

2021 Hazardous Waste Scanning Project

File Form Naming Convention.

(File_Type).(Program).(Site_Number).(YYYY-MM-DD).(File_Name).pdf

Note 1: Each category is separated by a period "."

Note 2: Each word within category is separated by an underscore "_"

Specific File Naming Convention Label:

Report, ERP, B00164, 2004-02-05, Geotech - Canal - Walls.pdf

120219

2/4/04

Dave

Information as
Requested

Laine City

879-4407

REC'D
FEB 10 2004
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FEB 10 2004
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FEB 10 2004

915029

D. Locey
[Signature]

UNION SHIP CANAL
GEOTECHNICAL REPORT FOR STRUCTURAL ANALYSIS OF
CANAL WALLS

17-JUNE-2002



I. INTRODUCTION

The U.S. Army Corps of Engineers-Buffalo District has been tasked with performing a structural assessment of the canal walls at the Union Ship Canal in Buffalo, NY. The Union Ship Canal was constructed in the early 1900's to provide adjacent iron and steel manufacturing operations access to Lake Erie for material transport. A geotechnical exploration was performed in February 2002 to gather information regarding soil and rock conditions as they relate to performance of the canal walls.

II. SITE GEOLOGY

The 1970 Geologic Map of New York indicates that the site is underlain by the Skaneateles Formation (Middle Devonian), which consists of the Levanna Shale and Stafford Limestone members. Bedrock encountered at the boring locations consisted of shale. Overburden soils consist of glacial till, glacial lake deposits, and fill.

III. SUBSURFACE EXPLORATION

Ten test pits were excavated at the locations illustrated on Figure 1. The purpose of test pit excavation was to gather information regarding the composition and geometry of the canal walls and to gather information regarding the composition of backfill materials. Thirteen borings were placed at the locations illustrated on Figure 1. The primary purpose of the borings was to gather information regarding the composition and geometry of backfill materials, natural soil deposits, and bedrock. Three concrete cores were obtained from concrete canal walls at the locations illustrated on Figure 1. The concrete cores were subjected to laboratory compressive strength testing.

Using the information collected during the subsurface exploration, subsurface sections (Figure 2 through Figure 9) were estimated. A description of the subsurface exploration techniques, boring logs, test pit logs, and laboratory test results are provided in Appendix A.

IV. RECOMMENDATIONS

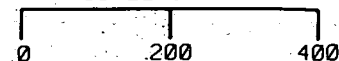
Estimated soil parameters relevant to structural stability analyses are estimated as shown on Figures 2 through 9. Normal groundwater levels can be assumed to match surface water levels in the canal. Cohesive soils adjacent to the canal walls can be assumed to have drained shear strength unless future surcharge loading is applied.



LEGEND FOR NUMBERED LOCATIONS

- | | |
|------------------------------|--|
| 1. TEST PIT B | 15. BORING D01-21, U01-21, AND U01-21A |
| 2. TEST PIT C-2 | 16. BORING D01-22 |
| 3. TEST PIT C-1 | 17. BORING D01-23 AND U01-23 |
| 4. TEST PIT D | 18. CONCRETE CORE C01-12 |
| 5. TEST PIT D-2 | 19. CONCRETE CORE C01-13 |
| 6. TEST PIT F | 20. CONCRETE CORE C01-14 |
| 7. TEST PIT G | 21. TEST PIT J |
| 8. TEST PIT I | |
| 9. TEST PIT H | |
| 10. BORING DC01-16 | |
| 11. BORING D01-17 AND U01-17 | |
| 12. BORINGS D01-18 AND A01-9 | |
| 13. BORING D01-19 | |
| 14. BORING D01-20 | |

SCALE IN FEET



UNION SHIP CANAL
2002 SUBSURFACE
EXPLORATION LOCATIONS

FIGURE 1

ESTIMATED SECTION AT BORING DC01-16

0' 6' 12'

