

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. SIC-118

DIST. 8 REGION

W.P. No. 181-81-01

CONT. No.

W. O. No. FORMERLY W.O. 81-46014)

STR. SITE No. N/A

HWY. No. N/A

LOCATION WOLFE ISLAND FERRY

DAWSON POINT TERMINAL DOLPHIN #3

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FILE
COPY



Ontario

Ministry of
Transportation and
Communications

foundation investigation and design report

ENGINEERING MATERIALS OFFICE
PAVEMENT & FOUNDATION DESIGN SECTION

WP 181-81-01 DIST 8
HWY Wolfe Island STR SITE
Ferry

Dawson Point Terminal Dolphin No. 3

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FOUNDATION INVESTIGATION REPORT

For

Dawson Point Terminal Dolphin No. 3
W.P. 181-81-01, Wolfe Island
District 8, Kingston

INTRODUCTION

This report provides the factual information obtained from a foundation investigation carried out at the above-mentioned ferry dock site and will briefly summarize previously forwarded design recommendations.

The field investigation consisted of two sampled boreholes advanced between 82 06 17 and 82 06 22 utilizing washboring techniques from a raft mounted diamond drill machine. Boreholes penetrated to depths of 15.6 and 16.4 metres below lake bottom with bedrock being cored in each boring for approximately 5 metres.

SUBSURFACE CONDITIONS

Beneath some 6.5 metres of lake water, the predominant soil stratum encountered consisted of 7.4 to 8.9 metres of a loose to very dense sandy silt to silty sand with some shells and interbedded zones of silty clay and gravel throughout. Cobble and boulder sized fragments were encountered in the upper limits of this stratum, probably reflecting rockfill which was dumped around cell #3 for scour protection purposes. In addition, occasional cobbles and/or boulders are dispersed throughout this deposit.

The granular deposit is underlain by some 1.2 to 1.4 metres of hard glacial till consisting of a silty clay of low plasticity with an excess of sand and some gravel. Standard Penetration Test 'N' values in excess of 100 blows per 0.3 metres were encountered within this glacial deposit.

Immediately overlying bedrock and underlying the cohesive till deposit is a thin veneer (1.1 to 1.9 metres thick) of very dense gravel and sand with cobble and boulder size fragments throughout.

Bedrock surface was encountered immediately below the thin coarse granular deposit at depths of 10.7 and 11.2 metres below lake bottom corresponding to elevations 57.6 and 57.0 respectively. Bedrock was proven using BX rock coring techniques for depths of 5 metres. Based on visual inspection bedrock is briefly described as a dense, very fine to fine, crystalline limestone of high strength. The upper 0.7 to 0.8 metres is slightly weathered with a 0.1 metre thick sand seam encountered in one borehole within this zone. A memo providing full geological descriptions of the core and interpreted rock qualities and parameters is appended to this report.

Lake water levels corresponded to an approximate elevation of 74.7 during the period of investigation.

The locations and elevations of the boreholes as well as the boundaries between the various soil types, laboratory test results and soil/rock descriptions are shown on the attached Record of Borehole Sheets.

DISCUSSION AND RECOMMENDATIONS

In order to replace the existing, distressed dolphin cell #3, which has tilted some 0.8 metres forward as a result of differential ice loading, it is proposed to construct an 3.3 X 5.6 metre reinforced concrete slab replacement dolphin. This rectangular structure will be supported on three sets of two vertical 0.4 metre diameter steel pipe pile bents driven and socketed into bedrock. These tubes will then be anchored into competent bedrock using a bundled dywidag bar system drilled and grouted some 3 metres in bedrock. The rock anchors and tube piles will be filled with 30 MPa grout and concrete respectively.

Based on visual inspection and testing of recovered bedrock core the following parameters are given for design estimating purposes:

1. Allowable bearing capacity for the rock mass = 4 MPa
2. Quantitative assessment of rock mass permeability $k = 1 \times 10^{-5}$ cm/sec. to be applied below the slightly weathered upper zone (0.75 metres) of bedrock
3. An allowable bond strength within the unweathered bedrock for design of rock anchors of 0.7 MPa is recommended.

The steel tube piles should be equipped with a sufficiently reinforced driving shoe and chisel point to insure penetration through cobbles and boulders within the overburden and allow proper socketing into bedrock.



A handwritten signature in black ink, appearing to read 'Tom Kazmierowski'.

T. Kazmierowski, P. Eng.
Foundations Engineer

M. Devata, P. Eng.
Senior Foundations Engineer

APPENDIX

memorandum

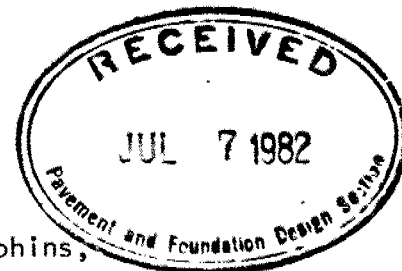


To: Mr. T. Kazmierowski,
Foundations Engineer,
Pav't. & Foundation Design Section,
Room 315, Central Building.

Date: 82 07 07

File: 3162-2-4-76
3162-2-4-113

From: Soils & Aggregates Section,
Engineering Materials Office,
Room 311, Central Building.



Re: Borehole Core Description,
Dawson's Point Terminal Dolphins,
Wolfe Island Ferry,
W.P. 181-81-01.

Core from Boreholes 1 and 2 was logged and descriptions including core recoveries and rock quality designations (R.Q.D.s) are attached.

The site is underlain by limestone of the Gull River Formation. The rock is predominantly a grey, very fine to fine crystalline limestone with occasional (<1%) very thin (about 1 to 2 mm) shale partings. The borehole core indicates the rock mass is in general of 'good' quality (R.Q.D. = 75 to 90%) with 'excellent' (R.Q.D. = 90 to 100) and 'fair' (R.Q.D. = 50 to 75%) sections. Core recoveries are high (generally greater than 90 percent). The rock mass is mainly unweathered with a high intact strength. The approximate uniaxial compressive strength of the rock determined by point load testing ranged from 43 to 156 MPa with an average of 110 MPa.

In Boreholes 1 and 2, the upper 0.79 and 0.7 m (2.6 and 2.3 feet) respectively of the bedrock is slightly weathered (oxidized bedding surfaces) and is more closely jointed than the rock at depth.

The upper 0.75 m (2.5 feet) of the rock mass is likely to have a marginally lower bearing capacity, a higher permeability, and a lower tensile strength than the underlying rock mass. It is consequently suggested that the following parameters be used for design purposes:

Intact rock strength (from point load tests on core):

Borehole #	Is_{50} MPa	Approximate equivalent uniaxial Compressive strength, MPa
	Range (average)	Range (average)
1	3.3 - 6.5 (5.2)	79 - 156 (125)
2	1.8 - 6.7 (3.9)	46 - 161 (94)

Rock excavation: the proposed installation of the hollow section piles at least 0.6 m (2.0') into bedrock is considered possible but will be difficult due to the homogeneous nature and high strength of rock.

Allowable bearing capacity (for the rock mass in general):

4 MPa (40 tsf)

Rock mass permeability (qualitative assessment):

$$k = 1 \times 10^{-5} \text{ cm/sec}$$

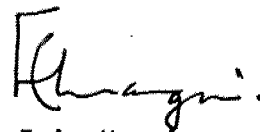
- this value should be applied below a depth of 0.75 m (2.5 ft.) in bedrock.
- the mass permeability of the upper 0.75 m of rock will probably be at least an order higher.

Allowable bond strength (for design of proposed rock anchors):

0.7 MPa (100 psi)

- this value to be applied below a depth of 0.75 m (2.5 ft.) in bedrock.
- standard rock anchor installation recommended including:
 - (i) use of spacers to produce equal grout thickness around anchors.
 - (ii) tremie grout from base of hole upwards to ensure maximum anchor/grout and grout/rock bonds.

ER/cm


Eric Magni,
Geologist.

BOREHOLE #1

<u>Core Run</u>	<u>% Core Recovery</u>	<u>% R.Q.D.</u>
16.6 - 17.1	63	0
17.1 - 18.8	93	67
18.8 - 20.4	100	96
20.4 - 22.0	96	94

General Description

16.6 - 17.1	Boulders and gravel.
17.1 - 17.8	Limestone, dark grey, very fine to fine crystalline, dense, high strength, slightly weathered. Jointing: near horizontal bedding joints, closely spaced (50 - 300 mm), mainly tight, some oxidation on joint surfaces.
17.8 - 22.0	Limestone, dark grey, very fine to fine crystalline, dense, high strength, unweathered. Jointing: near horizontal bedding joints, widely spaced (1 - 3 m), mainly tight.

BOREHOLE #2

<u>Core Run</u>	<u>% Core Recovery</u>	<u>% R.Q.D.</u>
17.7 - 18.2	88	24
18.2 - 18.3	100	0
18.3 - 19.7	92	85
19.7 - 21.3	99	66
21.3 - 22.9	82	75

General Description

17.7 - 18.4	Limestone, dark grey, very fine to fine crystalline, dense, high strength, slightly weathered. Jointing: near horizontal bedding joints, very closely (< 50 mm) to closely (50 - 300 mm) spaced, oxidation on joint surfaces, sand seam reported between 18.2 and 18.3 metres.
18.4 - 22.9	Limestone, dark grey, very fine to fine crystalline, dense, high strength, unweathered. Jointing: near horizontal bedding joints, moderate (0.3 - 1 m) to widely (1 - 3 m) spaced, mainly tight.

RECORD OF BOREHOLE No 2

METRIC

W P 181-81-01 LOCATION 1.75 Metres South of Cell #3 S. Face o/s 0.6 M. East ORIGINATED BY R.Z.
 DIST 8 HWY Ferry Terminal BOREHOLE TYPE Washboring, BXC Rock Core COMPILED BY R.Z.
 DATUM Geodetic DATE 82 06 22 CHECKED BY so

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					
74.7	Lake Surface																
0.0																	
	Water																
68.2	Lake Bottom																
6.5	Grey Occ. Cobbles and Boulders																
	Silty Sand to Sandy Silt Some Shells		2	SS	23												
	Silty Clay with Gravel		4	SS	41												
	Trace Sand Boulder		BX	RC	-												
	Brown																
	Silty Sand with Pockets of Clay and Gravel Loose to Very Dense		6	SS	94												
59.3			7	SS	87												
15.4	Grey (Glacial Till)																
58.1	Silty Clay and Sand Some Gravel Hard																
16.6	Gravel and Boulder Sand		8	RC	-												
57.0	With Cobbles & Boulders																
17.7	Slightly Weathered Sand Seam		9	BX RC	REC 88%												
	Dark Grey Limestone Bedrock Very Fine to Fine Crystalline Dense High Strength		10	BX RC	REC 92%												
			11	BX RC	REC 99%												
			12	BX RC	REC 82%												
51.8																	
22.9	End of Borehole																
	Note: Drive N Casing to Elevation 63.7 Drill B Casing to Elevation 56.7																

+3, x5 : Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 1

METRIC

W P 181-81-01 LOCATION 1.75 Metres North of Cell #3 N. Face o/s 1.2 M. East ORIGINATED BY R.Z.
 DIST 8 HWY Ferry Terminal BOREHOLE TYPE Washboring, BXL Rock Core COMPILED BY R.Z.
 DATUM Geodetic DATE 82 06 17 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			SHEAR STRENGTH										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE										10	20	30
74.7	Lake Surface																			
0.0	Water						74													
							72													
							70													
68.3	Lake Bottom						68													
6.4	Occ. Cobbles and Boulders						66													
	Sandy Silt to Silty Sand Some Shells Pockets of Clay and Gravel Loose to Dense		2	SS	26											7 23 64 6				
	Grey						64													
	Brown		4	SS	40															
							62									1 61 33 5				
60.9																				
13.8	Grey (Glacial Till) Silty Clay and Sand		8	SS	100	23 cm	60									18 43 25 14				
59.5	Some Gravel Hard																			
15.2	Gravel and Sand with Cobbles and Boulders		10	SS	120															
57.6							58									RQD = 0%				
17.1	Dark Grey Slightly Weathered		11	BX RC	REC 63%											RQD = 67%				
	Limestone Bedrock Very Fine to Fine Crystalline Dense High Strength		12	BX RC	REC 93%		56									RQD = 96%				
			13	BX RC	REC 100%															
			14	BX RC	REC 96%		54									RQD = 94%				
52.7																				
22.0	End of Borehole																			
	Note: Drive N Casing to Elevation 59.3 Drill B Casing to Elevation 57.9																			

+3, x5: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

memorandum

copy



copy to R. West ✓

To: M. Devata
Pavement & Foundation Design
Downsview

Date: 81 11 10

site 7-102/c

From: Structural Section
Eastern Region, Kingston

151-51-01

Re: W.O. 81-46014, Dawsons Point Terminal Dolphins
Wolfe Island Ferry

Further to our recent telephone conversation concerning the dolphins at Dawsons Point ferry terminal, I am enclosing copies of plans showing the layout and construction details of the dolphins together with copies of our field measurements, showing the deflections measured at Dolphins Nos. 2 and 3. You will notice that deflection increases with distance from pile tip to bedrock.

We should welcome your views on the causes of this problem and possible remedial action. We should be glad to visit the site with you at your convenience. The District are very concerned because of increasing difficulties of berthing the Wolfe Islander III.

The Dawsons Point terminal is used during each winter season so that we would appreciate your early attention to this matter if possible.

We have had cores taken through the concrete capping of dolphin No. 3, in order to determine whether differential settlement of the rockfill within the dolphin has occurred. However, the cores have revealed only a uniform settlement of approximately 8 inches.

Some bed scour was detected at the docking side of the dolphin (No. 3) last year. This was remedied at that time by placing rockfill. An underwater inspection recently shows that no further erosion has occurred.

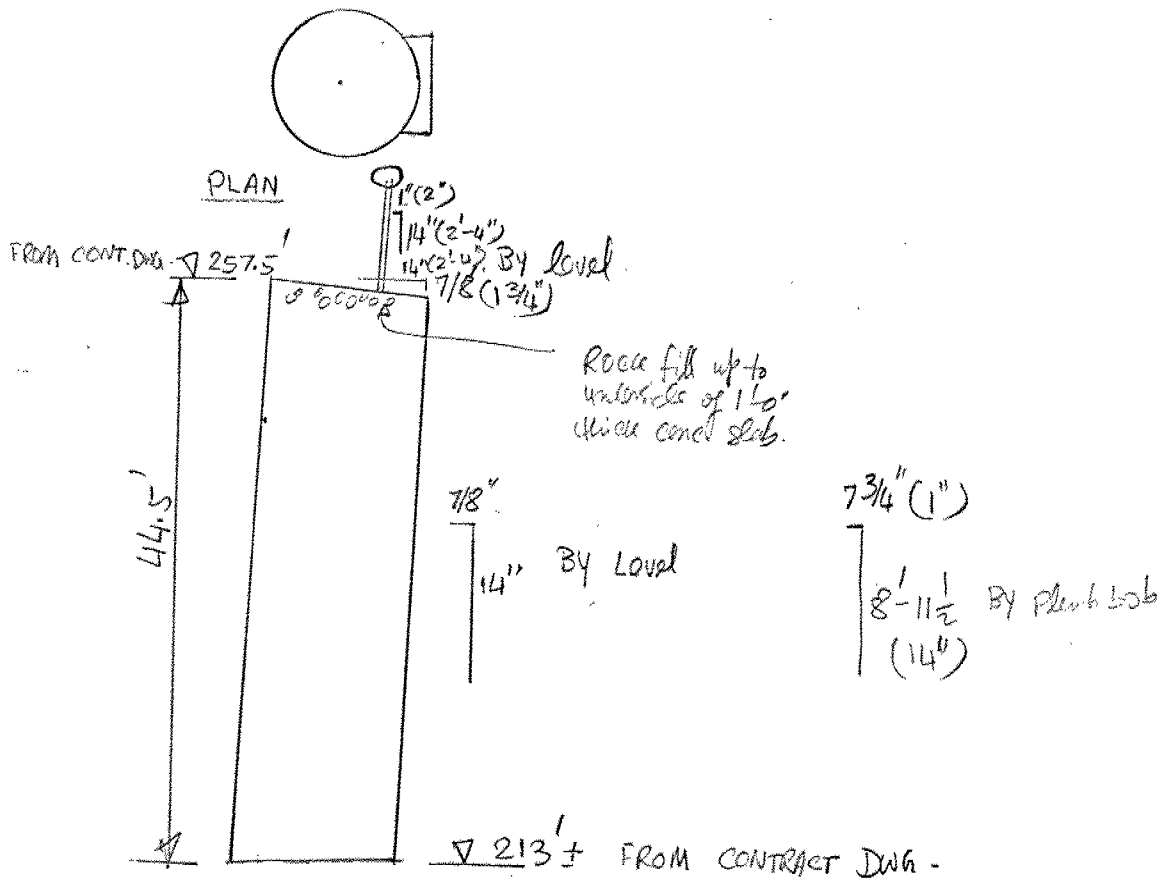
Thank you for your co-operation in this matter.

T. C. Kingsland
Head, Structural Section

TCK:sh
Encl.

c.c. K. G. Bassi (Encl.)
S. C. J. Radbone
Q. Islam ✓

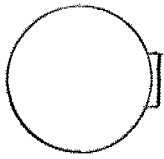
The following field observations were made during field inspection of Dawson's Point Ferry Dock.



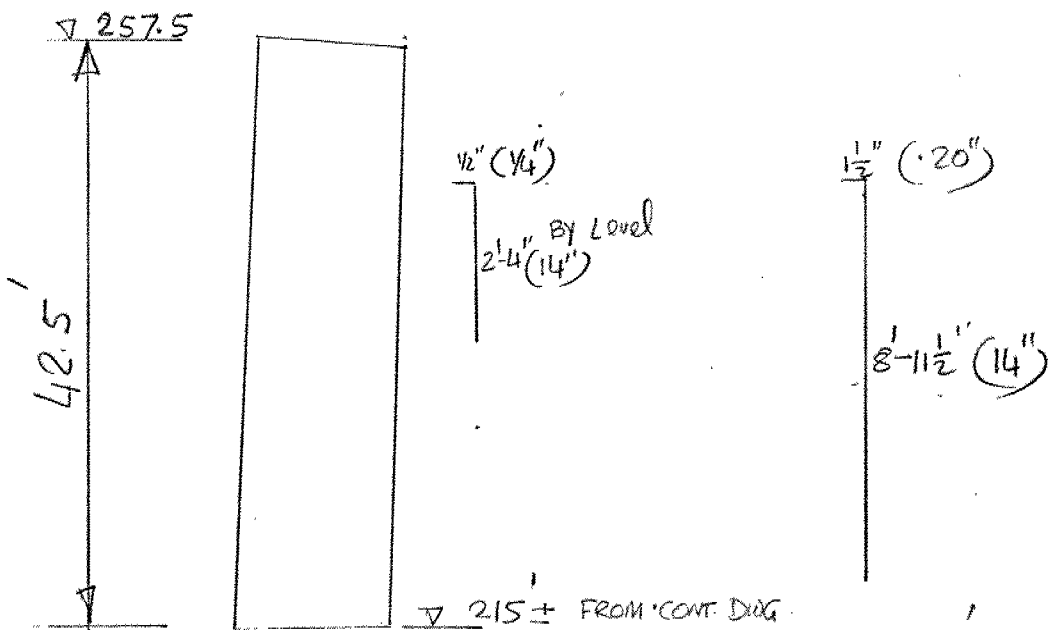
$$\rightarrow \left| \right| \text{Total movement} = \frac{1.75" \times 44.5'}{2.33} = 33.4" \left| \right| \rightarrow$$

ELEVATION
DOLPHIN 3

N.T.S

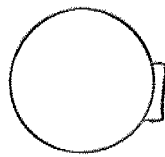


PLAN



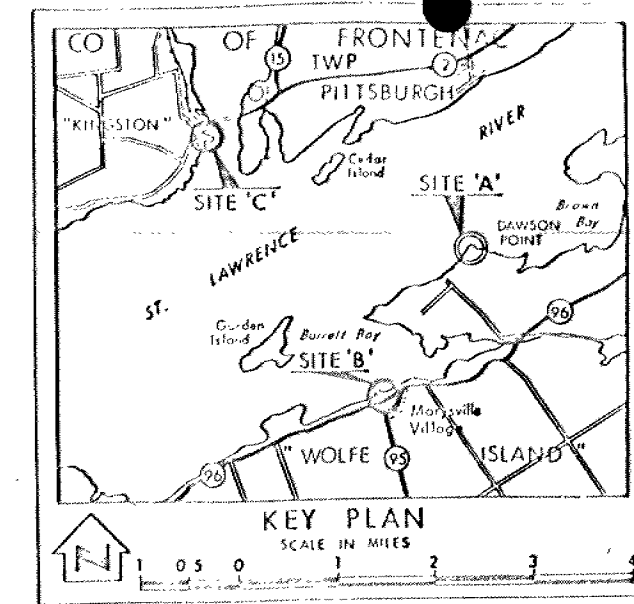
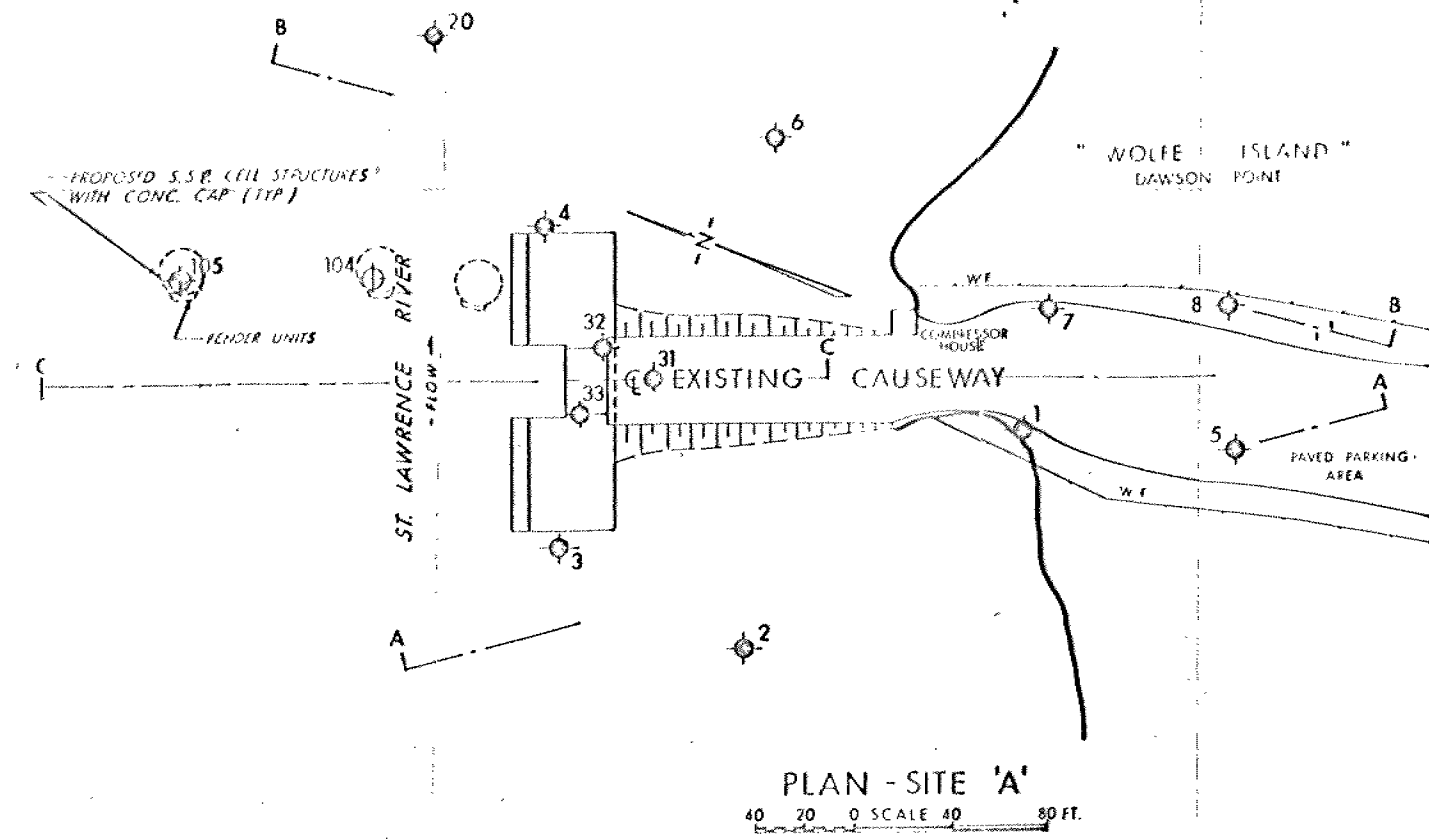
→ | ← Total movement = $.5'' \times \frac{42.5'}{2.33'} = 9.12''$
ELEVATION
DOLPHIN 2

N.T.S



DOLPHIN 1

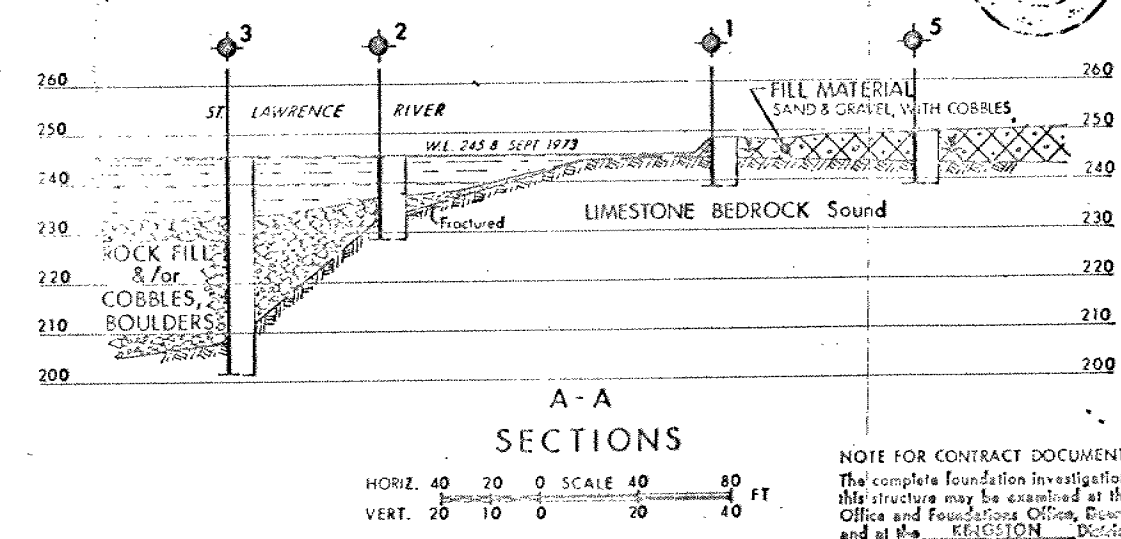
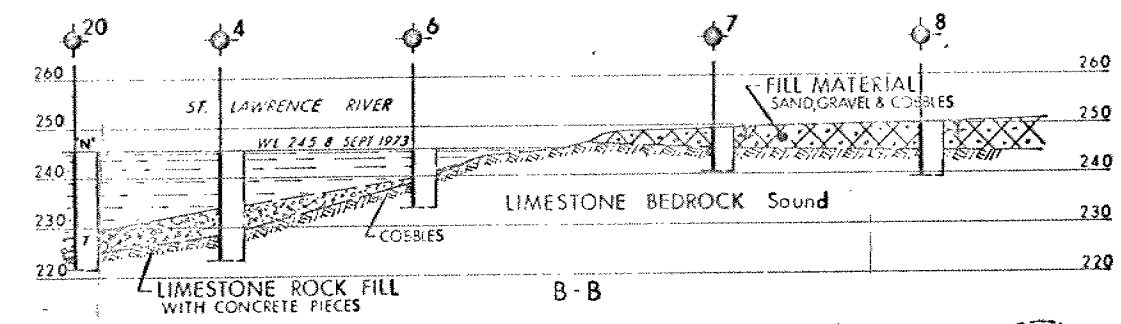
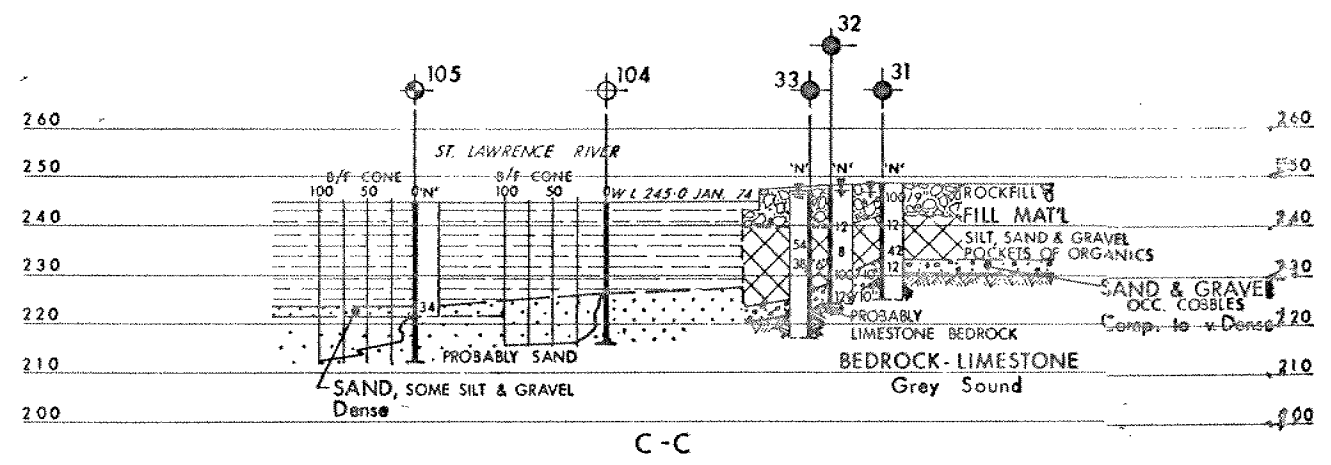
Movement of Dolphin 1
 is quite negligible.



LEGEND			
	Bore Hole		
	Cone Penetration Test		
	Bore Hole & Cone Test		
	Water Levels established at time of field investigation, SEPT. 1973		

NO.	ELEVATION	
1	248.6	
2	245.8	
3	245.8	
4	245.8	
5	249.6	
6	245.8	
7	249.2	
8	250.2	
20	245.8	
104	245.0	JAN. 1974
105	245.0	
31	249.0	
32	248.7	APR. 1974
33	247.1	

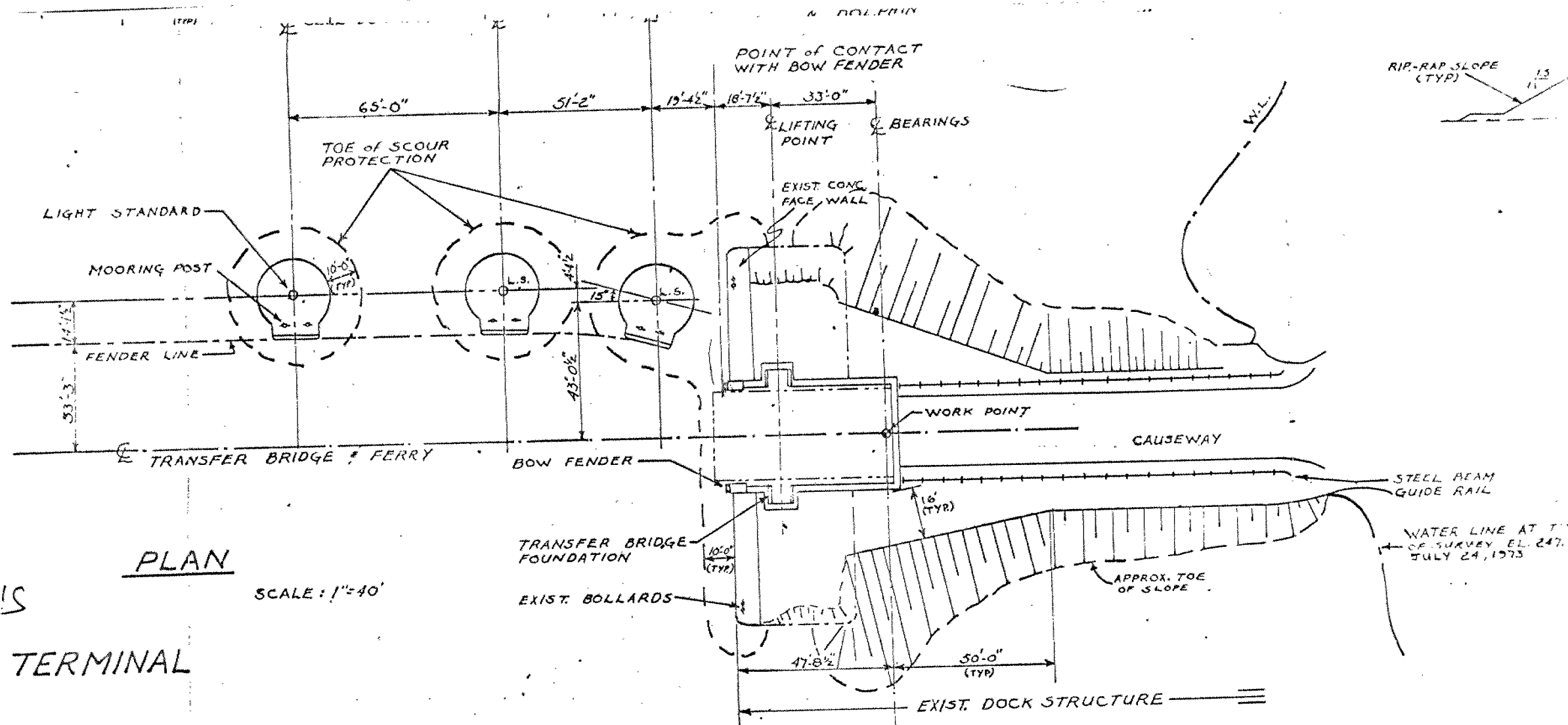
— NOTE —
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.



