

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 31L-61

DIST. B REGION

W.P. No. 591-92-01

CONT. No. 95-214

W. O. No.

STR. SITE No. 44-242

HWY. No. 11

LOCATION Along 11 & Genesee Creek

No of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

METRIC
DIMENSIONS ARE IN METRES
AND / OR MILLIMETRES
UNLESS OTHERWISE SHOWN

northland
engineering
limited
Consulting Engineers and Planners

DISTRICT 13 NORTH BAY
CONT No
WP No 591-92-00
GENESEE CREEK CULVERT
PROPOSED HWY. 11 S.B.L.
GENERAL ARRANGEMENT



SHEET
02

GENERAL NOTES

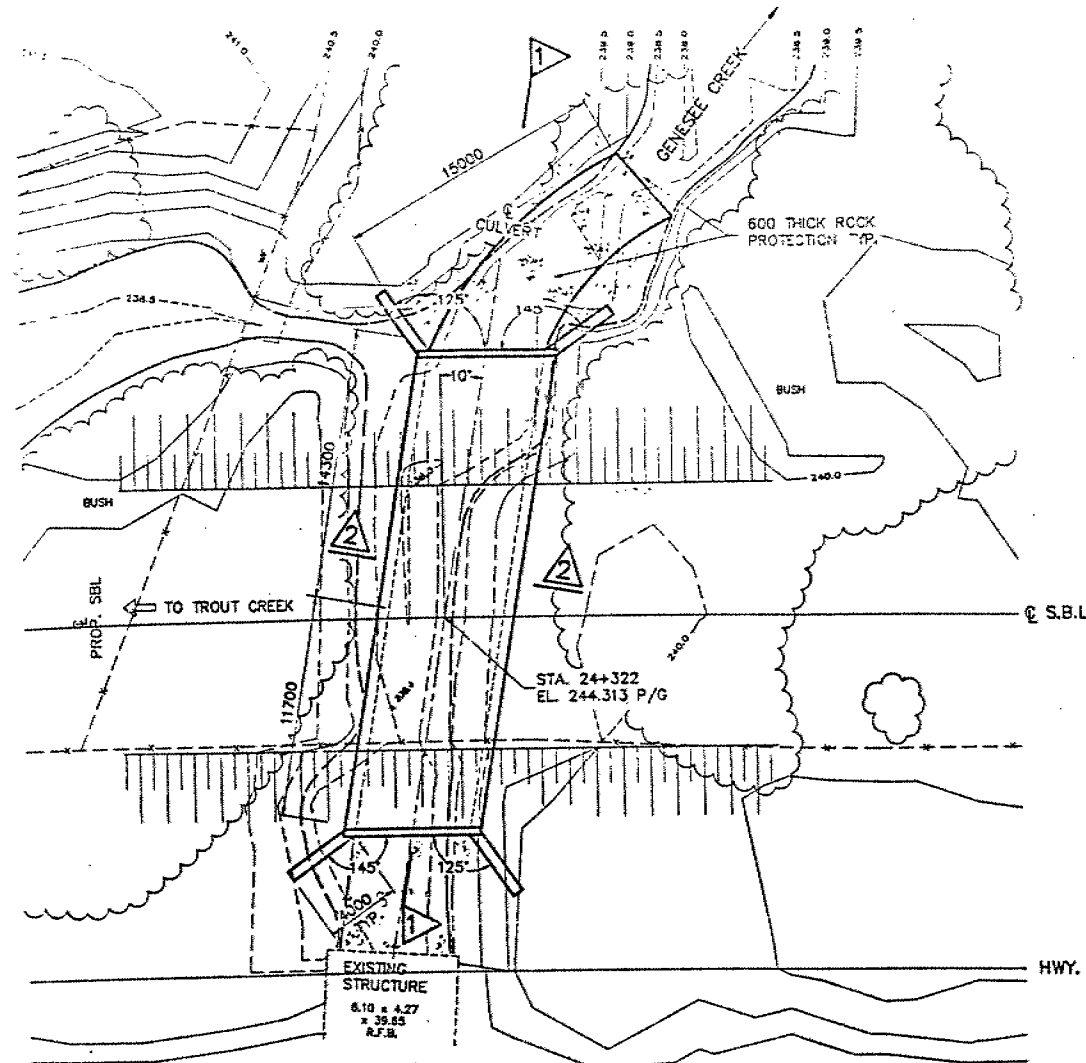
1. CLASS OF CONCRETE TO BE 30MPa.
2. CLEAR COVER TO REINFORCING STEEL
BOTTOM OF TOP SLAB 50 ± 10
BOTTOM OF BOTTOM SLAB 100 ± 25
REMAINDER 70 ± 20
UNLESS OTHERWISE NOTED
3. REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX C DENOTE COATED BARS.
4. MAX. SIZE OF GRAVEL COBBLES TO BE 150 mm

