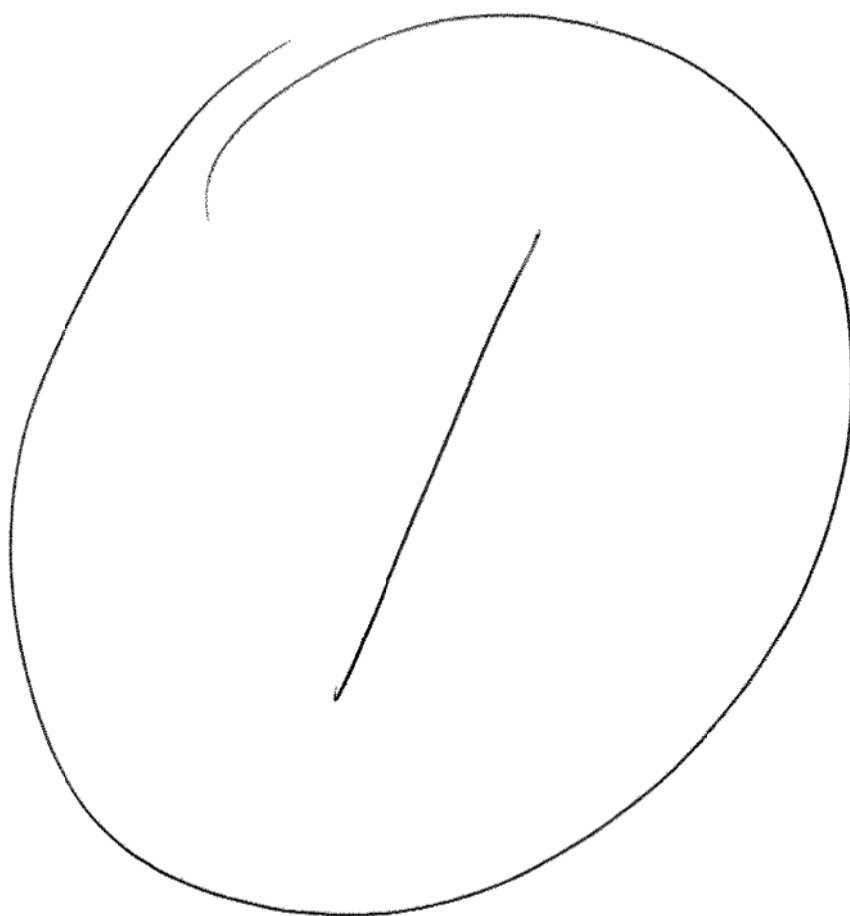


35MM

DRAWING



memorandum



To: Mr. L.G. Timson
Sr. Project Manager
Planning and Design Section
Kingston Region

Date: 1980-12-04

From: Pavement & Foundation Design Section
Room 313, Central Building
Downsview

Re: The Norris Whitney Bridge (Bay of Quinte)
W.P. 134-74-01, Contract 80-34, Hwy. 14

Further to your recent memo, we have reviewed the revised geometry incorporating a modified upper berm width ranging from 6 m to 8 m between Sta. 21+170 and Sta. 21+185 for the north approach. This memo confirms our telephone conversation with you indicating that the proposed modification will be satisfactory from the stability point of view.

A handwritten signature in dark ink, appearing to read "M. Devata".

M. Devata
Senior Foundations Engineer

MD:ea

cc: R.W. Franks

memorandum



To: M. Devata
Pavement and Foundation Design Section
Central Building
Downsview

Date: 1980 11 14

FROM: Planning and Design Section
Kingston, Ontario

RE: W.P. 134-74-01, Contract 80-34
Highway 14, The Norris Whitney Bridge

Further to our telephone conversation on Thursday, November 13th, we enclose a sketch showing proposed modifications to the upper berm of the north approach. Considering the fact that there must be a sufficient depth of earth on the approach to support tree and shrub growth, the side slope should be constructed at a 2:1 slope rather than at the $1\frac{1}{2}$:1 slope recommended by the Construction Office.

It would be appreciated if you provide us with comments on this proposal at your earliest convenience.

A handwritten signature in dark ink, appearing to read "L. G. Timson".

L. G. Timson
Sr. Project Manager

LFT/eb

c.c. R. W. Franks

Enclosure



L. Timson

MINUTES OF DESIGN PACKAGE REVIEW MEETING

Held 1980-11-05 at Field Office for Contract 80-34

In Attendance

L. Timson - Project Manager, Planning and Design
J. Drope - Technician, Planning and Design
A. J. Yorke - Project Supervisor, Construction Office
C. H. Quick - Construction Supervisor, Construction Office
(unable to attend)

The following items were discussed and appropriate action will result.

