RHW

WARHEIT WATER TEST WELL
NEAR PESCADERO
SAN MATEO COUNTY, CALIFORNIA

For

San Mateo County Department of Public Works

Prepared by:

Perry R. Wood
Engineering Geologist

September 13, 1982

Project 802-82

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September 13, 1982

Project 802-82

San Mateo County
Department of Public Works
590 Hamilton Avenue
County Government Center
Redwood City, Calif. 94063

ATTEN: Ed. Barnes

RE: Water Test Well near Pescadero, San Mateo County, California

Dear Mr. Barnes:

This brief report contains geologic and hydrologic information obtained when a water test well was drilled on "The Mesa" near an old sand and gravel quarry on Bean Hollow Road, southwest of Pescadero, San Mateo County, California. The report contains the following:

1. Location map (figure 1)
2. Geologic map (figure 2)
3. Generalized Topographic and hydrologic section showing probable fresh-water saturated zone between Butano Creek and the Pacific Ocean along a line drawn through the test well (figure 1 and 2)
4. Summary report, based on observations made during the drilling operation
5. Log of materials encountered as the well was drilled
6. Comments pertaining to well development, probable yield and water requirements.

It was a pleasure to have worked with you on this project. If you have any questions about the report, or if I can be of further service, please contact me at the address given on the letterhead.

Sincerely yours,

Perry R. Wood
Engineering Geologist
CEG # 711

CC: Ed Barnes
San Mateo County
Dept. Public Works (3)
Rich Wilson
San Mateo County
Dept. Envir. Health (2)
John J. Lingeman
Earth Flow Drlg. Co. (1)

CONTENTS

INTRODUCTION

Location

The water test hole, referred to in this report as the "Warheit Water Test Well", is located near the top of a north-trending ridge, southwest of an old sand and gravel quarry and a short distance west of Bean Hollow Road, near the town of Pescadero, San Mateo County, California. Figure 1 shows the approximate location of the test well and topographic and cultural features of interest.

Purpose

The test well was drilled to determine if soil materials and rock units near the old quarry were capable of yielding potable water that could be used by a small low-income community housing development. It was proposed that a test well be drilled to determine: a) presence or absence of potable water; b) probable thickness of potable water-bearing deposits; c) probable yield of a small-diameter production well; and d) an indication of the volume of potable water available for use.

Probable Water Requirement

For planning purposes, it was assumed that the proposed development might consist of 15 family units containing an average of 6 people per family. Water use was assumed to be 50 gallons per day per person. Using this information, it was computed that the domestic water requirement for the proposed development would be about 4500 gallons per day(15 units x 6 people per unit x 50 gallons per day per person).

The following table indicates how long a well pumping the indicated gallons per minute would have to operate to supply the assumed water requirement (4500gpd).

Well Yield	Volume of Water Pumped					
	1 hr	4 hrs	8hrs	12 hrs	16 hrs	40 hrs
20	1200	4800	9600			
10	600	2400	4800	7200		
5	300	1200	2400	3600	4800	
2	120	480	960	1440	1920	4800

Thus, one small diameter well capable of pumping 5 or more gallons per minute, could satisfy the assumed domestic requirement. A water storage tank could be constructed to store water for an occasional excessive water need or an emergency. A tank 20 feet x 50 feet x 10 feet could store 10,000 cubic feet or 74,800 gallons of water. Assuming that a well would pump 10 gallons per minute 12 hours each day, or 7200 gpd, for 30 days, then the daily domestic requirement (4,500 gpd) would have been satisfied and 72,000 gallons of water (2400 gpd x 30 days) would be available in the storage tank for other uses.

This reasoning suggests that, provided the rocks were fresh-vater-bearing, one or more low-yield, small diameter wells could supply water for the proposed development.

GEOLOGIC AND HYDROLOGIC SUMMARY

According to Brabb and Pampeyan (1972), the rocks in the project area and vicinity are part of the Pigeon Point Formation (Kpp, figure 2). This rock unit was discribed as sandstone and couglomerate distinctly interbedded with siltstone and mudstone. Unnamed volcanic rocks (KJv, figure 2) also occur in the area. The relationship between the volcanic rocks and Pigeon Point Formation is not known. However, both rock units were described as being hard, where fresh, and generally fractured on close spacing. From the general descriptions (Brabb and Pampeyan, 1972 and Ellen and others, 1972) I reasoned that ground water in either or both units probably would be stored in fracture openings and that well yields would be low. If the zone of fresh-water saturated rocks was 100 or more feet thick, then one or more low-yield wells ought to supply the water requirement. I recommended that a test well be drilled, preferrably with an air-drive rotary drill, to determine rock types; top of the saturated zone; probable yield; and probable quality of water.

TEST WELL AND OBSERVED HYDROLOGIC CONDITIONS

A test well was drilled August 30 and 31, 1982. A summary report of the drilling operation and a log of materials removed by the drill are given in Appendix A.