LEGEND

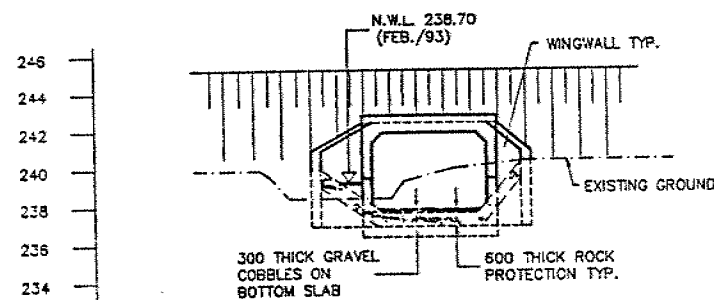
ALT DENOTES ALTERNATE
IF DENOTES INSIDE FACE
OF DENOTES OUTSIDE FACE
EF DENOTES EACH FACE

CONSTRUCTION NOTES

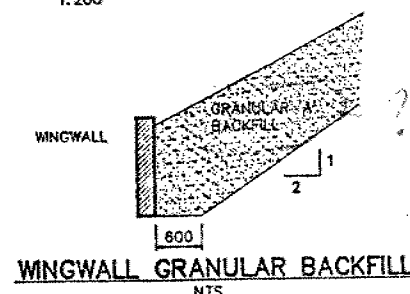
1. NO CONCRETE SHALL BE PLACED UNTIL THE DEPTH OF THE EXCAVATION AND THE CHARACTER OF THE FOUNDATION HAVE BEEN APPROVED BY THE ENGINEER.
2. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
3. SITE No. AND DATE FIGURES SUPPLIED BY WFO



