

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: July 7, 1995

TO: George McLeod  
District Chief Construction & Materials Engineer  
Transportation District #6

FROM: Jan G. Kinar *Jan G. Kinar*  
Geotechnical Engineer

SUBJECT: Site Investigation Report  
Project I.D. 7600-05-01  
M.S.E. RW-17-XX  
USH 12 & STH 29  
City of Menomonie  
Dunn County

Attached is the Site Investigation Report for the above project.

JGK:\dunn2  
Attachments

cc: District 6 (orig. +3)  
C.O. Bridge (2)  
C.O. Files  
C.O. Design  
J.E. Haverberg  
Geotechnical File

# **SITE INVESTIGATION REPORT**

**Project I.D. 7600-05-01**

**M.S.E. RW-17-XX**

**USH 12 & STH 29**

**City of Menomonie**

**Dunn County**

## **1. GENERAL**

The location of a proposed retaining wall is on USH 12 and STH 29 on the north side of its intersection with 22nd Street. The mechanically stabilized earth wall will vary in height from 5 to 11 feet, and will be approximately 175 feet long. A median is being added to the existing four lane roadway. The new roadway will be approximately 1.5 to 2 feet higher at the location of the retaining wall.

Topography consists of flat terrain, and there are several commercial businesses and a frontage road in the area. Surface soils consist of sandy silts.

## **2. SUBSURFACE CONDITION**

Three borings conforming to AASHTO T-206, Standard Penetration Test, were made to determine subsurface conditions at the site. Soil textures in the borings logs are field identifications made by the drillers and were later verified in the C.O. Geotechnical Lab.

Typically, the soil borings consisted of a medium to coarse sand with a trace of gravel and silt *over* alternating layers of loose silt or sand with firmer sand *over* a firm silt and sandstone. The distance from the ground's surface to the sandstone increased as one travels east at the site. For example, at Station 30+00 the sandstone is located 65 feet from the ground's surface and at Station 31+50, it is located 100 feet from the ground's surface. At the time of drilling in November 1994 and January 1995, the elevation of groundwater was 865±. The borings are summarized below:

Structure RW-17-XX Water Elevation 865±								
B#1: Station 30+00 - 55' LT of Existing Centerline			B#3: Station 30+75 - 55' LT of Existing Centerline			B#2: Station 31+50 - 55' LT of Existing Centerline		
Elev	Soil Description	Blow Count	Elev	Soil Description	Blow Count	Elev	Soil Description	Blow Count
885.2-865	M/C Sand; Tr Gravel & Silt	12	882.3-862	Firm Br Sand; Tr Gravel & Silt	12	881.1-851	Firm Br Sand; Tr Gravel & Silt	20
865-840	Loose Sand; Tr Silt	8	862-840	Loose Br Silt; Tr Sand	9	851-846	Loose Br Silt	8
840-820	Firm Fine Gr/Br Sand; Tr Silt	15	840-812	Firm Br Sand; Little Silt	15	846-801	Br/Gr'n-Br/Grey Fine Sand; Tr Silt	22
820-805	V. Dense Shaley Sandstone (EOB#1)	160/6"@820 100/1"@810	812-806	Firm Silt	13	801-779	Firm Dark Grey Silt	32
			806-797	Loose Shaley Weathered Sandstone	9	779-776	V. Dense Br Sandstone (EOB #2)	60/1"
			797-792	V. Dense Br Sandstone (EOB#3)	75/1"			

### 3. ANALYSIS

Analysis Assumptions: Several analyses including sliding, overturning, bearing capacity, and global stability, were made of the proposed mechanically stabilized earth wall to ensure external wall stability at heights of 6 and 11 feet. The analyses included the following assumptions:

- the backslope behind the wall is level,
- the minimum length of the reinforcing strips is 0.7 times the height of the wall or 6 feet, whichever is greater,
- minimum depth of wall embedment is 2 feet, and
- clean granular backfill is used behind the wall.

Backfill Behind the M.S.E. Wall: With proper drainage and compaction, the backfill behind the wall will exert an equivalent fluid pressure of 35-40 psf. Other design parameters for this soil are: unit weight of 115 pcf; friction angle of 31 degrees; and a cohesion of 0 psf.

Foundation Soils: Design parameters for the foundation soils are provided in the table below, and should be included in the plans.