Drainage - North Approach

Due to restricted area on the left side at Stations 21+160 and 21+175 the theoretical cross-section as shown on Sheet #10 requires revision.

These revisions are as follows.

1. Replace Culvert 2 with 600 mm CSP instead of 900 mm.
2. Place 20 m of 600 mm CSP under new entrance to West Zwick's Park.
3. Because of 1 and 2 above the drainage pattern will be split at Station 21+360.
4. Because of 1, 2 and 3 the low invert of culvert can be raised .3 m and the ditch to the north by corresponding depths.
5. Steepening of Berm side slopes Station 21+160 and 21+175 to $1\frac{1}{2}:1$ are still a requirement.

Mr. Timson will be contacting the Foundation and Landscaping Sections for comments re Item #5. On receipt of this information the necessary arrangements with the contractor will be made.

Construction North Approach

The approach fill is being changed to all rock borrow with a one metre cap of earth on the side slopes and berms. This cap depth will not be attainable at subgrade limits and will be somewhat less due to the need for consistent grade under curbs and sidewalks. Therefore, cap on fill slopes will vary for one metre at the bottom to one-third of a metre at subgrade. Mr. Timson felt that this depth would be sufficient to maintain vegetation.

Superelevation Control Data

Requested that this information be forwarded for alignment on Rossmore end.

Construction Operations

Mr. Timson queried what operations the contractor was going to proceed with this fall. This item was broached due to the sign advertising the Four Seasons Hotel not being lighted for sometime. The hotel management is agreeable to live with the sign not being lighted for a short time, but felt that the sign should be lighted for the winter season at whatever access was being used. This follows the conversations that I have had with the hotel maintenance supervisor - Mr. Milton McTaggart.

Silt Barrier Installation

Item was discussed re installation time and method. Mr. Timson stated that barrier should be anchored and set in place before barrier is dropped in water.

Standard DD917A

This standard was shown on Sheet #'s 7 and 10, but was not included in contract standards. Necessity of this could not be ascertained at this line.

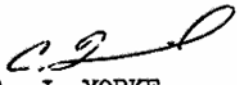
Detour Construction

The discussion on this item was limited to the completion of the contract. Mr. Timson felt it would not be out of order to resurface with a 40 mm lift of HL4 prior to acceptance by the City of Belleville.

Special Provision - Clay Seal

The requirements for this item were discussed. The Ministry specification for clay seal would cause an unrealistic cost for the intent of the material required to line the pit. A good impermeable material would be satisfactory for this operation.

As the contract progresses, further meetings on the Design Package may be necessary.


for A. J. YORKE
Project Supervisor

AJY/dj

c.c. R. W. Franks	G. A. Wrong
L. Timson	D. McFarlane
J. Drope	A. G. Kelly
A. J. Yorke	R. M. Dell
C. H. Quick	W. G. Wigle
E. J. Orr	S. C. J. Radbone
P. J. Harvey	J. W. Reid
B. J. Giroux	G.. Luyt

memorandum



To: Mr. K. Bassi
Head, Structural Design Office
Eastern Region

Date: 1980-03-03

Attention: Mr. C. Farrel

From: Pavement & Foundation Design Section
Room 313, Central Building
Downsview

Re: Bay of Quinte Crossing
at Belleville
W.P. 134-74-01, Site 28-28
Hwy. 14, District 8, Kingston

Further to our discussion of 80 02 14 we hereby confirm our verbal recommendations made to you at that time.

The extreme ends of the north abutment wing wall should be provided with additional support comprised of steel 'H' piles driven to the bedrock surface. These piles are intended to prevent rotation of the abutment due to lateral forces on the abutment piles resulting from shear flow of the underlying clay deposits.

If you have any further queries please do not hesitate to contact us.

M MacLean

MM:MD:ea

M. MacLean
For:
M. Devata
Senior Foundations Engineer

cc: T.C. Kingsland

memorandum



To: Mr. G. Wrong,
Head,
Pavement Design & Foundations Section,
Central Building, Downsview.

Date: 79 08 31

Attention: Mr. M. MacLean.

Subject: Bay of Quinte Crossing at Belleville,
W.P. 134-74-01, Site 28-28,
District #8.

I refer to our recent discussion regarding allowable pile loads on the above structure.

It was agreed that using 3 - HP 310 x 110 piles per caisson, the maximum working load per caisson could be 3500 KN rather than the 2700 KN value shown on page 24 of the foundation report. This value represents a tip pressure of 82.74 MPa (12,000 psi).