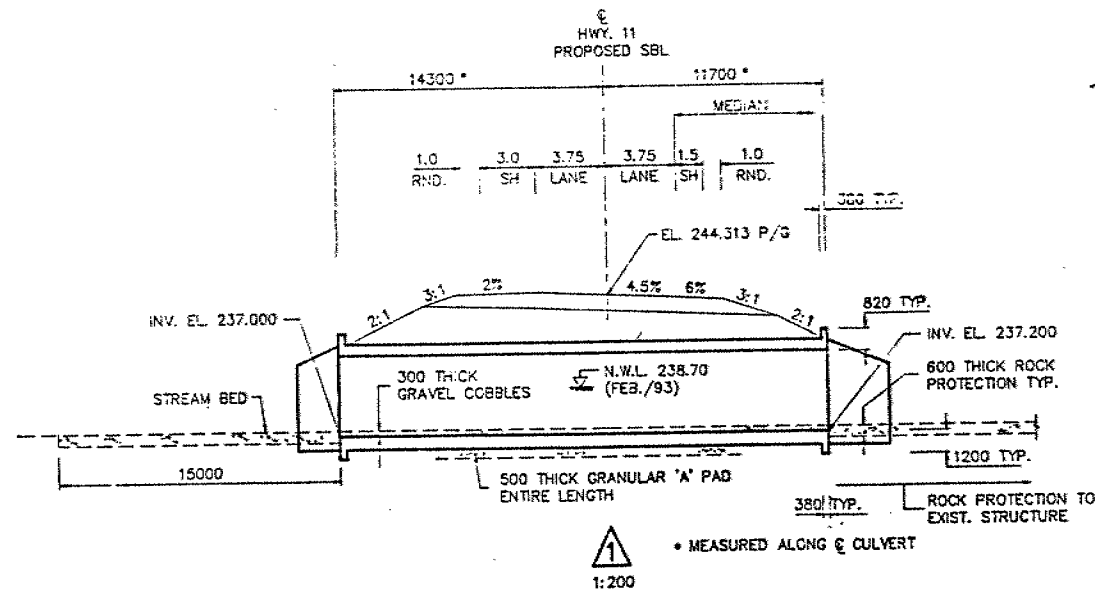
PLAN
1:200



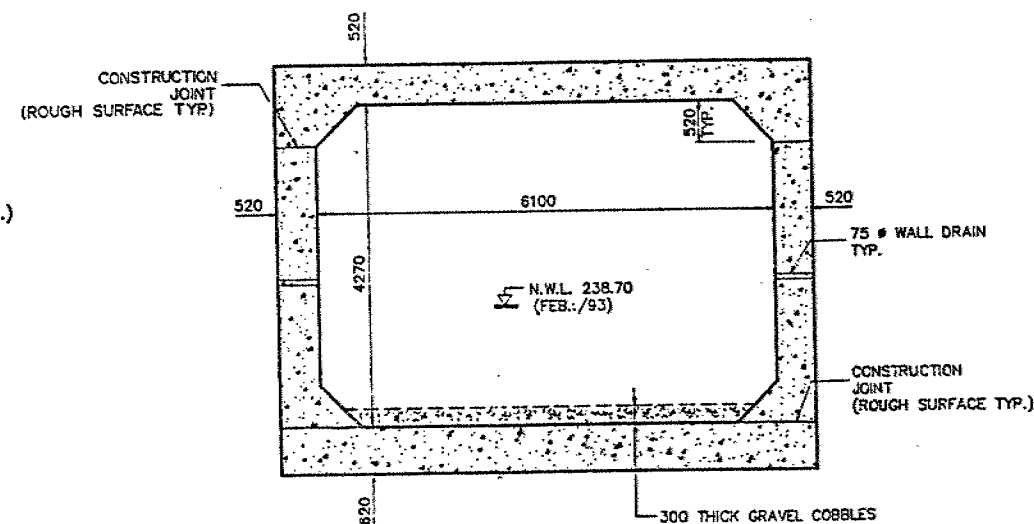
ELEVATION
1:200



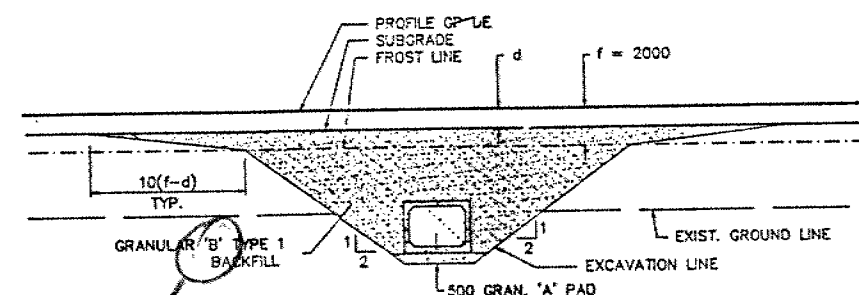
WINGWALL GRANULAR BACKFILL
NTS



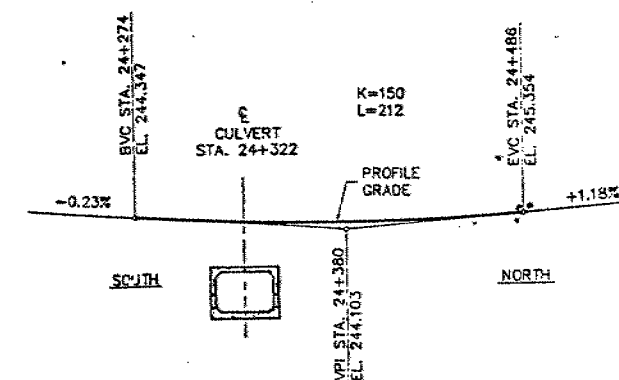
1
1:200



2
1:50



CULVERT GRANULAR BACKFILL
NTS



Q PROFILE PROPOSED HWY. 11 SBL
NTS

LIST OF DRAWINGS

1. GENERAL ARRANGEMENT
2. CULVERT DETAILS
3. WINGWALL DETAILS
4. STANDARD DETAILS

B.M. EL. 242.010

DRILL BIT AND SCREW
IN E. END OF CONC. CURB
STA. 24+317.38.1 RT.

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	S.M.	CHK	S.K.P.
DRAWN	O.A.H.	CHK	S.K.P.
DATE	FEB/94	DATE	FEB/94
PROJECT	44-242 STRUCT	PROJECT	44-242 STRUCT
SCALE	1:200	SCALE	1:200

METRIC
DIMENSIONS ARE IN METRES
AND / OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
WP No 591-92-00

PROP. HWY 11 S.B.L.
GENESSEE CREEK CULVERT
CULVERT DETAILS

SHEET
00

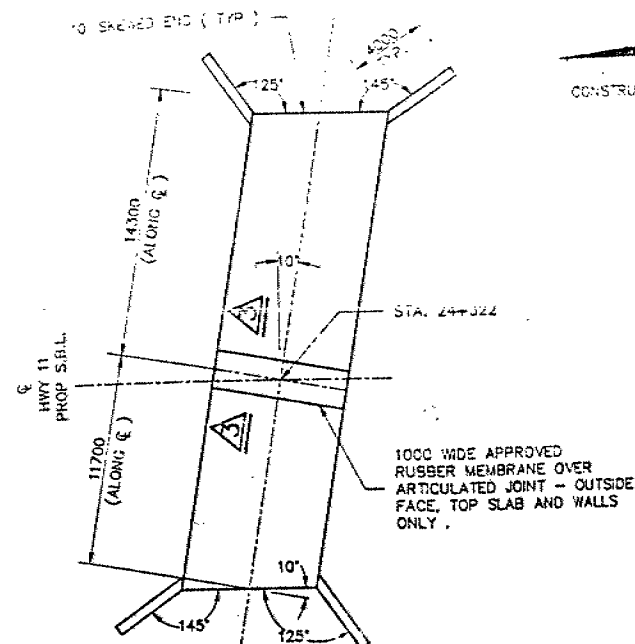
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GENERAL NOTES