The well log indicated that, at the well site, the Pigeon Point Formation differed considerably from those described in the geologic reports and from those noted in road cuts on Bean Hollow Road and on Pescadero Road. Beds of conglomerate and silt stone were conspicuously absent. Weathered dark yellow brown to orange brown sand and clayey sand containing seemingly randomly located subangular to well-rounded pebbles and granules of polished quartz seemed to be the dominant sedimentary unit to a depth of 110 feet. This unit was moist and tended to cave readily. Brown sand, similar to an old beach or sand dune deposit, was dominant from 110 to 240 feet. This unit drilled rather easily, but moderate down pressure was needed in addition to the weight of the drill column.

Below a depth of 120 feet, only occasional fragments of siltstone were noted in drill cuttings. In my, opinion, siltstone is not an important part of the brown sand unit.

Goundwater was reached at depth of about 205 feet. The flow of water increased gradually between 205 and 220 feet. There seemed to be no significant change in water conditions below 220 feet. Caving conditions, generally above the 110 feet depth interval made a determination of probable yield difficult. The driller estimated, on the basis of the water-foam-sand mixture flowing from the top of the starter casing, that the yield was about 20 gallons per minute. I used 10 gpm in my analysis. Figure 3, topographic and hydrologic profile, shows an interpretation of the saturated fresh-water zone in the vicinity of the test well. In my opinion, there is an elongate lens of fresh water between the Butano Creek Valley and the Pacific Ocean. That lens of fresh water probably covers many tens of acres and probably is 80 to 100 feet thick in the project area. If not overly developed by other wells, the fresh-water lens probably will be a source of fresh water for many years.

CONCLUSIONS AND RECOMMENDATIONS

Well Development

I recommend that a small diameter well be drilled to a depth of about 260 feet and completed using a 6 inch casing. The well should be completed and the casing should be sealed in accordance with requirements of the San Mateo County Department of Environmental Health. The perforated area of the casing should be "gravel packed" with sand that will prevent fine

grained material from entering the casing. The static water level probably will be 180-200 feet below land surface. The size of perforations and the perforated interval should be based information obtained from the production well. Sieve analysis (figures 4, 5, and 6) of samples obtained from the test well may not accurately reflect the fine grained fraction because excessive caving conditions may have prevented many of the fines from migrating up the well bore.

The production well should be drilled using a bentonite slurry sufficiently thick to prevent caving. When the well is developed, pumping and surging should be continued untill the bentonitemud or "cake" is effectively removed from the wall of the well bore.

Probable Yield

The yield of the completed well probably will exceed 10 gallons per minute. However, any pumping equipment should be installed on the basis of pumping tests made in the production well during the development period.

Estimated Water Requirement

The estimated water requirement for the proposed housing development is about 4500 gallons per day. If the production well pumps less than 5 gpm, a second well may be required. The second well should be spaced sufficiently far from the first well that the two units will not interfer with each other during pumping periods.

LIMITATIONS

The opinions, recommendations and conclusions given in this report were made in accordance with generally accepted priniciples and practices in the field of engineering geology. No other warranty is expressed or implied.

Sincerely yours,

Perry R Wood
Geologist GS 2427
Eng. Geologist CEG 711

REFERENCES

Edward E. Johnson, Inc, 1966, Ground Water and Wells: Saint Paul, Minn.

Brabb, E. E.,and Pampeyou, E. H.,1972, Prelinary Geologic Map of San Mateo County, California: U. S. Geol. Survey Misc Field Studies Map MF-328

Ellen and Others, 1972, Description of Geologic Map Units, San Mateo County, California: U.S. Geol. Survey Misc. Field Studies Map MF-328

