RESULTS OF EXPLORATORY DRILLING FOR WATER IN WAIHANAU VALLEY, MOLOKAI, HAWAII

By Kiyoshi J. Takasaki

U.S. GEOLOGICAL SURVEY

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CONVERSION TABLE

The following table may be used to convert measurements in the inch-pound system to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
Length		
foot (ft)	0.3048	meter (m)
mile, (mi)	1.609	kilometer (km)
Area		
square foot (ft^2)	0.0929	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
Volume		
cubic foot (ft^3/s)	0.02832	cubic meter (m^3)
gallon (gal)	3.785	liter (L)
million gallons (Mgal)	3,785	cubic meter (m^3)
Volume Per Unit Time (includes Flow)		
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second-day (ft^3/s-d)	2,447	cubic meter (m^3)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
Miscellaneous		
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
foot per day (ft/d)	0.3048	meter per day (m/d)
gallon per minute per foot (gal/min)/ft	0.207	liter per second per meter (L/s)/m.
foot squared per day (ft^2/d)	0.0929	meter squared per day (m^2/d)
degree Fahrenheit (^oF)	$^oC = 5/9 (^oF - 32)$	degree Celsius (^oC)
micromho per centimeter at 25° Celsius (µmho/cm at 25°C).	1.000	microsiemens per centimeter at 25° Celsius (µS/cm at 25°C).

Results of Exploratory Drilling for Water in Waihanau Valley, Molokai, Hawaii

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ABSTRACT

Three exploratory wells, located in lower Waihanau Valley on Molokai, were drilled and tested for their yields during the period May to October 1983. The first well, 582 feet deep, tapped the main water body in a basaltic aquifer intruded by scattered near-parallel volcanic dikes. Water in this water body is impounded by the dikes and has a head of about nine feet above sea level.

A 48-hour pumping test was conducted on this well. The well was pumped at various rates ranging from 144 to 455 gallons per minute for nine hours. Thereafter, the well was pumped for 39 hours at a rate of 156 gallons per minute approximating the planned operational rate of 150 gallons per minute. The specific capacities of the well at the rates pumped averaged about 30 gallons per minute per foot of drawdown. The temperature of the pumped water remained nearly constant at 69° F (20.5°C). The chloride concentration ranged from 19 to 22 milligrams per liter during the test. Analyses of the chemical constituents and trace metals of the water pumped indicated that it was of excellent quality. Based on these results, the well was finished as a production well.

A shallow water body perched about 30 feet below ground surface and more than 400 feet above the main water body was discovered during the drilling of the first well when about 50 gallons per minute of water cascaded down the well. Two wells were drilled to depths of 200 and 150 feet, respectively, to explore this perched water.

Drilling logs and yield tests indicated that the perched aquifer is a thin, shallow partly confined deposit of poorly consolidated talus debris that underlies a more consolidated and less permeable deposit of alluvial and talus debris. The poorly permeable rocks that overlie the perched-water body act as the confining member. The underlying perching formation consists of highly weathered and poorly permeable basaltic lava flows that extend to a depth of about 200 feet. With depth, the basaltic lava flows become progressively less weathered, more permeable, and finally cease to be a perching layer. Due to the generally poor yield of the wells, no further attempt was made to develop the perched-water body.

Graphic logs of the wells and graphs of the yield tests conducted are included in this report.

INTRODUCTION

This report summarizes the results of a drilling program to explore ground-water conditions in lower Waihanau Valley on Molokai. The purpose of the drilling program, initiated by the National Park Service early in 1982, was to determine the feasibility of replacing the existing distant streamflow source with a closer ground-water source to supply domestic water for the Kalaupapa Hansen's Disease Settlement. Even though the streamflow source is developed nearly energy free, the replacement with a ground-water source was deemed desirable because of recurring breaks in the old pipeline and the need for maintaining filtration and other treatment equipment.

The U.S. Geological Survey was asked by the National Park Service to head the exploratory phase of this program, which consisted of the following activities:

1. The reconnaissance of three deep valleys near Kalaupapa Peninsula to determine if the geologic framework is favorable for the occurrence of developable groundwater reservoirs, and to investigate the possible surface discharge of ground water.
2. An electrical resistivity survey to determine the thickness of fresh ground water in Kalaupapa Peninsula.
3. The recommendation of possible test well sites based on the results of the above activities.
4. Performance of test drilling and aquifer tests at the recommended sites.

DESCRIPTION AND GEOLOGIC FRAMEWORK OF THE STUDY AREA

The study area lies on the north coast of the island of Molokai. The area includes Kalaupapa Peninsula and the valleys of Waikolu Stream, Waialeia Stream and Waihanau Stream (fig. 1).

Waihanau Valley is cut into the northeast rift zone of the East Molokai dome. The bulk of the volcanic dome is composed of thin-bedded basaltic lava flows of the Lower Member of the East Molokai Volcanics. The basaltic flows are capped with a crust of massive andesitic lava flows of the Upper Member. Because Waihanau Valley has cut deep into the volcanic dome, the andesite cap has been eroded away and is absent in the valley and occurs only on the little-eroded facets and spurs high above the valley walls. Huge boulders of andesite make up much of the channel debris of Waihanau Stream.

The basaltic lava flows in the rift zone are intruded by many scattered northwest striking dikes. The dikes, mostly vertical and nearly parallel, crop out prominently along the cliffs and valley walls. Waihanau, Waialeia and Waikolu Valleys are traversed by these dikes.

Kalaupapa Peninsula, about 2-1/2 miles long and 2-1/2 miles wide, was formed long after the initial mountain-building stage of the East Molokai volcano. The peninsula was built by basaltic lavas from renewed volcanic activity following a long post-erosional period. The lavas extruded from an eruptive center located more than 1,000 feet offshore and at a depth of more than 200 feet. Kauhako Crater on the peninsula is probably the site of the original offshore eruptive center. The southern rim of the crater, its highest point, reaches an elevation of 405 feet above sea level.

Figure 2 shows the areal distribution and figure 3 shows the vertical distribution of the rocks in the Kalaupapa area.