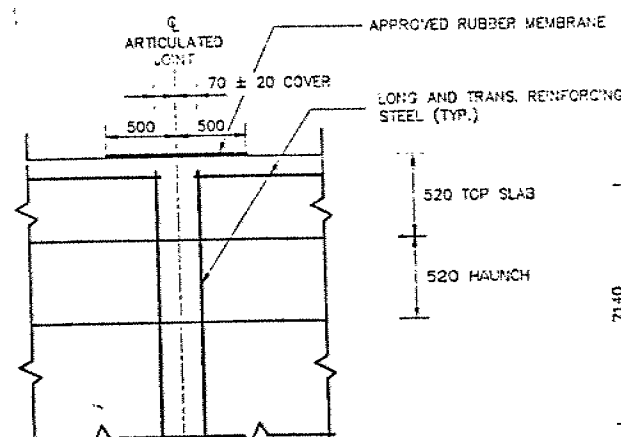
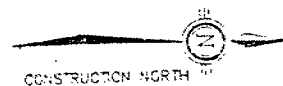
- CLASS OF CONCRETE TO BE 30MPa.
- CLEAR COVER TO REINFORCING STEEL
BOTTOM OF TOP SLAB 40 ± 10
REMAINDER 70 ± 20 UNLESS OTHERWISE NOTED
- REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED. BARS MARKED WITH SUFFIX C DENOTE COATED BARS.
- LONGITUDINAL REINFORCING STEEL SHALL BE DISCONTINUED AT ARTICULATED JOINTS.
- LEGEND
ALT DENOTES ALTERNATE
IF DENOTES INSIDE FACE
OF DENOTES OUTSIDE FACE
EF DENOTES EACH FACE

CONSTRUCTION NOTES

- BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH SIDES OF CULVERT KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
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- SITE No. AND DATE FIGURES SUPPLIED BY MTO