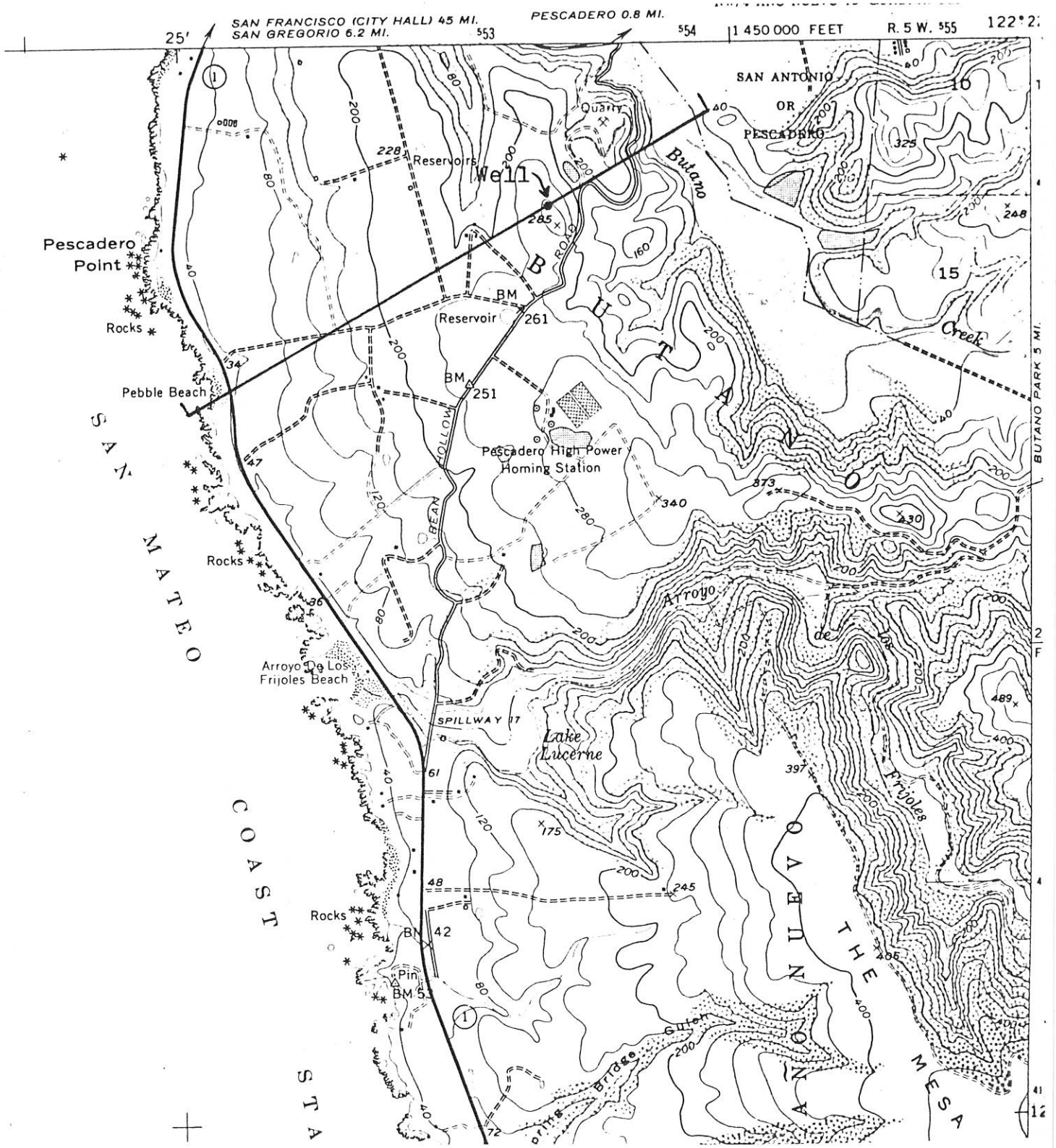
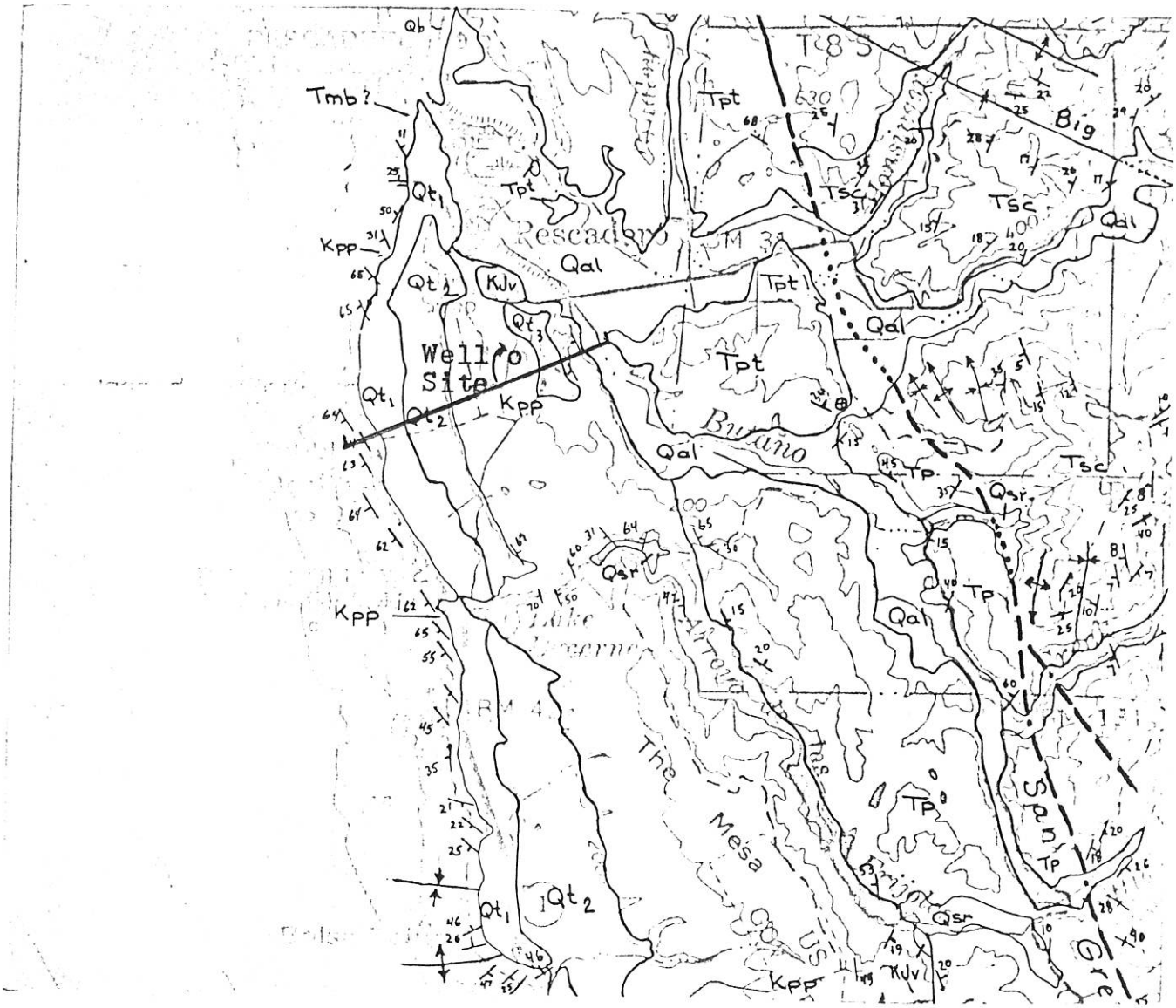