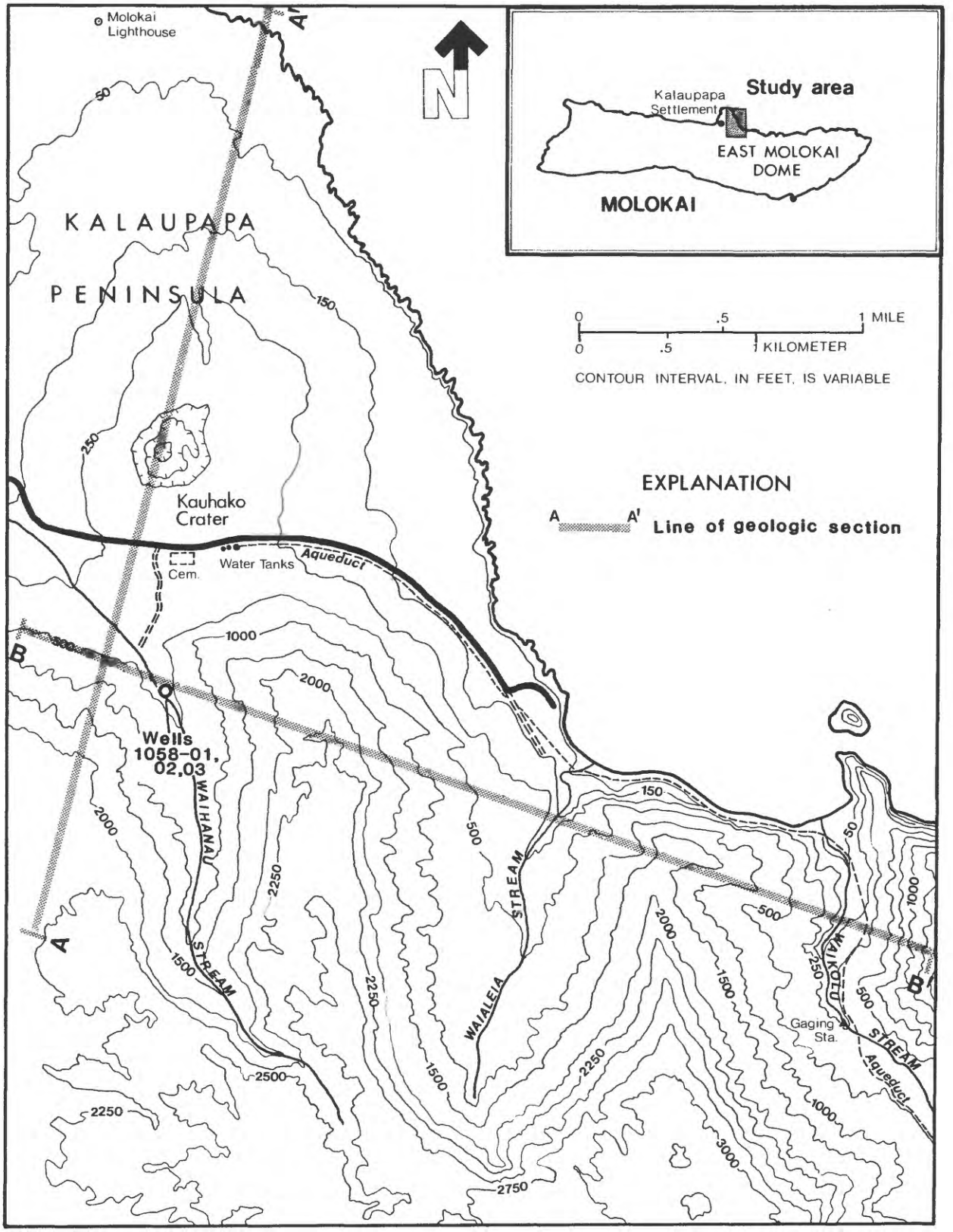


Figure 1. Kalaupapa area showing location of wells and lines of geologic sections.

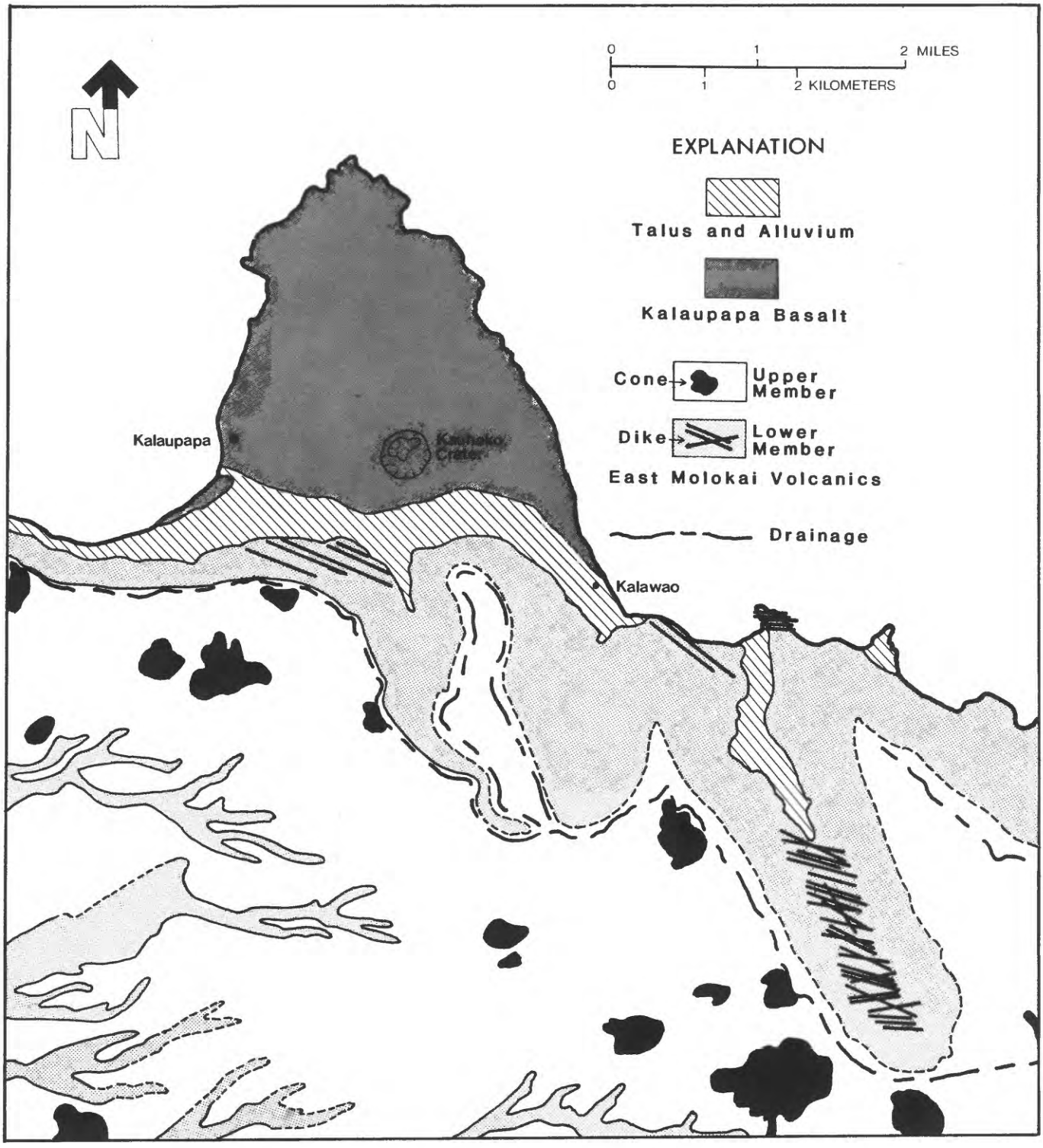


Figure 2. Generalized geologic map of Kalaupapa area (after Stearns and MacDonald, 1947).