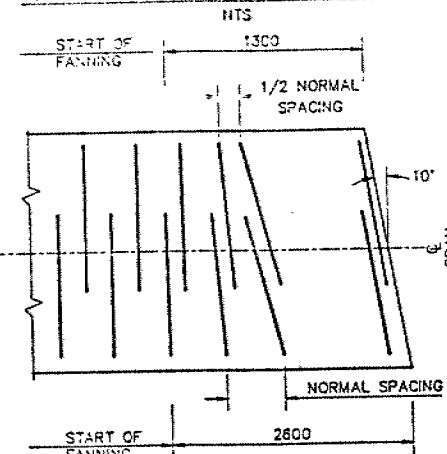


KEY PLAN
1:200

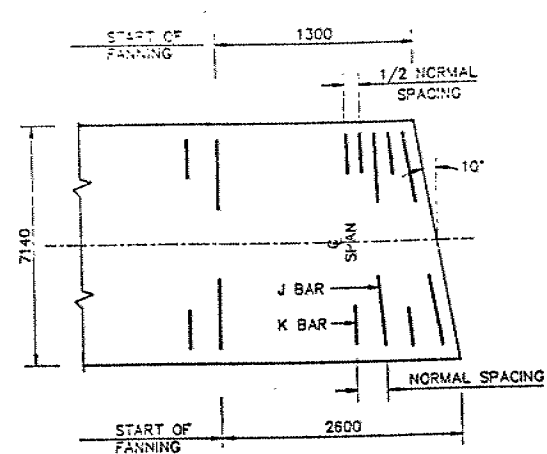


NOTE: WALL REINFORCING NOT SHOWN FOR SAKE OF CLARITY

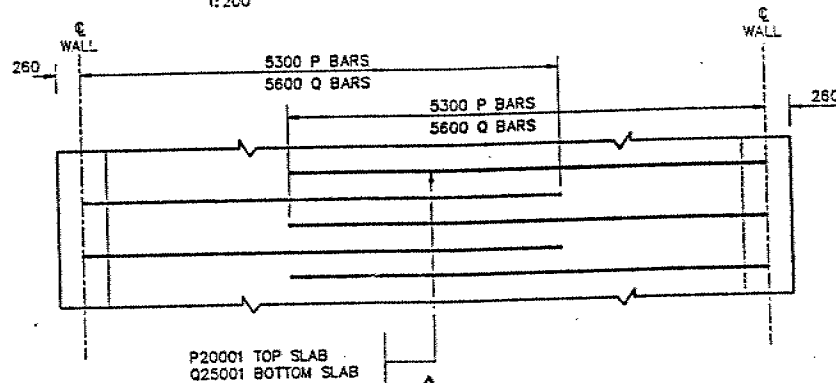
CULVERT CAMBER DIAGRAM
NTS



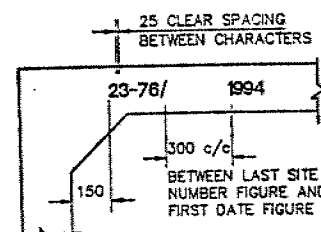
FANNING OF P AND Q BARS
NTS



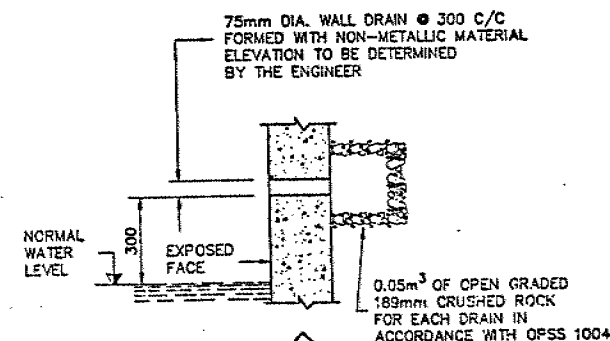
FANNING OF J AND K BARS
NTS



P20001 TOP SLAB
Q25001 BOTTOM SLAB



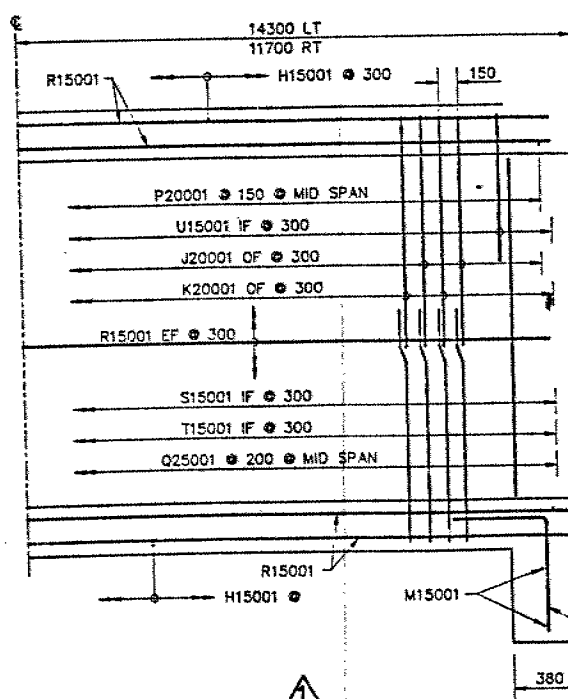
LOCATION OF SITE NUMBER
AND DATE FIGURES



NORMAL WATER LEVEL

EXPOSED FACE

0.05m³ OF OPEN GRADED 189mm CRUSHED ROCK FOR EACH DRAIN IN ACCORDANCE WITH OPSS 1004



TYPICAL CULVERT SECTION

MARK	No.	REQ'D	C/C	LENGTH	DETAILS	REMARKS
H15001	182	300	2780	STRAIGHT		TOP OF TOP SLAB BOTTOM OF BOTTOM SLAB
J20001	364	300	5350		2180 R=440	J-BARS ALTERNATE WITH K-BARS
K20001	364	300	4620		1450 R=440	K-BARS ALTERNATE WITH J-BARS
P20001	162	150	5300	STRAIGHT		BOTTOM OF TOP SLAB STAGGERED
Q25001	137	200	5600	STRAIGHT		TOP OF BOTTOM SLAB STAGGERED
R15001	715	300	5530	STRAIGHT	143 SETS @ 5 PER SET	LONGITUDINAL
S15001	182	300	2330		45° 1970 45° 180	HAUNCH
T15001	182	300	4300	STRAIGHT		INSIDE FACE OF WALLS
U15001	182	300	2230		45° 1870 45° 180	HAUNCH
L15001	50	300	1580		1080 500	DOWELS TO APRON WALLS
W15001	4	450	7110	STRAIGHT		APRON WALL
Y15001C	8	SEE (B)	7110	STRAIGHT		HEADER WALL
Z15001C	50	300	2045		225 190 230	HEADER WALL

NOTES
- ALL DIMENSIONS SHOWN TO CENTRE LINE OF BAR
- **C/C SPACING GIVEN AT MIDSPAN

QUANTITIES			
ITEM	WALLS & SLABS	WINGWALLS	TOTAL
MASS OF REINFORCING STEEL	uncoated		
tonnes	23.5	4.1	27.6
	coated	0.6	0.8
VOLUME OF CONCRETE			
cubic metres	358.5	43.7	402.2

STANDARD DRAWING
JUNE 1993
SS114-2
RIGID FRAME BOX CULVERT

DESIGN S.H. CHK S.K.P. CODE CHBDC 1991 LOAD DATE FEB.
DRAWN D.A.H. CHK S.K.P. SITE 44-242 (STRUCT) I SCHEME TOWNSHIP

FILE COPY



Ministry
of
Transportation

FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

CONT 95-214

WP 591-92-01 DIST 13

HWY 11 STR SITE 44-242

Genesee Creek Culvert Extension
Proposed Southbound Lanes

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FOUNDATION INVESTIGATION REPORT
for
Genesee Creek Culvert Extension
Proposed Southbound Lanes, Highway 11
W.P.591-92-01, Site No. 44-242
District 13, North Bay

INTRODUCTION

This report summarizes the information obtained from the foundation investigation carried out at the above noted site. The investigation was carried out at the request of the Northern Region Structural Section for an extension of the existing culvert required due to the proposed four laning of Highway 11. The field work, carried out on 93 06 07 and 93 06 08, consisted of two (2) sampled boreholes and three (3) dynamic cone penetration tests along the length of the proposed culvert site.

SITE DESCRIPTION

The site is located on the proposed southbound lanes of Highway 11, approximately 0.4 km north of the intersection of Highway 534 in the Township of South Himsworth, District of Parry Sound.

The immediate area is flat to moderately rolling. The site is grassed with trees on both sides of the creek. Land use in the adjacent areas includes the highway corridor and livestock pasture. According to the Northern Ontario Engineering Geology Terrain Study published by the Ministry of Natural Resources, the site is of Glaciofluvial Landform with kame moraine. The material expected typically comprises sand and gravel.

