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W.P. No. 254-94-00

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. Q.E.W.

LOCATION HML - Q.E.W. WB. TTC Structure to Grand Ave.

No of PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

FOUNDATION INVESTIGATION REPORT

for

High Mast Lighting

QEW Rehabilitation - Grand Avenue to TTC Structure

W.P. 254-94-00, Central Region

Introduction

This report summarizes the foundation investigation information obtained for the proposed high mast lighting poles (P1 through P11) along the QEW between the TTC structure to Grand Avenue. The subsurface data was collected from existing available information.

Site Description

The site is located in the city of Etobicoke, just west of the Humber River. This stretch of the QEW is highly developed with industrial and commercial land use.

Physiographically, the site lies within the Iroquois Plain which is characterized by overburden consisting of fine grained and glacial till deposits overlying shale bedrock.

General Subsurface Conditions

The predominant deposit across the site is a clayey silt to silty clay stratum containing random silt layers throughout. The cohesive layer is generally firm to stiff. It is overlain by cohesive and non-cohesive fill material that varies in thickness across the site from less than 1 m to more than 13 m at the CN structure approaches. At some locations, the clayey silt to silty clay deposit is underlain by cohesive clayey silt glacial till. The presence of cobbles and boulders is likely in the glacial till deposit.

Shale bedrock of the Dundas-Meaford Formation is present beneath the glacial deposit. In the vicinity of the TTC structure bedrock was encountered at El. 73.3. The bedrock elevation increases in a westerly direction. At the Grand Avenue structure, the bedrock elevation is 90.0 m.

The groundwater level recorded at the time of the investigations (1970) ranged from approximately El. 78.0 at the TTC structure and in the vicinity of Mimico Creek, to El 87.0 in the proximity of the CN structure and Park Lawn Road, and El. 89.0 at the Grand Avenue structure.

The present groundwater conditions may vary from those identified on the borehole log sheets. Where groundwater levels are recorded in non-cohesive materials, it is possible that instability would result under conditions of unbalanced hydrostatic head.

For more site specific subsurface condition, refer to the appropriate borehole log sheets. The locations of the boreholes are shown on Drawing 2549000-A. The Record of Borehole sheets and drawing are appended.

Discussion and Recommendations

The high mast lighting poles will be founded on single reinforced concrete caissons. Their foundations should be designed in accordance with the methods described by B.B. Broms in the following two papers:

Broms, B.B. Lateral Resistance of Piles in Cohesive Soils
Journal of the Soil Mechanics and Foundations Division
ASCE, Vol. 90, No. SM2, Paper 3825, March 1964.

Broms, B.B. Lateral Resistance of Piles in Cohesionless Soils
Journal of the Soil Mechanics and Foundations Division
ASCE, Vol. 90, No. SM3, Paper 3909, May 1964.

The table presented on the following page provides the geotechnical parameters for design at each high mast light pole location.

Ground elevations obtained from the existing borehole data differ from present elevations. In many cases additional fill has been placed for structure and roadway widenings. A non-cohesive fill material may be assumed at these locations having an internal friction angle of 25° and a unit weight of 20 kN/m^3.

For caissons penetrating the shale bedrock, a minimum 1.0 m embedment should be maintained.

Cut Considerations
If the grade is to be changed at the pole locations, the most critical lowest surface elevation should be assumed for design purposes.

Fill Considerations
Considerable heights of fill have been placed in this area over the years. The condition and composition of the fill varies. It should be assumed that the fill will provide only half of the calculated lateral resistance.

For proposed fill, the following design parameters should be used, taking into consideration that only 60% of the proposed fill height will provide lateral support, $\phi = 30°$, $= 20\ kN/m^3$.

Any organic or soft material should be removed within the plan limits of the fill before placing. The fill should consist of acceptable soil free of organic material. It should be placed and compacted as per MTO standard.

It should be assumed that soil in the zone of frost penetration does not provide any lateral resistance. The depth of frost penetration at this site is 1.2 m.