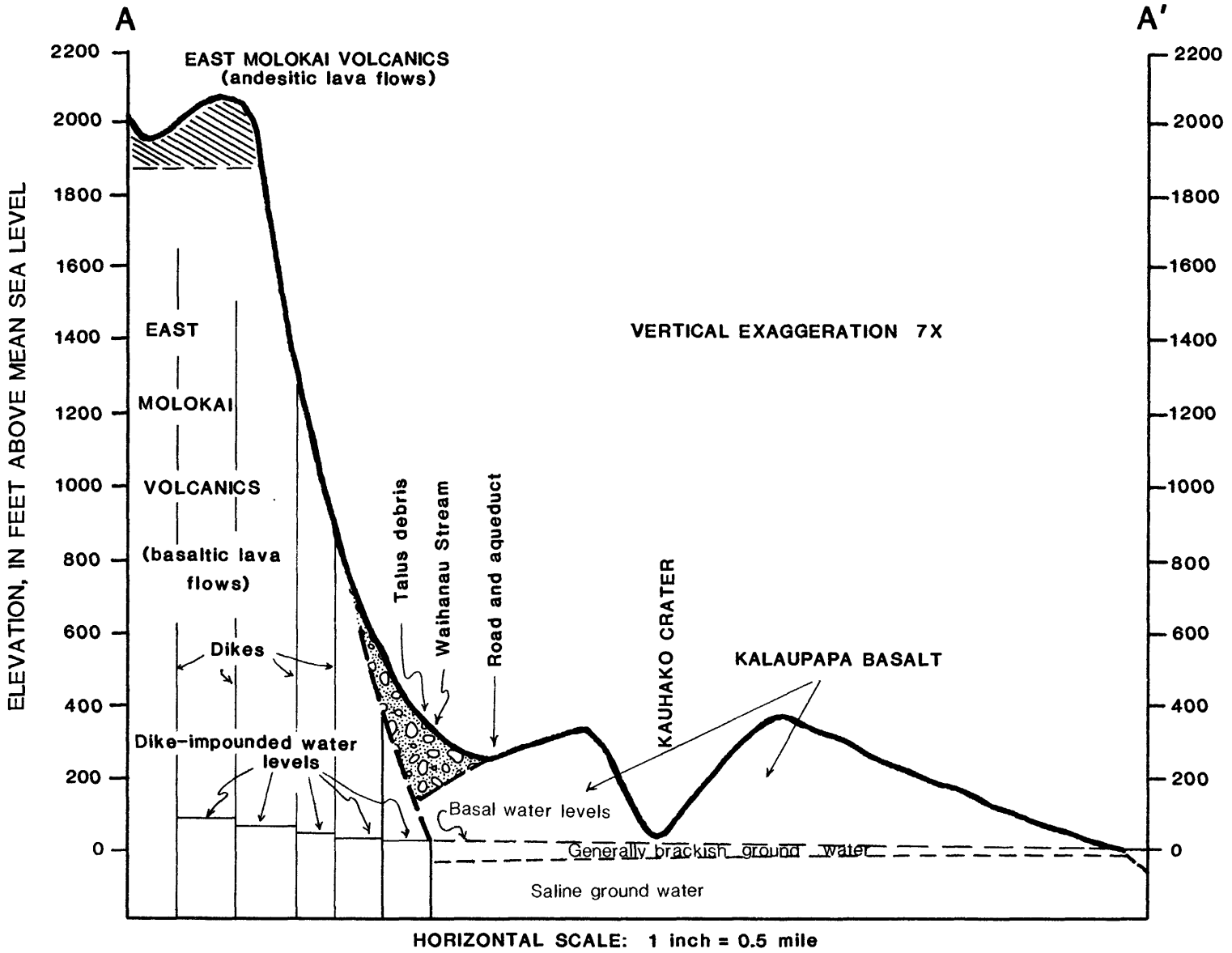


Figure 3. Generalized geologic section across Kalaupapa Peninsula showing distribution of rocks and occurrence of ground water along line A - A' in figure 1.

HYDROLOGIC RECONNAISSANCE OF STREAM VALLEYS

The basaltic lava flows are highly permeable and contain most of the ground water, which is generally fresh in the mountainous area and brackish in the peninsula. The capping andesitic lava flows, the talus, and alluvium are generally less permeable than the basalts and contain little water. Dikes, except for fractures in them, are nearly impermeable. The regional permeability of lavas, whether high or low initially, is significantly reduced when they are intruded by dikes. The reduction in permeability is a function of the number and volume of the dike intrusions and the geometry of the dikes. Because the basaltic lava flows in the rift zone in lower Waihanau Valley are sparsely intruded, the permeability of the lavas has not been significantly reduced.

Ground water in the mountainous area occurs principally in impounded water bodies between dikes and less abundantly in perched bodies lying above the impounded water. Valleys, where they are cut deep enough to tap these water bodies, act as drains or sinks. Waikolu Valley, lying to the east of the peninsula drains many large, near-parallel dike-impounded water bodies and several perched-water bodies, the combined drainage of which composes the large perennial flow of Waikolu Stream. Waialeia Stream, located in Waialeia valley, west of Waikolu, has a small dry-weather flow because its channel cuts much less deeply into the water bodies. Waihanau Stream, in Waihanau valley, the next valley to the west, is dry in dry weather because its channel does not cut deep enough to tap the underlying ground-water bodies.

Figure 4 is a cross-section across Waihanau, Waialeia and Waikolu Streams along line B - B' in figure 1 and shows probable depths to water in these valleys. The cross-section was drawn parallel to coincide with the dike located about 50 feet seaward of well 1058-01. The dike trends about N. 70° W. and is representative of the general trend of the dikes in lower Waihanau Valley. The high water-level is at Waikolu Valley, and the low water level is probably at or near the edge of the sea cliffs south of the settlement. The cliffs there truncate the northwest extensions of the dikes.

As a result of the hydrologic reconnaissance, possible exploratory well sites were recommended in the lower parts of Waialeia and Waihanau Valleys. The rationale for recommendation was submitted to the National Park Service by correspondence dated March 2 and July 16, 1982.

