
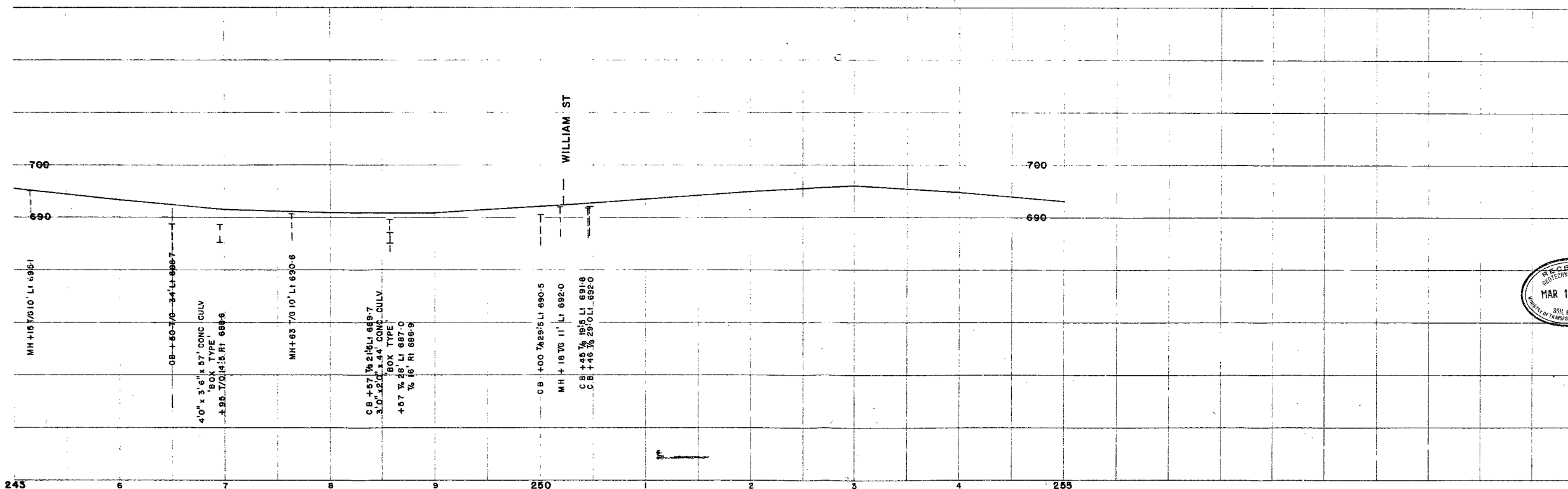
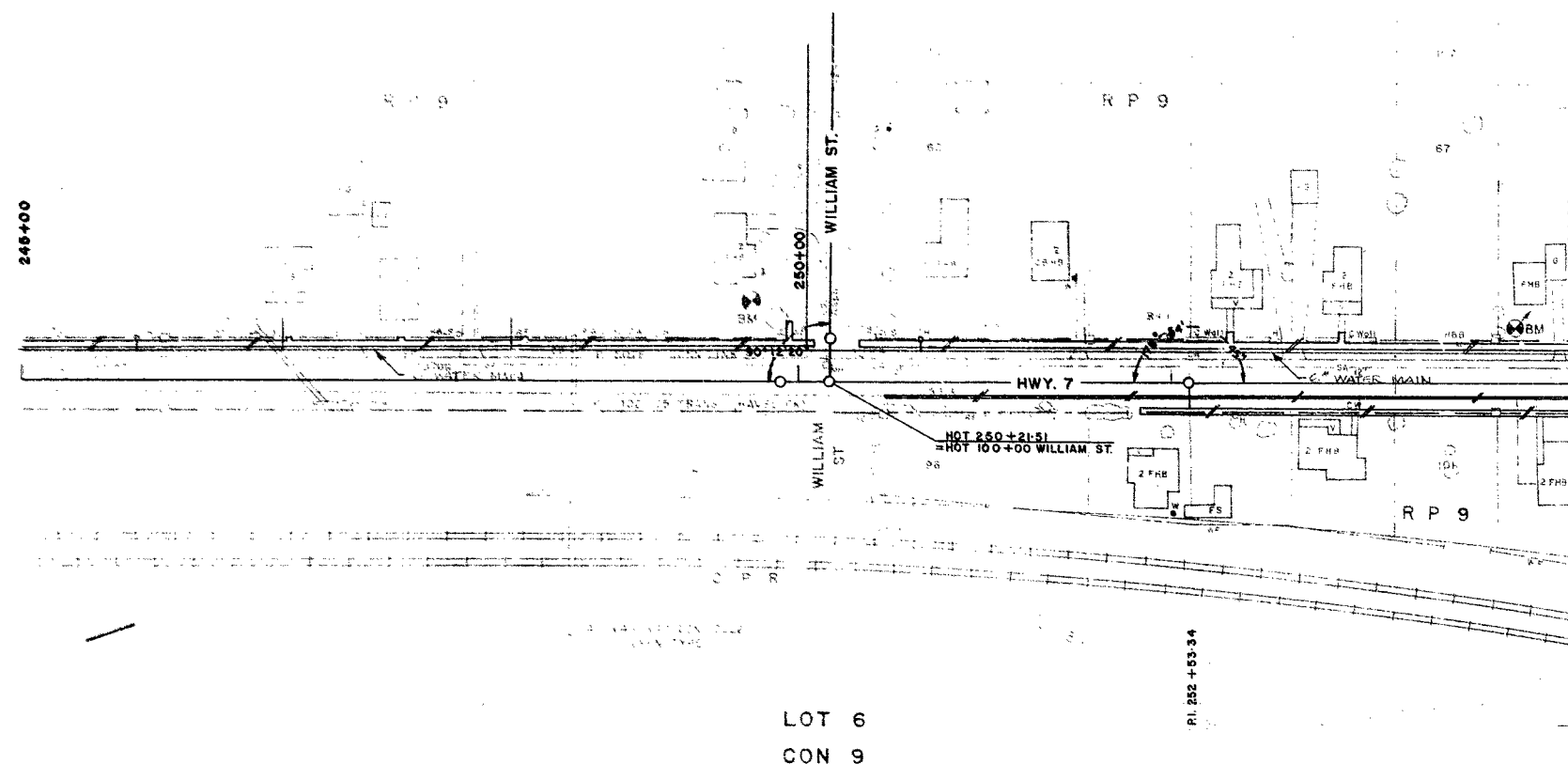