This bridge is being designed to the requirements of the Ontario Highway Bridge Design Code using ultimate limit state considerations. According to Cl. 6.8.4.3.2, the factored capacity of a caisson = $F_p R_s$, where $F_p = 0.4$ for steel H sections, R_s can be taken from Cl. 10.8.3 as $\phi A F_y$ (the λ values for these installations relatively small). Using 260 MPa yield steel, we obtain a factored capacity = $0.4 \times 0.9 \times 42.3 \times 260 = 3959$ KN. This represents a value of 1.13 x the working capacity. It is the thinking of this Section that this value is unduly conservative and would result in more piles than if the structure had been designed using working stress methods with an allowable tip pressure of 12,000 psi.

Using an F_p value of 0.45, we would obtain a factored capacity of 4454 KN which represents a value of 1.27 x the working capacity. This value more accurately represents the typical values of the applied load factors, and it was agreed that a factored capacity of 4454 KN should be used for the design of the caissons.

CFF/cf

C. F. Farrell
C. F. Farrell,
Design Engineer,
Eastern Section.

*This in response
to conversation
with C. Farrell & M.M.
I am in agreement
with the structural
offices conclusions
M.M.*

c.c. K. Bassi
W. McFarlane



*MM
M.D.*

Mr. T.C. Kingsland
Head, Structural Section
Eastern Region

1979-11-27

From: Pavement & Foundation Design Section
Room 313, Central Building
Downsview

Re: Bay of Quinte Bridge at Belleville
W.P. 134-74-01, Site 28-28
Hwy. 14, District 8, Kingston

In response to your written request of 1979-11-14 concerning the foundations for the barrier wall for the above structure, we have the following comments to make.

We feel that adequate performance can be obtained from the barrier wall without supporting it on timber piles. The base width of the footing and depth below ground surface should be sized in view of the imposed loads according to the following soil parameters:

Maximum Allowable Bearing Capacity 100 kPA
Coefficient of Passive Earth Pressure $k_p = 3.0$

Because of anticipated settlements of the approach fill due to consolidation of the underlying subsoil as well as the settlements within the approach fill, the construction of the barrier wall should be delayed as long as possible after completion of the embankment.

MM:MD:ea

M. MacLean
Project Foundations Engineer
For: M. Devata
Senior Foundations Engineer

cc: C. Bassi - Att: C. Farrel
L. Timson

617134-74-01

memorandum



To: Mr. T.C. Kingsland
Head, Structural Section
Eastern Region

Date: 1979-11-27

From: Pavement & Foundation Design Section
Room 313, Central Building
Downsview

Re: Bay of Quinte Bridge at Belleville
W.P. 134-74-01, Site 28-28
Hwy. 14, District 8, Kingston

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M MacLean

MM:MD:ea

M. MacLean
Project Foundations Engineer
For: M. Devata
Senior Foundations Engineer

cc: C. Bassi
Att: C. Farrel
L. Timson



Memorandum

To: Mr. L. G. Timson,
Planning & Design Office,
Eastern Region.

From: Pav't. & Foundation Design Section,
Engineering Materials Office,
Room 315, Central Building,
Downsview, Ontario.

Attention:

Date: 79 11 09

Our File Ref.

In Reply to

Subject:

Re: Bay of Quinte Crossing at Belleville,
Hwy. 14, District 8, Kingston,
W.P. 134-74-01, Site 28-28.

It is understood from recent discussions with you that the City of Belleville requires that the lower berm for the north approach fill be 16 metres wide to accommodate their needs. As discussed in our Foundation Investigation Report, an 8 metre wide upper berm and 12 metre wide lower berm is required for stability purposes. As you requested, we have reassessed the stability of the approaches based on the new requirements for the City of Belleville. Our recommendations are as follows.

Behind the centreline of the north abutment bearings, in the transverse direction, an 8 metre wide upper berm and a 12 metre wide lower berm are required for stability purposes. Further, our analysis indicates that an 8 metre wide upper berm with a lower berm of 16 metres wide would also be stable.

Ahead of the north abutment bearings, in the direction of the forward slope, a 6 metre wide upper berm and a minimum of 14 metre wide lower berm are required for stability purposes. Hence, a 6 metre wide upper berm and a 16 metre wide lower berm as required by the city would be stable also in the longitudinal direction.

A smooth transition should be incorporated between the transverse and longitudinal geometry.

If you have any further questions, please do not hesitate to call this office.

