

DATE: October 2, 1990

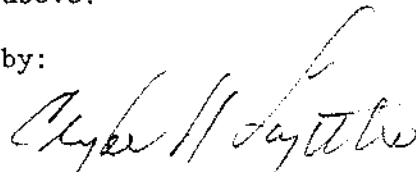
TO: Thomas Carlson, P.E., Director
Transportation District 6
Attention: George McLeod, P.E.
District Chief Construction and
Materials Engineer

FROM: Stephen F. Shober, P.E.
State Materials Engineer for Highways

SUBJECT: Materials
Soils
Site Investigation Report
Project I.D. 8631-02-00
STH 170 over Tiffany Creek
Boyceville to Downing Road
Structure 13-17
Dunn County

We are attaching copies of our Site Investigation Report for the project noted above.

by:



Clyde N. Laughter, P.E.
Chief Soils Engineer

CNL:t00059

cc: District 6 (original plus 3)
Bridge (2)
C.O. Design
SFS
C.O. File
Soils File✓

Site Investigation Report
Project I.D. 8631-02-00
STH 170 over Tiffany Creek
Boyceville to Downing Road
Structure 13-17
Dunn County

1. General.

The existing 3-span steel beam/concrete deck bridge carrying STH 170, station 11±, over Tiffany Creek is to be replaced by a wider 2 span structure. The existing bridge is supported on treated timber piles and the abutments have treated timber back walls. The abutment piles have jack braces fastened into the deck beams.

The existing fills are about 7 feet high at the north bridge and 5 at the south. No grade change is anticipated. There is boulder type riprap along the creek banks.

At the time of drilling, September 1990, the meandering creek was about 10 feet wide and 2± feet deep with sand and boulders in the stream bed.

The site is in a farmed valley surrounded by gently rolling wooded hills. The areas adjacent to the creek banks appear marshy with willows and cattails.

2. Subsurface Condition.

Three borings were made on the site in essential conformance to AASHTO Method T-206, Standard Penetration Test. The tests were conducted to evaluate relative soil density, fix presumptive bearing capacity, determination factors for pile type selection and pile support characteristics, review potential for alternate foundation schemes, and recover samples for soil textural identification. Soil textures noted in the drilling logs are driller's field identification with a followup check in the Central Soils Office.

Borings 1 and 2 were made from the existing roadway, elevation 987±.

The upper 5 to 8 feet reflected fill materials of loose sands or silty sands. Below this the soils were predominately firm sands or sands and gravel down to elevation 915±. However in this elevation 981± to 915± zone, isolated rather thick loose pockets were noted as in Boring 1 from elevation 954± to 944±. Below elevation 915± down to 894± the soils were predominately high firm to dense sands or sands and gravel. Dense sandstone was logged at elevation 894±.

Boring 3 was made for the proposed center pier with drill collar on the existing bridge at an elevation of 987.6. There was about 8.5 feet of air and 1± foot of water down to stream bed, elevation 978±. Below this black peat with a little fiber was logged to elevation 971± where firm sand was encountered. Below this Boring 3 somewhat mirrored Boring 1 and 2.

At the time of drilling the ground water elevation was 977± which approximated creek level.

3. Bearing Capacity.

The soft peats at the center pier location preclude any consideration for spread footings for this unit. The bearing capacity for abutments founded below elevation 977 is 2500psf. With this relatively low bearing and mandatory piles at the center pier, spread footings are not an attractive option.

4. Piles.

The table below can be used to estimate pile lengths.

<u>Structure</u>	<u>Elevation</u>	<u>Pile Skin Friction</u>	<u>End Bearing. psf</u>	
Units		(psf) (SF-2)	(Displ. Piles)	(A-Ales)
Abutments	Surface to 915±	400*	35,000	18,000
	915± to bedrock	8100#	120,000	75,000
	Bedrock	_____	Refusal	1-2 ft. penetration
Pier	Creekbed to 978±	_____	_____	_____
	978± to 915±	300*	28,000	15,000
	915± to bedrock	700*	62,000	35,000
	Bedrock	_____	Refusal	1-2 ft. penetration

* Increase 25% for treated timber.

5. Alternate Foundation Type.

For a relatively modest structure, the mobilization costs of \$4-6,000 for any of the common alternative foundations (largely proprietary) negate any value incentives.