FIGURE 1.--TOPOGRAPHIC MAP SHOWING LOCATION OF WARHEIT WATER TEST WELL AND LINE OF SECTION SHOWN IN FIGURE 3.

Source: Pigeon Point Quadrangle, 1:24,000

Scale : 1 inch = 2,000 feet



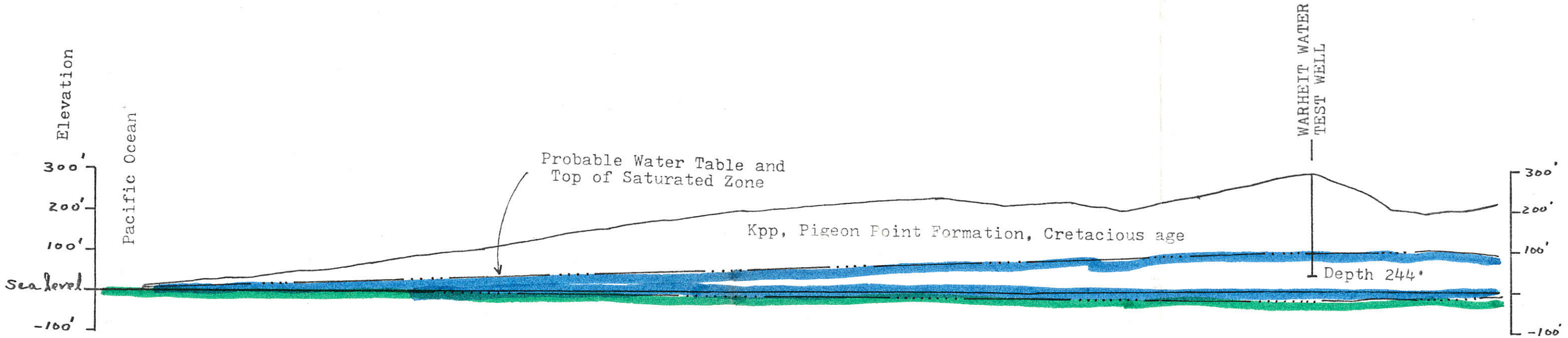
Scale: 1 inch = 2,000 feet Source: Brabb and Pampeyan, 1972

