 46.1 ft.			

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done	
June 10 1040	-	Start placing gravel pack in annular space between 8-in casing and screen and wall of 12-in hole. Gravel poured into annular space in 5-gal increments. Following tabulation shows times of placement of increments of gravel and depths to top of gravel fill below top of 8-in casing, 1.8 ft above ground surface. Depth to bottom of annular space before placement of gravel, 52 ft.	
	<u>Depth to gravel (ft)</u>	<u>Cumulative 5-gallon increment</u>	<u>Cumulative gravel, in gallons</u>
1041	51.7	1	5
1044	48.5	2	10
1051	46.5	3	15
1100	44.2	4	20
1115	40.9	5	25
1119	41.9	6	30
1121	36.5	7	35
1125	34.9	8	40
1127	33.7	9	45
1125	-	Q, 19 gal/min. Depth to water 50.9 ft.	
1133	32.8	10	50
1134	31.8	11	55
1137	30.9	12	60
1140	29.7	13	65
1142	28.1	14	70
1144	26.1	15	75
1146	24.1	16	80
1148	22.9	17	85
1150	-	Q, 19 gal/min. Depth to water 51.6 ft.	
1155	22.0	18	90
1158	20.9	19	95
1200	20.0	20	100
1202	19.4	21	105
1204	19.0	22	110
1207	18.5	23	115
1210	18.0	24	120

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 10		
1210	-	About 16 cu ft of gravel pack placed.
1211	-	Depth to water, 50.9 ft below top of 8-in casing.
1230	-	Stop pump.
1407	-	Depth to water, 5.8 ft below top of 8-in casing.
1416	-	Start airlift pump.
1500	-	From 1416 hrs surged well by on-and-off pumping with airlift. Regulated pumping so that water level in hole was mostly above top of screen at 24 ft below ground surface.
1500	-	Start continuous pumping with airlift.
1510	-	Q, 20 gal/min. Depth to water, 48.2 ft.
1525	-	Q, 20 gal/min. Depth to water, 49.7 ft.
1550	-	Q, 20 gal/min. Depth to water 49.9 ft.
1600	-	Depth to top of gravel pack, 17.5 ft below top of 8-in casing. Start mixing portland cement for placement in annular space outside 8-in casing.
1705	-	From 1607 to 1705 hrs 15 bags of portland cement mixed as neat cement grout were placed in annular space.
1710	-	Q, 17 gal/min.
1720	-	Shut down for the day. Heavy rain.
June 11		
0740	-	Depth to top of cement grout in annular space, about 3 ft.
0755	-	Depth to water in well, 6.7 ft below top of 8-in casing.
0805	-	Start removing airlift pump from well.

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 11 0845	-	Start running drilling tools into well with 5-in rotary rock bit.
0905	-	Bit stopped at 71 ft below ground surface.
0910	71	Start drilling with 8-in bit using compressed air.
0925	73½	Slow drilling with much bit chatter.
0940	76	Stop drilling.
0950	76	Remove cuttings from hole with compressed air.
0955	76	Start removing drilling tools from hole.
1017	-	Start installing airlift pump
1045	-	Depth to water, 7.5 ft.
1047	-	Start airlift pump.
1048	-	Q, 53 gal/min.
1053	-	Depth to water, 34.4 ft.
1055	-	Q, 33 gal/min.
1058	-	Depth to water 36.3 ft.
1102	-	Depth to water, 37.0 ft. Q, 32 gal/min.
1105	-	Start on-and-off pumping.
1355	-	Q, 31 gal/min. Depth to water 42.9 ft.
1510	-	Chloride concentration in water, 16 mg/L.
1600	-	Shut down for the day.

WELL 18

RECORD OF CONSTRUCTION--Continued

Date Time	Depth (feet)	Description of work done
June 12 0750	-	Drilling equipment moved to test hole 11.
0800	-	Depth to water, 7.2 ft below top of 8-in casing, 1.8 ft above ground surface.
June 17 1120	-	Depth to water, 7.0 ft below top of 8-in casing.
1200	-	Submersible deep-well turbine pump installed in well.
1220	-	Depth to water 7.1 ft.
June 18 0800	-	Start pumping test of June 18, 1976.
2200	-	Stop pumping test.

PUMPING TEST

Date: June 18, 1976

Pumping test made with electric-driven submersible deep-well turbine pump set with intake at 68 ft below ground surface. Depth to water measured with electric tape below top of 8-in casing, 1.8 ft above ground surface. Pumping rate regulated with 1½-in globe valve or 1-in plug valve in discharge line of pump and measured with 30-gal container and stopwatch. Observations by D. A. Davis, Ted Lund, and Betsy Ewar. Field determinations of chloride concentration in water by D. A. Davis.

