

#58-F-223-C

OTTAWA,

QUEENSWAY &

KIRKWOOD AVE.

MCROSTIE & ASSOCIATES

CONSULTING ENGINEERS AND SURVEYORS

OTTAWA 1
CANADA

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58F223C

FOUNDATION REPORT SUBWAYWAY AND KINROSS1. FIELD WORK

Four boreholes were completed at the site in the locations shown on Plate One. At each of these locations it was necessary to make several attempts to get below boulders. Where the boulders were encountered above 15 feet, new holes were attempted, below this, drilling through or blasting was required. Two inch split barrel samples were recovered for visual classification and standard penetration tests were performed in the boreholes. The underlying rock was diamond drilled, cores recovered for inspection, and a record kept of core recovery percentages. A careful watch was kept for drops or discontinuities in the rock during drilling.

Groundwater levels were observed during the programme and an observation well was installed in Hole No. 1 so that groundwater conditions up to and immediately preceding construction could be readily observed.

2. OBSERVATIONS

Soil types at the site are variable, but in general consist of a surface layer of loose sand or fill under which is a few feet of clay which is absent in the Southerly holes. Below 3 to 10 feet is glacial till (boulder clay) which continues to rock in all but the Northeastern area of the site where dense sands underlie the till. The high number of blows recorded for the standard penetration test in the till soils should be regarded with caution. The presence of stones would have the effect of increasing the blow count and the resistance of piles on or through tills of the Ottawa area has been found, on occasion, to be lower than might be inferred from the high blow count.

Rock occurs with an apparently uniform slope towards the East, but it has areas of broken rock on its upper surface. It is a shaley limestone formation and a few drops or discontinuities in the drilling also indicated the existence of seams or breaks in the upper few feet of the deposit.

Groundwater levels vary over the site but were in places as much as 10 feet below the surface. These levels can be assumed to be near the seasonal low point and would resemble somewhat the low summer period levels. Higher groundwater elevations, up to 2 feet from the surface were observed at the site during test drilling in March 1955.

3. RECOMMENDATIONS

3.1 Soil Strengths

Soil conditions are sufficiently variable that the two abutments are best considered separately. Recommended bearing values are as follows:

East abutment

Above El. 239 - loose sandy soils not suitable for support of heavy structures.

El. 239 to El. 235 - 1000 pounds per sq. ft. but groundwater control required and unusual care required to protect the low strengths of some soils.

Below El. 235 - 4000 pounds per sq. ft. but groundwater control required.

West abutment

Above El. 240 - loose sandy soils not suitable for support of heavy structures.

El. 240 to 236 - 1500 pounds per sq. ft. and groundwater control required in till.

4.

During construction, if soils are used for structural support, as mentioned above, a careful watch would need to be kept for soil variations between the borehole locations. Such variations could be evaluated at the time and suitable measures taken.

3.

Below El. 236 - 4000 pounds per square foot but groundwater control required.

3.2 Soil Compressibility

Since thick deposits of soft clay soils are not involved in the support of structures, long term consolidation settlements need not be considered here.

