

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 533-91-07 DIST 3
HWY 6 & 24 STR SITE -
Proposed Speed River Weir Relocation

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FOUNDATION INVESTIGATION REPORT

For

Proposed Speed River Weir Relocation

W.P. 533-91-07, Hwy. 6 & Hwy. 24

District 3, Stratford

INTRODUCTION

This report summarizes the results of a Foundation Investigation conducted in conjunction with the proposed Speed River weir relocation. The existing weir located immediately downstream of the existing Hwy. 6-Speed River Crossing structure must be relocated because it conflicts with the proposed new E/W-S ramp structure. A weir relocation approximately 20 metres downstream of the existing location has been accepted and approved by all the internal and external agencies involved in the project. The weir will span the width of the Speed River and adjoining floodplain.

SITE DESCRIPTION AND GEOLOGY

General

The site is located downstream of the existing weir within the Speed River. The existing concrete weir is located adjacent to the existing four (4) span concrete beam Hwy. 6 Southbound/Speed River structure located in turn adjacent to a twin Hwy. 6 Northbound

structure. The site is situated approximately 0.5 km south of the Wellington Street/ Hanlon Expressway intersection in the City of Guelph, Wellington County.

The existing concrete weir is approximately thirty six (36) metres in length and spans the Speed River. Concrete slabs and a retaining wall are located at the western edge of the weir. The water level upstream of the weir was approximately 1 metre and downstream at the proposed weir relocation the water level was approximately 0.3 m to 0.5 m at the time of the investigation. A turbulent water overflow is prevalent at all times, an indication of the dynamic flow conditions at the weir location.

River bank slopes exist on either side of the Speed River at the site. The slopes which are approximately 1H:1V and covered by grassland, low lying shrubs and tall trees exhibit no signs of instability. A water gauge shed used as a monitoring station by the Water Survey of Canada is situated on the east bank at the weir location.

Drainage ditches and CSP's are also located at various locations across the site. These ditches and CSP's are part of the Hwy. 6 hydrological storm water catchment that downfalls into the Speed River.

At the site, the Speed River is bounded by private land owned and managed by Guelph Dolime Ltd. Guelph Dolime Ltd operate a quarry southeast of the site. Stockpiles of crushed dolostone and rock and soil precipice are evidence of the operation. A bridge structure located approximately 100 to 150 metres downstream of the proposed relocated weir is used to access the quarry. A woodlot and office building is located immediately

north of the site.

Geology

Physiographically, the site is located within the region known as the "Guelph Drumlin Field". Within this area, there are approximately 300 drumlins of all sizes. The drumlins in this area are not closely spaced and there is intervening low lying grounds between the drumlins. This is for the reason that during the most recent Wisconsinan Glaciation period (approximate 12,000 years ago), the ice which moulded this field advanced from the southeast whilst the receding glacier moved perpendicular to this direction. As a result, the drainage of the ice front was directed to lower and lower outlets and hence the drumlin field is furrowed by parallel valleys running perpendicular to the trend of the drumlins. Along the sides of these valleys there are broad sand and gravel terraces.

As a result of the glacial activity, the general landform pattern consists of drumlins or groups of drumlins fringed by gravel terraces. The dominant soil materials are the unstratified, unsorted drumlin tills consisting of a heterogeneous mixture of gravels, sand and silts and the deep gravel terraces of the old meltwater spillways. Overburden in the site area is underlain by dolostones of the Amabel and Guelph Formations. Overburden thicknesses are shallow in the site area and usually less than five (5) metres.

INVESTIGATION PROCEDURE

General

Soil and rock data and inherent properties were obtained by conducting both an in situ field investigation and laboratory analyses. Details of the field investigation and laboratory testing program are discussed below.

Field Investigation

The fieldwork for this project was conducted on February 18, 1993 and consisted of a total of three (3) sampled boreholes. The boreholes were advanced to depths ranging from 2.6 m to 3.2 m.

All boreholes were advanced using a conventional track mounted Central Mining Equipment (CME) 55 drilling unit. Hollow stem auguring techniques were used to penetrate the overburden and conventional rock coring techniques consisting of an NX core barrel and NW Casing was used to core up to 1.5 metres of bedrock.

