

## **RECONSTRUCTION OF I-95 OVER WEST RIVER BRIDGE NO. 00163**

### **Micropile Recommendations for Pier 5**

The foundations for Bridge No 00163 over the West River in New Haven – West Haven were designed with 406 mm (16 in) square precast prestressed concrete piles. The Connecticut Department of Transportation Construction Department has requested that Pier 5 of the bridge be redesigned utilizing drilled micropiles instead of the precast prestressed concrete piles. They also requested that a one-for-one replacement of the piles be utilized to minimize the impact on the bridge design.

The subsurface conditions at Pier 5 are discussed in the December 2003 “Final Structure Soil and Rock Report, Bridge No. 00163 (Reconstruction of I-95 Over West River)” Three test borings P5-1 thru P5-3 were drilled at the location of this approximately 53.7 m (176 ft) long pier. The logs of these borings, as well as a subsurface profile for Pier 5 based on that report are attached. The report stated for Pier 5:

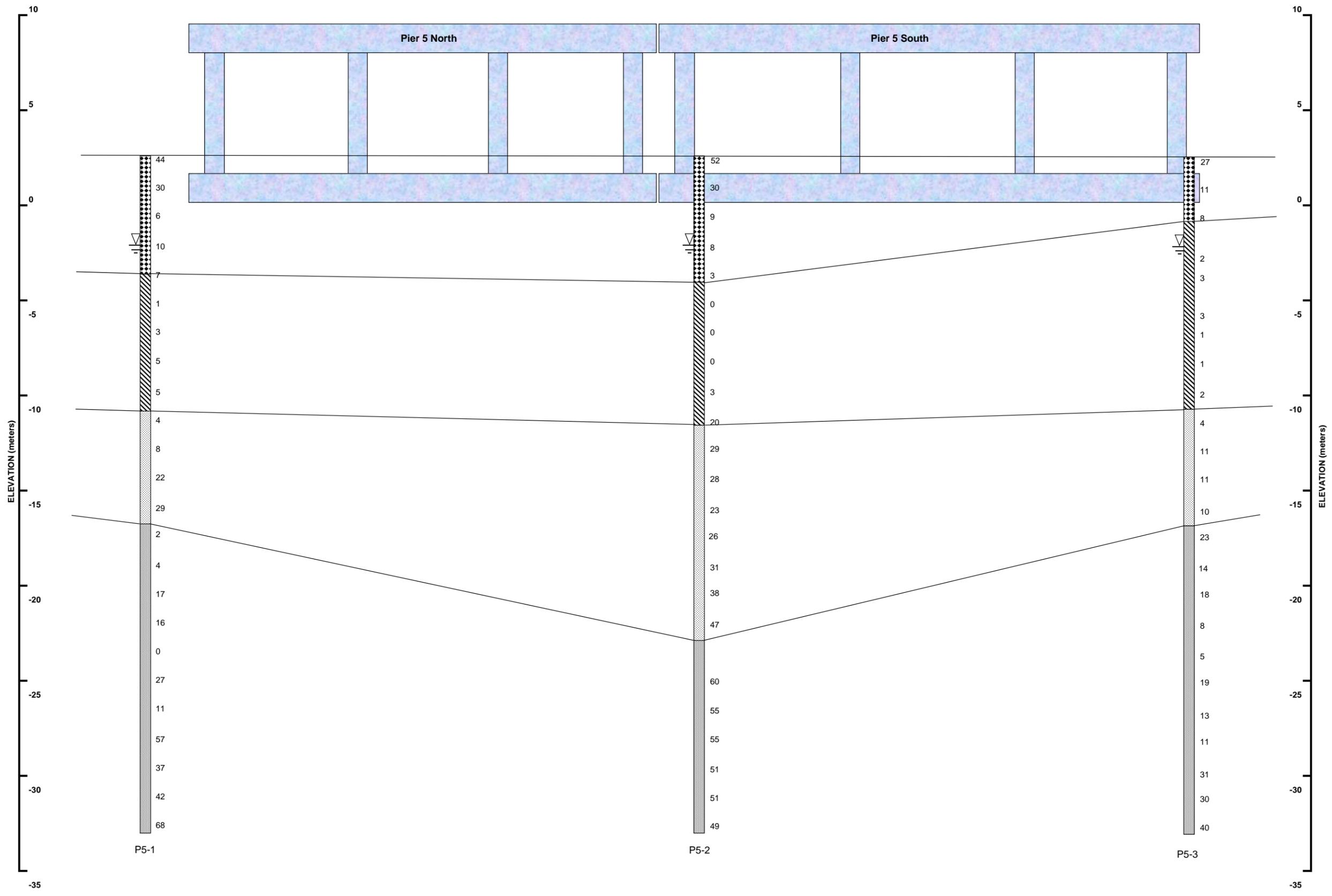
The ground surface at the Pier 5 borings, P5-1, P5-2 and P5-3 was approximately El 2.6 m (8.5 ft). Approximately 3.3 to 6.2 m (11 to 20.5 ft) of very loose to dense, generally medium dense brown to black fine sand with brick and concrete rubble fill overlay approximately 7 to 10 m (23 to 33 ft) of very soft to medium stiff, generally very soft to soft, gray organic silt. The bottom of the organic silt layer was between approximately at El –10.5 to –11.5 m (-34.5 to -38 ft). Beneath the organic silt was a layer of loose to dense, generally medium dense, red brown, fine sand, silty fine sand to sand and silt. The bottom of this layer varied from approximately El –17 to –23 m (-55.5 to –75.5 ft). This overlays very loose to very dense, generally medium dense, red brown sandy silt to silt to the bottom of the borings at approximately El –33 m (-108 ft). Ground water was noted at approximately El 0.0 m (0.0 ft).