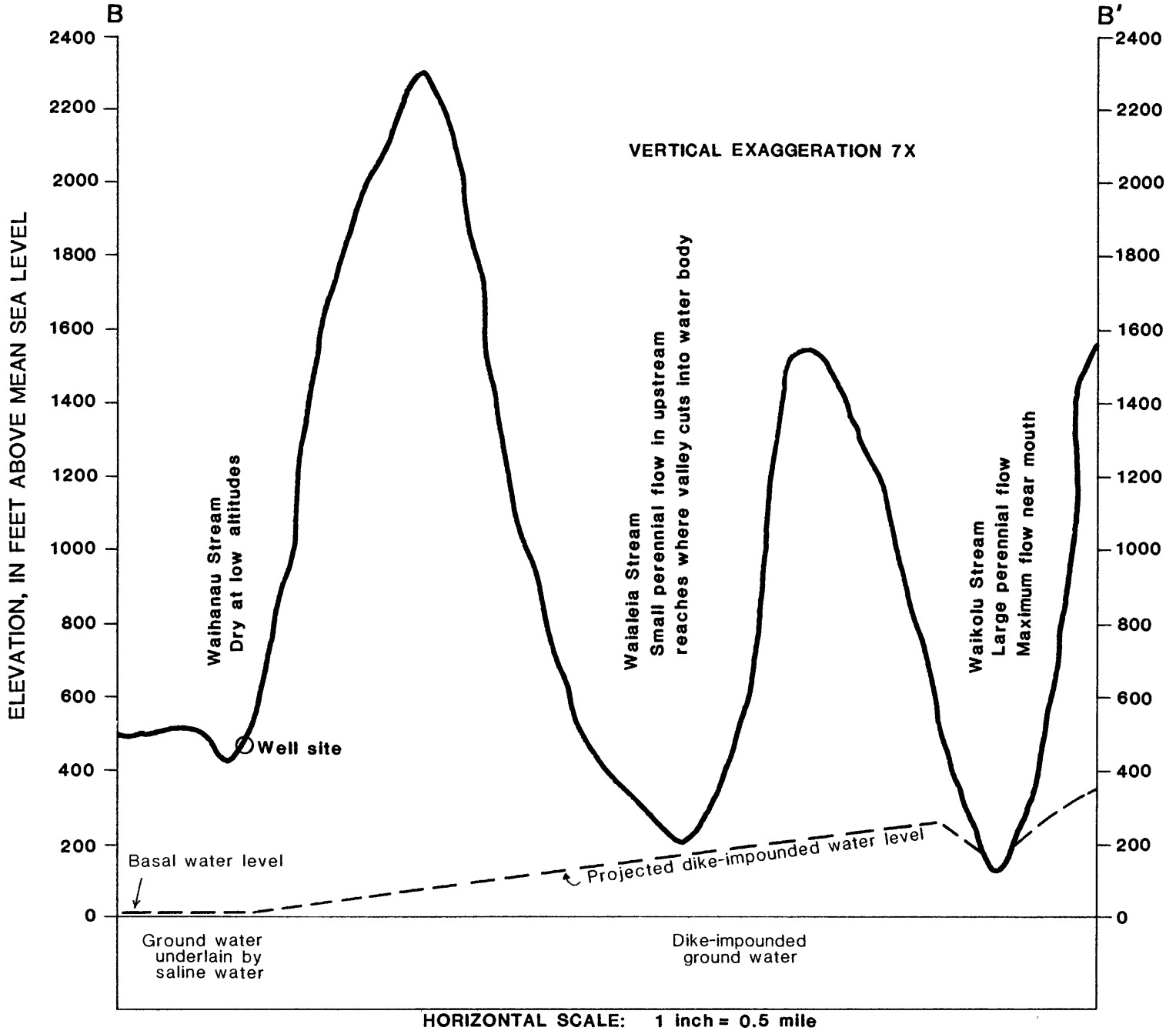


Figure 4. Projected depth of stream channels and water levels along line B - B' in figure 1.

ELECTRICAL RESISTIVITY SURVEY

Ground-water levels are markedly lower in the dike-free Kalaupapa basalts that underlie the peninsula than in the dike-intruded East Molokai Volcanics. Ground water underlying the peninsula occurs as basal water in a thin lens of fresh water that floats on saline ground water. In order to estimate the thickness of this lens, 5 vertical electrical-resistivity soundings (VES) were made (Kauahikaua, 1983). All of the soundings, except for one near the mouth of Waihanau Valley at an elevation of about 375 feet above sea level, indicated that the lens was thin. The excepted sounding was made in an area underlain by talus and probably overlying dike-intruded basaltic lavas of the East Molokai Volcanics. This sounding indicated a lens thickness of about 290 feet, the top of which is about 370 feet below ground surface or about seven feet above sea level. The sounding was about 800 feet seaward of the selected well site.

EXPLORATORY WELLS

The first exploratory well was drilled in the lower part of Waihanau Valley at a distance of about two miles southeast of the settlement. This site was chosen by the National Park Service in preference to a site in Waialeia Valley because it is closer to the storage tanks near the mouth of Waihanau Valley.

Ground-water conditions in the lower part of Waihanau Valley were determined from the drilling of three exploratory wells between May and October in 1983. The top of the main water body stood nine feet above sea level or about two feet higher than the elevation calculated for the electrical resistivity sounding site, 800 feet seaward. This difference in water levels indicates a gradient of about 13 feet per mile, which is too high for aquifers consisting of dike-free flank lava flows. The gradient is, however, consistent with that found in dike-intruded volcanic aquifers elsewhere in the Hawaiian Islands.

A shallow water body perched about 30 feet below the ground surface and more than 400 feet above the main water table was discovered during the drilling of the first well which was drilled to a depth of 582 feet. Two additional wells were drilled to depths of 200 and 150 feet, respectively, to explore the feasibility of developing this perched water body. Development of the perched water body was advantageous because it would act as a standby source and it would not require as much lift as the deeper water body.

The first well has been designated as well 1058-01; the second as well 1058-02; and the third as well 1058-03. Well 1058-02 is 15 feet southeast of well 1058-01. Well 1058-03 is 10 feet northwest of well 1058-01.

The wells were drilled on the eastern side of the valley at an elevation of approximately 472 feet above sea level. A bench mark has been established by the National Park Service about 50 feet northeast of the wells and is set in a large 15-foot wide volcanic dike.

The ground-water bodies tapped by the three wells drilled are described as follows:

Well	Description of occurrence
1058-01	Main ground-water body. Ground water occurs in basaltic lava flow intruded by dikes. Ground water reservoir is dike-impounded.
1058-02	Perched ground-water body. Ground-water occurs in volcanic debris overlying highly weathered basaltic lava flows. Weathered basalt is perching layer. Perched body leaks with depth as degree of weathering decreases.
1058-03	Same as well 1058-02.

Driller's Logs and Their Interpretation

The driller's logs are summarized in graphic form in figures 5, 6 and 7. The graph shows how the drilling progressed and how the water levels reacted to the drilling. The bottom of the hole as shown was recorded after the end of each day of drilling and the corresponding water level was recorded at the start of the next drilling day. The time between the end and the start of drilling was usually about 12 hours. Water levels were also measured at the end of each drilling day and were noted in the graphs whenever they were of significance.

The interpretation of the driller's log for each well follows the graphic log of each well, respectively, in tables 1, 2 and 3.

Table 1. Interpretation of driller's log, well 1058-01

Feet		Material	Water	Water level, feet	
Depth	Altitude			Depth	Altitude
0	472	Ground surface			
0 to 58	472 to 414	Talus debris	Unsaturated		
58 to 75?	414 to 397?	Talus debris overlying highly weathered surface of basaltic flows.	Saturated Perched body	32	440
75 to 195	397 to 277	Highly weathered basaltic flows. Principal perching member.	Probably saturated.	36	436
195 to 483	277 to -11	Weathered basaltic flows. Act as leaky perching member above water table.	Unsaturated	90 to 390	382 to 82
483 to 510	-11 to -38	Slightly weathered basaltic flows. Poorly permeable.	Unsaturated	440	32
510 to 582	-38 to -110	Slightly weathered basaltic flows. Permeable.	Saturated. Level of main water body.	463	9
582	-110	Bottom of hole.			

A graph of the drilling logs is shown in figure 5.