NOTE FOR CONTRACT DOCUMENTS
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Brampton, and at the KINGSTON District Office.

REVISIONS	DATE	BY	DESCRIPTION
	APR 74	R S	REVISED DWG. SUPERCEDES DWG. 73-11071A, OCT. 11, 1973

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO			
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE			
KINGSTON-WOLFE ISL. FERRY SERVICE			
PROPOSED TERMINAL AT DAWSON POINT			
HIGHWAY NO.	SITE 'A'	DIST. NO. 8	
CO. FRONTENAC			
TWP. WOLFE ISLAND			
BORE HOLE LOCATIONS & SOIL STRATA			
SUBD. C.P.	CHECKED	W.P. NO. 25-73-01	DRAWING NO.
DRAWN S.O.	CHECKED	W.O. NO. 73-11071	73-11071A
DATE 7 MAY 1974	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	CONT. NO. 74-37	34	



DAWSON'S
POINT TERMINAL



CONT. No. 74-37
W.P. No. 25-73-01,02,05

22

MINISTRY OF TRANSPORTATION
AND COMMUNICATIONS

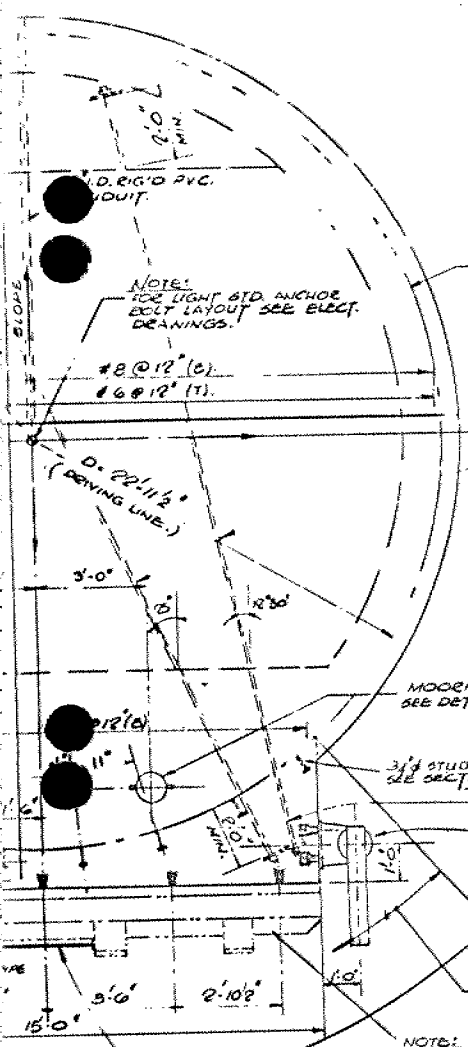
WOLFE ISLAND FERRY
SERVICE

DOLPHINS
PLAN & DETAILS

MAR-LAND ENGINEERING LIMITED
CONSULTING ENGINEERS

Also for Dawson's
Point Ferry Dock.

DOLPHIN



44 - RBP-35 S.S.P.
OR APPROVED EQUAL

1 1/2" DIA. RODS THEADED
EACH END WITH 6 x 3/4 x 6" #6.
@ IN-SHORE DOLPHINS ONLY.

MOORING POST.
SEE DETAIL.

3/4" STUDS (TYP)
SEE DETAIL.

NOTE:
LOCATE THIS
END OF RODS
@ EL. 248.50
MOORING LINE SUSPENSION
ASSEMBLY TYPE 'C' (IN-SHORE
DOLPHINS ONLY). FOR DETAILS SEE
DWG. N° 26.

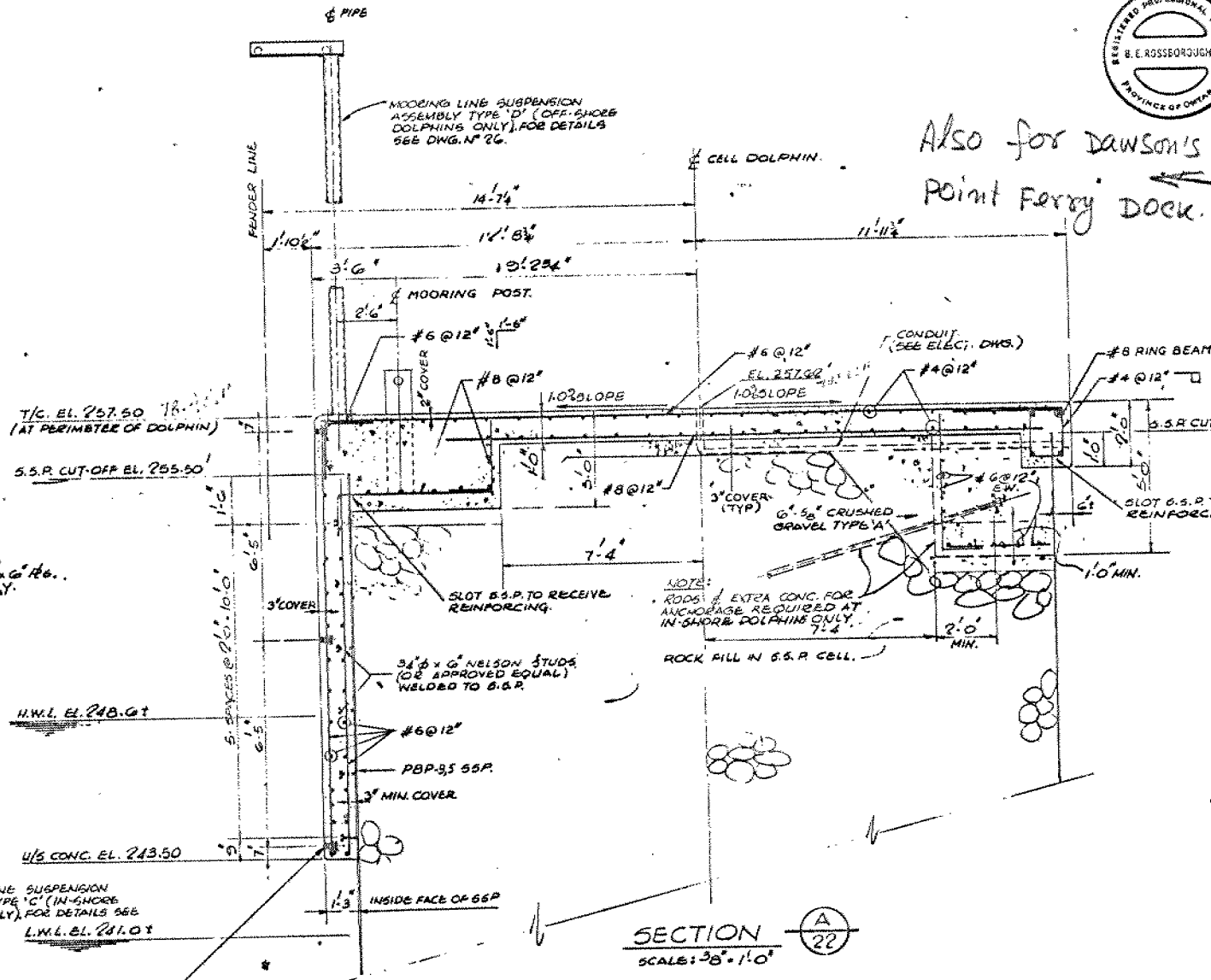
EXTEND RING BM. REINF.
3'-0" BEYOND THIS LINE
(TYP).

NOTE:
FOR DETAILS OF TIEBEE
FENDERS SEE DWG. N° 23
TYPE 'X' UNITS.

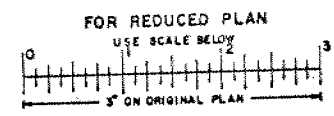
LADDER TYPE 'D' SEE
DWG. N° 25 FOR
DETAILS.

1 @ EL. 257.50'
SCALE: 3/8" = 1'-0"

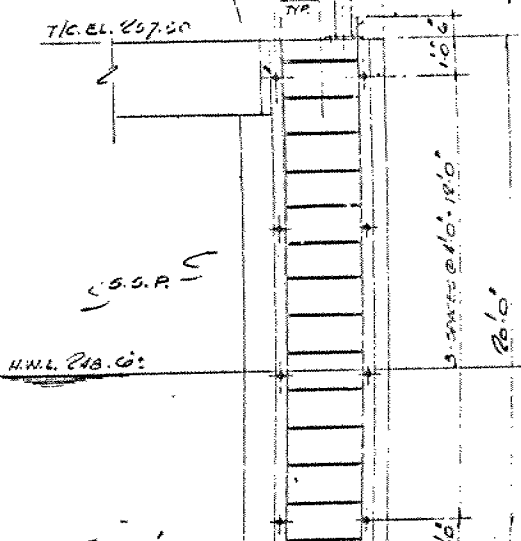
LOCATIONS AND APPROX. DRIVING DEPTHS
ARRANGEMENT DRAWINGS.



SECTION
SCALE: 3/8" = 1'-0"



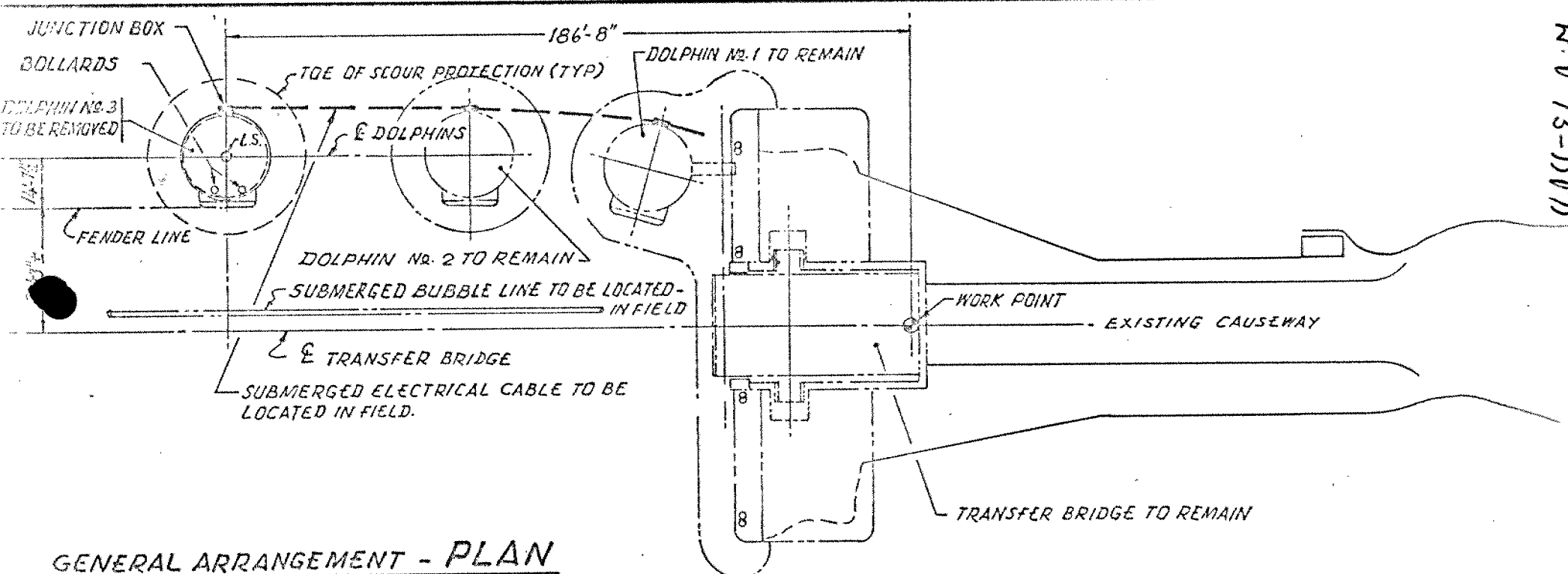
1 1/2" ACROW RICHMOND
CONC. INSERTS OR
APPROVED EQUAL.



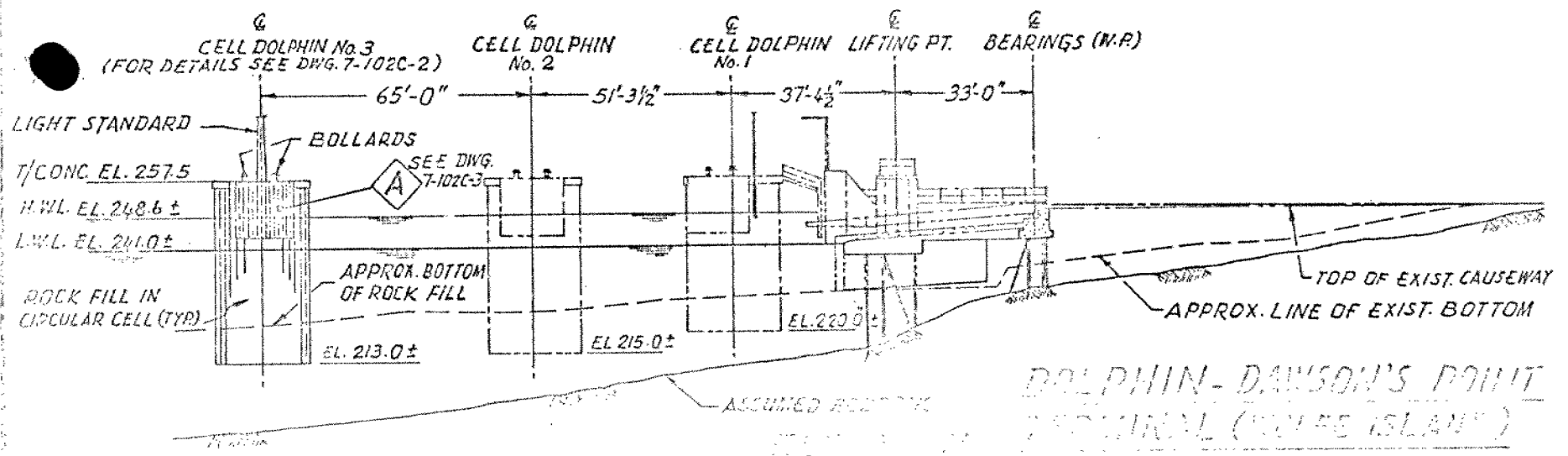
NOTE:
FOR LOCATION OF STUDS
WELDED TO S.S.P. & CONC.
INSERTS SEE PLAN & EL. 257.50'
FACE OF S.S.P.

PROVIDE 2 #4 BARS
PER PAIR OF CONC. INSERTS
AT MOORING POST ANCHORAGE

PHD M.P. 25-73-0
H. 0 73-1107



GENERAL ARRANGEMENT - PLAN
SCALE 1" = 40'-0"



DOLPHIN - DAWSON'S POINT
ISLAND (ROSE ISLAND)