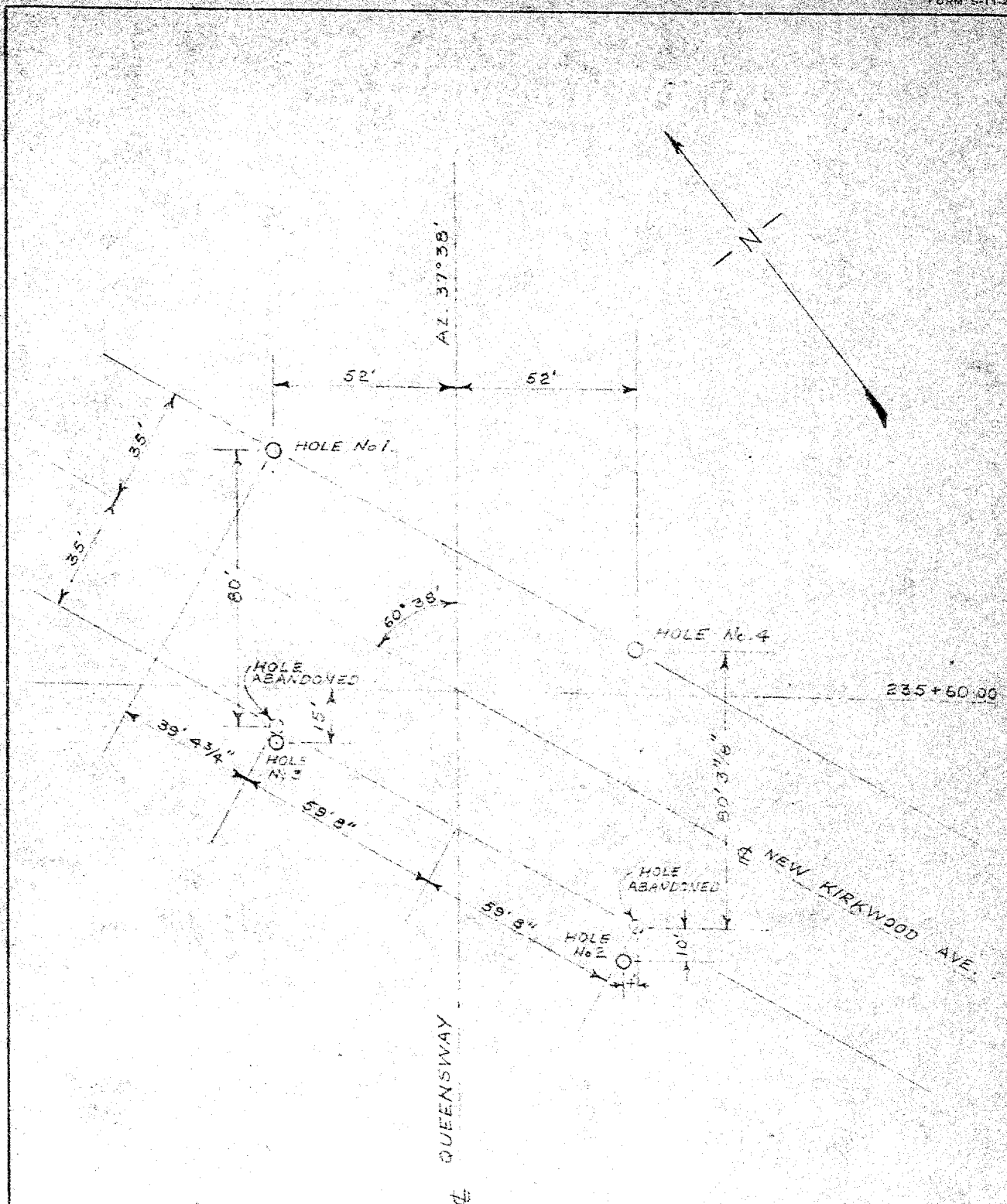
3.3 Foundation Type

A choice may be made on the basis of an economic comparison between the use of footings or piles to support the abutments. When piles are considered, allowance should be made for an expected penetration of a few feet into the broken rock surface and the irregularity of the surface considered. Payment clauses for piles should be sufficiently flexible to permit adjustments due to variations occurring between borehole locations.

When footings are considered, we feel that there would need to be a significant saving from their use to compensate for the extra care during construction which will be necessary. Variations between boreholes can occur in these soils and construction care would be required. However, it should not be felt that a satisfactory footing foundation cannot, in our opinion, be achieved at the site.

4. CONSTRUCTION PRECAUTIONS

Groundwater levels can be observed at the observation well installed in Hole No. 1 up to and immediately preceding construction operations. This might provide useful information in planning the excavation. If the soils are to be used for support of the structure, groundwater levels will need to be lowered below footing level to preserve the strength of the till soils which are not sufficiently impervious that they will not soften with an upward flow or pressure of groundwater. Wellpoints into the sandy layers of the till or adjacent sand deposit could be used or deep ditches surrounding the excavations, running to a pumped or free outlet.



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BOREHOLE LOCATIONS
KIRKWOOD & QUEENSWAY
BRIDGE No. 6

SCALE 1" = 40 FT.

PLATE 1

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SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

KIRKWOOD, & QUEENSWAY
BRIDGE #6

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 244.3 (Geodetic Datum)

REMARKS ref: B.M. 11-11 (244.1') Top M.H. 20' S. of Cairns. INTER. Casing
F.R.I.

HOLE NO.