6. Lateral Earth Pressure.

Specification Granular Backfill will create an active lateral earth pressure of 30-33psf on abutment backwalls or other retaining structures. At the same time relatively clean sands locally available will generate 33psf. Both materials must be adequately compacted and thoroughly drained for these values. Although there is no obvious reason to use either silts or clay, if used the minimum force is 55 and 85psf respectively and the actual pressures will be greater.

If drainage is not accomplished, the minimum pressure must be 63psf.

7. Construction Problems.

No unusual or different foundation construction problems are foreseen.

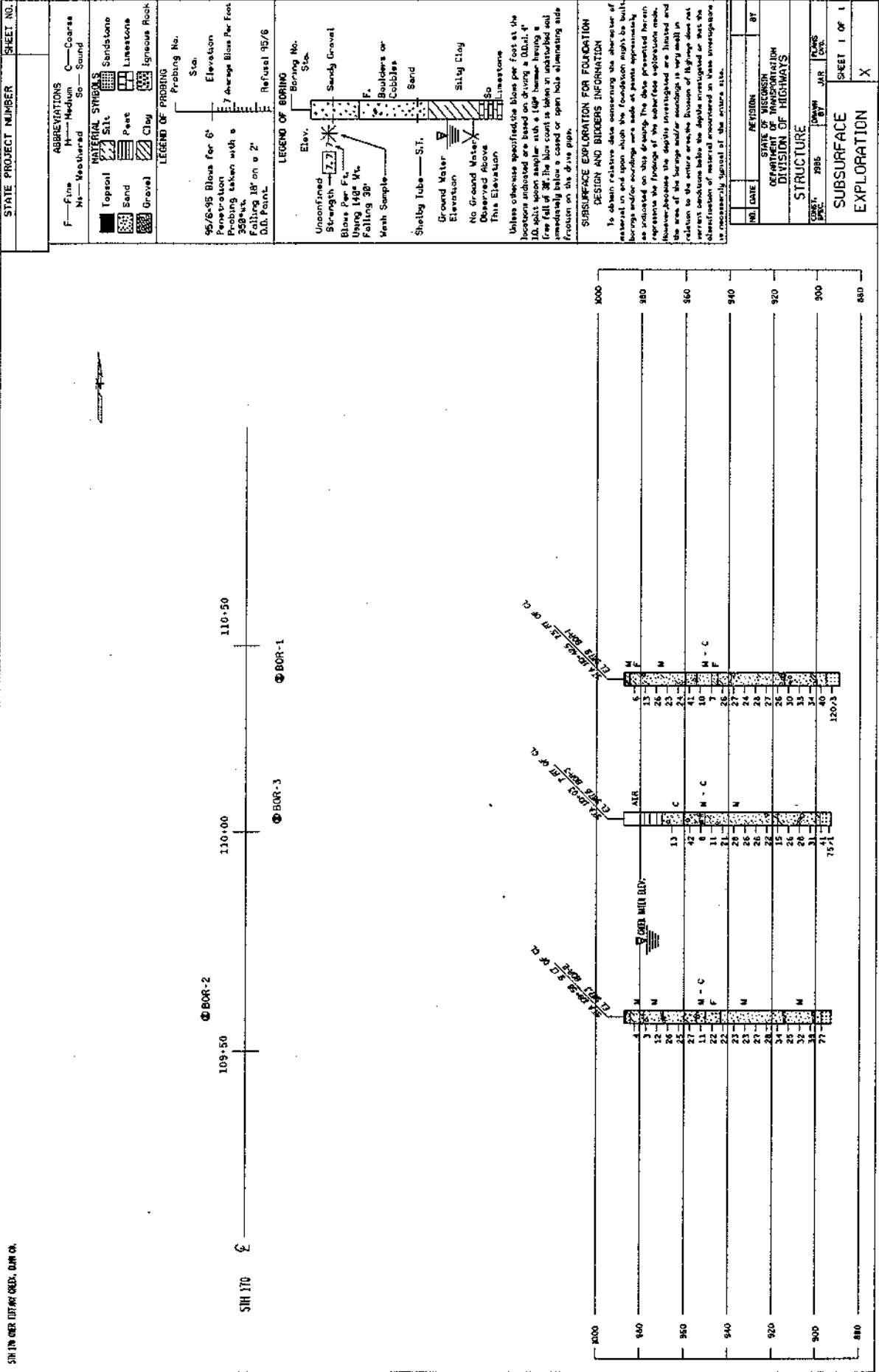
8. Recommendations.