MM/MD/cy

c.c. T. C. Kingsland
K. Bassi
W. Blum
Files ✓

M MacLean

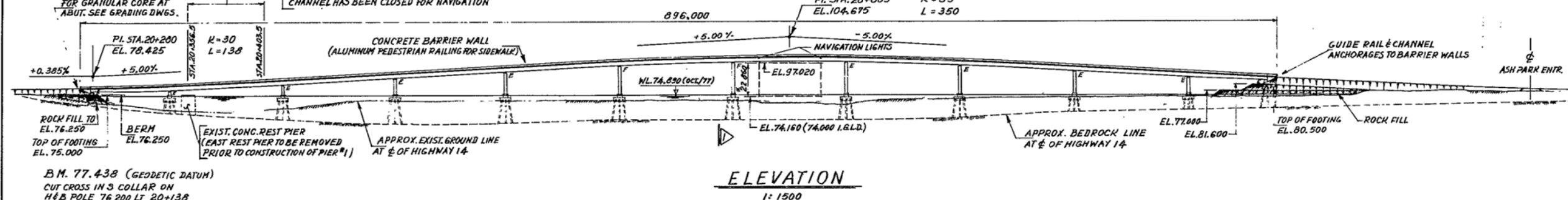
M. MacLean,
Project Foundations Engineer.
For: M. Devata,
Senior Foundations Engineer.

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE SHOWN.
ELEVATIONS, COORDINATES, CURVE
AND ALIGNMENT DATA ARE IN METRES.
STATIONS ARE IN KILOMETRES + METRES



FOR GRANULAR CORE AT
ABUT. SEE GRADING DWGS.

STRUCTURAL STEEL IN THIS SECTION OF
BRIDGE TO BE ERECTED AFTER EXISTING
CHANNEL HAS BEEN CLOSED FOR NAVIGATION



B.M. 77.438 (GEODETIC DATUM)
CUT CROSS IN S COLLAR ON
H&B POLE 76 200 LT 20+138

CLASS OF CONCRETE
DECK, BARRIER WALLS, P
REMAINDER

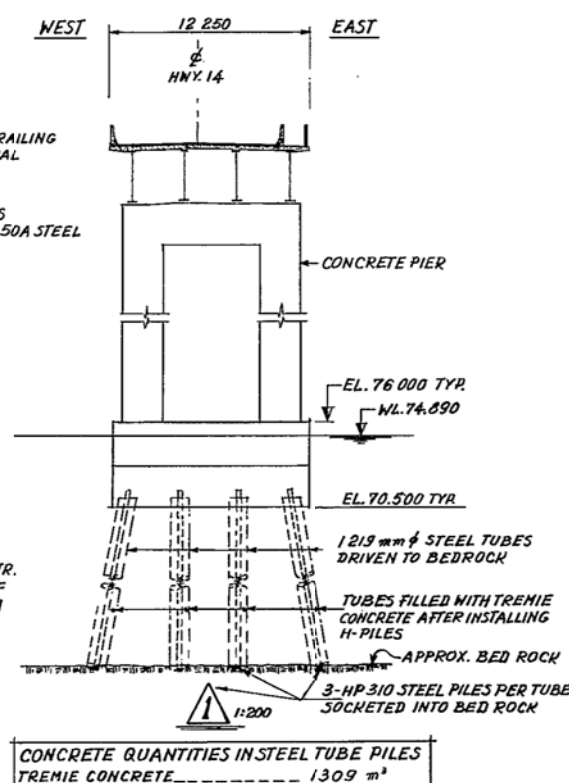
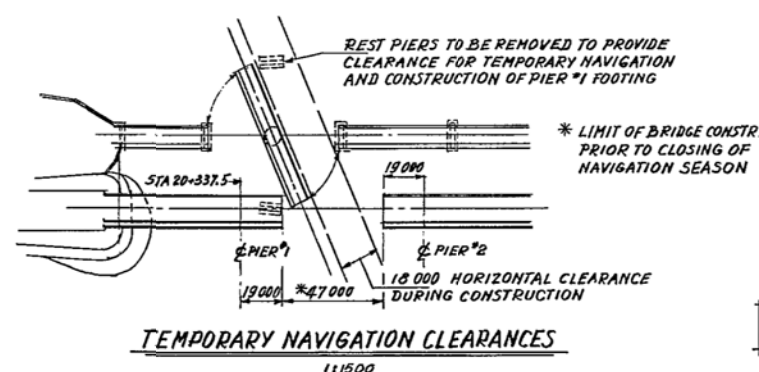
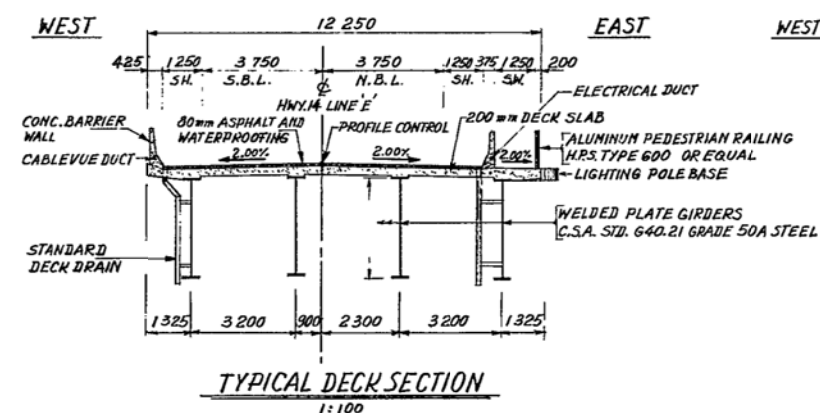
GRADE 400,
COATED BARS HAVE A SUFFIX 'C'
CLEAR COVER TO REINFORCING STEEL
FOOTINGS 75mm, ABUTMENTS 75mm, PIERS 75mm, DECK TOP 50mm
DECK BOTTOM 40mm, APPROACH SLABS 50mm.
UNLESS NOTED OTHERWISE ON DRAWINGS