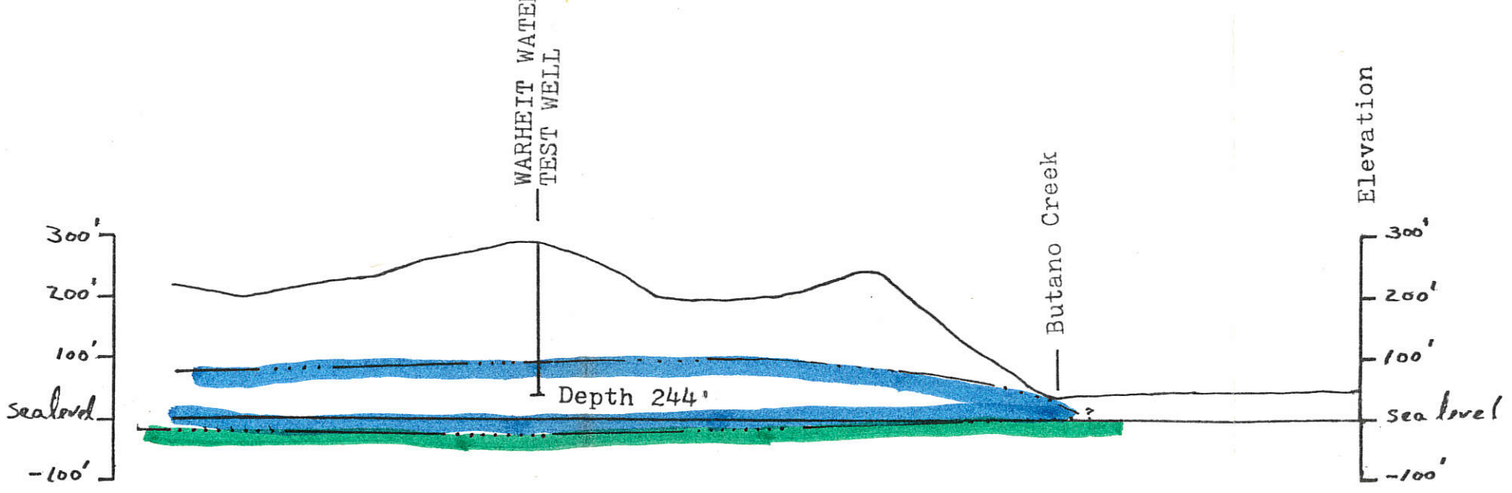
FIGURE 2.-- GEOLOGIC MAP, PESCADERO AREA, CALIFORNIA

KJv - Volcanic Rocks Kpp - Pigeon Point Formation

Tp - Purisima Formation Qt - Terrace Deposits

↳ Line of Section (Figure 3)





Fresh-water Zone

Salt-water Zone

Scale:
Horiz. 1 inch = 500 feet
Vert. 1 inch = 250 feet

FIGURE 3.-- TOPOGRAPHIC AND HYDROLOGIC SECTION ALONG A LINE DRAWN THROUGH THE WARHEIT WATER TEST WELL FROM THE PACIFIC OCEAN TO BUTANO CREEK NEAR PESCADERO, CALIFORNIA