Design Parameters for Foundation Soils M.S.E. Wall RW-17-XX				
Soil Description	Unit Weight (pcf)	Friction Angle (degrees)	Soil Cohesion (psf)	Allowable Bearing Capacity (psf)
M/C Sand; Trace of Gravel & Silt	110	31	0	4000
Loose Silt	105	28	0	2000
Firm Sand; Trace of Silt	115	31	0	4000

Excessive or differential settlement of the wall is not anticipated.

#### 4. ASSESSMENT OF PRACTICAL WALL SYSTEMS

The Specialized Expertise Section of the C.O. Design Office indicated that a mechanically stabilized earth wall was proposed for this site, and hence our analyses were done for a M.S.E. wall system. If a different wall system is later selected for this site, the Geotechnical Section should be notified so that the appropriate analyses can be made at that time.

#### 5. RECOMMENDATIONS

The wall stability factors shown in the table below should be provided as part of the plan documents. They satisfy the Department's norms for external stability safety factors.

Calculated Factors of Safety for Mechanically Stabilized Earth Wall (wall base width equals 0.7*wall height)	
Criteria	F.S.
Sliding (F.S. $\geq 1.5$ )	2.1
Overturning (F.S. $\geq 2.0$ )	3.6
Bearing Capacity (F.S. $\geq 2.5$ )	3.0
Global Stability (F.S. $\geq 1.3$ )	1.5

No soil remediation measures are necessary for the in-situ soils. If it has not already been considered, a fence should be added on top of the wall for safety reasons. If you have any questions, please contact the Geotechnical Unit.

JGK:\dunn2

Retaining Wall/Culvert, USH 12/STH 29 City of Menomonee, 21st St. - CTH E, Dunn County

