*59-F-223C

BRIDGE #12

FAIRMONT AVE.

& OTTAWA

QUEENSWAY

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS AND SURVEYORS
OTTAWA 1
CANADA

G. C. McROSTIE, B.A.Sc., O.L.S., P. ENG., M.E.I.C.
ASSOCIATES
A. SETO, B. ENG., P. ENG., M.E.I.C.
G. E. S. SINCLAIR, B.Sc., D.L.S., P. ENG., M.E.I.C.
W. J. MACLEAN, B.A., D.L.S., O.L.S.
ASSOCIATE CONSULTANT
D. F. COATES, M. ENG., M.A., P. ENG., M.E.I.C.

393 BELL STREET
TELEPHONE CE. 2-5334

59-F-223c

FAIRMONT AVENUE - BRIDGE NO. 12

1. TERMS OF REFERENCE

We were requested by the Ottawa Office of De Leuw Cather & Company to investigate foundation conditions at the site of a proposed bridge to carry the Queensway over Fairmont Avenue. Proposed grades for the Queensway and Fairmont Avenue, and preferred footing elevations were supplied, and a report was to be prepared on the investigation.

2. RECOMMENDATIONS

2.1 Foundation Type

The structure happens to be located at a fault in the rock and this results in unusually variable conditions at the site. It has been necessary to consider each abutment separately since different types of support are recommended for each abutment.

East Abutment

Some type of pile or caisson support is recommended for this abutment. The soils below the abutment are unsuitable for the support of major structural loads for a considerable depth, thus a system of transferring the load of the structure to the fractured rock at depth is necessary.

If "H" piles are used they cannot be expected to develop sufficient resistance in the dense till soils to act as friction piles in this material.

They should be driven into the fractured rock or to end bearing on unbroken rock in the few places where it occurs. The high number of blows for the standard penetration test in some of the till layers has been found not to represent the degree of driving resistance in the Ottawa Area till soils which might be expected from experience elsewhere. Despite the possible lack of frictional driving resistance in the tills, driving difficulties due to boulders are to be expected. Test drilling efforts encountered boulders in several holes with sizes up to a few feet in diameter.

An alternate proposal should be requested on a fixed price basis for abutment support by means of expanded base, encased shaft, concrete piles of the "Franki" type. The specification for this type of pile should provide for a guaranteed load capacity such as 100 tons on a 16 inch shaft diameter with the pile length chosen by the contractor. A load test should be included in the fixed total cost with the test to be made on any pile chosen by the supervising engineer. The specification should also include the requirement for a permanent metal casing for the pile shaft to be fastened to the enlarged base in such a manner that the two will not separate. No metal casing should be filled with concrete until inspected.

West Abutment

For this abutment we would recommend the use of footings to spread the abutment load on the fractured rock at about elevation 208. Random dips in the fractured rock surface were found to be filled with dense till soil but if suitably low bearing values are used on the fractured rock, the

till soils can support similar loads and the dips in the rock surface would not be critical. In addition the rigidity of the abutment itself would allow small areas of low density to be spanned.

The preceding recommendations do not apply however to the southerly wing-wall of the west abutment. Loose till soils overly the fractured rock in this location and the wing-wall footings should therefore follow the fractured rock surface. Towards the westerly end of the wing-wall, where the embankment retained by the wall becomes small, a shallower wing-wall supported on the dense higher soil layers could be considered.

2.2 Soil And Rock Strengths

Bearing values for units of the structure can be recommended as follows: -

East Abutment

Soils at reasonable footing depths are not suitable for the support of a major structure.

West Abutment

fractured rock at about elevation 208	15,000 POUNDS PER SQUARE FOOT
dense till at about elevation 208	10,000 POUNDS PER SQUARE FOOT

West Abutment Southerly Wing-Wall

fractured rock at elevation 208 - 203	15,000 POUNDS PER SQUARE FOOT
soils at elevation 217 - 214	6,000 POUNDS PER SQUARE FOOT
loose soils below elevation 211	Not suitable for support of major elements of structure

Approach Embankment Foundation.

The organic layers encountered in the easterly abutment location would not have suitable strengths to act as a foundation for the approach embankment. These organic soils should be removed despite the fact that they are presently beneath several feet of fill.

2.3 Soil Compressibilities

The soils and rocks which are recommended for use as support of the structure are basically granular soil types and hence do not produce long term consolidation settlements. However, the layers of organic material several feet in thickness which were encountered beneath the easterly abutment would also exist beneath the new approach embankment fills hence large settlements of this fill would occur even if the strength of the organic layer was not exceeded. This fact provides an additional reason for the removal of the organic layers.

2.4 Construction Precautions

During the construction of the westerly abutment foundations, where the rock surface may be irregular, the contractor should be prevented from excavating in a manner that would disturb the bearing soils. Even in the fractured rock areas the material should be treated in a similar manner as an earth excavation so that the natural tendency of an excavator who feels that he is "going to rock" can be prevented. It is unlikely that any smooth working surface will result and if the loosest rock fragments cannot be removed by hand or by machine scraping, recompaction of the upper few inches of broken material may be required.

Another item which should be considered during construction is that the foundations of the existing bridge abutment may cause some interference with normal construction operations. This point should be drawn to the attention of the bidders.

An important point regarding the relative timing of the construction period for the easterly abutment and its approach fill is that the organic soils under the site of the structure should be removed before the structure or the embankment is built. These organic soils would be stressed by the weight of the approach embankment and could provide the mechanism for a failure by lateral yield. If the structure were to be built first, without the removal of the organic soils, it would be very difficult to have them removed at a later date.

3. SITE INVESTIGATION

3.1 Field Work

The field work in this investigation was more extensive than normal since variable soil and rock conditions were gradually discovered. Investigation was made in four stages with a period of study of the previous findings inbetween each stage and with consultations with the designing office to discuss the significance of information as it became known.

The four stages of the program are outlined below:

Stage 1 - Six boreholes were made at the site in the normal pattern with our test drilling rig, samples were recovered and a study was made of the till soils to investigate the possibility of their use as foundation support for the structure.

Stage 2 - When soil and rock conditions were found to be variable, and footings on the till soils found unlikely to be suitable, and considerable depths of soil deposit found in the southeasterly corner of the east abutment, three additional holes were made in the deepest soil area. Two of the holes were made with our test drilling rig and the third was made by J. B. Dufresne Limited, Drilling Contractors, who were asked to bring heavy drilling equipment in an effort to overcome difficulties due to boulders. Great difficulty was experianced in all three holes due to boulders and the borehole (No. 8) made by J. B. Dufresne Limited was discontinued before reaching rock and little information was gained from it except that test drilling conditions were exceptionally difficult. At this time, test drilling was discontinued and a test pile scheme was studied as an alternate means of providing information on the load capacity and possible length of end bearing piles.

Stage 3 - The slope of the rock at the easterly edge of the footings for the westerly abutment and soil conditions for an extension of the southerly wing-wall were then studied by means of three boreholes (Nos. 10, 11 and 12) made with our test drilling rig. In these holes the elevation of the rock surface was the main object of study.

Stage 4 - When unusual variations in rock depth and structure were observed in Stage 3, two further holes were made with our test drilling rig. These holes confirmed that soil and rock conditions were exceedingly variable and that special foundation measures would be required.

In all stages, 2" split barrel samples were recovered in the non-cohesive soil layers, standard penetration tests were performed in the boreholes, and groundwater levels were observed during the field program. During diamond drilling a watch for and record of drops and discontinuities in the drilling was kept so that as much information as possible could be obtained on the rock structure in place.

3.2 Laboratory Testing

As mentioned above, the samples recovered in Stage 1 of the investigation were tested for water content and mechanical analysis in order to provide aids to a judgement of their inplace densities. These results also aided in judging the suitability of the tills for use as support of friction piles.

3.3 Rock Core Logging

Since fractured rocks at a fault zone are involved and a complex rock surface was discovered which is of considerable significance in the design and construction of the new structure, a complete description

of the cores recovered and of the information obtained regarding the rock formation during drilling has been included in the report.

3.4 Observations

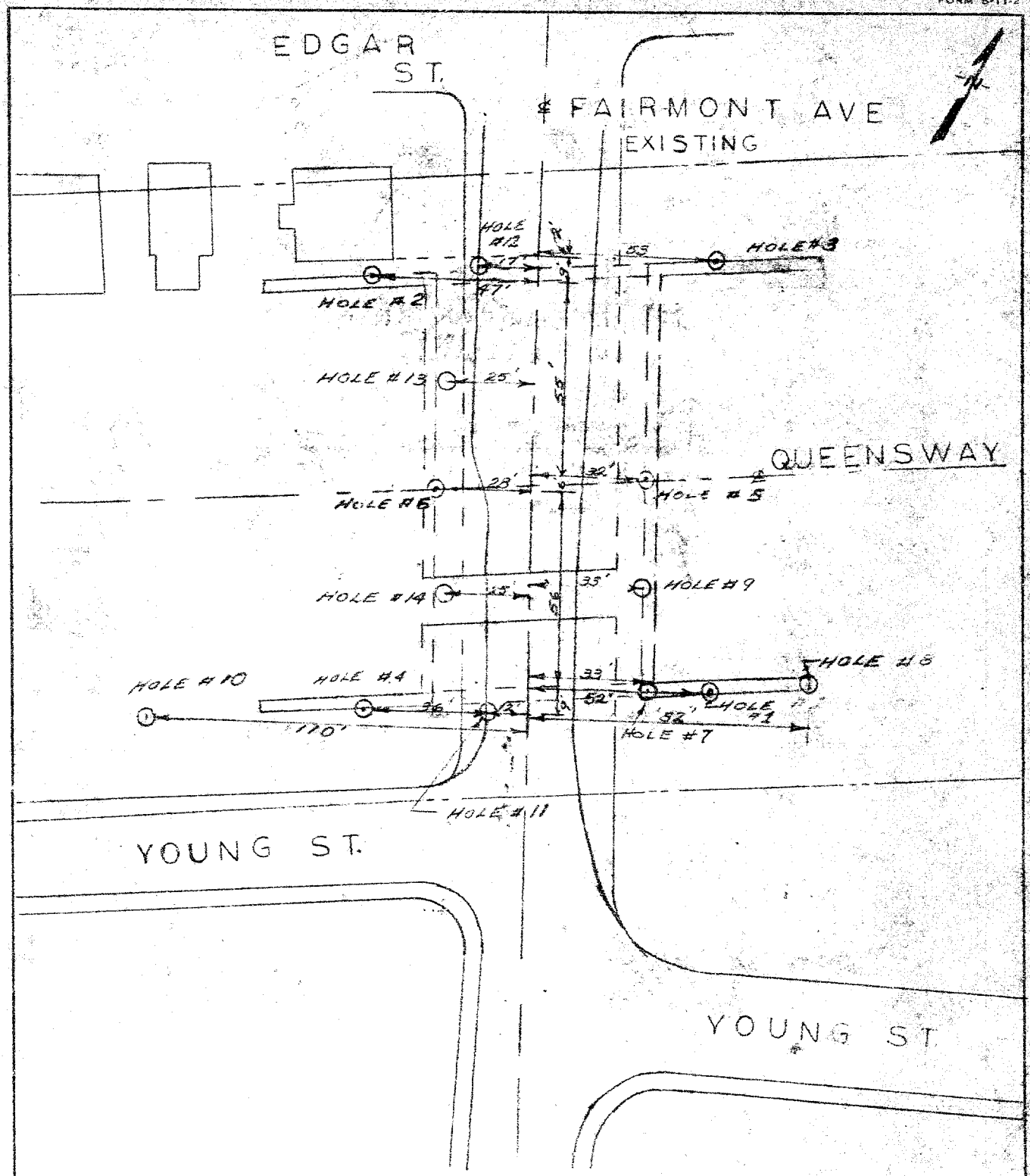
Details of soil and rock conditions are shown on the accompanying plates but can be generalized as follows. The site of the structure apparently lies across the edge of one of a group of rock faults which traverse the area and hence abrupt changes in the rock surface were observed. These changes involve rock depths which vary from a few feet to more than 50 feet within a space of 40 feet or less.

The rock itself, which is a limestone of the Ottawa Formation, is strongly fractured due to the fault action and the upper layers are weathered in addition to the fractures. Where soils exist to considerable depths, they are chiefly glacial tills overlain by sands, fills, or organic deposits, and the tills were observed to have densities varying from loose to very dense. A significant boulder content exists in the till, boulders up to 2 feet in diameter were encountered during the test drilling and doubtless larger boulders are present. Groundwater levels were observed at 5 to 10 feet below the surface and, with the exception of spring thaw conditions, appear to be controlled by the level of municipal sewers on adjacent streets.

The remains of a former railway bridge and the approach fills for this bridge occupy part of the site of the new structure. The effect of these existing features should be considered in the construction of both the new embankment and the new structure.

Finally, in summary, it could be noted that this site is both complex and difficult for investigation, design, and construction, but is fortunately not typical of what can be generally expected.