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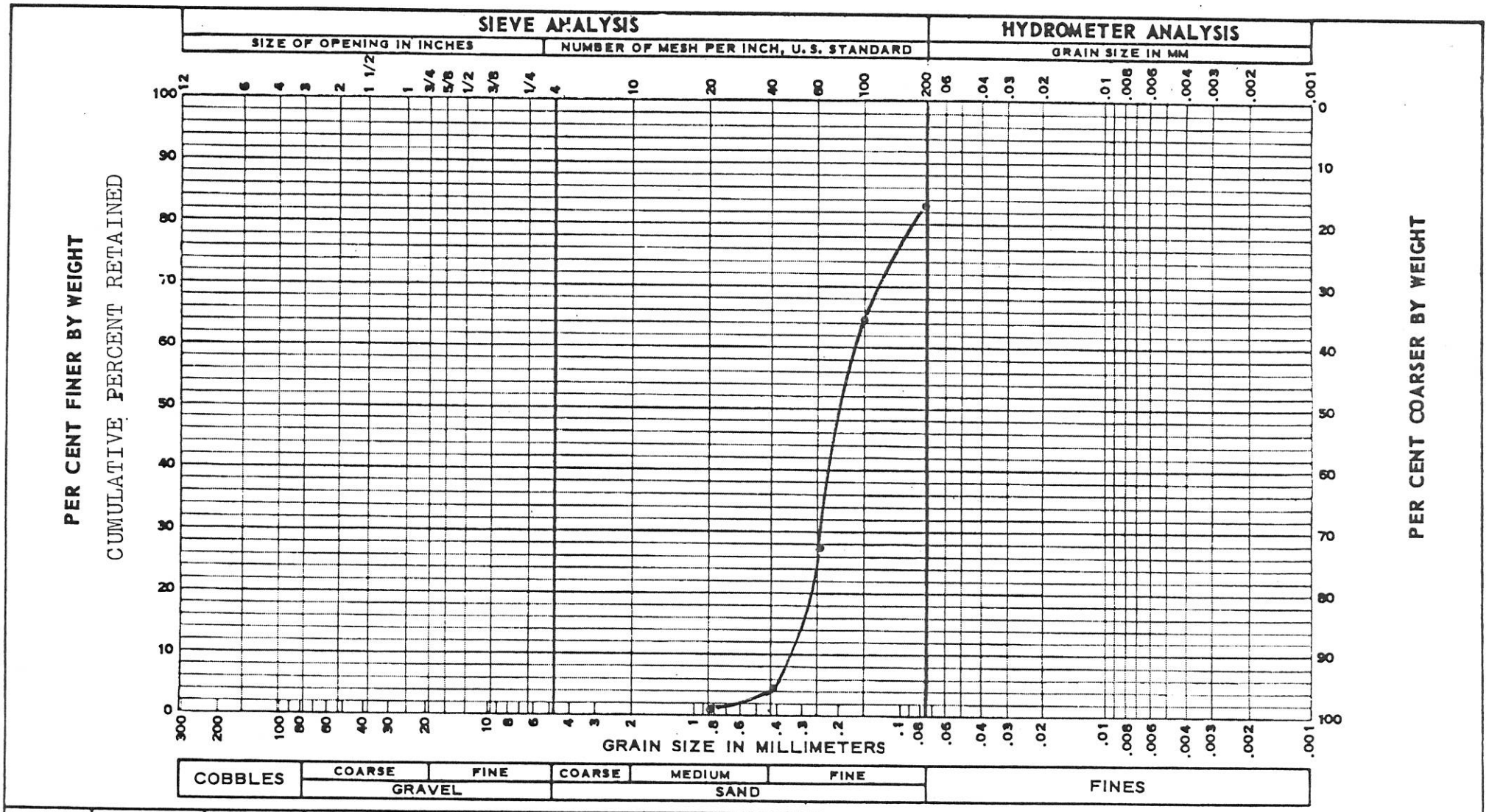
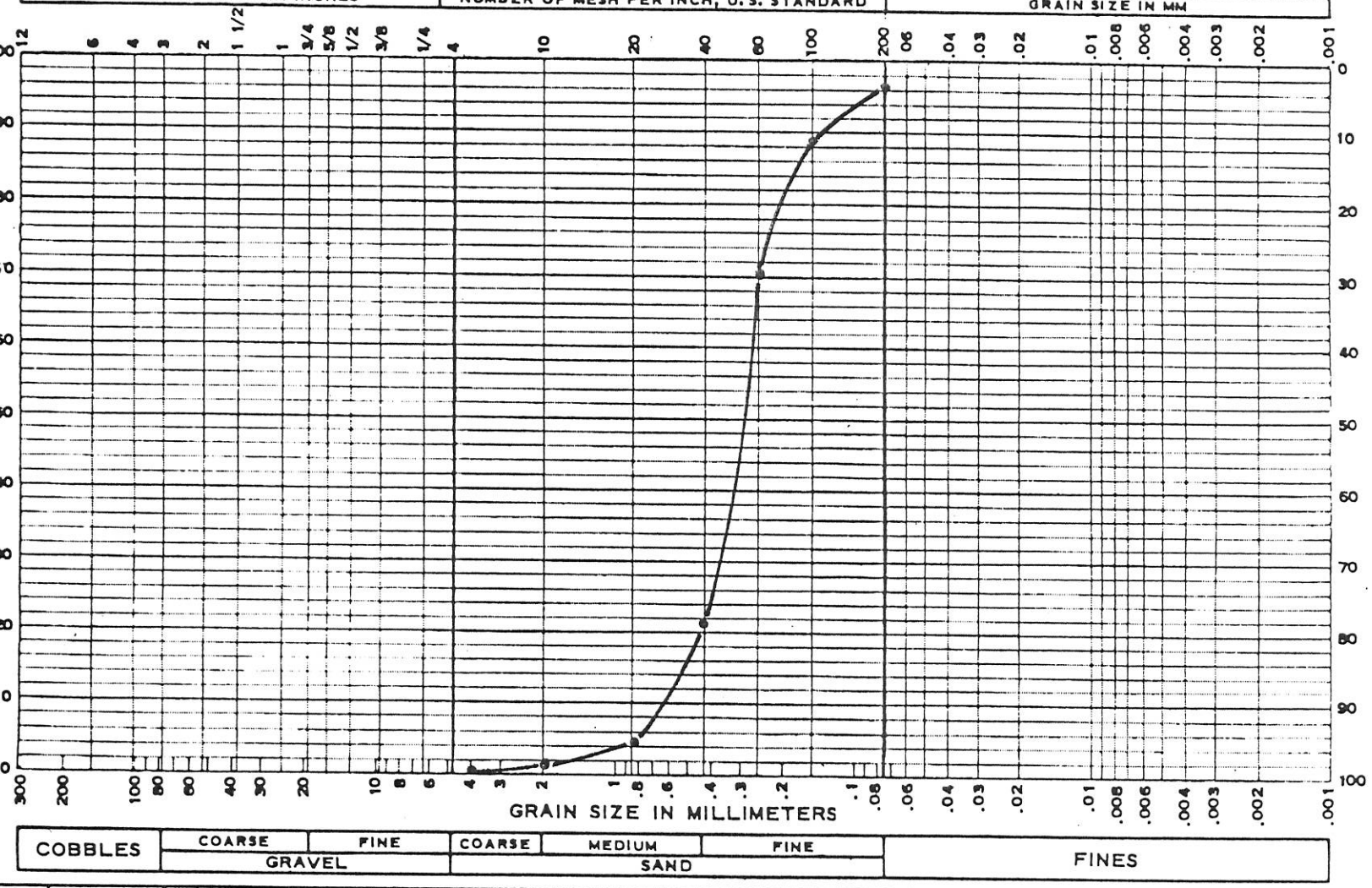