31C-133 240-7/15-1

CONT. No. W. P. No. 921-75-01	 SHEET
REMOVALS STA 245+00 TO STA 255+00	

31C-133



SCALES

25' 0 50'  
Horizontal

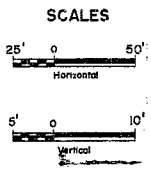
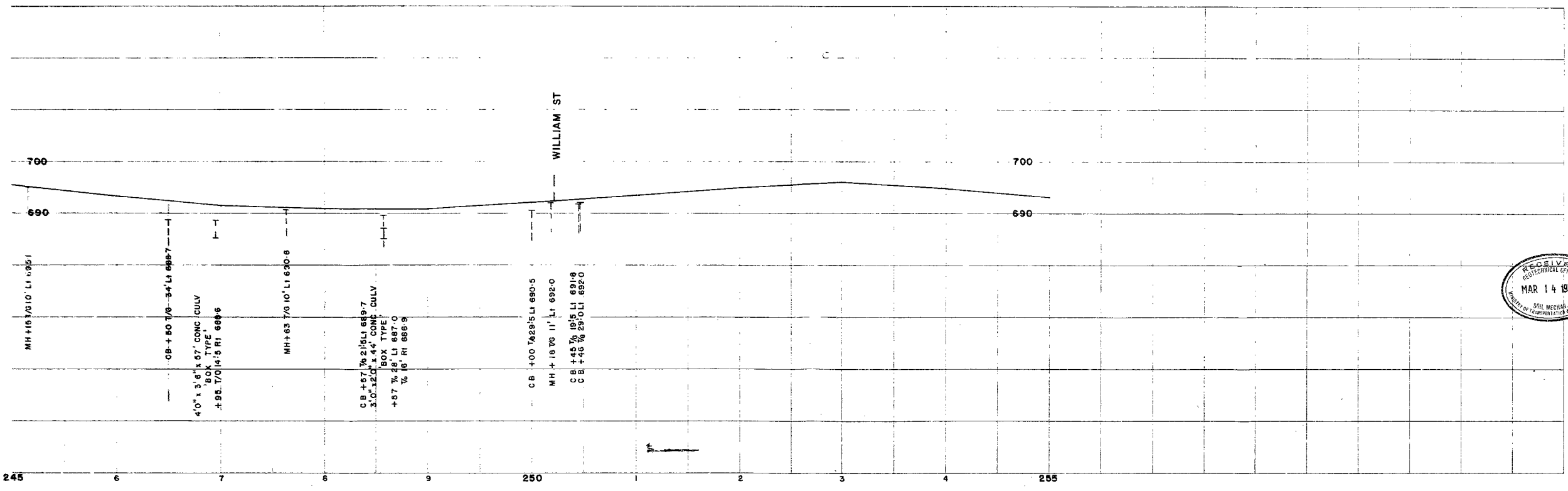
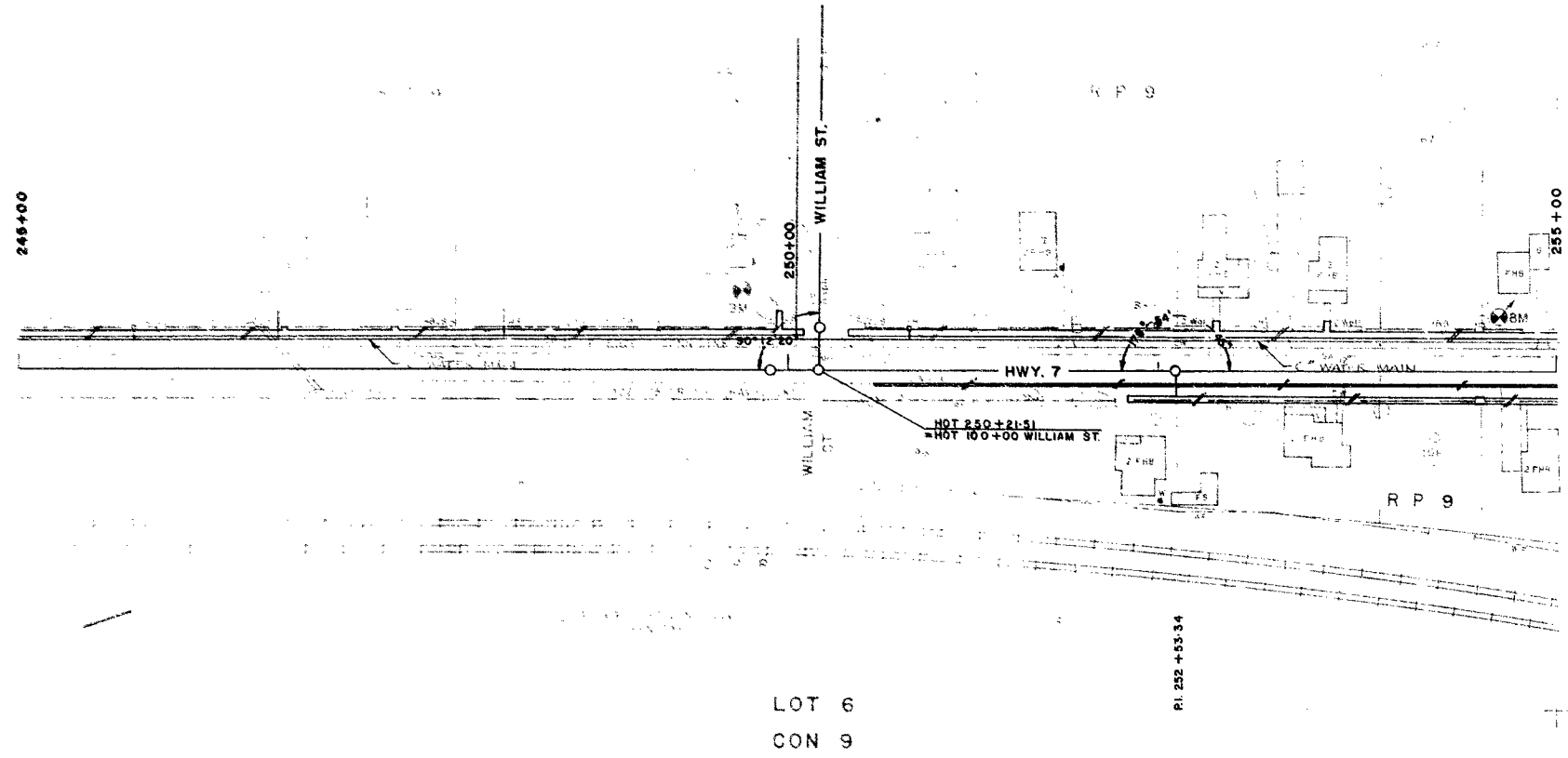
5' 0 10'  
Vertical