Disturbed subsoil samples were retrieved in the overburden using a 50 mm diameter split spoon sampler driven in accordance with the Standard Penetration Test (SPT-ASTM D1586). The samples were retrieved at 0.76 m intervals until bedrock was encountered.

All subsoil samples were identified in the field and then properly sealed in plastic containers to preserve natural moisture contents in the soil. The samples were then transported to the laboratory where additional visual classifications were carried out and pertinent laboratory tests were conducted as described in the next section below.

Rock core samples were also identified in the field and physical index properties were determined by visual examination and also by measurement of rock quality designations (RQD's) and rock core recovery. All rock core were placed in standard rock core boxes and carefully transported to the laboratory.

Survey elevations of the river level and river bottom were taken to determine the depth of water present at the time of the investigation. The survey related to the location and elevation of the individual boreholes was provided by Southwestern Region Surveys and Plans.

Laboratory Analysis

All subsoil samples were carefully visually examined in the laboratory in accordance with the procedures outlined in the Visual Method described in Chapter 2 of the MTO Soil Classification Manual. Grain size distributions of the soils were determined by mechanical sieve and hydrometer analyses. Sample preparation and testing were conducted in accordance with the MTO Laboratory Testing Manual.

Detailed rock core logging was conducted in the laboratory by an in-house resident geologist. The rock core logging included descriptions of colour, grain size, bedding, jointing and strength.

Laboratory test results have been summarized below in the subsequent section of this report entitled "Subsurface Conditions" and are illustrated on the corresponding boreholes and figures included in the Appendix to this report.

SUBSURFACE CONDITIONS

GENERAL

The subsurface conditions across the site are uniform and consist of a shallow native deposit comprised of approximately 0.8 to 1.5 metres of a heterogeneous mixture of boulders, cobbles, gravel, sand and silt underlain by dolostone bedrock. The bedrock surface elevation is flat and ranges from 301.3 m to 301.7 m across the site. At the time of the investigation, there was no water present at the extreme ends of the river, but water did exist within these outer limits.

A plan of the site illustrating the locations and elevations of the boreholes is shown on Dwg. No. 5339107-A in the Appendix. A subsoil stratigraphical section produced along the length of the proposed weir is also provided. The boundaries between the various soil types, in situ and laboratory test results as well as water levels established at the time of investigation are shown on the stratigraphical section and also on the individual Record of Borehole sheets

in the Appendix.

SOIL/ ROCK DESCRIPTIONS

Water

Approximately 0.3 m of standing water was present in the Speed River at the time of the investigation. The water had frozen at the edges of the river, at the time of the investigation. Some flow was evident within the middle of the river.

Heterogeneous Mixture of Boulders, Cobbles, Gravel, Sand and Silt (Glacial Till)

At the river bottom and overlying the bedrock for a thickness ranging from 0.8 m to 1.5 m exists a native deposit consisting of a heterogeneous mixture of boulders, cobbles, gravel, sand and silt. The deposit is generally brown in colour but black organics are also evident within the surficial thicknesses of the deposit. Grain size distribution curves shown on Figure 1 in the Appendix illustrate the broad range of particle sizes that is characteristic of these types of deposits of glacial till origin. Boulders and cobbles, however, are not shown in the gradation curves.

The 'N' values as determined by the Standard Penetration Test range from 13 blows/0.3 m to 20 blows/0.3 m indicating a compact state of denseness. Larger 'N' values such as 60 blows/3 cm that were observed are a reflection of the sampler driven on boulders or bedrock.

Bedrock

The bedrock that underlies the heterogeneous mixture of boulders, cobbles, gravel , sand and silt at the site is a dolostone of the Guelph Formation. The dolostone bedrock is a chemical sedimentary rock that is medium grained. The rock is unweathered to slightly weathered and is featured by a porous "vug" texture and stylolites. The rock is very pale orange to yellowish brown in colour and contains thin horizontal beds and very close to moderately close spaced vertical fractures. Detailed descriptions of the bedrock are attached in the Appendix in a report entitled "Description of Rock Core".

An assessment of the quality and strength of the rock was carried out by measuring core recoveries and Rock Quality Designations (RQD's) in the field and by physical index property testing. Recoveries were all at 100% and RQD's ranged from 28% to 85% indicating that the rock is of poor to good quality. Rock strengths can be described as weak.