Micropiles need to obtain their capacity from the medium dense sand, silty fine sand to sand and silt underlying the organic silt. Drilled micropiles consisting of 273 mm (10 3/4 in) outside diameter 12.5 mm (0.5 in) wall thickness steel pipe with a yield strength of 414 MPa (60 ksi) filled with 35 MPa (5000 psi) grout and a #57 metric (#18) threadbar with a yield strength of 517 MPa (75 ksi) have been used for design. The micropile casing (steel pipe) should extend from the footing through the existing fill and organic silt (approximately 12.2 m (40 ft)). Then a 248 mm (9.75 in) diameter socket should

extend for 22 m (72 ft), filled with the 35MPa (5000 psi) grout and the #57 metric (#18) threadbar extending from the footing to within 75 mm (3 in) of the bottom of the socket. The overall length of the micropiles is 34.2 m (112 ft). It is noted that the length of the micropile may exceed the depth of the borings, but is not a concern since other deeper borings in the area indicate that the same medium dense sandy soil extends for several hundred feet.

The strength limit pile capacity of this micropile is 905 KN (203 kips) and the ultimate capacity pile capacity of the micropile is 1641 KN (369 kips). A verification load test the ultimate pile capacity should be performed on a sacrificial micropile drilled nearby to verify the pile load capacity. Additionally, in accordance with AASHTO requirements at least 5% of the production piles should be proof tested to the strength limit load.

The stiffness of the micropile was compared to the stiffness of the precast prestressed concrete pile and it was approximately 33% that of the concrete pile. This reduction in stiffness resulted in additional analysis of the response of the pier foundation to lateral loading. Since alternate micropile designs by contractors will be acceptable, the vertical capacity must be the same, but if the stiffness differs significantly, additional response to lateral loading will need to be evaluated.



**LEGEND**

- FILL  
Brown to red-brown fine sand to silty fine with occasional pockets of silt.
- ORGANIC SILT  
Gray organic silt.
- SAND AND SILT  
Red-brown fine sand, silty fine sand, fine silt, to sandy silt.
- SILT  
Red-brown sandy silt to silt with gray clay.
- GROUNDWATER LEVEL
- STANDARD PENETRATION TEST N-V