CONT. No.  
W. P. No. 921-75-01  
REMOVALS  
STA 245+00 TO STA 255+00



SHEET

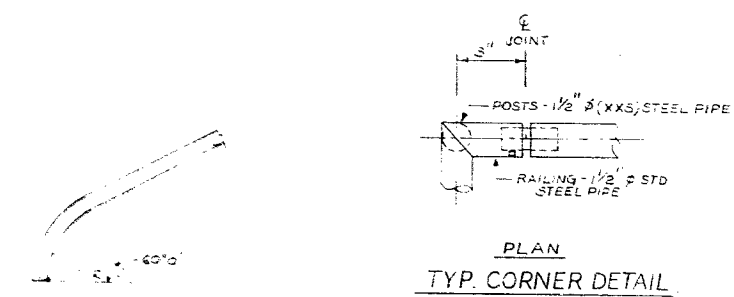
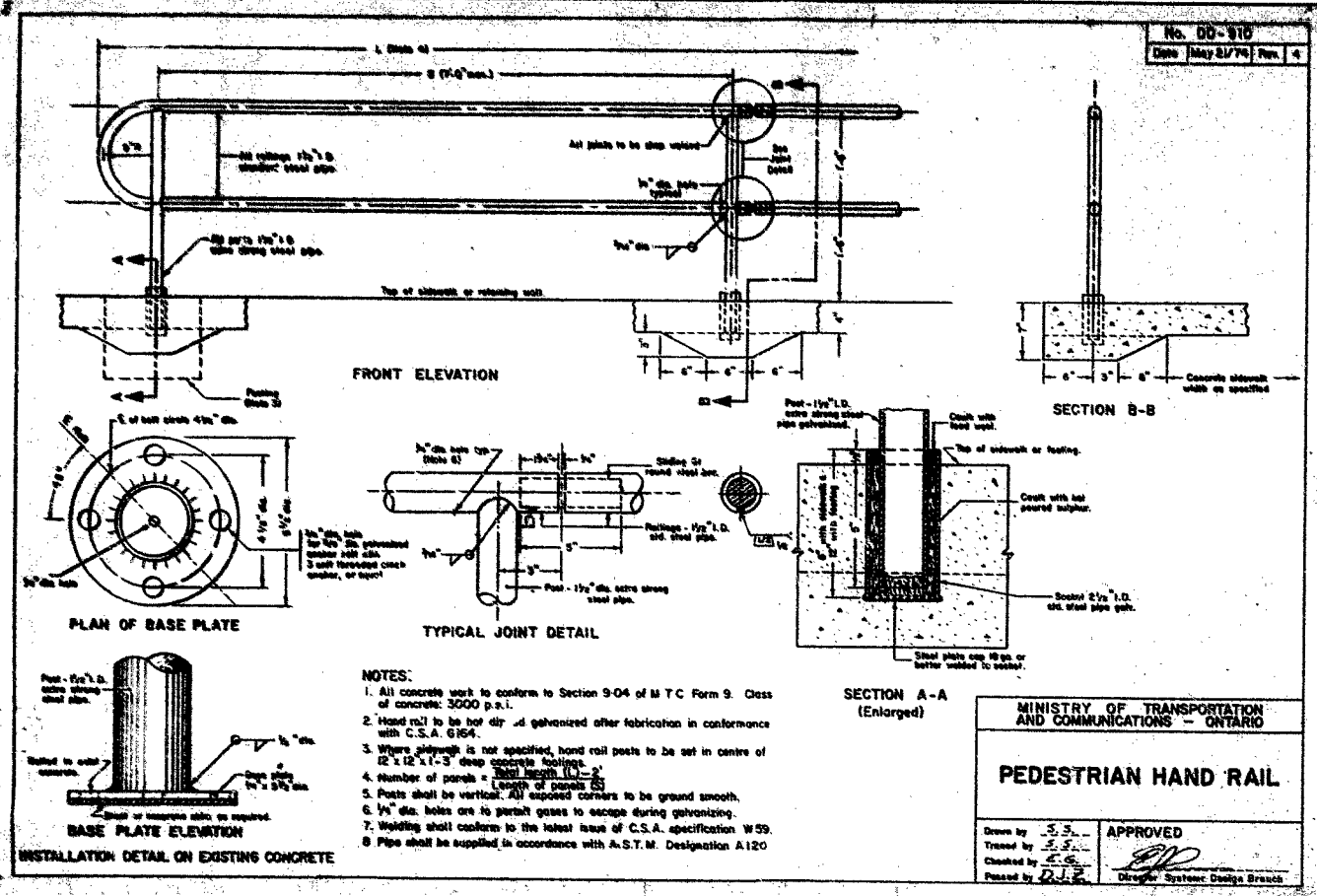
31C-133