FORM 6-11-2



McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

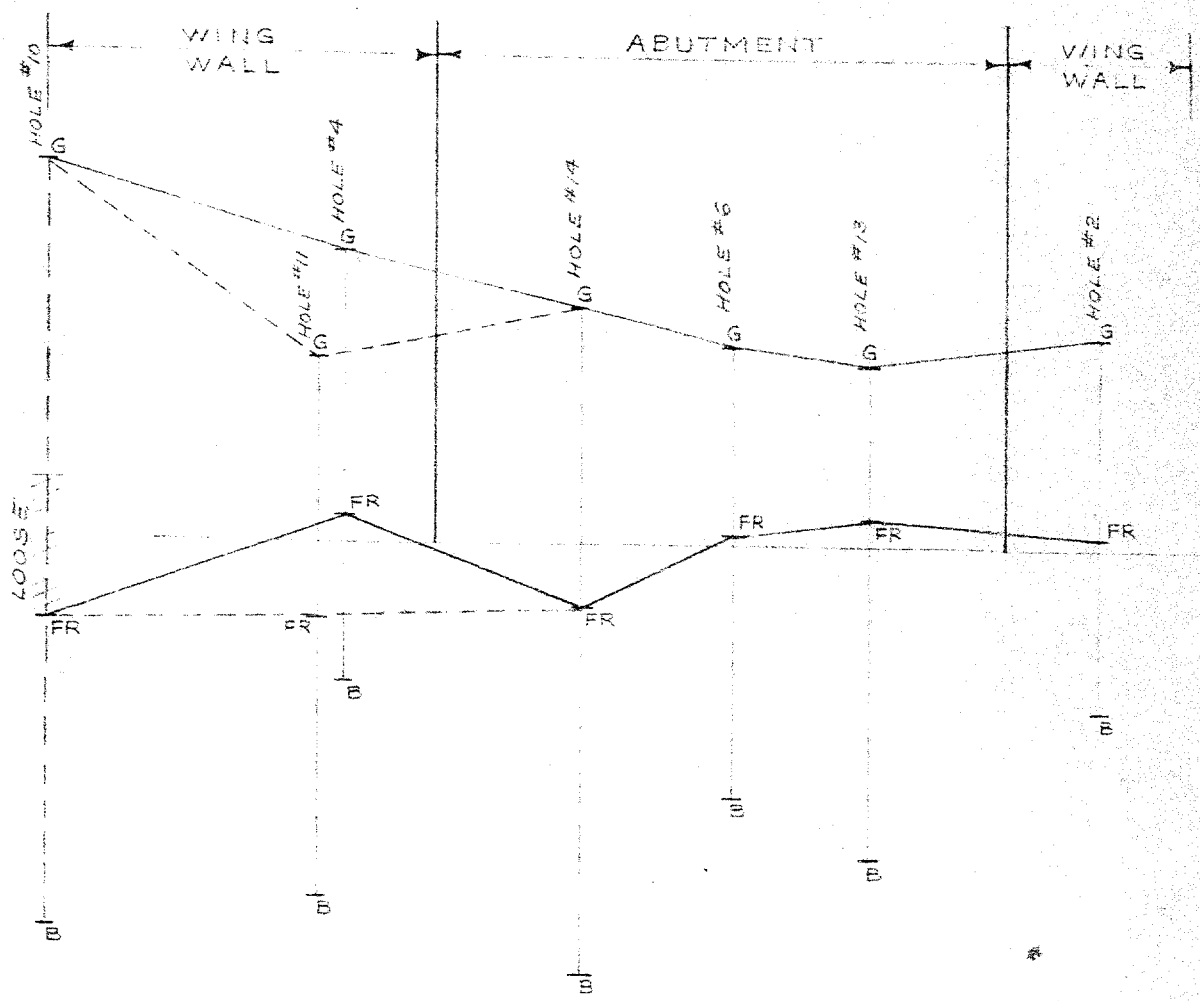
BOREHOLE LOCATIONS

QWY ℄ FAIRMONT

SCALE 1" = 40'

PLATE 1

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA



G = GROUND

FR = FRACTURED ROCK

B = BOTTOM OF HOLE

SCALES: HORIZONTAL: 1" = 40'
VERTICAL: 1" = 10'

SECTION THROUGH WEST ABUTMENT AND AROUND WING WALLS

QUEENSWAY & FAIRMONT

PLATE NO. 2

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 221.3 DATE 21-24 Nov. 1958 HOLE NO. 1

REMARKS CITY B.M. R.C. SCHOOL ON MELROSE SOUTH OF DUNNMEL ELEV. 223.7 : GEODETIC DATUM

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL (FOR MECHANICAL ANALYSIS SEE PLATES No. 31 TO 35)	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	221.3
		3	1-1	FILL		
		10	1-2			
		10 for 6" 13	1-3		8.0	
					10.0	211.3
		5	1-4	ORGANIC		
					12.5	
		33	1-5	DENSE GRAVELLY TILL		
					15.2	
		5	1-6			
		11	1-7			
		5	1-8		20.0	201.3
		10	1-9			
		7	1-10	LOOSE TILL		
					30.0	191.3
		13	1-11			
					35.0	
		80	1-12			
				DENSE TILL	40.0	181.3
		153	1-13			
					43.8	
				BOULDERS IN TILL	46.0	175.3
				BOTTOM OF HOLE		

LB. HAMMER ..... INCH DROP

NO CASING ..... INCH DIA. ROD

OVERNIGHT W.L. EL. 211.9

0 20 40 60 80 10

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 3

L.-M. CO.—A30614

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 219.5' DATE 20 Nov. /58

REMARKS See Plate No. 3 – FOR MECHANICAL ANALYSIS SEE PLATE No. 36

HOLE No. 2

[redacted] LB. HAMMER [redacted] INCH DROP NO CASING [redacted] INCH DIA. ROD

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	219.5
		19	2-1	FILL		
		19	2-2	MEDIUM DENSE FINE & MEDIUM SAND	5.5 / 7.5	
		14	2-3	MEDIUM DENSE TILL		
		14 for 11"	2-4		10.0 / 10.9	209.5' / 208.6
				FRACTURED LIMESTONE CORE RECOVERY 50%	13.4	
				LIMESTONE CORE RECOVERY 82%	14.9	
				FRACTURED LIMESTONE CORE RECOVERY 61%	16.4	
				FRACTURED LIMESTONE CORE RECOVERY 57% 60°-80° DIP	20.5	199.0
				BOTTOM OF HOLE		

OVERNIGHT W.L. 213.9

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 4

L.-M. CO.—A30614

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 214.4' DATE 13-18 Nov. 1958

REMARKS See PLATE No 3 - FOR MECHANICAL ANALYSIS SEE PLATES No. 37 TO No. 41

HOLE No. 3

[redacted] LB. HAMMER [redacted] INCH DROP NO CASING .....INCH DIA. ROD

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	214.4'
		49	3-1	FILL		
					5.0	
		3	3-2	ORGANIC		
		1 5 in 18"	3-3			
					10.0	204.4
		35	3-4	MEDIUM DENSE SANDY TILL		
		19 for 6"	3-5		12.5	
		125 for 1"	3-6	DENSE TILL		
		96	3-7			
					20.0	194.4
		60 for 6"	3-8	DENSE SANDY TILL & BOULDERS		
		67	3-9		24.0	
		76	3-10	DENSE TILL		
		72	3-11			194.4
				BOULDER	32.5	
				DENSE TILL	34.0	180.4
				SHALEY LIMESTONE (CORE RECOVERY 85%)		
				SHALEY LIMESTONE (CORE RECOVERY 81%)	44.6	
				CORE RECOVERY 93% 45° DIP	44.2	170.2
				BOTTOM OF HOLE		

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 5

L.-M. CO.—A30814

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 223.8 DATE 19-20 Nov. '58 HOLE NO. 4

REMARKS See PLATE No. 3 - FOR MECHANICAL ANALYSIS SEE PLATES No. 4-2 AND No. 4-3

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0'	223.8
		5	4-1	FILL		
		28	4-2	6.5'		
		47 for 6"	4-3	DENSE SANDY TILL		
		29	4-4	DENSE WELL GRADED SAND WITH SOME GRAVEL 12.5'	10.0	213.8
		10	4-5	LOOSE TILL 14.2'		209.6
				WEATHERED LIMESTONE CORE RECOVERY 74% 30° DIP 18.9'		
				FRACTURED LIMESTONE (CORE RECOVERY 77%)	23.6'	200.2
				BOTTOM OF HOLE		

½" Drop

OVERNIGHT W.L. EL 214.6

..... LB. HAMMER
..... INCH DROP
NO CASING
..... INCH DIA. ROD

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 6

L.-M. CO.—A30614

FORM S-10-2 REV.

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 221.0' DATE 4-5 DEC. /58

REMARKS See PLATE No. 3 - FOR MECHANICAL ANALYSIS SEE PLATES No. 44 TO No. 46

HOLE NO. 5

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0'	221.0'
		11	S-1	FILL		
		11	S-2			
		5	S-3	8.0		
		6	S-4	ORGANIC	10.0	211.0
		8	S-5	11.5'		
		11	S-6	LOOSE TILL		
		24	S-7	17.5		
		9 for 6"	S-8	MEDIUM DENSE TILL	20.0'	201.0
		171	S-9	21.0		
		45 for 6"	S-10	BOULDERS IN DENSE TILL		
				27.0		194.0'
				WEATHERED LIMESTONE		
				CORE RECOVERY 48% 5.0	30.0'	191.0'
			3" DROP	CORE RECOVERY 36%		
				45° DIP 34.0'		
				SHALEY LIMESTONE		
				CORE RECOVERY 81%		
				30° DIP 38.0		
				CORE RECOVERY 100%		
				30° - 45° DIP		
				41.0'		180.0
				Bottom of Hole		

..... LB. HAMMER
..... INCH DROP

NO CASING
..... INCH DIA. ROD

OVERNIGHT W.L. EL. 212.5

0 20 40 60 80 1

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 7

L.-M. CO.—A31832

FORM S-10-2 REV.

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 218.8 DATE 8-9 DEC. /58

REMARKS See PLATE No. 3

HOLE NO. 6

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0'	218.8
		39	6-1	FILL	4.0'	
		46	6-2			
		100 for 5"	6-3	DENSE TILL		
		95 for 5"	6-4	WEATHERED SHALEY LIMESTONE 35° DIP	10.4'	208.4
		½" DROP		CORE RECOVERY 54 %	12.4'	
				SHALEY LIMESTONE 30° DIP		
				CORE RECOVERY 84 %	15.7'	
				LIMESTONE C.R. 89 %	16.4'	
				FRACTURED LIMESTONE 45° DIP		
				CORE RECOVERY 62 %	18.8'	
				30° DIP		
				CORE RECOVERY 73 %	21.0'	
				LIMESTONE 45° DIP		
				CORE RECOVERY 91 %	24.7'	194.1
				BOTTOM OF HOLE		

[redacted]

[redacted] LB. HAMMER [redacted] INCH DROP

NO CASING [redacted] INCH DIA. ROD

⊙ OVERNIGHT W. L. EL. 208.2

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 8

L.-M. CO.—AS1632

FORM S-10-2 REV.

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 220.8 DATE 15-22 Dec. /58

REMARKS See Plate No.3 - FOR MECHANICAL ANALYSIS SEE PLATE No. 47

HOLE No. 7

UNCONFINED COMPRESSIVE STRENGTH, KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	220.8
		7	7-1	FILL		
					9.0	
		7	7-2	ORGANIC	10.0	
					16.5	
		8	7-3	LOOSE TILL		
	ENCOUNTERED STONE	56 for 6" 190	7-4		20.0	200.8
		83	7-5	DENSE TILL		
		71 for 6" 89 for 6"	7-6		30.0	190.8
		DRILLED	7-7		34.5	
				BOULDERS IN TILL	38.0	
		64 for 6" 125 for 6"	7-8	DENSE SANDY TILL	40.0	180.8
					42.5	178.3
				FRACTURED SHALEY LIMESTONE (CORE RECOVERY 33%)		
					47.9	
				CORE RECOVERY 55%	49.5	
					50.0	170.8
				CORE RECOVERY 76%		
					53.0	
				CORE RECOVERY 45%	54.9	
				CORE RECOVERY 43%		
				CORE RECOVERY 29%	56.6	
					58.0	
				FRACTURED SHALEY LIMESTONE 30° DIP		
				CORE RECOVERY 52%	60.6	160.8
				BOTTOM OF HOLE	61.8	159.0

.....LB. HAMMER
.....INCH DROP

NO CASING
.....INCH DIA. ROD

OVERNIGHT W.L. EL. 211.0

0 20 40 60 80 10

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 9

L.-M. CO.—A31632

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 221.2 DATE 17-24 FEB 1/59

REMARKS See Plate No. 3

HOLE NO. 8

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	221.2'
		11	S-1	Fill		
		7	S-2	Organic	10.5	210.7'
					13.5	208.7'
		5	S-3	Loose Till		
					20.0	201.2'
		9-10-7	S-4	Boulders in Soil	25.0	196.2'
					30.0	191.2'
					42.6	178.6'
				Bottom of Hole		

W.L. 20 FEB 1/59 EL 218.3

W.L. 18 FEB 1/59 EL 216.3

W.L. 21 FEB/59 EL 207.7

W.L 19 FEB/59 EL 204.7

..... LB. HAMMER
..... INCH DROP
NO CASING
..... INCH DIA. ROD

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 10

L-M CO-TA 2SP45

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 230.5 DATE 5-10 MARCH 159

REMARKS See Plate No. 3.

HOLE NO. 9

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	230.5
		14	9-1			
		9	9-2	Sandy Fill		
		8	9-3			
		16	9-4		17.5	213.0
		15		Organic		
		19 for 6"	9-5		21.0	209.5
				Dense Sand with Gravel	22.5	208.0
		8	9-6	Loose Till		
					25.0	205.5
		12	9-7	Medium Dense Till		
					30.0	200.5
		34	9-8	Dense Sandy Till		
					32.0	198.5
		29	9-9	Medium Dense Sandy Till		
		117 for 9"	9-10		40.0	190.5
				Dense Till		
					44.9	185.6
				Boulders in Till		
					47.5	183.0
				FRACTURED SHALEY LIMESTONE CORE RECOVERY 30%		
				60° DIP	52.5	178.0
				CORE RECOVERY 73%	55.0	175.5
				FRACTURED LIMESTONE CORE RECOVERY 75%		
					60.8	169.7
				FRACTURED SHALEY LIMESTONE CORE RECOVERY 21%	64.2	166.3

[redacted] LB. HAMMER [redacted] INCH DROP NO CASING [redacted] INCH DIA. ROD

[redacted]

OVERNIGHT W.L., EL. 212.7

0 20 40 60 80 100

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 11

L.-M. CO.—A33048

BOTTOM OF HOLE

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 228.7' DATE 19-20 & 28-29 May/59 HOLE NO. 10

REMARKS SEE PLATE No. 3

OVERNIGHT W.L. DRY 21 MAY /59

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	228.7'
		14	10-1	FILL		
		6	10-2			
		4 6 16	10-3	LOOSE SILTY WELL GRADED SAND WITH SOME GRAVEL	6.5' / 8.0'	222.2' / 220.7'
		29	10-4	MEDIUM DENSE SILTY		
		9 6 6	10-5	WELL GRADED SAND WITH SOME GRAVEL		
		13 6 6 58	10-6	DENSE TILL / DENSE WELL GRADED SAND	15.5' / 16.5' / 17.5'	213.2' / 212.2' / 211.2'
		6	10-7			
		4	10-8	LOOSE TILL		
		7	10-9			
				WEATHERED OR FRACTURED LIMESTONE CORE RECOVERY 54%	25.3' / 28.1'	203.4' / 200.6'
				CORE RECOVERY 74%	31.0'	197.7'
				CORE RECOVERY 43%	33.5'	195.2'
				CORE RECOVERY 45%	37.0'	191.7'
				FRACTURED LIMESTONE CORE RECOVERY 75%	39.0'	189.7'
				CORE RECOVERY 75% / LIMESTONE CORE RECOVERY 93%	39.8' / 40.3'	188.9' / 186.4'
				BOTTOM OF HOLE		

..... LB. HAMMER
..... INCH DROP
NO CASING
..... INCH DIA. ROD

0 20 40 60 80 100
% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊟
PLASTIC LIMIT △

PLATE 12

L-M... O.—A35049

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

Q.W.Y. & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 218.0 DATE 21 May /59

REMARKS SEE PLATE No. 3

HOLE NO. 11

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION	PROBING OR VANE TEST
				GROUND SURFACE	0.0	218.0	.....LB. HAMMER / .....INCH DROP; NO CASING .....INCH DIA. ROD; BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.²
				SOIL			OVERNIGHT W.L. EL 209.7
				WEATHERED OR FRACTURED LIMESTONE	14.1	203.8	
				CORE RECOVERY 36%	17.1		
				CORE RECOVERY 41%	18.6	199.4	
				LIMESTONE CORE RECOVERY 87%	19.9		
				CORE RECOVERY 86%			
				FRACTURED LIMESTONE	22.2	195.8	
				CORE RECOVERY 43%	24.7	193.3	
				LIMESTONE			
				CORE RECOVERY 95%			
				BOTTOM OF HOLE	29.7	188.3	