GROUNDWATER CONDITIONS

Observation of the groundwater level was carried out by measuring the water levels in the open boreholes and monitoring the lake level throughout the duration of the field investigation. The river level was approximately 302.8 m at the time of the investigation and the water level for BH 1 (located on a small island within the water) also had a water level elevation equivalent to 302.8 m.

Groundwater and river levels in general, are subject to seasonal fluctuations and hence can vary from the values given in this report.

DISCUSSION AND RECOMMENDATIONS

A conflict in the location of an existing concrete weir and the proposed E/W-S ramp structure will necessitate the relocation of the existing weir. It has been agreed by the Ministry of Transportation and various external agencies (Water Survey of Canada, Grand River Conservation Authority and the Ministry of Natural Resources) to relocate the weir approximately 20 metres downstream. The proposed concrete weir will span across the Speed River.

The Water Survey of Canada relies on this weir for flow measurement and flood predictions. They have advised that the existing weir must not be removed until the new one has been installed and calibrated.

Both the Ministry of Natural Resources and the Grand River Conservation Authority initially expressed their desires to have the weir completely removed since it obstructs fish passage and creates an area of impoundment. However, the weir must be replaced as specified by the Water Survey of Canada.

A plan illustrating the existing and proposed weir location is shown on Dwg. 5339107-A. Recommendations to facilitate the foundation design and construction of this weir is included in this report and described below.

Foundation Design

It is recommended that the structure foundations be supported on conventional spread footings founded on the bedrock surface. The bedrock surface is horizontal and at a uniform elevation of approximately $301.5 \pm$ at the site. For purposes of the O.H.B.D.C., all footings founded on the dolostone bedrock can be designed using a factored capacity at U.L.S. of 1500 kPa. The bearing capacity at the Serviceability Limited State does not govern the design because of the unyielding nature of the bedrock. Stresses required to induce detrimental settlements at the Serviceability Limit State will exceed the factored capacity at U.L.S.

The bearing capacity given pertains to vertical normal loads only. Reductions of bearing capacities to account for inclined loadings shall conform to factors provided in Section 6-7.3.3.5 of the O.H.B.D.C.

The resistance of the spread footing founded on the bedrock surface can be computed by employing an unfactored angle of friction of 30° between the concrete footing and the bedrock surface. Should additional horizontal resistance to sliding be required, shear keys or dowels can be incorporated. An unconfined compressive strength of 10 MPa and a bond stress of 100 kPa (between cement grout and bedrock) at U.L.S. are relevant shear key/dowel design parameters within the dolostone bedrock. The lateral resistance of shallow foundations shall be computed in accordance with Section 6.7.3.3.2 of the O.H.B.D.C.

It is prudent that the footing base be protected against weathering during construction. To preserve the integrity of the bedrock surface during construction, it is recommended that a 100 mm thick lean mix concrete coating be placed on the footing bedrock surface within four (4) hours of exposure. Any previously weathered or loosened rock shall be removed prior to the placement of the concrete coating.

Foundation Construction

Footing construction should be conducted in the dry and therefore a temporary dam and/or temporary diversion is recommended. A construction staging sequence may also be necessary. Once the water flow has been diverted, excavation and construction can be executed within a "box-type" excavation using sump pumps if necessary. The box excavation scheme involves the excavation and then subsequent displacement of a prefabricated enclosure until the bedrock surface is encountered while pumping water to facilitate the excavation. Once the overburden has been excavated, and the prefabricated enclosure is positioned on the bedrock surface and sealed effectively at the bedrock surface to minimize water inflow, conventional sump pumping techniques can be used to discharge any additional water.

It is recommended that the Contractor submit dewatering scheme plans prior to construction as specified in OPSS 902.04. Our office can then assist in the review of these drawings to determine acceptability of the proposal.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of T. Sangiuliano, Foundation Engineer, utilizing equipment owned and operated by Malone's Soil Samples. Logging of rock core in the laboratory was carried out by D. Williams, Petrographer.