RECORD OF TEST

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
1976					
June 18					
0750	-	7.0	-	-	
0800	0	-	-	-	Start pump.
0811	11	30.7	37	-	Adjusting flow with globe valve.
0813	13	-	36	-	
0814	14	32.9	-	-	
0816	-	-	33	-	
0821	21	39.5	-	-	
0822	22	-	37	-	
0824	24	40.3	-	-	
0826	26	-	37	-	
0827	27	39.4	34	-	
0829	29	39.4	37	-	
0832	32	40.0	36	-	
0835	35	40.6	35	-	
0837	37	40.6	35	-	
0840	40	-	-	-	Installed 1-in plug valve in discharge line of pump for control of pumping rate.
0908	68	31.7	35	-	Adjusting rate with plug valve.
0912	72	35.4	34	-	
0918	78	40.6	34	-	
0925	85	42.0	34	-	
0936	96	44.2	35	-	
0945	105	48.5	36	-	

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 18					
1000	120	49.3	36	-	
1005	-	-	-	15	
1015	135	50.4	36	-	
1030	150	51.0	35	-	
1045	165	51.3	35	-	
1100	180	51.7	36	-	
1115	195	51.9	35	-	
1130	210	52.1	35	-	
1200	240	52.4	36	-	
1215	255	52.5	36	-	
1230	270	52.6	35	-	
1245	285	52.7	36	-	
1300	300	52.8	35	-	
1310	310	-	-	-	Temp. of water 83°F (28°C).
1315	315	53.0	36	-	
1320	-	-	-	15	
1330	330	53.0	36	-	
1345	345	53.1	35	-	
1400	360	53.1	36	-	
1415	375	53.2	35	-	
1430	390	53.3	35	-	
1500	420	53.4	36	-	
1520	440	53.5	36	-	
1600	480	53.7	35	-	
1620	500	53.8	36	-	
1640	520	53.9	36	-	
1700	540	54.0	35	-	
1720	560	54.0	35	-	
1735	575	-	-	16	
1745	585	54.1	36	-	
1800	600	54.2	35	-	
1820	620	54.2	35	-	
1840	640	54.3	35	-	
1900	660	54.3	35	-	
1920	680	54.4	34	-	
1940	700	54.7	36	-	
2000	720	55.1	35	-	
2020	740	55.2	35	-	
2030	750	-	-	20	
2040	760	55.2	35	-	
2055	775	55.3	35	-	
2100	780	-	-	-	Stop pump. Start measurement of recovery of water level.

WELL 18

PUMPING TEST--Continued

Date Time	Elapsed time (min)	Depth to water (ft)	Pumping rate (gal/min)	Chloride (mg/L)	Remarks
June 18 2100	0	-			Stop pump. Elapsed time since pumping stopped measured with stopwatch.
	$\frac{1}{2}$	49.6			
	1	44.4			
	$1\frac{1}{2}$	39.4			
	2	34.8			
	$2\frac{1}{2}$	31.1			
	3	27.9			
	$3\frac{1}{2}$	24.7			
	4	21.2			
	$4\frac{1}{2}$	18.9			
	5	16.7			
	$5\frac{1}{2}$	15.1			
	6	13.8			
	7	12.1			
	8	11.0			
	9	10.5			
	10	10.1			
	11	9.8			
	12	9.6			
	15	9.1			
	18	8.9			
	21	8.7			
	24	8.5			
	27	8.3			
	30	8.2			
	37	8.0			
	42	7.9			
	48	7.8			
	54	7.7			
2200	60	7.6			Last measurement.
July 19 0840	-	7.0			Measured from top of 8-in casing, 1.8 ft above ground surface.

Compiled from records kept by D. A. Davis and Ted Lund in the drilling of test hole 5.

	Depth (feet)
Coralline rubble fill.	0- 1
Light brown clay.	1- 8
Brown clay.	8- 17
Weathered basalt with scattered residual boulders of hard black fresh basalt.	17- 35
Weathered basalt with pockets of gray clay and scattered boulders of hard black fresh basalt.	35- 75
Total depth.	75

SUMMARY OF RECORDS OF WELLS

Summary of records of wells constructed on Moen, Truk, June-July 1976

⌈ Altitudes given are approximate heights above mean sea level of ground surface at the well sites.
 All depths are measured below the ground surface. All figures are rounded. Date of completion is
 date of completion of pumping test on the well. ⌋

Well No.	Date completed	Alti- tude (ft)	Depth intervals of casing, screen, gravel, pack, and seal (ft)						Depth to static water level (ft)	Pumping rate (gal/min)	Draw- down (ft)	Specific capacity (gal/min/ft)	Chloride concen- tration (mg/l)	Converted from test hole No.
			Depth (ft)	8-in casing	8-in screen	Open hole	Gravel pack	Grout seal						
8	6-26-76	39	65	0-31	31-55	55-65	16-50	0-16	11	15	17	1	120	TH-10
10	6-16-76	12	57	0-23	23-47	52-57	17-51	0-17	4	50	27	2	16	TH-11
				47-52										
12	7- 2-76	22	74	0-48	48-72	None	23-72	0-23	9	60	10	6	45	TH-9
				72-74										
13	7-12-76	38	80	0-39	39-47	79-80	23-74	0-23	21	60	13	5	17	TH-20
				47-60	60-76									
				76-79										
14	7- 6-76	22	74	0-38	38-62	64-74	16-55	0-16	7	60	19	3	20	TH-16
				62-64										
15	7-27-76	15	68	0-27	27-34	None	14-66	0-14	7	37	26	1	33	TH-22
				34-43	43-67									
				67-67½										
17	7-19-76	23	47	0-22	22-45	None	14-47	0-14	14	37	10	4	14	TH-4
				45-47										
18	6-18-76	9	75	0-24	24-48	53-75	16-50	0-16	5	35	48	3/4	20	TH-5
				48-53										

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