HML Pole	Reference Borehole	GWL (El)	Elevation From - To	Subsurface Material	ϕ	q_u (kPa)	γ (kN/m³)
P1	16 (WP 314-65-01) Lakeshore Sewer	75.9	79.1 - 76.2 76.2 - 72.8 72.8	Cohesive Fill Cohesive Shale Bedrock	0 0 0	100 50 500	19.0 18.5 22.0
P2	18 (WP 314-65-01) Lakeshore Sewer	77.8	80.8 - 77.4 77.4 - 74.8 74.8	Cohesive Fill Cohesive Shale Bedrock	0 0 0	100 300 500	19.0 20.0 22.0
P3	4 (WP 314-65-01) Lakeshore Sewer	78.5	81.7 - 80.2 80.2 - 77.9 77.9	Cohesive Fill Cohesive Shale Bedrock	0 0 0	100 300 500	19.0 20.0 22.0
P4	1 (WP 314-65-01) Lakeshore Sewer	82.8	84.6 - 82.4 82.4 - 78.7 78.7	Cohesive Fill Cohesive Shale Bedrock	0 0 0	100 200 500	19.0 19.5 22.0
P5	11 (WP 314-65-06) CNR Structure	86.6	87.8 - 85.0 85.0 - 84.7 84.7 - 80.4 80.4 - 79.4 79.4	Cohesive Fill Cohesive Cohesive Cohesive Till Shale Bedrock	0 0 0 0 0	100 25 100 300 500	19.0 18.0 19.0 20.0 22.0
P6	1 (WP 314-65-06) CNR Structure	87.9	89.0 - 86.5 86.1 - 80.1 80.1	Non-cohesive Fill Cohesive Shale Bedrock	25° 0 0	0 300 500	19.0 20.0 22.0
P7	1 (WP 314-65-05) Park Lawn Road	88.9	92.5 - 90.2 90.2 - 81.9 81.9	Cohesive Fill Cohesive Shale Bedrock	0 0 0	200 300 500	19.5 20.0 22.0
P8	2 (WP 314-65-05) Park Lawn Road	87.1	91.6 - 88.3 88.3 - 82.8 82.8	Cohesive Fill Cohesive Shale Bedrock	0 0 0	200 300 500	19.5 20.0 22.0
P9	6 (WP 314-65-04) Mimico Creek	78.9	87.9 - 79.4 79.4 - 78.3 78.3	Cohesive Fill Cohesive Shale Bedrock	0 0 0	200 300 500	19.5 20.0 22.0
P10	2 (WP 314-65-03) Grand Ave.	88.8	90.4 - 89.1 89.1	Cohesive Till Shale Bedrock	0 0	300 500	20.0 22.0
P11	1 (WP 314-65-03) Grand Ave.	93.9	95.7 - 90.2 90.2 - 87.6 87.6	Non-cohesive Fill Cohesive Till Shale Bedrock	28° 0 0	0 300 500	19.5 20.0 22.0

Where:	GWL	=	Groundwater level recorded at the time of the investigation
	ϕ	=	Apparent angle of internal friction
	q_u	=	Unconfined compressive strength
	γ	=	Bulk unit weight; the submerged unit weight should be used below the water table

Slope Considerations

For HML placed near slopes, the caisson should be a minimum of 3 m from the crest of the 2H:1V downslope. The upper 50% of the embedment length within the embankment, taken from the frost penetration depth, should be disregarded for lateral resistance. If the HML caisson is constructed at a distance of 3 m from the crest of a 3H:1V slope the reduction in embedment length would be 25%. Similarly for a 4H:1V slope, the reduction in embedment length would be 0%.

For HML poles placed on slopes, assume no lateral resistance above the depth at which the caisson is a horizontal distance of 5 m away from the slope.

Construction Requirements

It is recommended that a non-standard special provision for the construction of the high mast lighting foundations be incorporated in the contract. A copy of the latest NSSP is appended.

The contractor should be advised of the variable subsurface materials and that the soil descriptions in this report are generalized and not site specific. For construction planning purposes, it may be assumed that:

- Groundwater is near ground surface
- Cohesionless seams susceptible to disturbance under conditions of unbalanced hydrostatic head may be encountered
- Glacial deposits are present and there is a probability that occasional cobbles and boulders will be encountered during caisson installation.