Piles are the obvious foundation units for this job. Steel H-piles will drive to lengths that probably are not cost effective with refusal 1 to 3 feet into bedrock.

Either treated timber driven to 36 ton/pile or 10 3/4" CIP concrete piles driven to 55 ton/pile will work well. The support values in 4. Piles above should be used to estimate lengths.

There may be some inequality of lengths for sticks in close proximity to each other. Overdriving should be avoided.

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FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure Tiffany Creek County Dunn Sheet 1 of 3

Project 8631-02-00 Road STN. 170

Station	110 + 42.5	Offset	7.5' Rt' \angle	Surface Elevation	987.9
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Water Elev. 976.8

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	DRILLING METHOD	Start	9/11/80	Unit	III
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D = Damp	HS = Hollowstem	ST = Shelby tube	A = Auger	E = Easy
M = Moist	WA = Washahead	SS = Split spoon	C = Coring	M = Medium
W = Wet	RB = Rockbit	DM = Drilling mud	W = Wash	H = Hard

Finish - Chief Meyers

No.	Blows on	and	ed	Blows on

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	
					Asphalt Gravel.					A
					Br. med. SAND - Tr. silt					
					Loose Br. silty Fine SAND					
1	W	3	3					2		
		4						3		
								8		
								11		
								21		
								27		
2	W	6	7		Firm Br. med. SAND - Tr. Gravel. Tr. silt			18		R.R. Ahead Rev.
		8								
3	W	12	14							
		12								
4	W	12	11							
		12								
5	W	11	13							
		13								
6	W	21	20		Dense Br. SAND - 1/3 GRAVEL - Tr. silt					
		14								
7	W	5	5		Loose Br. med. to coarse SAND					
		6								
8	W	3	4		Loose Br. Fine SAND - Tr. silt					
		9								

Checked by	Final	Boring No.
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Final

Boring No.

FIELD BORING LOG

EL3(S) 385

Box 17-14
State of Wisconsin/Department of Transportation

Boring No. 1 Structure Tiffany Care County Dunn Sheet 2 of 3
Project 8631-02-00 Road STH-170
Station 110+42.5 Offset 7.5' RT of E Surface Elevation 987.9

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 = 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 9/11/90 Unit III
Finish _____ Chief Meyers

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	
8	W	3	4	40'	Loose Br. Fine SAND - Tr. SILT							RB
		9										Revert
			8	45'	Fine Br. SAND - Little Gravel - layers							
9	W	13	13		Tr. SILT							
		15										
			9	50'								
10	W	13	14									
		14										
			8	55'								
11	W	12	12									
		13										
			10	60'								
12	W	12	16									
		14										
			10	65'								
13	W	13	14									
		17										
			9	70'								
14	W	12	14									
		12										
			12	75'	Hard layer of Gravel							
15	W	14	16		Fine to Dense Br. SAND -							
		21			with Gravel layers							
			12	80'								
16	W	14	19									
		23										

Checked by _____ Final _____ Boring No. 1

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure Tiffany Creek County Dunn Sheet 3 of 3

Project 8631-02-00 Road STH 178

Station 110+42.5' Offset 2.5' Rt of C Surface Elevation 987.9

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 2/11/90 Unit TIT
Finish 9/12/90 Chief Meyer

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	
16	W	14	19		80' Firm to Dense Br SAND - with layers of Gravel.					RB
		23								Ahead Revert
17	W	14	20		8' Dense.					
		23								
18	W	17	23		90' Dense					
		51								
19	W	120			Drilled. V. Hard. - white Sand. in wash water. no Recovery.					
					V. Dense - Sandstone					
					Drilled. to 98.5' V. Hard cut even.					
					98.5'					
					100'					
					205'					
					30' 0					
					35' 5					
					40' 20					

Checked by Final Boring No. 1

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure Tiffany Creek County Dunn Sheet 1 of 3

Project 8631-02-00 Road STH. 170

Station 109+58 Offset 9' LT Surface Elevation 987.9

GROUND WATER OBSERVATIONS

987.3

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
 H5 = 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 9/12/80 Unit III
 Finish _____ Chief Meyers