**HORIZONTAL SCALE METERS**

0      5      10      20

<b>M. Jennett</b>		SM - 001 - M REV. 1/94 BORING REPORT								Hole No. <b>P5-1</b>					
DRILLER		STATE OF CONNECTICUT								Line & Station <b>I-95 1+040.3</b>					
<b>E. Fulton</b>		DEPARTMENT OF TRANSPORTATION								Offset <b>29.1 LT</b>					
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202450.7</b>					
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289066.9</b>					
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.					
		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER					
Surface Elevation: <b>2.61</b>		Casing				Auger		Mud	Sampler		Core Barrel				
Date Started: <b>7/10/2002</b>		Utilized				<b>X</b>		<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>				
Date Finished: <b>7/11/2002</b>		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	UP	B (st)	B (dt)	NX (st)	NV II (dt)
Groundwater Observations		Size I.D. (mm)	60	76	100	64		150	<b>X</b>	36		35	35	55	55
@ <b>~2.59</b> m after _____ hours		Hammer (kg)	136	136	136	136			Bit	63.5		Type		Diamond	
@ _____ m after _____ hours		Fall (m)	0.6	0.6	0.6	0.6			0.80 mm	0.76		of Bit		Carbide	
D E P T H	Casing blows per half meter	SAMPLE					BLOWS PER 0.15 METERS ON SAMPLER				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)			
		DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60					
5		<b>0.00 - 0.60</b>	<b>1</b>	<b>0.60</b>	<b>0.43</b>	<b>D</b>	<b>5</b>	<b>20</b>	<b>24</b>	<b>18</b>	<b>6.18</b>	Light brown / brown f SAND, little silt, trace c sand, trace brick, trace f gravel.  Red brown f SAND, trace c sand, trace f gravel.  Red brown f SAND, little to trace silt, little c sand, brick and wood, wet.  Brown f SAND, trace silt, trace c sand, trace f gravel.			
		<b>1.52 - 2.12</b>	<b>2</b>	<b>0.60</b>	<b>0.23</b>	<b>D</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>24</b>					
		<b>3.05 - 3.65</b>	<b>3</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>5</b>					
		<b>4.57 - 4.72</b>	<b>4</b>	<b>0.60</b>	<b>0.41</b>	<b>D</b>	<b>3</b>	<b>5</b>	<b>5</b>	<b>5</b>					
		<b>6.10 - 6.71</b>	<b>5</b>	<b>0.60</b>	<b>0.23</b>	<b>D</b>	<b>21</b>	<b>4</b>	<b>3</b>	<b>3</b>					
		<b>7.01 - 7.61</b>	<b>1</b>	<b>0.60</b>	<b>0.60</b>	<b>UP</b>									
		<b>7.62 - 8.22</b>	<b>6</b>	<b>0.60</b>	<b>0.20</b>	<b>D</b>	<b>1/0.30m</b>		<b>1/0.30m</b>						
		<b>9.14 - 9.74</b>	<b>7</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>					
		<b>10.06 - 10.66</b>	<b>2</b>	<b>0.60</b>	<b>0.60</b>	<b>UP</b>									
		<b>10.67 - 11.27</b>	<b>8</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>4</b>					
10		<b>12.19 - 12.79</b>	<b>9</b>	<b>0.60</b>	<b>0.51</b>	<b>D</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>13.26</b>	Top 0.08m: Gray brown c GRAVEL.  Bottom 0.15: Gray organic SILT, trace shells, trace f sand.  Piston. Gray organic SILT, trace shells, trace f sand, trace clay.  Gray organic SILT, trace f sand, trace clay, trace shells.  Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace clay, trace shells.			
		<b>13.72 - 14.32</b>	<b>10</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>4</b>					
15											<b>-10.65</b>	Gray f SAND, little silt, trace shells.			
Casing		Meters of				NOTES: <b>Raising and dropping of the 140-lb (63.5kg) safety hammer was</b>									
Size	From	To	Earth	Rock	<b>accomplished using a wire winch.</b>										
<b>100 mm</b>	<b>0</b>	<b>4.57</b>	<b>35.66</b>												
		No. of Samples													
		<b>24D/2UP</b>													
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test										Hole No. <b>P5-1</b>					
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%										Sheet <b>1</b> of <b>3</b>					