The installation of all caissons should proceed with liners due to the nature of the subsurface material. The contractor should maintain the stability of the base of the caisson when penetrating below the groundwater table with the use of drilling mud or water to balance the hydrostatic head. Tremie concreting techniques should be employed when such a condition is encountered.

The contractor is responsible for constructing the high mast light pole foundations without disturbing the material at the sides or base of the foundation. The contractor's proposal should be capable of dealing with the above-noted site condition. The contractor shall submit eight copies of his proposed construction method to MTO for review prior to commencing construction of the foundation elements.

Miscellaneous

The report was prepared and written by B. Bennett, Foundation Engineer. The report was reviewed and approved by D. Dundas, Senior Foundation Engineer.

Betty Bennett, P.Eng.
Foundation Engineer

David Dundas, P.Eng
Sr. Foundation Engineer

Ministry of Transportation
Ontario

FAXGRAM

PLEASE TYPE DATE Nov. 20/95 PAGE 1 OF 4

TO:	FROM:
RICK HASALL DELCAN FAX: 441 4131	BETTY BENNETT PVMTS & FDNS SECTION PH: 235-3731

SUBJECT: QEW HIGH MAST LIGHTING - PRELIM FOUNDATION RECS.
WP 254-94-00

Further to our discussion this morning, please find following the recommendations forwarded to Frank Chan on Nov. 3.

Re: the CSP Maintenance Platform
I have prepared a rough cross-section at HML P6. Based on that sketch, it would appear that no lateral resistance is assumed for the depth of the CSP liner.

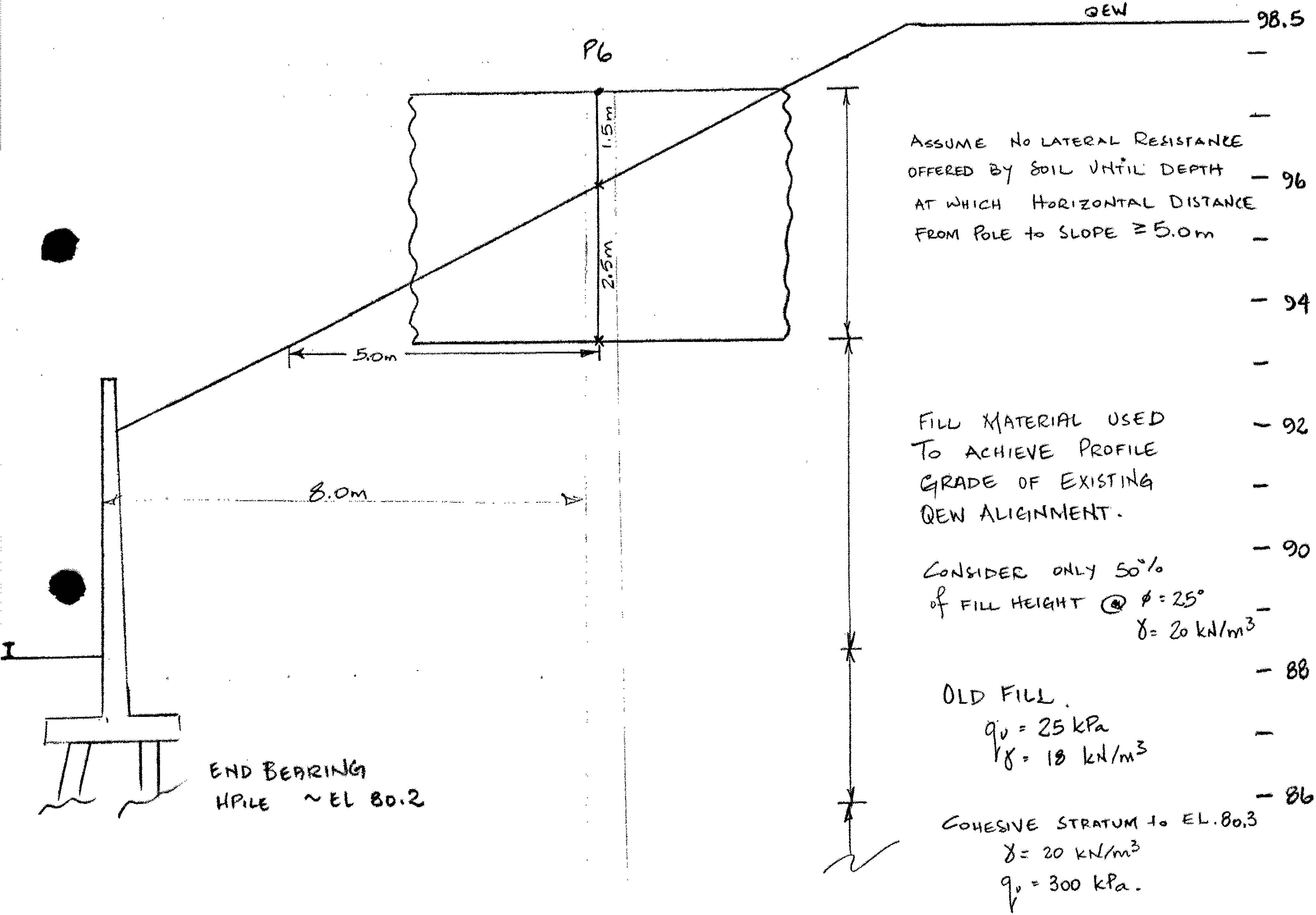
W.R.T the existing retaining wall, the platform will introduce additional vertical loading that may affect the stability of the wall. In addition, the construction of the platform make create instability of the slope. If possible, please explain the anticipated sequence of construction of the platform. Is the backfill compacted?