EXISTING SITE CONDITIONS
7-102C-1
WT No 101-01-1
COUNT NO

GEOGRES No. 310-118

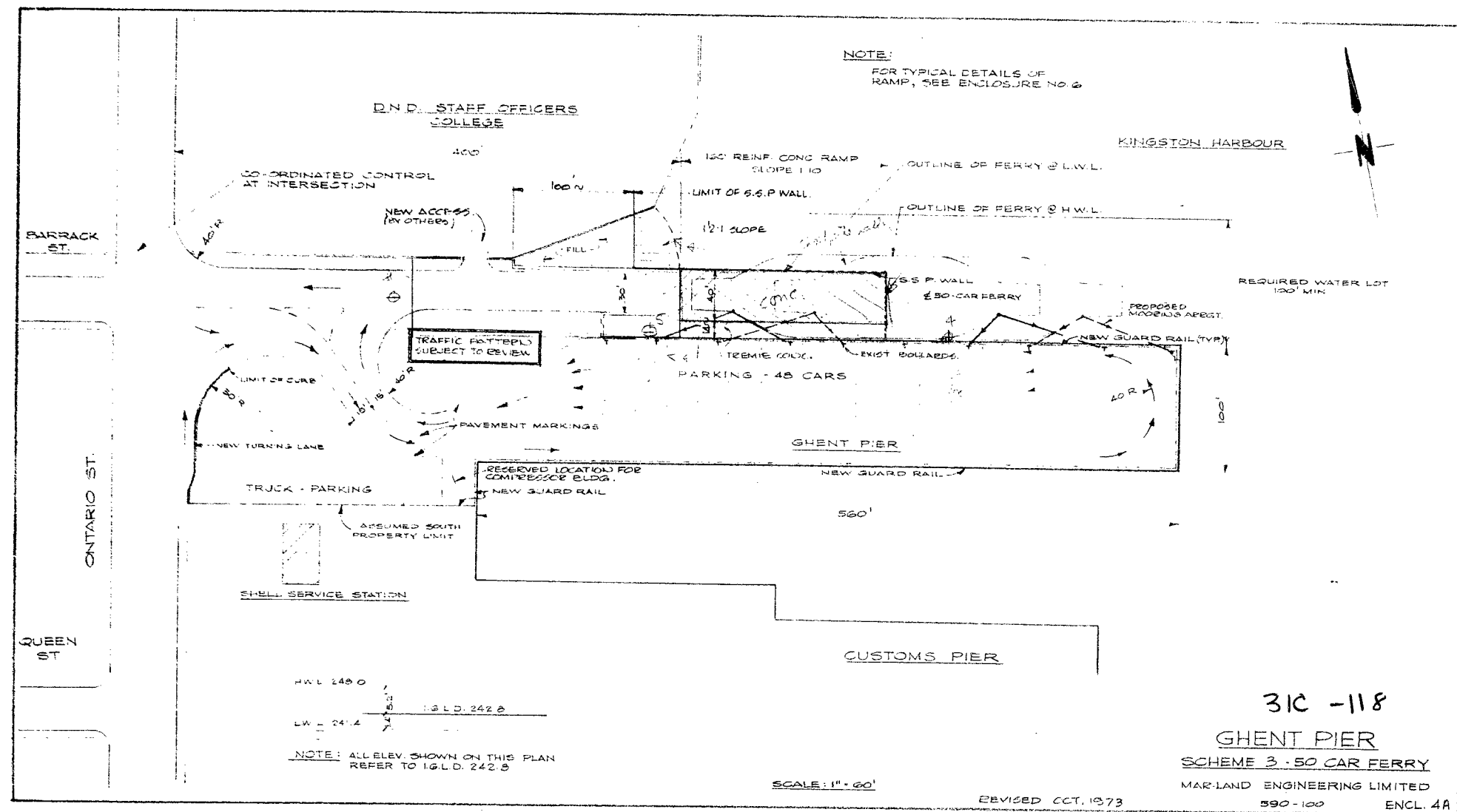
W.P. No. 25-73-C1

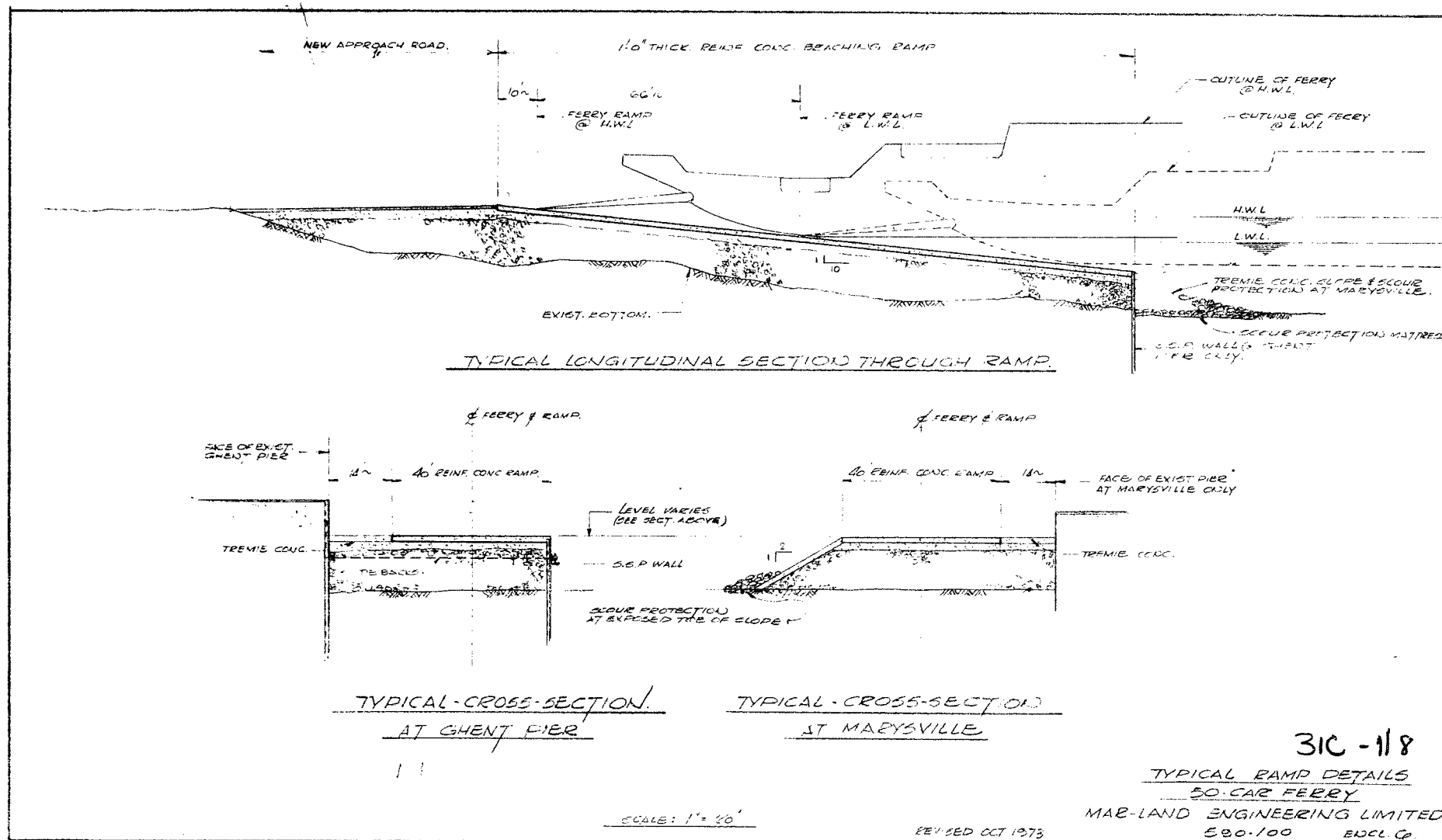
W. O. No. 73-11071

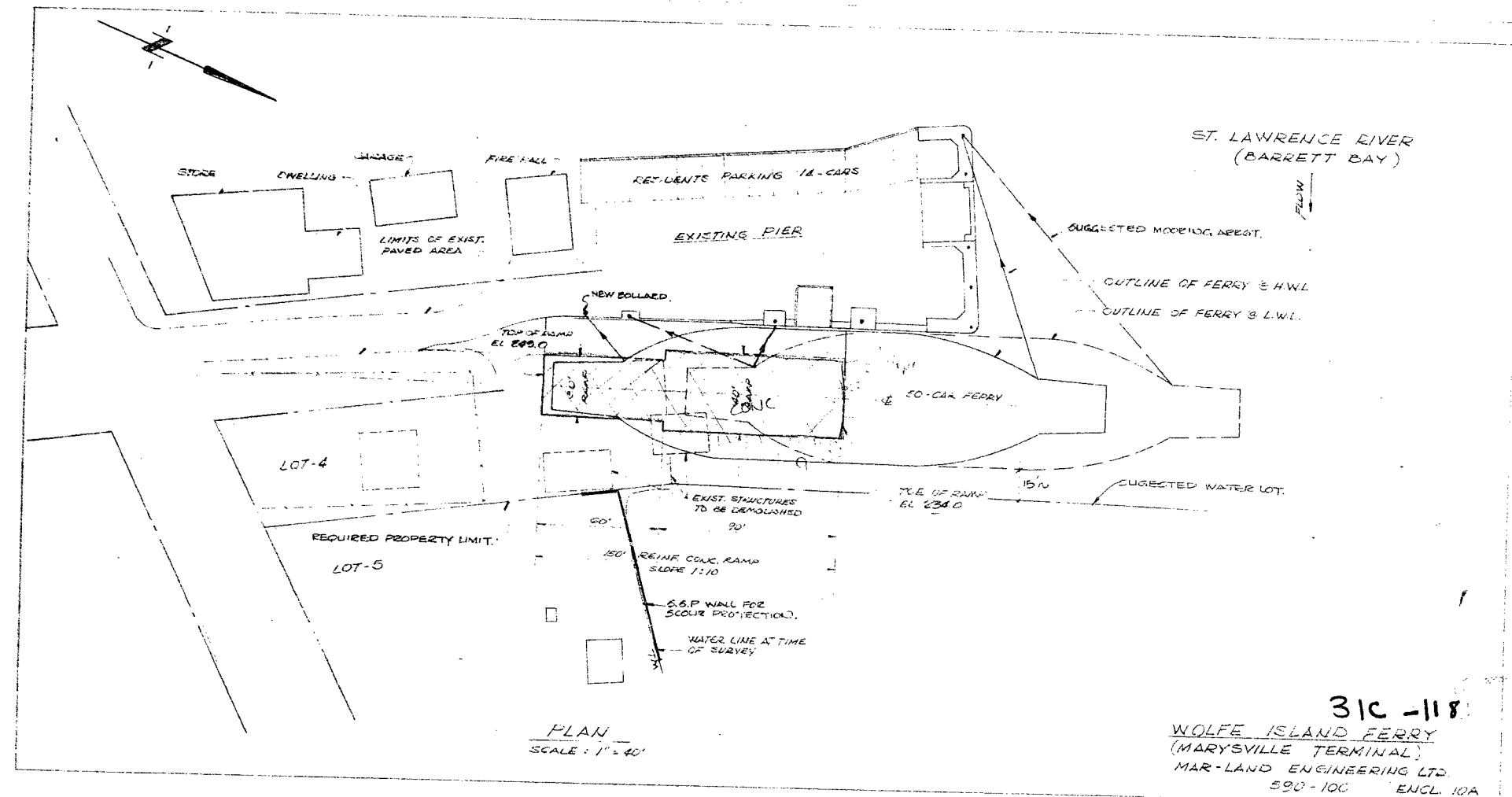
NAVY No. _____

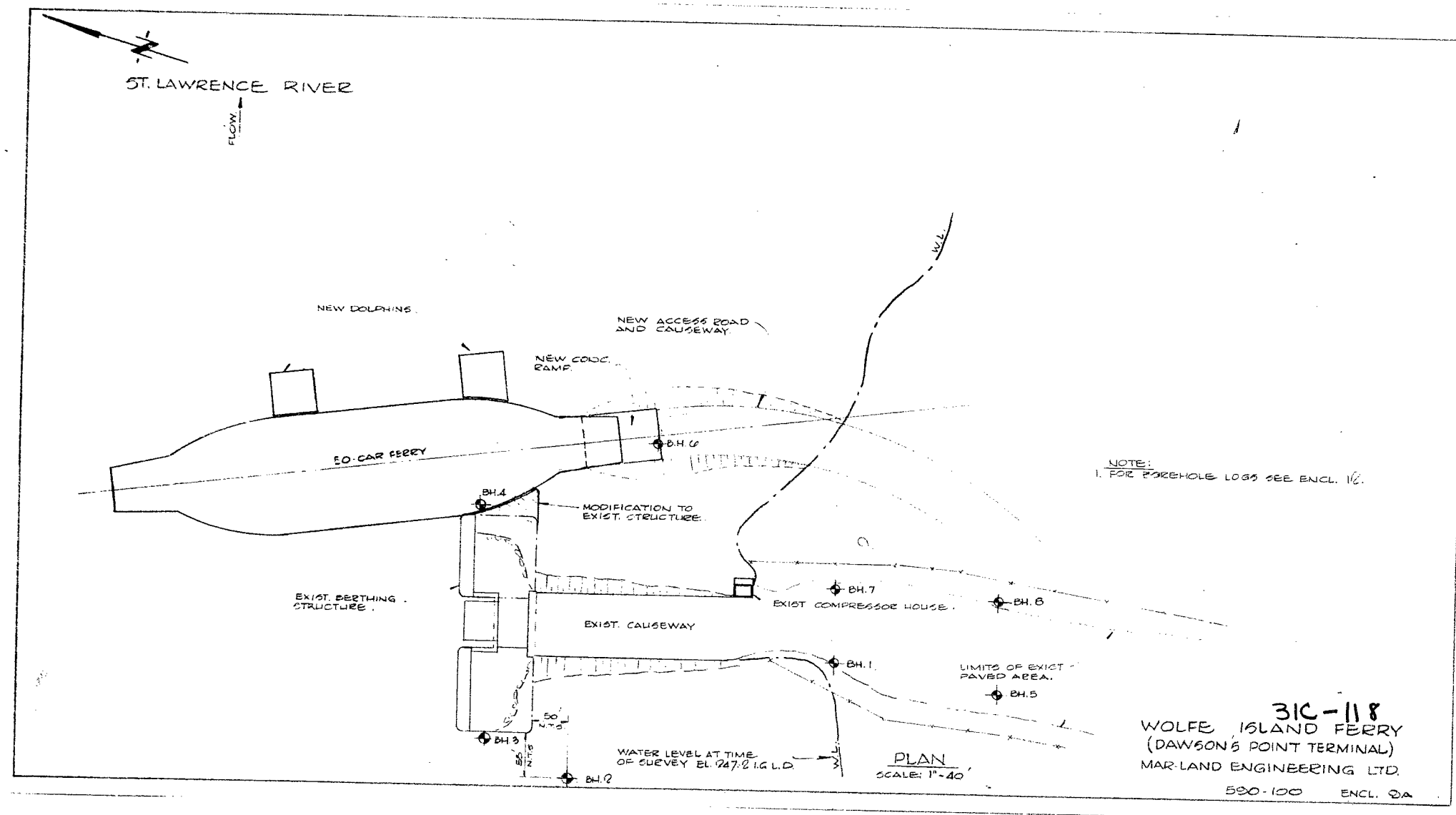
SERVICE

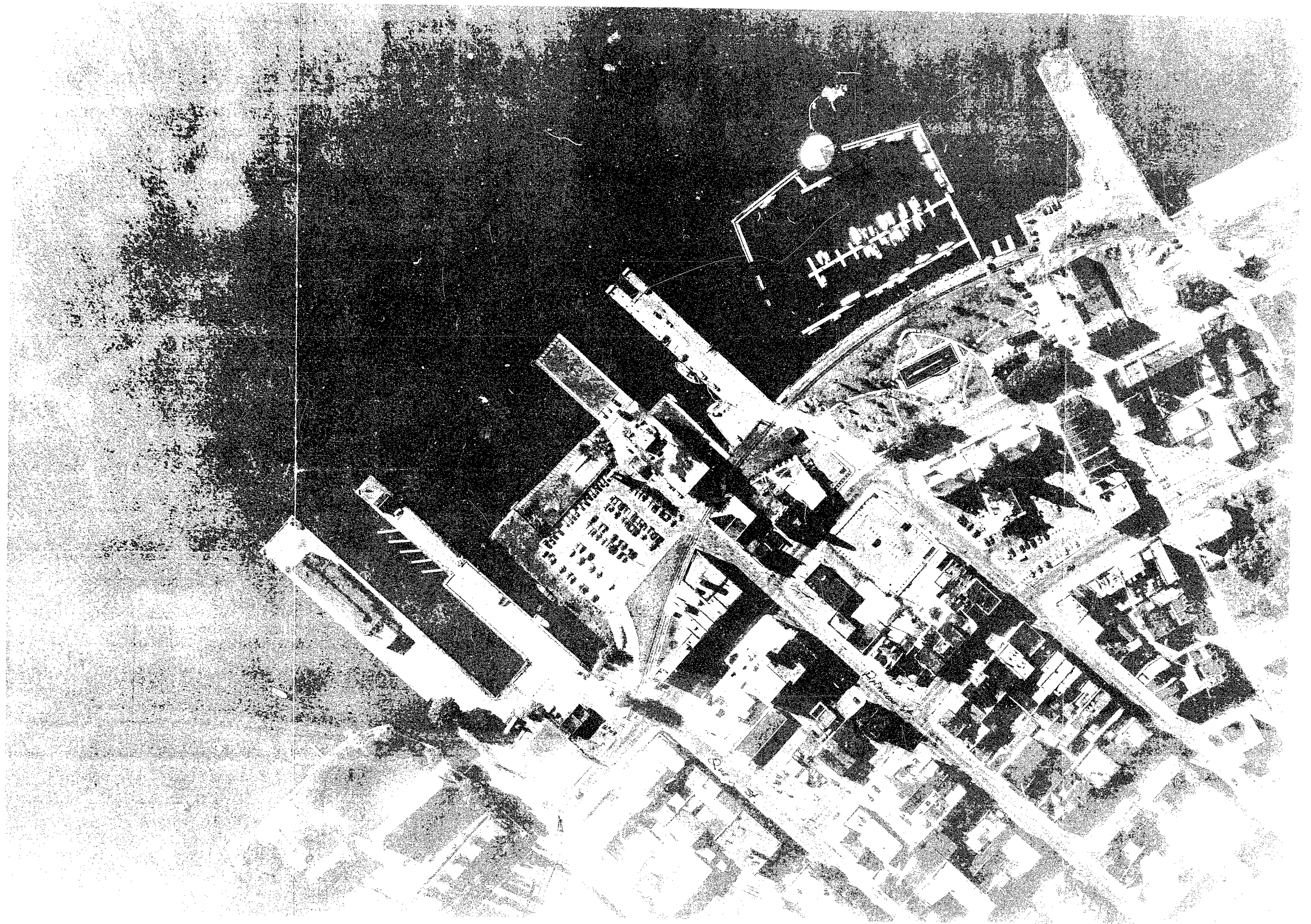
3

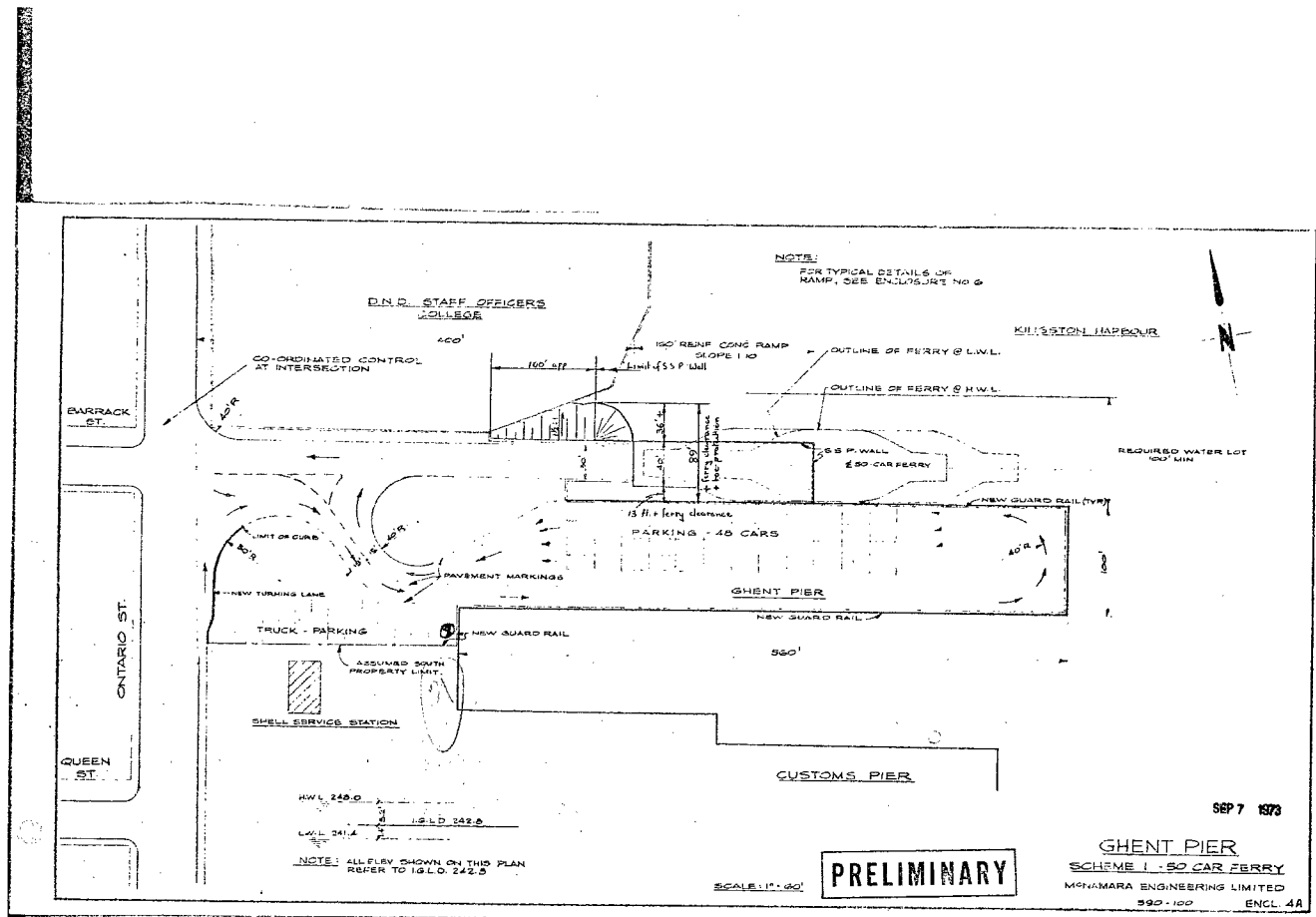




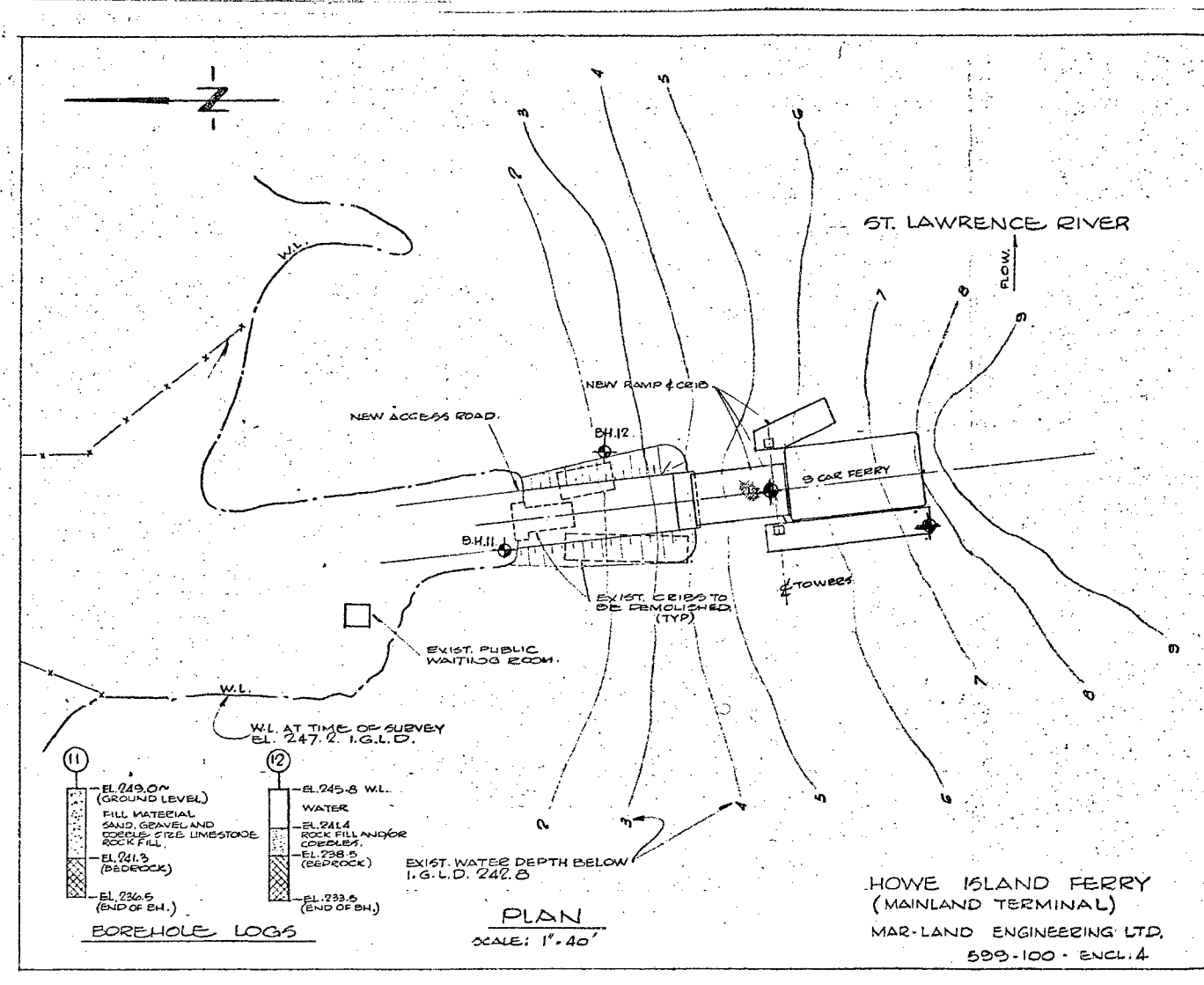


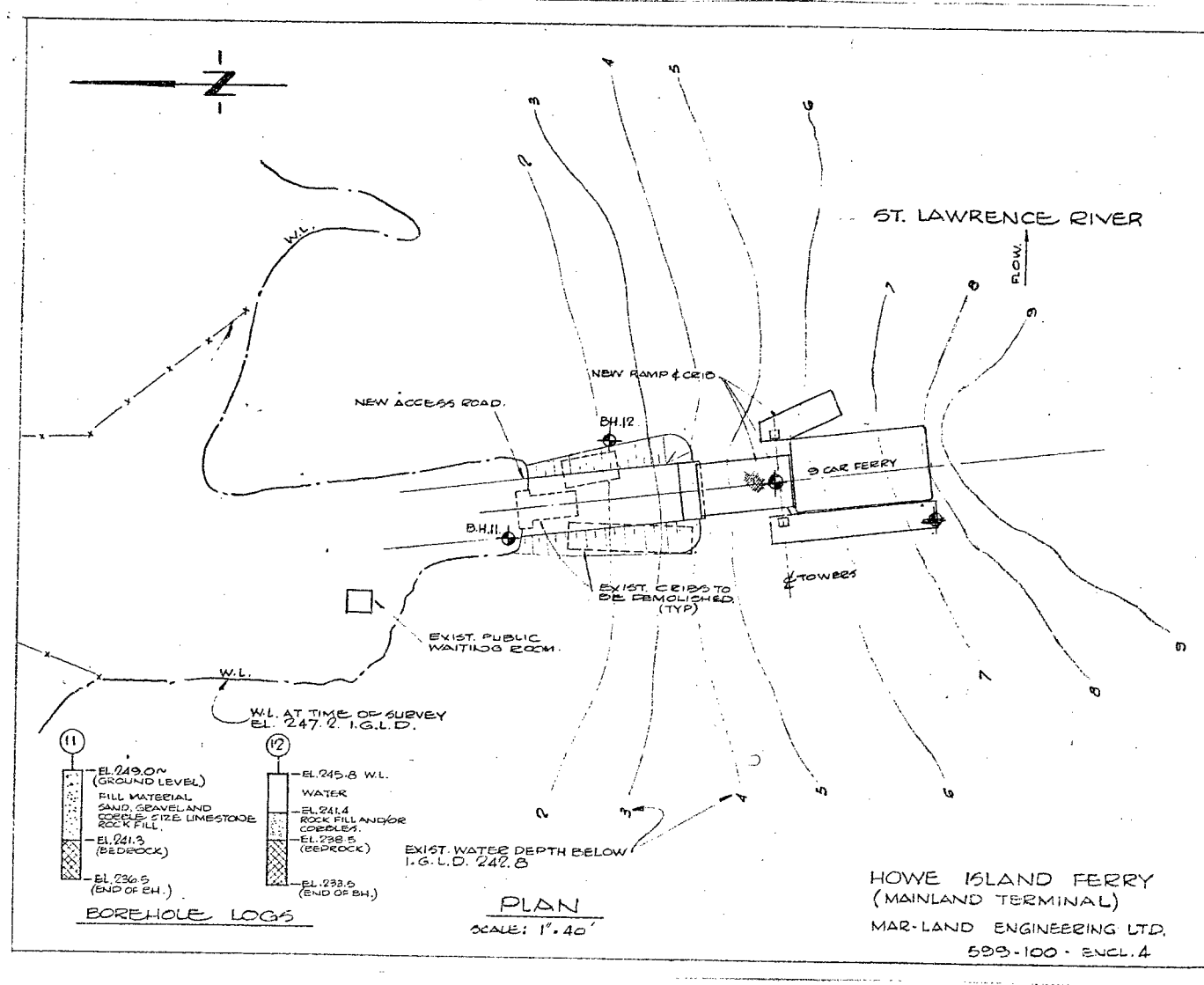


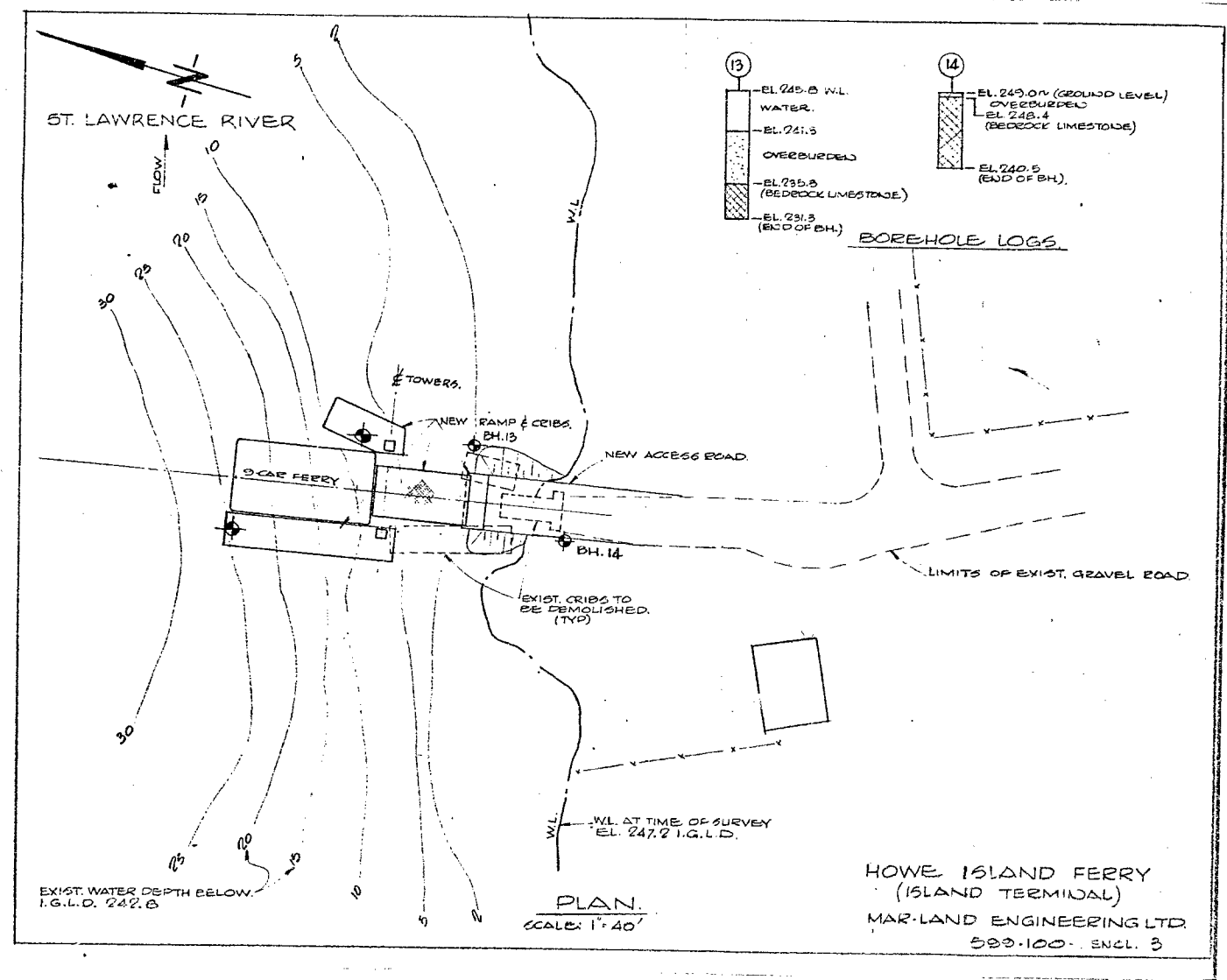


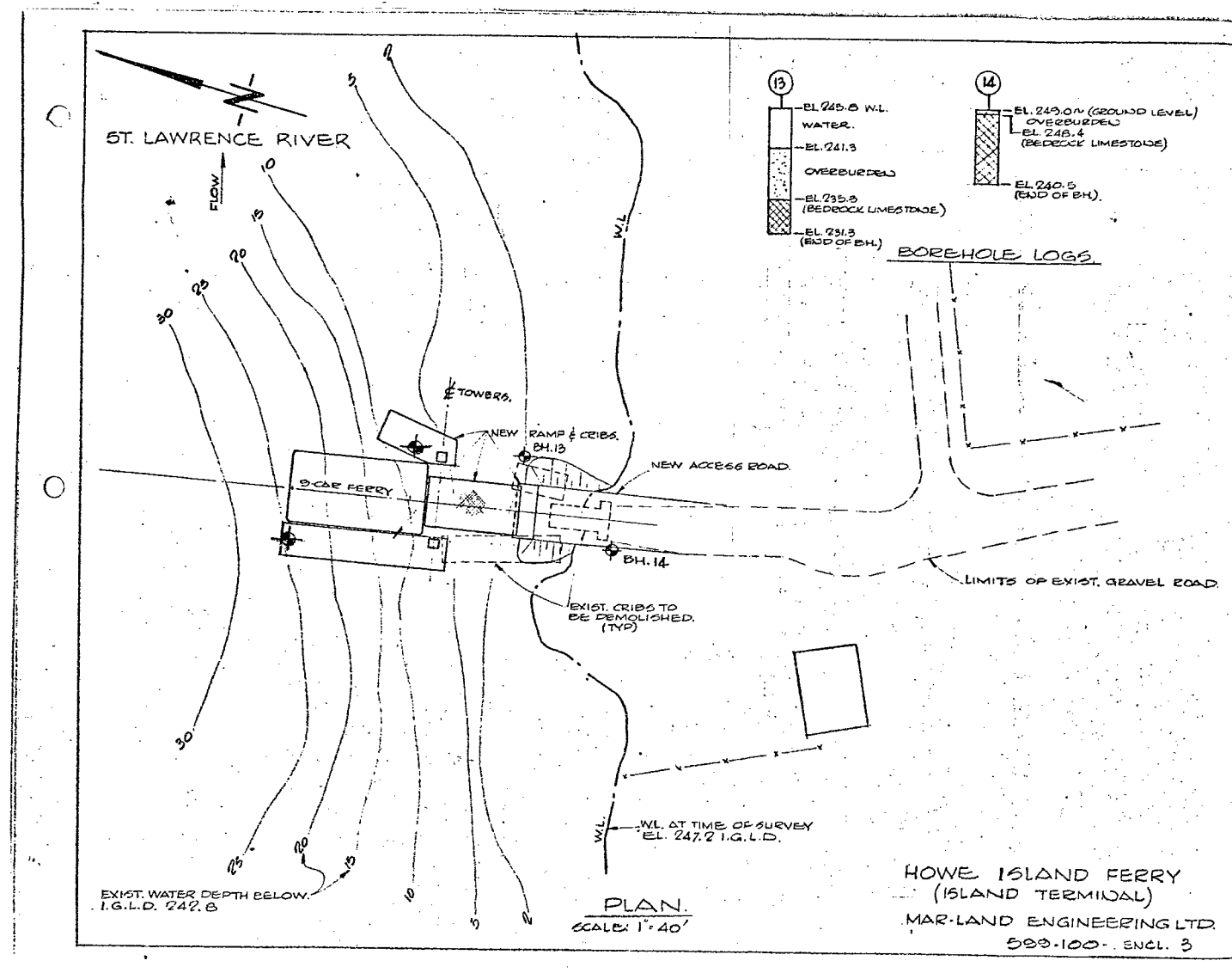


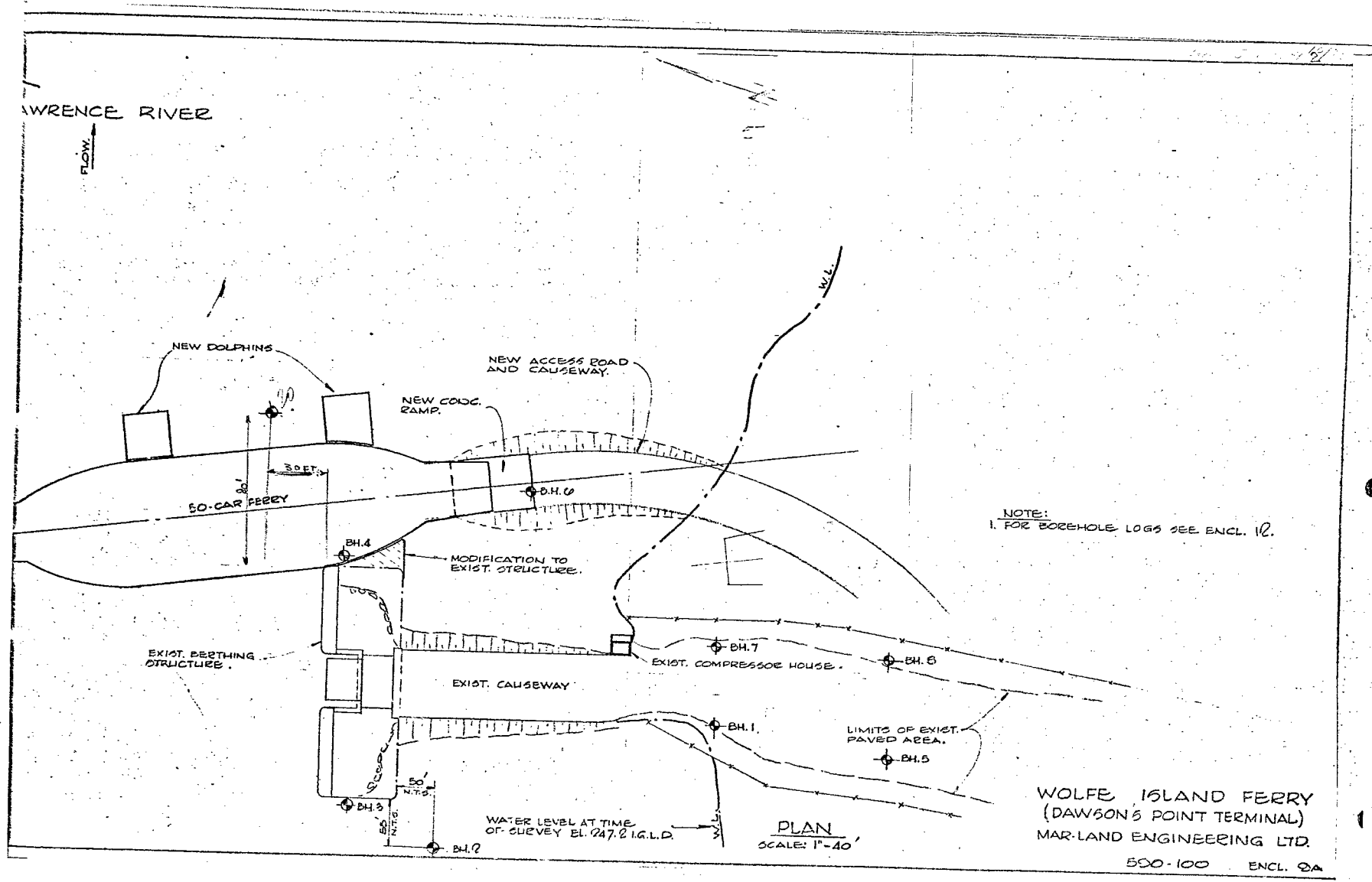
31C - 118











DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 31C-118

DIST. 8 REGION Eastern

W.P. No. 25-73-01

CONT. No. 74-176

W. O. No. 73-11071

STR. SITE No. _____

HWY. No. _____

LOCATION Wolfe Island Ferry
Service

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded
before microfilming

FOUNDATION INVESTIGATION REPORT
For
Proposed Terminals
Kingston - Wolfe Island Ferry Service
City of Kingston and Township of Wolfe Island
County of Frontenac
District No. 8 (Kingston)
W.O. 73-11071 - W.P. 25-73-01

1. INTRODUCTION:

It was proposed to improve the Kingston - Wolfe Island Ferry Service. The improvement will involve the construction of new terminals in order to accommodate the new 50-car end-loading ferry. A subsurface investigation at the Kingston side terminal (C.S.L. Dock) was carried out by this office in February, 1973. The results of the investigation was presented in our Foundations Report W.O. 72-11164, submitted on April 12, 1973.

The Foundations Office was requested to carry out an investigation to determine the subsoil and bedrock conditions at the site of the proposed Terminal at Dawson's Point, Wolfe Island. The request was contained in a memo from Mr. T.C. Kingsland, Regional Structural Planning Engineer, Eastern Region, dated August 27, 1973. Subsequently, an investigation was carried out by this Office.

This report contains the factual data obtained from this investigation, together with recommendations pertaining to the design of the proposed Ferry Terminal.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

Three sites were investigated for this project, namely, Dawson's Point (Site 'A'), Marysville Dock (Site 'B') and C.S.L. Dock (Site 'C'). The first two sites are located at the north side of Wolfe Island which is approximately three miles southeast of the City of Kingston. The Marysville Dock is presently used as the Wolfe Island Terminal.

The C.S.L. Dock (Ghent Pier) is located within the City of Kingston. A detailed description of this dock was presented in our Report W.O. 72-11164.

Physiographically, these sites are located within the "Napane Plain". In this region, the overburden is very shallow and it is followed by the Black River limestone bedrock.

3. FIELD INVESTIGATION AND LABORATORY WORK:

A total of ten boreholes was put down during the course of the field investigation. Eight of these were located at Dawson's Point (Site 'A'). The other two boreholes are located at Marysville Dock (Site 'B') and C.S.L. Dock (Site 'C'). The location of the boreholes are shown on Drawing No. 73-11071A.

The borings were advanced by means of a conventional skid-mounted diamond drill rig. For those boreholes put down in water, a 12' x 18' raft was used.

BX size rock core samples were obtained at all of the boring locations to prove the bedrock conditions. The subsoil and bedrock conditions encountered at the borings are presented in the Record of Borehole sheets, contained in the Appendix. The elevations of the boreholes were surveyed in the field by personnel from Engineering Surveys Section, Eastern Region. The elevations are referenced to a Geodetic Datum.

The rock core samples were identified in the laboratory by Mr. G. Woda, Geologist.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) Site 'A' (Dawson's Point):

The depth of overburden in the general area under investigation is shallow, particularly in boreholes located on or close to the shore. The boreholes put down on the shore (Borehole Nos. 1, 5, 7 and 8) revealed that the bedrock is overlain by a layer of fill material (sand and gravel, with occasional cobbles) whose thickness ranges from 3.7 feet (Borehole No. 7) to 5.9 feet (Borehole No. 5). The rest of the boreholes (Borehole Nos. 2, 3, 4 and 6), which were put down through the water, revealed that the overburden mainly consists of rock fill and/or cobbles and boulders. Its thickness is quite variable, ranging from 1 foot (Borehole No. 6) to 25 feet (Borehole No. 3).

Bedrock was proven at all of the boring locations by obtaining up to 6.5 feet of BX size rock core samples. The bedrock elevation was found to vary between elevations 208 (Borehole No. 3) and 246 (Borehole No. 7), generally dipping in a northerly direction.

The bedrock, consisting of a grey medium to thick bedded limestone of Black River Formation, was found to be, in general, in a sound condition.

4.2) Site 'B' (Marysville Dock - Wolfe Island):

One borehole (Borehole No. 9) was put down in the vicinity of the existing launching ramp immediately east of the Marysville Dock. At this location, limestone bedrock was found immediately below a thin topsoil cover (approximately 0.6 feet). The upper 4.5 feet of the bedrock is fractured and has been moderately weathered.

4.3) Site 'C' (C.S.L. Dock - Kingston):

One borehole (Borehole No. 10) was put down near the existing asphalt ramp at this site. At this boring location, the subsoil consists of a thin topsoil cover (one half of a foot) followed by a 12 foot thick limestone rock fill with bricks and some sand. Limestone bedrock was found underlying one fill material at a depth of 12.4 feet. Two (Borehole Nos. 4 and 5) of the eight boreholes, put down around the dock during a previous

investigation (W.O. 72-11164), were incorporated in this project. The subsoil consists of a variable thickness of silty clay to clay stratum underlain by a thin deposit of glacial origin, which is in turn, followed by limestone bedrock. Detailed description of the subsoil conditions was presented in our Foundation Report W.O. 72-11164.

5. GROUNDWATER CONDITIONS:

The water level of the St. Lawrence River, at the time of the field investigation (September, 1973), was at elevation 245.8.

Groundwater level observations were carried out during the field investigation by taking water level readings in the open boreholes put down on the shore. The observations indicate that groundwater level varies between elevations 246 and 248, corresponding to levels from 2 to 4 feet below the existing ground surface.

6. THE EXISTING AND PROPOSED DETAILS:

6.1) Existing Ferry Service:

A year-round ferry service between Kingston and Wolfe Island is being operated by the Ministry of Transportation and Communications, serving as the link between Hwy. 2 in Kingston

and Hwy. 96 in Wolfe Island. The service is provided by two vessels, the Wolfe Islander (20 car capacity) and the Upper Canada (10 car capacity). Each vessel makes a round trip in approximately 1-1/3 hours, giving the service a capability of transporting approximately 23 passenger car vehicles per hour in each direction. During the winter months, the service is provided by one vessel only, the Wolfe Islander.

Both the ferry vessels are of side-loading type.

6.2) Proposed Ferry Service:

It is proposed to improve the existing ferry service system by providing a new end-loading type of vessel, approximately 285 feet long and 65 feet wide, having a capacity of 50 standard automobiles. It is estimated that this new vessel will make one round trip per hour and have a capability of transporting 50 passenger car vehicles per hour in each direction, thus doubling the capacity of the existing system. In addition, it is proposed to improve the terminal facilities on both ends of the ferry service system.