SAMPLE NO.	DEPTH -FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
1	200						

GRAIN SIZE CLASSIFICATION

WARHEIT TEST WELL

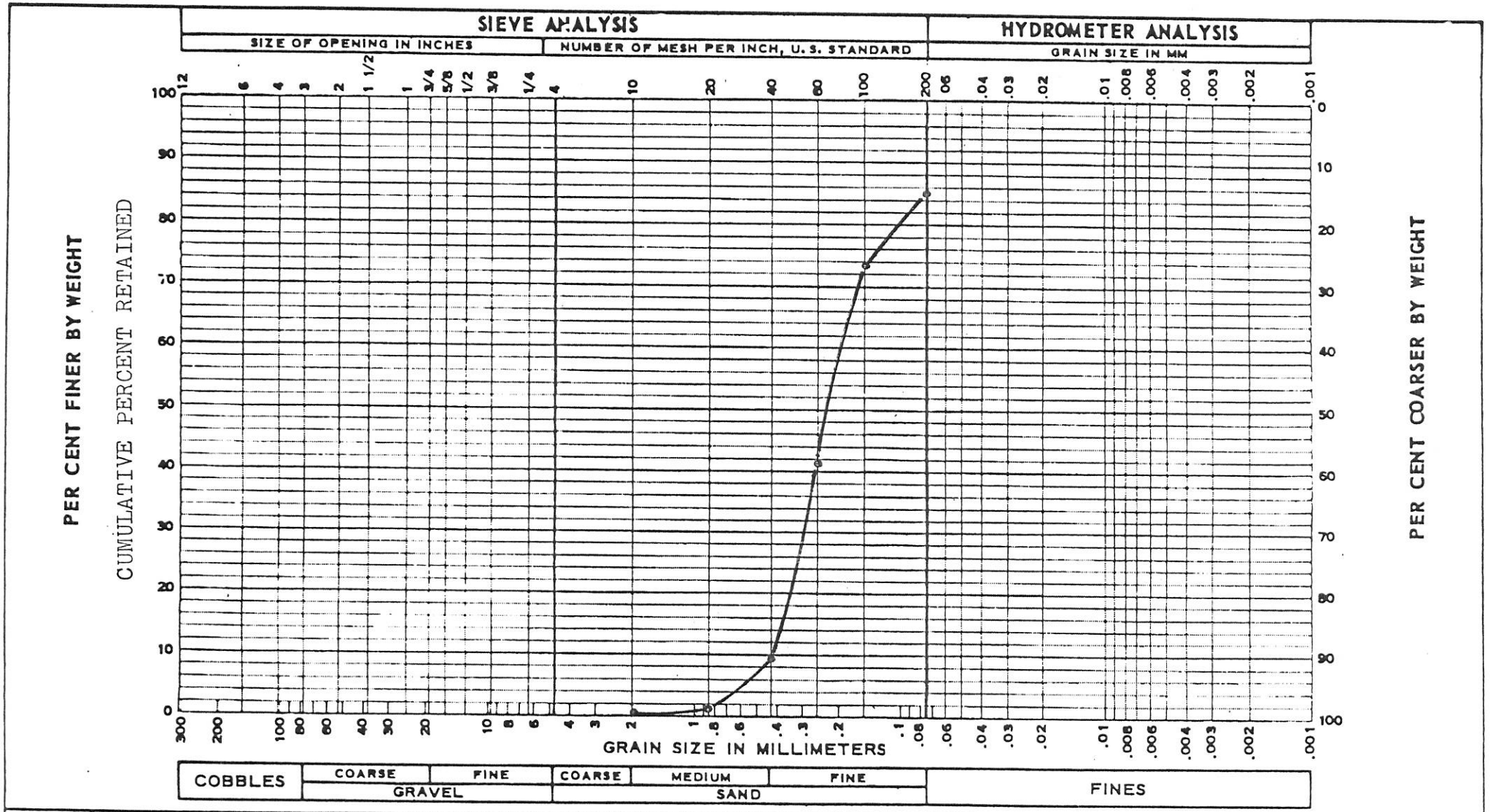
Depth 200 feet



SAMPLE NO.	DEPTH -FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
2	220						

GRAIN SIZE CLASSIFICATION

Warheit Test Well
Depth 220 feet



SAMPLE NO.	DEPTH -FT.	U.S.C.	CLASSIFICATION	NAT. W.C. %	LL	PL	PI
			Bulk sample from water-foam-sand mixture near end of diamond period depth of hole 244 feet. Caving conditions caused considerable mixing.				