The project was carried out by T. Sangiuliano under the general supervision of P. Payer, Senior Foundation Engineer. The report was written by T. Sangiuliano, reviewed by P. Payer and approved by Mr. M. Devata, Chief Foundation Engineer.



A handwritten signature in black ink, appearing to read 'T. Sangiuliano', written in a cursive style.

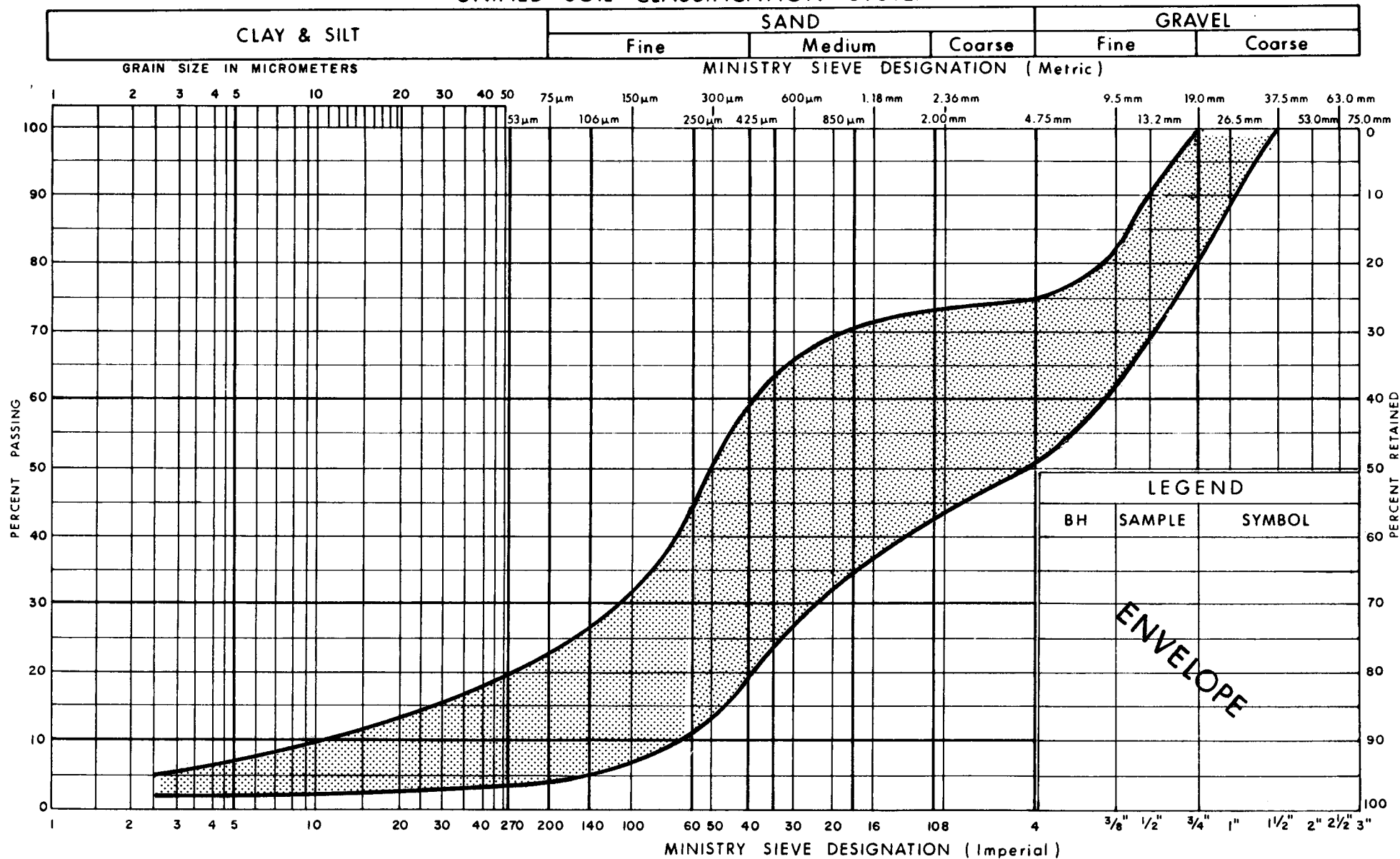
**T. Sangiuliano, P.Eng.
Foundation Engineer**

A handwritten signature in black ink, appearing to read 'M. Devata', written in a cursive style.