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 3"	Probe Size	
					Asphalt Gravel.					A
					Br. Sand. - Little silt					
1	M	1	2		Loose Br. SILT - Tr. Sand	5		3		W
		2	2					3		
								4		
								12		
								17		
2	W	2	2		V. loose grey med. SAND, tr. gravel	10		21		W
		1	1					12		RB
										Ahead
										Revert
3	W	7	7		Thin layer gravel	15				
		5	5		Firm					
4	W	11	12			20				
		14	14							
5	W	11	12			25				
		13	13							
6	W	12	13		Firm Br. SAND & GRAVEL tr. silt	30				
		14	11							
7	W	6	5		Firm Br. med-coarse SAND, tr. gravel	35				
		6	6							
8	W	9	10		Firm Br. Fine SAND	40				
		12	10							

Checked by _____ Final _____ Boring No. 2

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure Tiffany Creek County Dunn Sheet 2 of 3Project 8631-02-00 Road STH 170Station 109+58 Offset 9' L2 Surface Elevation 987.3

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 = WetHS = Hollowstem
WA = Washhead
RB = RockbitST = Shelby tube
SS = Split spoon
DM = Drilling mud

DRILLING METHOD

A = Auger
C = Coring
W = WashE = Easy
M = Medium
H = HardStart 9-12-90 Unit 3Finish _____ Chief Houston

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	
8	W	12	10	240	Firm Br. fine SAND					WA RB revert
9	W	8 12	10 13	245	Firm Br. Med SAND, - with layers of Fine Gravel.					
10	W	5 13	10 13	250						
11	W	10 12	11 12	255						
12	W	10 15	12 15	260						
13	W	17 13	15 13	265						
14	W	12 17	17 15	270	Dense. v. Hard layer of Gravel.					
15	W	13 14	12 12	275	Firm					
16	W	15 16	11 17	280	Dense.					

Checked by _____ Final _____ Boring No. 2

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 3 Structure TIFFANY CR. BRDG. County DUNN Sheet 2 of 3

Project 8631-02-00 Road S.T.H. 170

Station 110+03 Offset 7' R+P Surface Elevation 987.6

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

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

A = Auger
 C = Coring
 W = Wash

E = Easy
 M = Medium
 H = Hard

Start 9-20-90 Unit 3
 Finish _____ Chief Hartman

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	Size	
					<u>440</u> Firm Br. med SAND, tr of gravel + silt						WA
											RB
											Revert
<u>6</u>	<u>W</u>	<u>8</u>	<u>10</u>		<u>445</u> layer gravel						
		<u>11</u>	<u>13</u>								
<u>7</u>	<u>W</u>	<u>9</u>	<u>13</u>		<u>450</u> layer gravel						
		<u>15</u>	<u>15</u>								
<u>8</u>	<u>W</u>	<u>11</u>	<u>13</u>		<u>455</u>						
		<u>13</u>	<u>14</u>								
<u>9</u>	<u>W</u>	<u>10</u>	<u>13</u>		<u>460</u>						
		<u>13</u>	<u>14</u>								
<u>10</u>	<u>W</u>	<u>8</u>	<u>10</u>		<u>465</u>						
		<u>12</u>	<u>12</u>								
<u>11</u>	<u>W</u>	<u>6</u>	<u>6</u>		<u>470</u> Firm Br. SAND, w/ layers gravel, tr silt						
		<u>9</u>	<u>12</u>								
<u>12</u>	<u>W</u>	<u>9</u>	<u>12</u>		<u>475</u>						
		<u>14</u>	<u>17</u>								
<u>13</u>	<u>W</u>	<u>12</u>	<u>10</u>		<u>480</u>						
		<u>18</u>	<u>22</u>								

Checked by _____

Final _____

Boring No. 3

FIELD BORING LOG

BL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 3 Structure Tiffany Creek County Dunn Sheet 3 of 3Project 8631-02-00 Road STH 170Station 110+03 Offset 7' RT Surface Elevation 987.6

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 = WetHS = Hollowstem
WA = Washhead
RB = RockbitST = Shelby tube
SS = Split spoon
DM = Drilling mud

DRILLING METHOD

A = Auger
C = Coring
W = WashE = Easy
M = Medium
H = HardStart 9-20-90 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	Size	
					80 Firm Br. SAND w/ layers gravel, tr silt						WA RB revert
14	W	12 16	15 21		85 Dense						
15	M	11	30		90 Dense weathered SANDSTONE						
16	M	44 75	110 11		V. Dense SANDSTONE						H
					95 E.O.B 94.5						
					100						
					105						
					110						
					115						
					120						

Checked by _____ Final _____ Boring No. 3