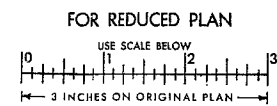
31C-123

DIST No 7		SHEET
CONT No		
WP No 921-75-01		
VILLAGE OF HAVELOCK		
PIPE HANDRAIL		

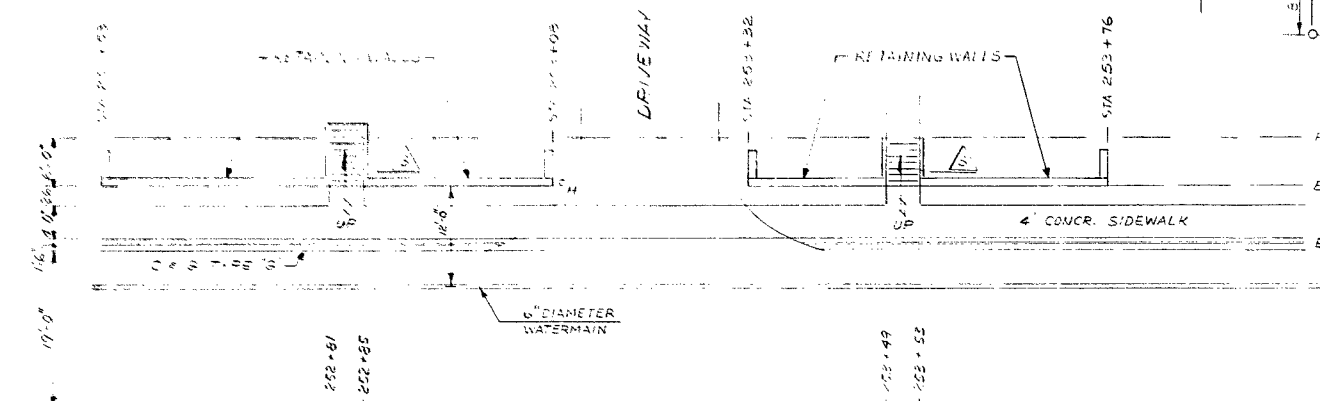
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO



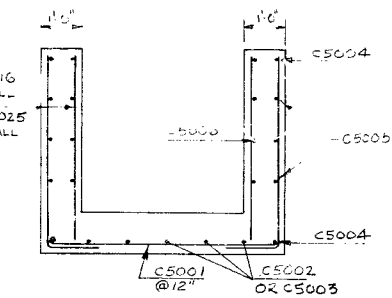
DETAIL OF HANDRAIL  
BEYOND AT END



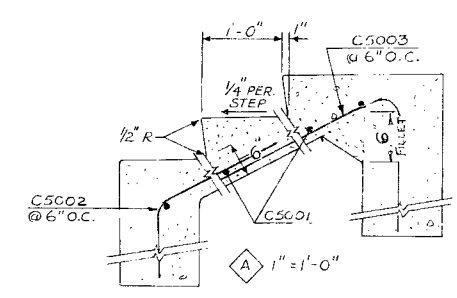
REVISIONS		DATE BY		DESCRIPTION	
DESIGN	STD.	CHECK	LOADING	DATE	NOV/77
DRAWING	L.A.	CHECK	SITE No 36-RW	DWG	2



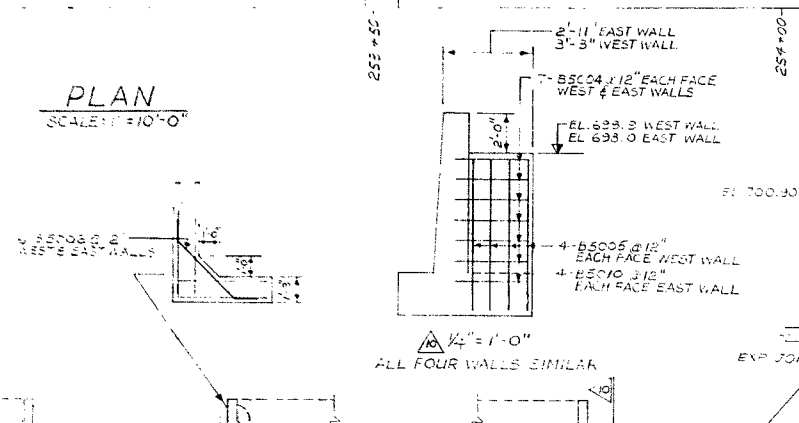
PLAN  
SCALE: 1" = 10'-0"



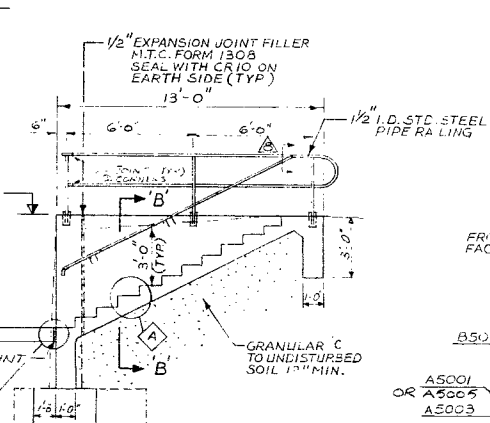
SECTION B-B  
SCALE: 1/2" = 1'-0"