**M. Devata, P.Eng.
Chief Foundation Engineer**

APPENDIX

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
HET. MIXTURE OF BOULDERS, COBBLES,
GRAVEL, SAND & SILT (Glacial Till)

FIG No 1

W P 533 - 91 - 07

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (R Q D), FOR MODIFIED RECOVERY, IS:

R Q D (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kN/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kN/m ³	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kN/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ³ /s	RATE OF DISCHARGE
γ_d	kN/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $\frac{w_L - w_p}{w_p}$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kN/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m ³	SEEPAGE FORCE
γ'	kN/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 533-91-07 LOCATION Co-ords: N 4 820 772.5; E 243 248.0 ORIGINATED BY TS
 DIST 3 HWY 6 BOREHOLE TYPE HS Auger, NW Casing, NX Core COMPILED BY TS
 DATUM Geodetic DATE 93 02 18 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
303.2	Ground Surface																
0.0	Black, trace Organics		1	SS	17												37 52 10 1
	Heterogeneous Mixture of Boulders, Cobbles, Gravel, Sand and Silt (Glacial Till)		2	SS	16												
301.7	Grey, Compact		3	SS	60	/3cm											
1.5	Dolostone Bedrock																
	Weak, Unweathered to Slightly Weathered		4	RC	REC 100%												RQD = 85%
300.1																	
3.1	End of Borehole																
	* 93 02 19																

RECORD OF BOREHOLE No 2

1 OF 1

METRIC

W.P. 533-91-07 LOCATION Co-ords: N 4 820 767.7; E 243 261.5 ORIGINATED BY TS
 DIST 3 HWY 6 BOREHOLE TYPE HS Auger, NW Casing, NX Core COMPILED BY TS
 DATUM Geodetic DATE 93 02 18 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
302.8	Water Surface																
0.0	Water																
0.3	Heterogeneous Mixture of Boulders, Cobbles, Gravel, Sand and Silt (Glacial Till)		1	SS	16												49 47 3 1
301.7	Grey, Compact to Very Dense		2	SS	60	/5cm											
1.1	Dolostone Bedrock																
	Weak, Unweathered to Slightly Weathered		3	RC	REC 100%												RQD = 56%
300.2																	
2.6	End of Borehole																

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 533-91-07 LOCATION Co-ords: N 4 820 768.8; E 243 270.7 ORIGINATED BY TS
 DIST 3 HWY 6 BOREHOLE TYPE HS Auger, NW Casing, NX Core COMPILED BY TS
 DATUM Geodetic DATE 93 02 18 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
302.8	Water Surface																
0.0	Water																
0.3	Heterogeneous Mixture of Boulders, Cobbles, Gravel, Sand and Silt (Glacial Till)		1	SS	13		302										26 52 20 2
			2	SS	20												
301.3	Grey, Compact		3	SS													
1.5	Dolostone Bedrock Weak, Unweathered to Slightly Weathered		4	RC	REC 100%		300										RQD = 28%
299.6																	
3.2	End of Borehole																
	* Sampler Bouncing																