The existing Highway 11 embankment is approximately 4 m high at this location with the watercourse accommodated by a rigid concrete box culvert.

INVESTIGATION PROCEDURES

Soil data and inherent properties were obtained by in-situ and laboratory testing. The procedures employed are discussed below.

Field

The field work for the investigation was carried out on 93 06 07 and 93 06 08 and

consisted of two (2) sampled boreholes and three (3) dynamic cone penetration tests. BH 1 was basically a probe hole where a dynamic cone penetration test was carried out. BH 3 was advanced to 11.1 m depth whereas BH 2 was advanced to refusal at 17.1 m depth.

The boreholes were advanced using conventional hollow stem augering techniques with a track mounted continuous flight auger machine. The sampling program consisted of split spoon samples collected in the overburden. Disturbed subsoil samples were retrieved by split spoon sampler in accordance with Standard Penetration Test (ASTM D1586). Standard Penetration ('N') values were recorded for assessment of the denseness of the materials encountered. All subsoil samples were identified in the field and returned to the laboratory for further examination and appropriate testing. Dynamic Cone Penetration tests were carried out at the location of each borehole.

Groundwater levels were measured in each borehole and in the watercourse. All boreholes were backfilled upon completion of the field work.

Surveying required to ascertain borehole locations and elevations was carried out by the Northern Region Surveys and Plans Section.

Laboratory

The laboratory testing on selected soil samples consisted of the following:

- Grain Size Distribution
- Natural Moisture Content Determination
- Organic Content Determination

Laboratory results are given in the following section of this report and are illustrated on Record of Borehole sheets included in the Appendix.

SUBSURFACE CONDITIONS

General

In 1985, a preliminary foundation investigation was carried out by this office for the proposed Hwy 11 & 534 interchange, with a borehole (BH 7) sunk at the southwest

corner of the existing culvert at Genesee Creek. The Record of Borehole sheet produced therein together with the current ones are attached in the Appendix. The locations of the boreholes are shown in Dwg. No. 5919201-A.

The predominant soil stratum encountered in the boreholes consisted of Silty Sand. Some organics are found from ground surface to 2 - 3 m depths. Dynamic Cone Penetration tests and augering reached refusal at probable bedrock at 15.8 - 17.4 m depths (222.6 - 223.3 m) in BH 1 - 3.

Following are the specific descriptions of the materials encountered in the investigation:

Silty Sand

This is the major deposit in the area. It extends from the ground surface to a hard bottom (probable bedrock) at depth. The material is generally described as silty sand although the proportion of silt to sand varies with depth. Some organics was encountered at the surface to a depth of 2 to 3 m. Trace gravel was found below El. $231 \pm$ m. The Standard Penetration Resistance 'N' values recorded range from 0 to 10 blows/0.3 m down to EL $231-232 \pm$ m, indicating very loose to loose state of denseness. The material becomes compact to dense below that elevation with 'N' values of 15 to 33 blows/0.3 m. One very low 'N' value of 1 blow/0.3 m was recorded in BH 2 close to the termination depth. This low blowcount is due to unbalanced hydrostatic head and does not represent the denseness of the material.

Typical properties of the material, as determined by laboratory tests on representative samples may be summarized as follows:

<u>Property</u>	<u>Range</u>	<u>No. of Test</u>
Natural Moisture Content (w%)	19.0-40.5	8
Organic Content Determination(%)	0.23-2.54	2
Grain Size Distribution(%)		8
-Gravel	0-13	
-Sand	47-95	
-Silt	1-47	
-Clay	2-3	

Groundwater

The groundwater level measured in the boreholes was typically close to the ground surface at approximately El. 238 to 239 m. During the time of the investigation, the water level in the creek was at El. 238.7 m.

Groundwater levels are subject to seasonal fluctuations and hence may vary from the elevations given in this report.

DISCUSSION AND RECOMMENDATIONS

General

The proposed culvert is a 6 m X 4 m open footing rigid frame culvert. The culvert is required to carry water from the existing culvert at Genesee Creek through the proposed SBL of Highway 11. The proposed grade will result in a fill height of about 3 m over the new structure and approach fill of up to about 7.0 m high.

Foundation

The proposed top of footing elevation is El. 237.3 m at the location of the existing culvert. Assuming a footing thickness of about 0.3 m, the founding elevation is at about El. 237.0 \pm m at the inlet and roughly at 236.5 m at the outlet. Based on the investigation results, the subsoils at or below the proposed footing founding elevation typically comprises very loose to loose silty sand.

It is recommended to construct the culvert and wingwalls on conventional shallow foundation such as footings. Subexcavation should be carried out to about 0.5 m below the proposed underside elevation of the footings (i.e. El. 236.5 m at the inlet to 236.0 m at the outlet). This would in effect remove all the surficial organics. A 0.5 m thick granular pad should then be placed and compacted in 'dry' to form a working mat as well as bearing surface for the placement of the structure. Creek diversion and advance dewatering is required for this purpose. Dewatering may be in the form of pilot trenches with sump pumping to draw the water level down to at least 0.5 m below the bottom of the excavation.