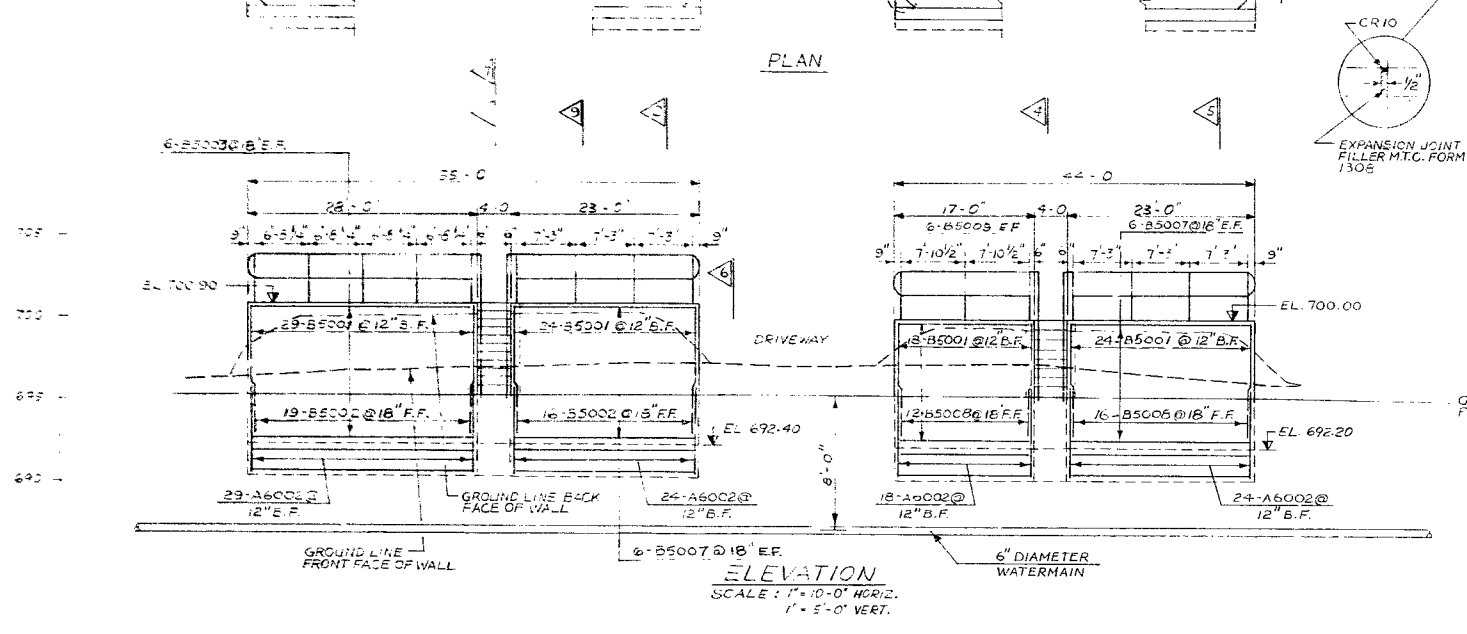
1/4" = 1'-0"



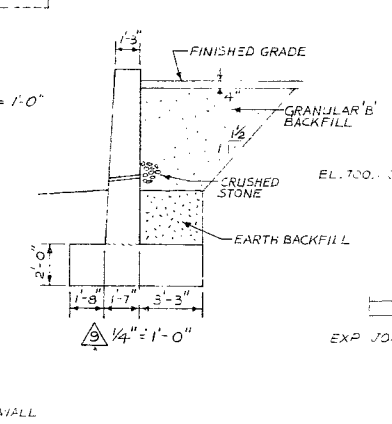
PLAN



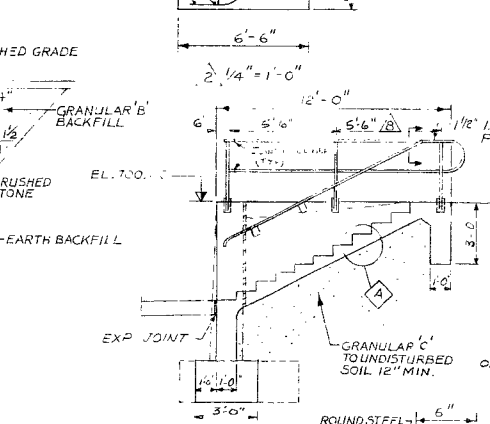
1/4" = 1'-0"



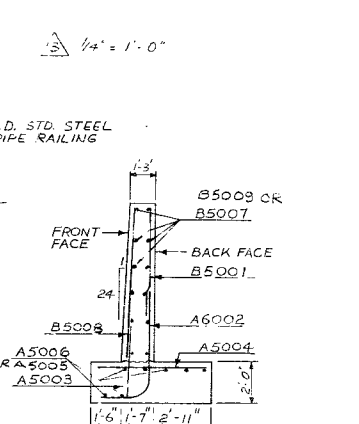
ELEVATION  
SCALE: 1" = 10'-0" HORIZ.  
1" = 5'-0" VERT.