% WATER CONTENT
NATURAL ○
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 13

L.-M. CO.—AS3048

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 217.2' DATE 22 MAY 59

REMARKS See Plate No. 3

BORE HOLE DRY ON 1 JULY 59

HOLE No. 12

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION	PROBING OR VANE TEST
				GROUND SURFACE	0.0	217.2	.....LB. HAMMER / NO CASING .....INCH DROP / .....INCH DIA. ROD BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.²
				SOIL			
				FRACTURED LIMESTONE CORE RECOVERY 60%	4.8	212.4'	
				CALCITE SEAMS CORE RECOVERY 80%	6.1	211.1	
				LIMESTONE CORE RECOVERY 100%	6.9 7.4	210.3 209.8	
				CORE RECOVERY 100%	9.4	207.8	
				CORE RECOVERY 100%	10.4	206.8	
				CORE RECOVERY 90%	12.0	205.2'	
				CORE RECOVERY 96%	14.0	203.2'	
				BOTTOM OF HOLE			

% WATER CONTENT
NATURAL ○
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 14

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY; FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 217.9 DATE 4th JUNE 59

REMARKS See Plate No. 3

BOREHOLE DRY ON 1 JULY 59

HOLE NO. 13

[redacted] LB. HAMMER ..... INCH DROP NO CASING ..... INCH DIA. ROD [redacted]

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	217.9
				FILL		
		29	13-1		2.5	215.4
				MEDIUM DENSE TILL		
		41	13-2		5.5	212.4
		100 blows/6"		DENSE TILL		
					8.6	209.3
				WEATHERED LIMESTONE 45°-50° DIP CORE RECOVERY 55%	11.0	206.9
				FRACTURED LIMESTONE CORE RECOVERY 72% 45° DIP	12.5	205.4
				CORE RECOVERY 56% 60° DIP	15.2	202.7
				CORE RECOVERY 72%	17.6	200.3
				45°-70° DIP CORE RECOVERY 59%	22.1	195.8
				LIMESTONE 45° DIP CORE RECOVERY 94%	27.0	190.9
				BOTTOM OF HOLE		

0 20 40 60 80

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊟
PLASTIC LIMIT △

PLATE 15

L.-M. CO.—A33048

FORM S-10-3

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

QWY & FAIRMONT

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 220.8 DATE May 29th to June 3rd/54

REMARKS See Plate No. 3

HOLE NO. 14

[redacted] ..... LB. HAMMER ..... INCH DROP — NO CASING ..... INCH DIA. ROD [redacted]

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0.0	220.8
		4	19-1	FILL		
		3 to 6 / 16	14-2	MEDIUM DENSE SILTY TILL	5.5 / 6.5	215.3
		10	14-3	LOOSE TILL (1" SILT LAYER AT 6.2')		
		6 to 9	14-4		10.8	210.0
				BOULDERS IN TILL		
		15 to 6"	14-5	MEDIUM DENSE TILL	12.5 / 13.5	
				DENSE TILL		
				WEATHERED OR FRACTURED LIMESTONE - 45° DIP	16.3	204.5
				CORE RECOVERY 50%	19.9	
				CORE RECOVERY 80%		
				FRACTURED LIMESTONE	23.0	197.8
				CORE RECOVERY 47%	24.6	
				CORE RECOVERY 69%	26.1	
				30° - 45° DIP		
				CORE RECOVERY 73%		
				LIMESTONE	31.7	189.1
				45° - 60° DIP		
				CORE RECOVERY 81%		
				BOTTOM OF HOLE	36.7	184.1

TILL ○ SILT

0 20 40 60 80 10

% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT ⊡
PLASTIC LIMIT △

PLATE 16

L-M. CO.—AS3048

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT Queensway at Fairmont
BOREHOLE NO. 2
SURFACE ELEV'N 219.5' (MSL)
BOREHOLE DEPTH 20.5'

DRILLER W. Deevy
RECORDER G.Bilodeau
BORING DATE 20 Nov. 1958
LOGGING BY G.L. Genest P.Eng.
CORE SIZE 7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	219.5	GROUND SURFACE soil - fill, sand and till
	208.6	BEDROCK SURFACE
No drop of rods no loss of drill water	50%	fractured limestone, dark grey, medium grained, high angled joints, calcite filled to 1/16", thin shaley partings between bedding planes, some pyrite deposit, core lengths - from broken to 2", probable 60° dip
	206.1	
no drop of rods no loss of drill water	89%	limestone, dark grey, fine to medium grained, vertical fracture at El.203.9 ¾", thick limestone filled and vertical hairline calcite infilling, near horizontal joints calcite and crystallin calcite filled to 1/8", average core lengths 1½", probable 80° dip
	204.6	
no drop of rods no loss of drill water	61%	fractured limestone, dark grey, fine to medium grained, high angled joints calcite filled to 1/16", core lengths - from broken to 2", probable 45° dip
	203.1	
no drop of rods no loss of drill water	57%	fractured limestone, dark grey, medium grained, high angled joints calcite filled to 1/16", core lengths - from broken to 4", 60°- 80° dip
	199.0	BOTTOM OF HOLE

PLATE NO. 17

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	3	RECORDER	G. Bilodeau
SURFACE ELEV'N	214.4 (MSL)	BORING DATE	13-18 Nov, 1958
BOREHOLE DEPTH	44.2'	LOGGING BY	G.L. Genest P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	214.4	GROUND SURFACE soil - fill and till
	180.4	BEDROCK SURFACE
no drop of rods no loss of drill water	85%	shaley limestone, dark grey, fine grained, vertical joints calcite filled 1/32" to 1/2", distorted bedding planes at El.178.9, average core lengths 1½", probable 60° dip
	178.2	
no drop of rods no loss of drill water	81%	shaley limestone, dark grey, fine grained, shale partings to 3/8", vertical joints calcite filled 1/32" to ½" at El. 176.6, average core lengths 2"
	173.6	
no drop of rods no loss of drill water	93%	shaley limestone, dark grey, fine grained, vertical joints calcite filled to 1/16", shale partings to 1/4", average core lengths 2½", 45° dip
	170.2	BOTTOM OF HOLE

PLATE NO. 18

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	4	RECORDER	G. Bilodeau
SURFACE ELEV'N	223.8 (MSL)	BORING DATE	19-20 Nov., 1958
BOREHOLE DEPTH	23.6'	LOGGING BY	G.L. Genest P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	223.8	GROUND SURFACE soil - fill and till
	209.6	BEDROCK SURFACE
½" drop of rods at El.207.1 Lost drill water at El.207.1	74%	Weathered or fractured limestone, dark grey, fine grained, vertical joints, calcite filled to ¼", core lengths - from broken to 2", 30° dip
	204.9	
no drop of rods losing drill water	77%	fractured limestone, dark grey, fine grained, high angled joints, calcite filled to 1/16", fracture zone at El.202.8, calcite filled to ¾", core lengths - from broken to 4", probable near horizontal bedding.
	200.2	BOTTOM OF HOLE

PLATE NO. 19

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	5	RECORDER	G. Bilodeau
SURFACE ELEV'N	221.0 (MSL)	BORING DATE	4-5 Dec, 1958
BOREHOLE DEPTH	41.0'	LOGGING BY	G.L. Genest P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	221.0	GROUND SURFACE soil - fill and till
	194.0	BEDROCK SURFACE
no drop of rods no loss of drill water	48%	weathered limestone, dark grey, fine to medium grained, vertical joints, calcite filled to 1/16", core lengths - from broken to 2½", near horizontal bedding.
	190.0	
3" drop of rods at El. 189.2 no loss of drill water	36%	Weathered limestone, dark grey, fine to medium grained, thin shaley partings calcite intrusions, core lengths - from broken to 3", 45° dip
	187.0	
no drop of rods no loss of drill water	81%	shaley limestone, dark grey, fine to coarse grained, high angled joints, calcite filled to 1/32", fracture zones at El. 186.3 and 185.0 shale infilling, average core lengths 2½", 30° dip
	183.0	
no drop of rods no loss of drill water	100%	shaley limestone, dark grey, fine grained, high angled joints, calcite filled to 1/16", vertical fracture at El 181.6 shale infilling, average core lengths 2½", 30° - 45° dip
	180.0	BOTTOM OF HOLE

PLATE NO. 20

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	6	RECORDER	G. Bilodeau
SURFACE ELEV'N	218.8 (MSL)	BORING DATE	8-9 Dec. 1958
BOREHOLE DEPTH	24.7	LOGGING BY	G.L.Genest,P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	218.8	GROUND SURFACE soil - fill and till
½" drop of rods at El 207.0 no loss of drill water	208.4 54%	BEDROCK SURFACE weathered shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", core lengths - from broken to 2", 30° dip
no drop of rods no loss of drill water	206.4 84%	shaley limestone, dark grey, fine to medium grained, vertical joints calcite filled to 1/16", thin shale partings between bedding planes, average core lengths 2", 30° dip
no drop of rods no loss of drill water	203.1 89%	limestone, dark grey, fine grained hairline partings calcite filled, average core lengths 1", probable 45° dip
no drop of rods no loss of drill water	202.4 62%	fractured limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", thin shale partings, core lengths - from broken to 2", 45° dip
no drop of rods no loss of drill water	200.0 73%	fractured limestone, dark grey, fine grained, vertical joints calcite filled to 1/16", thin shale partings, average core lengths 2", 30° dip
no drop of rods no loss of drill water	197.8 91%	limestone dark grey, fine grained, hairline joints calcite filled, thin shale partings, average core lengths 2", 45° dip
	194.1	BOTTOM OF HOLE

PLATE NO. 21

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	7	RECORDER	G. Bilodeau
SURFACE ELEV'N	220.8 (MSL)	BORING DATE	15-22 Dec. 1958
BOREHOLE DEPTH	61.8'	LOGGING BY	G.L.Genest,P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	220.8	GROUND SURFACE soil - fill and till
	178.3	BEDROCK SURFACE
no drop of rods no loss of drill water	33%	fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled and shale infilling to 1/16", core lengths - from broken to 3", distorted bedding planes.
	173.0	
no drop of rods no loss of drill water	55%	fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/8", fracture zone at El 173.0 shale infilling, core lengths - from broken to 2"
	171.3	
no drop of rods no loss of drill water	76%	fractured shaley limestone, dark grey, fine grained high angled joints calcite filled to 1/8", fracture zone at El 171.1, shale infilling, core lengths - from broken to 5"
	167.8	
no drop of rods no loss of drill water	45%	fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", several shale intrusions at El 167.8, core lengths - from broken to 1½", probable 30° - 45° dip
	166.0	
no drop of rods no loss of drill water	43%	fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", shale partings to 1/32" layers, core lengths - from broken to 1½"
	164.2	
no drop of rods no loss of drill water	29%	fractured shaley limestone, dark grey, fine grained, thin shale partings, core lengths - from broken to 1½"
	162.8	

PLATE NO. 22

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

BOREHOLE NO. 7 Page No. 2

		162.8	
no drop of rods no loss of drill water	52%		fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", shale partings to 1/32" layers, core lengths - from broken to 1½", 30° dip
		159.0	BOTTOM OF HOLE

PLATE NO. 23

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	9	RECORDER	G. Bilodeau
SURFACE ELEV'N	230.5 (MSL)	BORING DATE	4-10 March, 1959
BOREHOLE DEPTH	64.2'	LOGGING BY	G.L. Genest, P.Eng.
		CORE SIZE	7.8"

DRILLING & WATER CONDITIONS	ELEVATION, & RECOVERY	CORE DESCRIPTION
	230.5	GROUND SURFACE soil - fill and till
	183.0	BEDROCK SURFACE
no drop of rods no loss of drill water	30%	fractured shaley limestone, dark grey, fine grained, high angled joints calcite filled to 1/16", several shale intrusions, fracture zone at El 182.5, average core lengths 2"
	178.0	
no drop of rods no loss of drill water	73%	fractured shaley limestone, dark grey, fine grained, high angled joints at El 178.0 ¼" shale infilling, near vertical joints calcite filled to 1/16", fracture zone at El 177.7, thin shale partings, average core lengths 2", 60° dip
	175.5	
no drop of rods no loss of drill water	75%	fractured limestone, dark grey, fine to medium grained, high angled joints shale filled to 1/8" and calcite filled to 1/32", shaley limestone at El 170.8 to El 169.7, average core lengths 2"
	169.7	
no drop of rods no loss of drill water	21%	fractured shaley limestone, dark grey fine grained, high angled joints calcite filled to ¼", core lengths - from broken to 1"
	166.3	BOTTOM OF HOLE

PLATE NO. 24

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	10	RECORDER	G. Bilodeau
SURFACE ELEV'N	228.7 (MSL)	BORING DATE	19-20& 28-29 May/59
BOREHOLE DEPTH	42.3'	LOGGING BY	G.L.Genest,P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	228.7	GROUND SURFACE soil - fill and till
	203.4	BEDROCK SURFACE
no drop of rods no loss of drill water	54%	weathered or fractured limestone, dark grey, fine grained, core lengths - from broken to 2", calcite seams, probable 45° dip
	200.6	
no drop of rods no loss of drill water	74%	weathered or fractured limestone, dark grey, shaley, fine grained, high angled joint 1/16" calcite filled at elevation 201.3, core lengths - from broken to 3", probable 45° dip
	197.7	
no drop of rods no loss of drill water	43%	weathered or fractured limestone, dark grey, fine grained, core lengths - from broken to 2", probable 45° dip
	195.2	
no drop of rods no loss of drill water	45%	weathered or fractured limestone, dark grey, fine grained, shaley partings to 1/8" layers, core lengths - from broken to 2", probable 45°- 60° dip
	191.7	
no drop of rods lost drill water at El. 190.9	75%	fractured limestone, dark grey, fine grained, core lengths - from broken to 2", probable 45° - 60° dip
	189.7	
no drop of rods	75%	fractured limestone, dark grey, fine grained, average core lengths 1", probable 45° dip
	188.9	
no drop of rods	93%	limestone, dark grey, fine grained, shaley partings to 1/8" layers, core lengths - from broken to 3", probable 45° dip
	186.4	BOTTOM OF HOLE

PLATE NO. 25

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	11	RECORDER	G. Bilodeau
SURFACE ELEV'N	218.0 (MSL)	BORING DATE	21 May, 1959
BOREHOLE DEPTH	29.7'	LOGGING BY	G.L.Genest,P.Eng.
		CORE SIZE	7⅞"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	218.0	GROUND SURFACE soil -
	203.8	BEDROCK SURFACE
no drop of rods no loss of drill water	36%	weathered or fractured limestone, dark grey, fine grained, core lengths- from broken to 1½", probable 60° dip.
	200.8	
no drop of rods no loss of drill water	41%	weathered or fractured limestone, dark grey, fine grained, core lengths- from broken to 2", probable 45° dip.
	199.4	
no drop of rods no loss of drill water	87%	limestone, dark grey, fine grained, 1/16" - 1/8" calcite intrusions, distorted bedding planes, average core lengths 2½".
	198.2	
no drop of rods no loss of drill water	86%	limestone, dark grey, fine grained, 1/16" - 1/8" calcite intrusions, distorted bedding planes, average core lengths 2½".
	195.8	
no drop of rods no loss of drill water	43%	fractured limestone, dark grey, fine grained, high angled joints, calcite filled 1/16", core lengths - from broken to 1", probable 45° dip.
	193.3	
no drop of rods no loss of drill water	95%	limestone, dark grey, fine grained, no fractures, near vertical joints calcite filled 1/16", average core lengths 2½", bedding planes near horizontal.
	188.3	BOTTOM OF HOLE