The factored bearing capacity at U.L.S. recommended as per the O.H.B.D.C. is 200 kPa. From serviceability considerations, a design capacity of 120 kPa may be used. At this pressure, a settlement of up to 60 mm will occur due to the compression of the founding soils. Such settlements will occur immediately on completion of construction of the culvert and placement of fill above. The design of the structure should include a camber of 60 mm at the centre and articulated joints to accommodate differential settlements along the length of the culvert.

Depth of excavation required will be up to 3.5 \pm m. Temporary excavation may be carried out at a gradient of 2H:1V. Backfill to the culvert should consist of granular material. Reference is made to OPSD 803 standards for details. Culvert inlet and outlet treatments should comply with MTO Standards.

Frost Protection

The minimum earth cover required for frost protection is 2.0 m or equivalent insulation, unless the culvert is structurally designed to accommodate frost action.

Earth Pressure

Backfill to culvert walls should consist of granular material in accordance with MTO Standard Special Provision No. 109F03.

Computation of earth pressures should be in accordance with Section 6.7 of the O.H.B.D.C. The at-rest condition will govern earth pressure design for unyielding condition. For design purposes, the following properties for backfill are recommended:

<u>Material</u>	ϕ	γ	K_0
Granular A	35°	22.8 kN/m ³	0.43
Granular B	30°	21.2 kN/m ³	0.50

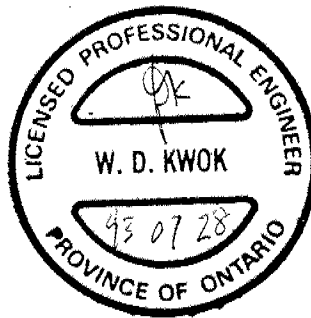
Embankment Slopes

Approach embankment slopes may be safely constructed at a gradient of 2H:1V or flatter up to a maximum height of 7.0 m. Surficial organic material should be removed prior to filling. Only relatively free draining granular material should be used below the water level.

MISCELLANEOUS

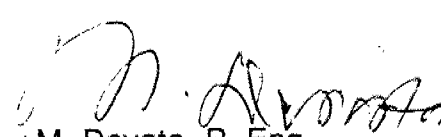
The fieldwork for this investigation was carried out under the supervision of D. Kwok, Project Foundation Engineer using the equipment owned and operated by Master Soil Investigation Ltd.

The project was carried out by D. Kwok under the general supervision of B. Iyer, Senior Foundation Engineer. The report was written by D. Kwok, reviewed by B. Iyer, and approved by M. Devata, Chief Foundation Engineer.




D. Kwok, P. Eng.
Project Foundation Engineer




M. Devata, P. Eng.
Chief Foundation Engineer

APPENDIX

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 (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	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

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_r	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

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

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 = $w_L - w_p$	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 2

1 OF 1

METRIC

W.P. 591-92-01 LOCATION Co-ords: N 5 104 725.0 ; E 314 827.8 ORIGINATED BY DK
DIST 13 HWY 11 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY DT
DATUM Geodetic DATE 93 06 07 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	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								
239.7	Ground Surface												
0.0	Trace Gravel Trace Organics & Rootlets Brown, Very Loose		1	SS	1								13 84 1 2
			2	SS	2								0 88 10 2
			3	SS	1								
			4	SS	6								
	Silty Sand Pinkish Brown Very Loose to Loose		5	SS	1								
			6	SS	3								
			7	SS	7								1 81 15 3
	Trace Gravel becoming Compact		8	SS	17								
			9	SS	20								
			11	SS	33								
			12	SS	1	**							
222.6													
17.1	End of Borehole Probable Bedrock												
	* 93 06 07 ** Material disturbed due to unbalanced hydrostatic head												

RECORD OF BOREHOLE No 3

1 OF 1

METRIC

W.P. 591-92-01 LOCATION Co-ords: N 5 014 734.6 ; E 314 806.8 ORIGINATED BY DK
DIST 13 HWY 11 BOREHOLE TYPE Hollow Stem Auger, Cone Test COMPILED BY DT
DATUM Geodetic DATE 93 06 08 CHECKED BY BI

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								
239.1	Ground Surface												
0.0			1	SS	2		238						
	With Organics and Rootlets Very Loose		2	SS	1								0 52 46 2
			3	SS	0								
			4	SS	3		236						0 95 2 3
			5	SS	2								
	Trace Silt						234						
	Silty Sand		6	SS	7								3 47 47 3
	Pinkish Brown						232						
	Very Loose to Loose		7	SS	10								
	becoming Compact Trace Gravel		8	SS	15		230						
228.0			9	SS	17								
11.1	End of Borehole												
	Probable Silty Sand Trace Gravel												
223.3													
15.8	End of Cone Test												
	* 93 06 08												