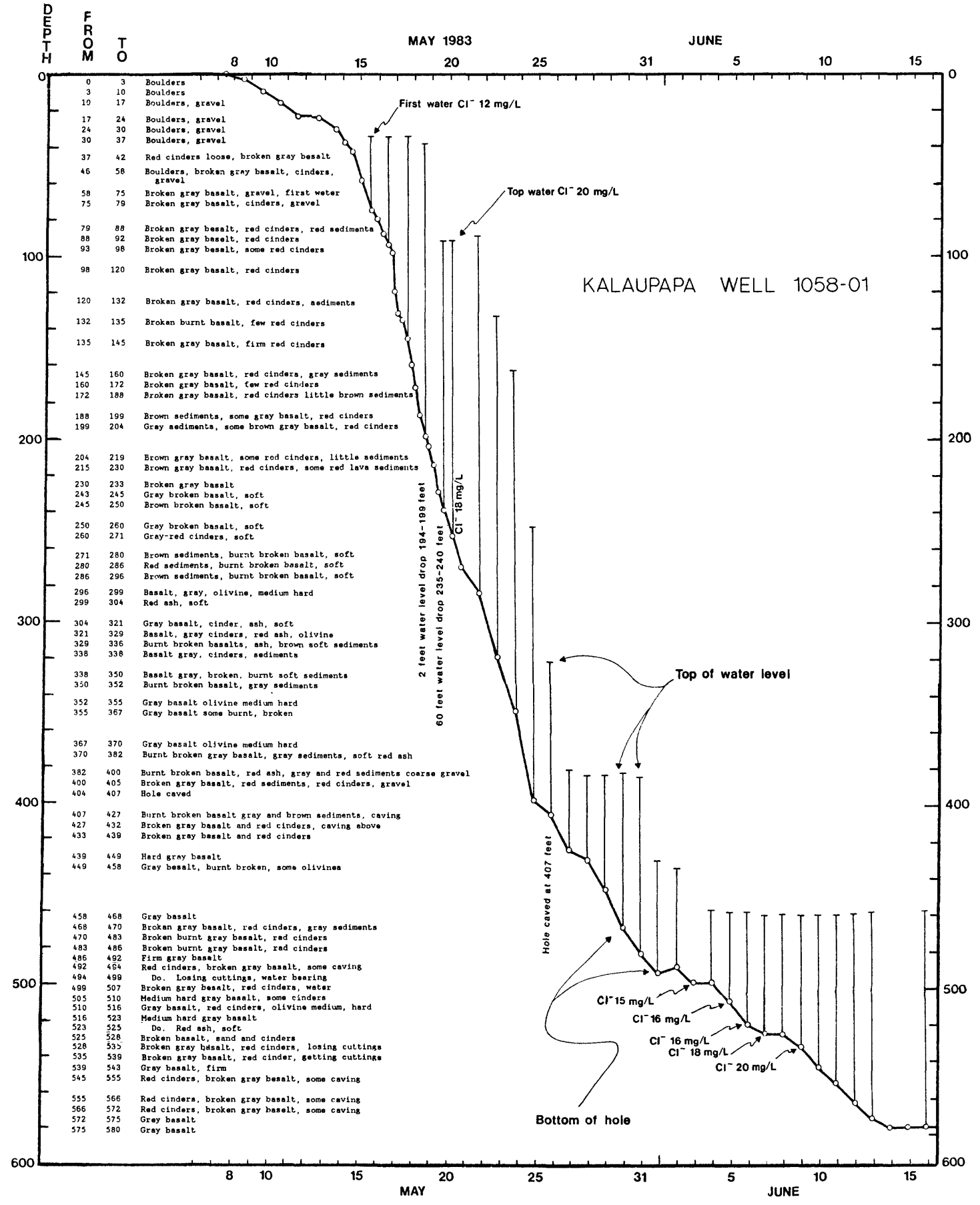


Figure 5. Graphic log of well 1058-01.

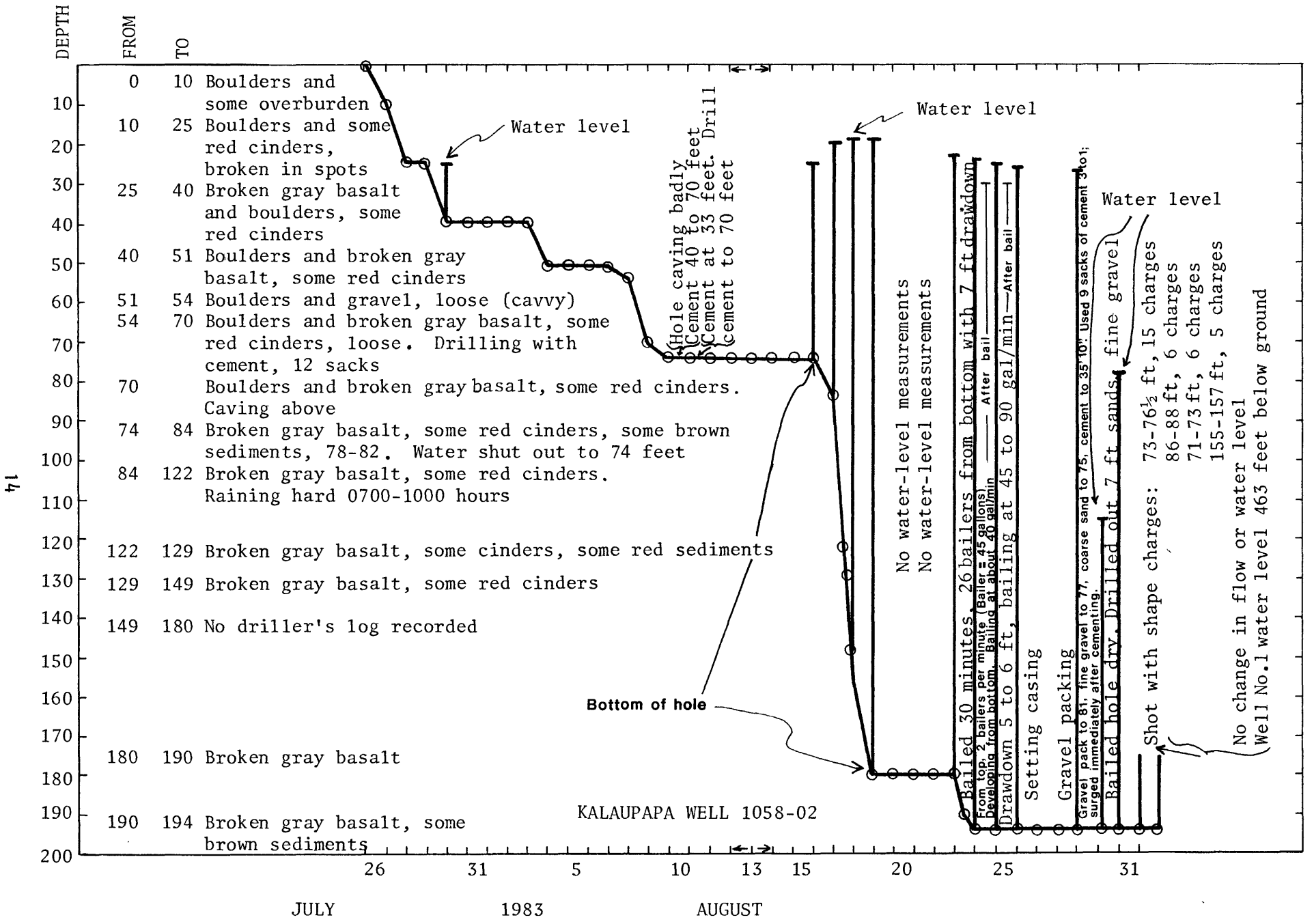


Figure 6. Graphic log of well 1058-02.