<b>M. Jennett</b>		SM - 001 - M REV. 1/94								BORING REPORT				Hole No. <b>P5-1</b>			
DRILLER		STATE OF CONNECTICUT												Line & Station <b>I-95 1+040.3</b>			
<b>E. Fulton</b>		DEPARTMENT OF TRANSPORTATION												Offset <b>29.1 LT</b>			
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202450.7</b>							
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289066.9</b>							
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.							
		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER							
Surface Elevation: <b>2.61</b>		Casing				Auger		Mud		Sampler		Core Barrel					
Date Started: <b>7/10/2002</b>		Utilized				<b>X</b>			<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>					
Date Finished: <b>7/11/2002</b>		Type	BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	UP	B (st)	B (dt)	NX (st)	NV II (dt)		
Groundwater Observations		Size I.D. (mm)	60	76	100	64			150	<b>X</b>	36		35	35	55	55	
@	<b>~2.59</b> m after	hours	Hammer (kg)	136	136	136	136			Bit	63.5		Type	<b>X</b>	Diamond		
@		hours	Fall (m)	0.6	0.6	0.6	0.6			0.80 mm	0.76		of Bit		Carbide		
D	Casing	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)					
E	blows	DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER										
P	per						0 -	0.15 -	0.30 -	0.45 -							
T	half						0.15	0.30	0.45	0.60							
H	meter																
		<b>15.24 - 15.84</b>	<b>11</b>	<b>0.60</b>	<b>0.51</b>	<b>D</b>	<b>3</b>	<b>3</b>	<b>5</b>	<b>7</b>							
		<b>16.76 - 17.36</b>	<b>12</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>5</b>	<b>11</b>	<b>11</b>	<b>16</b>							
		<b>18.29 - 18.89</b>	<b>13</b>	<b>0.60</b>	<b>0.51</b>	<b>D</b>	<b>6</b>	<b>13</b>	<b>16</b>	<b>17</b>							
20		<b>19.81 - 20.41</b>	<b>14</b>	<b>0.60</b>	<b>0.41</b>	<b>D</b>	<b>WOR</b>	<b>WOR</b>	<b>2</b>	<b>5</b>	<b>19.35</b>						
		<b>21.34 - 21.94</b>	<b>15</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>WOR</b>	<b>1</b>	<b>3</b>	<b>5</b>	<b>-16.74</b>						
		<b>22.86 - 23.46</b>	<b>16</b>	<b>0.60</b>	<b>0.51</b>	<b>D</b>	<b>8</b>	<b>9</b>	<b>8</b>	<b>9</b>							
		<b>24.38 - 24.98</b>	<b>17</b>	<b>0.60</b>	<b>0.30</b>	<b>D</b>	<b>5</b>	<b>7</b>	<b>9</b>	<b>9</b>							
25																	
		<b>25.91 - 26.51</b>	<b>18</b>	<b>0.60</b>	<b>0.03</b>	<b>D</b>	<b>WOR</b>	<b>WOR</b>	<b>WOR</b>	<b>3</b>							
		<b>27.43 - 28.03</b>	<b>19</b>	<b>0.60</b>	<b>0.20</b>	<b>D</b>	<b>10</b>	<b>12</b>	<b>15</b>	<b>17</b>							
		<b>28.96 - 29.56</b>	<b>20</b>	<b>0.60</b>	<b>0.25</b>	<b>D</b>	<b>1</b>	<b>5</b>	<b>6</b>	<b>8</b>							
30																	
Casing		Meters of		NOTES: <b>Raising and dropping of the 140-lb (63.5kg) safety hammer was</b>													
Size	From	To	Earth	Rock	<b>accomplished using a wire winch.</b>												
<b>100 mm</b>	<b>0</b>	<b>4.57</b>	<b>35.66</b>														
				No. of Samples													
				<b>24D/2UP</b>													
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test											Hole No. <b>P5-1</b>						
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%											Sheet <b>2</b> of <b>3</b>						



<b>J. Maccino</b>		SM - 001 - M REV. 1/94 BORING REPORT								Hole No. <b>P5-2</b>							
DRILLER		STATE OF CONNECTICUT								Line & Station <b>I-95 1+023.9</b>							
<b>R. Sharp</b>		DEPARTMENT OF TRANSPORTATION								Offset <b>0.3 LT</b>							
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202420.8</b>							
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289052.7</b>							
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.							
		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER							
Surface Elevation: <b>2.61</b>		Casing				Auger		Mud	Sampler		Core Barrel						
Date Started: <b>7/29/2002</b>		Utilized				<b>X</b>		<b>X</b>	<b>X</b>	<b>X</b>							
Date Finished: <b>7/30/2002</b>		Type		BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	UP	B (st)	B (dt)	NX (st)	NV II (dt)	
Groundwater Observations		Size I.D. (mm)		60	76	100	64		150	<b>X</b>	36		35	35	55	55	
@	<b>~2.59</b>	m after _____ hours		Hammer (kg)	136	136	136	136		Bit	63.5		Type		Diamond		
@		m after _____ hours		Fall (m)	0.6	0.6	0.6	0.6		0.80 mm	0.76		of Bit		Carbide		
D	Casing	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)					
E	blows	DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER										
P	per						0 -	0.15 -	0.30 -	0.45 -	5.64	-3.03	14.13	-11.52			
T	half																
H	meter																
		<b>0.00 - 0.60</b>	<b>1</b>	<b>0.60</b>	<b>0.30</b>	<b>D</b>	<b>7</b>	<b>20</b>	<b>32</b>	<b>50</b>							Light / medium brown f SAND, some c sand, little f-c gravel, trace silt.
																	Top 0.05m: CONCRETE
		<b>1.52 - 2.12</b>	<b>2</b>	<b>0.60</b>	<b>0.41</b>	<b>D</b>	<b>21</b>	<b>16</b>	<b>14</b>	<b>11</b>							Bottom 0.36m: Red brown f SAND, some silt, trace c sand.
																	Dark gray f SAND, some silt, trace c sand, trace f-c gravel, 0.03m of concrete in middle of sample, moist.
		<b>3.05 - 3.65</b>	<b>3</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>6</b>							Top 0.40m: Dark gray c SAND, little f sand, little silt.
5		<b>4.57 - 4.72</b>	<b>4</b>	<b>0.60</b>	<b>0.51</b>	<b>D</b>	<b>7</b>	<b>3</b>	<b>5</b>	<b>4</b>							Bottom 0.10m: Gray organic SILT, trace shells and fibers.
		<b>6.10 - 6.71</b>	<b>5</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>							Gray organic SILT, little f sand, trace c sand, trace f gravel, trace fibers.
		<b>7.62 - 8.22</b>	<b>6</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>WOH</b>	<b>WOH</b>	<b>WOH</b>	<b>WOH</b>							Gray organic SILT, trace f sand, trace shells, trace fibers.
		<b>9.14 - 9.74</b>	<b>7</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>WOH</b>	<b>WOH</b>	<b>WOH</b>	<b>WOH</b>							Gray organic SILT, trace f sand, trace shells, trace fibers.
10																	
		<b>10.67 - 11.27</b>	<b>8</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>WOR</b>	<b>WOR</b>	<b>WOR</b>	<b>WOR</b>							Gray organic SILT, trace f sand, trace shells, trace fibers.
		<b>12.19 - 12.79</b>	<b>9</b>	<b>0.60</b>	<b>0.56</b>	<b>D</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>							Gray organic SILT, trace f sand, trace shells, trace fibers.
		<b>13.72 - 14.32</b>	<b>10</b>	<b>0.60</b>	<b>0.60</b>	<b>D</b>	<b>6</b>	<b>7</b>	<b>13</b>	<b>15</b>							Top 0.40m: Gray organic SILT and f SAND.
15																	Bottom 0.20m: Gray red brown f SAND, little silt.
Casing		Meters of		NOTES: <b>Bombardier rig - Raising and dropping of the 140-lb (63.5kg)</b>													
Size	From	To	Earth	Rock	<b>safety hammer was accomplished using a wire winch.</b>												
<b>100 mm</b>	<b>0</b>	<b>4.57</b>	<b>35.66</b>														
		No. of Samples															
		<b>24D</b>															
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test											Hole No. <b>P5-2</b>						
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%											Sheet <b>1</b> of <b>3</b>						

