

926-2-148

GROUNDWATER EVALUATION

NEW WESTMINSTER

COURT HOUSE EXCAVATION

Description of Pump Test and Results

for

Macleod Geotechnical

W. L. Brown, P. Eng.

April 1978

78-082

## 1.0 INTRODUCTION

This report describes the drilling and testing of a well located on the Agnes Street side of the proposed New Westminster Court House excavation. The attached location plan (Drawing 1) shows the location of the test well and of the five piezometers used to measure water levels within the site of the proposed excavation. This pump test was conducted to furnish the data and information necessary for the design of a temporary dewatering system required to allow the site to be excavated to elevation 66 feet without failure.

A water-bearing sand zone was encountered beneath the site at an elevation of 65 feet. The static water level within the zone rose to an elevation of 105 feet. Information from the piezometers and from bore holes drilled for foundation purposes indicates that the top of the water-bearing sand zone and the static water levels both slope southeastwards at slopes that are sub-parallel with the slope of the ground surface (please see cross-section Drawing 2).

The water level must be lowered to a maximum elevation of 61 feet to ensure that final excavation and excavations for footings and piping can proceed essentially in the "dry" without failure.

## 2.0 DRILLING RESULTS

Eight-inch diameter casing was drilled to a total depth of 105 feet (elevation 5 feet). Please refer to the well log (Drawing 3) for descriptions of sediments encountered. It will be noted that a water-bearing sand zone was encountered between depths of 45 to 70 feet (elevations 65 to 40 feet). Drawings 4 to 7 show the grading curves of representative samples of this zone.

Thin water-bearing zones were also encountered above a depth of 33 feet. These zones can be expected to produce weeping of water on the excavation face and should be controlled as much as possible by the temporary dewatering system. Filter blankets should be used to control any localized weeping if the magnitude of the flow is sufficient to move ground.

### 3.0 WELL CONSTRUCTION

The 8-inch diameter casing was withdrawn to a depth of 70 feet as the lower part of the hole was back filled. A 6-inch nominal diameter well screen (5 5/8 inches O.D. and 4 7/8 inches I.D.) was set between depths of 48 to 70 feet. The casing was withdrawn to expose the screen to the water-bearing sands as the annular space between the screen and the casing was filled with F16 Monterey filter sand. The screen was cleaned by bailing and surging.

Cross-section (Drawing 2) shows the settings of the piezometers and their distance from the test well.

### 4.0 PUMP TEST AND RESULTS

The well was pump tested at a constant discharge rate of 10 Igpm (12 USgpm or 0.75 litres per second) for 3,000 minutes (50 hours) from March 30th to April 1st, 1978. During this period water level measurements were taken in the pumping well and in the five piezometers (PH2 to PH6). These readings were recorded and are available upon request.

A semi-logarithmic plot of the water levels at the end of the pump test (Drawing 9) is also attached. This plot shows that the water levels in piezometers PH2-6 fall on a straight line that depicts a transmissivity of 674 USgpd per foot (or a permeability of 27 USgpd per square foot or .00142 cm per second).

This plot also shows that the test well suffered from 10 feet of well loss caused by the groundwater passing into the well from the natural ground through the filter sand and screen. The specific capacity of the well was 0.27 USgpd per foot of drawdown (12/45).

Piezometer PH3 did not fall as fast as the other piezometers and was approximately four feet higher than it should have been. It however was continuing to drop at the end of the test even though the pumping water level in the test well had essentially stabilized at 1,500 minutes into the test.

#### 4.0 PUMP TEST AND RESULTS, cont'd.

The stand pipes in PH2 and PH3 were recording the water levels in the top zone. They dropped four and three feet respectively and show that the test well affected the upper zone even though it was only screened in the lower zone. Please see cross-section Drawing 2 for the levels at which the stand pipes were set.

#### 5.0 TEMPORARY DEWATERING SYSTEM

5.1 Test Well - The test well has been capped and left in place for use as a dewatering well at the contractor's discretion.