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 3 mm.
NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

TO ACHIEVE THE MINIMUM CLEAR COVER OF 50mm SPECIFIED AT TOP OF DECK. THE TOP LAYER OF REINFORCEMENT SHALL BE PLACED PRIOR TO CONCRETING, WITH A CLEAR COVER OF 65 ± 15mm TOLERANCE

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE
APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS.

CONCRETE IN PERS. ABUTMENTS & WING WALLS 20MPa	276 m
30MPa	2804 m
CONCRETE IN DECK	2444 m
CONCRETE IN BARRIER WALLS	416 m
CONCRETE IN APPROACH SLABS	36 m
STRUCTURAL STEEL QUANTITY	2573 TONNE

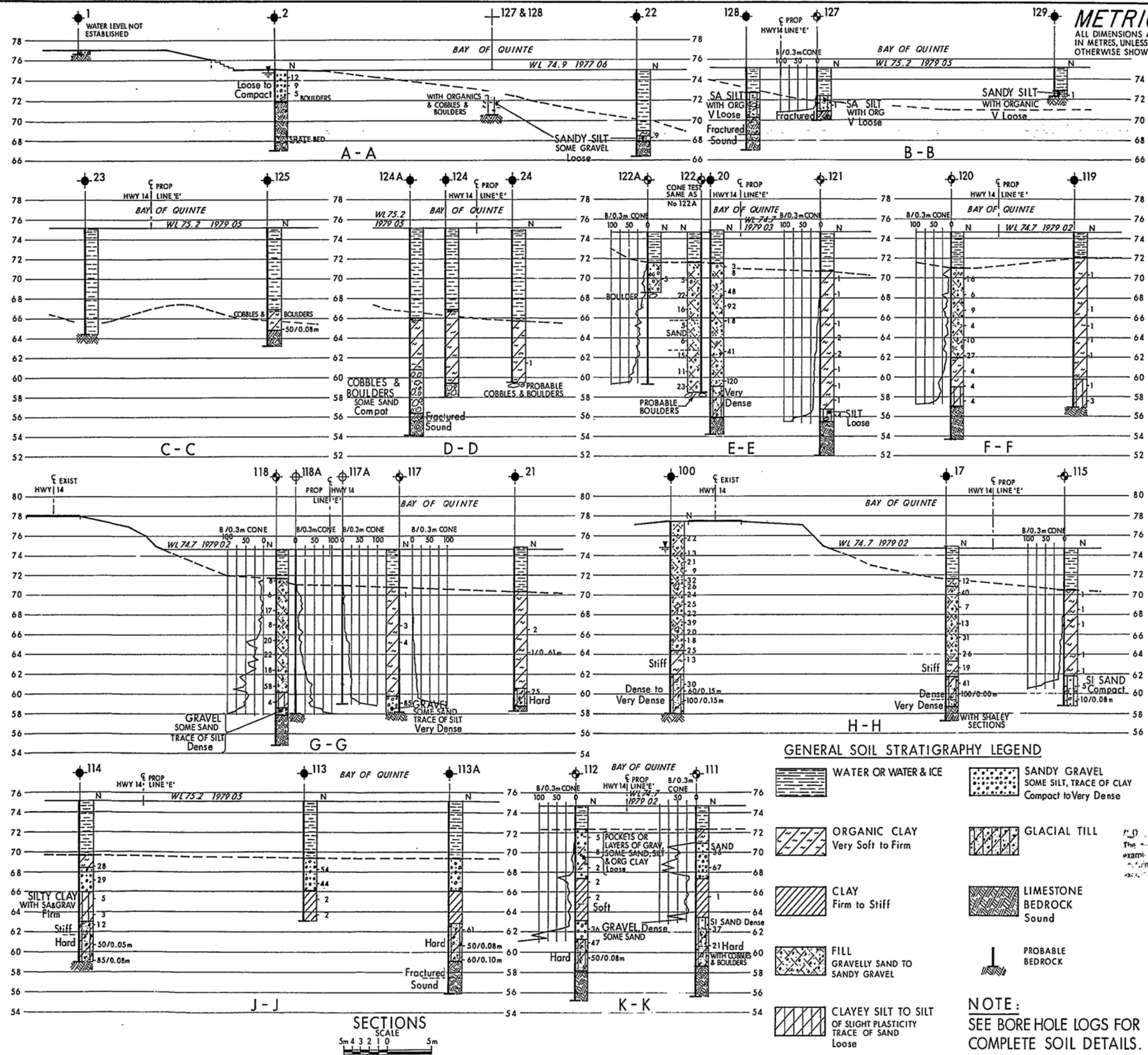


- 28-28- 1 GENERAL LAYOUT
- 28- 2a BOREHOLE LOCATIONS & SOIL STRATA
- 28- 2b BOREHOLE LOCATIONS & SOIL STRATA
- 28- 2c BOREHOLE LOCATIONS & SOIL STRATA
- 28- 3 FOOTING LAYOUT
- 28- 4 FOOTING REINFORCEMENT I
- 28- 5 FOOTING REINFORCEMENT II
- 28- 6 SOUTH ABUTMENT
- 28- 7 NORTH ABUTMENT
- 28- 8 PIERS I
- 28- 9 PIERS II
- 28- 10 BEARINGS
- 28- 11 STRUCTURAL STEEL I
- 28- 12 STRUCTURAL STEEL I
- 28- 13 STRUCTURAL STEEL II
- 28- 14 STRUCTURAL STEEL IV
- 28- 15 STRUCTURAL STEEL V
- 28- 16 DECK PLAN
- 28- 17 DECK DETAILS
- 28- 18 DECK SCREED ELEVATIONS
- 28- 19 EXPANSION JOINTS
- 28- 20 WEST BARRIER WALL
- 28- 21 EAST BARRIER WALL
- 28- 22 PEDESTRIAN RAILING
- 28- 23 6 000 mm APPROACH SLAB