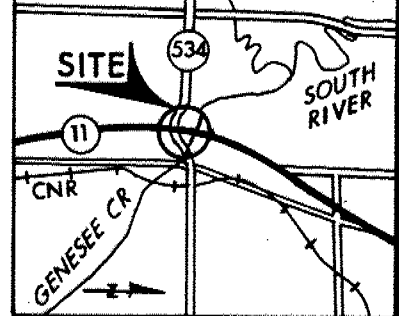
RECORD OF BOREHOLE No 7

METRIC

W P 84-05-0022 LOCATION 381.5 m North of Clarke St.; 0/S 19.4 m West of Hwy. 11
 DIST 13 HWY 11 & 534 BOREHOLE TYPE Hollow Stem Auger & NX Washboring
 DATUM Geodetic DATE 85 03 22
 ORIGINATED BY SW
 COMPILED BY SW
 CHECKED BY *[Signature]*

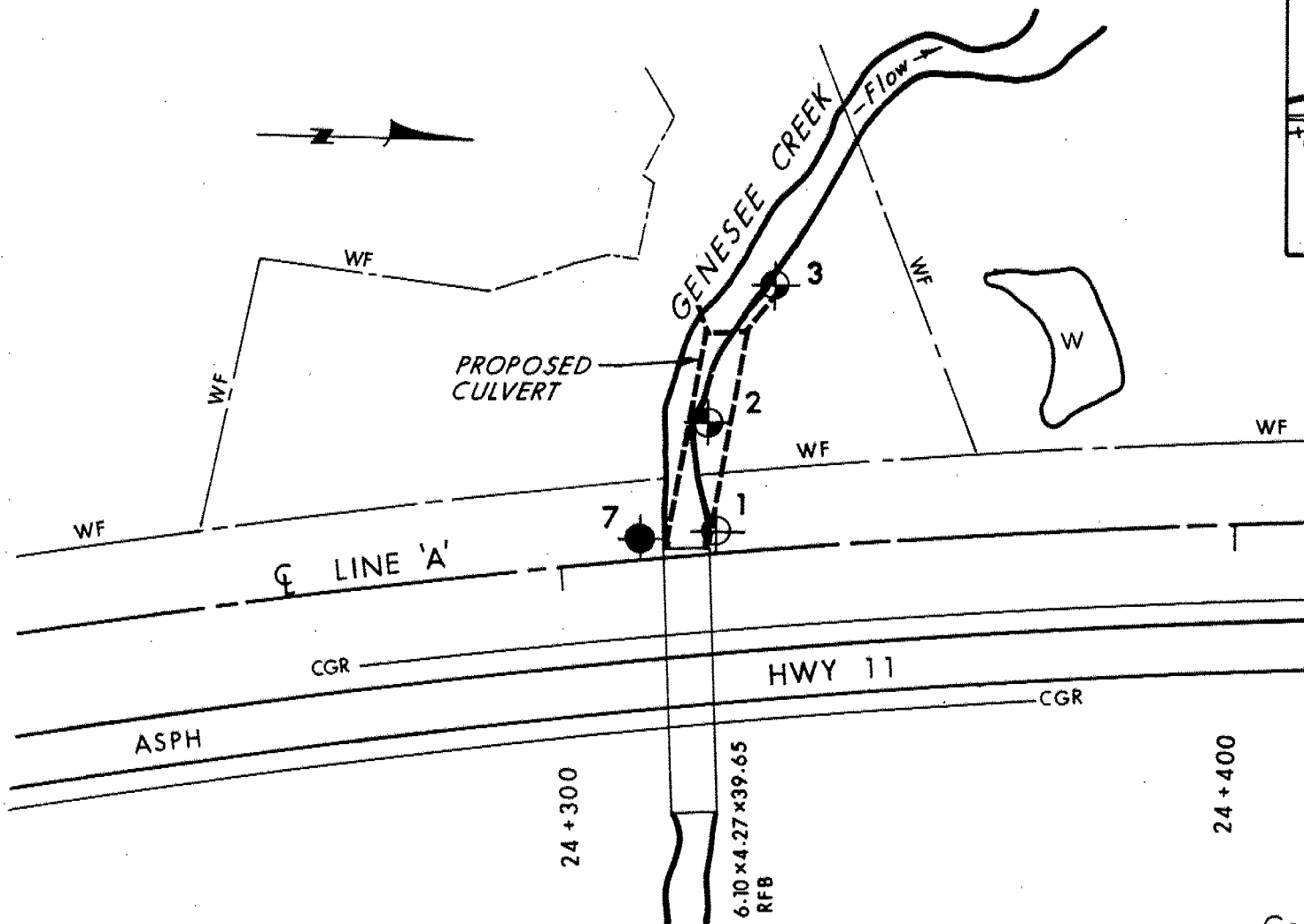
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
								SHEAR STRENGTH									

DIST OF PARRY SOUND
TWP OF SOUTH HIMSWORTH



KEY PLAN

SCALE



PLAN

SCALE



LEGEND

- Cone Test
- Borehole & Cone
- Borehole
(Previous Investigation)
WO 84-05-0022

Geocres No 31L-61

WP 591-92-01

Dist 13

Dwg No 5919201-A

Note :

For subsurface information refer
to Record of Borehole sheets