VERTICAL SCALE : F. 20

50'-1

50'-3

50'-2

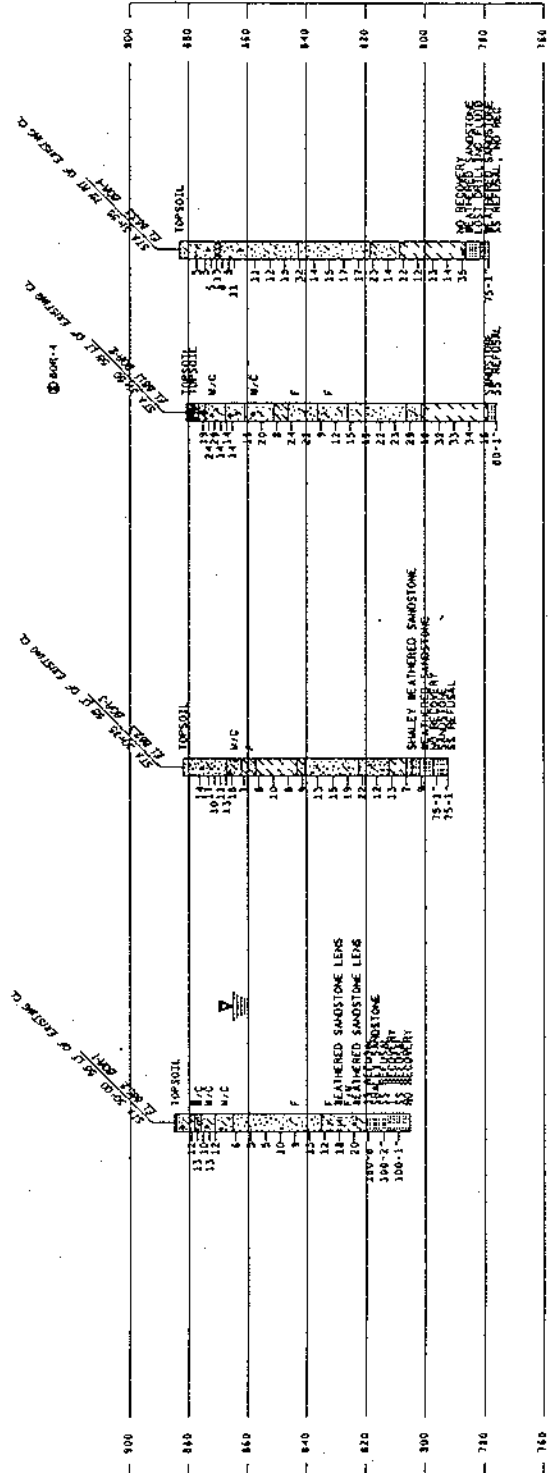
USH 12/STH 29 EXISTING E

31-50

31-00

30-50

30-00



STATE PROJECT NUMBER		SHEET NO.	
F—Fine M—Medium Co—Coarse		C—Coarse S—Sand	
MATERIAL SYMBOLS		MATERIAL SYMBOLS	
Topsoil		Silt	
Sand		Peat	
Gravel		Clay	
Limestone		Igneous Rock	
LEGEND OF PROBING		LEGEND OF BORING	
95/8-95 Blows for 8' Elevation		Unconfined Strength—7.7	
Probing taken with a 358" Wt. Falling 18" on a 2" D.O. Point.		Blows Per Ft. Using 110" Wt. Falling 30"	
Refusal 95/8		Sandy Gravel	
LEGEND OF BORING		Boulders or Cobbles	
Shelly Tills—S.L.		Sand	
Drilled Water Elevation		Silty Clay	
No Ground Water Observed Above This Elevation		Limestone	
Unless otherwise specified the blow per foot at the locations indicated are based on driving a 2" O.D. x 1.1" I.D. split spoon sampler with a 140 lb hammer having a free fall of 30". The blow count is taken in undisturbed soil immediately below a sand or silt hole eliminating side friction on the drive pipe.		SUBSURFACE EXPLORATION FOR FOUNDATION DESIGN AND BIDDING INFORMATION	
To obtain relative data concerning the character of material in and upon which the foundation rests, borings were made at the locations indicated on this drawing. The data are presented herein to represent the findings of the subsurface exploration made. However, because the depths investigated are limited and the area of the borings and soil samples is very small in relation to the entire area, the Division of Highways does not warrant opinions as to the depths investigated or that the classification of material encountered in these investigations is representative of the entire site.		DESIGN AND BIDDING INFORMATION	
To obtain relative data concerning the character of material in and upon which the foundation rests, borings were made at the locations indicated on this drawing. The data are presented herein to represent the findings of the subsurface exploration made. However, because the depths investigated are limited and the area of the borings and soil samples is very small in relation to the entire area, the Division of Highways does not warrant opinions as to the depths investigated or that the classification of material encountered in these investigations is representative of the entire site.		DESIGN AND BIDDING INFORMATION	
NO. DATE		REVISION	
1		1	
STATE OF WISCONSIN		DIVISION OF HIGHWAYS	
STRUCTURE RW-17, C-17-35		SHEET 1 OF 1	
DATE: 1946		BY: TJC	
SUBSURFACE EXPLORATION		X	

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure Retaining Wall County Dunn Sheet 1 of 2  
 Project 7605-05-01 Road STH 29 City of Menomonie  
 Station 30+00 Offset \_\_\_\_\_ Surface Elevation 885.2

While drilling 20' Time after drilling 1 Day 2 Days  
 Before casing removal \_\_\_\_\_ Depth to water 20.1 20.1  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE  
 D = Damp  
 M = Moist  
 W = Wet  
 HS = Hollowstem  
 WA = Washhead  
 RB = Rockbit  
 DRILLING METHOD  
 ST = Shelby tube  
 SS = Split spoon  
 DM = Drilling mud  
 A = Auger  
 C = Coring  
 W = Wash  
 E = Easy  
 M = Medium  
 H = Hard  
 Start 11-11-94 Unit 3  
 Finish 11-14-94 Chief Horzeman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
					<u>1st sandy TOP SOIL</u>					
					<u>Br. SAND tr gravel + silt</u>					<u>HS</u>
1	D	6	6		<u>Firm Br med SAND tr silt</u>					<u>Cont</u>
2	D	7	6		<u>Firm med-coarse SAND</u>					
		7	7		<u>little gravel tr silt</u>					
3	D	5	4		<u>Firm Br. med-coarse SAND</u>					
		6	6		<u>tr gravel + silt</u>					
4	D	4	5							
		8	11							
5	M	4	6		<u>Firm Br. med-coarse SAND</u>					
		6	11		<u>little gravel tr silt</u>					
6	W	1	2		<u>V. loose-loose Br. SAND</u>					
		1	5		<u>tr silt</u>					
7	W	2	2							
		3	4							
8	W	2	2							
		3	5							
9	W	3	5							
		5	7							
10	W	3	4							
		5	5							