- 28- 24 AS CONSTRUCTED ELEV. & DIM.
- 28- 25 STANDARD DETAILS I
- 28- 26 STANDARD DETAILS II
- 28- 27 STANDARD DETAILS III
- 28- 28 ELECTRICAL EMBEDDED WORK
- 28- 29 ELECTRICAL EMBEDDED WORK
- 28- 30 ELECTRICAL GROUNDING LAYOUT
- 28- 31 ELECTRICAL STANDARDS
- 28- 32 CABLEVUE EMBEDDED WORK

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING



REVIEWS				
DATE	BY	DESCRIPTION		
DESIGN CFF	CHECK JFQ	LOADING 048DC-A-79		DATESER
DRAWING T.57	CHECK CFF	SITE No	28-28	DWG 1



CONT No 80-34
WP No 134-74-01

BAY OF QUINTE CROSSING
AT BELLEVILLE

BORE HOLE LOCATIONS & SOIL STRATA

SHEET
23

ATTENTION IS DRAWN TO THE FOLLOWING:
THE NEW MTC SOIL CLASSIFICATION SYSTEM IS NOT USED ON
THIS DRAWING. THE ACTUAL SYSTEM USED IS GIVEN IN THE
CONTRACT REPORT. THE MORE PERTINENT DIFFERENCES BETWEEN
THE OLD AND NEW SOIL CLASSIFICATION SYSTEMS IS SHOWN
IN THE TABLE BELOW.

SYMBOL	DESCRIPTION OF SOIL	
	NEW SYSTEM	SYSTEM USED HERE
ML	SILT, CLAYEY SILT, SANDY SILT	SILT, SANDY SILT
CL	SILTY CLAY	CLAYEY SILT
CI	SILTY CLAY	SILTY CLAY
CH	CLAY	CLAY

LEGEND	
●	Bore Hole
⊕	Dynamic Cone Penetration Test (Cone)
⊙	Bore Hole & Cone
N	Blows/0.3m (Std Pen Test, 475 J/blow)
CONE	Blows/0.3m (60° Cone, 475 J/blow)
WL	WL at time of investigation
1977 05 & 06	
1979 02 to 05	
WL NOT Established for Bore Hole No	
---	Bottom of Bay from Contours.
No	ELEVATION