<b>J. Maccino</b>		SM - 001 - M REV. 1/94								BORING REPORT				Hole No. <b>P5-2</b>															
DRILLER		STATE OF CONNECTICUT												Line & Station <b>I-95 1+023.9</b>															
<b>R. Sharp</b>		DEPARTMENT OF TRANSPORTATION												Offset <b>0.3 LT</b>															
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202420.8</b>				E. Coordinate <b>289052.7</b>															
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								PROJECT NUMBER <b>92-533</b>				Parsons Brinckerhoff Quade & Douglas, Inc.															
SOILS ENGINEER		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER																			
Surface Elevation: <b>2.61</b>		Casing				Auger		Mud		Sampler		Core Barrel																	
Date Started: <b>7/29/2002</b>		Utilized		<b>X</b>		<b>X</b>		<b>X</b>		<b>X</b>																			
Date Finished: <b>7/30/2002</b>		Type		BW		NW		HW		Pipe		Solid		Hollow		Bentonite		SS		UP		B (st)		B (dt)		NX (st)		NV II (dt)	
Groundwater Observations		Size I.D. (mm)		60		76		100		64		150		<b>X</b>		36		35		35		55		55					
@ <b>~2.59</b> m after _____ hours		Hammer (kg)		136		136		136		136		Bit		63.5		Type		<b>X</b>		Diamond									
@ _____ m after _____ hours		Fall (m)		0.6		0.6		0.6		0.6		0.80 mm		0.76		of Bit				Carbide									
D	Casing	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)																	
E	blows	DEPTH		NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER																					
P	per	IN METERS						0 -	0.15 -	0.30 -	0.45 -																		
T	half	FROM - TO						0.15	0.30	0.45	0.60																		
H	meter																												
		<b>15.24 - 15.84</b>		<b>11</b>	<b>0.60</b>	<b>0.30</b>	<b>D</b>	<b>9</b>	<b>14</b>	<b>15</b>	<b>11</b>	Gray f-c SAND, little f-c gravel, little silt, trace f sand lense.  Red brown f SAND, little silt, trace c sand, trace f gravel.  Red brown f SAND, little silt, trace c gravel.  Red brown f SAND, little silt, trace c gravel.  Red brown f SAND, trace silt.  Red brown f SAND, some silt.  Red brown f SAND, some silt.																	
		<b>16.76 - 17.36</b>		<b>12</b>	<b>0.60</b>	<b>0.08</b>	<b>D</b>	<b>16</b>	<b>14</b>	<b>14</b>	<b>15</b>																		
		<b>18.29 - 18.89</b>		<b>13</b>	<b>0.60</b>	<b>0.36</b>	<b>D</b>	<b>14</b>	<b>11</b>	<b>12</b>	<b>9</b>																		
20		<b>19.81 - 20.41</b>		<b>14</b>	<b>0.60</b>	<b>0.53</b>	<b>D</b>	<b>12</b>	<b>12</b>	<b>14</b>	<b>16</b>																		
		<b>21.34 - 21.94</b>		<b>15</b>	<b>0.60</b>	<b>0.48</b>	<b>D</b>	<b>17</b>	<b>17</b>	<b>14</b>	<b>17</b>																		
		<b>22.86 - 23.46</b>		<b>16</b>	<b>0.60</b>	<b>0.41</b>	<b>D</b>	<b>14</b>	<b>19</b>	<b>19</b>	<b>22</b>																		
		<b>24.38 - 24.98</b>		<b>17</b>	<b>0.60</b>	<b>0.36</b>	<b>D</b>	<b>16</b>	<b>23</b>	<b>24</b>	<b>19</b>																		
25		<b>25.91 - 26.51</b>		<b>18</b>																									
		<b>27.43 - 28.03</b>		<b>19</b>	<b>0.60</b>	<b>0.25</b>	<b>D</b>	<b>31</b>	<b>30</b>	<b>30</b>	<b>29</b>		(Hole collapsed, driller had to wash it out, ended up 0.60m ahead, so he skipped the sample and went to 27.43m. Inspector was not there when it happened.)  Red brown SILT, little to some f sand, trace clayey silt seams (~0.08 - 0.16cm).  Red brown SILT, little f sand, saturated, rapid dilatancy, trace clayey silt seams. (~0.08cm).																
		<b>28.96 - 29.56</b>		<b>20</b>	<b>0.60</b>	<b>0.36</b>	<b>D</b>	<b>22</b>	<b>24</b>	<b>31</b>	<b>30</b>																		
30																													
Casing		Meters of		NOTES: <b>Bombardier rig - Raising and dropping of the 140-lb (63.5kg)</b>																									
Size	From	To	Earth	Rock	<b>safety hammer was accomplished using a wire winch.</b>																								
<b>100 mm</b>	<b>0</b>	<b>4.57</b>	<b>35.66</b>																										
		No. of Samples																											
		<b>24D</b>																											
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test										Hole No. <b>P5-2</b>																			
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%										Sheet <b>2</b> of <b>3</b>																			