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 1

FIELD BORING LOG










EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure Retaining Wall County Dunn Sheet 2 of 4  
 Project 7605-05-01 Road STH 29 City of Menomonie  
 Station 30+00 Offset \_\_\_\_\_ Surface Elevation 885.2

While drilling 20' Time after drilling 1 Day 2 Days  
 Before casing removal \_\_\_\_\_ Depth to water 20.1' 20.1'  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE D = Damp M = Moist W = Wet  
 HS = Hollowstem WA = Washhead RB = Rockbit  
 DRILLING METHOD ST = Shelby tube SS = Split spoon DM = Drilling mud  
 A = Auger C = Coring W = Wash  
 E = Easy M = Medium H = Hard  
 Start 11-11-94 Unit 3  
 Finish 11-14-94 Chief Anderson

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size		
10	W	3 5	4 5		Loose - Firm fine Br. SAND little silt						HS SS
11	W	4 8	5 10		FIRM						
12	W	7 8	4 9		FIRM FINE GREENISH BRN SAND TR. SILT						
13	W	4 10	8 12		FIRM FINE GREENISH BRN SAND w/ WEATHERED SANDSTONE LENS TR. SILT						
14	W	4 10	10 9		FIRM FINE-MED GREENISH SAND w/ LENS of REDDISH BRN WEATHERED SANDSTONE - some SILT						
15	D	140/6"			SS REFUSAL SHALEY SANDSTONE VERY DENSE						
16	D	100/2"			SS-REFUSAL 1" RECOVERY SHALEY VERY DENSE SANDSTONE						
17		100/1"			SS-REFUSAL No Recovery						
					E.O.B						

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 1



# FIELD BORING LOG

C-17-35 and  
 Boring No. 2 Structure Retaining Wall County Dunn Sheet 1 of 3  
 Project 7605-05-01 Road STH 29 City of Menomonie  
 Station 31750 Offset 55' Lt Existing E Surface Elevation 881.1

## GROUND WATER OBSERVATIONS

While drilling \_\_\_\_\_ Time after drilling \_\_\_\_\_  
 Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_  
 After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
 Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

### MOISTURE

D = Damp  
 M = Moist  
 W = Wet

HS = Hollowstem  
 WA = Washhead  
 RB = Rockbit

### DRILLING METHOD

ST = Shelby tube  
 SS = Split spoon  
 DM = Drilling mud

A = Auger  
 C = Coring  
 W = Wash

E = Easy  
 M = Medium  
 H = Hard

Start 11-16-94 Unit 3

Finish 11-17-94 Chief Horsbman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing	Probe	Size	
					Loose Br. sandy TOPS 0.12						A
					Loose Br. silty SAND 1.2% gravel						HS
					Br TOPS 0.12						
					Loose Br. SAND some gravel to silt						
1	M	2	10		Firm Br. SAND 1.2% gravel to silt	5					Cont
		9	10								S.P.
2	M	8	11		Firm Br. SAND to gravel to silt						
		13	15		(med-coarse)						
3	M	20	18			10					
		11	9								
4	M	8	7								
		7	10								
5	M	6	7		Firm Br. SAND 1.2% gravel to silt	15					
		7	8								
6	M	5	6								WB
		8	8								RB
											revert
7	W	9	10		Firm Br. med-coarse SAND to gravel to silt	20					
		9	9								
8	W	9	10			25					
		10	11								
9	W	4	3		Loose Br. SILT	30					
		5	5								
10	W	8	12		Firm Br. fine SAND to silt	35					
		12	16								
11	W	9	10			40					
		11	13								

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 2

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure Retaining Wall County Dunn Sheet 2 of 3

Project 7605-05-01 Road STH 29 City of Menomonie

Station 31+50 Offset 55' Lt Existing & Surface Elevation 881.1

GROUND WATER OBSERVATIONS

While drilling \_\_\_\_\_ Time after drilling \_\_\_\_\_

Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_

After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_

Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE  
D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Washahead  
RB = Rockbit