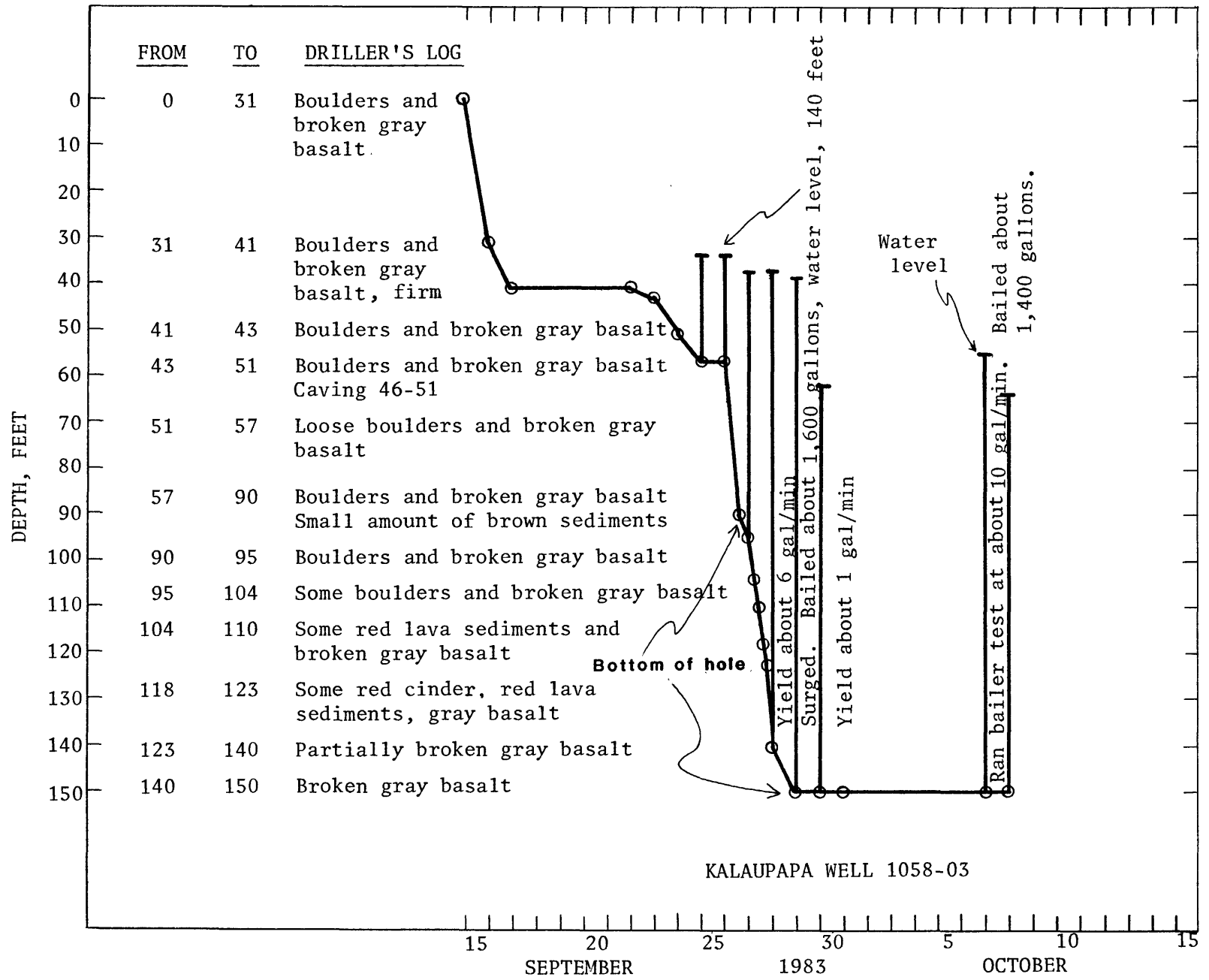


Figure 7. Graphic log of well 1058-03.

Table 2. Interpretation of driller's log, well 1058-02

Feet		Material	Water	Water level, feet	
Depth	Altitude			Depth	Altitude
0	472	Ground level		--	--
0 to 40	472 to 432	Talus debris	Unsaturated		
40 to 100?	432 to 372?	Talus debris overlying highly weathered surface of basaltic lava flows.	Saturated Perched body	19 to 25	453 to 447
100? to 194	372? to 278	Highly weathered basaltic lava flows. Principal perching member. Leaky member near bottom.	Unsaturated Leaky	19 to 25	453 to 447
194	278	Bottom of hole.			

A graph of the drilling logs is shown in figure 6.

Table 3. Interpretation of driller's log, well 1058-03

Feet		Material	Water	Water level, feet	
Depth	Altitude			Depth	Altitude
0	472	Ground level		--	--
0 to 51	472 to 421	Talus debris	Unsaturated	--	--
51 to 60	421 to 412	Talus debris overlying highly weathered surface of basaltic lava flows.	Saturated Perched body	34 to 38	438 to 434
60 to 150	412 to 322	Highly weathered basaltic lava flows. Principal perching member. Leaky near bottom.	Unsaturated Leaky	39 to 62	433 to 410
150	322	Bottom of hole.			

A graph of the drilling logs is shown in figure 7.

Yield Tests

The yield test of well 1058-01 is summarized in table 4, yield observations for well 1058-02 are presented in table 5, and the yield test of well 1058-03 is summarized in table 5. Well 1058-02 was not tested for yield because there was a significant decrease in yield after the well was gravel packed and grout sealed.

The yield tests for well 1058-01 and 1058-03 are shown graphically in figures 8 and 9.

Table 4. Yield test, well 1058-01

Test results:
Static water level
Depth to water: 463 feet
Altitude of water: 9 feet above sea level

Specific capacity: (Rate in gallon per minute/Drawdown in feet)
31 at 156 gal/min with drawdown of 5 feet (planned operational rate, 150 gal/min)

Chloride concentration:
Ranged from 19 to 22 mg/L during test

Water temperature:
69°F (20.5°C)

Total water pumped:
506,000 gallons in 48 hours

Date of test:
July 12 to 14, 1983

Test conducted by:
U.S. Geological Survey

Synopsis: Yield of well is adequate for planned operational rate of 150 gal/min. Specific capacity of well will probably increase significantly with deepening of well.

Table 5. Yield observations, well 1058-02

Test results: No yield test conducted
Static water level
During drilling
Depth to water: About 25 feet
Altitude of water: About 447 feet above sea level
After setting gravel pack and grout seal
Depth to water: About 175 feet
Altitude of water: About 297 feet above sea level

Specific capacity: (Rate in gallon per minute/Drawdown in feet)
About 10 as determined from bailer tests during drilling.
Less than 1 after setting gravel pack and grout seal.

Chloride concentration:
About 20 mg/L during drilling

Water temperature:
69°F (20.5°C)

Synopsis: Test shows significant decrease in yield after setting gravel pack and grout seal. Well is not feasible for development because of low yield.