DATE JAN 30 1982

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	PENETRATION TEST			
							LB. HAMMER		NO CASING	
							INCH DROP		INCH DIA. ROD	
GROUND SURFACE							BLOWS PER FOOT			
				Topsoil	1.5'	244.8'				
		4	1-1							
		7	2-1	Loose Fine SAND						
3.25		5	3-1		5.5'	240.8				
	2 for 10'	6								
1.0		2 for 10'	4-1	Stiff BROWNISH GRAY Clay						
					5'	239.3	OVER-NIGHT Water Level - 6.5'			
0.7		2 for 10'	5-1	Soft GRAY Clay						
					11.5'	239.8				
	5 for 10'			Loose SANDY Till						
		22	6-1		13.0'	238.3				
				MED. DENSE SANDY Till						
	27		7-1		16.0'	236.3				
	25 for 10'									
	20 for 10'		8-1	DENSE SANDY Till						
		43								
	14 for 10'		9-1		20.0'	226.3				
		13								
	11 for 10'		10-1	MED. DENSE SANDY Till						
		18								
	75		11-1		25.0'	221.3				
	53 for 10'									
	108 for 10'		12-1	DENSE SANDY Till						
	17 for 10'		13-1							
				Shaly Limestone	21.3'	215.0				
				CORE RECOVERY - 87%						
					33.5'	212.5				
				Shaly Limestone						
				CORE RECOVERY - 52%						
					38.5'	208.0				
				Shaly Limestone						
				CORE RECOVERY 82%						
					43'	202.8				
				Shaly Limestone						
				CORE RECOVERY 85%						
				Bottom of Hole	46.5'	200.0				
							% WATER CONTENT			PLATE
										2

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SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Kirkwood & Queensway
Bridge #6

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 244.2' (Geodetic Datum)

REMARKS Ref: B.M. 11-11 (e.l. 246.1') Top M.H. 20'S. of Carling Inter. Carling
C.R.L.

HOLE NO.

3

DATE JAN. 30/58

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	PENETRATION TEST			
							LB. HAMMER		NO CASING	
							INCH DROP		INCH DIA. ROD	
GROUND SURFACE							BLOWS PER FOOT			
					0'	244.2'				
				Loose Fine Sand						
				2.5' to 3.5' Brownish Gray Clay	2.5'	242.2'				
				Stiff Silty	2.5'	241.7'				
48	35006	5	1-3	Brownish Gray Clay						
	15006	3	2-3							
21	25006	8	3-3	Loose Till	5.0	239.2'				
	35006	10	4-3		8.0	236.2'				
				Medium Loose Till						
	25006	55	5-3	Dense Till	10.0	234.2'				
				Very Dense Till	12.5	231.7'				
	50006	63	6-3	Very Dense Well-Graded Sand	13.5	230.7'				
				Very Dense Fine Sand						
				Very Dense Well Graded	16.0	228.2'				
	50006	57	7-3	Sand with some pebbles						
				Very Dense Fine & Medium	18.5	225.7'				
	46006	53	8-3	Boulders in Very Dense Well-Graded Sand	20.5	222.7'				
				Boulders in Dense Sandy Till	21.5	221.7'				
	50006	10-3			23.0	221.2'				
				Shaly Limestone (G.D.M.) CORE RECOVERY - 33%						
				Shaly Limestone	25.0	218.2'				
				CORE RECOVERY - 80%						
				Shaly Limestone	28.0	215.2'				
				CORE RECOVERY - 81%	30.5	212.7'				
				Shaly Limestone						
				CORE RECOVERY - 100%	32.5	210.7'				
				Bottom of Hole						
							% WATER CONTENT			
							PLATE			
							4			

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SOIL PROFILE AND SUMMARY OF LABORATORY TESTS

Kirkwood & Queensway
Bridge #6

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 245.9' (Geodetic DATUM)

REMARKS Ref. B.M. 11-11 (el. 246.1) Top M.H. 20'S. of CARLING INTER. CARLING

HOLE NO.

4

DATE JAN 30/58

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	PENETRATION TEST				
							LB. HAMMER		NO CASING		
							INCH DROP		INCH DIA. ROD		
GROUND SURFACE							BLOWS PER FOOT				
					0	245.9'					
	10500	10	1-4	Fill							
	8500	17	2-4								
	4500	6	3-4	Loose Fine Sand	40	241.9'					
1.3	2500	15	4-4	Stiff Silty Brownish Grey Clay	65	235.4'					
				Medium Soft	75	235.4'					
				Sandy Grey Clay	95	235.4'					
				Boulders in Dense Till							
	19500	47	6-4	Dense Fine Sand	150	220.9'					
				with some Well-Graded Gravel a few stones							
			7-4		190	226.3'					
	40500										
	12500			Very Dense Fine Sand							
	22500		8-4		250	220.9'					
	12500		9-4	Dense Sandy Till							
					300	215.9'					
				Shaley Limestone							
				core recovery - 62%	322	213.7'					
				Shaley Limestone							
				core recovery - 48%	345	211.4'					
				Shaley Limestone							
				core recovery - 77%							
					388	207.1'					
				Shaley Limestone							
				core recovery - 92%							
					445	200.7'					
				Bottom of Hole							
							% WATER CONTENT			PLATE 5	