ST = Shelby tube  
SS = Split spoon  
DM = Drilling mud

A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start 11-16-94 Unit 3  
Finish 11-17-94 Chief Horszeman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
11	W	9	10	40	Firm Br fine SAND to silt					WA RB relogs
		11	13							
12	W	5	3	45	Loose Br fine SAND some silt					
		6	5							
13	W	5	6	50	Firm					
		6	8							
14	W	5	6	55	Firm Greenish Br SAND to silt					
		9	9							
15	W	6	7	60	Firm					
		8	10							
16	W	8	10	65						
		12	14							
17	W	9	11	70						
		12	15							
18	W	10	13	75	Firm-Dense Grey SAND to silt					
		16	18							
19	W	5	4	80	Firm Dk grey SILT					
		6	6							

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 2

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Checked by	Final	Boring No.
		2

## FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 3 Structure Retaining Wall County Dunn Sheet Lot 3Project 7605-05-01 Road STH 29Station 30+75 Offset 55' Lt Existing Surface Elevation 882.3While drilling Used Revert GROUND WATER OBSERVATIONS

Before casing removal \_\_\_\_\_ Time after drilling \_\_\_\_\_

After Boring Completed \_\_\_\_\_ Depth to water \_\_\_\_\_

Cave In \_\_\_\_\_ Depth to cave-in \_\_\_\_\_

Water Notes \_\_\_\_\_

## MOISTURE

D = Damp  
M = Moist  
W = WetHS = Hollowstem  
WA = Washahead  
RB = RockbitST = Shelby tube  
SS = Split spoon  
DM = Drilling mud

## DRILLING METHOD

A = Auger  
C = Coring  
W = WashE = Easy  
M = Medium  
H = HardStart 1-9-95 Unit 3Finish \_\_\_\_\_ Chief Horsman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
					<u>3170 P.S. 01</u>					
					<u>Fine Br. SAND</u> tr gravel & silt					<u>HS</u>
1	M	6	7							
		7	8							
2	M	7	8							<u>cont</u>
		9	8							<u>SS</u>
3	M	2	5							
		5	6							
4	M	4	5							
		6	6							
5	M	5	6							
		7	8		<u>Firm Br. med-coarse SAND</u>					
6	M	8	9		<u>little gravel tr silt</u>					
		9	10							<u>Ad</u>
7	W	4	3							<u>WA</u>
		4	5		<u>Loose Br. SILT</u> tr fine sand					<u>BR</u>
										<u>revert</u>
8	W	4	4							
		4	5		<u>Loose Br. SILT</u>					
9	W	4	4							
		6	7							
10	W	4	4							
		4	5							
11	W	4	4							
		5	5		<u>Loose Br. SILT</u> tr sand					

Checked by \_\_\_\_\_

Final \_\_\_\_\_

Boring No. 3

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 3 Structure Retaining Wall County Dunn Sheet 2 of 3

Project 7605-05-01 Road STH 29

Station 30 + 75 Offset 55' 28' Existing E Surface Elevation 882.3

GROUND WATER OBSERVATIONS

While drilling \_\_\_\_\_ Time after drilling \_\_\_\_\_  
Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_  
After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_  
Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE  
D = Damp  
M = Moist  
W = Wet

DRILLING METHOD  
HS = Hollowstem  
WA = Washhead  
RB = Rockbit  
ST = Shelby tube  
SS = Split spoon  
DM = Drilling mud  
A = Auger  
C = Coring  
W = Wash  
E = Easy  
M = Medium  
H = Hard

Start 1-9-95 Unit 3  
Finish \_\_\_\_\_ Chief Horstman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on			Drilling Method
		0/6	6/12					Casing Size	Probe Size		
11	W	4	4	10	Loose Br. SILT to sand	40					WA
		5	5	10	Firm Br. SAND little silt						RB
12	W	5	6	45		45					
		7	8								
13	W	6	7	50		50					
		8	10								
14	W	9	9	55		55					
		10	11								
15	W	8	10	60	Firm Greenish Br SAND	60					
		12	14		tr silt						
16	W	5	5	65		65					
		7	10								
17	W	5	6	70	Firm Dk grey SILT	70					
		7	10								
18	W	4	4	75		75					
		3	4		loose shaly weathered SAND STONE						
19	W	5	5	80		80					
		4	5		loose Br. weathered SAND STONE						

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 3