PLATE NO. 26

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	12	RECORDER	G. Bilodeau
SURFACE ELEV'N	217.2 (MSL)	BORING DATE	22 May, 1959
BOREHOLE DEPTH	14.0'	LOGGING BY	G.L.Genest, P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	217.2	GROUND SURFACE soil
	212.4	BEDROCK SURFACE
no drop of rods no loss of drill water	60%	weathered or fractured limestone, dark grey, medium grained, average core lengths 1½"
	211.1	
no drop of rods no loss of drill water	60%	weathered or fractured limestone, dark grey, medium to fine grained, high angle joint at El 211.5, calcite filled 1/32", core lengths from broken to 1½"
	210.3	
no drop of rods no loss of drill water	50%	fractured limestone, dark grey, fine grained, fracture zone, calcite filled 1/8", core lengths from broken to ½"
	209.8	
no drop of rods no loss of drill water	100%	limestone, dark grey, fine grained, no fracture, vertical joints, calcite filled 1/32", average core lengths 2"
	207.8	
no drop of rods no loss of drill water	100%	limestone, dark grey, medium grained, no fracture, high angled joints, calcite filled 1/16", average core lengths 2½", probable 45° dip.
	206.8	
no drop of rods no loss of drill water	90%	limestone, dark grey, medium grained, vertical fracture at Elevation 206.9, calcite partings to 1/16", average core lengths 2"
	205.2	
no drop of rods no loss of drill water	96%	limestone, dark grey, fine grained, high angled joints, calcite filled to 1/8", average core lengths 1½", bedding probably horizontal
	203.2	BOTTOM OF HOLE

PLATE NO. 27

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	13	RECORDER	G. Bilodeau
SURFACE ELEV'N	217.9 (MSL)	BORING DATE	4 June, 1959
BOREHOLE DEPTH	27.0'	LOGGING BY	G.L.Genest, P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	217.9	GROUND SURFACE soil - fill and till
	209.3	BEDROCK SURFACE
no drop of rods no loss of drill water	55%	weathered limestone, dark grey, fine to medium grained, vertical joints calcite filled 1/8", near horizontal partings calcite filled 1/16", core lengths - from broken to 3", 45° - 60° dip
	206.9	
no drop of rods no loss of drill water	72%	fractured limestone, dark grey, fine grained, vertical joints calcite filled 1/32", horizontal partings calcite filled 1/32", core lengths - from broken to 2½", 45° dip
	205.4	
no drop of rods no loss of drill water	56%	fractured limestone, dark grey, medium grained, vertical joints calcite filled 1/16", horizontal partings calcite filled 1/32", core lengths - from broken to 2½", thin shaley partings between bedding planes, 45° dip
	202.7	
no drop of rods no loss of drill water	72%	fractured limestone, dark grey, fine to medium grained, vertical fracture at El 202.4, near vertical joints calcite filled to 1/16", horizontal partings calcite filled 1/16" core lengths - from broken to 3", 60° dip
	200.3	
no drop of rods lost drill water at El 200.2	59%	fractured limestone, dark grey, fine to medium grained, vertical fractures, near vertical joints calcite filled to 1/8", near horizontal partings at El 199.3 calcite filled to ¼", horizontal partings calcite filled to 1/32", Thin shaley partings between bedding planes, core lengths - from broken to 3½", 45° - 70° dip
	195.8	

PLATE NO. 28

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

BOREHOLE NO. 13 Page No. 2.

		195.8	
no drop of rods no drill water return		90%	limestone, dark grey, fine to medium grained, vertical joints calcite filled to ¼" at El 194.4 and 191.4, high angled joints calcite filled to 1/16", average core lengths 2", thin shaley partings between bedding planes, 45° dip
		190.9	BOTTOM OF HOLE

PLATE NO. 29

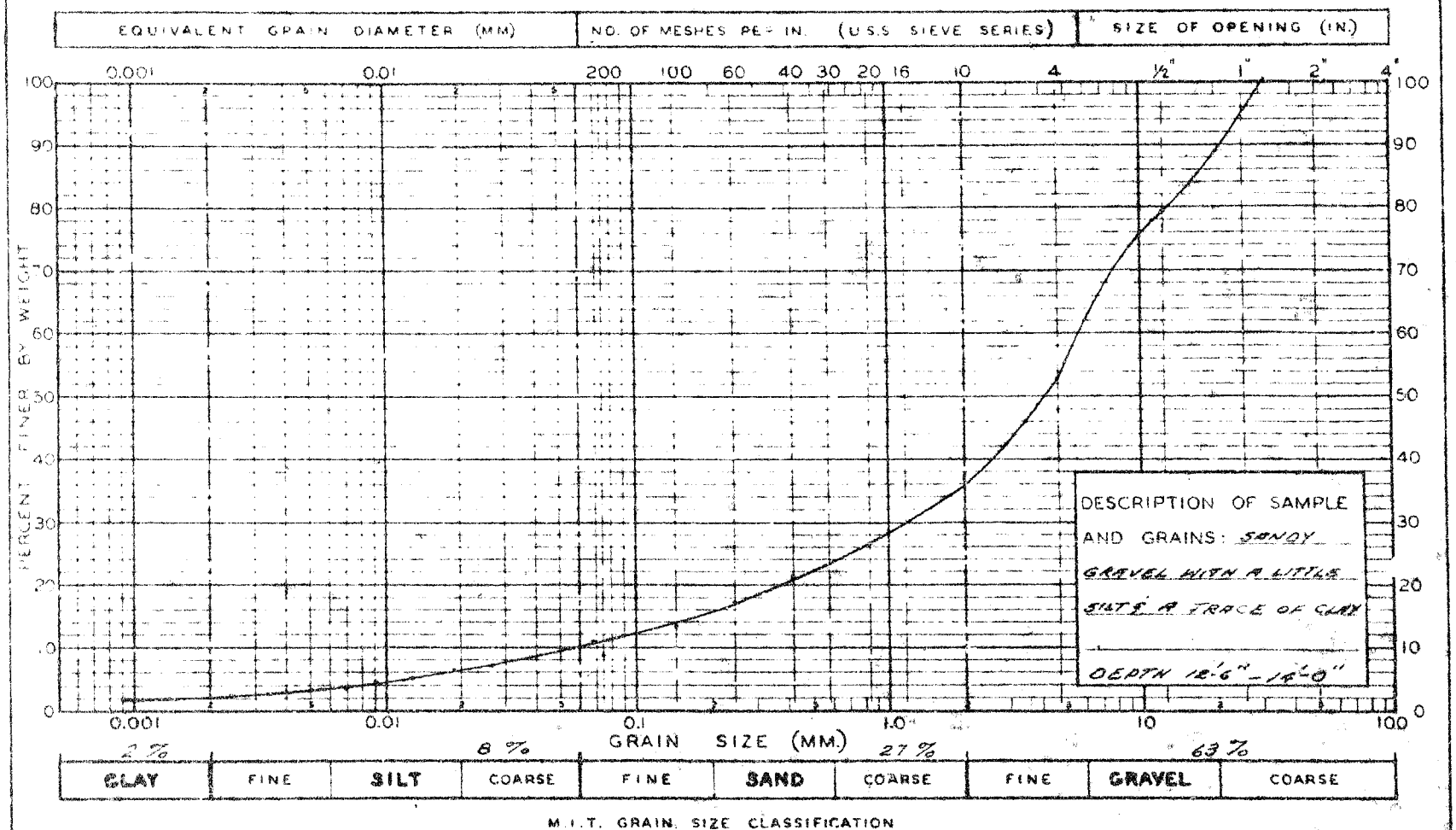
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS
OTTAWA CANADA

PROJECT	Queensway at Fairmont	DRILLER	W. Deevy
BOREHOLE NO.	14	RECORDER	G. Bilodeau
SURFACE ELEV'N	220.8 (MSL)	BORING DATE	29 May-3 June, 1959
BOREHOLE DEPTH	36.7'	LOGGING BY	G.L. Genest, P.Eng.
		CORE SIZE	7/8"

DRILLING & WATER CONDITIONS	ELEVATION, % RECOVERY	CORE DESCRIPTION
	220.8	GROUND SURFACE soil - fill and till
	204.5	BEDROCK SURFACE
no drop of rods no loss of drill water	50%	weathered or fractured shaley limestone, dark grey, fine to medium grained, high angled joints, calcite filled to 1/8", thin partings, shale filled, core lengths - from broken to 3", 45° dip
	200.9	
no drop of rods no loss of drill water	30%	weathered or fractured limestone, dark grey, medium grained, high angled joints, calcite filled to 1/8", core lengths - from broken to 3", probable 45° dip
	197.8	
no drop of rods no loss of drill water	47%	fractured limestone, dark grey, fine grained, near vertical fractures, high angled joints calcite filled to 1/16", average core lengths 1½", probable 45° dip
	196.0	
no drop of rods no loss of drill water	69%	fractured limestone, dark grey, medium grained, high angled joints calcite filled to 1/16", partings calcite filled to 1/16", average core lengths - 1½"
	194.7	
no drop of rods no loss of drill water	73%	fractured limestone, dark grey, medium to fine grained, high angled fractures, shale filling, high angled joints calcite filled to ½", average core lengths 2½", 30° - 45° dip
	189.1	
no drop of rods lost drill water at El. 194.7	81%	limestone, dark grey, fine to medium grained, high angled joints, calcite filled to 1/8", shaley partings, average core lengths 2", 45° - 60° dip
	184.1	BOTTOM OF HOLE

PLATE NO. 30

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 1-5

PLOTTED: C.V. DATE: Dec 1st/58

CHECKED: O.M. DATE: Dec 12th/58

REMARKS: .002 TO .105 SIZE = 11%

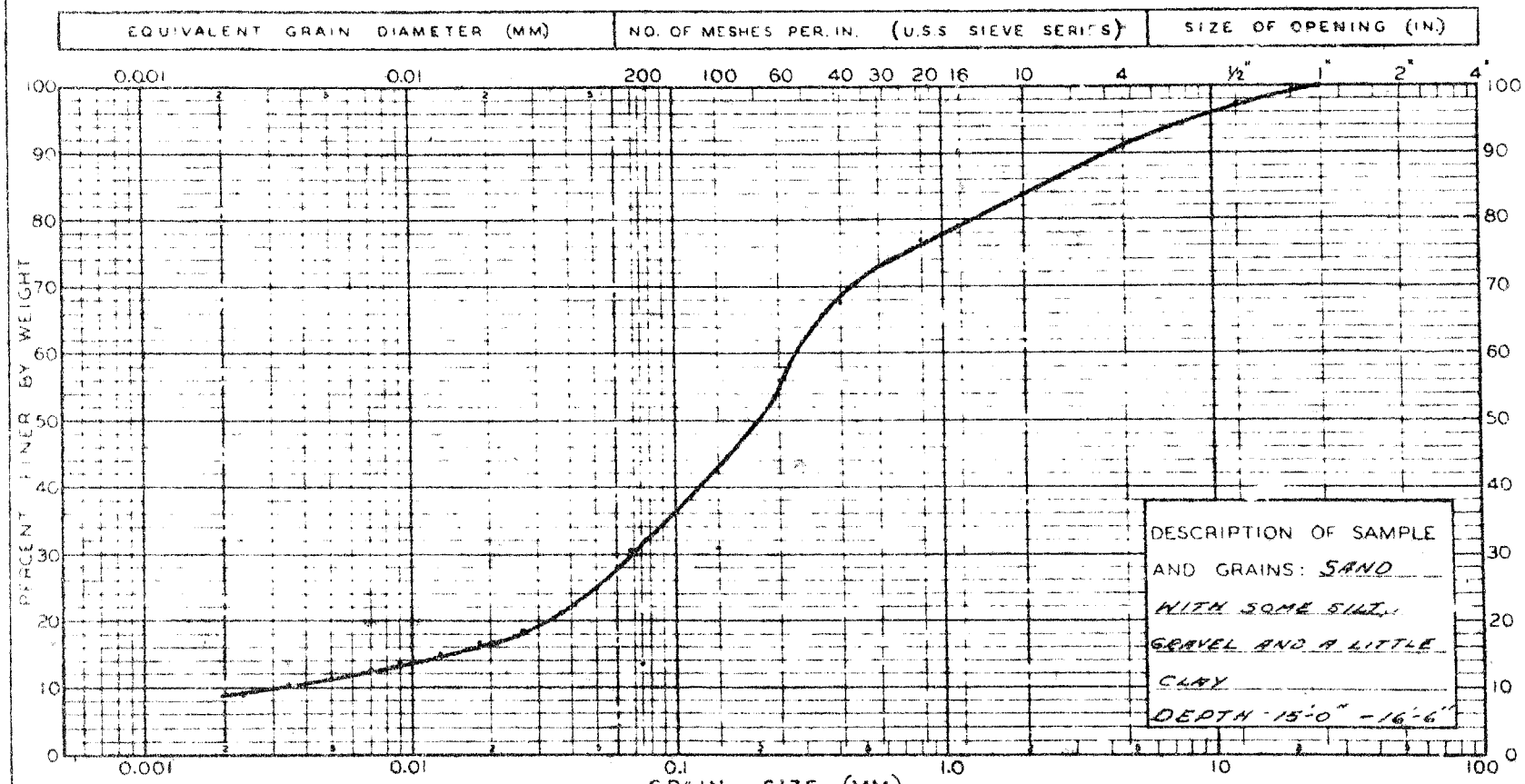
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 1-5