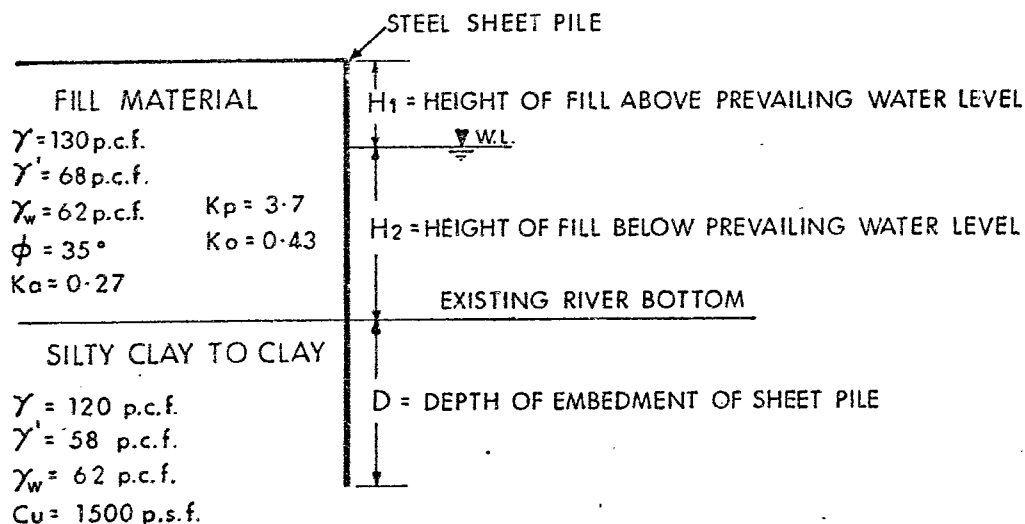
7. DISCUSSION AND RECOMMENDATIONS:

As mentioned previously, a new end-loading type of ferry will replace the two side-loading type ferries now in operation. As a result of this, at each of the three proposed

terminals, a new transfer ramp is required. Recommendations with regard to the foundations of the ramp structures will be discussed for each terminal in detail in the subsections to follow:

7.1) Ghent Pier (C.S.L. Dock, Site 'C'):

It is proposed to construct an 160' x 40' x 1' thick reinforced concrete ramp at the north side of the existing Ghent Pier. The location of the ramp structure and the existing subsoil conditions are shown on Drawing No. 73-11071A. From available information, the profile grade of the top of the ramp varies from elevation 250 (near the shore) to elevation 234 (10:1 slope). At these elevations, the ramp structure will be up to 23 feet above the existing lake bottom. It is therefore recommended that the ramp be constructed on fill material, retained within steel sheet piled cofferdam. The fill material should be free-draining granular type of material or rock fill. In designing these walls, the depth of penetration into the overburden (silty clay to clay stratum) should be determined using the following soil properties:



Concrete ramp so formed may be designed using a coefficient of subgrade reaction* of 75 p.s.i. per inch. If rock fill is used as backfill material, a granular pad (Granular 'A') having a minimum thickness of 2 feet should be placed prior to the construction of the concrete ramp.

7.2) Marysville Dock (Site 'B'):

It is proposed to construct a reinforced concrete ramp some 150 feet long at the east side of the existing dock (as shown on Drawing No. 73-11071A). The top of the ramp at the shore-end will be at elevation 249, whereas that of the other end at elevation 234.

According to available information the proposed ramp may be founded on rock fill, constructed with 2:1 side and forward slopes. Recommendations with regard to the design and construction of the concrete ramp at this location will be similar to those discussed under subsection 7.1).

7.3) Dawson's Point Dock (Site 'A'):

The exact location of the proposed reinforced concrete ramp has not been finalized at the time of the preparation of this report. However, the location of the ramp structure (original scheme) is shown on Drawing No. 73-11071A. Based on the preliminary information the top of the concrete ramp will vary

* Terzaghi, K. 1955 Evaluation of Coefficient of Subgrade Reaction, Geotechnique Vol. V, pp. 297-326.

from elevation 250 to 232. The limestone bedrock in the area of the proposed ramp ranges from elevations 244 to 233. From these elevations, it can be seen that some rock excavation may be required for the construction of the ramp.

If underwater rock excavation is proven to be uneconomical or impractical, consideration should be given to shifting the ramp structure some 50 feet towards the St. Lawrence River channel. If this scheme is adopted, the ramp may be founded on rock fill. The recommendations regarding the design and construction of the ramp given in 7.1) will be applicable.

8. MISCELLANEOUS:

The field work, carried out between September 6 and 26, 1973, was under the supervision of Messrs. C.S. Poon and J. Bangs, Project Foundations Engineers. Mr. C.S. Poon prepared this report.

The drilling equipment used in this project was owned and operated by P.V.R. and Sons Drilling Company of Burford, Ontario.

This project was carried out under the general supervision of Mr. M. Devata, Supervising Foundations Engineer, who reviewed this report.



C.S. Poon

C.S. Poon, P. Eng.

M. Devata

M. Devata, P. Eng.

CSP/zh
October 10, 1973.

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 1

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01





BORING DATE September 12 - 13, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Rock Core

CHECKED BY

SOIL PROFILE.			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %				
248.6	Ground Level													
0.0	Fill material.													
	sand and gravel													
244.1	(with cobbles)													246.1
4.5	Bedrock - Limestone		1	BX RC	96% Rec	240								
238.8	Grey - sand													
9.8	End of Borehole					230								

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE September 20 - 21, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Rock Core

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F. GR.SA.SI.CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %				
							w_p	w	w_L	w_p	w	w_L		
245.8	Lake Level													
0.0	Water					240								
237.5														
8.3	Rock fill and/or cobbles, boulders.													
232.5														
13.3	fractured		1	BX RC	98% Rec									
	Bedrock - Limestone		2	BX RC	95% Rec	230								
228.4	Grey sound		3	BX RC	90% Rec									
17.4	End of Borehole.					220								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 73-11071

LOCATION As Shown on drawing

ORIGINATED BY C.S.P.

W.P. 25-71-01

BORING DATE September 17 - 20, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring, BX Rock Core

CHECKED BY *ML*

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.			PLASTIC LIMIT — w_p				WATER CONTENT — w	
							O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %					
245.8 0.0	Lake Level													GR.SA.SI.C	
	Water						240								
233.3 12.5	Rock fill and/or cobbles, boulders (with sand, seams below elevation 223)						230								
			1	BX RC	50% Rec										
			2	BX RC	50% Rec										
			3	BX RC	42% Rec		220								
			4	BX RC	10% Rec										
			5	BX RC	90% Rec		210								
207.2 37.9	Bedrock - limestone		6	BX RC	44% Rec										
201.5 44.3	Grey sand		7	BX RC	97% Rec										
	End of Borehole						200								

OFFICE REPORT SOIL EXPLORATION

RECORD OF BOREHOLE NO 4 (72-11164)

JOB 73-11071

LOCATION As shown on Drawing

ORIGINATED BY C. D.

W.P. 25-71-01

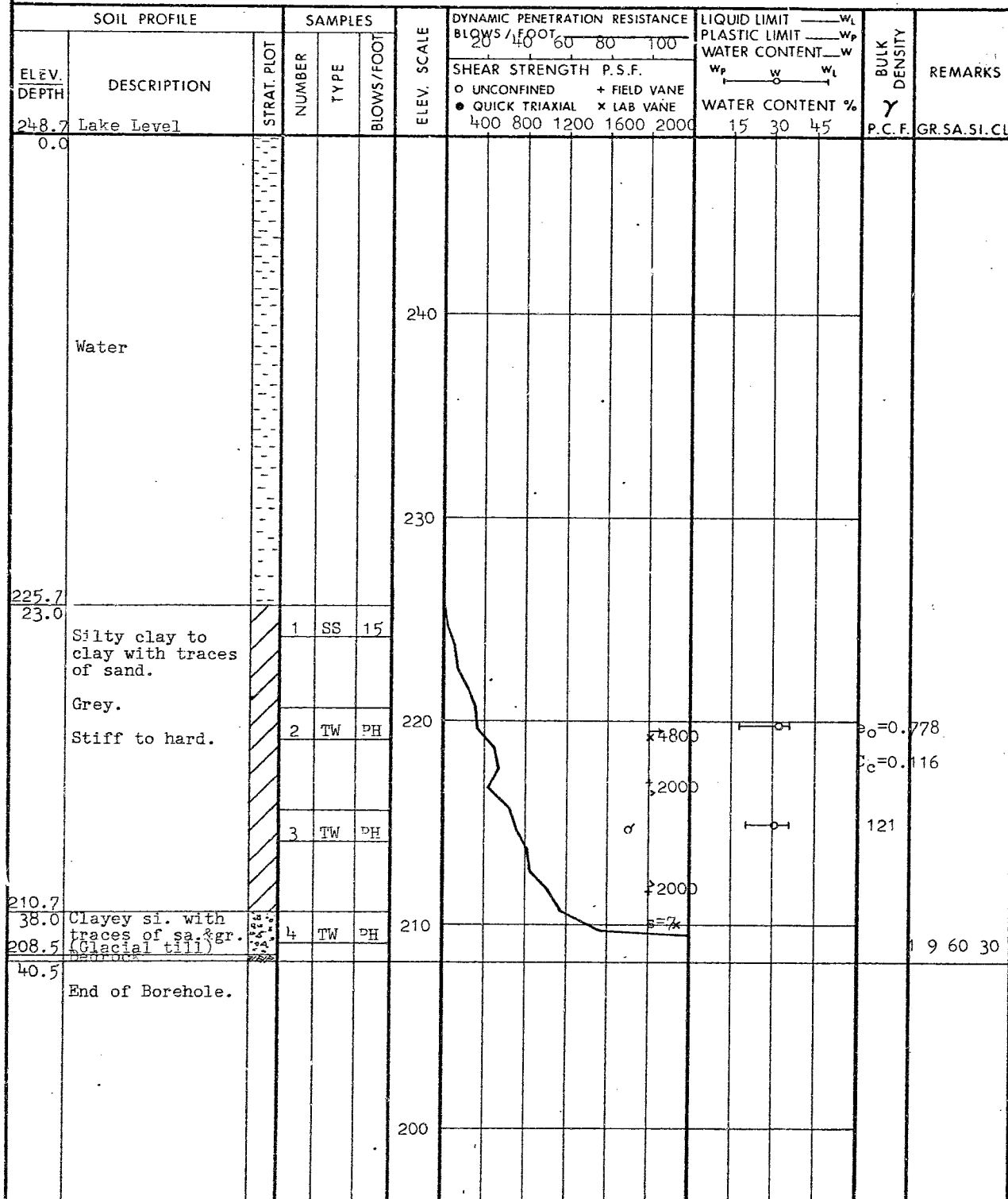
BORING DATE February 15, 1973

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Washboring & Cone Test

CHECKED BY SK.



DESIGN SERVICES BRANCH				RECORD OF BOREHOLE NO 5				FOUNDATIONS OFFICE			
JOB <u>73-11071</u>		LOCATION <u>As Shown on Drawing</u>		ORIGINATED BY <u>C.S.P.</u>							
W.P. <u>25-73-01</u>		BORING DATE <u>September 13, 1973</u>		COMPILED BY <u>C.S.P.</u>							
DATUM <u>Geodetic</u>		BOREHOLE TYPE <u>Washboring, BX Rock Core</u>		CHECKED BY <u>[Signature]</u>							

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_P</u> WATER CONTENT <u>W</u> <u>W_P</u> — <u>W</u> — <u>W_L</u> WATER CONTENT %			BULK DENSITY <u>Y</u>	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLT.	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
249.6	Ground Level														
0.0	Fill material sand & gravel (with silt, cobbles and chunks of asphalt)	X													▼245.8
243.7 5.9	Bedrock - Limestone	X	1	BX RC	93% Rec	240									
239.0 10.6	Grey sand End of Borehole														

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 4

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE September 17, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Wash Boring, BX Rock Core

 CHECKED BY *SR*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			W_P W W_L WATER CONTENT %				
245.8 0.0	Lake Level													P.C.F. GR.SA.SI.CL.
	Water					240								
233.8 12.0	Limestone rock fill with concrete pieces.		1	BX RC	33% Rec	230								
228.2 17.6	Bedrock - limestone		2	BX RC	90% Rec									
223.5 22.3	Grey sand		3	BX RC	100% Rec									
	End of Borehole.					220								

FOUNDATIONS OFFICE

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.D.

W.P. 25-71-01

BORING DATE February 13 - 14, 1973

COMPILED BY S.O.

DATUM Geodetic

BOREHOLE TYPE Washboring, Cone Test & BXL Rock Core

CHECKED BY CK

20
15 ϕ 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 6

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE September 21, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY *SR*




SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — w_p	WATER CONTENT — w		
245.8	Lake Level											
0.0	Water											
239.6						240						
6.2	Cobbles											
7.0	Bedrock - Limestone		1	BX RC	93% Rec							
233.6	Grey sand											
12.2	End of Borehole					230						

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 7

JOB 73-11071 LOCATION As Shown on Drawing ORIGINATED BY J.B.
 W.P. 25-73-01 BORING DATE September 24, 1973 COMPILED BY C.S.P.
 DATUM Geodetic BOREHOLE TYPE Washboring and BX Rock Core CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT			PLASTIC LIMIT — w_p				
249.2	Ground Level						SHEAR STRENGTH P.S.F.			WATER CONTENT — w				
0.0	Fill material - sand and gravel						○ UNCONFINED + FIELD VANE			w_p — w — w_L				
245.5	Gray		1	BX RC	100% Rec		● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %			Y	GR.SA.SI.CL.
3.7	Bedrock - Limestone		2	BX RC	100% Rec									2472
240.5	Grey sand													
8.7	End of Borehole.					240								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 8

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY J.B.

W.P. 25-73-01

BORING DATE September 24, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % W_P — W — W_L				
250.2	Ground Level													
0.0	Fill material - sand, gravel, and cobbles													248.2
244.6	Brown sand													
5.6	Bedrock - Limestone		1	BX RC	90% Rec									
			2	BX RC	100% Rec									
239.6	Grey sand					240								
10.6	End of Borehole.													

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 9

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY J.B.

W.P. 25-73-01

BORING DATE September 24, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				WATER CONTENT %					
							O UNCONFINED		+ FIELD VANE							
250.7	Ground Level															
0.0	Topsoil															
0.6	Bedrock - fract. & weath. sound Limestone		1	BX RC	50% Rec	250										
			2	BX RC	100% Rec											
242.7	Grey															
8.0	End of Borehole.					240										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 10

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY J.B.

W.P. 25-73-01

BORING DATE September 25, 1973

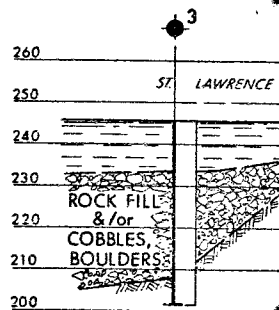
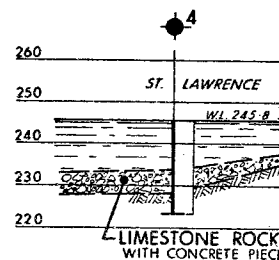
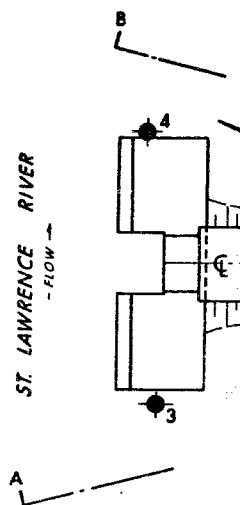
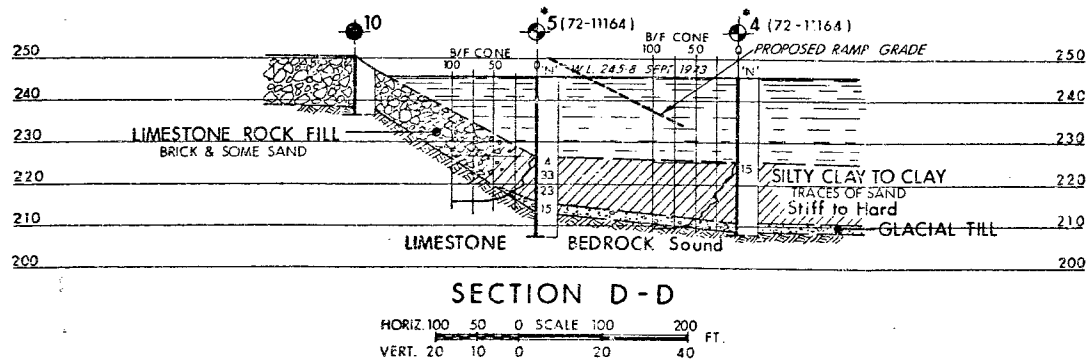
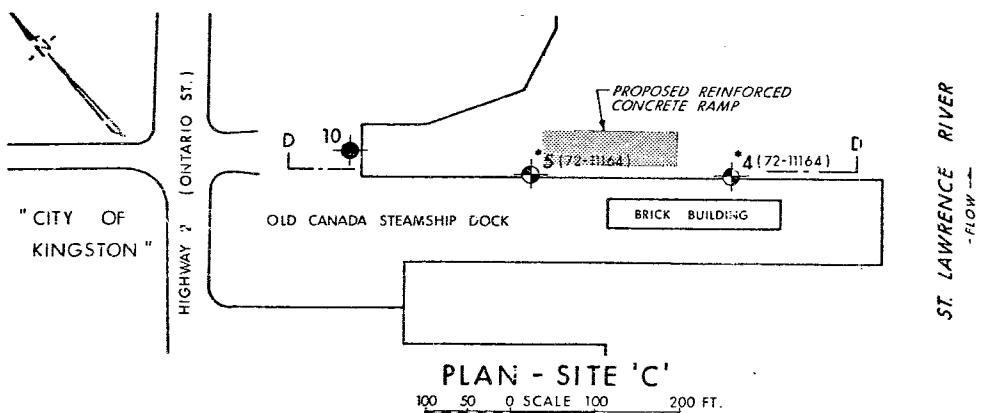
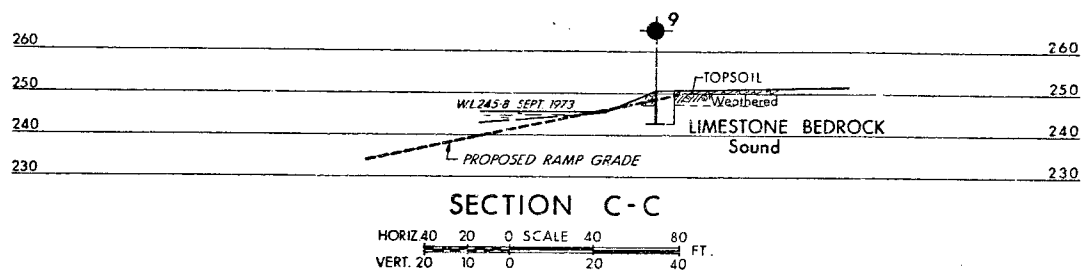
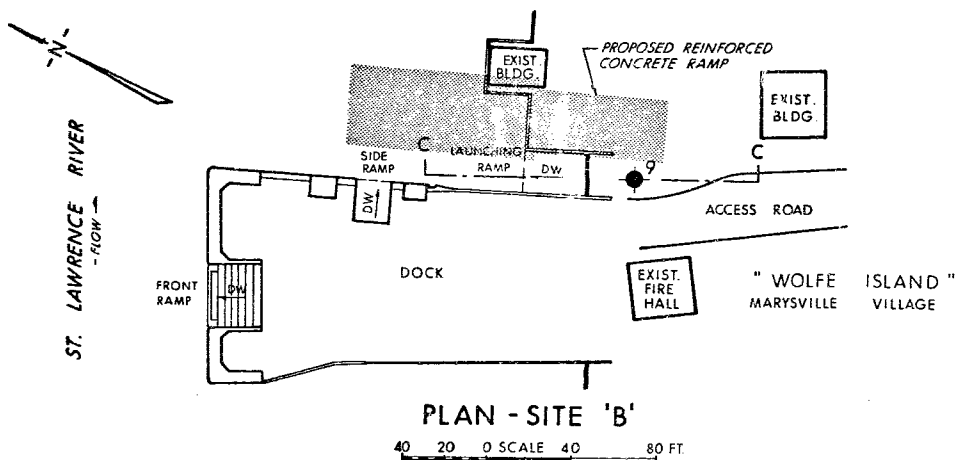
COMPILED BY C.S.D.

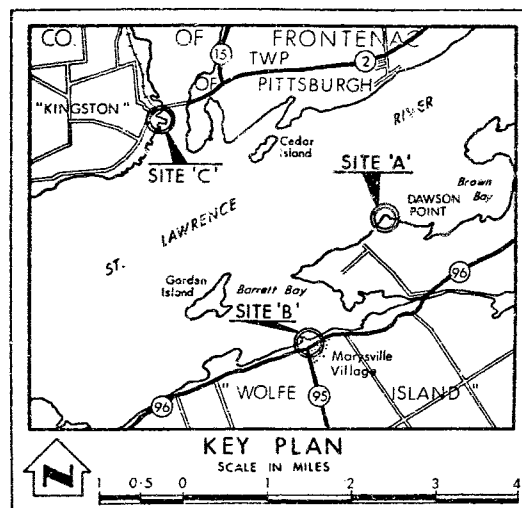
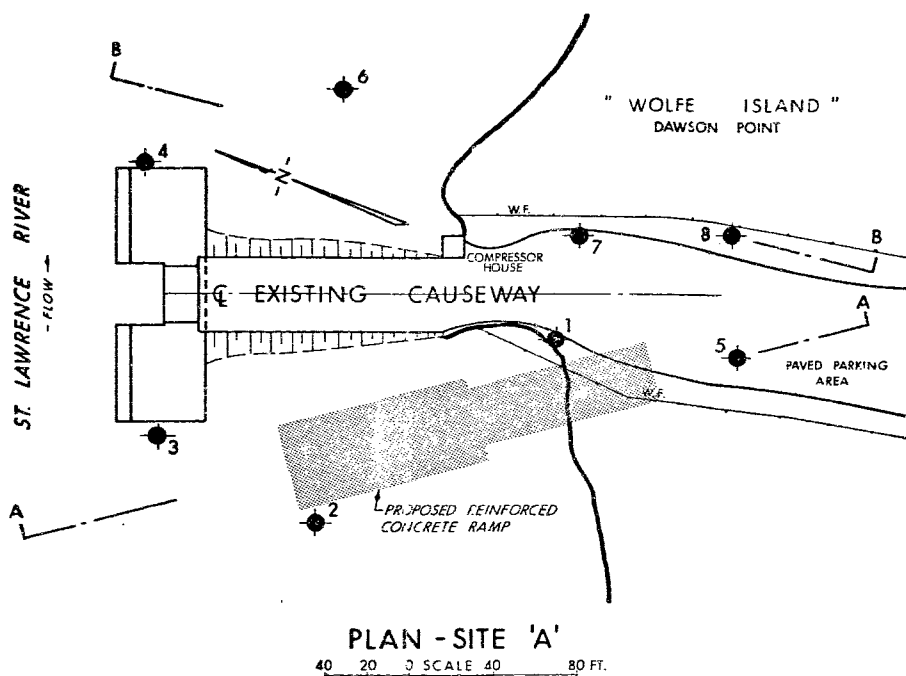
DATUM

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT _____ w_L PLASTIC LIMIT _____ w_p WATER CONTENT _____ w w_p — w — w_L				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT %					
250.6	Ground Level															
0.0	Topsoil					250										
0.5	Fill material -															
	Limestone rock fill, bricks and some sand.															
			1	BX RC	43% Rec	240										
			2	BX RC	10% Rec											
238.2	Bedrock -		3	BX RC	70% Rec											
12.4	limestone															
236.4	Gray fractured		4	BX RC	100% Rec											
14.2	End of Borehole.					230										





LEGEND		
	Bore Hole	
	Cone Penetration Test	
	Bore Hole & Cone Test	
	Water Levels established at time of field investigation. SEPT. 1973	

NO.	ELEVATION	
1	248.6	
2	245.8	
3	245.8	
4	245.8	
4*	248.7	
5	249.6	
5*	248.7	
6	245.8	
7	249.2	
8	250.2	
9	250.7	
10	250.6	

LOCATIONS AS SHOWN ON DWG.

* BORE HOLES FROM PREVIOUS REPORT 72-11164

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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

PROPOSED TERMINALS KINGSTON-WOLFE ISL. FERRY SERVICE

HIGHWAY NO. _____ DIST. NO. 8

CO. FRONTENAC

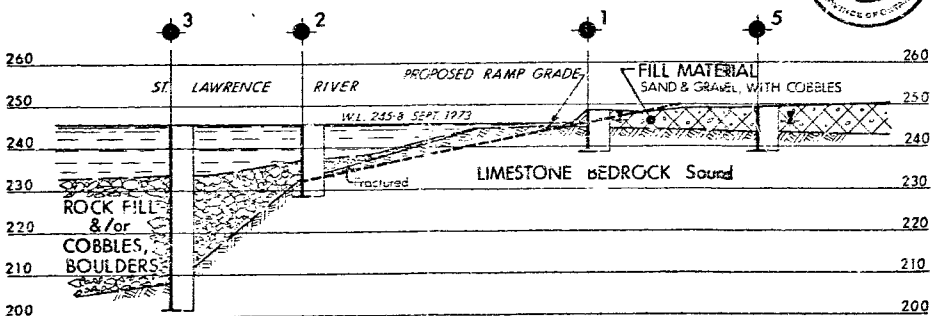
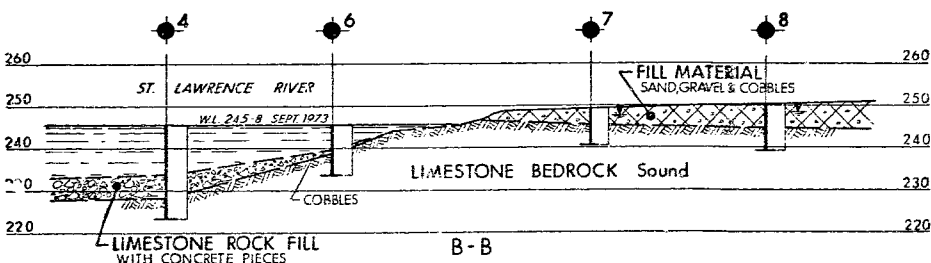
TWP. WOLFE ISLAND CITY OF KINGSTON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. C.P. CHECKED <input checked="" type="checkbox"/>	W.P. NO. 25-73-01	DRAWING NO.
DRAWN S.O. CHECKED <input checked="" type="checkbox"/>	W.O. NO. 73-11071	73-11071A
DATE 17 OCT 1973	SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>[Signature]</i>	CONT. NO.	
PRINCIPAL FOUNDATION ENGINEER 12		

NOTE FOR CONTRACT DOCUMENTS

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the KINGSTON District Office.



SECTIONS

HORIZ. 40 20 0 SCALE 40 80 FT.
VERT. 20 10 0 20 40

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 20

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY J.B.

W.P. 25-73-01

BORING DATE October 4 - 9, 1973

COMPILED BY C.S.P.

DATUM Geodetic

BOREHOLE TYPE Wash Boring and BX Rock Core

CHECKED BY *MC*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE * QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 10 20 30				
245.8	Lake Level														
0.0	Water														
228.8															
17.0	Gravel, some sand (with boulders below elevation 226)		1	SS	7										
224.4	Grey Loose														
21.4	Bedrock - limestone		2	RC	Rec										
221.4	Grey sound		3	RC	Rec										
24.2	End of Borehole														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 21

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY J.B.

W.P. 25-73-01

BORING DATE October 9 - 10, 1973

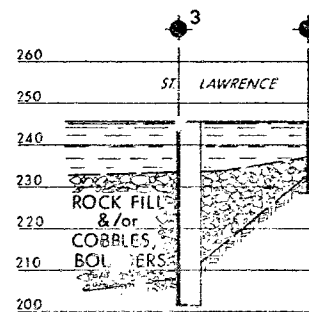
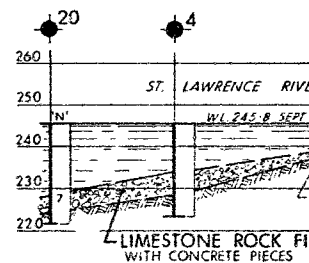
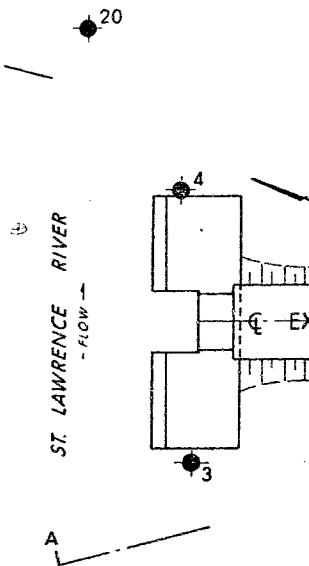
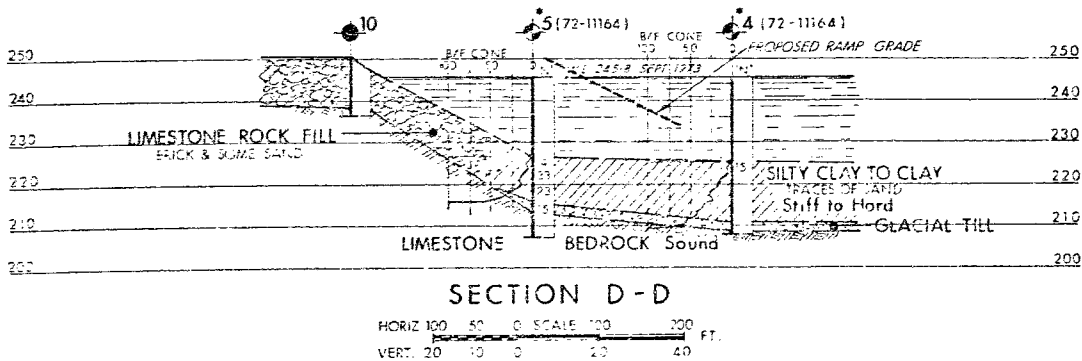
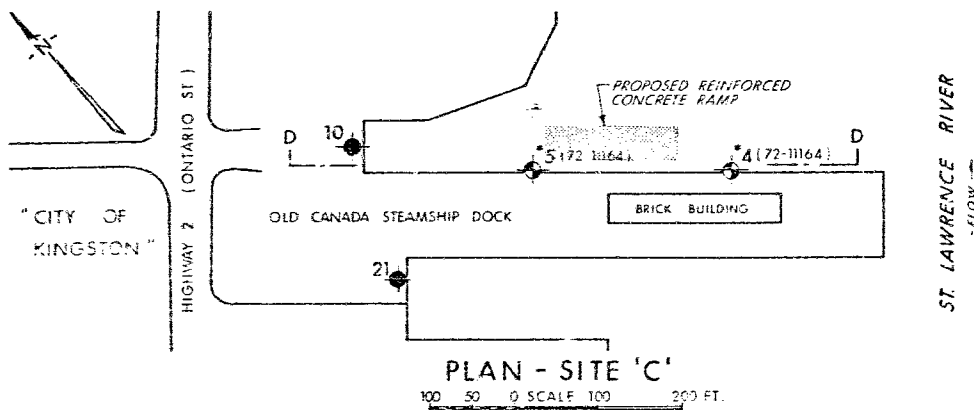
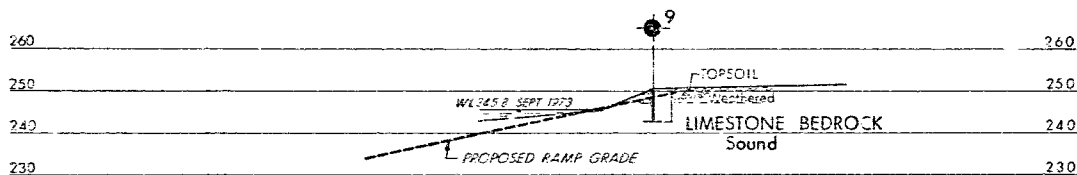
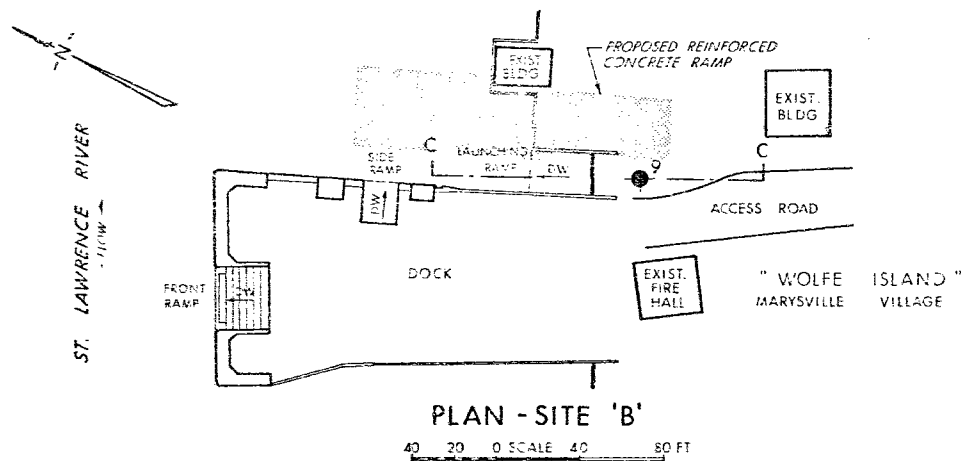
COMPILED BY C.S.P.