ROCK CORE DESCRIPTION **WP 533-91-07**

Page 1 of 1

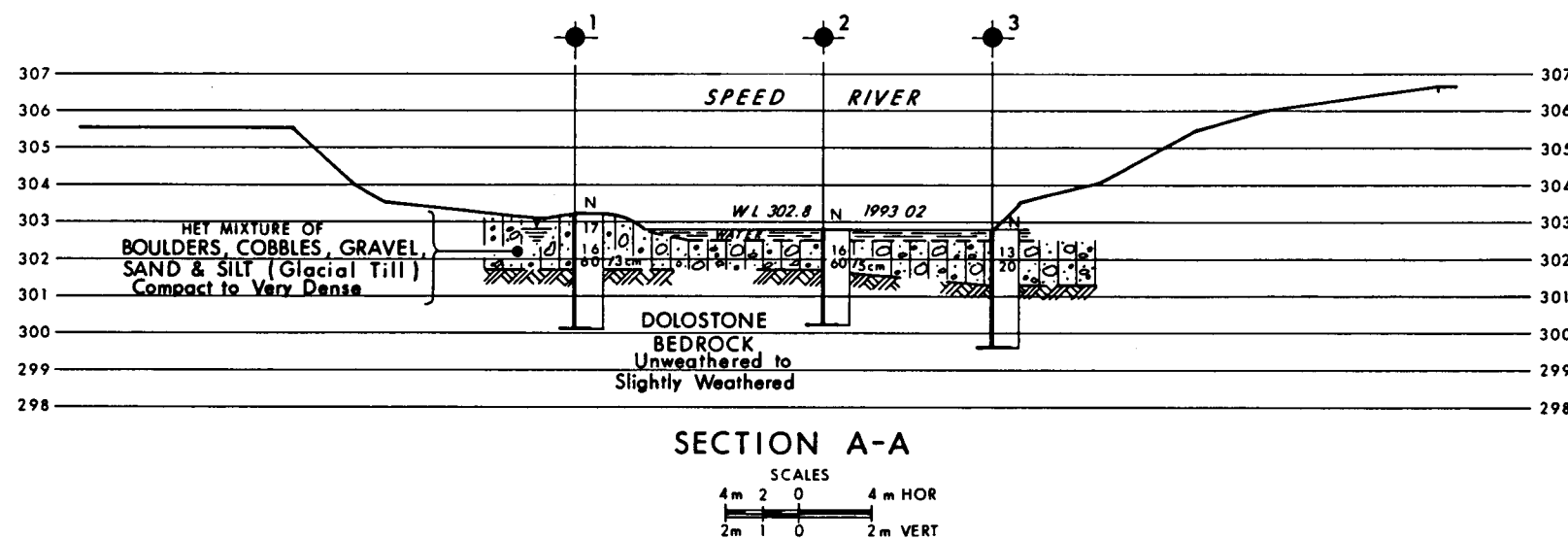
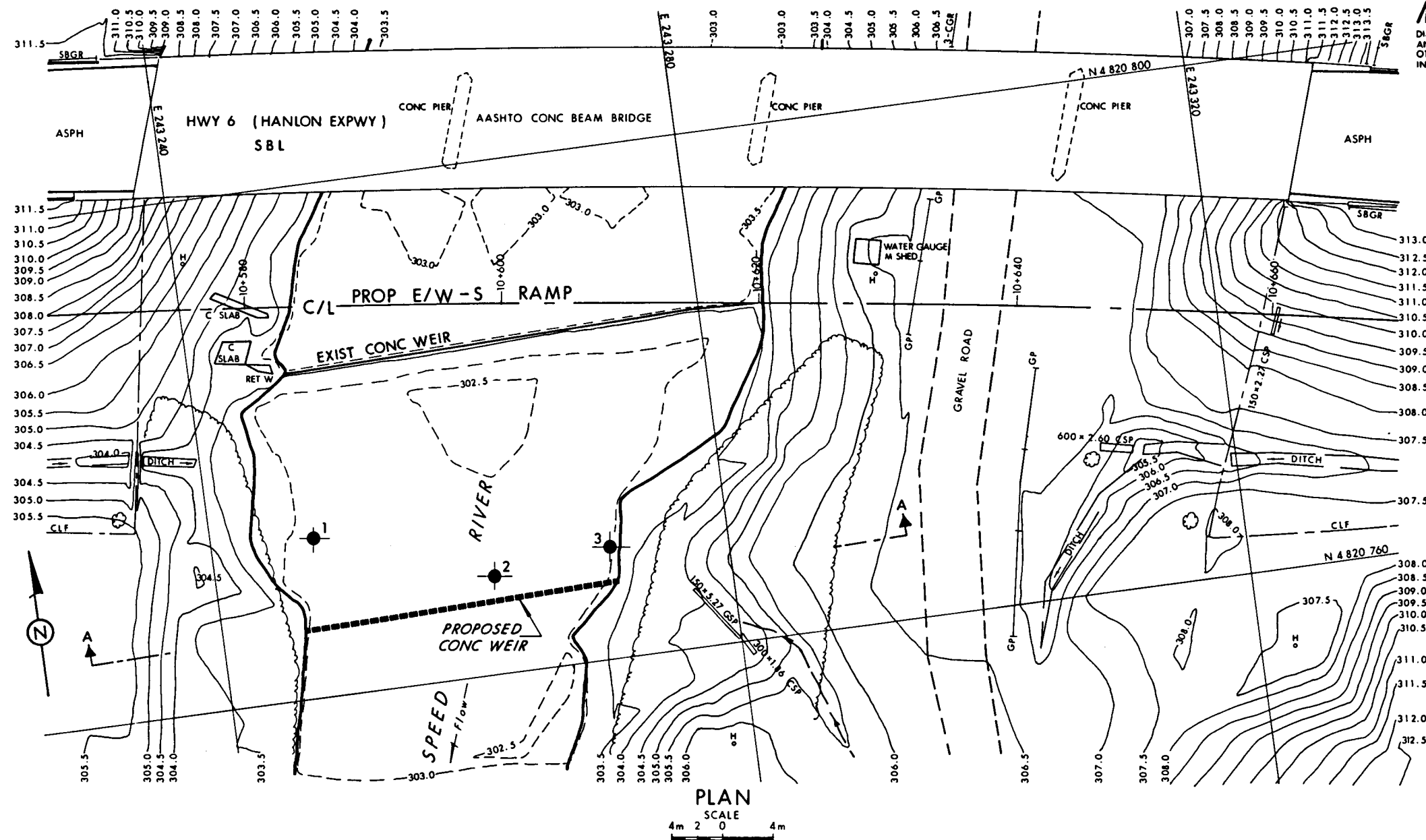
CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
1	4	1.55-3.07	100	85	1.55-3.07	DOLOSTONE (with stylolites, abundant small vugs, and some larger vugs up to 3 cm in diameter, commonly containing calcite crystals), very pale orange to pale yellowish brown; medium grained; weak; unweathered to slightly weathered; fractures moderate to close spaced, flat to dipping, undulating to planar, smooth to rough.
2	3	1.07-2.59	100	56	1.07-2.59	DOLOSTONE (with stylolites, abundant small vugs, and some larger vugs up to 3 cm in diameter), very pale orange to pale yellowish brown; medium grained; weak; unweathered to slightly weathered; fractures moderate to very close spaced, flat to near vertical, undulating to planar, smooth to rough.
3	4	1.70-3.22	100	28	1.70-3.22	DOLOSTONE (with stylolites, abundant small vugs, and some larger vugs up to at least 4 cm in diameter, commonly containing calcite crystals), very pale orange to pale yellowish brown; medium grained; weak; unweathered to slightly weathered; fractures close to extremely close spaced, flat to near vertical, undulating to planar, smooth to rough.