PLATE NO. 3

FORM S8

MECHANICAL ANALYSIS OF SOILS



9%		19%		56%			16%		
CLAY	FINE	SILT	COARSE	FINE	SAND	COARSE	FINE	GRAVEL	COARSE

M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 1-6

PLOTTED: D.M. DATE: DEC. 12th/58

CHECKED: C.J. DATE: DEC 18th/58

REMARKS: .002 TO .105 SIZE = 31%

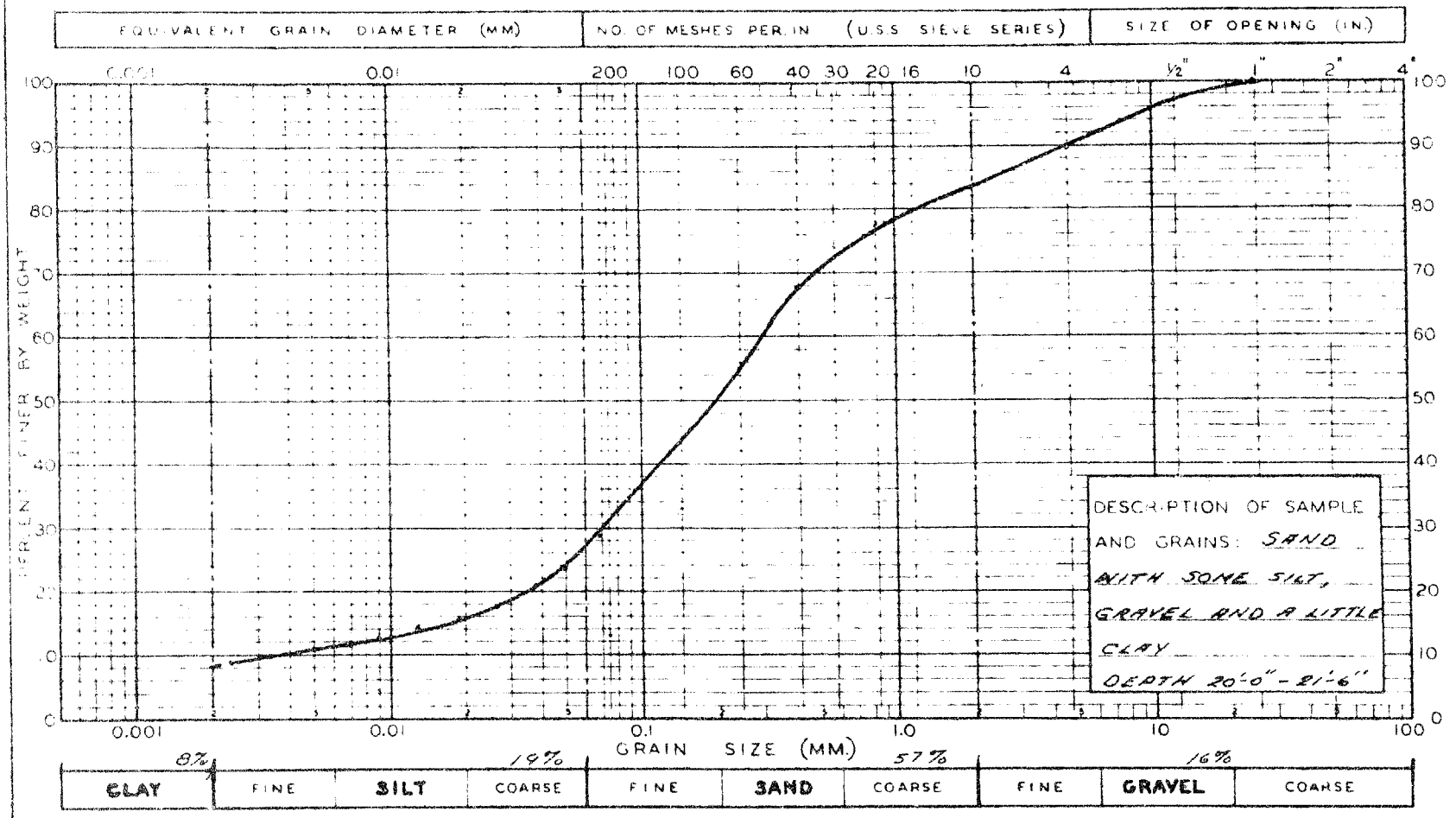
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 1-6

PLATE NO. 32

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 1-8

PLOTTED: D.M DATE: Dec 12th/56

CHECKED: C.J DATE: Dec 12th/56

REMARKS: .002 TO .105 SIZE = 32%

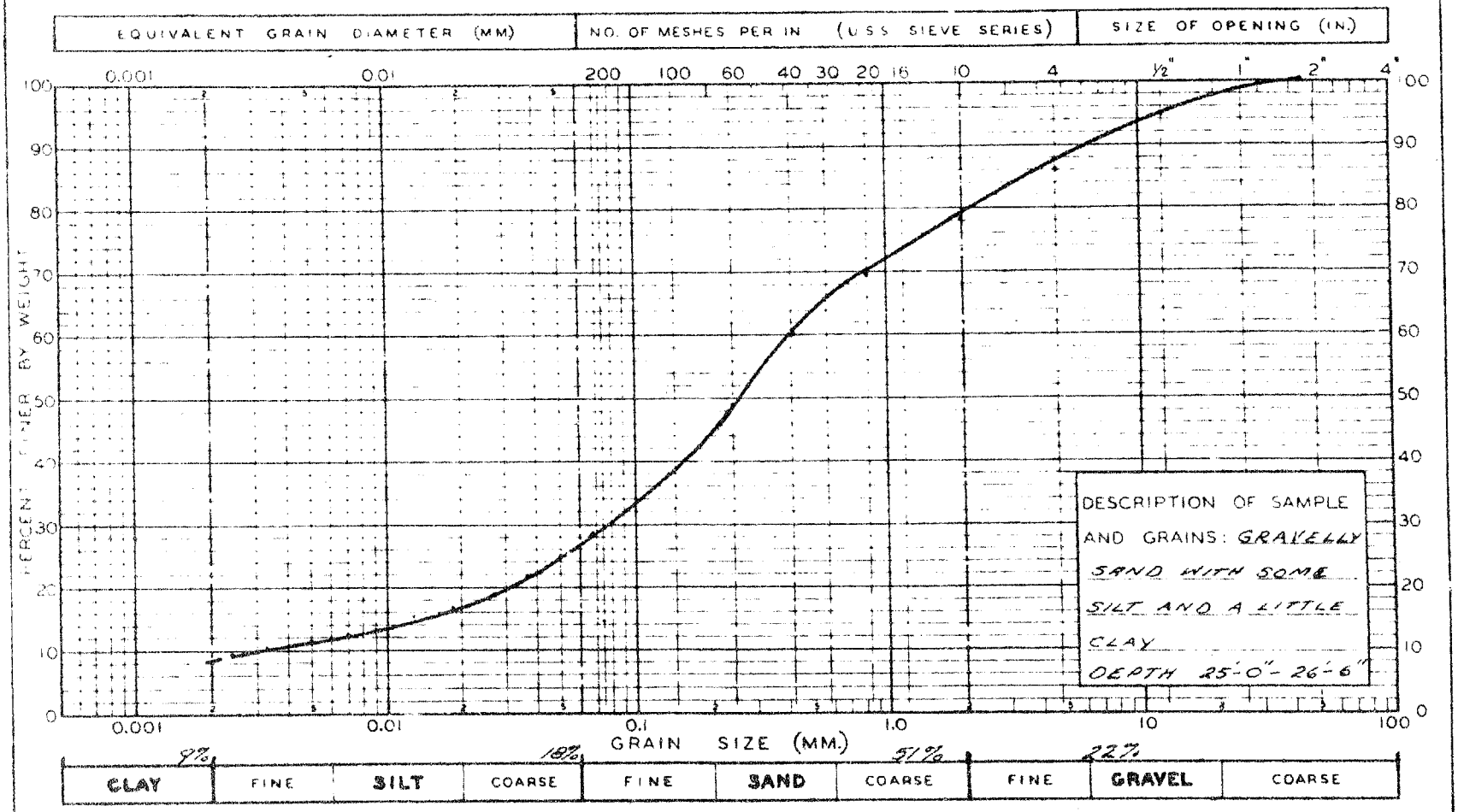
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 1-8

PLATE NO. 23

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 1-10

PLOTTED: O. M. DATE: Dec 11th/58

CHECKED: C. J DATE: Dec 12th/58

REMARKS: .002 TO .105 SIZE = 27%

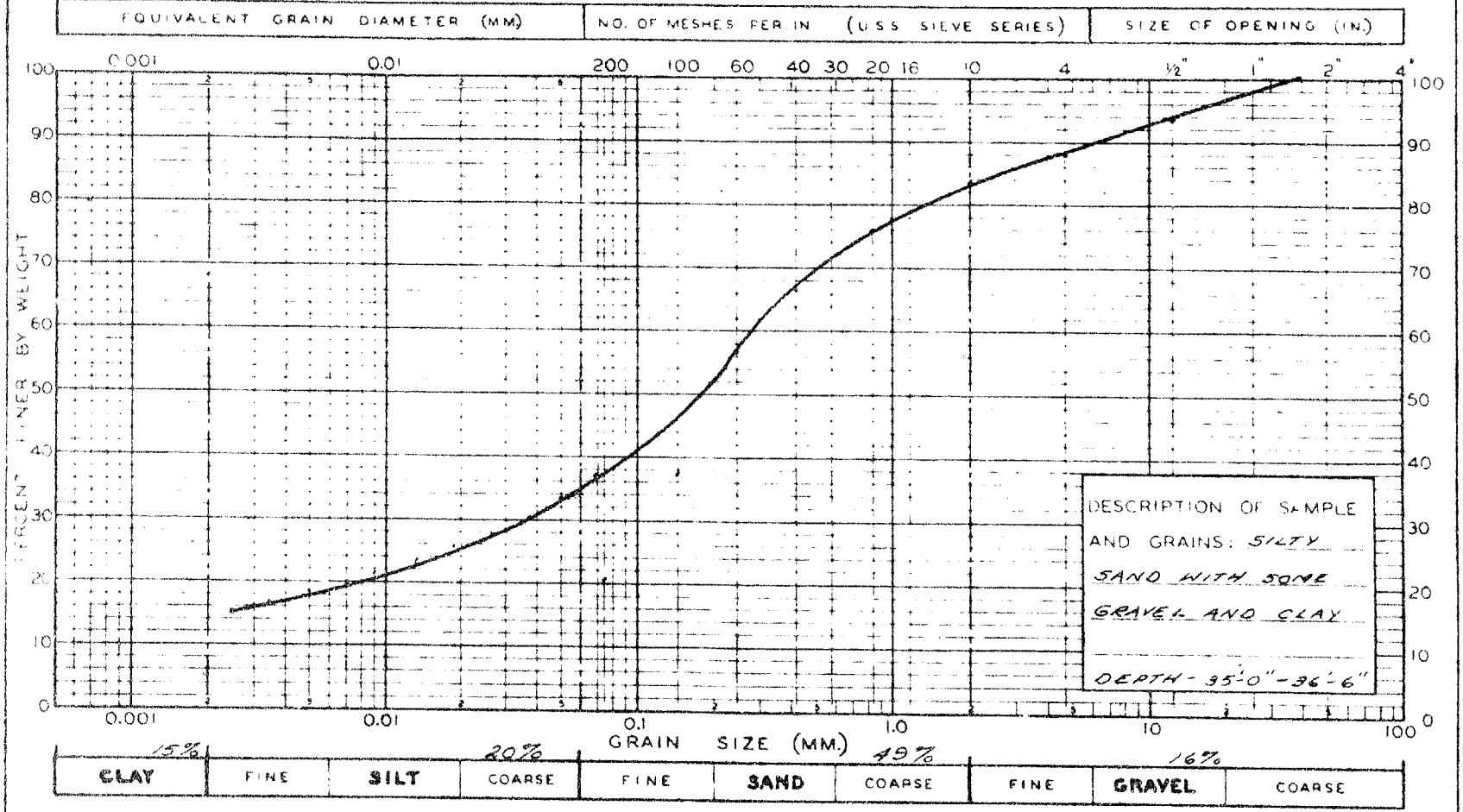
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

FORM S8

PLATE NO. 3

SAMPLE NO. 1-10

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 1-12

PLOTTED: O.M. DATE: Dec 12th/58

CHECKED: C.J. DATE: Dec. 12th/58

REMARKS: .002 TO .105 SIZE = 29%

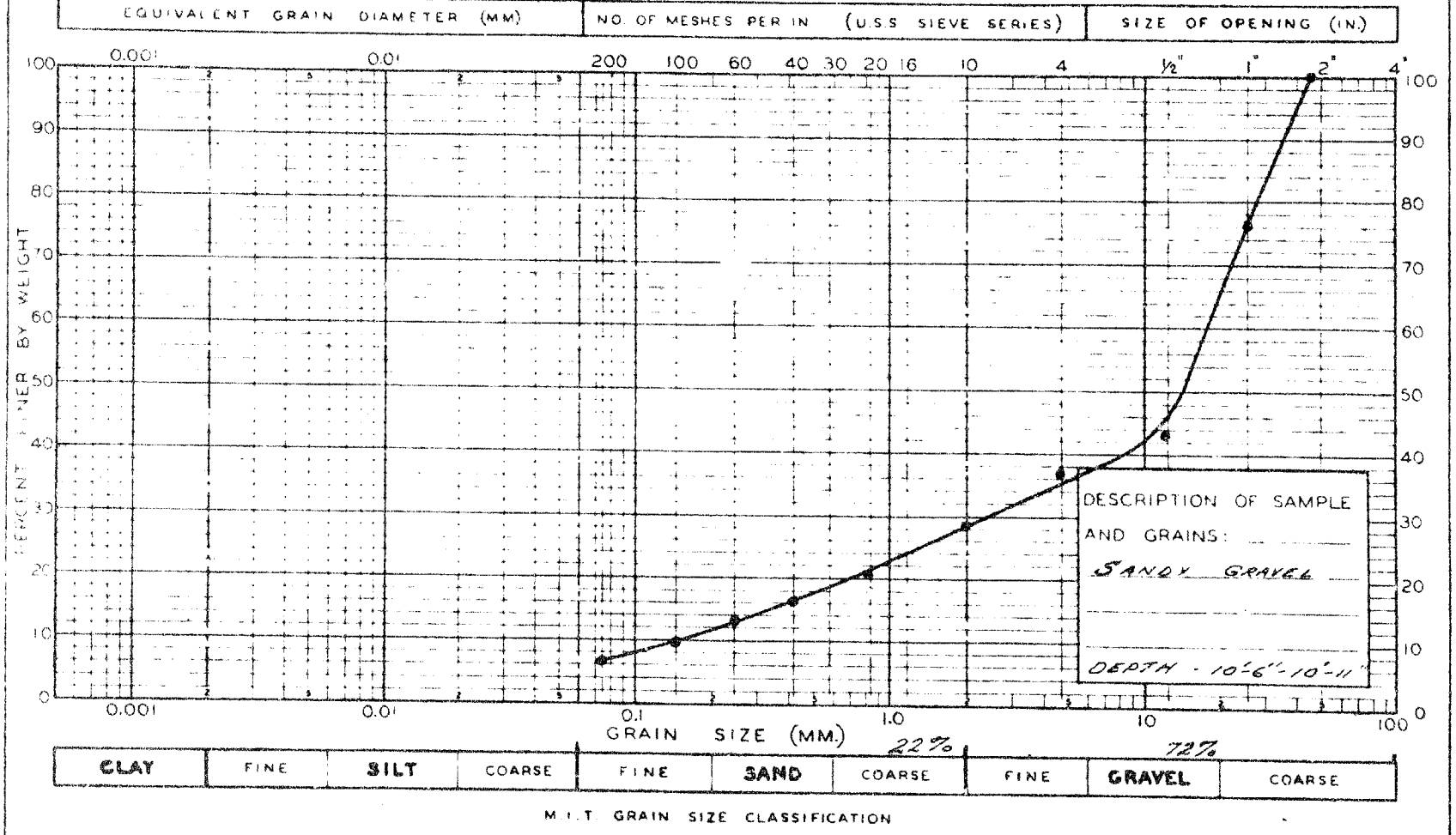
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 1-12