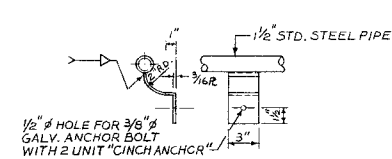
1/4" = 1'-0"



1/4" = 1'-0"

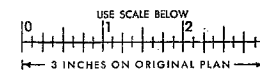


1/4" = 1'-0"



BRACKET DETAIL  
SCALE: 1/8" = 1"

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION
DESIGN ADPT.	CHECK WM	LOADING	DATE JULY 77
DRAWING ADPT.	CHECK WM	SITE No 36-RV	DWG 1

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 31C-133

DIST. 7 REGION Central

W.P. No. 921-75-01

CONT. No. 78-102

W. O. No. \_\_\_\_\_

STR. SITE No. \_\_\_\_\_

HWY. No. 7

LOCATION Retaining Walls,  
Sta. 252+53 to Sta. 253+75,  
Connecting Link in the Village of  
Havelock

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: documents to be unfolded  
before microfilming

ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 921-75-01

DIST 7

HWY 7

STR E N/A

Retaining Walls  
Sta. 252-53 to Sta. 253+75  
Connecting Link in the Village of Havelock

DISTRIBUTION

G.C.E. Burkhardt (3)  
R.D. Gunter  
M.R. Ernesaks  
D.E. Thrasher (2)

C. Grebski  
G.A. Wrong  
B.J. Giroux  
R.S. Pillar

R. Hore

R. Fitzgibbon }  
J. Anderson } cover only  
G. Sloan }

Files

SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	April 22/77	MD
TUBES	—	—
ROCK CORES	—	—

# FOUNDATION INVESTIGATION REPORT

For

Retaining Walls  
Sta. 252+53 to Sta. 253+75  
Connecting Link in the Village of Havelock  
Hwy. 7, District 7, Port Hope  
W.P. 921-75-01, Site No. N/A

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## INTRODUCTION

This report contains the results of a foundation investigation carried out at the site of the above mentioned project. The fieldwork was carried out during March 15, 1977. It consisted of a total of 2 sampled boreholes advanced by means of 2½" hollow stem flight augers to depths ranging from 9 to 19 feet below the existing ground surface.

## SITE DESCRIPTION AND GEOLOGY

The site is located on Hwy. 7 connecting link about 300 feet east of William St. in the Village of Havelock, Township of Belmont, County of Peterborough. Gently rolling terrain is prevalent throughout this area and in the immediate vicinity of the site the land use is residential.

The site lies on what is known physiographically as the Dummer Moraines. This is an area of rough stony land bordering the Canadian Shield. The underlying bedrocks are sedimentary limestones, mostly of the Black River Group.

## SUBSURFACE CONDITIONS

### General

The parent subsoil at the site, encountered beneath a layer of topsoil up to 1 foot thick, consists of a 9 foot thick stratum of compact to dense uniform fine sand followed by a 5 to 10 foot thick deposit of very dense gravelly sand. According to available local geological information, the overburden is underlain by limestone bedrock. At the shoulder of Hwy. 7, well compacted fill material (sand and gravel with some silt and clay) was encountered. Detailed descriptions of various soil types encountered in each borehole are given on the Record of Borehole Sheets. Locations and elevations of the boreholes, together with a stratigraphical profile as inferred from the borehole data is shown on Drawing No. 9217501-A.

From ground level downwards, the various soil types encountered are as follows.

### Fill

In one location beneath the shoulder of Hwy. 7, fill material up to 4 feet thick was encountered. The composition of the fill material is sand and gravel with some silt and clay. Based on the Standard Penetration Test 'N' values, 13 and 17 blows per foot, it is inferred that the fill material is well compacted.

### Uniform Fine Sand

At the west end of the retaining wall beneath a 1 foot thick layer of topsoil the surficial deposit is a 9 foot thick stratum of uniform fine sand. Based on Standard Penetration Test 'N' values which vary from 6 to 34 blows per foot generally increasing with depth, the relative density of the surficial fine sand stratum is estimated to be compact to dense.

### Gravelly Sand

Immediately below the fine sand or below the fill material of the existing Hwy. 7 is a 5 to 10 foot thick stratum of grey gravelly sand. The Standard Penetration Test gave 'N' values ranging from 63 blows per foot to over 50 blows for 1 inch. Based on these values it is estimated that the relative density of the sand and gravel stratum is very dense.

### Bedrock

Bedrock was not proven but according to available geological information in this area the underlying bedrock is a limestone of the Black River Formation. Bedrock surface at the site is inferred to exist at the elevations where augering met refusal. Based on this assumption the bedrock surface was found to vary from elevation 677 to 685 which corresponds to depths ranging from 9 to 19 feet below existing ground surface.

### Groundwater Conditions

Groundwater observations were made at the time of the field investigation by measuring water level in the open boreholes. At the time of the investigation groundwater seepage was not encountered in B.H. 2 and the hole was found to be in a generally dry condition. In B.H. 1 the groundwater was found to be some 16 feet below existing ground surface which corresponds to elevation 680.



## DISCUSSION AND RECOMMENDATIONS

### General

It is proposed to reconstruct Hwy. 7 connecting link in the Village of Havelock. No alignment changes are proposed. The existing retaining walls between Sta. 252+53 to Sta. 253+75 left of centreline are in poor condition and it is proposed to construct new walls during the reconstruction of the connecting link. In a memorandum dated March 3, 1977 Mr. G.C. Burkhardt, Head, Structural Section, requested the Soil Mechanics Section to carry out a foundation investigation to establish the carrying capacity of the soil for the design of the retaining walls.

The proposed retaining walls will be in the order of 6 feet high and a total length of some 85 feet.

The following recommendations pertain to the design and construction of the retaining walls.

### Retaining Wall Foundations

The proposed retaining walls can be supported on spread footings. A minimum cover of 5 feet should be provided to the underside of the footings in order to provide adequate frost protection. The grade of Hwy. 7 will be at approximate elevation 695 and taking into account sufficient frost cover, the footing base should be at elevation 690. The subsurface conditions are such that the fine sand or gravelly sand will provide adequate support for the spread footings. Footings located at or below elevation 690 can be designed using an allowable bearing pressure of 3.0 t.s.f. The anticipated settlements for the footings of the retaining wall should not exceed 1 inch.