<b>J. Maccino</b>		SM - 001 - M REV. 1/94								BORING REPORT				Hole No. <b>P5-2</b>					
<b>DRILLER</b>		STATE OF CONNECTICUT								Line & Station <b>I-95 1+023.9</b>									
<b>R. Sharp</b>		DEPARTMENT OF TRANSPORTATION								Offset <b>0.3 LT</b>									
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202420.8</b>									
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289052.7</b>									
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.				PRIME DESIGNER					
		BORING CONTRACTOR: <b>General Borings, Inc.</b>																	
Surface Elevation: <b>2.61</b>						Casing				Auger		Mud		Sampler		Core Barrel			
Date Started: <b>7/29/2002</b>		Utilized				<b>X</b>				<b>X</b>		<b>X</b>		<b>X</b>					
Date Finished: <b>7/30/2002</b>		Type				BW NW HW Pipe				Solid Hollow		Bentonite		SS UP		B (st) B (dt) NX (st) NV II (dt)			
Groundwater Observations		Size I.D. (mm)				60 76 100 64				150		<b>X</b>		36		35 35 55 55			
@ <b>~2.59</b> m after _____ hours		Hammer (kg)				136 136 136 136						Bit		63.5		Type Diamond			
@ _____ m after _____ hours		Fall (m)				0.6 0.6 0.6 0.6						0.80 mm		0.76		of Bit Carbide			
D E P T H	Casing blows per half meter	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)							
		DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER												
							0 - 0.15	0.15 - 0.30	0.30 - 0.45	0.45 - 0.60									
		<b>30.48 - 31.08</b>	<b>21</b>	<b>0.60</b>	<b>0.30</b>	<b>D</b>	<b>21</b>	<b>25</b>	<b>30</b>	<b>29</b>		Red brown SILT, little f sand, saturated, rapid dilatancy, trace clayey silt seams. (~0.08cm).							
		<b>32.00 - 32.60</b>	<b>22</b>	<b>0.60</b>	<b>0.41</b>	<b>D</b>	<b>19</b>	<b>22</b>	<b>29</b>	<b>28</b>		Red brown SILT, some f sandD.							
		<b>33.53 - 34.13</b>	<b>23</b>	<b>0.60</b>	<b>0.38</b>	<b>D</b>	<b>23</b>	<b>22</b>	<b>29</b>	<b>32</b>		Red brown SILT, little to some f sand.							
35		<b>35.05 - 35.65</b>	<b>24</b>	<b>0.60</b>	<b>0.46</b>	<b>D</b>	<b>17</b>	<b>21</b>	<b>28</b>	<b>23</b>		Red brown SILT, little f sand, little clayey silt seams (~0.08-0.16 cm).							
											<b>35.65</b>	Bottom of Boring 35.65 m.							
40																			
45																			
Casing			Meters of			NOTES: <b>Bombardier rig - Raising and dropping of the 140-lb (63.5kg)</b>													
Size	From	To	Earth	Rock	<b>safety hammer was accomplished using a wire winch.</b>														
<b>100 mm</b>	<b>0</b>	<b>4.57</b>	<b>35.65</b>																
			No. of Samples																
			<b>24D</b>																
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test											Hole No. <b>P5-2</b>								
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%											Sheet <b>3</b> of <b>3</b>								