5.2 Drainage - The temporary dewatering system must lower the water pressure beneath the excavation in zone "C" to a maximum elevation of 61 feet. The system must drain all parts of zone "C" to a depth of 40 feet below the excavation bottom or to an elevation of 26 feet.

The dewatering system should also maximize the drainage of zone "A".

5.3 Timing - The temporary dewatering system must be in operation and tested before breaking ground and the piezometric water level must be five feet below any level of the excavation as digging proceeds. The temporary dewatering system must continue to maintain the maximum water level beneath the excavation at elevation 61 feet until the excavation is back filled to elevation 90.5 feet.

5.4 Standby - The contractor must supply a standby generator and at least one standby pump and controls. At the critical stage when the final excavation is to elevation 66 feet but before back filling is to elevation 90.5 feet the whole temporary dewatering system must never be off for more than 15 minutes and one well must never be off for more than one hour.

5.0 TEMPORARY DEWATERING SYSTEM, cont'd.

5.5 Water Level Monitoring - Provision must be made to allow water level measurements to be taken in each well and to measure the pumping discharge rate of each well.

A control stand pipe piezometer will be installed in the central area of the northwestern part of the excavation by the owner. This piezometer must be protected by the contractor during excavation.

Other monitoring piezometers are to be installed at the contractor's discretion.

6.0 WATER SUPPLY

The test well was drilled to a total depth of 105 feet in part to explore for groundwater-bearing zones capable of yielding a reliable continuous supply of water for air conditioning purposes. A sand and gravel zone was encountered between depths of 83 and 87 feet. Drawing 8 shows the sieve analysis of a representative sample of this zone.

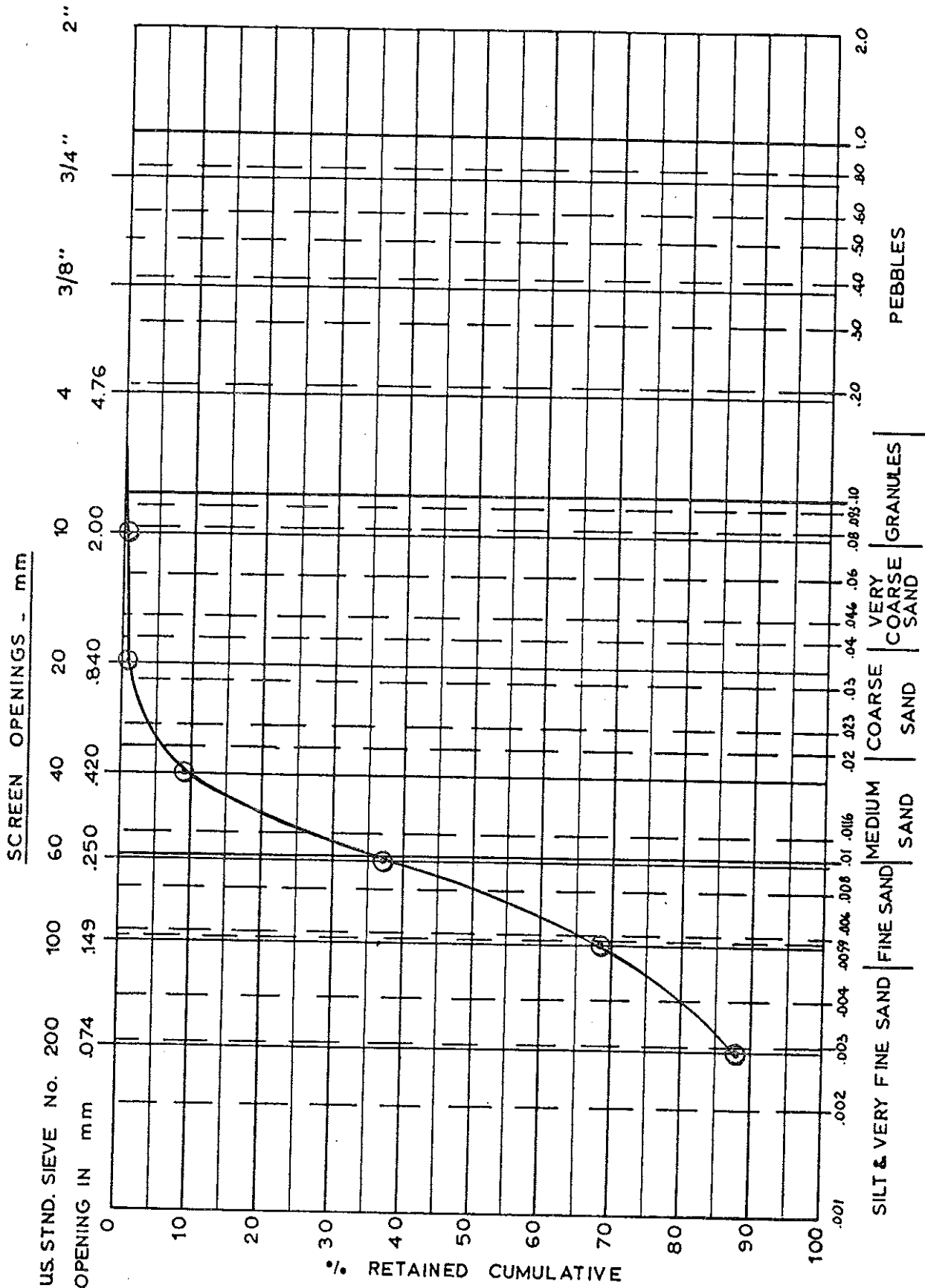
The complex interbedded nature of impermeable till-like deposits and water-bearing zones in the lower part of the test well indicates that a reliable water source is not present. The sand and gravel zone encountered would be a poor producer and is probably a large lens or "bathtub" surrounded by impermeable material. As such the lens would eventually become dewatered and the productivity of the zone reduced to zero.