No dewatering problems are anticipated since the footings are located above the prevailing groundwater table. Any surface run-off into the footing excavations can be removed by pumping from sumps.

For estimating the earth pressure on the retaining wall a coefficient of active earth pressure of  $K_a=0.33$  may be used if some movement at the top of the wall is permitted, whereas if no movement at the top of the wall is anticipated, a coefficient of earth pressure at rest  $K_o=0.5$  may be used for design purposes.

To estimate the horizontal resistance to sliding between rough concrete and the granular subsoil, a coefficient of friction of 0.6 may be used.

Furthermore, to prevent the build up of hydrostatic pressures behind the abutment wall, free draining granular material should be used for backfill behind the wall as per current M.T.C. Standards.

Alternatively, a bin type wall may be considered for this location if property restrictions permit. The Soil Mechanics Section would provide the necessary recommendations if it is decided to proceed with this alternative.

#### MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of Mr. M. MacLean, Project Engineer. The equipment used was owned and operated by Master Soils Investigation Ltd.

This report was written by Mr. M. MacLean and reviewed by Mr. M. Devata, Supervising Engineer.

*M. MacLean*

M. MacLean, P. Eng.  
Project Engineer



*M. Devata*

M. Devata, P. Eng.  
Supervising Engineer

MD/MM/gs  
April, 1977

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 921-75-01 LOCATION Sta 252 + 42 30' Lt. C/L Hwy 7 ORIGINATED BY MM  
 DIST 7 HWY 7 BORING DATE March 15, 1977 COMPILED BY MM  
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Augers CHECKED BY C.F.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$			UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	$w_p$	$w$	$w_L$		
696.1	Topsoil	~	1	SS	10	690										
1.0	Uniform	...	2	SS	6											
	Fine sand	...	3	SS	11											
	Brown	...	4	SS	34											
686.6	Compact to Dense	...	5	SS	50/1"	680										
9.5	Gravelly Sand	...	6	SS	63											
	Grey	...	7	SS	50/4"											
	Very Dense	...	8	SS	50/10"											
676.5	End of Borehole	///				680.1										
19.0	Refusal to Augering															
	Probable Bedrock															

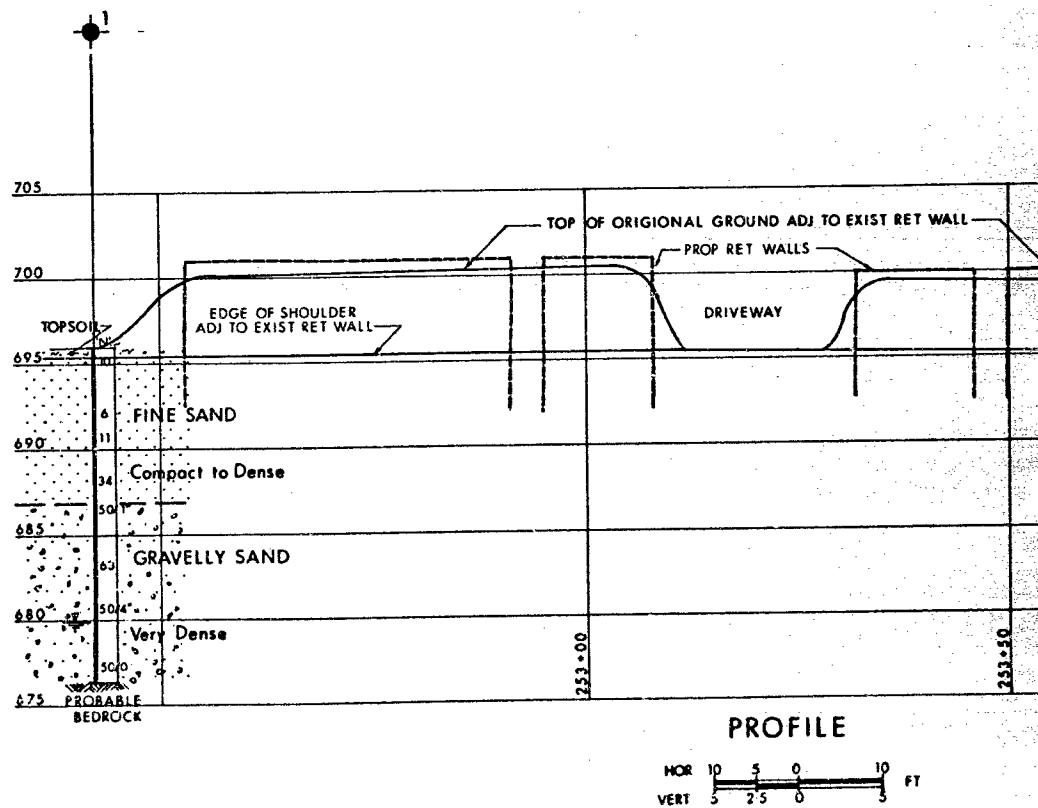
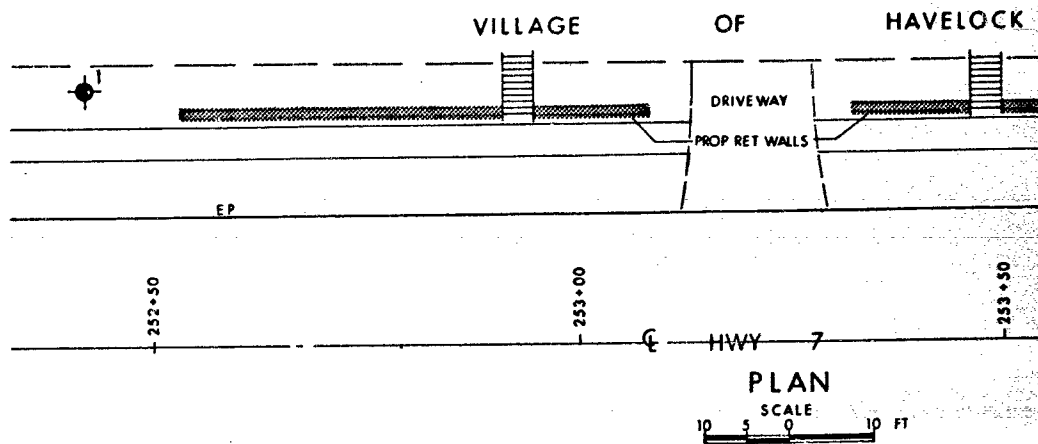
OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 921-75-01 LOCATION Sta 253 + 87 17' It. C/L. Hwy 7 ORIGINATED BY MM  
 DIST 7 HWY 7 BORING DATE March 15, 1977 COMPILED BY MM  
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Augers CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT $W_L$ PLASTIC LIMIT $W_P$ WATER CONTENT $W$ $W_P$ — $W$ — $W_L$ WATER CONTENT %	UNIT WEIGHT $\gamma$	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100			
694.3	Fill Sand & Gravel trace of silt and clay		1	SS	13							10		GR SA SI CL
690.3			2	SS	17									28 56 (16)
4.0	Gravelly sand Grey		3	SS	61									
685.3	Very Dense		4	SS	72									37 49 (14)
9.0	End of Borehole Refusal to Augering Probable Bedrock		5	SS	2570"									
	Note: Ground Water was not encountered													