<b>M. Jennett</b>		SM - 001 - M REV. 1/94								BORING REPORT				Hole No. <b>P5-3</b>			
DRILLER		STATE OF CONNECTICUT								Line & Station <b>I-95 1+010.4</b>							
<b>E. Fulton</b>		DEPARTMENT OF TRANSPORTATION								Offset <b>26.3 RT</b>							
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202393.3</b>							
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289041.0</b>							
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.							
		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER							
Surface Elevation: <b>2.59</b>				Casing				Auger		Mud		Sampler		Core Barrel			
Date Started: <b>7/12/2002</b>		Utilized				<b>X</b>			<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>					
Date Finished: <b>7/15/2002</b>		Type		BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	UP	B (st)	B (dt)	NX (st)	NV II (dt)	
Groundwater Observations		Size I.D. (mm)		60	76	100	64		150	<b>X</b>	36		35	35	55	55	
@	<b>~2.59</b>	m after _____ hours		Hammer (kg)	136	136	136	136		Bit	63.5		Type		Diamond		
@		m after _____ hours		Fall (m)	0.6	0.6	0.6	0.6		0.80 mm	0.76		of Bit		Carbide		
D	Casing	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)					
E	blows	DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER										
P	per						0 -	0.15 -	0.30 -	0.45 -	3.35	Dark brown f SAND, trace c sand, little silt, trace brick, trace wood fibers.					
T	half	0.15	0.30	0.45	0.60	-0.76	Top 0.10m: Brown f SAND, little silt, trace brick. Middle 0.03m: CONCRETE. Bottom 0.05m: Red BRICK fragments. Top 0.05m: Brown black f SAND, trace silt, trace wood.										
H	meter	0.00 - 0.60	1	0.60	0.20							D	3	10	17	20	13.26
		1.52 - 2.12	2	0.60	0.18	D	7	5	6	8	-10.67	Piston. Gray organic SILT, trace clay, trace f sand, trace shells.  Gray organic SILT, trace shells.  Gray organic SILT, trace shells.					
		3.05 - 3.65	3	0.60	0.25	D	4	5	3	3							13.26
		4.57 - 5.17	1	0.60	0.36	UP					13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
		5.18 - 5.78	4	0.60	0.60	D	1	1	1	2							13.26
		6.10 - 6.70	5	0.60	0.60	D	1	1	2	1	13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
		7.62 - 8.22	2	0.60	0.60	UP											13.26
		8.22 - 8.84	6	0.60	0.46	D	1	1	2	3	13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
		9.14 - 9.74	7	0.60	0.60	D	1/0.30m		1/0.30m								13.26
		10.67 - 11.27	8	0.60	0.60	D	1/0.30m		1/0.30m		13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
		12.19 - 12.79	9	0.60	0.60	D	1	1	1	1							13.26
		13.72 - 14.32	10	0.60	0.60	D	1	2	2	2	13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
15																	13.26
											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
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											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
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											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
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											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
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											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
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											13.26	Piston. Gray organic SILT, trace f sand, trace shells.  Gray organic SILT, trace shells.					
																	13.26