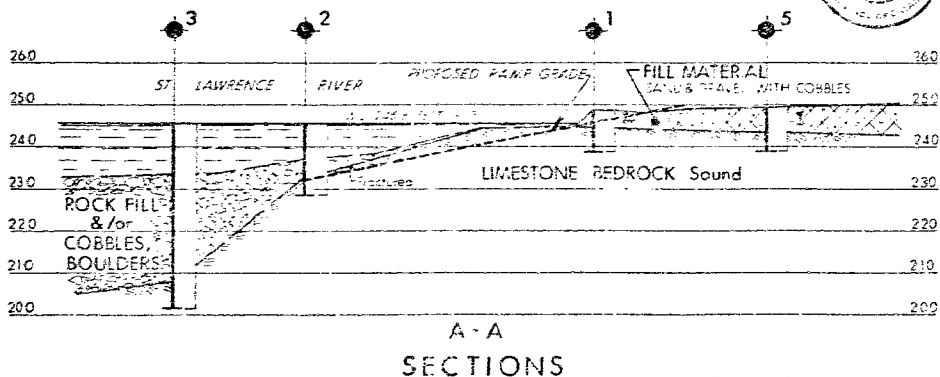
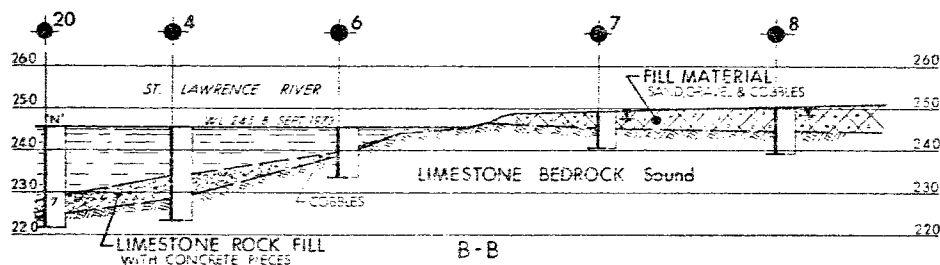
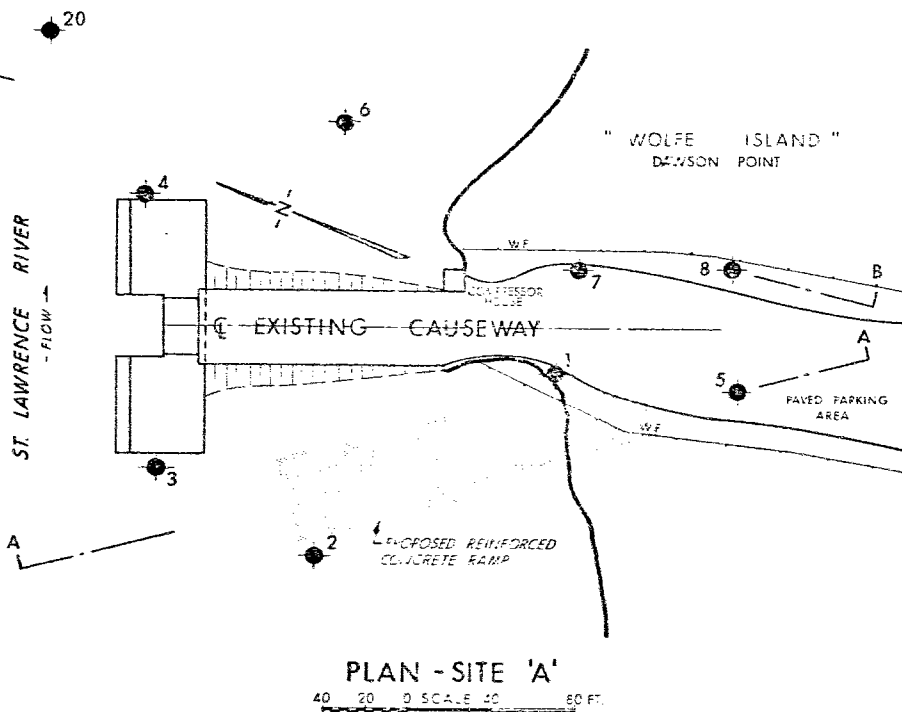
DATUM Geodetic

BOREHOLE TYPE Wash Borings and BX Rock Core

CHECKED BY *[Signature]*

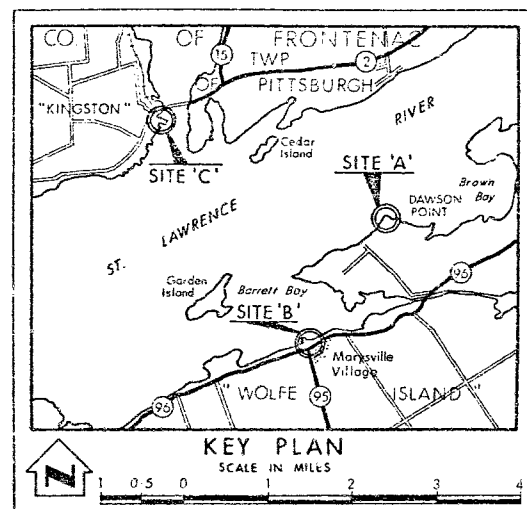
SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 10 20 30						
250.6 0.0	Ground Level					250										
243.1 7.5	Fill Material					240										
	Gravel, sand, silt and trace of organics		1	SS	13											
			2	SS	15											
			3	SS	95		bouncing									
			4	SS	2											
234.1 16.5	Wood and Sand		5	SS	3											
			6	SS	19											
			7	SS	64	bouncing										
230.4 20.2	Clayey silt, some sand and gravel Grey Very stiff to hard					230										
	End of Borehole. Probably bedrock															





NOTE FOR CONTRACT DOCUMENTS

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the Kingston District Office.



LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation, SEPT. 1973

NO.	ELEVATION	
1	248.6	
2	245.8	
3	245.8	
4	245.8	
4*	248.7	
5*	249.6	
6	248.7	
7	245.8	
8	249.2	
9	250.7	
10	250.6	
20	245.8	
21	250.6	

* BORE HOLES FROM PREVIOUS REPORT 72-11164

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION
1	NOV 73	S.O.	BORE HOLES 20 & 21 ADDED

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

PROPOSED TERMINALS KINGSTON-WOLFE ISL. FERRY SERVICE

HIGHWAY NO. _____ DIST. NO. 8

CO. FRONTENAC

TWP. WOLFE ISLAND CITY OF KINGSTON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD. C.P.	CHECKED	W.P. NO.	25-73-01	DRAWING NO.
DRAWN	5	CHECKED	W.O. NO.	73-11071
DATE	10 OCT 73	SITE NO.		BRIDGE DRAWING NO.
APPROVED		CONT. NO.		

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T.C. Kingsland, (2)
Regional Structural Planning Eng.,
Eastern Region,
Kingston, Ontario.

FROM: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

ATTENTION:

DATE: February 28th, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: RE: Additional Subsoil Investigation,
Proposed Terminals for Kingston-
Wolfe Island Ferry Service,
City of Kingston & Township of
Wolfe Island, County of Frontenac,
District #8 (Kingston),
W.O. 73-11071 W.P. 25-73-01.

1. INTRODUCTION:

A subsurface investigation was carried out by this Office in September, 1973 for the proposed terminals of this project. The results of one investigation, together with the pertinent recommendations were presented in our Report W.O. 73-11071 submitted on October 12th, 1973.

Since the submission of this report, a new scheme of terminal facilities was adopted at Dawson's Point and Marysville Village. At these two locations, new dolphin cells of 18 feet diameter will be constructed. As a result of this, the Geotechnical Office was requested to carry out an additional investigation for this project.

The request was contained in a memo from Mr. T.C. Kingsland, Regional Structural Planning Engineer, Kingston, dated December 17th, 1973. Subsequently, an investigation consisting of five boreholes (B.H.#101-#105) was carried out. The record of Borehole Sheets together with sketches of Borehole locations were sent to you immediately after the field work had been completed, in order to expedite this project.

Mr. T.C. Kingsland

In the sections to follow, the factual information and recommendations are discussed. A new drawing No. 73-11071B is also included in this memo.

2. SUBSOIL AND BEDROCK CONDITIONS:

2.1) Site 'A' - Dawson's Point.

Two dynamic cone penetration tests were carried out at the proposed locations of the dolphin cells at this site. In one of these holes (B.H.#105) a split spoon sample was taken at the bottom of river channel. This sample consists of sand, some silt and gravel. The thickness of the overburden at the borehole locations was found to be in excess of 10.8 (B.H.#104) and 11.5 feet (B.H.#105) (3.5 to 3.8 m). Standard penetration testing gave "N" values ranging from 2 to 92 blows/ft. (0.3 m) generally increasing with depth. The relative density of this deposit is therefore very loose to very dense. The overburden is believed to be underlain by limestone bedrock.

2.2) Site 'B' - Marysville Dock.

Two boreholes were put down at the proposed locations of the dolphins. At these locations, the overburden consists of silt, sand and some gravel. The thickness varies from 1.3 ft. (B.H. #102) to 2.8 ft. (B.H.#101) (0.4 to 0.9 m). Two standard penetration tests carried out in this deposit gave 'N' values of 12 to 13 blows/ft. (0.3 m). The relative density of this granular deposit is therefore compact. This stratum is underlain by limestone bedrock which was in a sound condition as evidenced by the high percentage recovery (95 to 97%).

Mr. T.C. Kingsland

2.3) Site 'C' - Ghent Pier.

One borehole (B.H.#103) was put down along the line of the proposed steel sheet pile wall. The overburden at this location consists of 3 ft. (1 m) of very loose black sand with some gravel, which is underlain by 8 ft. (2.5 m) of silty clay with trace of sand. From boreholes carried out for the previous investigation (W.O. 72-11164), the overburden is underlain by sound limestone bedrock.

3. RECOMMENDATIONS:

3.1) Dolphin Cells at Dawson's Point and Maryville Dock.

It is understood that the dolphin cells (steel sheet pile cell structures with concrete cap) are to have a diameter of 18 ft. (5.5 m). At these two sites, the overburden consists of silt, sand and gravel of variable thickness. No major problems during the construction of the sheet pilings are anticipated.

No elaborate calculations were carried out to check the stability of the cell structures since the details of the loading were not available. However, the river bottom at the proposed dolphin cells is reasonably level, therefore, the proposed cells will have an adequate factor of safety against instability and sliding.

Alternatively, considerations may be given to a scheme, using end-bearing piles driven to bedrock to support the concrete cap of the dolphin, at the Dawson's Point terminal where the thickness of the overburden is in excess of 10 ft. (3.3 m). We would be pleased to elaborate this aspect if this scheme is adopted.

February 28th, 1974.

Mr. T.C. Kingsland

3.2) Steel Sheet Pile Wall at Ghent's Pier.

Recommendations pertaining to the design of the steel sheet pile wall at this site were given in p.7 of the original foundation report (W.O. 73-11071).

4. OTHER CONSIDERATIONS:

It should be noted that the dock in Dawson's Point was in use during the time of the field investigation. It was, therefore, unable to carry out detailed borings at this site without interrupting the ferry service.

If further information is required, this Office will carry out necessary supplementary borings when this terminal is not in use.



C.S. Poon,
Project Engineer,
For: M. Devata,
Supervising Engineer.



CSP/mj
Attach.

c.c. E.J. Orr
B.R. Davis
A. Rutka
A.J. Percy
V.A. Snell
B.J. Giroux
E.R. Saint
G.A. Wrong
B.A. Singh

Foundation Files ✓
Documents
Marland Engineering Ltd.,
Toronto. (G. McFarlane)

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 101

FOUNDATIONS OFFICE

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE Jan. 8 - 9, 1974

COMPILED BY C.S.P.

DATUM I.G.L.D.

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY

SOIL PROFILE		SAMPLES			ELEV. SCALE ft.	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w $w_p \quad w \quad w_L$	BULK DENSITY γ	REMARKS
ELEV. DEPTH Ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
74.7 0.0	0.0	Water Level							
		Water				240 73			
70.2	230.2					230 of 70 rods			
69.4 11.5	227.5 11.7	Silt, sand some gravel Grey loose to compact	1A	SS	wt.				
5.3 69.4	17.5 227.5	Bedrock - Limestone	1	SS	12				
67.9	222.5	Grey Sand	2	EX	95%				
6.8	22.5	End of Borehole		RC	Rec	220 67			

OFFICE REPORT ON OIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 102

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE Jan. 9 - 10, 1974

COMPILED BY C.S.P.

DATUM I.G.L.D.

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE ft m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w				BULK DENSITY γ	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (U.S. 30")		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % w_p w w_L					
74.7	245.0	Water Level														
0.0	0.0	Water														
70.4	230.8															
4.3	14.2	Sand and gravel, comp.		1	SS	13										
4.7	15.5	Bedrock - Limestone		2	BX	97%										
68.6	225.0	Grey Sound			RC	Rec.										
6.1	20.0	End of Borehole														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 103

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY CSP

W.P. 25-73-01

BORING DATE January 17 - 18, 1974

COMPILED BY CSP

DATUM I.C.L.D.

BOREHOLE TYPE Wash Boring

CHECKED BY SR

		SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY γ	REMARKS
							TIPS / FOOT		PLASTIC LIMIT — w_p			
		DESCRIPTION		STRAT. PICT			SHEAR STRENGTH P.S.F.		WATER CONTENT — w			
							○ UNCONFINED + FIELD VANE		w_p — w — w_L			
							● QUICK TRIAXIAL x LAB VANE		WATER CONTENT %			

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 104

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY CSP

W.P. 25-73-01

BORING DATE January 22, 1974

COMPILED BY CSP

DATUM I.G.L.D.

BOREHOLE TYPE Dynamic Cone Penetration Test

CHECKED BY SR

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3m)			LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ	REMARKS	
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3m)	ELEV. SCALE (ft./m)	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % W _P — W — W _L				
245.0	Water Level													P.C.F. GR.SA.SI.CL.
0.0	Water					240								
						73								
						230								
226.5						70								
18.5	probably sand, some silt, trace of gravel					220								
215.7	very loose to compact					67								
29.3	End of Cone Test													
						210								
						64								

OFFICE REPORT OF SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 105

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY CSP

W.P. 25-73-01

BORING DATE January 22, 1974

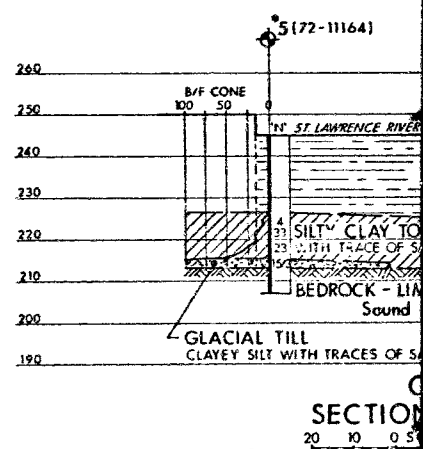
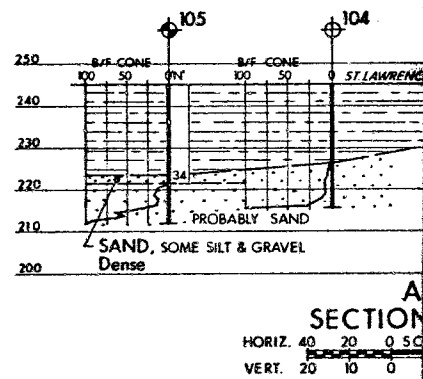
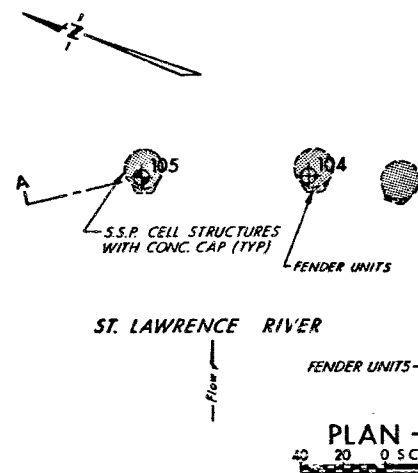
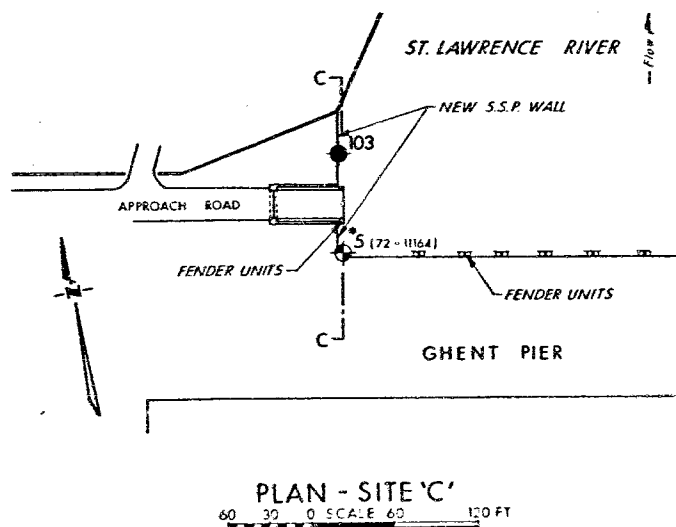
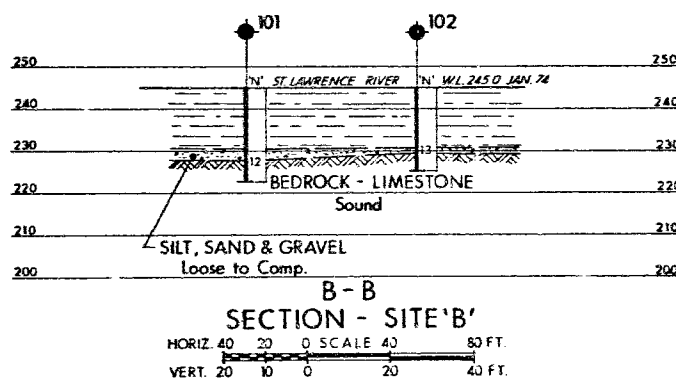
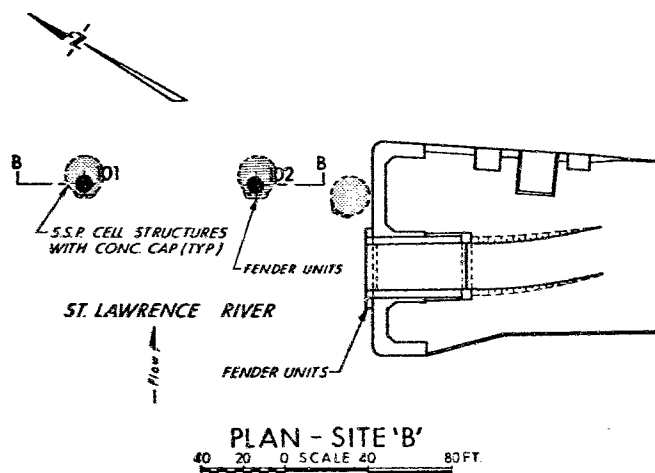
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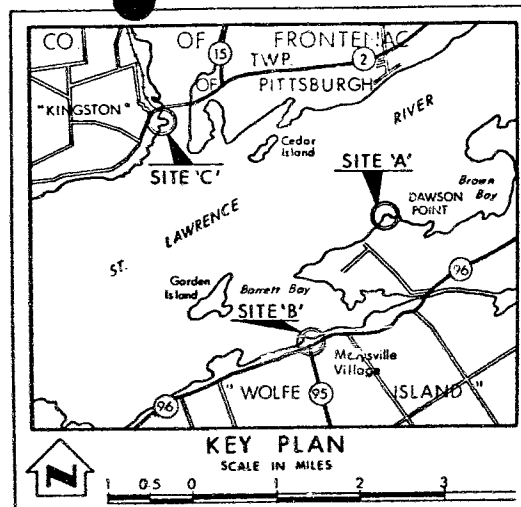
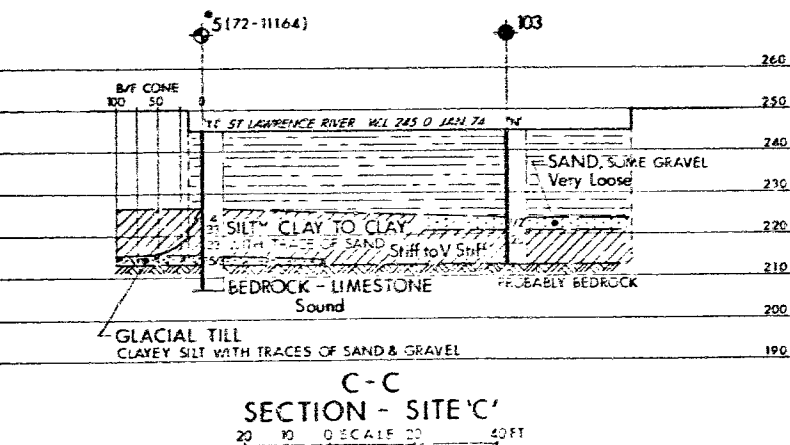
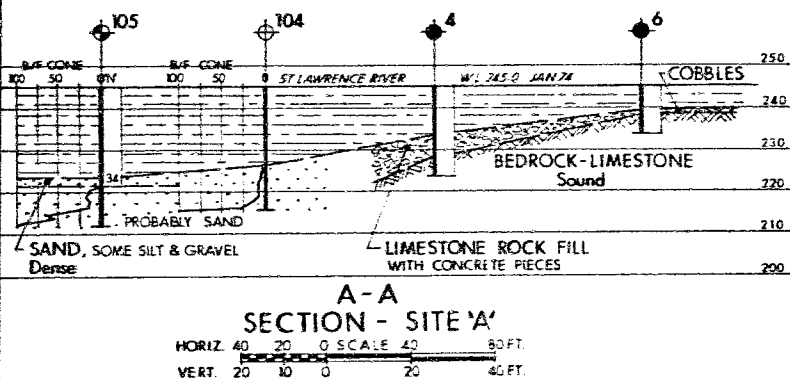
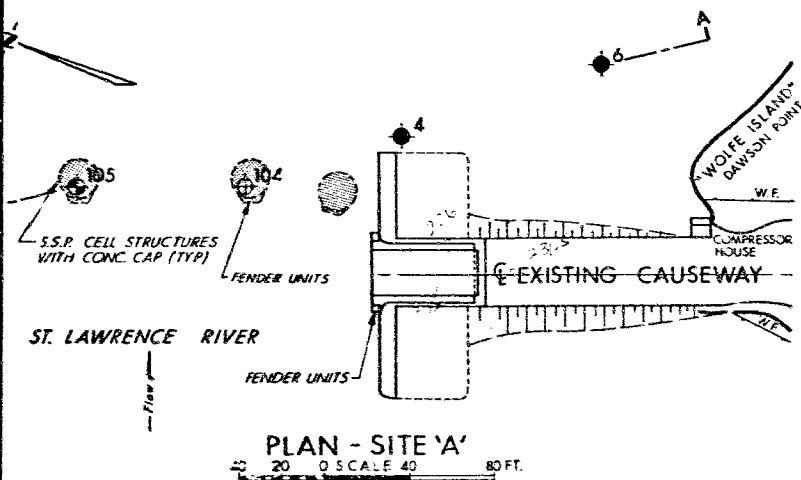
DATUM T.G.L.D.

BOREHOLE TYPE Wash boring and dynamic cone penetration

CHECKED BY SR

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE		TEST		BULK DENSITY	REMARKS				
ELEV. / m.	DEPTH / ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT (0.3m)	ELEV. / m.	DEPTH / ft.			LIQUID LIMIT — w_L	PLASTIC LIMIT — w_p	WATER CONTENT — w	SHEAR STRENGTH P.S.F.
74.7	245.0	Water Level												
0.0	0.0	Water					240	73						
							230	70						
68.1	223.5													
67.5	221.5	sand, some silt, gravel		1	SS	34								
7.2	23.5	End of Borehole					220	67						
		Probably sand, some silt and gravel												
64.6	212.0	compact-v. dense												
10.1	33.0	End of Cone Test					210	64						





LEGEND		
	Bore Hole	
	Cone Penetration Test	
	Bore Hole & Cone Test	
	Water Levels established at time of field investigation, Sept. 73 & Jan. 74.	
NO.	ELEVATION	
4*	245.8	LOCATIONS AS SHOWN ON DWG.
5*	248.7	
6*	245.8	
101	245.0	
102	245.0	
103	245.0	
104	245.0	
105	245.0	

* BORE HOLE FROM PREVIOUS REPORT 72-11164
 * BORE HOLES CARRIED OUT IN SEPT. 1973

NOTE FOR CONTRACT DOCUMENT:

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the KINGSTON District Office.

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
 ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE

PROPOSED TERMINALS KINGSTON - WOLFE ISL. FERRY SERVICE

HIGHWAY NO. _____ DIST. NO. 8
 CO. FRONTENAC
 TWP. WOLFE ISLAND CITY OF KINGSTON

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD C.P.	CHECKED <input checked="" type="checkbox"/>	W.P. NO. 25-73-01	DRAWING NO.
DRAWN S.R.	CHECKED <input checked="" type="checkbox"/>	WO NO. 73-11071	73-11071B
DATE <u>6 FEB 1974</u>		SITE NO.	BRIDGE DRAWING NO.
APPROVED _____		CONT. NO.	



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T.C. Kingsland, (2)
Regional Structural
Planning Engineer,
Eastern Region, Kingston.

FROM Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

ATTENTION:

DATE May 8th, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: RE: Additional Borings at Dawson's Point,
Kingston-Wolfe Island Ferry Services,
W.O. 73-11071 W.P. 25-73-01.

A meeting was held on April 5th, 1974 between Mar-Land Engineering and the Ministry's Structural Office, Soil Mechanics Section and Equipment Office, for the abovementioned Project.

At this meeting, it was agreed that the main transfer bridge abutments should be supported on piles driven to bedrock. This would ensure the overall rigidity of the structure. In order to clarify the bedrock profile in the area where piles are to be driven at the Dawson's Point Terminal, the Soil Mechanics Section carried out three additional boreholes (B.H.'s #31-#33). These borings were carried out between April 16th and 18th, 1974, using a C.M.E. 55 drilling machine equipped with hollow stem auger (approximately 7" in diameter). The borelogs were appended to this memo and they are self-explanatory.

In addition, three drawings, 73-11071 A (Dawson's Point), 73-11071 B (Marysville) and 73-11071 C, were also enclosed. These drawings will supercede and cancel Drawings 73-11071 A & B and 72-11164 A issued previously. The Mylars of these three drawings were forwarded to Mr. G. McFarlane of Mar-Land Engineering Ltd., so that they will be included in the Contract Documents.


C.S. Poon,
Project Engineer,

For: M. Devata,
Supervisor

CSP/mj

c.c.	E.J. Orr	G.A. Wrong
	B.R. Davis	B.A. Singh
	A.J. Percy	L.G. Timson
	V.A. Snell	Mar-Land (Mr. G. McFarlane,
	B.J. Giroux	Files ✓
	E.R. Saint	Documents

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 31

JOB 73-11071

LOCATION As shown on Drawing 73-11071A

ORIGINATED BY JB

W.P. 25-73-01

BORING DATE April 16, 1974

COMPILED BY CP

DATUM I.G.L.D.

BOREHOLE TYPE Hollow Stem Auger, BX Rock Core

CHECKED BY *JB*

SOIL PROFILE			SAMPLES		ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS/FOOT (0.3 m)	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT % w_p ——— w ——— w_L 10 20 30		
m 75.9	249.0	Ground Level									
0.0	0.0	Fill Material rock fill with occ. lenses of grey silty clay		1	SS	100/0"					∇ 247.0 75.3
73.8	242.0			2	SS	bouncing					
2.1	7.0	Sand, silt and gravel with pockets of organics		3	SS	12	240		o		4,88, (8)
				4	SS	42	73.2				
71.0	233.0								o		23,63,12, 2
4.9	16.0	Silty sand with some gravel. Compact		5	SS	12	230		o		9,55,32, 4
70.3	230.5	Bedrock Limestone		6	PC	80"	70.1				
5.6	18.5	Grey Sound		7	BX	91%					
68.6	225.1										
7.3	23.9	End of Borehole									
						220					
						67.1					

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 32

FOUNDATIONS OFFICE

JOB 73-11071

LOCATION As shown on drawing 73-11071A

ORIGINATED BY JB

W.P. 25-73-01

BORING DATE April 18, 1974

COMPILED BY Cp

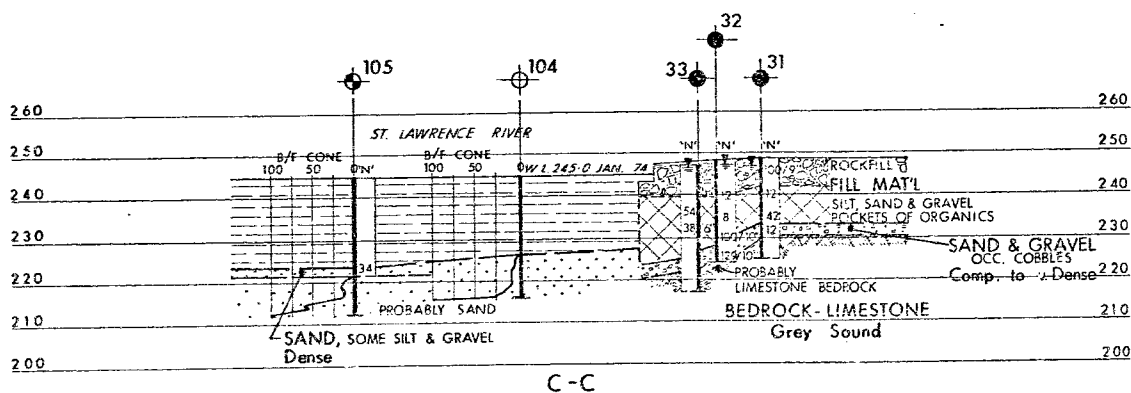
DATUM I.G.L.D.

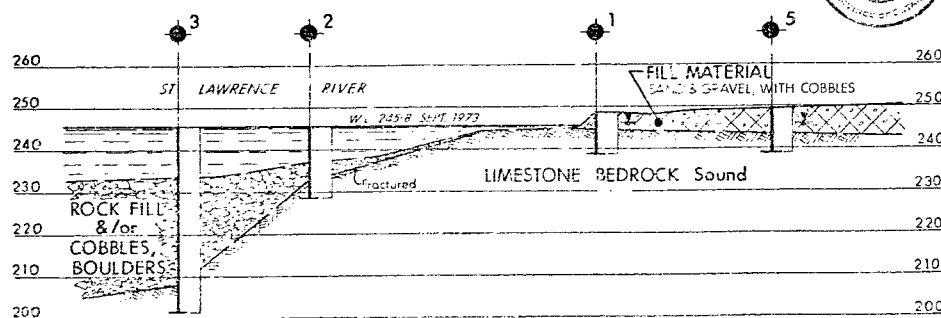
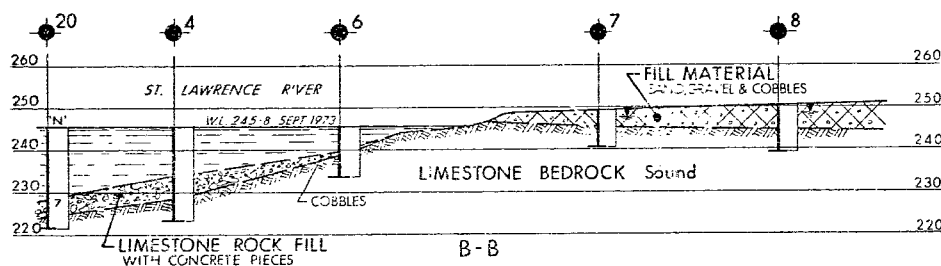
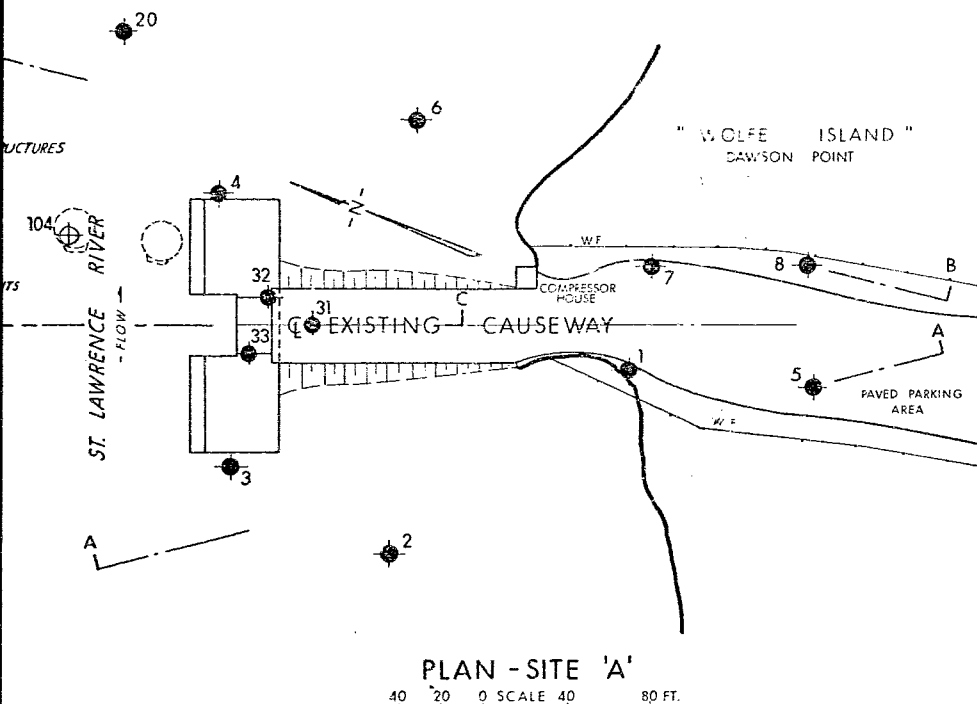
BOREHOLE TYPE Hollow Stem Auger, BX Rock Core

CHECKED BY

SOIL PROFILE				SAMPLES		ft./ft	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		PLASTIC LIMIT ——— w_p		BULK DENSITY	REMARKS	
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0-3m)		BLOWS / FOOT		WATER CONTENT — w		WATER CONTENT %				
							SHEAR STRENGTH P.S.F.		w_p ——— w ——— w_L				γ	P.C.F. GR. SA. SI. CL.	
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
75.8	248.7	Ground Level													
0.0	0.0	Fill Material													
		Rock Fill													
73.1	239.7			1	SS	12	240								
2.7	9.0	Sand, gravel, traces of sil* & clay with occ. inclusion of organics.		2	SS	8	73.2								
				3	SS	1007	0" 230								
69.7	228.7					70.1								19, 63, (18)	
6.1	20.0	Sand & gravel with fragments of limestone													
68.4	224.3	Very Dense	4	SS	1297	0"								21, 52, 24, 3	
7.4	24.4	End of Borehole Probably limestone bedrock	5	EC											
						220									
						67.1									

OFFICE REPORT OF SOIL EXPLORATION

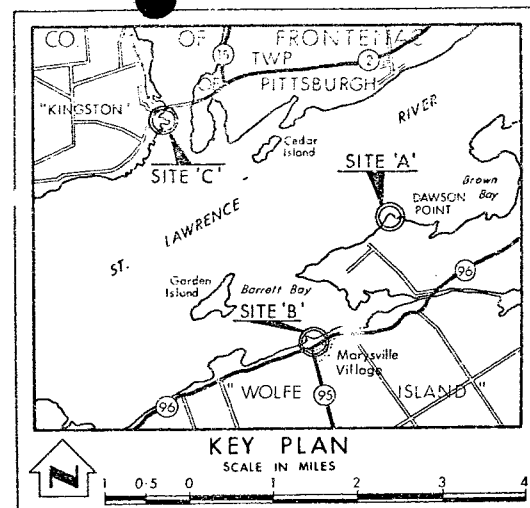




HORIZ. 40 20 0 SCALE 40 80 FT.
VERT. 20 0 20 40

NOTE FOR CONTRACT DOCUMENTS

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the KINGSTON District Office.



LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation, SEPT. 1973

NO.	ELEVATION	
1	248.6	
2	245.8	
3	245.8	
4	245.8	
5	249.6	
6	245.8	
7	249.2	
8	250.2	
20	245.8	
104	245.0	JAN. 1974
105	245.0	
31	249.0	
32	248.7	APR. 1974
33	247.1	

— NOTE —

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

REVISIONS	DATE	BY	DESCRIPTION
APR 74	R.S.		REVISED DWG. SUPERCEDES DWG 73-11071A, OCT 11, 1973

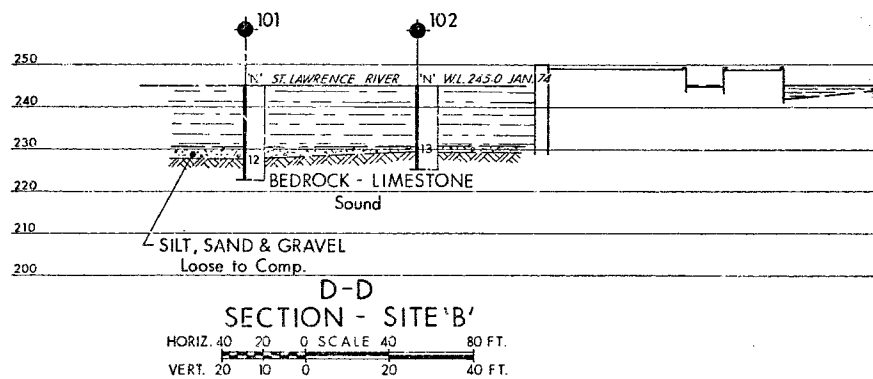
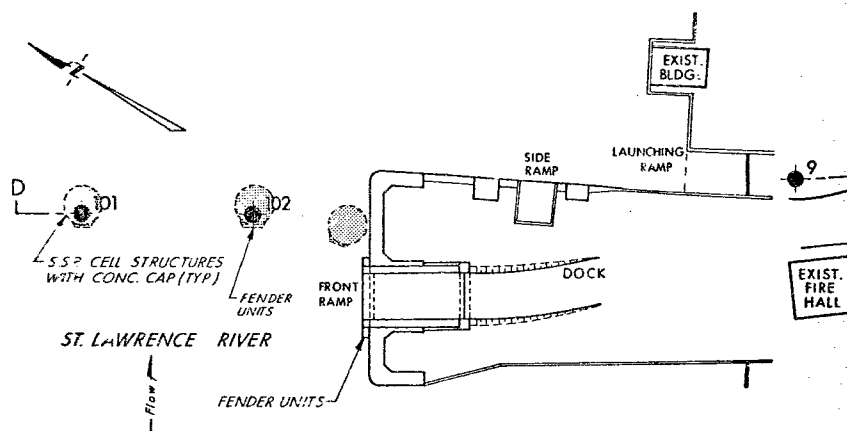
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE

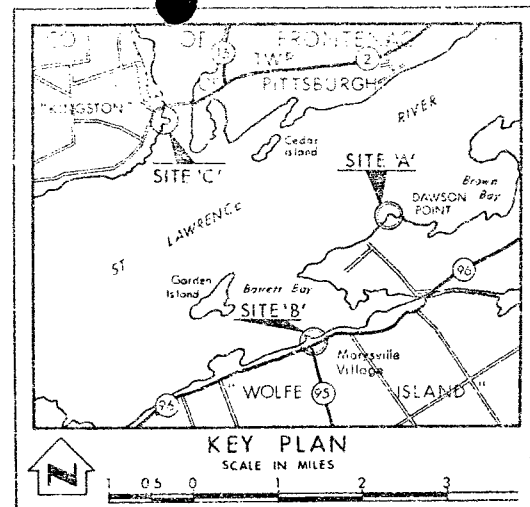
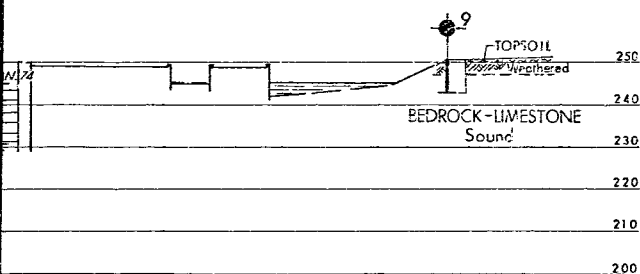
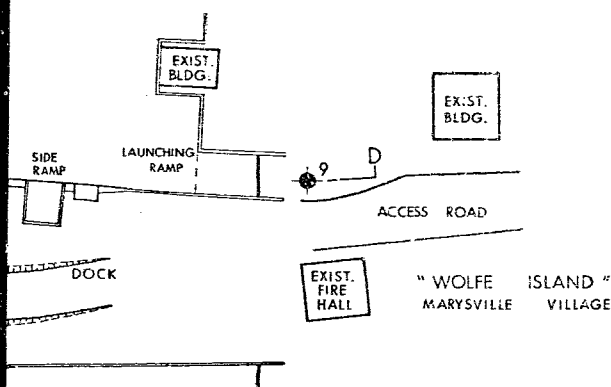
KINGSTON-WOLFE ISL. FERRY SERVICE PROPOSED TERMINAL AT DAWSON POINT

HIGHWAY NO. SITE 'A' DIST. NO. 8
CO. FRONTENAC
TWP. WOLFE ISLAND

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD C.F. CHECKED <input checked="" type="checkbox"/>	WP NO. 25-13-01	DRAWING NO. 73-11071A
DRAWN S.O. CHECKED <input checked="" type="checkbox"/>	WC NO. 73-11071	BRIDGE DRAWING NO.
DATE 7 MAR 1974	SITE NO.	
APPROVED <input checked="" type="checkbox"/>	CONT. NO.	





LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation.

NO.	ELEVATION	
9	250 - 7	24 SEPT. 1973
101	245 - 0	9 JAN. 1974
102	245 - 0	10 " "

NOTE

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

REVISIONS	DATE	BY	DESCRIPTION
APR. 74	B. S.		SUPERCEDES DWG. 73-11071B DATED 6 FEB. 1974

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH—GEOTECHNICAL OFFICE

KINGSTON-WOLFE ISLAND FERRY SERVICE
PROPOSED TERMINAL AT MARYSVILLE VILLAGE
HIGHWAY NO. — SITE 'B' — DIST. NO. 8
CO FRONTENAC
TWP WOLFE ISLAND LOT — CON —

BORE HOLE LOCATIONS & SOIL STRATA

SUBMIT C.P.	CHECKED ✓	WP JO 25-73-01	DRAWING NO
DRAWN R.S.	CHECKED ✓	WG NO 73-11071	73-11071B
DATE 26 APR. 1974	SITE NO		BRIDGE DRAWING NO
APPROVED	CONT. NO		



NOTE FOR CONTRACT DOCUMENT:
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the KINGSTON District Office.

Mr. T.C. Kingsland, (2)
Regional Structural
Planning Engineer,
Eastern Region, Kingston.

Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

May 8th, 1974.

RE: Additional Borings at Dawson's Point,
Kingston-Wolfe Island Ferry Services,
W.O. 73-11071 W.P. 25-73-01.

A meeting was held on April 5th, 1974 between Mar-Land Engineering and the Ministry's Structural Office, Soil Mechanics Section and Equipment Office, for the abovementioned Project.

At this meeting, it was agreed that the main transfer bridge abutments should be supported on piles driven to bedrock. This would ensure the overall rigidity of the structure. In order to clarify the bedrock profile in the area where piles are to be driven at the Dawson's Point Terminal, the Soil Mechanics Section carried out three additional boreholes (B.H.'s #31-#33). These borings were carried out between April 16th and 18th, 1974, using a C.M.E. 55 drilling machine equipped with hollow stem auger (approximately 7" in diameter). The borelogs were appended to this memo and they are self-explanatory.

In addition, three drawings, 73-11071 A (Dawson's Point), 73-11071 B (Marysville) and 73-11371 C, were also enclosed. These drawings will supercede and cancel Drawings 73-11071 A & B and 72-11164 A issued previously. The Mylars of these three drawings were forwarded to Mr. G. McFarlane of Mar-Land Engineering Ltd., so that they will be included in the Contract Documents.

C.S. Poon,
Project Engineer,
For: M. Devata,
Supervising Engineer.

CSP/mj

C.C.	E.J. Orr	G.A. Wrong
	B.R. Davis	B.A. Singh
	A.J. Percy	L.G. Timson
	V.A. Snell	Mar-Land (Mr. G. McFarlane)
	B.J. Giroux	Files
	E.R. Saint	Documents

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 101

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 26-73-07

BORING DATE Jan. 8 - 9, 1974

COMPILED BY C.S.P.

DATUM T.T.D.

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY CS

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. ^{ft.} m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W $W_P \quad W \quad W_L$ WATER CONTENT %				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE									
240.0	Water Level														GR. SA. SI. CL.	
230.0	Water					240 73										
227.5	Silt, sand some gravel very loose to compact		1A	SS	wt.	230 of 70 rods										
222.5	Bedrock - Limestone		1	SS	12											
222.5	very Sound		2	RX	95% RC Rec											
222.5	End of Borehole					220 67										

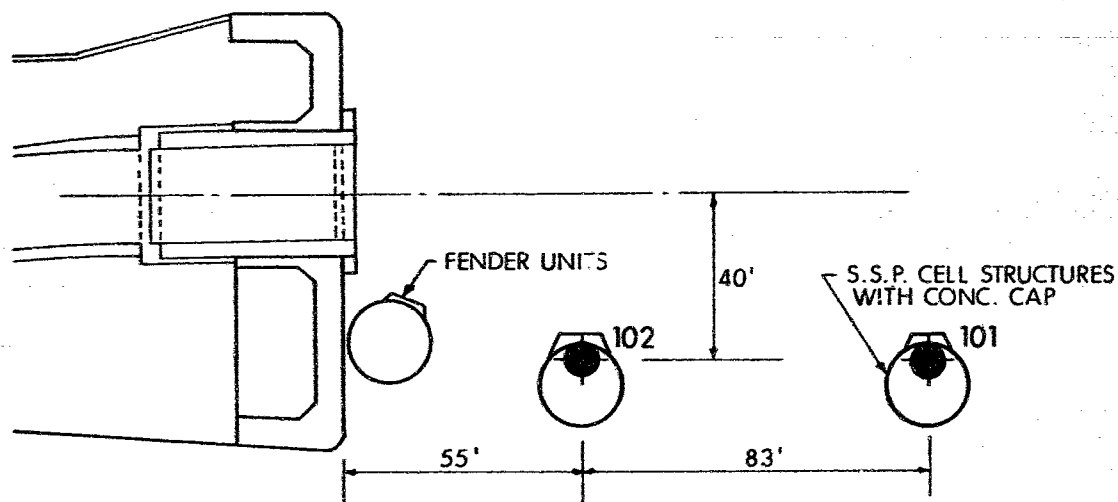
DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 102

JOB 73-1102LOCATION As Shown on DrawingORIGINATED BY C.B.F.W.P. 05-73-01BORING DATE Jan. 9 - 10, 1974COMPILED BY C.B.F.DATUM T.M.B.D.BOREHOLE TYPE Washboring and BX Rock CoreCHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE ft m	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L WATER CONTENT %				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
70.2	230.8	Water				240 73										
69.3	229.9	Sand and gravel, compact	1	SS	13	230 70										
68.7	229.3	Bedrock - Limestone	2	BX RC	97% Rec.											
68.1	228.7	Trav Sound														
67.5	228.1	End of Borehole				220 67										



ST. LAWRENCE RIVER (BARRETT BAY)

FLOW
↓

BORE HOLE LOCATION PLAN

SCALE 1"=40'

WOLFE ISLAND FERRY
(MARYSVILLE TERMINAL)

22 March 1973

EX C.S.L. DOCK - KINGSTON

DETAILS OF CONSTRUCTION

- From the end face of the dock to approximately 2-1/2 ft. behind the sheet piles forming the face there is a layer of rock fill.
- From 2'-6" behind the face of the dock for approximately 25 ft. rock filled crib (plan dimensions 25' x 20').
- For the next 25 ft. 10"-12" dia. timber piles in groups of 9 with poor quality concrete or mortar pile caps 5 ft. square. The groups of piles are at 10'-12' centres.
- From approximately 35 ft. from the northwest end of the building ~~there~~ there would appear to be more groups of piles similarly spaced.
- Tops of the pile heads carry beams of concrete or steel, or perhaps timber in places. A few feet below the tops of the piles transverse timbers or walings carry deck timbers spanning between the pile groups, and these decking timbers carry fill. Thus, below the surface of the dock it can be assumed that there are a few feet of fill supported by timber of unknown condition, with voids and water beneath. It is understood that there is a longitudinal drainage system contained within the fill extending from the dock building to a storm sewer in Ontario Street. There are also electrical and possibly other services following the same route.

- The dock building is supported on a solid concrete plinth or a concrete edge beam. The plinth possibly forms a capping to groups of piles supporting the structure so that if the entire building were removed to top of dock elevation, this may expose the piles and the entire area may have to be resurfaced in some way, e.g., with a reinforced concrete slab. It is thought that the dozen or so groups of piles near the southeast end of the dock building were used originally to support an elevator structure.

In summary, it would appear that the dock consists of several different forms of construction, built at different times.

The report by McNamara suggests that the dock surface is capable of carrying vehicles up to light trucks in loading. Presumably the portion of the dock required for off-loading and storage will have to be further investigated to assess its capability for carrying the heavy truck traffic which will make up part of the ferry loading.

T. C. Kingsland

TCK/hl

73-11071

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. M. Devata,
Supervising Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION:

DATE: 10 January 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 25-73-01, Ghent Dock Terminal (Kingston)
for Wolfe Island Ferry Service

I refer to Mr. A. M. Batten's memo to you dated January 10, 1974.

Referring to the last paragraph, I wish to make a correction. The borehole at this site requested by me for foundations purposes will in fact be supervised by Foundations Office, as originally arranged, after Mr. Batten has used your equipment for his pavement design borings.

Early in 1973 this office obtained some information on sub-surface conditions at this dock, and this has been made available to Mr. Batten.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl

c.c. C. Poon
A. J. Percy
L. G. Timson
A. M. Batten (+att.)

M.D.
Jan 10/74

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. M. Devata
Supervising Foundations Engineer
Downsview, Ontario

FROM: Regional Materials & Testing Office
Kingston Region

ATTENTION:

DATE: January 10, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 25-73-01, Ghent Dock Terminal (Kingston)
for Wolfe Island Ferry Service

In order to assess the existing fill conditions at the above mentioned site, it is necessary for us to place some bore holes in addition to the holes placed around the area under W.O. # 73-11071 and W.O. # 72-11164.

We would therefore appreciate it if you would have the rented drill equipment assigned to us for a couple of days when the work that you are presently carrying out is completed.

This work was discussed with C.S. Poon, January 9, 1974. Our technician will complete an additional hole that is required by Mr. Poon and forward a copy of all of the bore hole data to your office.

A.M. Batten

A.M. Batten
Senior Soils Supervisor

AMB:sl

c.c. A.J. Percy
T. Kingsland
L. Timson

7311071

Mr. M. Devata,
Supervising Foundations Engineer,
Downsview, Ontario.

Structural Planning Office,
Kingston, Ontario.

10 January 1974.

W. P. 25-73-01, Ghent Dock Terminal (Kingston)
for Wolfe Island Ferry Service

I refer to Mr. A. M. Batten's memo to you dated January 10,
1974.

Referring to the last paragraph, I wish to make a correction.
The borehole at this site requested by me for foundations purposes
will in fact be supervised by Foundations Office, as originally
arranged, after Mr. Batten has used your equipment for his pavement
design borings.

Early in 1973 this office obtained some information on sub-
surface conditions at this dock, and this has been made available to
Mr. Batten.

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl

c. e.

✓
C. Poon
A. J. Percy
L. G. Timson
A. M. Batten (+att.)



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 17 December 1973.


OUR FILE REF.

IN REPLY TO

SUBJECT: Wolfe Island Ferry Service
W.P.'s 25-73-01/02/05, District 8

Further to my telephone conversation with Mr. M. Devata on Friday, December 14, I confirm that additional boreholes are required at Dawson Point and Marysville on Wolfe Island and also at the Ghent pier terminals in Kingston.

The locations of the boreholes required are shown on the enclosed three sketches.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. A. J. Percy
L. G. Timson
V. Snell
R. Forrest

73-11071
file
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 17 December 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: Wolfe Island Ferry Service
W.P.'s 25-73-01/02/05, District 8

Further to my telephone conversation with Mr. M. Devata on Friday, December 14, I confirm that additional boreholes are required at Dawson Point and Marysville on Wolfe Island and also at the Ghent pier terminals in Kingston.

The locations of the boreholes required are shown on the enclosed three sketches.

T.C. Kingsland

T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. A. J. Percy
L. G. Timson
V. Snell
R. Forrest

D.N.D. STAFF OFFICERS
COLLEGE

PROPOSED BOREHOLE
LOCATION.

LIFT BEAM.

NEW. S.S.P. WALL.

APPROACH ROAD.

50 CAR FERRY

NEW TRANSFER BRIDGE
(REFER TO ENCL. 10°5)

FENDER UNITS.

FENDER UNITS
EXTEND ON
EXIST. DOCK

TRAFFIC PATTERN
AND ILLUMINATION
TO BE SUPPLIED
BY M.T.C.

GHENT PI

560'


SHELL SERVICE STATION

HWL. 248.6

I.G.L.D 242.8

L.W.L. 241.0±

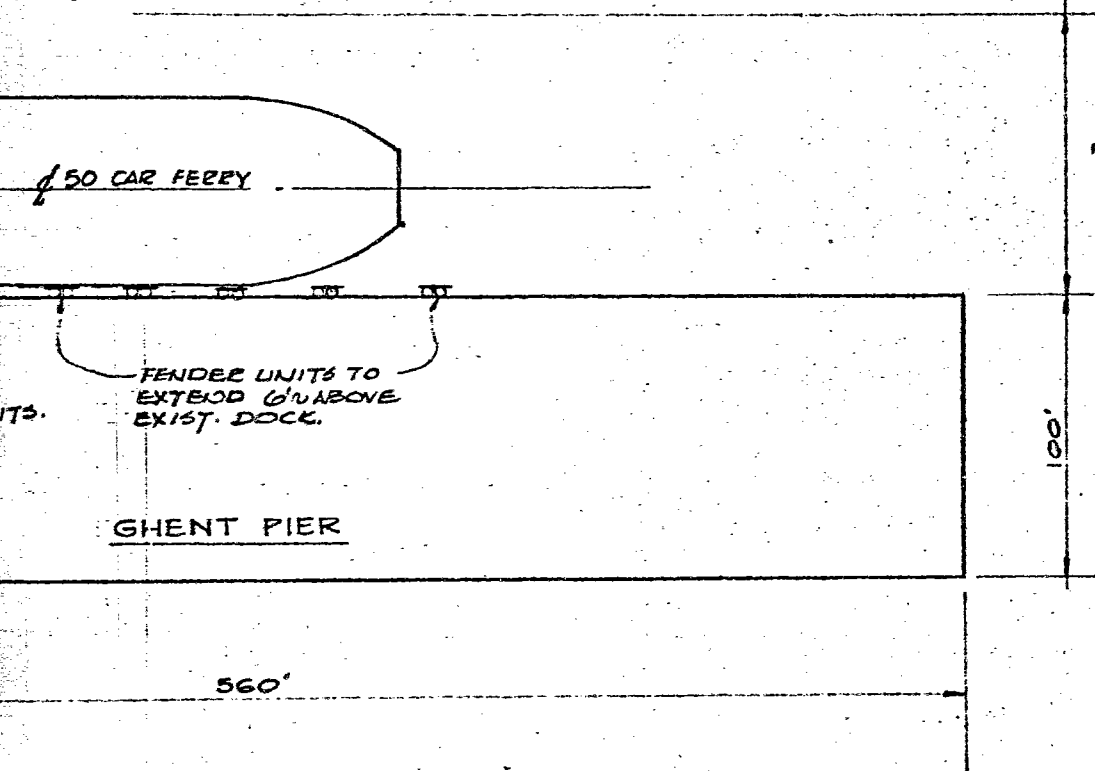
NOTE: ALL ELEV. SHOWN ON THIS PLAN
REFER TO I.G.L.D. 242.8

SCALE 1"=60'

KINGSTON HARBOUR



S.S.P. WALL.



REQUIRED WATER LOT
100' MIN.

100'

560'

CUSTOMS PIER

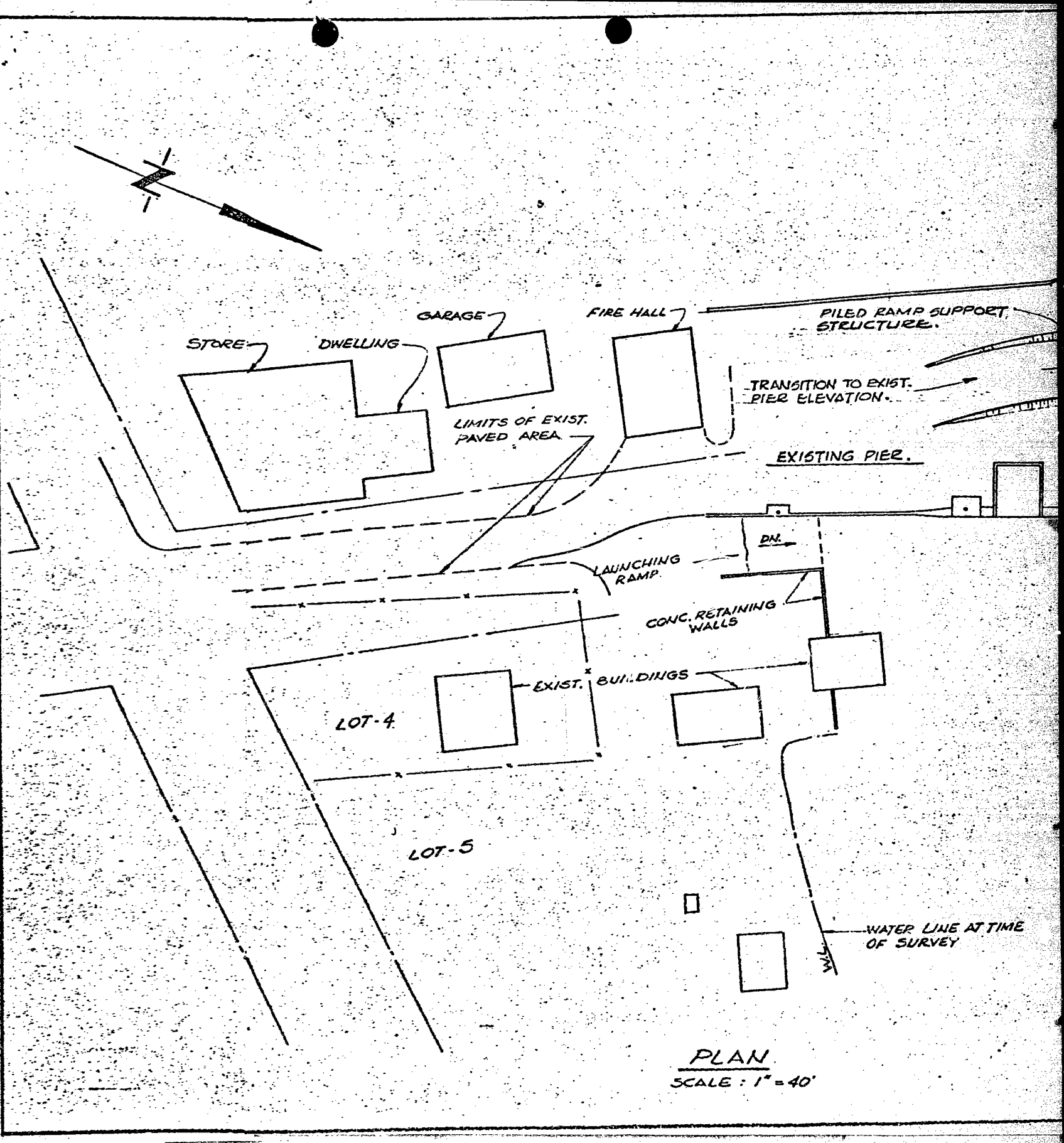
WOLFE ISLAND FERRY
(GHENT PIER TERMINAL)

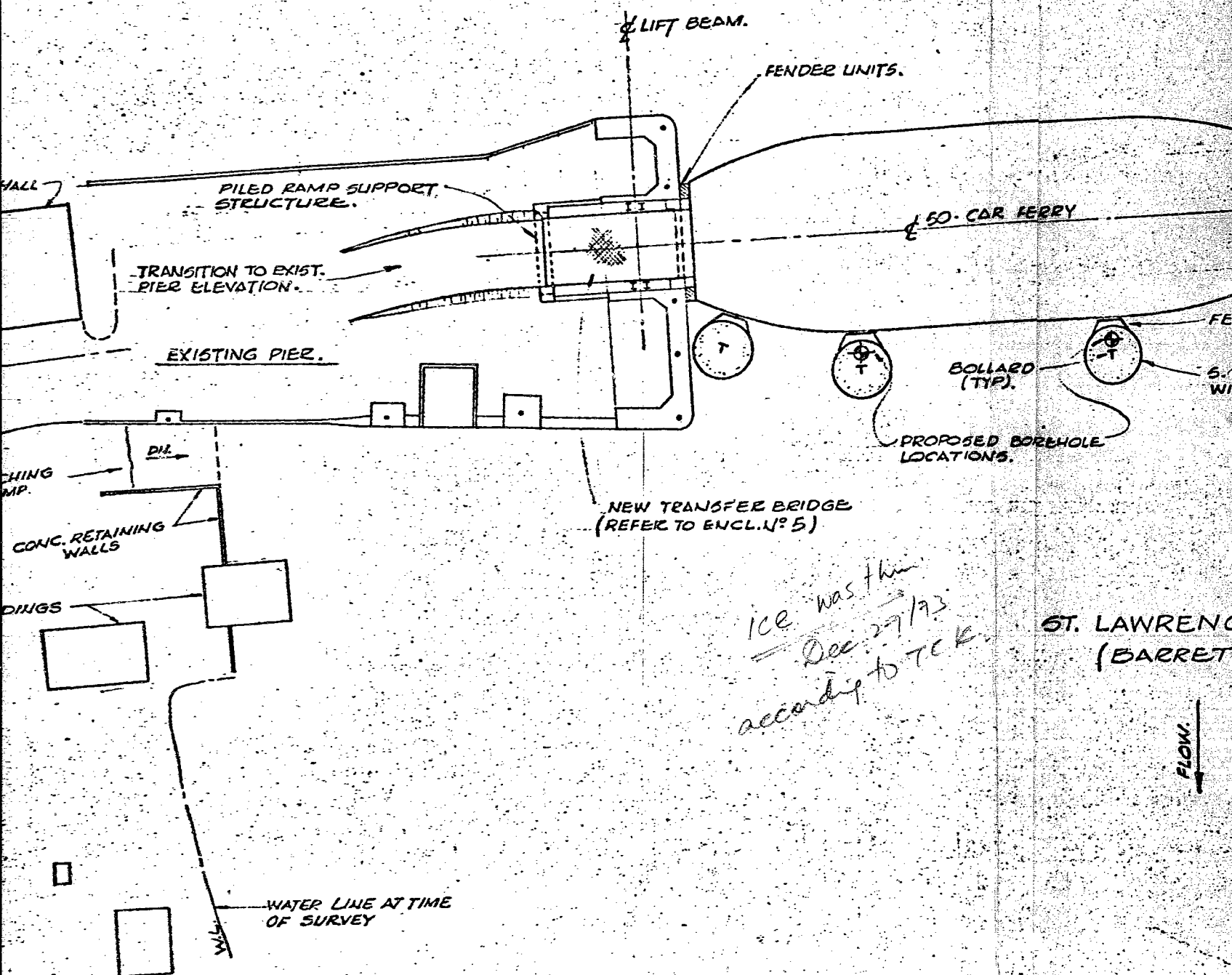
MAR-LAND ENGINEERING LIMITED

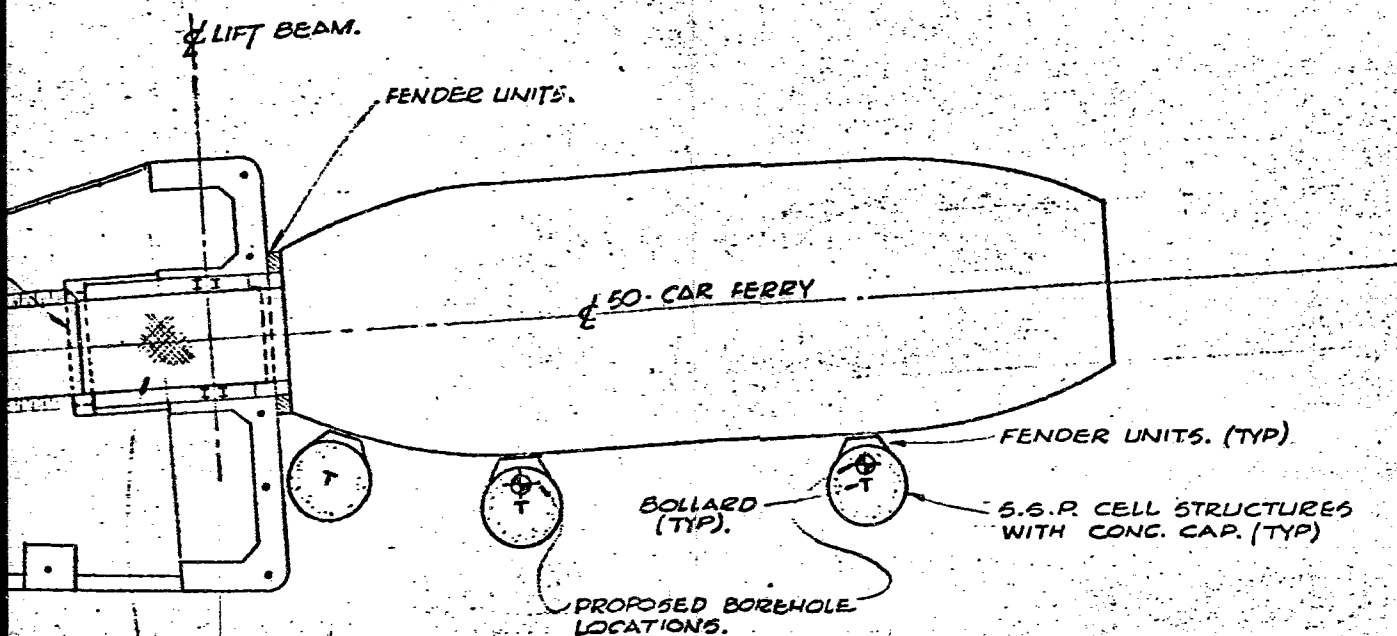
590-101

ENCL. 1

SCALE 1" = 60'