GENERAL SOIL STRATIGRAPHY LEGEND	
	WATER OR WATER & ICE
	ORGANIC CLAY Very Soft to Firm
	CLAY Firm to Stiff
	FILL GRAVELLY SAND TO SANDY GRAVEL
	CLAYEY SILT TO SILT OF SLIGHT PLASTICITY TRACE OF SAND Loose
	SANDY GRAVEL SOME SILT, TRACE OF CLAY Compact to Very Dense
	GLACIAL TILL
	LIMESTONE BEDROCK Sound
	PROBABLE BEDROCK

NOTE:
SEE BORE HOLE LOGS FOR
COMPLETE SOIL DETAILS.

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
Geocres No 31C - 135			
HWY No 14 LINE "E"			DIST 8
SUBMD M.M. CHECKED 11/11/79 DATE 1979 08 03			SITE 28-28
DRAWN R.S. CHECKED 11/11/79 DATE 1979 08 03			DWG 28-28

LOCATION	BATTER	HP 310x110		STEEL TUBES	
		N ^o	LENGTH	N ^o	LENGTH
S. ABUTMENT	1:3-5	7	5.50	—	—
	1:8	2	5.50	—	—
PIER#1	VERT.	—	—	—	—
	1:4-5	30	7.25	4-25	10
PIER#2	VERT.	—	—	—	—
	1:4-5	30	15.50	12-50	10
PIER#3	VERT.	—	—	—	—
	1:4-5	30	16.00	13-00	10
PIER#4	VERT.	—	—	—	—
	1:4-5	30	14.75	11-75	2
PIER#5	VERT.	—	—	—	—
	1:4-5	30	15.0	12-0	10

LOCATION	BATTER	HP 310x110		STEEL TUBES	
		N ^o	LENGTH	N ^o	LENGTH
PIER#6	VERT.	6	12.75	9-75	2
	1:4-5	36	13.0	10-0	12
PIER#7	VERT.	6	12.50	9-50	2
	1:4-5	30	12.75	9-75	10
PIER#8	VERT.	6	13.50	10-50	2
	1:4-5	30	13.75	10-75	10
PIER#9	VERT.	6	10.25	7-25	2
	1:4-5	30	10.50	7-50	10
PIER#10	VERT.	—	—	—	—
	1:4-5	30	8-0	5-0	10
N. ABUTMENT	1:3	8	15-0	—	—
	1:8	2	14-50	—	—
	VERT.	2	19-50	—	—

NOTES:

- ALL PILES TO BE HP 310x110. ALL STEEL TUBES TO BE 1219 mm O.D. 12.7 mm THICK WALL.
- STEEL TUBE SPACING TO BE MEASURED AT UNDER SIDE OF FOOTING.
- H-PILES IN PIER FOOTINGS TO BE SOCKETED INTO SOUND BEDROCK AS SHOWN.
- LENGTHS OF H-PILES & STEEL TUBES GIVEN IN TABLE ARE THE THEORETICAL LENGTHS BELOW CUT-OFF.
- H-PILES IN ABUTMENT FOOTINGS TO BE DRIVEN TO SOUND BEDROCK.

METRIC

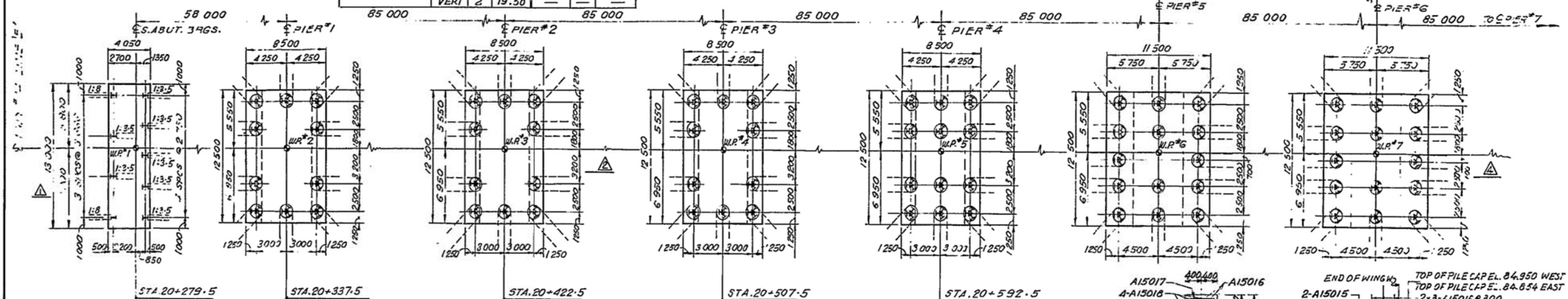
DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METRES. STATIONS ARE IN KILOMETRES+METRES.