PLATE NO. 3

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 2-4

PLOTTED: O.M. DATE: 24/11/58

CHECKED: C.J. DATE: 24/11/58

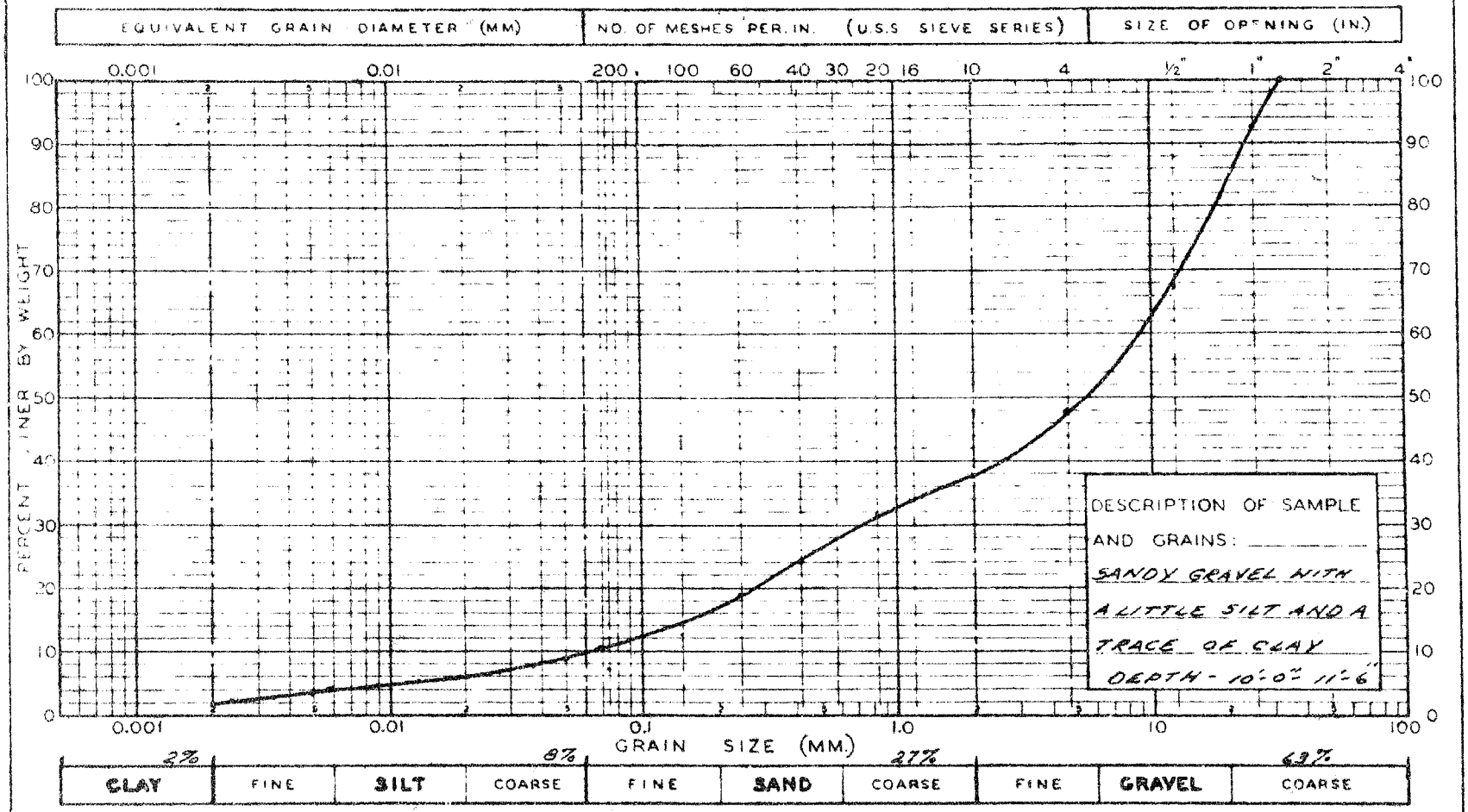
REMARKS: .002 TO .015 SIZE = 8%

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 2

PLATE NO. 5

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION.

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 3-4

PLOTTED: D.M. DATE: 29/11/58

CHECKED: B.M. DATE: 29/11/58

REMARKS: .002 TO .105 SIZE = 12%

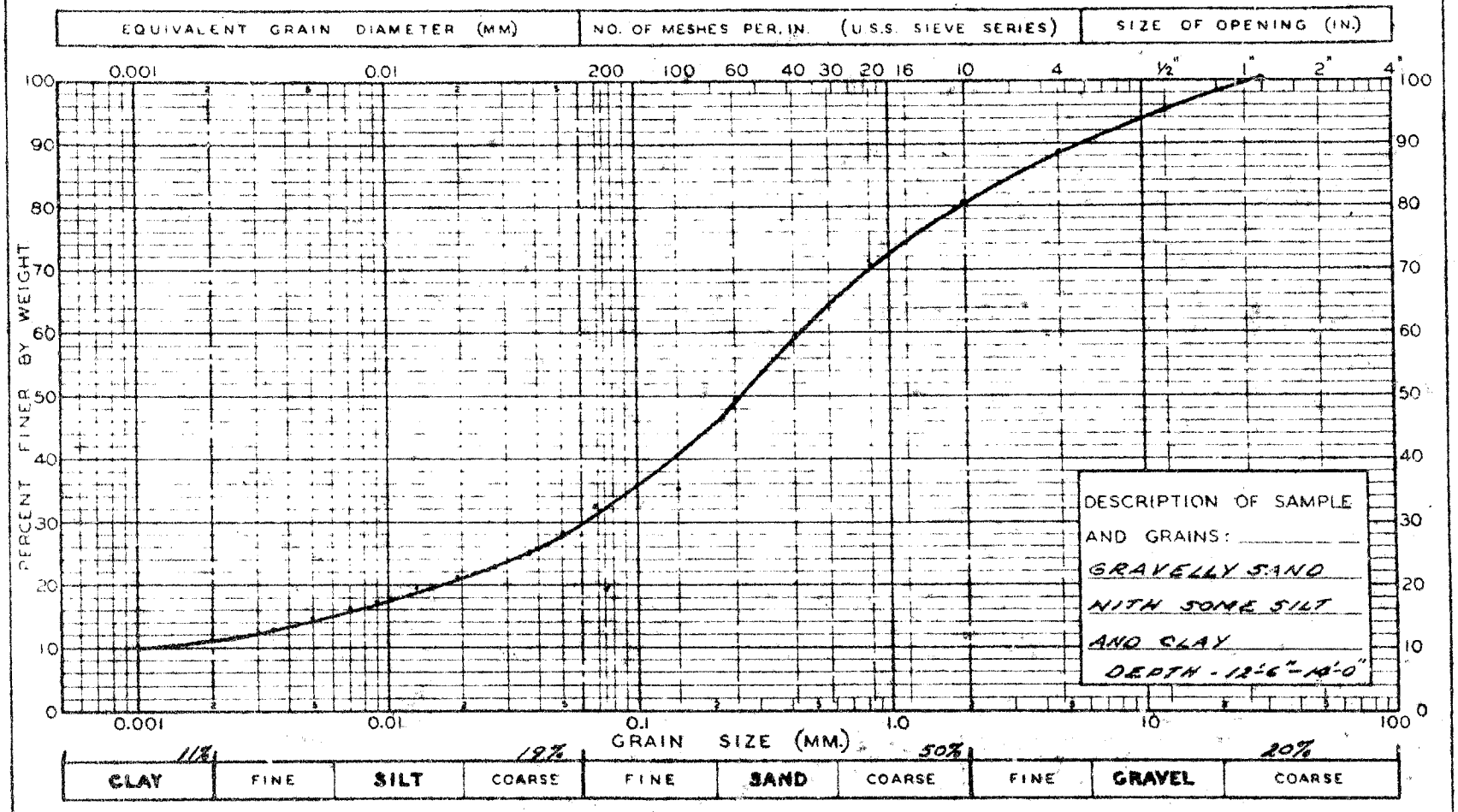
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

FORM S8

PLATE NO. 3

SAMPLE NO. 3-4

MECHANICAL ANALYSIS OF SOILS



PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 3-5

PLOTTED: D.M. DATE: 29/11/68

CHECKED: A.M. DATE: 29/11/68

REMARKS: .002 TO .105 SIZE = 20%

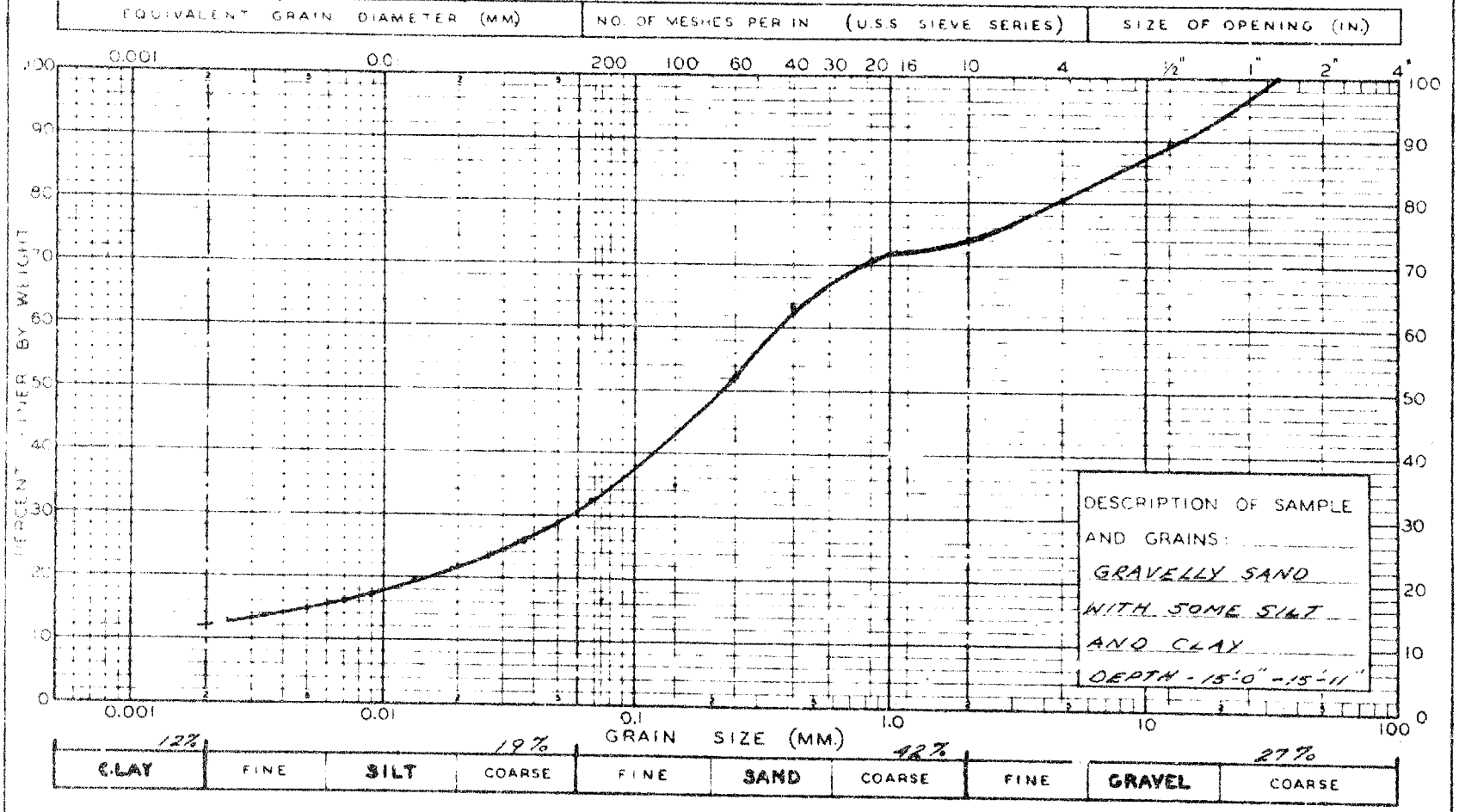
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

FORM S8

PLATE NO. 38

SAMPLE NO. 3-5

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 3-6

PLOTTED: D M DATE: 12/12/58

CHECKED: C J DATE: 12/12/58

REMARKS: .002 TO .105 SIZE = 28%

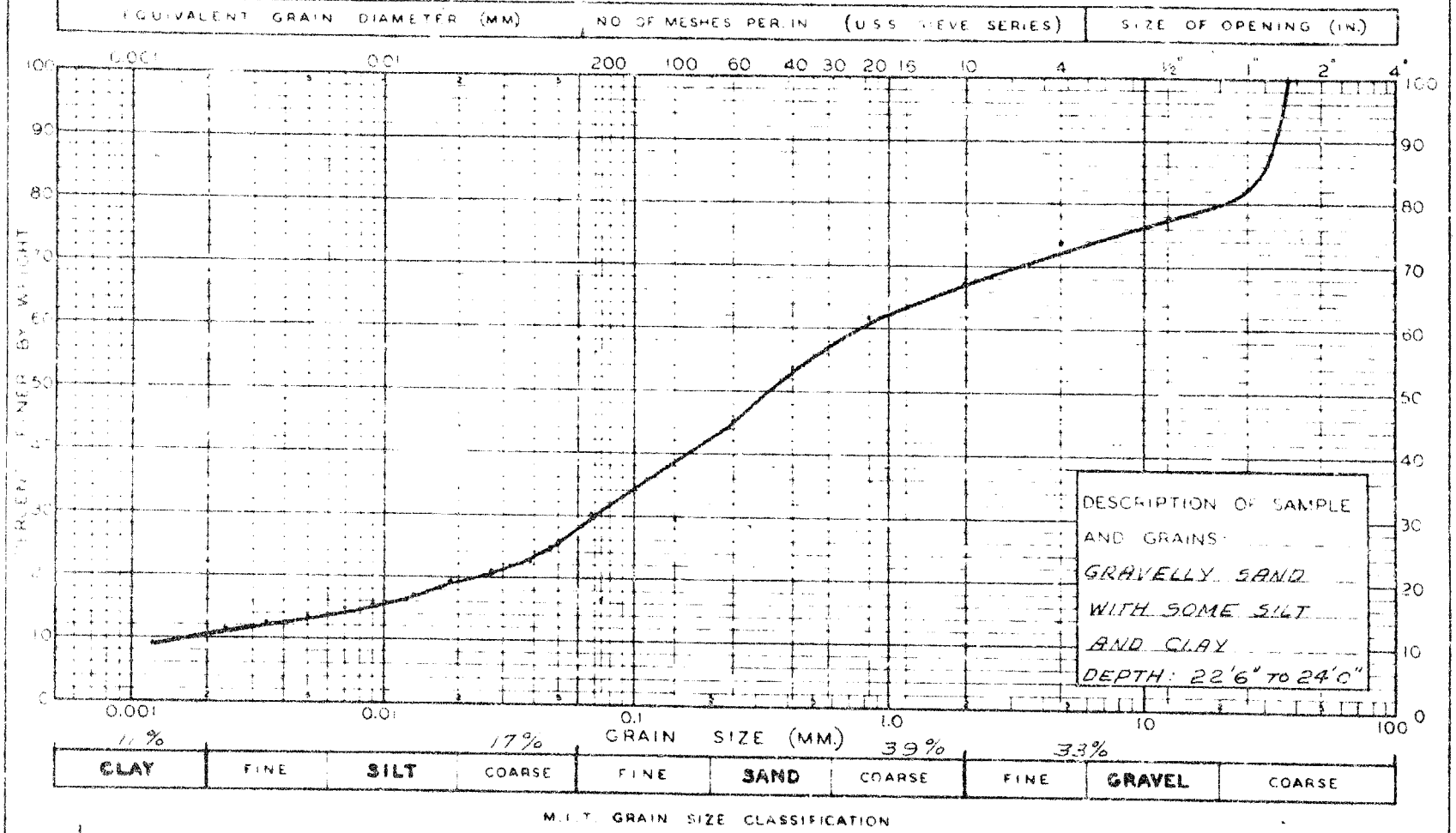
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 3-6