NEW TRANSFER BRIDGE
(REFER TO ENCL. N° 5)

Ice was thin
- Dec 27/73
according to TCR

ST. LAWRENCE RIVER
(BARRETT BAY)

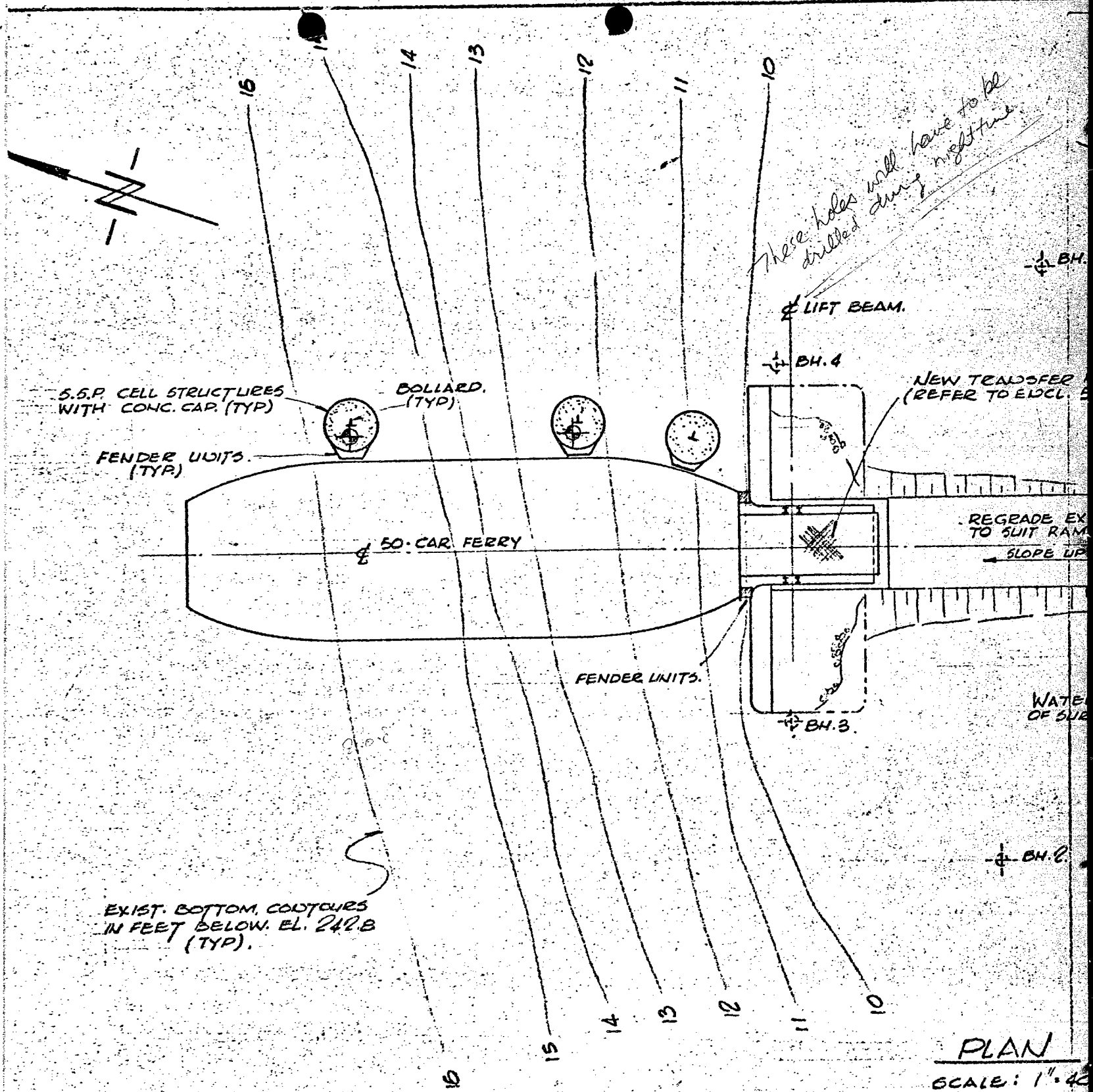
FLOW
↓

WOLFE ISLAND FERRY
MARYSVILLE TERMINAL

MAR-LAND ENGINEERING LTD.

590-101

ENCL. 2



PLAN
SCALE: 1" = 40'

all have to be
very tight

- ⊕ INDICATES EXISTING BOREHOLES.
- ⊕ INDICATES ADDITIONAL BOREHOLES REQUIRED FOR DESIGN PURPOSES.

AM.

⊕ BH. 6

NEW TRANSFER RAMP.
(REFER TO ENCL. 5)

EXIST. COMPRESSOR HOUSE.

⊕ BH. 7

⊕ BH. 8

REGRADE EXIST. CAUSEWAY
TO SUIT RAMP

EXIST. EL. 248.9

→ SLOPE UP.

⊕ BH. 1

LIMITS OF EXIST.
PAVED AREA.

⊕ BH. 5

WATER LEVEL AT TIME
OF SURVEY EL. 247.2 IGLD.

⊕ BH. 2

Note:

ELEV. SHOWN ON THIS DWG. REFER
TO I.G.L.D. 242.8.

H.W.L. 248.6 ±

5.8 ±

I.G.L.D. 242.8

L.W.L. 241.0 ±

1.8 ±

PLAN

SCALE: 1" = 40'

WOLFE ISLAND FERRY.

(DAWSON'S POINT TERMINAL)

SCHEME 'A'

MAR-LAND ENGINEERING LTD.

590-101 ENCL. 3.

73-11071

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac
Principal Foundations Engineer
Downsview

FROM: Structural Planning Office
Kingston, Ontario

ATTENTION: Mr. M. Devata

DATE: October 4, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT:

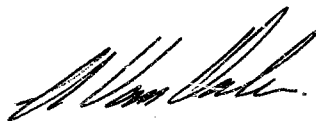
W. P. 62-73-02 - Howe Island Ferry Service
W. P. 25-73-01 - Wolfe Island Ferry Service
District 8 Kingston

Further to my conversation with Mr. C.S. Poon on October 3, 1973 I hereby confirm that Mar-Land Engineering Limited has requested one additional borehole at the Dawson Point site as shown on the attached drawing.

It was suggested by the Equipment section that a foundation investigation be carried out at the site of the proposed pump-house on Ghent's dock. The location of the pump-house has been shown in red on the attached drawing.

Copies of these drawings have been handed to Mr. J. Bangs on October 3, 1973.

I also enclose two copies each of sketches handed to me by Mr. G. McFarlane of Mar-Land Engineering. Additional Boreholes at the Howe Island sites, requested by him directly from your office are shown thereon. It is understood that his instructions were, that if the first borehole at either side of the crossing indicated a limited amount of over-burden the second hole could be deleted.



A. Van Dalen
For: T. C. Kingsland
Regional Structural
Planning Engineer

AVD:s1

Encl.

c.c. B.R. Davis
P.D. Billings
C.S. Grebski-Atten: K. Bassi
R. Forrest

13-1107
file

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 17 September 1973.

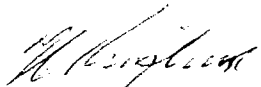
OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 25-73-01, Wolfe Island Ferry Service

Further to my memo to you dated August 27, 1973, I now enclose copy of letter from Mar-Land Engineering Limited dated September 13 together with two sketch plans showing the locations of additional boreholes required at the Ghent (C.S.L.) dock, Kingston, and at the Marysville dock.

The request for additional boreholes has been passed by this office to Mr. C. S. Poon in the field.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. P. D. Billings
A. J. Percy
L. G. Timson
V. Snell
E. R. Saint
R. Forrest



MAR-LAND ENGINEERING LIMITED

Consulting Engineers

14 Dorchester Avenue, Toronto, Ontario, M8Z 4W3 . (416) 259-7874

September 13, 1973

Ministry of Transportation
and Communications,
Postal Bag 4000,
Kingston, Ontario,
K7L 5A3.

Attention: Mr. T. Kingsland, P. Eng.,
Regional Structural Planning Engineer.

Dear Sirs:

RE: Wolfe Island Ferry Service

Further to our telephone conversation of this date, we are enclosing the following sketches which show additional suggested borehole locations:

Enclosure 2 - Ghent Pier

- one additional borehole in area of small craft launching ramp.

Enclosure II - Marysville

- one additional borehole in area of existing launching ramp.

With this added soils information, we feel that all sites will be adequately covered for the purposes of design.

Yours very truly,

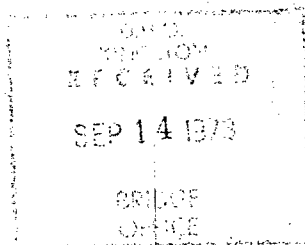
MAR-LAND ENGINEERING LIMITED

G. McFarlane, P. Eng.,
Vice-President.

cc: Mr. P. D. Billings
Mr. E. J. Orr
Mr. J. B. Wilkes

590-3

GM/ec
Encl.





D.N.D. STAFF OFFICERS
COLLEGE.

NOTE:

ADDITIONAL INFORMATION AVAILABLE
ON SEWERS, ROADS, ETC.

Proposed borehole
location.

EXIST. ASPHALT
RAMP.

H.P. & TRANS.

HYD.

EXIST.
TREE.

TO ONTARIO STREET.

Ghent Pier

OVERHEAD
POWER
LINES.

H.P.

GUARD RAIL

SHELL
SERVICE
STA.

SEE ENCLOSURE 4 FOR
TYPICAL WALL SECTION.

BOLLARD (TYP.)

(13.0)

SOUNDINGS
FIELD SHEET

12.9
(17.0)

15.4
(17.0)

(16.9)

SOUNDINGS

(17.0)

17.9
(17.0)

LIMIT OF DIVING

18.1
(17.0)

18.4
(17.0)

17.2
(17.0)

EXIST.
RAIL

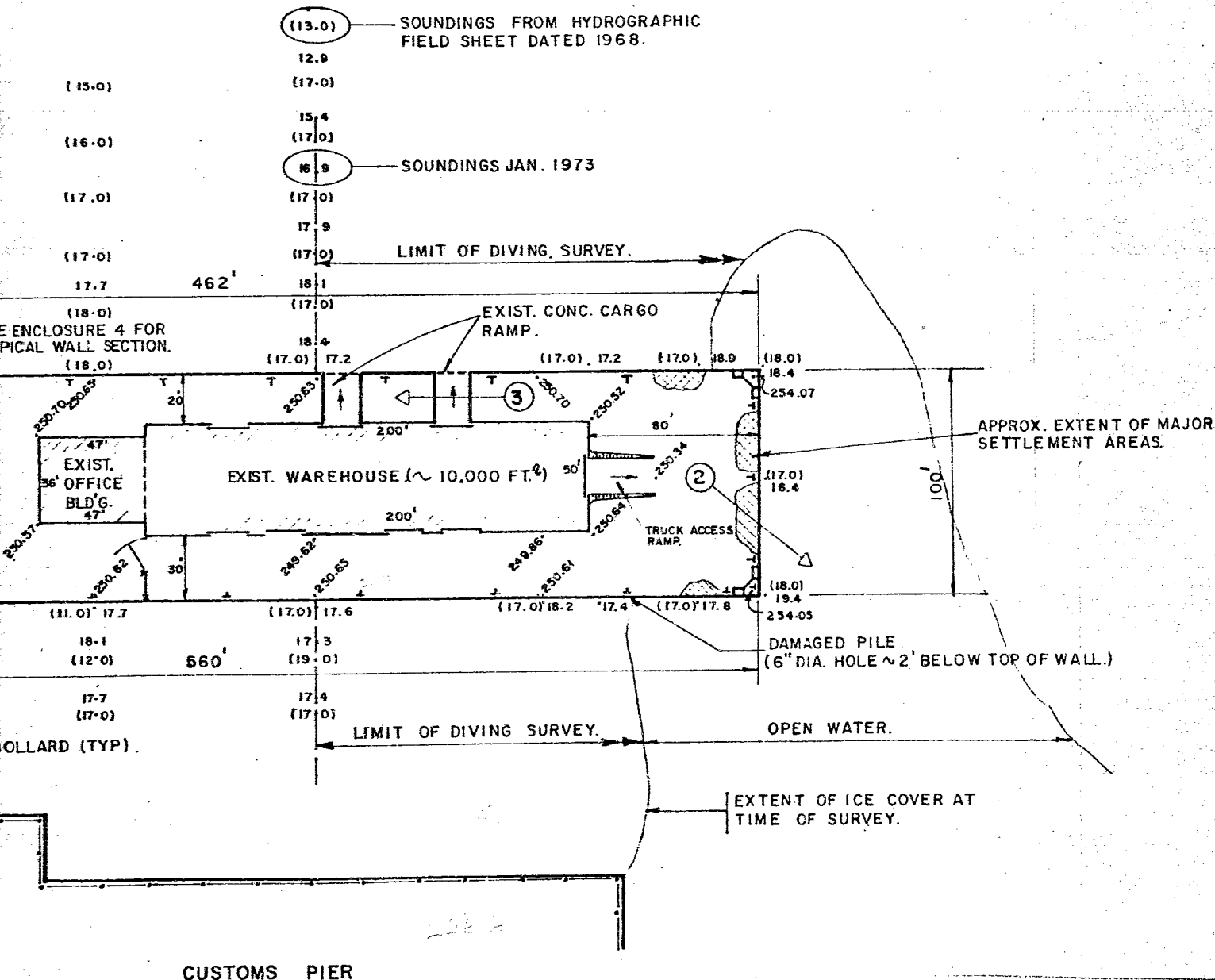
EXIST. WAREHOUSE (~ 10,000)

SCALE: 1" = 60'

SURVEY CARRIED OUT BY McNAMARA ENGINEERING LTD.
ON JAN. 23 to 26, 1973

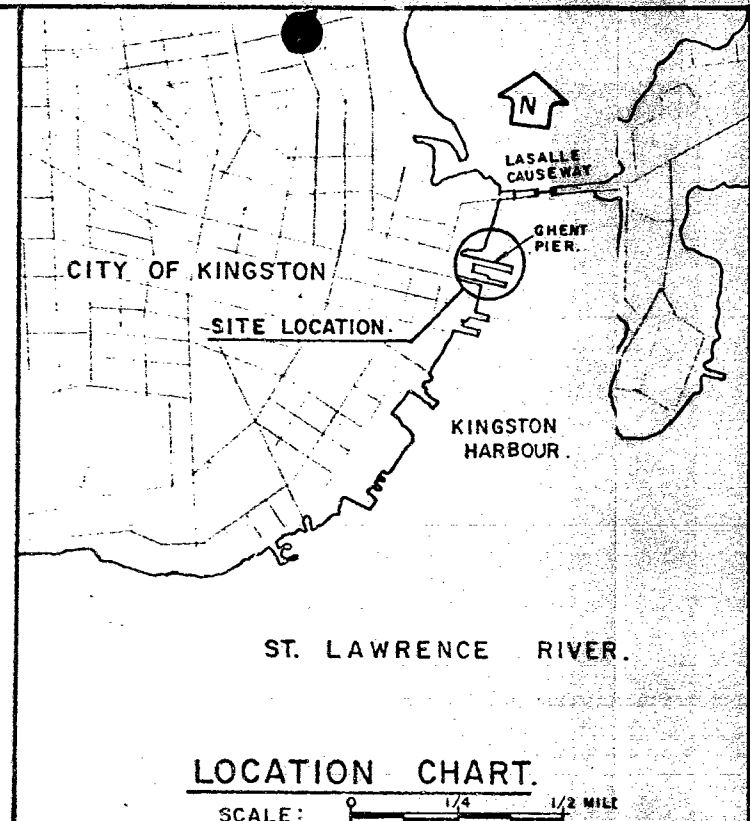
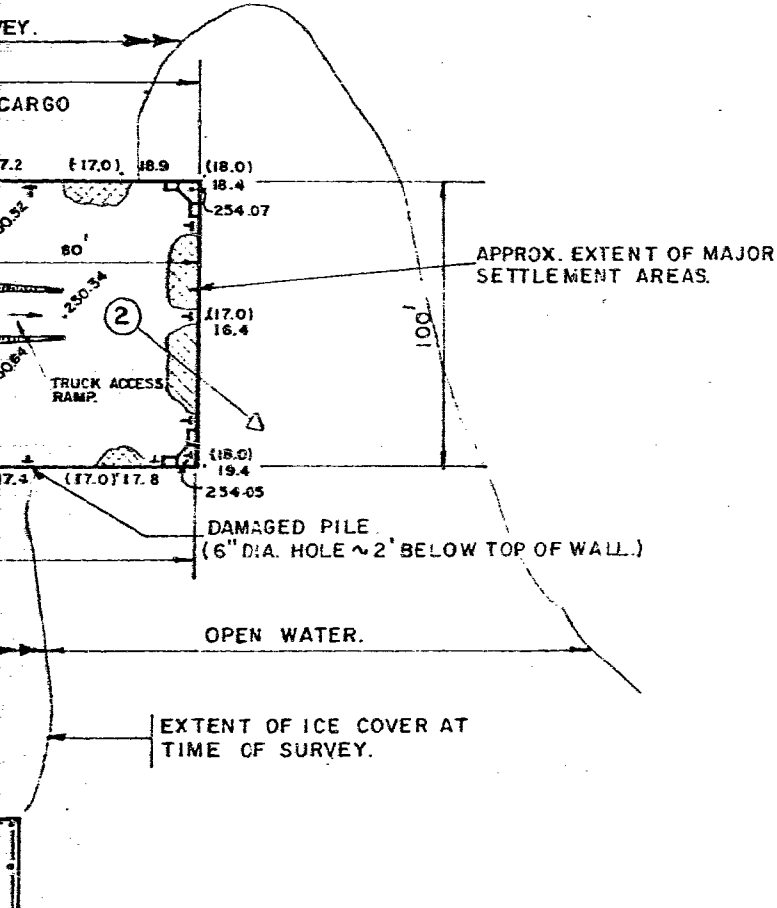
CUSTOMS PIER

246.6



NO ENTRY ONLY

ROGRAPHIC
968.



WATER LEVEL AT TIME OF SURVEY = 245.92 (I.G.L.D.) = 246.44 (GEOD.)

3.12'

242.80 (I.G.L.D.) = 243.32 (GEOD.)

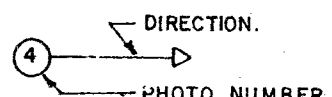
NOTE:

ALL SOUNDINGS SHOWN ARE IN FEET BELOW I.G.L.D. 242.80

NOTES:

1. REFER TO ENCLOSURES 2 AND 3 FOR PHOTOS.
2. REFER TO ENCLOSURE 4 FOR TYPICAL WALL SECTION.
3. ALL ELEV. SHOWN REFER TO GEOD. DATUM.

LEGEND.



SEP 13 1973

REFERENCE ONLY

GHENT PIER-EXISTING CONDITIONS
McNAMARA ENGINEERING LIMITED

590-100

ENCLOSURE 2.

73-11071 file
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

D.T.C.
DIVISION
RECEIVED
OCT 4 1973

TO: Mr. A.J. Percy
Mr. L.G. Timson
Mr. E.R. Saint
Mr. A.G. Boucher

FROM: Right-of-Way Branch
Kingston, Ontario DIVISION

ATTENTION:

DATE: October 3rd, 1973

OUR FILE REF.

IN REPLY TO

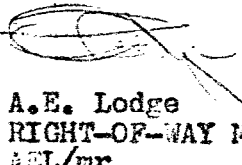
SUBJECT:

Property of Wilghent Limited,
W.P. 25-73-01, City of Kingston,
Proposed Wolfe Island Ferry Dock

I am attaching a copy of a letter received from Mr. Radley, solicitor for Dr. Ghent, wherein you will note permission has been granted for this Ministry to enter upon the abovenoted property for the purpose of conducting surveys, soils tests, etc.

Although this property has been expropriated, possession will not be legally available until about the first of the new year.

In light of this and since negotiations on this property are extremely sensitive at this time, I would ask that your staff take every precaution during the performance of their work and to document any incidents or damages during their undertakings.


A.E. Lodge
RIGHT-OF-WAY MANAGER
AEL/mr
Att.(1)

PETER J. RADLEY

279 KING STREET EAST
K7L-4V6

BOX 143

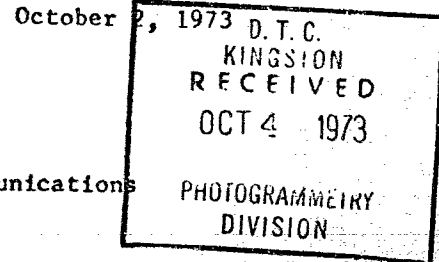
KINGSTON - ONTARIO

613 - 544-5612

BARRISTER & SOLICITOR

73/153

FILE NO.



Mr. G. H. Lodge
Right-of-Ways Division
Ministry of Transportation & Communications
1055 Princess Street
Kingston, Ontario

Re: Wilghent Dock - Ministry of
Transportation and Communications
- Early occupancy

Dear Mr. Lodge:

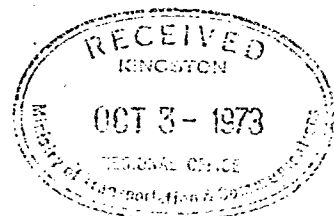
In reply to your request of yesterday's date to enter upon the property of Wilghent Limited for the purpose of taking further survey readings and drilling for soil tests, I would advise that I spoke today with Dr. Ghent, President of the Company. Dr. Ghent advised me to instruct you that he was satisfied to permit early occupancy for the purposes enumerated in this letter, and this letter shall be your good and sufficient authority to so enter upon the property.

Dr. Ghent also asked me to convey to you his request for a partial payment for the land at your earliest possible convenience.

Yours very truly,

PJR/kh

PETER J. RADLEY



MEMORANDUM

TO: FILE

FROM: Photogrammetry Section,
Kingston, Ontario.

ATTENTION:

DATE: 6 September 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT:

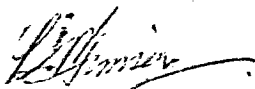
Wolfe and Howe Island Ferry Services

Mr. G. McFarlane, of Mar-Land Engineering, informed us by telephone today that he has been assured by Mr. J. B. Wilkes and by C.E.L.L. that the Howe Island Ferry is to be in service by spring 1974 and the Wolfe Island Ferry target date is still June 1, 1974.

This would indicate that construction of the Howe Island docks must be scheduled for this winter and construction of the Wolfe Island docks to commence early next spring.

Preliminary plans of the Howe Island docks and the Dawson Point dock in sufficient detail for us to determine property and water lot requirements will be mailed to us on September 7th.

Schedule dates for all of the Dock Sites should be available early next week.



L. G. Timson
Regional Photogrammetric Engineer

LGT/hl

c/c/

J. B. Wilkes

P. D. Billings

A. J. Percy

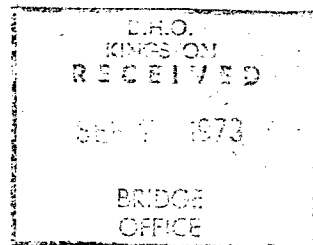
✓ T. C. Kingsland

A. E. Lodge

V. A. Snell

R. J. Forrest

E. J. Drimmel



Copy made for: (TCK: 13/9/73)

✓ Mr. M. Devata

from

OUTLINE OF SUNKEN
BARGE ~ 3' 0" BELOW M/L

EXISTING AIR SYSTEM -
IN 2" PIPES ON BOTTOM

PLASTIC AIR FLOW

TINDER CRIBWORK.

B.H. 7

8th 13

EXISTING A
FENCE.

PAVED PARKING
AREA

④ 8H

EXISTING A
PLACE.

$$\begin{array}{r} 2528 \\ 69 \\ \hline 2459 \end{array}$$

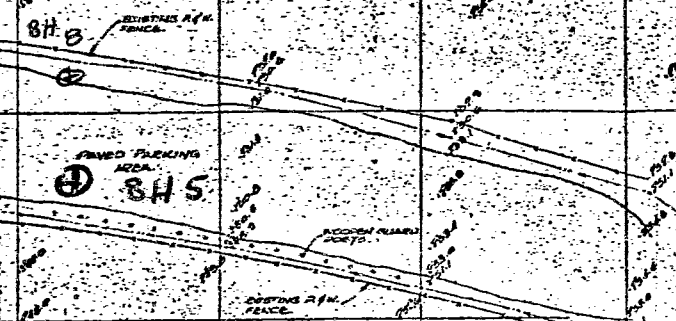
CONTRACT No.
W.P. No.

MINISTRY OF TRANSPORTATION
AND COMMUNICATIONS

DAWSON'S POINT

EXISTING CONDITIONS

MAR-LAND ENGINEERING LIMITED
CONSULTING ENGINEERS



BH5 0+20.5
0+35 W

SELECTION OF BORING CONTRACTOR

W.O. 73-11071

W.P. _____

- 1) Type of Drill Required Diamond Drill + Raft
- 2) Starting Date Sept 6th 1973
- 3) Estimated Total Footage of Drilling Required 240 ft. (100 hrs)
- 4) Qualified Drilling Companies and Estimated Costs Including Mobilization

1	<u>P.V.K</u>	<u>\$ 2508</u>
2	<u>Johnston</u>	<u>\$ 2924</u>
3	<u>Dominion Soil</u>	<u>\$ 2933</u>
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
- 5) Lowest Cost Company Able to Supply Equipment on Required Starting Date P.V.K
- 6) Additional Information Raft required for 5 days All companies will mobilise from Ottawa

Date Sept 4th 1973

Signed M. Linata
Supervising Foundation Engineer

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 27 August 1973.

OUR FILE REF.

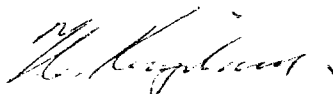
IN REPLY TO

SUBJECT: W.P. 25-73-01 - Wolfe Island Ferry Service 73-11071
W.P. 62-73-02 - Howe Island Ferry Service 73-11083

With reference to the foundation investigation carried out by your office for the proposed Wolfe Island Ferry Terminal (see your Report reference W.O. 72-11164 dated April 12, 1973), I now enclose copy of letter dated August 23, 1973, from Mar-Land Engineering Limited requesting further foundations information at the proposed ferry terminals for the above-mentioned projects.

I shall be glad if you will put in hand the required foundation investigation. We understand from you that this further information can be obtained at fairly short notice.

As stated in Mar-Land's letter, a meeting is being held today in Kingston to discuss the above-mentioned projects. I will let you know if any further information becomes available at that meeting.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encl.

c.c. P. D. Billings
A. J. Percy
E. R. Saint
V. Snell
L. G. Timson
R. J. Forrest



MAR-LAND ENGINEERING LIMITED

Consulting Engineers

14 Dorchester Avenue, Toronto, Ontario, M8Z 4W3 . (416)-259-7874

August 23, 1973

Ministry of Transportation
and Communications,
Postal Bag 4000,
Kingston, Ontario,
K7L 5A3.

Attention: Mr. P. D. Billings, P. Eng.,
Regional Director.

Dear Sirs:

RE: Wolfe Island and Howe Island
Ferry Service Projects.

Further to a request from Mr. L. G. Timson of your staff on August 20, 1973, we are enclosing one copy each of preliminary existing condition site plans for Marysville, Dawson's Point and Howe Island (mainland and island sides).

Please note that we have indicated suggested borehole locations on the drawings for Howe Island and Dawson's Point. We understand that the Foundations Section of the Ministry can provide the necessary site work and report for the sub-surface investigation work. Generally, the following soils information will be required for the design phase of the work:

a) Dawson's Point

Boreholes 1 & 2; overburden characteristics and bedrock depth
- general assessment for foundation for ferry ramp facilities.

Boreholes 3 & 4; basic assessment of bedrock characteristics for
possible drilling in for anchors for existing dock facilities.

b) Howe Island; mainland and island sides

- assessment for bearing capacity of in-site material for ramp structures and marine docking facilities.
- overburden characteristics and bedrock depth.

Cont'd.

MAR-LAND ENGINEERING LIMITED

Ministry of Transportation
and Communications,

Page 2,

August 23, 1973.

We understand that a meeting in Kingston is presently set up for August 27, 1973 at 2:00 p. m. Should further details be required, we would be pleased to discuss it with you at that time.

Yours very truly,

MAR-LAND ENGINEERING LIMITED



G. McFarlane, P. Eng.,
Vice-President.

cc: Mr. J.B. Wilkes, P. Eng.

590-3

GM/ec

Enl.



6+00 E

ST. LAWRENCE RIVER.

1+00 E

0+00

1+00 W

2+00 W

3+00 W

4+00 W

5+00 W

0+00 E

0+00 W

0+00 E

0+00 W

0+00 E

0+00 W

0+00 E

0+00 W

2428.79 LD

EXISTING AIR SYSTEM
2" & 4" PIPES ON BOTTOMPLASTIC AIR PIPING
ON BOTTOM

TWEEZER CRIBWORK

OUTLINE OF SUNKEN
BARGE ~ 5'-0" BELOW WLCOMPRESSED AIR
ON CONC. FOUNDATIONEXISTING R/W
FENCEPAVED PARKING
AREAEXISTING R/W
FENCE

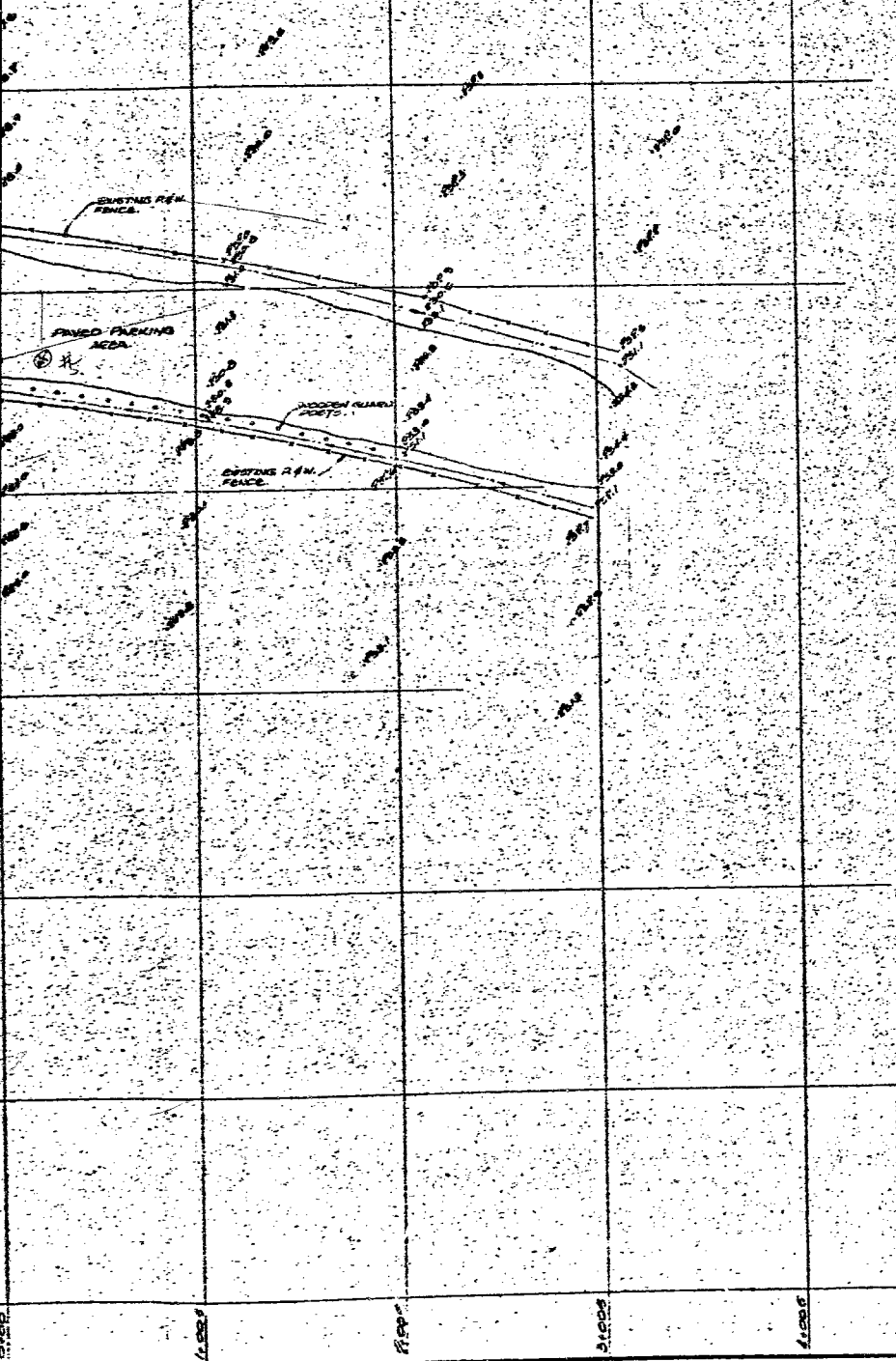
CONTRACT No.
W.P. No.