<b>M. Jennett</b>		SM - 001 - M REV. 1/94								BORING REPORT				Hole No. <b>P5-3</b>			
DRILLER		STATE OF CONNECTICUT												Line & Station <b>I-95 1+010.4</b>			
<b>E. Fulton</b>		DEPARTMENT OF TRANSPORTATION												Offset <b>26.3 RT</b>			
INSPECTOR		TOWN: <b>New Haven / West Haven, CT</b>								N. Coordinate <b>202393.3</b>							
Parsons Brinckerhoff Quade & Douglas, Inc.		PROJECT NAME: <b>Reconstruction I-95 Over West River</b>								E. Coordinate <b>289041.0</b>							
SOILS ENGINEER		PROJECT NUMBER <b>92-533</b>								Parsons Brinckerhoff Quade & Douglas, Inc.							
		BORING CONTRACTOR: <b>General Borings, Inc.</b>								PRIME DESIGNER							
Surface Elevation: <b>2.59</b>		Casing				Auger		Mud		Sampler		Core Barrel					
Date Started: <b>7/12/2002</b>		Utilized				<b>X</b>			<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>					
Date Finished: <b>7/15/2002</b>		Type		BW	NW	HW	Pipe	Solid	Hollow	Bentonite	SS	UP	B (st)	B (dt)	NX (st)	NV II (dt)	
Groundwater Observations		Size I.D. (mm)		60	76	100	64		150	<b>X</b>	36		35	35	55	55	
@	<b>~2.59</b>	m after _____ hours		Hammer (kg)	136	136	136	136		Bit	63.5		Type	<b>X</b>	Diamond		
@		m after _____ hours		Fall (m)	0.6	0.6	0.6	0.6		0.80 mm	0.76		of Bit		Carbide		
D	Casing	SAMPLE					BLOWS				STRATA CHANGE: DEPTH, ELEV.	FIELD IDENTIFICATION OF SOIL, REMARKS (INCL. COLOR, LOSS OF WASH WATER, ETC.)					
E	blows	DEPTH IN METERS FROM - TO	NO.	PEN. m	REC. m	Type	PER 0.15 METERS ON SAMPLER										
P	per						0 -	0.15 -	0.30 -	0.45 -							
T	half						0.15	0.30	0.45	0.60							
H	meter																
		15.24 - 15.84	11	0.60	0.30	D	3	5	6	6			Top 0.10m: Brown f-c SAND. Bottom 0.20m: Red brown f SAND, little silt.				
													Red brown f SAND, trace to little silt.				
		16.76 - 17.36	12	0.60	0.30	D	3	5	6	6			Red brown f SAND, trace to little silt.				
													Red brown f SAND, little silt, saturated, rapid dilatancy.				
		18.29 - 18.89	13	0.60	0.51	D	5	5	5	7			Red brown f SAND, little silt, saturated, rapid dilatancy.				
													19.35				
20		19.81 - 20.41	14	0.60	0.36	D	5	8	15	16			-16.76 Red brown SILT, trace f sand, trace clayey silt seams, saturated, rapid dilatancy.				
													No Recovery.				
		21.34 - 21.94	15	0.60	0.00	D	4	6	8	8			Red brown SILT, little f sand, rapid dilatancy.				
													No Recovery.				
		22.86 - 23.46	16	0.60	0.30	D	6	6	12	14			Red brown SILT, little f sand, rapid dilatancy.				
													No Recovery.				
		24.38 - 24.98	17	0.60	0.00	D	13	6	2	7			Red brown SILT, trace to little f sand, rapid dilatancy.				
25													Red brown SILT, trace to little f sand, rapid dilatancy.				
		25.91 - 26.51	18	0.60	0.36	D	WOR	WOR	5	10			Red brown SILT, trace to little f sand, rapid dilatancy.				
													Red brown SILT, trace to little f sand, rapid dilatancy.				
		27.43 - 28.03	19	0.60	0.60	D	6	9	10	16			Red brown SILT, trace to little f sand, rapid dilatancy.				
													Red brown SILT, little f SAND, rapid dilatancy, saturated.				
		28.96 - 29.56	20	0.60	0.51	D	WOR	4	9	14			Red brown SILT, little f SAND, rapid dilatancy, saturated.				
30																	
Casing		Meters of		NOTES: <u>Raising and dropping of the 140-lb (63.5kg) safety hammer was</u>													
Size	From	To	Earth	Rock	<u>accomplished using a wire winch.</u>												
100 mm	0	4.57	35.66														
		No. of Samples															
		24D/2UP															
SAMPLE TYPE CODING: D=Driven C=Core A=Auger UP=Undisturbed Piston V=Vane Test											Hole No. <b>P5-3</b>						
PROPORTIONS USED: Trace = 1 -10%, Little = 10 - 20%, Some = 20 - 35%, And = 35 - 50%											Sheet <b>2</b> of <b>3</b>						