7.0 CONCLUSIONS

7.1 Dewatering - Analysis of the results of the pumping test show that the excavation can readily be dewatered or depressurized so that it can be excavated without danger of failure by "boils" from artesian pressure zones that underlie the excavation.

7.2 Water Supply - No reliable source of water for air conditioning purposes was discovered by the test well.





SCREEN OPENINGS - INCHES

SCREEN OPENINGS - mm

U.S. STND. SIEVE No. 200 100 60 40 20 10 4 3/8" 3/4" 2"

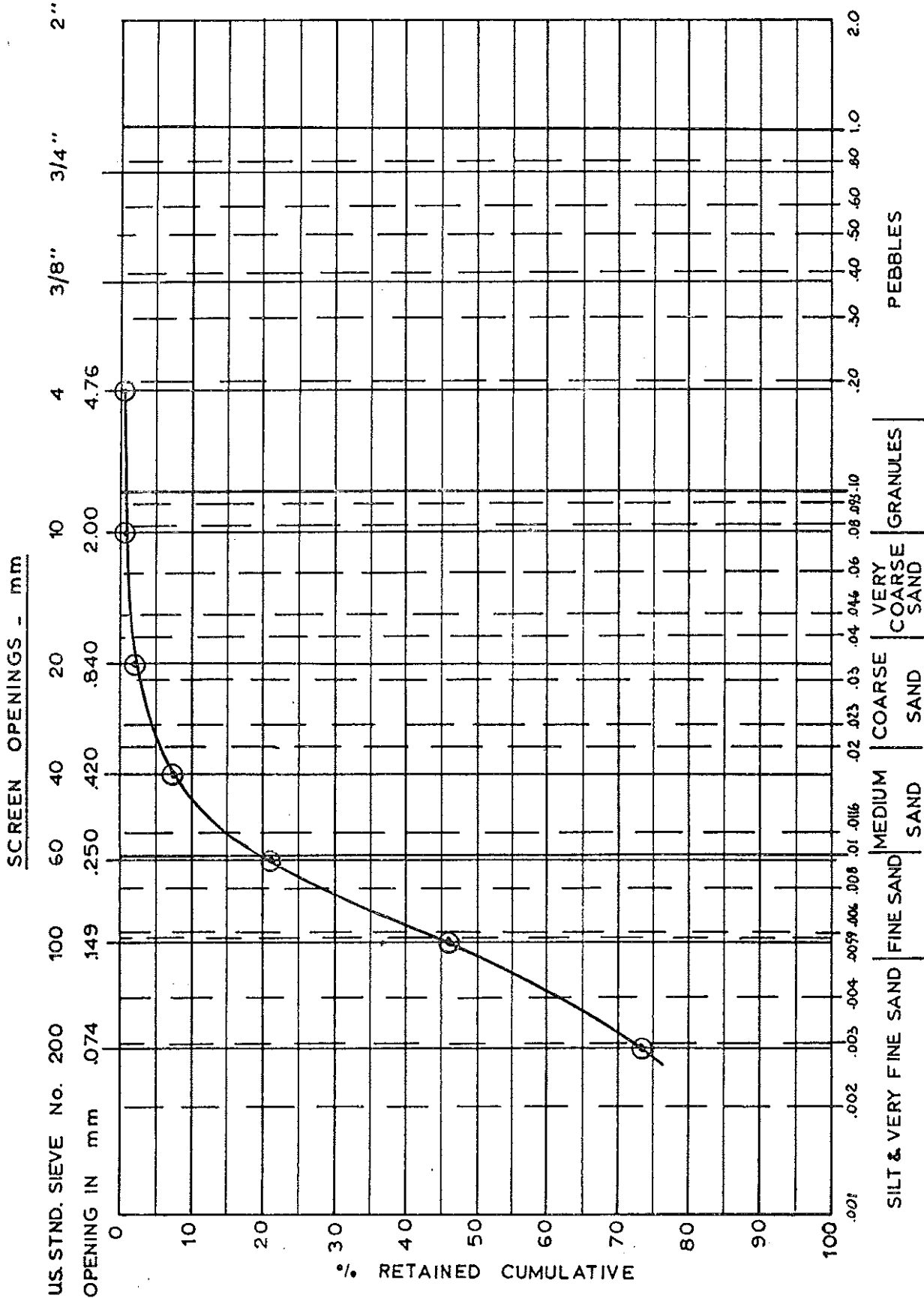
B.C.B.C.