Table 6. Yield test, well 1058-03

Test results:
Static water level
Initially about 35 feet below ground surface

Specific capacity: (Rate in gallon per minute/Drawdown in feet)
Less than 1

Chloride concentration:
About 20 mg/L

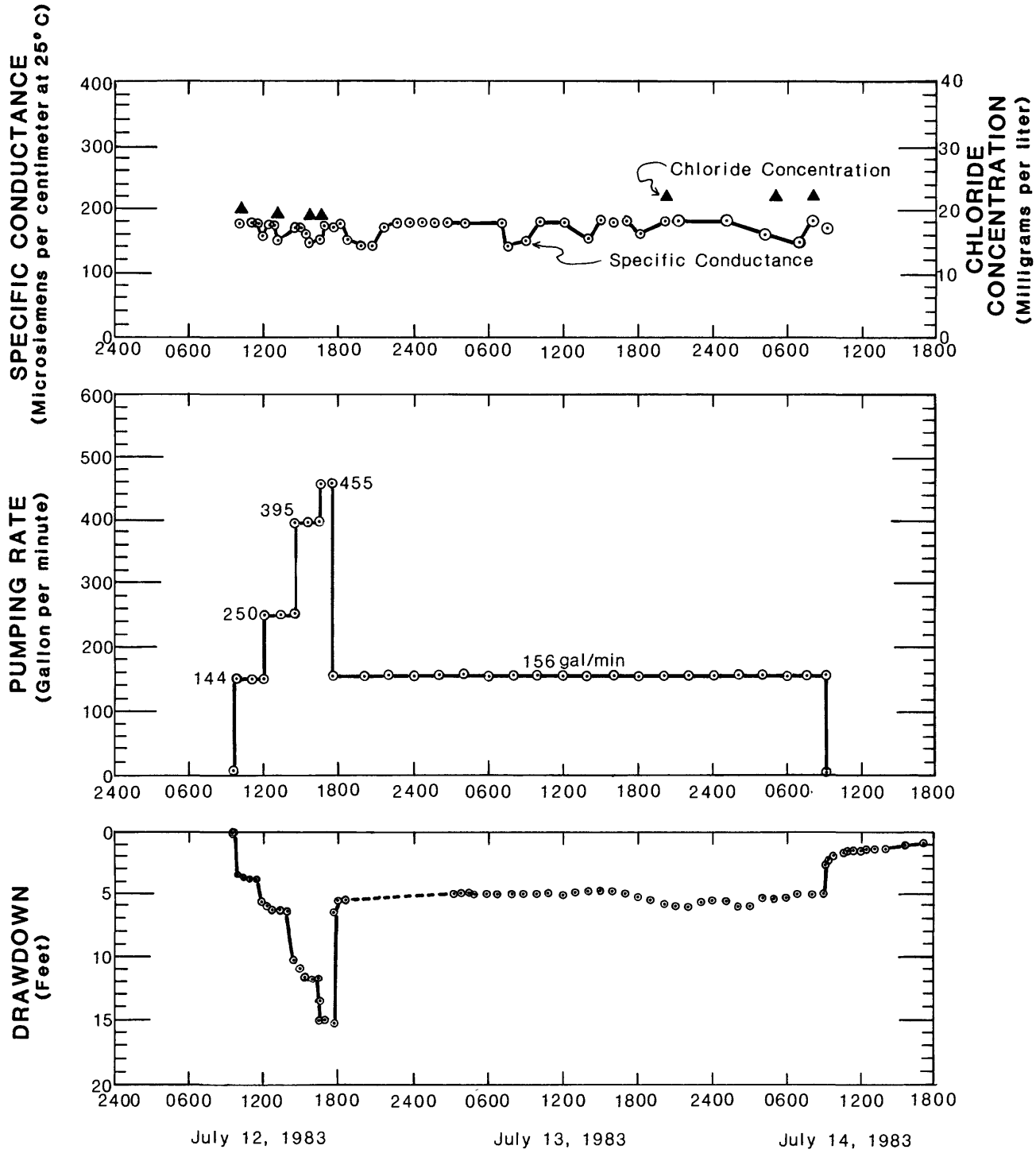
Water temperature:
69°F (20.5°C)

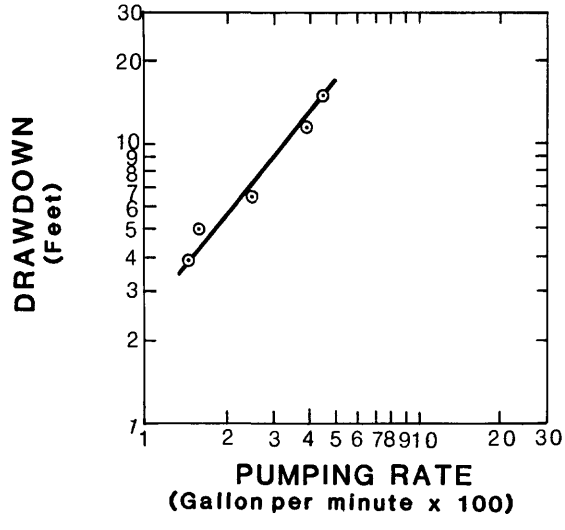
Total water pumped:
1,395 gallons in 124 minutes

Date of test:
October 7-8, 1983

Test conducted by:
U.S. Geological Survey

Synopsis: Well is not feasible for development because of low yield.





PHYSICAL DATA

Ground Elevation: 472 feet above sea level
Size of Casing: 10 inches
Depth of Casing (solid): 495.2 feet
Depth of Casing (screened): 575.7 feet
Depth of Hole: 582 feet
Water Temperature: 69° F
Latitude: 21° 10'44"
Longitude: 156° 58'07"

KALAUPAPA WELL 1058-01
MOLOKAI, HAWAII

Test Conducted By: U.S. Geological Survey

Figure 8. Graph of yield test, well 1058-01.

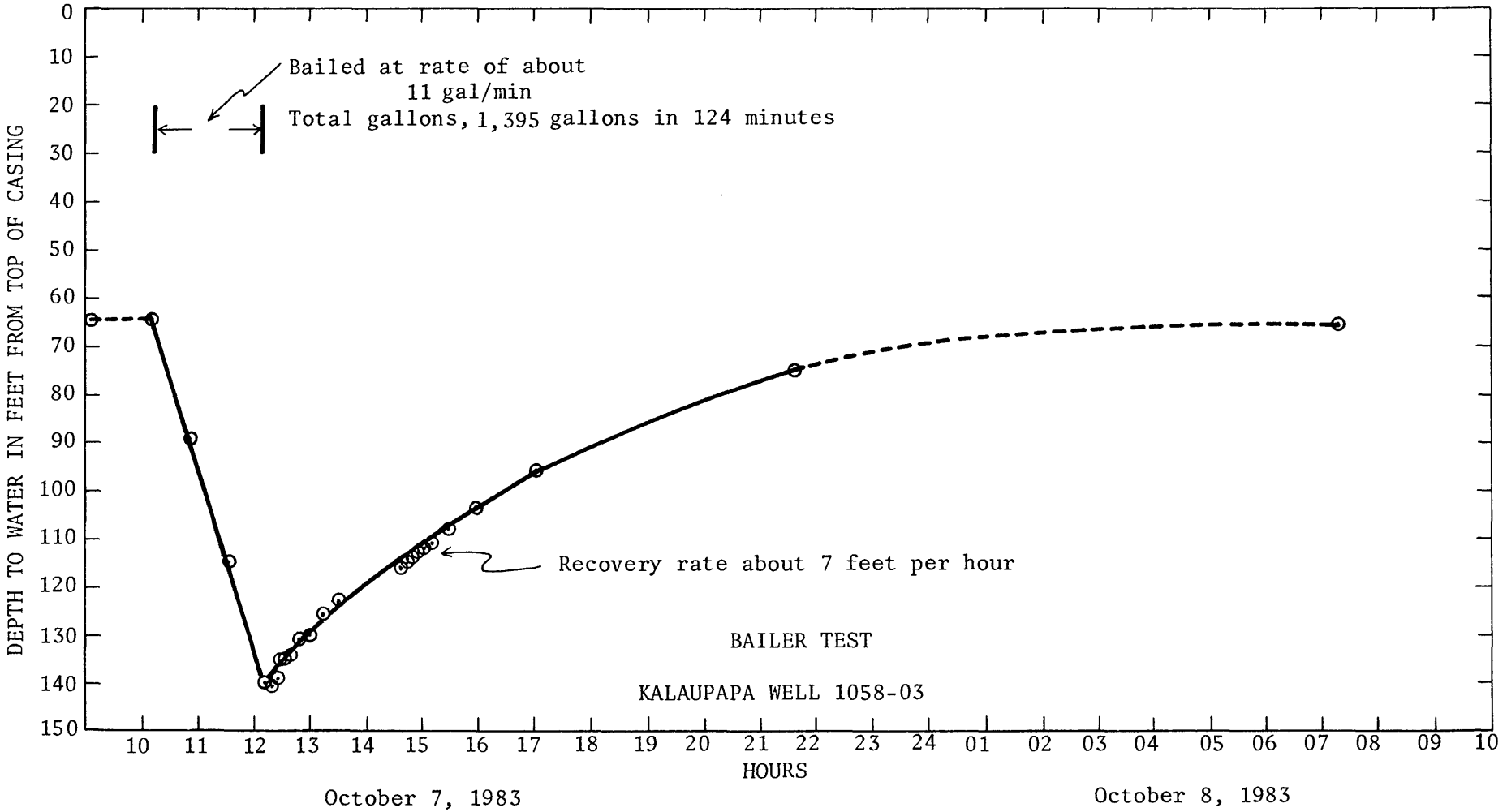


Figure 9. Graph of yield test, well 1058-03.