Because the retaining wall is founded on piles, perhaps the additional loading can be accomodated. Are you aware of what the design and actual loadings are on the retaining wall?

B Bennett

ADM-S-481 91-05

Made from recovered materials



QEW
98.5
P6
1.5m
2.5m
5.0m
8.0m
96
94
92
90
88
86
ASSUME NO LATERAL RESISTANCE OFFERED BY SOIL UNTIL DEPTH AT WHICH HORIZONTAL DISTANCE FROM POLE to SLOPE ≥ 5.0m
FILL MATERIAL USED To ACHIEVE PROFILE GRADE OF EXISTING QEW ALIGNMENT.
CONSIDER ONLY 50% of FILL HEIGHT @ ϕ = 25°
γ = 20 kN/m³
OLD FILL.
q_u = 25 kPa
γ = 18 kN/m³
COHESIVE STRATUM to EL. 80.3
γ = 20 kN/m³
q_u = 300 kPa.
END BEARING HPILE ~ EL 80.2

memorandum

Ontario

To: V. Boehnke
Head, Structural Section
Central Region

Date: November 3, 1995

Attn: F. Chan
Sr. Structural Engineer

From: Pavements and Foundations Section
Room 315 Central Building

Phone: 235-3731

Re: Preliminary Foundation Recommendations - High Mast Lighting
W.P. 254-94-00, QEW Rehabilitation - TTC Structure to Grand Avenue

switch

It is proposed to erect eleven high mast lighting poles (P1 through 11) along the QEW between the TTC structure to Grand Avenue. A considerable amount of existing subsurface information is available in this area. However, difficulties exist in translating the imperial data to the metric plans. Hence, this memo provides only preliminary recommendations for the foundations of the HML. The final recommendations, complete with drafting will become available once the existing borehole information can be accurately transferred to the plans.

General Subsurface Conditions
The predominant deposit across the site is a clayey silt to silty clay stratum containing random silt layers throughout. The cohesive layer is generally firm to stiff. It is overlain by cohesive and non-cohesive fill material that varies in thickness across the site from less than 1 m to more than 13 m at the CN structure approaches. At some locations the clayey silt to silty clay deposit is underlain by cohesive clayey silt glacial till. Shale bedrock of the Dundas-Meaford Formation is present beneath the glacial deposit. In the vicinity of the TTC structure, it was encountered at El 73.3. The bedrock elevation increases in a westerly direction. At the Grand Avenue structure, the bedrock elevation is 90.0 m. The groundwater level recorded at the time of the investigations (1970) ranged from approximately El 78 at the TTC structure and in the vicinity of Mimico Creek, to El 87 in the proximity of the CN structure and Park Lawn Road, and El 89 at the Grand Avenue structure.