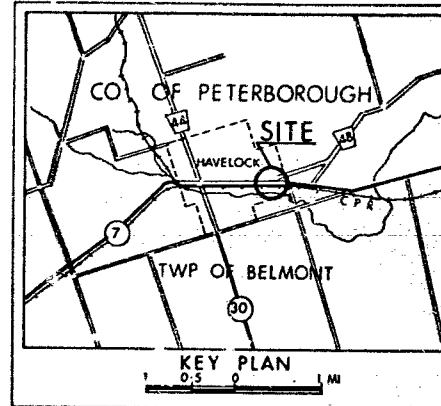
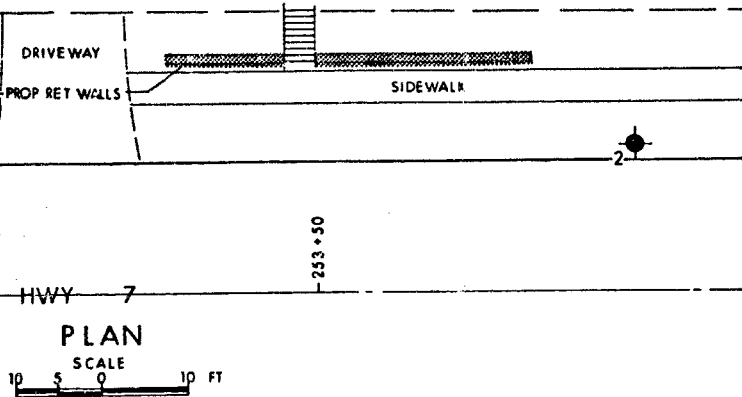
CONT No  
WP No 921-75-01



RETAINING WALLS  
VILLAGE OF HAVELOCK  
BORE HOLE LOCATIONS & SOIL STRATA

SHEET

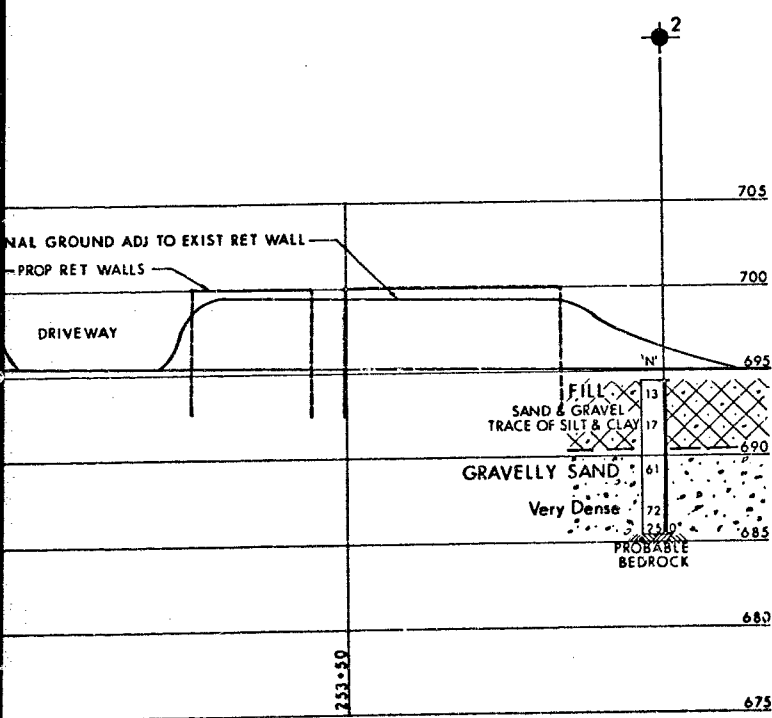
OF HAVELOCK



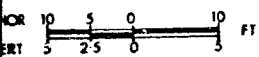
LEGEND

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊕ Bore Hole & Cone
- "N" Blows/ft (Std Pen Test 350 ft lbs energy)
- CONC Blows/ft (60° Cone, 350 ft lbs energy)
- W/L at time of investigation MAR 1977  
NO WL established BH No 2

No	ELEVATION	STATION	OFFSET
1	696.1	252+42	30' LT
2	694.3	253+87	17' LT



PROFILE



GEOGRES NO 31C-133

-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

DATE 30 MAR 1977  
DRAWN BY  
CHECKED BY  
DATE 30 MAR 1977  
DRAWN BY  
CHECKED BY