MINISTRY OF TRANSPORTATION
AND COMMUNICATIONS

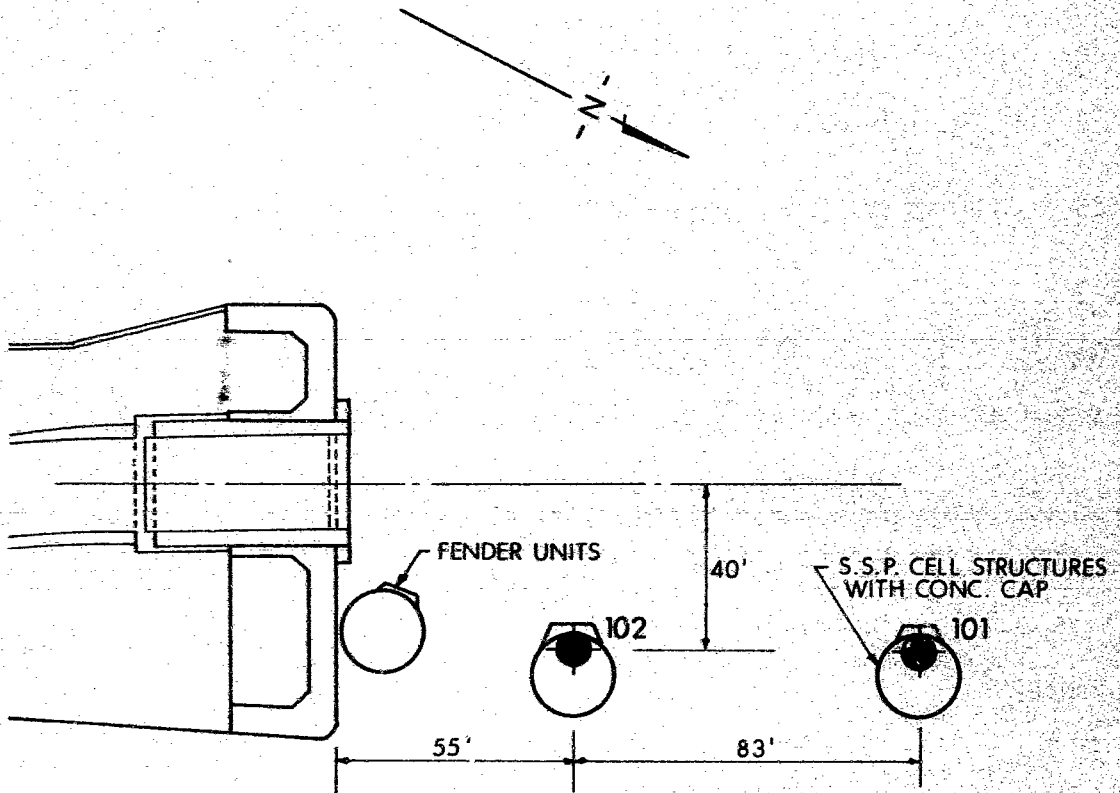
DAWSON'S POINT

EXISTING CONDITIONS

MAR-LAND ENGINEERING LIMITED
CONSULTING ENGINEERS



BH #5
0+20'S
0+35'W



ST. LAWRENCE RIVER (BARRETT BAY)

BORE HOLE LOCATION PLAN

SCALE 1"=40'

WOLFE ISLAND FERRY
(MARYSVILLE TERMINAL)



MAR-LAND ENGINEERING LIMITED

Consulting Engineers

14 Dorchester Avenue, Toronto, Ontario, M8Z 4W3 . (416) 259-7874

TO: Ministry of Transportation and DATE: October 5, 1973
Communications,
1201 Wilson Avenue, PROJECT: 590-100, 599-100
East Building,
Downsview, Ontario.

ATTENTION: Mr. C. Poon

GENTLEMEN:

THE COPIES LISTED BELOW ARE:

☒ ENCLOSED HEREWITH

☐ MAILED UNDER SEPARATE COVER

AND ARE

☒ FOR YOUR INFORMATION

☐ FOR APPROVAL

☐ APPROVED AS NOTED

☐ FOR QUOTATION

☐ FOR CONSTRUCTION

NO. OF COPIES	DRAWING NUMBER	REV. NO.	TITLE OR DESCRIPTION
1	Encl. 4A		Ghent Pier
1	Encl. 6		Typical Sections - Ghent Pier & Marysville
1	Encl. 9A		Dawson's Point
1	Encl. 10A		Marysville
1	Encl. 3		Howe Island (Island Terminal)
1	Encl. 4		Howe Island (Mainland Terminal)
1	Encl. 5		Howe Island - Profile
1	Encl. 6		Howe Island - Details

COMMENTS: As per your telephone conversation.

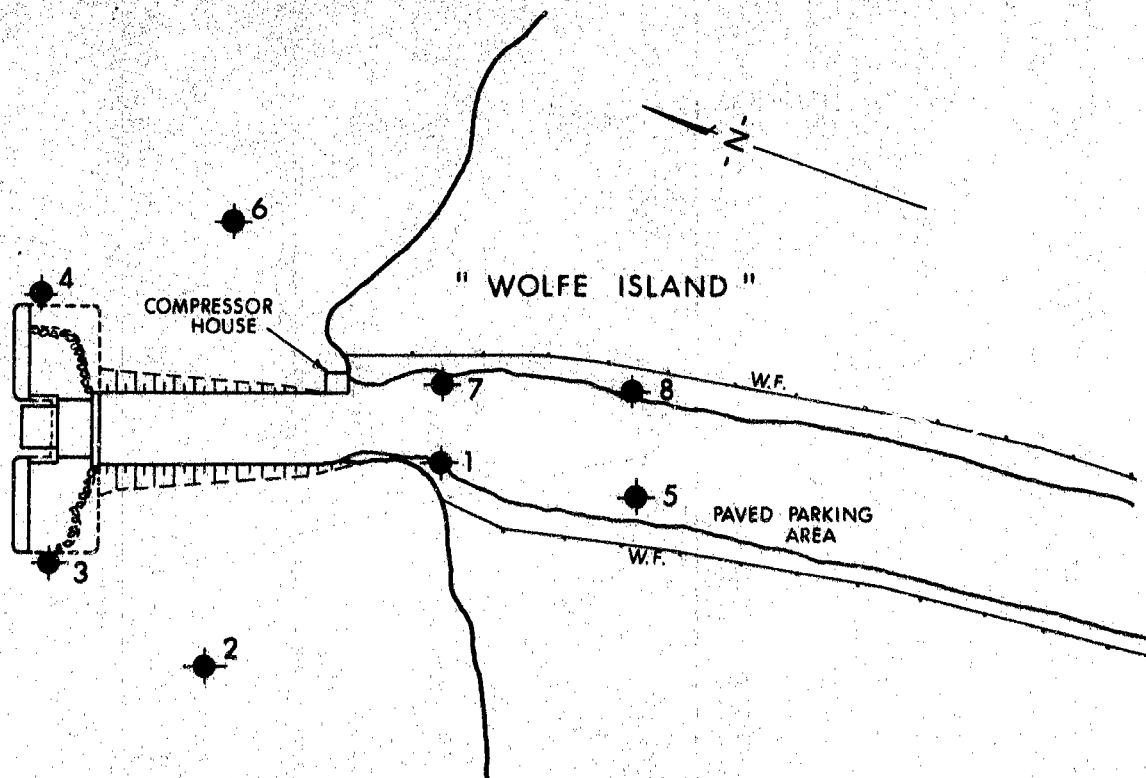
COPIES TO:

MAR-LAND ENGINEERING LIMITED

PER

G. McFarlane
G. McFarlane, P. Eng.,
Vice-President.

ST. LAWRENCE RIVER FLOW →



BORE HOLE LOCATION PLAN
DAWSON'S POINT - WOLFE ISLAND
SCALE 1" = 80'

W.O. 73-11071

W.P. 25-73-01

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 101

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

W.P. 25-73-01

BORING DATE Jan. 8 - 9, 1974

COMPILED BY C.S.P.

DATUM I.G.L.D.

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY LO

SOIL PROFILE				SAMPLES			ELEV. SCALE ft	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0-30)	SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE				WATER CONTENT % W_P — W — W_L							
71.7	215.0	Water Level														GR.SA.SI.CL	
0.0	0.0	Water				240 73											
70.2	230.2					230											
4.5	11.7	Silt, sand some gravel	1A	SS	wt.	of 70											
60.4	227.5	Grey loose to compact	1	SS	12	rods											
5.3	17.5	Bedrock - Limestone		BX	95%												
67.9	222.5	Grey Soud	2	RC	Rec												
6.0	22.5	End of Borehole				220 67											

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 102

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY C.S.P.

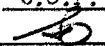
W.P. 25-72-01

BORING DATE Jan. 9 - 10, 1974

COMPILED BY C.S.P.

DATUM I.P.L.D.

BOREHOLE TYPE Washboring and BX Rock Core

CHECKED BY 

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. $\frac{ft}{m}$	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT (0-30)		SHEAR STRENGTH P.S.F.				WATER CONTENT %					
71.7	245.0	Water Level					O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				W_P — W — W_L WATER CONTENT %					
0.0	0.0	Water				240 73										
70.4	230.8					230 70										
11.2	14.2	Sand and gravel, compact	1	SS	13											
11.7	15.5	Bedrock - Limestone														
68.6	225.0	Grey Sound	2	BX RC	97% Rec.											
6.0	20.0	End of Borehole				220 67										

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 103

JOB 73-11071 LOCATION As Shown on Drawing ORIGINATED BY CSP
W.P. 25-73-01 BORING DATE January 17 - 18, 1974 COMPILED BY CSP
DATUM I.G.L.D. BOREHOLE TYPE Wash Boring CHECKED BY SR

SOIL PROFILE				SAMPLES			DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT ——— w_L				BULK DENSITY γ	REMARKS	
ELEV. DEPTH		DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m.)	BLOWS / FOOT				PLASTIC LIMIT ——— w_p						WATER CONTENT — w
m.	ft.						SHEAR STRENGTH P.S.F.				WATER CONTENT %						
							○ UNCONFINED + FIELD VANE				w_p — w — w_L						
							● QUICK TRIAXIAL x LAB VANE										
74.7	245.0	Water Level													P.C.F.	GR.SA.SI.CL.	
	0.0	Water					240										
							73										
							230										
							70										
68.3	224.0																
6.4	21.0	sand-some gravel		1	SS	1/2	ft.										
67.4	221.0	black-very loose					220										
7.3	24.0	Silty clay with trace of sand		2	SS	20	67										
64.9	213.0	Grey-Stiff to very stiff		3	TW	PM											
9.8	32.0	End of Borehole Probably Bedrock					210										
							64										

RECORD OF BOREHOLE N^o 104

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY CSP

W.P. 25-73-01

BORING DATE January 22, 1974

COMPILED BY CSP

DATUM I.G.L.D.

BOREHOLE TYPE Dynamic Core Penetration Test

CHECKED BY SR

[illegible]

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 105

JOB 73-11071

LOCATION As Shown on Drawing

ORIGINATED BY CSP

W.P. 25-73-01

BORING DATE January 22, 1974

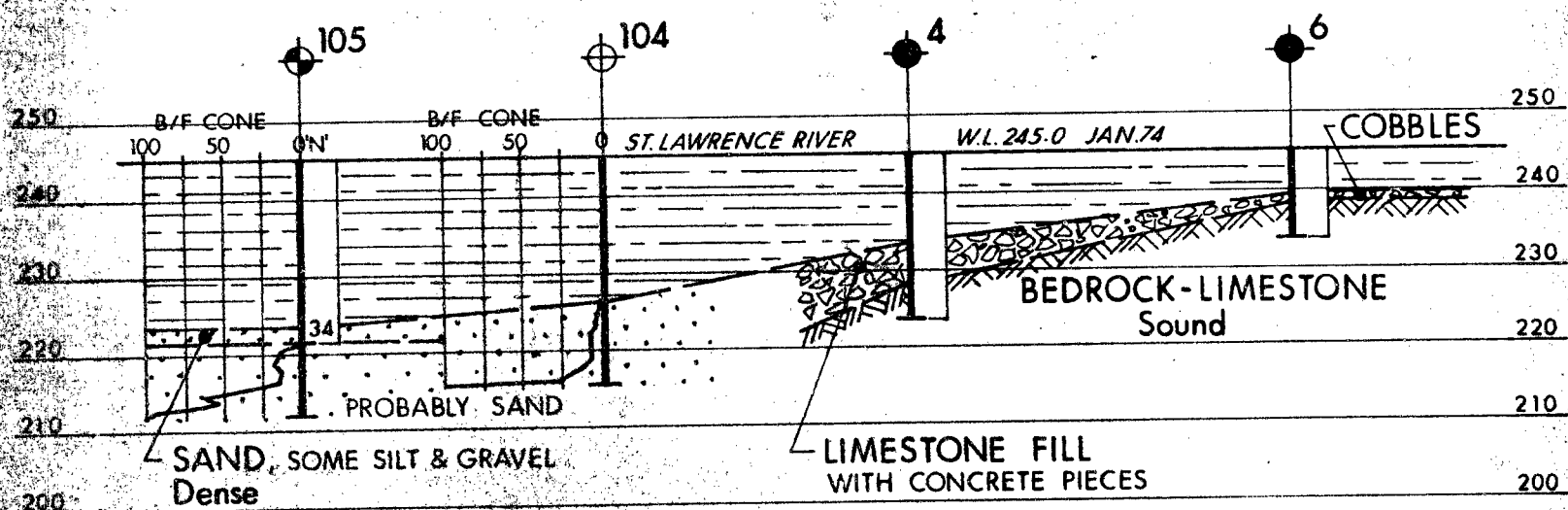
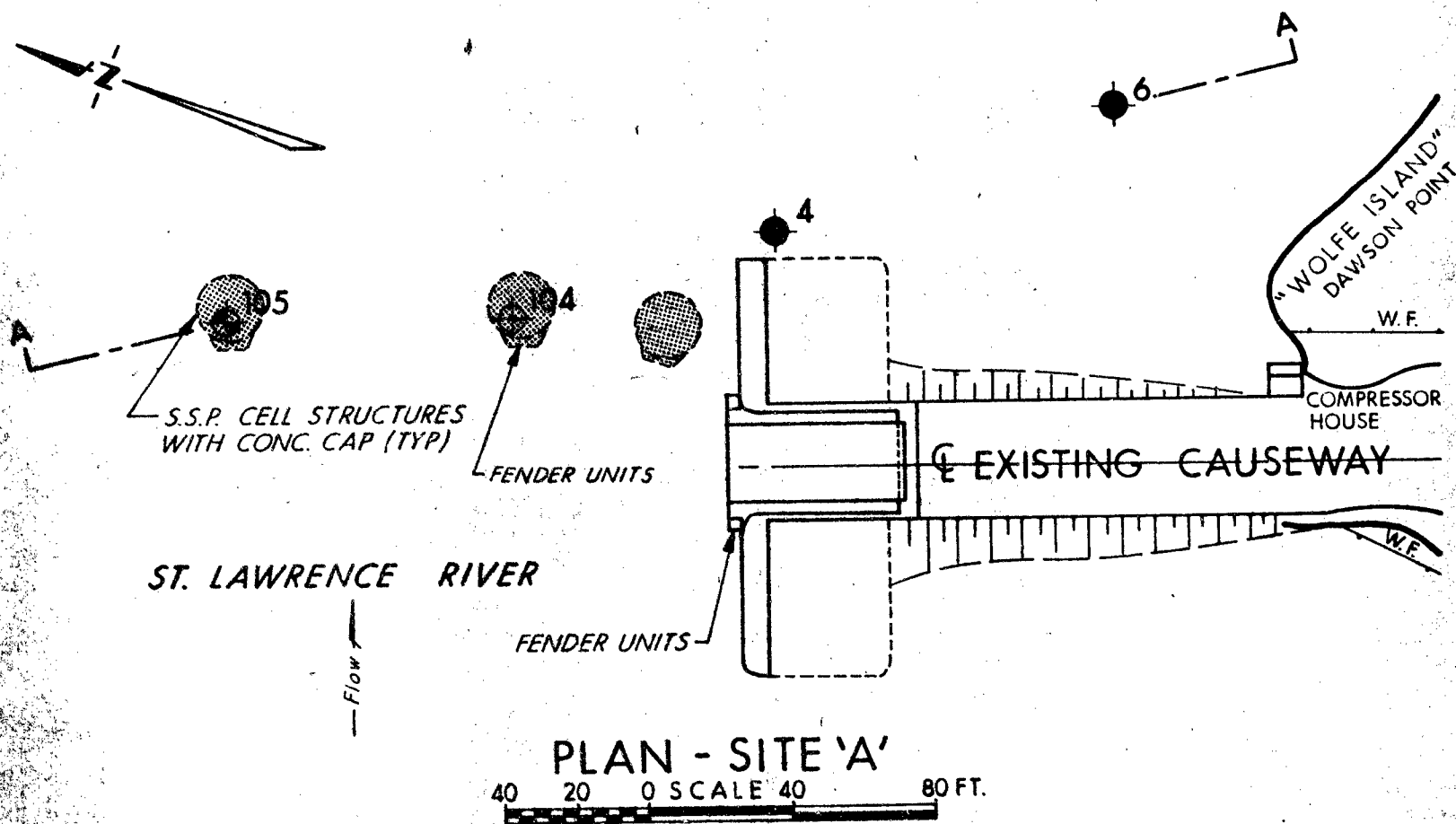
COMPILED BY CSP

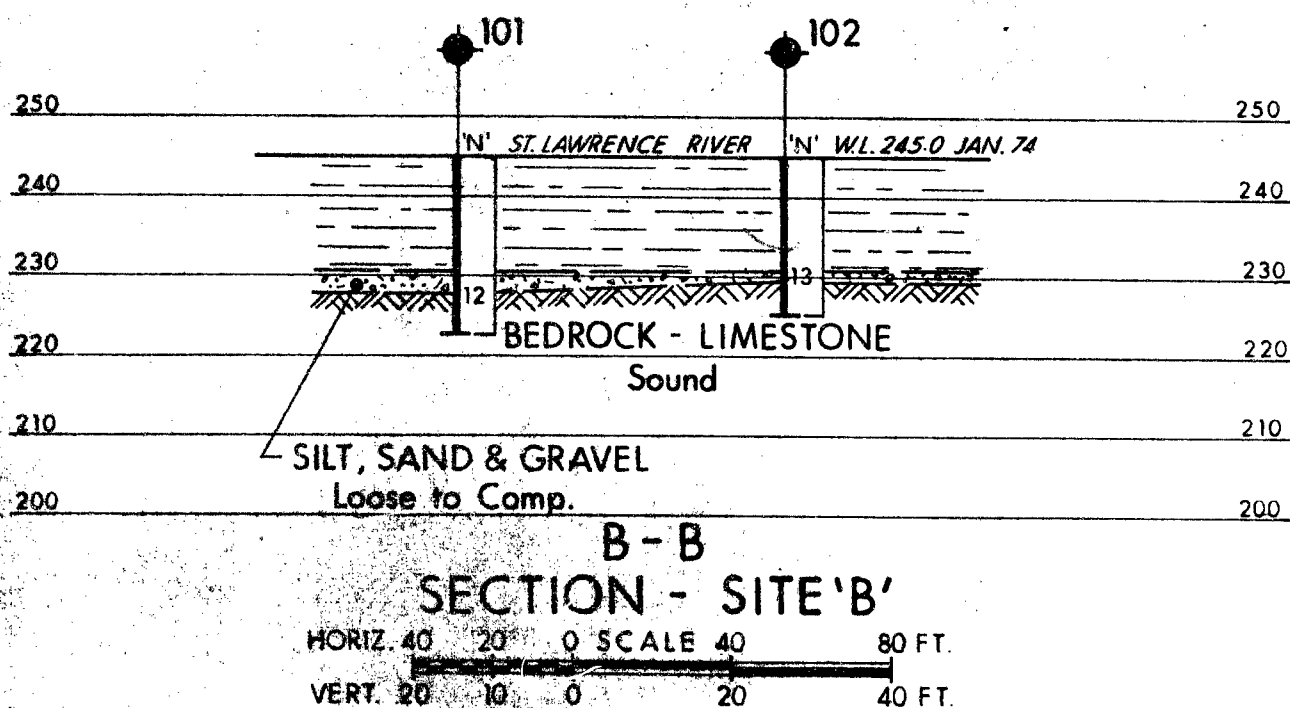
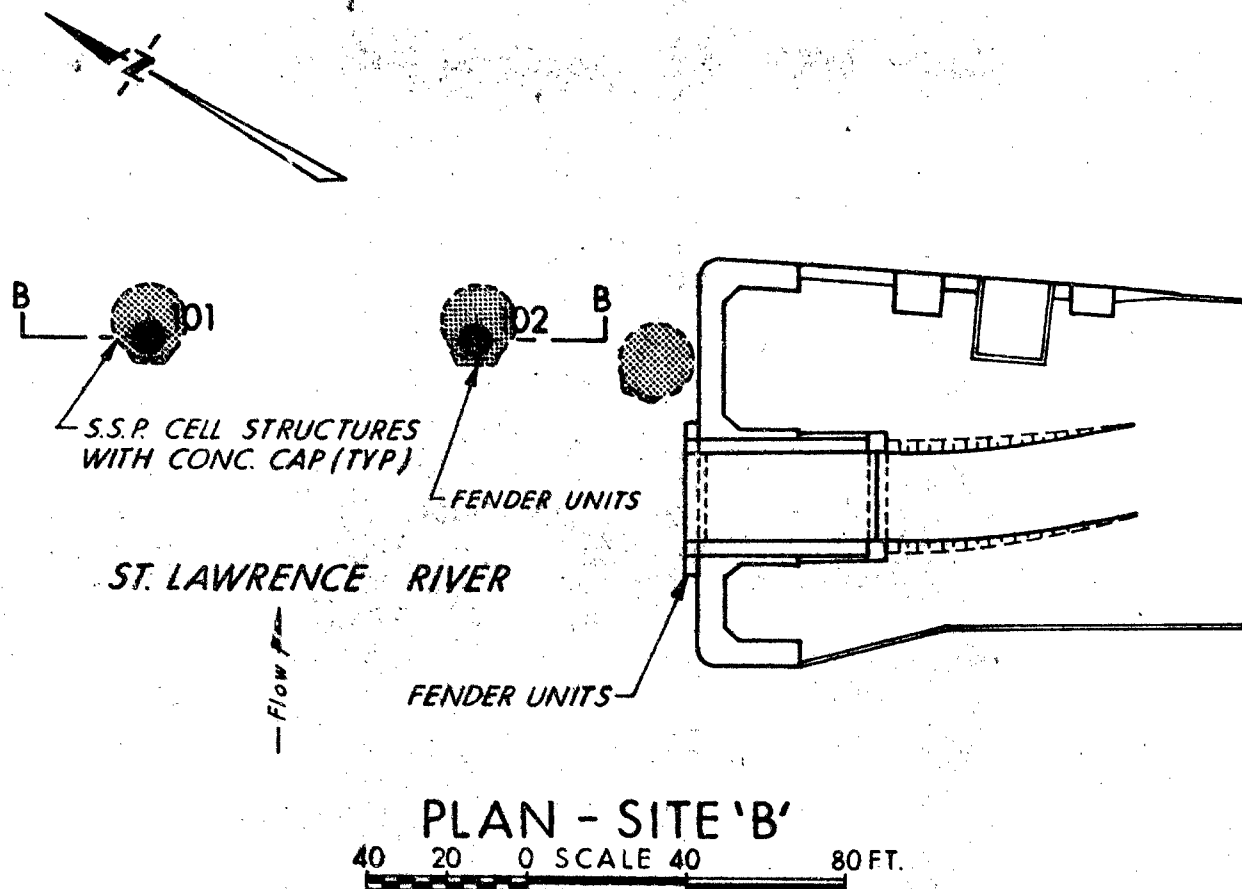
DATUM I.G.L.D.

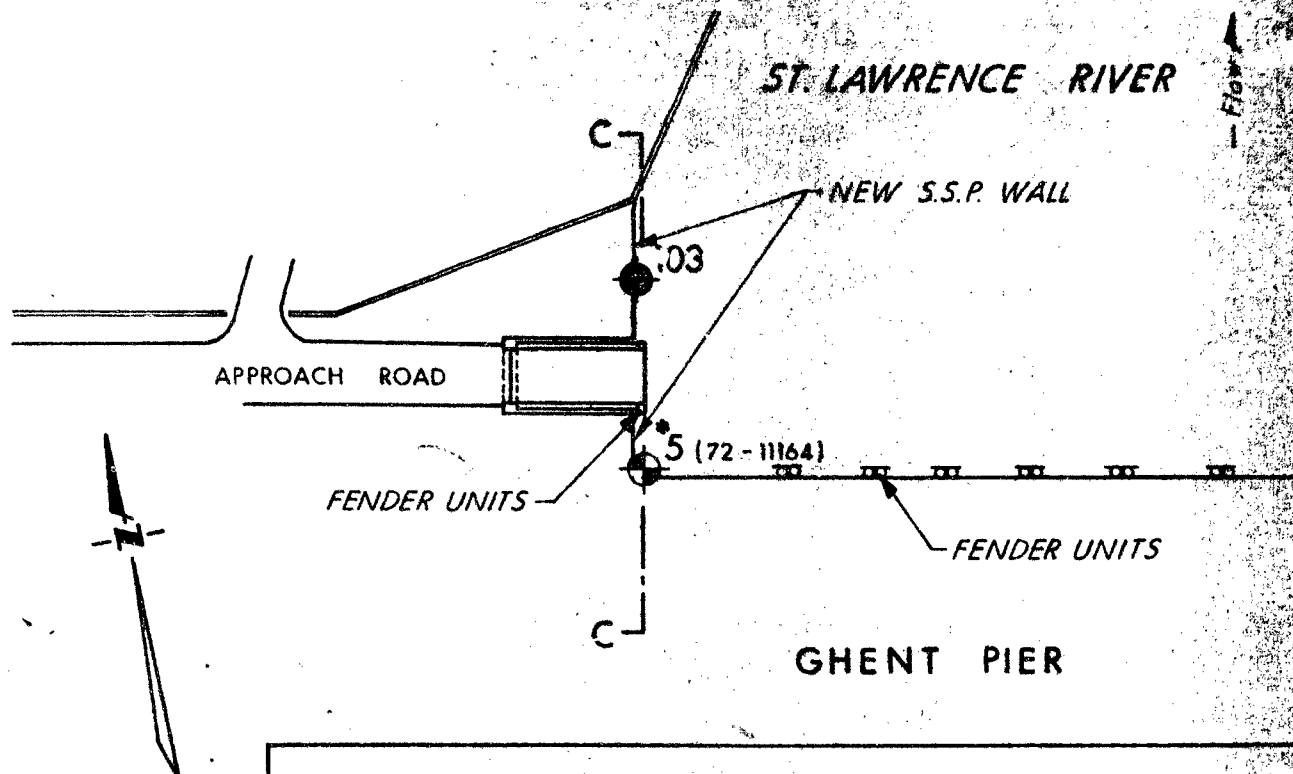
BOREHOLE TYPE Wash boring and dynamic cone penetration test

CHECKED BY SR

SOIL PROFILE			SAMPLES			ELEV. SCALE ft. / m.	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3m)					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3m)		20	40	60	80	100	w_p	w	w_L		
74.7	245.0	Water Level														
0.0	0.0															
		Water														
							240									
							73									
							230									
							70									
68.1	223.5															
67.5	221.5	sand, some silt, gravel	1	SS	34											
67.5	221.5	grey - dense														
7.2	23.5	End of Borehole					220									
		Probably sand, some silt and gravel					67									
64.6	212.0	compact-v. dense														
10.1	33.0	End of Cone Test					210									
							64									

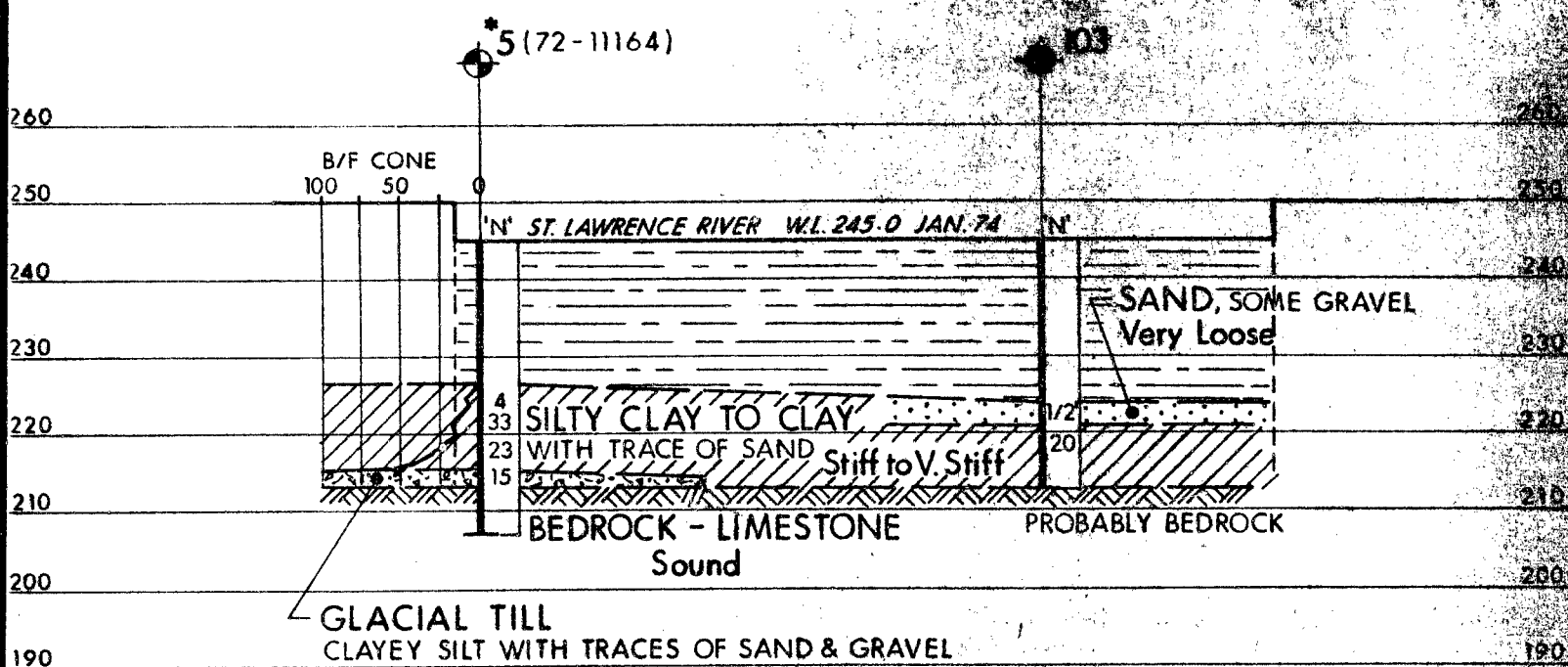






PLAN - SITE 'C'

60 30 0 SCALE 60 120 FT.



C - C SECTION - SITE 'C'

20 10 0 SCALE 20 40 FT.