**MACLEOD GEOTECHNICAL LTD.**  
West Vancouver, B.C.

NEW WESTMINSTER  
COURT HOUSE

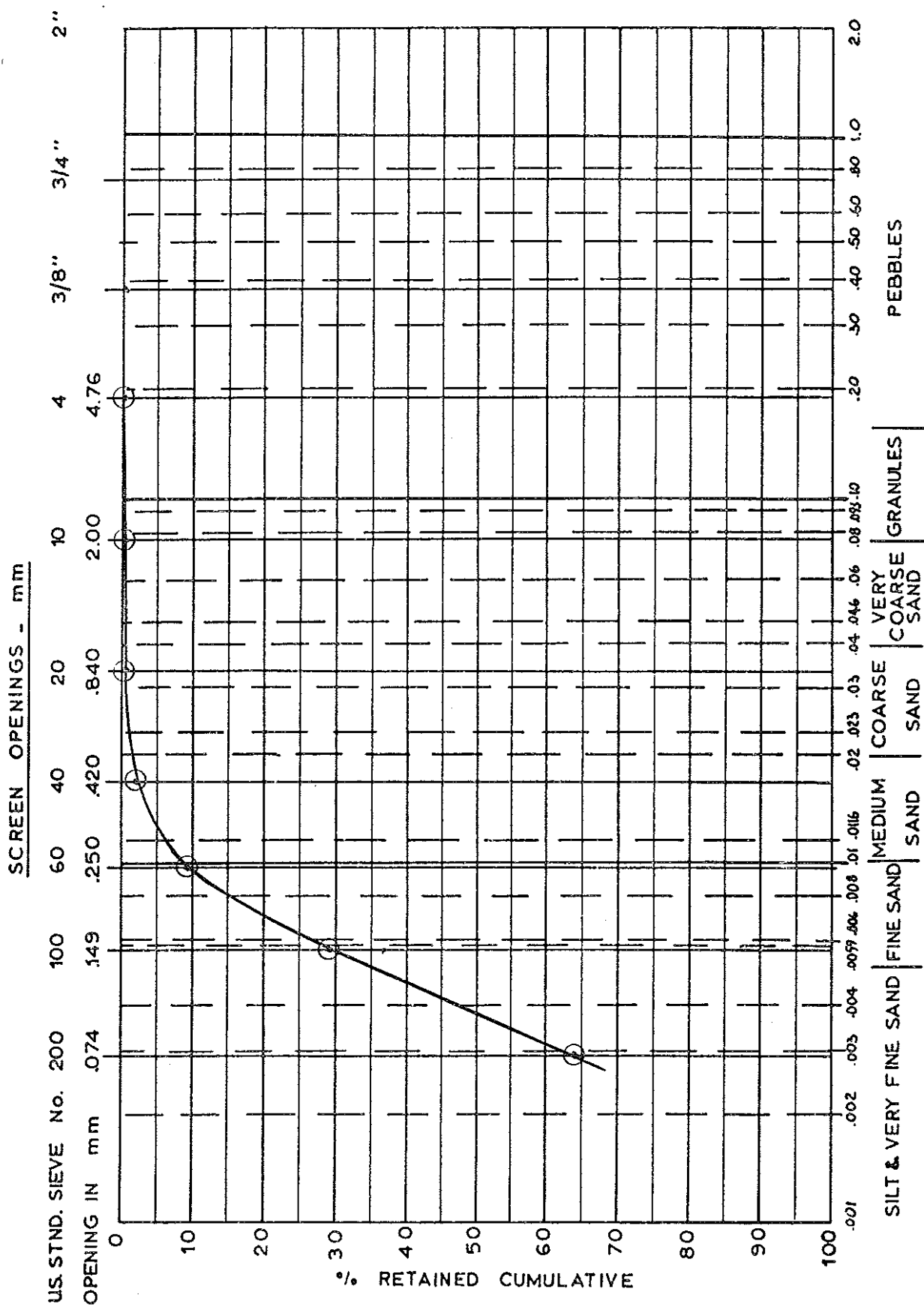
PUMPING TEST HOLE  
SAMPLE 50-54 ft

BY: EN	DATE: MAR 20 '78
JOB B42	DWG.: 4



B.C.B.C.		<b>MACLEOD GEOTECHNICAL LTD.</b>	
		West Vancouver, B.C.	
NEW WEST MINSTER COURTHOUSE	PUMPING TEST HOLE SAMPLE 60-64 FT	BY: EM	DATE: MAR 20 78
		JOB B42	DWG: 6