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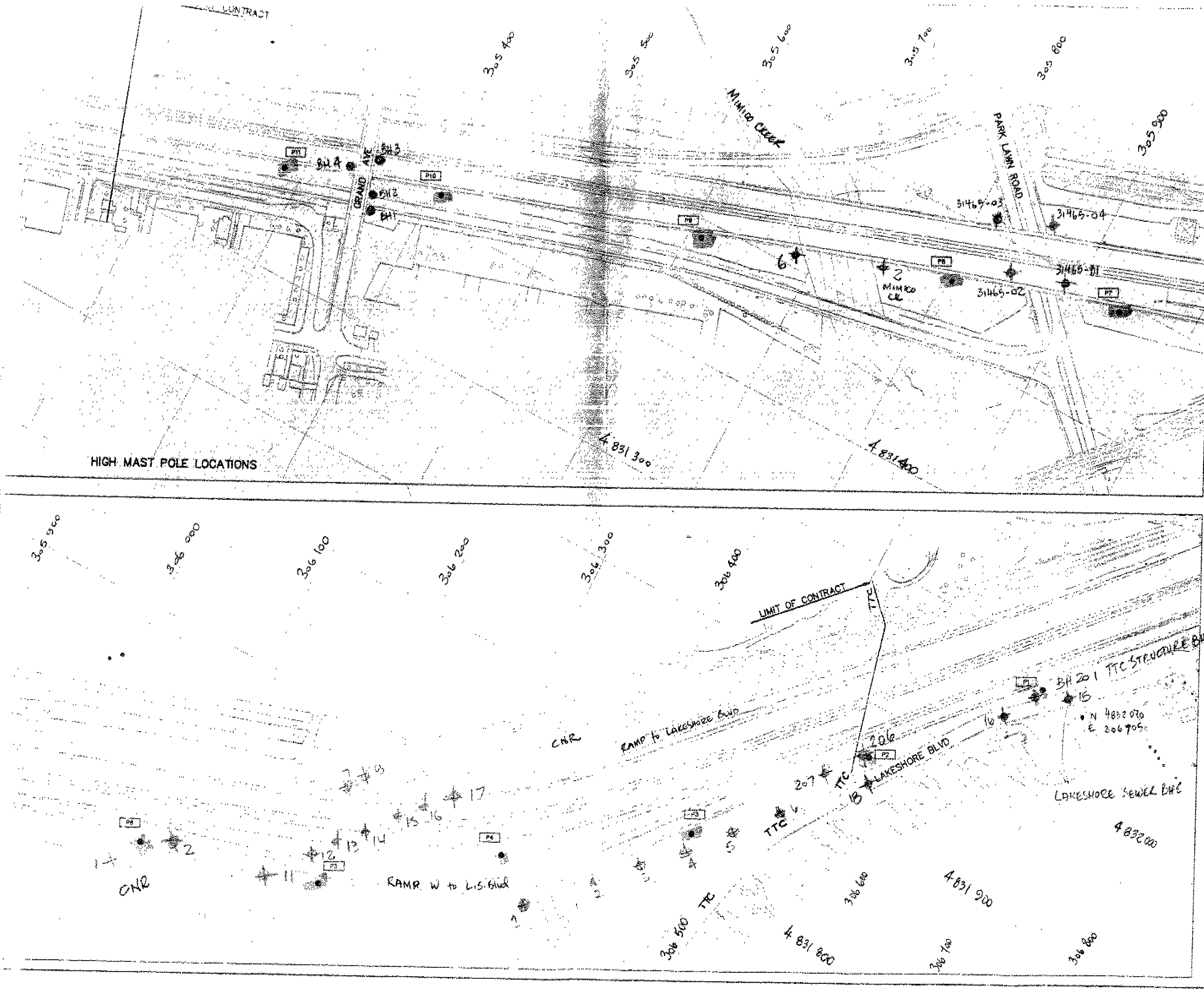
For HML poles placed on slopes, assume no lateral resistance above the depth at which the caisson is a horizontal distance of 5 m away from the slope.

Construction requirements and NSSP will be forwarded with the final recommendations.
If there are any questions regarding the above, please advise.

B Bennett

Betty Bennett, P.Eng.
Foundation Engineer



Betty Bennett -3731