PLATE NO. 3

FORM S8

MECHANICAL ANALYSIS OF SOILS



PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 3-9

PLOTTED: C.J. DATE: 12-12-58

CHECKED: D.M. DATE: 12-12-58

REMARKS: .002 TO .105 SIZE = 25%

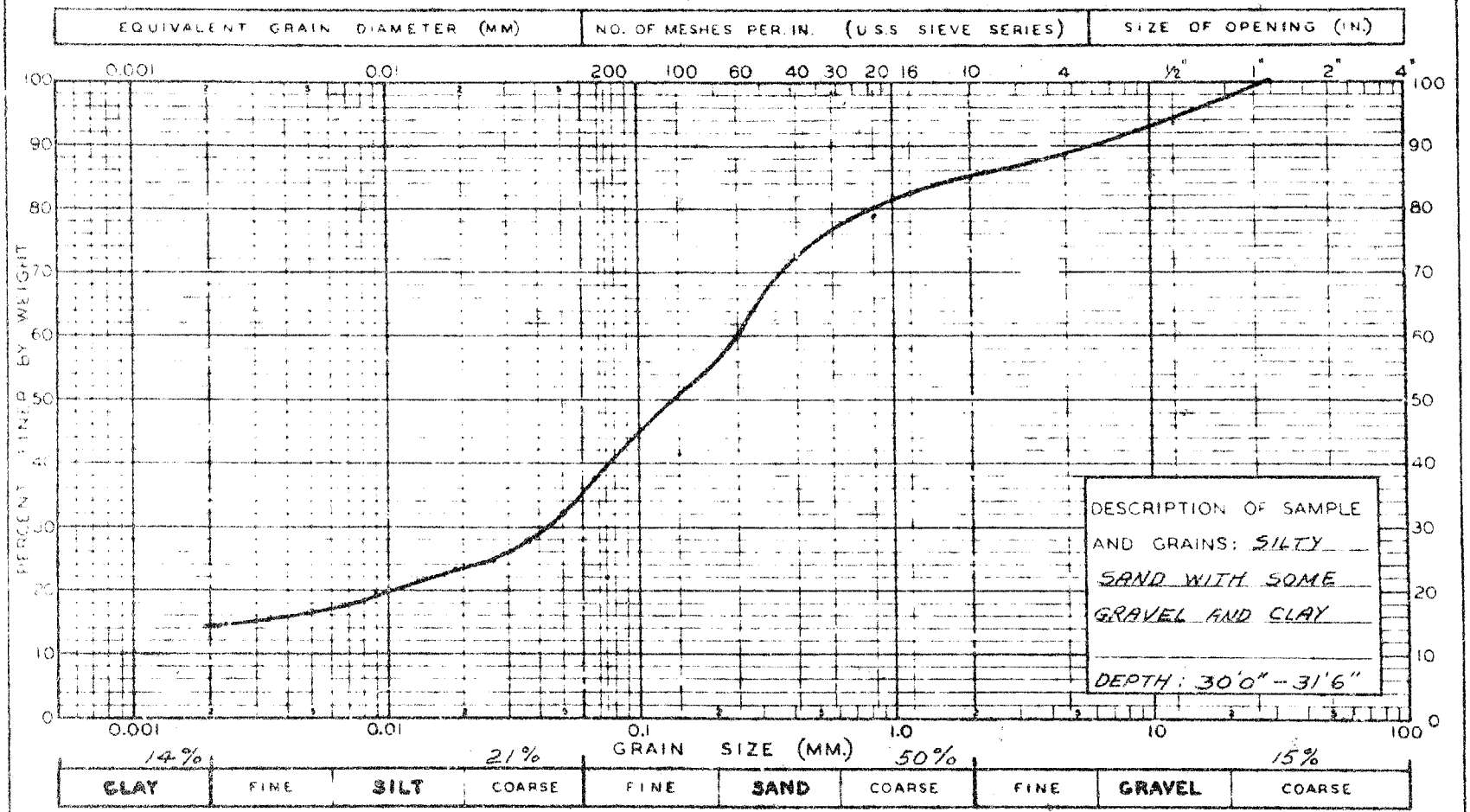
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 3-9

DATE NOV. 10

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 3 - 11

PLOTTED: D.M. DATE: 12-12-58

CHECKED: C.J. DATE: 12-12-58

REMARKS: .002 TO .105 SIZE = 34%

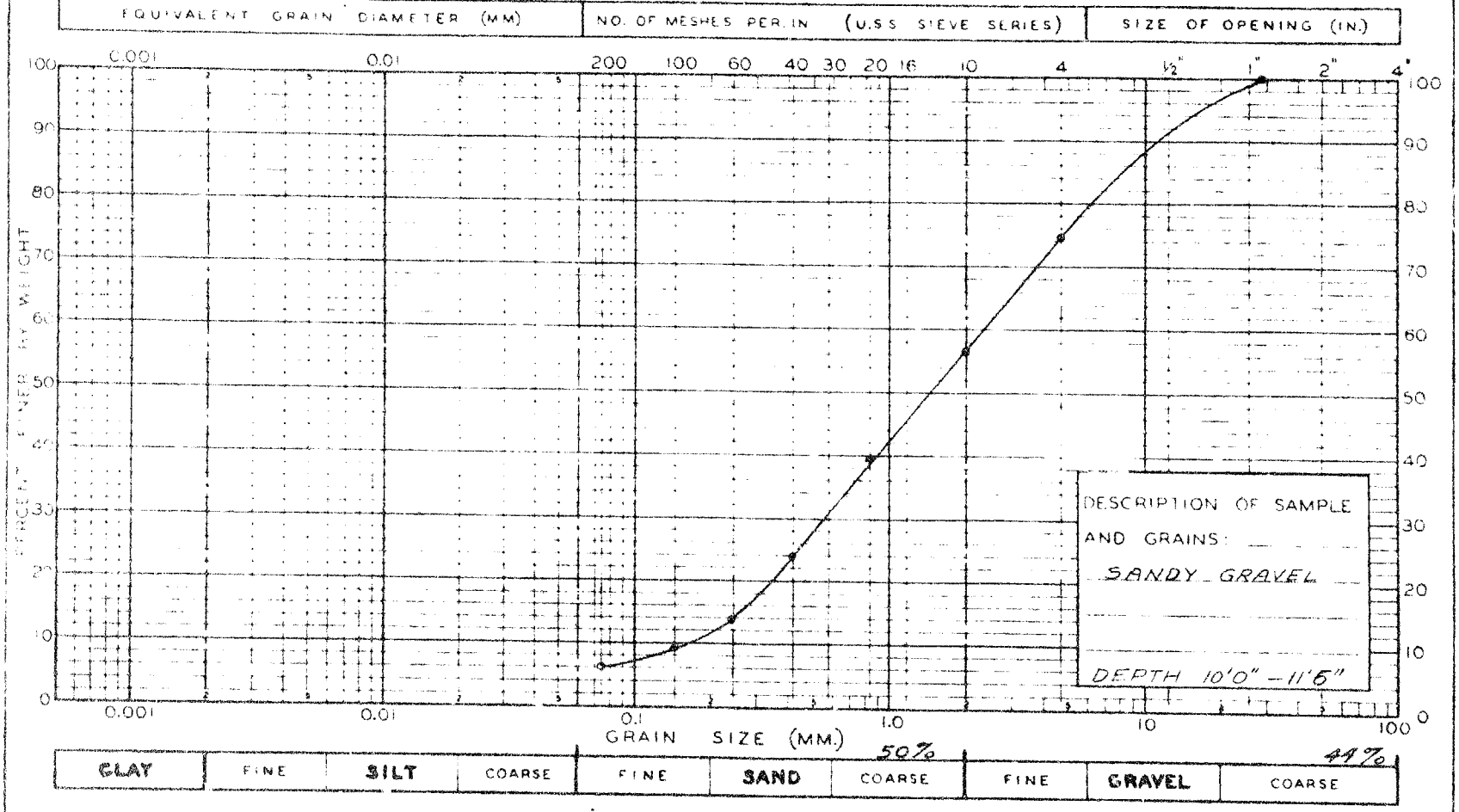
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 4

SAMPLE NO. 3-11

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 4-4

PLOTTED: D.M. DATE: 28/11/58

CHECKED: C.V DATE: 28/11/58

REMARKS: .002 TO .105 SIZE = 2%

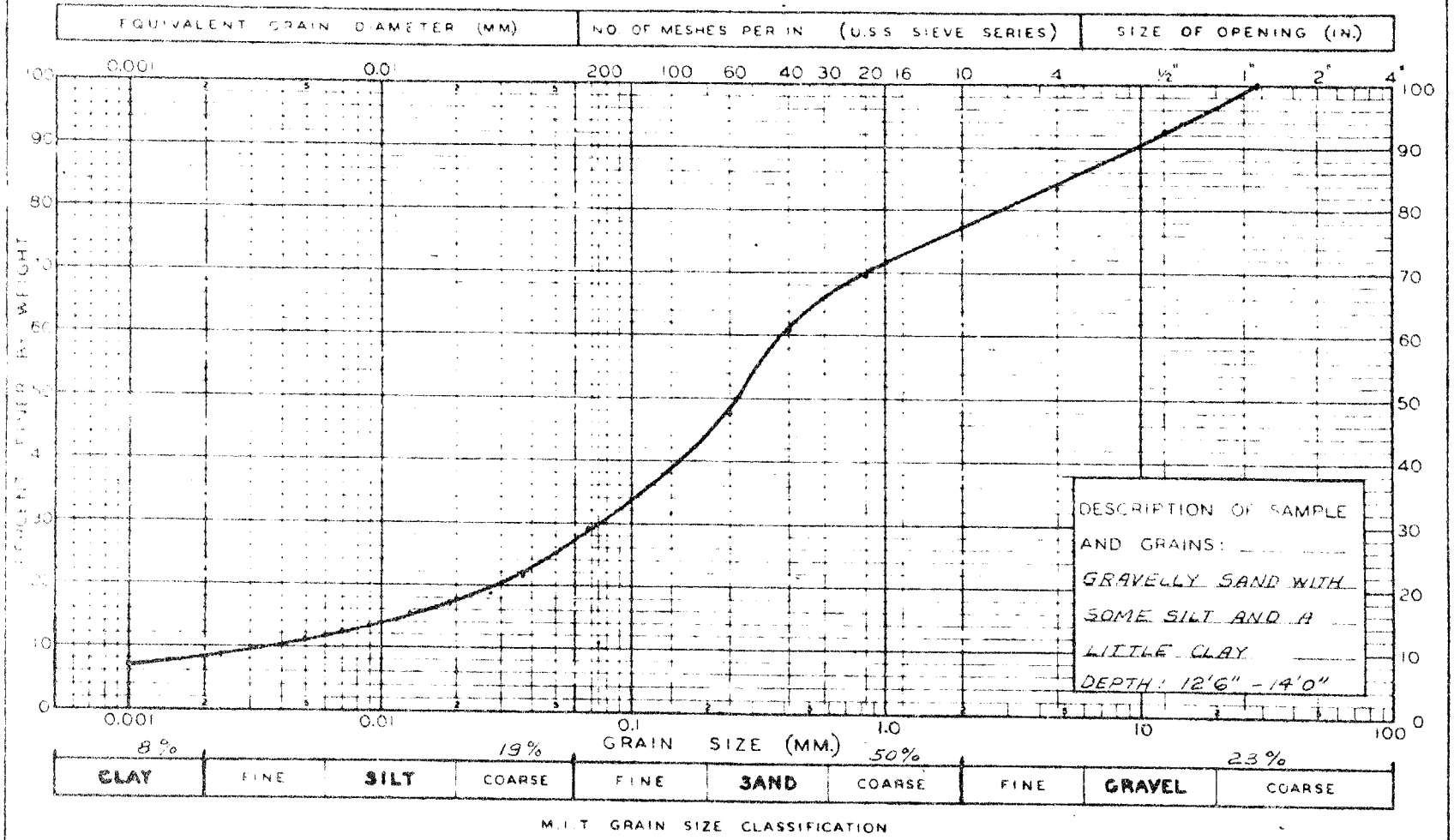
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