SCREEN OPENINGS - INCHES

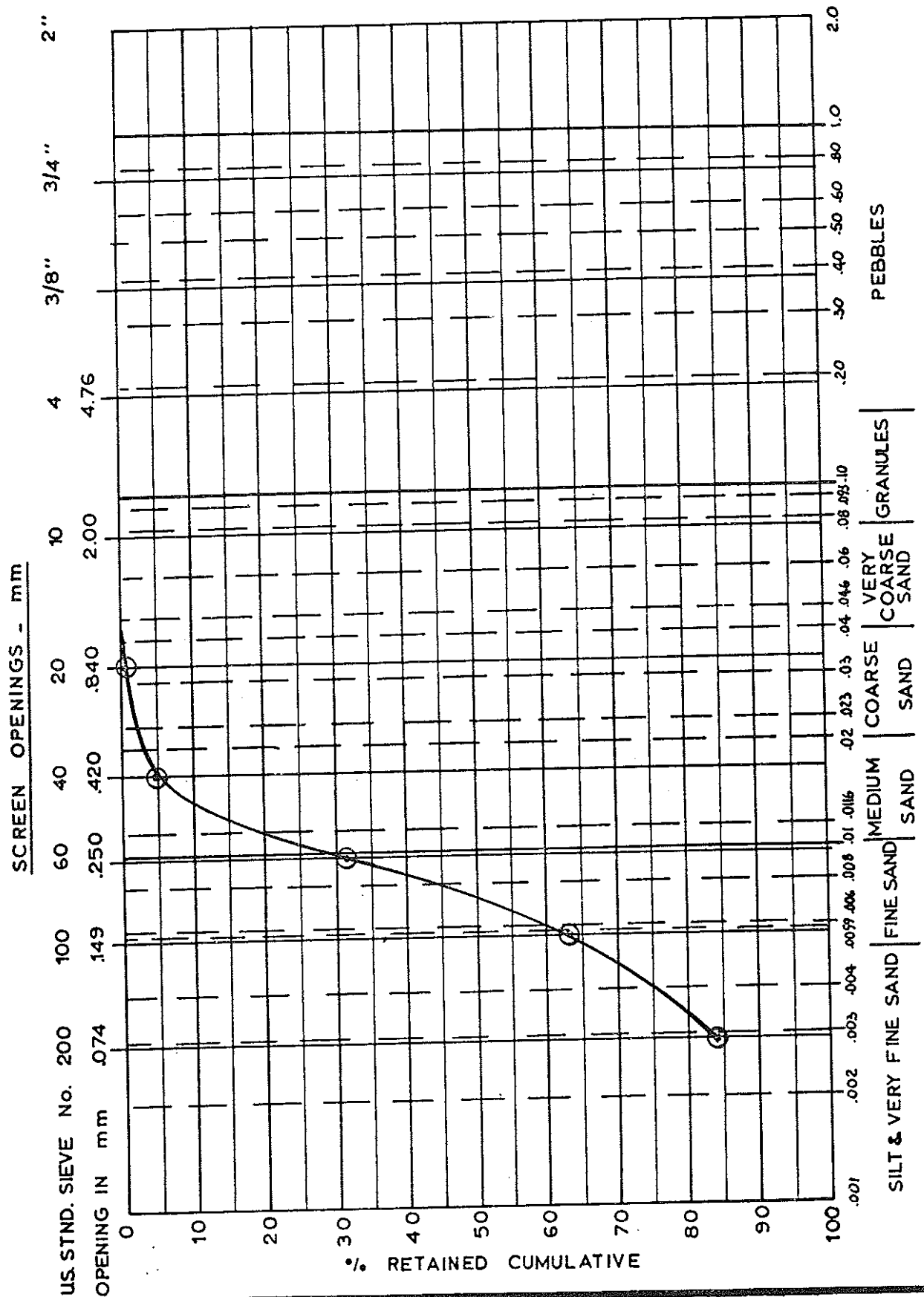
B.C. B.C.

**MACLEOD GEOTECHNICAL LTD.**  
**West Vancouver, B.C.**

NEW WESTMINSTER  
 COURT HOUSE

PUMPING TEST HOLE  
 SAMPLE 60 ft

BY: EN	DATE: MAR 20 '78
JOB 1342	DWG.: 5



B.C.B.C.		<b>MACLEOD GEOTECHNICAL LTD.</b>	
		<b>West Vancouver, B.C.</b>	
NEW WESTMINSTER COURT HOUSE	PUMPING TEST HOLE SAMPLE 70 ft	BY: EN	DATE: MAR 20 '78
		JOB B42	DWG.: 7