*CR = CORE RECOVERY

*RQD = ROCK QUALITY DESIGNATION

(NOTE: Depths are approximated where core recovery is less than 100%)

Logged by: DAW, Soils and Aggregates Section



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES + METRES.

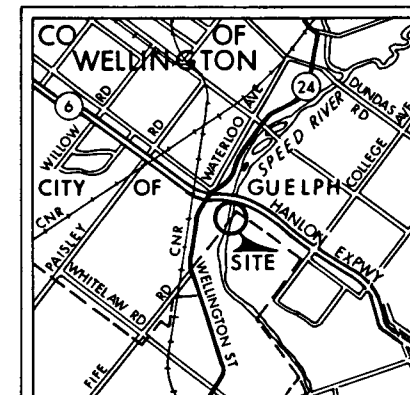
CONT No
WP No 533-91-07

PROP SPEED RIV WEIR RELOCATION
(INTERCHANGE AT HWY 6 & WELLINGTON ST)

BORE HOLE LOCATIONS & SOIL STRATA



SHEET



LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W.L. at time of investigation 1993 02

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	303.2	4 820 772.5	243 248.0
2	302.8	4 820 767.7	243 261.5
3	302.8	4 820 768.8	243 270.7

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen. Cond.

REV.	DATE	BY	DESCRIPTION

Geocres No 40P9-33

HWY No 6 (HANLON EXPWY)	DIST 3
SUBMITTS CHECKED TS DATE 1993 07 20	SITE
DRAWN RS CHECKED	APPROVED

DWG 5339107-A