DIST. No 8
CONT No 80-34
WP No 134-74-01

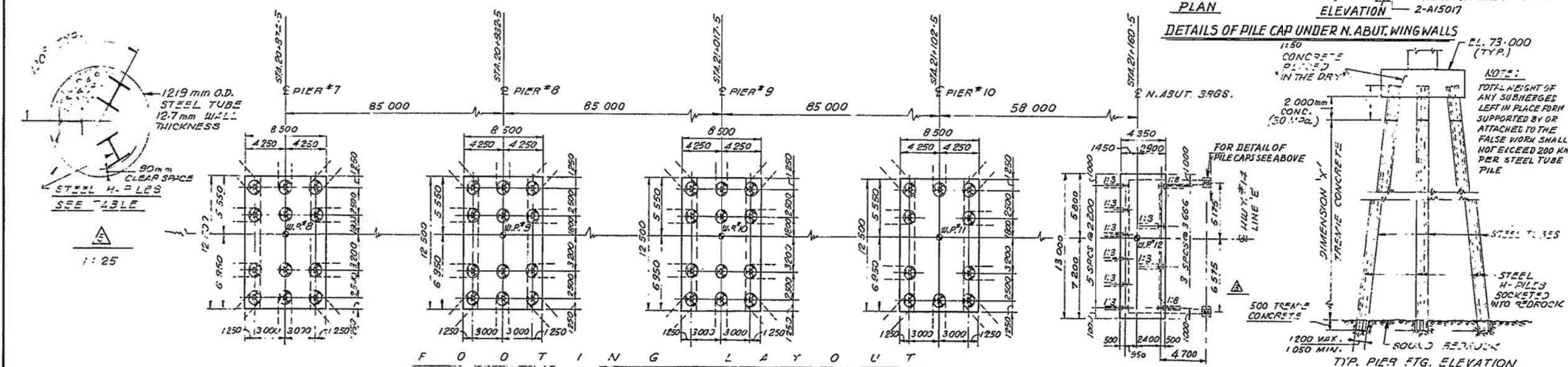
SAY OF QUOTE CROSSING
AT BELLEVILLE
FOOTING LAYOUT

SHEET
21

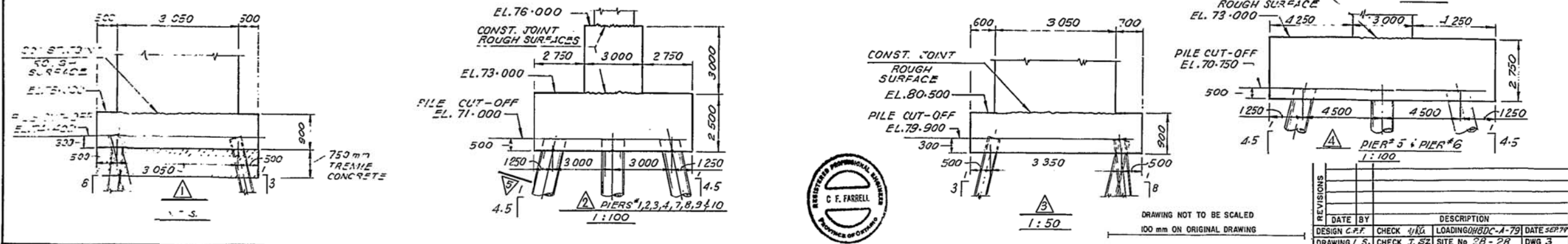
STRUCTURAL STEEL SCHEMATIC



NOTE: ALL OUTSIDE STEEL TUBES BATTERED 1:4.5



FOOTING LAYOUT



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS	DATE	BY	DESCRIPTION
DESIGN C.F.F.	CHECK J.S.	LOADING/HDC-A-79	DATE SEP 79
DRAWING L.S.	CHECK J.S.	SITE No 28-28	DWG 3



Appendix B
Site Photographs



West Side of Norris Whitney Bridge looking north from south shore



West Side of Norris Whitney Bridge looking south from north abutment, showing the existing causeway (former crossing)



Looking north from north side of navigation channel



Looking south from north side of navigation channel



North approach embankment, east side, looking south



North approach embankment, east side, looking north



Drain outlet on east side of north embankment; possible minor erosion



North approach embankment, west side, looking south



North abutment



North approach looking north; possible approach settlement



Pier adjacent to north shore, showing rock protection along shoreline



South abutment, west side, showing rock protection along shoreline



South approach, west side, looking north



South abutment, east side, looking south