SAMPLE NO. 4-4

FORM S8

PLATE NO. 4-4

MECHANICAL ANALYSIS OF SOILS



M.I.T GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 4-5

PLOTTED: D.M. DATE: 29-11-58

CHECKED: B.M. DATE: 29-11-58

REMARKS: .002 TO .105 SIZE = 29%

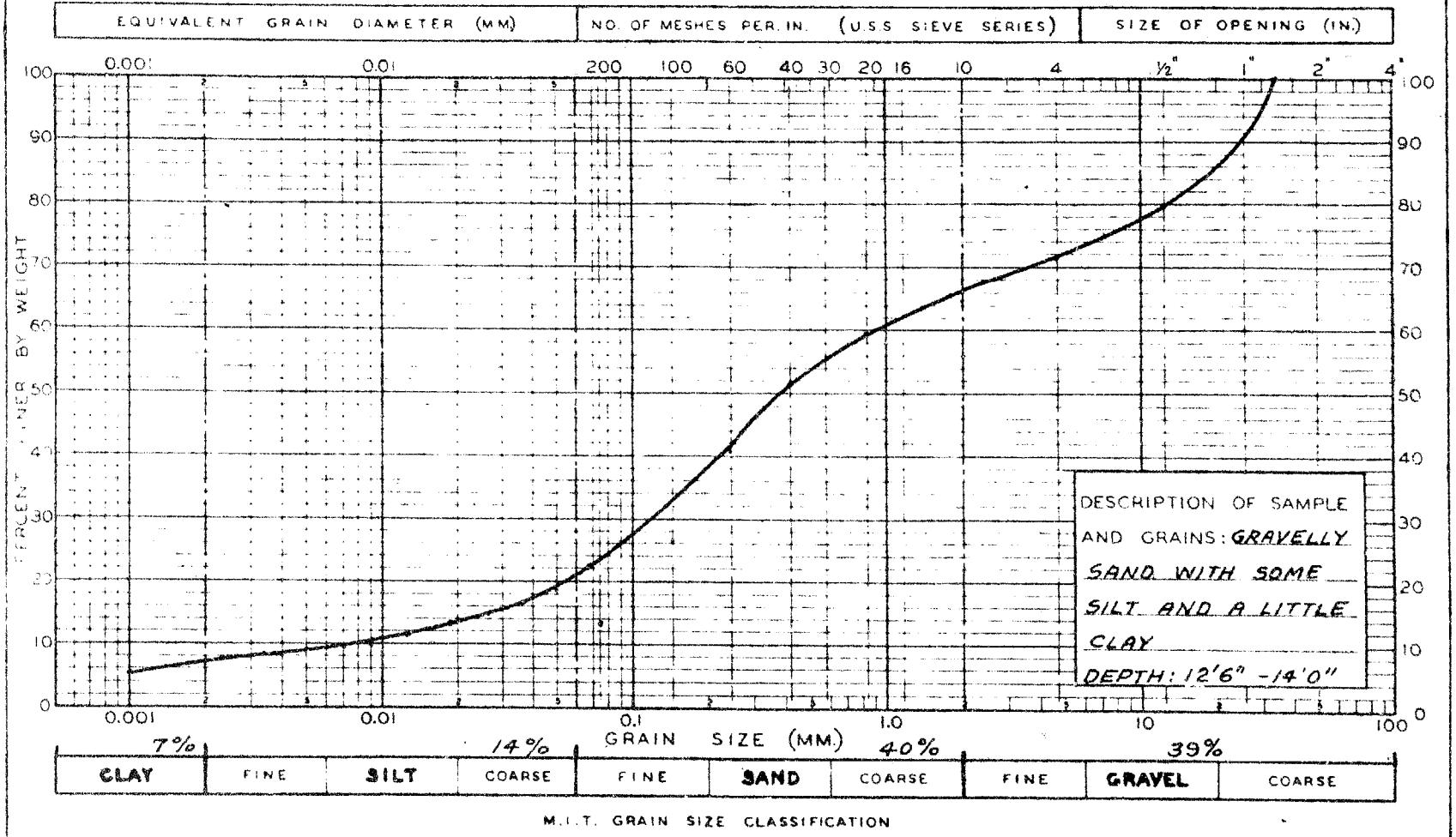
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 4-5

SAMPLE NO. 4-5

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 5-5

PLOTTED: D.M. DATE: 12-12-58

CHECKED: C.J. DATE: 12-12-58

REMARKS: .002 TO .105 SIZE = 23%

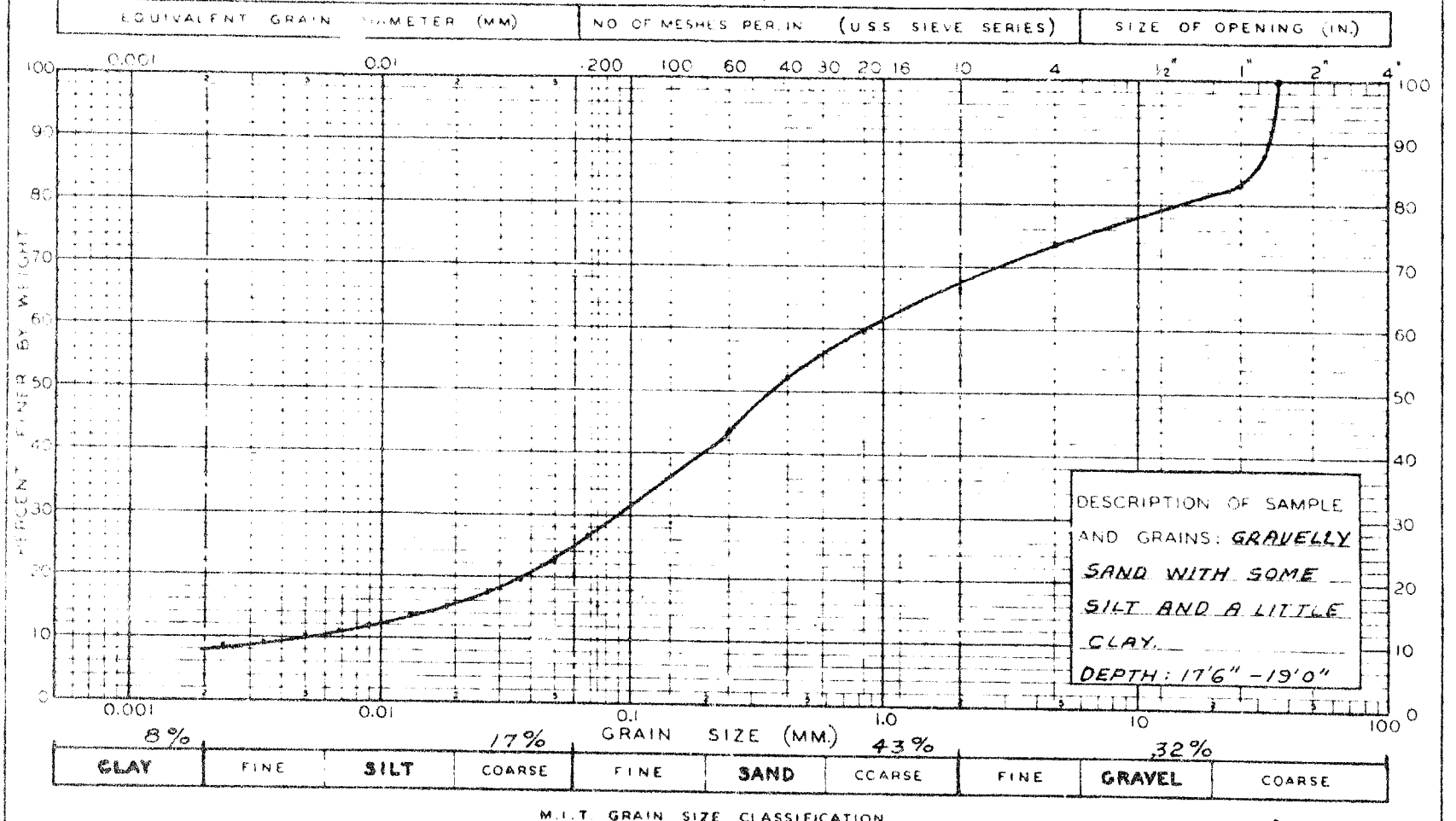
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 14

SAMPLE NO. 5-5

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 5-7

PLOTTED: D.M. DATE: 12-12-58

CHECKED: C.J. DATE: 12-12-58

REMARKS: .002 TO .105 SIZE = 26%

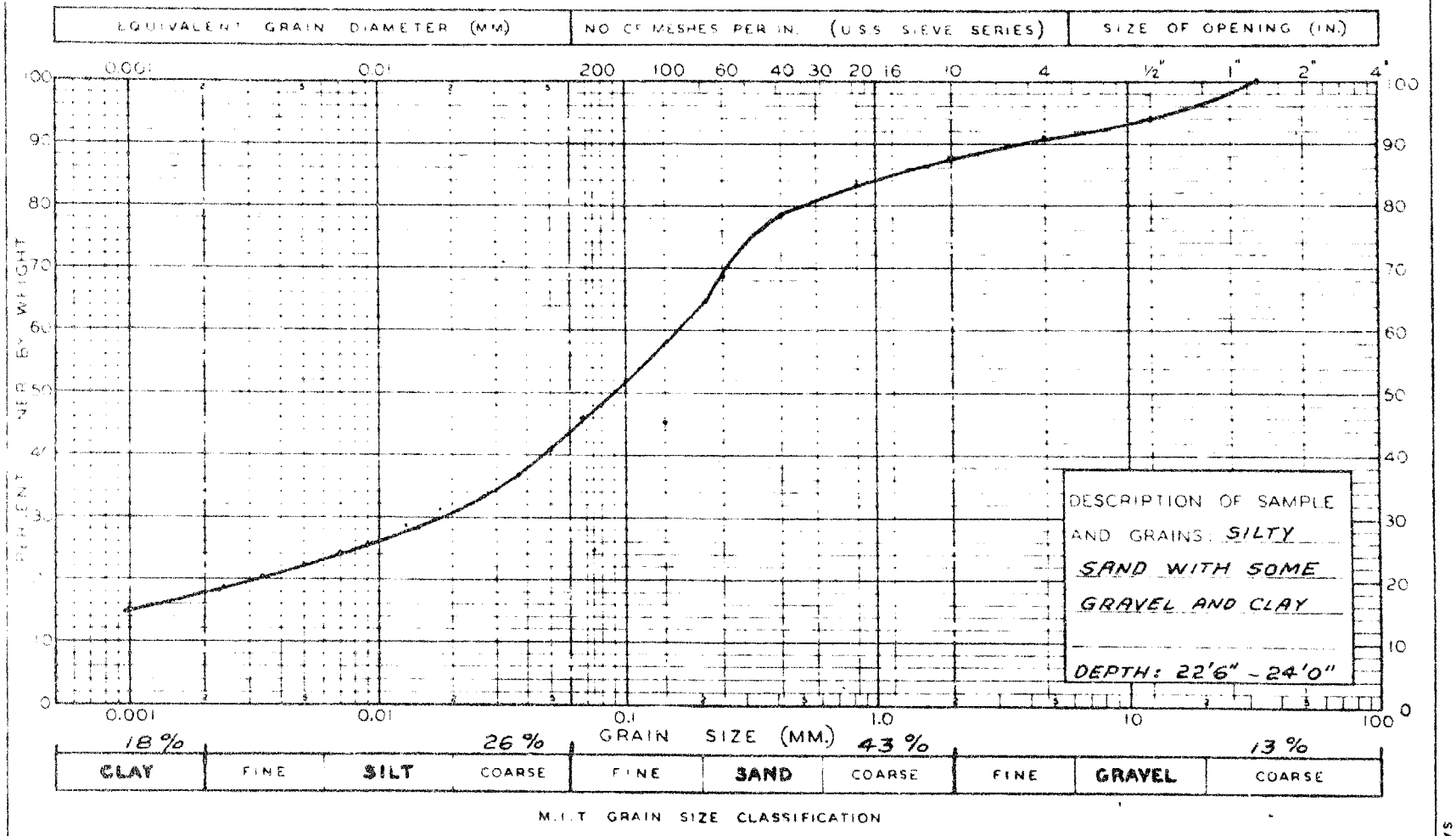
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 1

SAMPLE NO. 5-7

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 5-9

PLOTTED: B.M. DATE: 12-12-58

CHECKED C.J. DATE: 12-12-58

REMARKS: .002 TO .105 SIZE = 37%

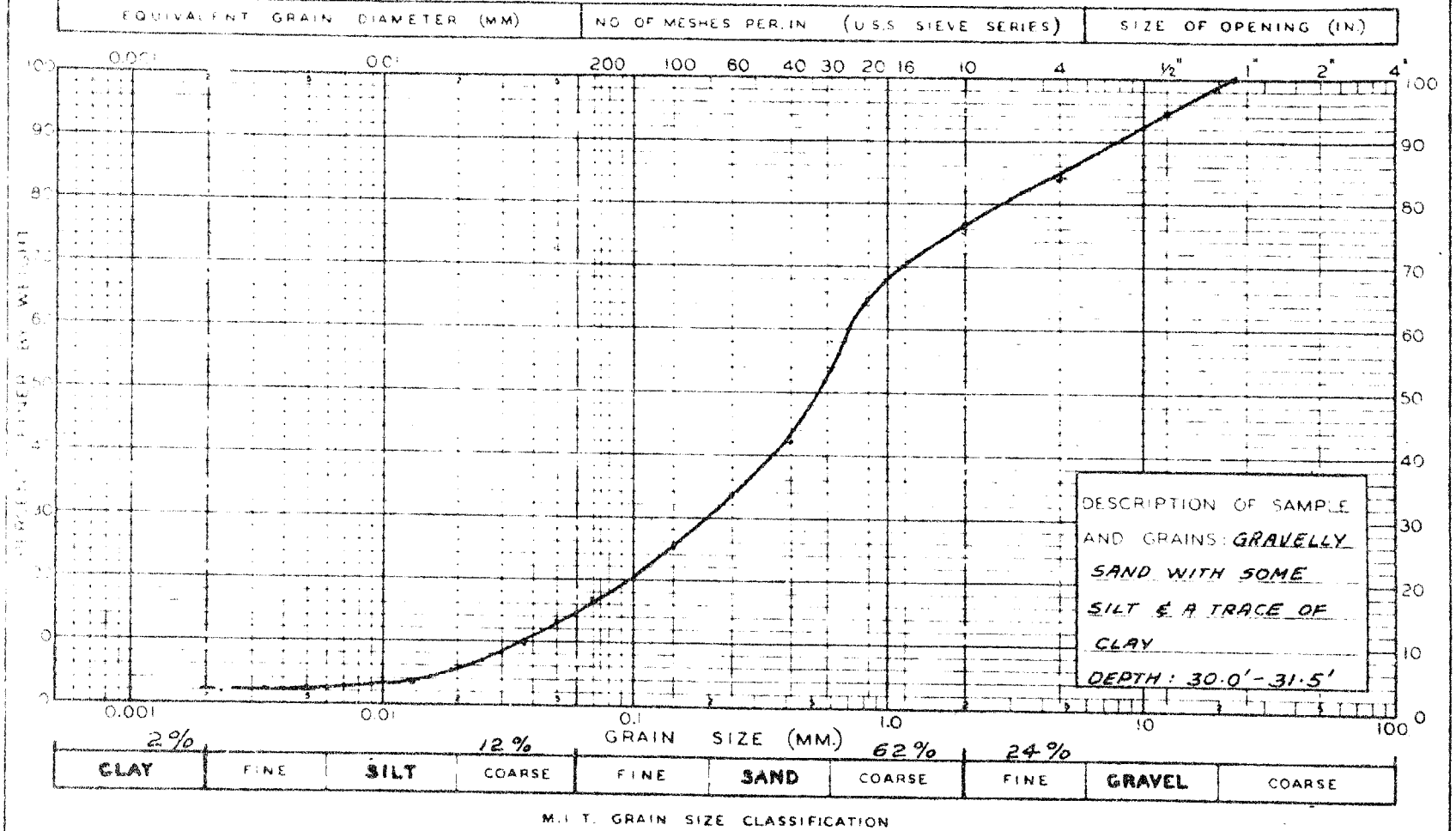
McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 4C

SAMPLE NO. 5-9

FORM S8

MECHANICAL ANALYSIS OF SOILS



M.I.T. GRAIN SIZE CLASSIFICATION

PROJECT: QUEENSWAY AT FAIRMONT

SAMPLE NO. 7-6

PLOTTED: D.M. DATE: 13-1-59

CHECKED: G.B. DATE: 13-1-59

REMARKS: .002 TO .105 SIZE = 21%

McROSTIE & ASSOCIATES
CONSULTING ENGINEERS

PLATE NO. 17

SAMPLE NO. 7-6

FORM S8