Well Construction

The construction of wells 1058-01, 1058-02, and 1058-03 are summarized in table 7.

Table 7. Well construction

Contractor	
	M-W Drilling Company[1/] (formerly Big Island Drilling) Anchorage, Alaska
Drilling Equipment	
	Cable Tool
Driller	
	William Tunnicliffe
Mobilization began	
	May 5, 1983, on Kalaupapa Peninsula
Construction Time	
Well	
1058-01	May 7, 1983 to July 18, 1983
1058-02	July 19, 1983 to September 10, 1983
1058-03	September 12, 1983 to October 12, 1983

[1/] Use of firm name in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

Table 7. Well construction--Continued

Well	Diameter, inches: Hole	Diameter, inches: Casing	Depth, feet below ground: Hole	Depth, feet below ground: Solid casing	Depth, feet below ground: Screen	Remarks
Depth and casing						
1058-01	16	16	582	74.5	--	Top of 10-inch casing, about 3 feet above ground.
		10		495.2	--	
				--	575.7	
				Perforation		
1058-02	16	0	194	--	--	Top of 10-inch casing about 3 feet above ground.
		10		--	184	16-inch hole cemented 75 to 40 feet depth and redrilled.
1058-03	16	16	150	17	56	Annular space between 10 and
		10		62.3	--	16-inch casings welded at top.
		10		--	144.8	Top is about 3 feet above ground.

Well	Gravel pack, feet: Material	Gravel pack, feet: Bottom	Gravel pack, feet: Top	Sanitary grout seal, feet: Casing	Sanitary grout seal, feet: Bottom	Sanitary grout seal, feet: Top	Remarks
Gravel pack and sanitary grout seal							
1058-01	Cement	582	575	10-inch	142	Ground	74.5 feet of 16-inch casing left in hole. Circular cement plug outside of 16-inch casing.
	No. 3 gravel	575	250	16-inch	6	Ground	
	Fine gravel	250	242				
1058-02	Cement	194	184	10-inch	75	Ground	16-inch casing was pulled.
	No. 3 gravel	184	81				
	Fine gravel	81	77				
	Sand	77	75				
1058-03	None	--	--	10-inch	--	--	Annular space between 10 and 16-inch casing welded at top. Circular cement plug outside of 16-inch casing.
				16-inch	6	Ground	

Water Quality

The perched water tapped by well 1058-01 was sampled with a bailer at depths of 90 and 250 feet. The main ground-water reservoir of dike-impounded water was sampled after the well was completed at 582 feet. Samples were taken near the start and near the end of a 48-hour pumping test.

The well water is of excellent chemical quality and is a great improvement over the quality of the existing stream supply.

Analyses of the chemical constituents and of the trace metals are given in table 8.

Table 8. Chemical analyses of water from well 1058-01, Waihanau Valley, Molokai, Hawaii

DATE	TIME	SAMPLING DEPTH (FEET)	SPECIFIC CONDUCTANCE (UMHOS)	PH (STANDARD UNITS)	TEMPERATURE (DEG C)	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	POTASSIUM, DISSOLVED (MG/L AS K)	ALKALINITY LAB (MG/L AS CACO3)
MAY										
20...	1500	90.0	--	--	--	7.6	5.2	15	2.2	44
20...	1515	250	--	--	--	8.7	5.5	13	1.6	51
JUL										
12...	0955	--	175	--	20.5	--	--	--	--	--
12...	1300	--	145	--	20.5	--	--	--	--	--
12...	1530	--	145	--	20.5	--	--	--	--	--
12...	1620	--	150	--	20.5	--	--	--	--	--
13...	2000	--	180	--	20.5	--	--	--	--	--
14...	0400	--	160	--	20.5	--	--	--	--	--
14...	0800	--	180	8.2	20.5	8.7	5.2	17	1.8	52

DATE	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N)	PHOSPHORUS, TOTAL (MG/L AS P)	ALUMINUM, TOTAL RECOVERABLE (UG/L AS AL)	ARSENIC TOTAL (UG/L AS AS)
MAY										
20...	3.0	21	<.10	16	--	.16	--	--	--	--
20...	3.0	18	<.10	18	--	.14	--	--	--	--
JUL										
12...	--	20	--	--	--	--	--	--	--	--
12...	--	19	--	--	--	--	--	--	--	--
12...	--	19	--	--	--	--	--	--	--	--
12...	--	19	--	--	--	--	--	--	--	--
13...	--	22	--	--	--	--	--	--	--	--
14...	--	22	--	--	--	--	--	--	--	--
14...	3.9	22	<.10	30	.20	.60	.40	.030	60	<1

DATE	TIME	BARIUM, TOTAL RECOVERABLE (UG/L AS BA)	BERYLLIUM, TOTAL RECOVERABLE (UG/L AS BE)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR)	COBALT, TOTAL RECOVERABLE (UG/L AS CO)	COPPER, TOTAL RECOVERABLE (UG/L AS CU)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	LEAD, TOTAL RECOVERABLE (UG/L AS PB)
MAY										
20...	1500	--	--	--	--	--	--	--	13	--
20...	1515	--	--	--	--	--	--	--	20	--
JUL										
14...	0800	.00	<10.0	<1.0	<10	6.0	2.0	70	53	<0

DATE	LITHIUM TOTAL RECOVERABLE (UG/L AS LI)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	MOLYBDENUM, TOTAL RECOVERABLE (UG/L AS MO)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)
MAY									
20...	--	--	61	--	--	--	--	--	--
20...	--	--	94	--	--	--	--	--	--
JUL									
14...	<10	<10	2	<.0	<1	<1.0	<1	<1.0	30

< Actual value is known to be less than the value shown.

SUMMARY AND CONCLUSIONS

Geologic and hydrologic observations in the field indicated the likelihood that ground water underlying the valleys above Kalaupapa Peninsula was dike-impounded. The results from exploratory drilling in the lower Waihanau Valley confirm that a ground-water reservoir exists at a depth that is feasible for development. A test well was pumped at various rates for 48 hours with results indicating that it was capable of yielding water at a planned operational pumping rate of 150 gal/min. Based on these results, the test well was finished as a production well.

A shallow water body at a depth of 30 feet and perched more than 400 feet above the main water table was discovered during the exploratory drilling. The yields obtained from two test wells drilled to explore the perched-water body were low and indicated that its development was not feasible.

Dike-impounded water occurs at shallower depths in the valleys lying to the east of Waihanau Valley. The prospects of additional ground-water development appear favorable in these valleys.

Ground water underlying Kalaupapa Peninsula occurs as basal water in a thin lens of fresh-water floating on saline ground water. The prospects for developing this water are not favorable.

REFERENCES

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