GRAIN SIZE CLASSIFICATION

WARHEIT TEST WELL

APPENDIX A

PERRY R. WOOD
Engineering Geologist
1021 Dale Ave., Mountain View, Ca. 94040
Telephone (415) 968-2510

SUMMARY REPORT, WATER-TEST WELL

Drilled by: Earth Flow Drilling Co.
2600 Smith Grade
Santa Cruz, CA 95060 (408) 423-3288

For: San Mateo County Department of
Public Works
County Government Center
Redwood City, Ca. 94063

Date Drilled: August 30 and 31, 1982

Location: Near top of ridge, south of Pescadero Road and west of Bean Hollow Road and southwest of Pescadero, San Mateo County, California

Equipment: Air Drive Rotary Drill equipment with a 7 3/4 inch Tricone bit

Drilled 0-180 feet August 30, 1982. No stabilizing mud used 0-70 feet. "Quick Foam" and water added below 70 feet because of caving conditions in weathered sandy formation. Drill string pulled from hole, evening August 30. Hole had squeezed in during the night and had to be reamed out; about an hour spent reaming hole and cleaning caving sand.

Static water level reached about 205 feet below land surface. Water flow increased gradually as bit advanced from 205 to 244 feet. We had problems with caving conditions and could not obtain a good indication of probable yield because sand and water boiled around in cavities on its way to the surface. Driller estimated about 20 gpm at 244 feet, bottom of hole. Hole collapsed when airflow was stopped and drill string was removed.

We had to place the drill string (without drill bit) back into the hole and force it down to a depth of 200 feet in order to get water samples for preliminary chemical analysis of water. Static water level not known accurately but we estimated that it was about 190 feet below land surface.

Mr. Rich Wilson, San Mateo County Department of Environmental Health made preliminary tests of chloride content and iron content of water and took water samples for more detailed chemical analysis.

The test hole was filled and a cement plug and cap was installed by the driller and John J. Lingemann, Earth Flow Drilling Company.

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LOG OF TEST WELL

Logged by: Perry R. Wood, Geologist #2427 and Engineering Geologist, CEG #711, August 30 and 31, 1982

Feet	Description and Remarks
0-3	Gravelly clay, rounded granules and pebbles up to about ¼ inch, dry.
3-4	As above, moist, dark yellow brown.
4-15	Clay, yellow brown, with minor sand, moist.
15-20	Sand and sandy clay, dark yellow brown, occasional rounded pebbles up to about ¼ inch, moist.
20-60	Clayey sand, dark yellow brown to orange brown, moist with occasional well rounded gravels up to about ½ inch; very moist at 40 feet; increase in clay at about 50 feet.
60-62	Clayey sand, red brown, moist.
62-64	Sand, fine, brown to dark yellow brown, clay matrix, chocolate brown well rounded siltstone pebbles up to about 1 inch; fresh water drops on pebbles, minor caliche powder; rig chatter indicates harder drilling.
64-70	As above, except only occasional siltstone pebbles, wet; no water in cuttings removed from hole.
70	Driller started to add "Quick Foam" and water to stop caving conditions in interval above drill bit.
70-80	Sand, fine, with siltstone? dark yellow brown to gray brown, occasional siltstone fragment and numerous small pieces and specs of charcoal-like carbonaceous material; occasional pieces up to about ½ inch.
80-110	Sand with high clay content, caving,occasional rounded pebble up to ¼ inch.
110-120	Sand, brown, (SP), slightly moist, drills harder than previously. Looks like an old beach or dune sand; occasional polished pebble up to ¼ inch. No water.

LOG OF TEST WELL (cont)

Feet	Description and Remarks
120-138	As above, drills easier 135-138 feet, no indication of change in stratigraphy.
138-150	As above, drills harder, slightly moist.
150-184	Sand brown, (SP), minor clay content, slightly moist, drills harder, rig rattles; nearly dry below 160 feet.
184	Had to stop drilling and clean hole. Bit had to be drilled out in order to clean hole. (end of day).
	Walls of hole had "squeezed in" and drill had to be advanced slowly to 184 feet; hole cleaned with air and water foam mixture. No water.
184-204	Sand, brown to pepper color (SP), minor clay, nearly dry.
204-210	As above, water in cuttings at about 205 feet; water flow increased with depth; a hard, resistant layer reached about 210 feet; no obvious change in stratigraphy.
210-244	Sand, as above, minor clay evidenced in cuttings. Water flow increasing slightly with depth. Driller estimated about 20 gpm.
244	Drill stopped. Tried to get a measurement of well yield but too much sand caving as water brought up with air drive mechanism. Driller reported that cavities and caving conditions made it impossible to get a good estimate of well yield.
	Bottom of hole 244 feet - no salty taste in water. Drill stem and bit pulled from hole.

Note:

About 2 hours after drilling stopped an attempt was made to get water samples for chemical analysis. The hole had caved. In order to get water samples, the driller pushed drill rods down to a depth of 200 feet. An improvised bailer was made from a 9 foot section of 3/4-inch steel pipe. The so-called bailer was attached to a ¼-inch line and lowered through the drill stem to obtain water samples containing a high content of sand. Field analyses indicated a very low chloride content and moderate? iron content. More detailed analyses will be available from the laboratory.