Boring DC01-16

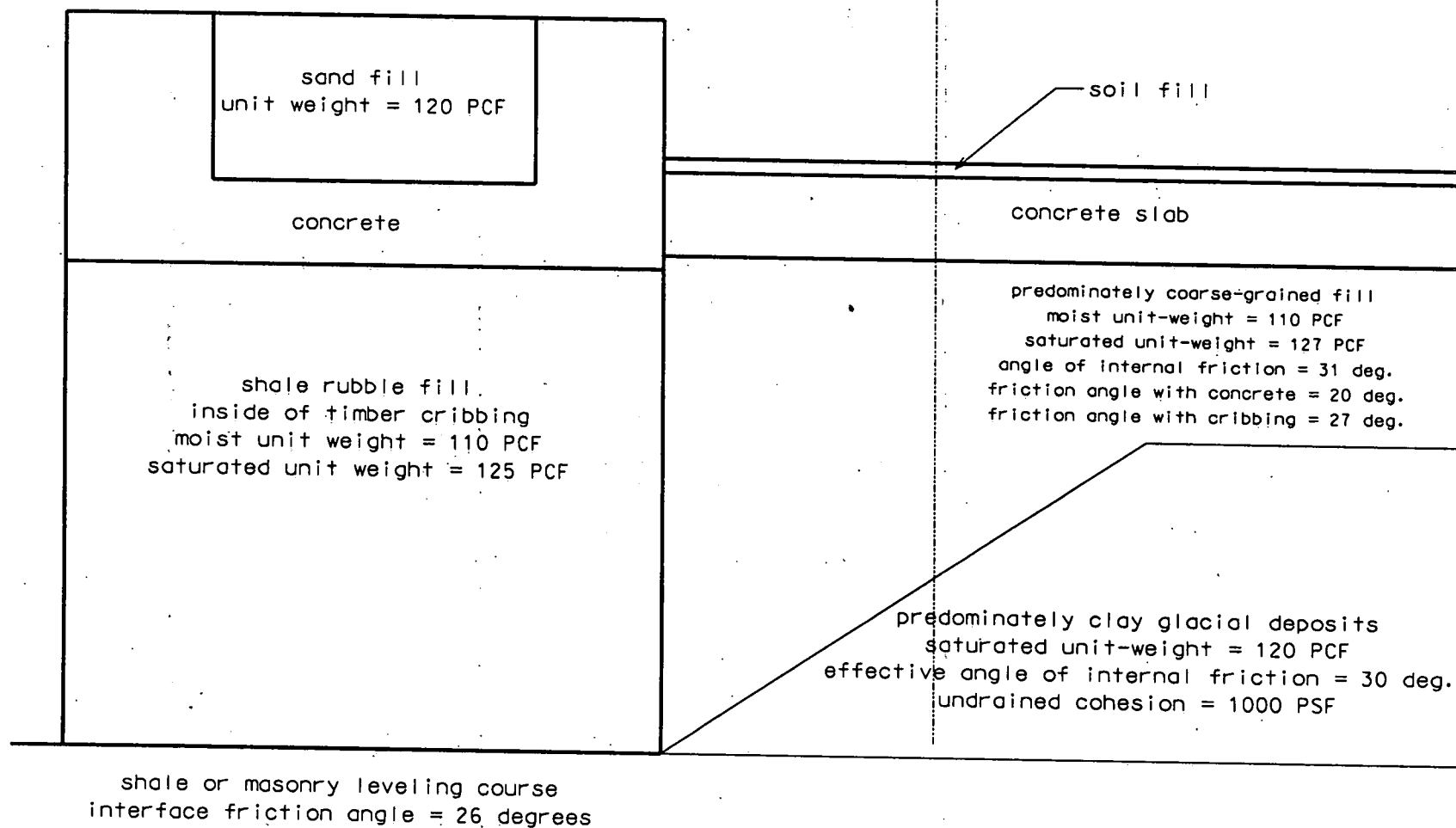


FIGURE 2

ESTIMATED SECTION AT BORING D01-17

0' 6' 12'

Boring D01-17

soil fill

sand fill
unit weight = 120 PCF

concrete slab

concrete

predominately coarse-grained fill
moist unit-weight = 110 PCF
saturated unit-weight = 127 PCF
angle of internal friction = 31 deg.
friction angle with conc. = 20 deg.
friction angle with cribbing = 27 deg.

shale rubble fill
inside of timber cribbing
moist unit weight = 110 PCF
saturated unit weight = 125 PCF

predominately clay glacial deposits
saturated unit-weight = 110 PCF
effective angle of internal friction = 29 deg.
undrained cohesion = 500 PSF

shale or masonry leveling course
interface friction angle = 26 degrees

FIGURE 3

ESTIMATED SECTION AT BORING D01-19

0' 6' 12'

Boring D01-19

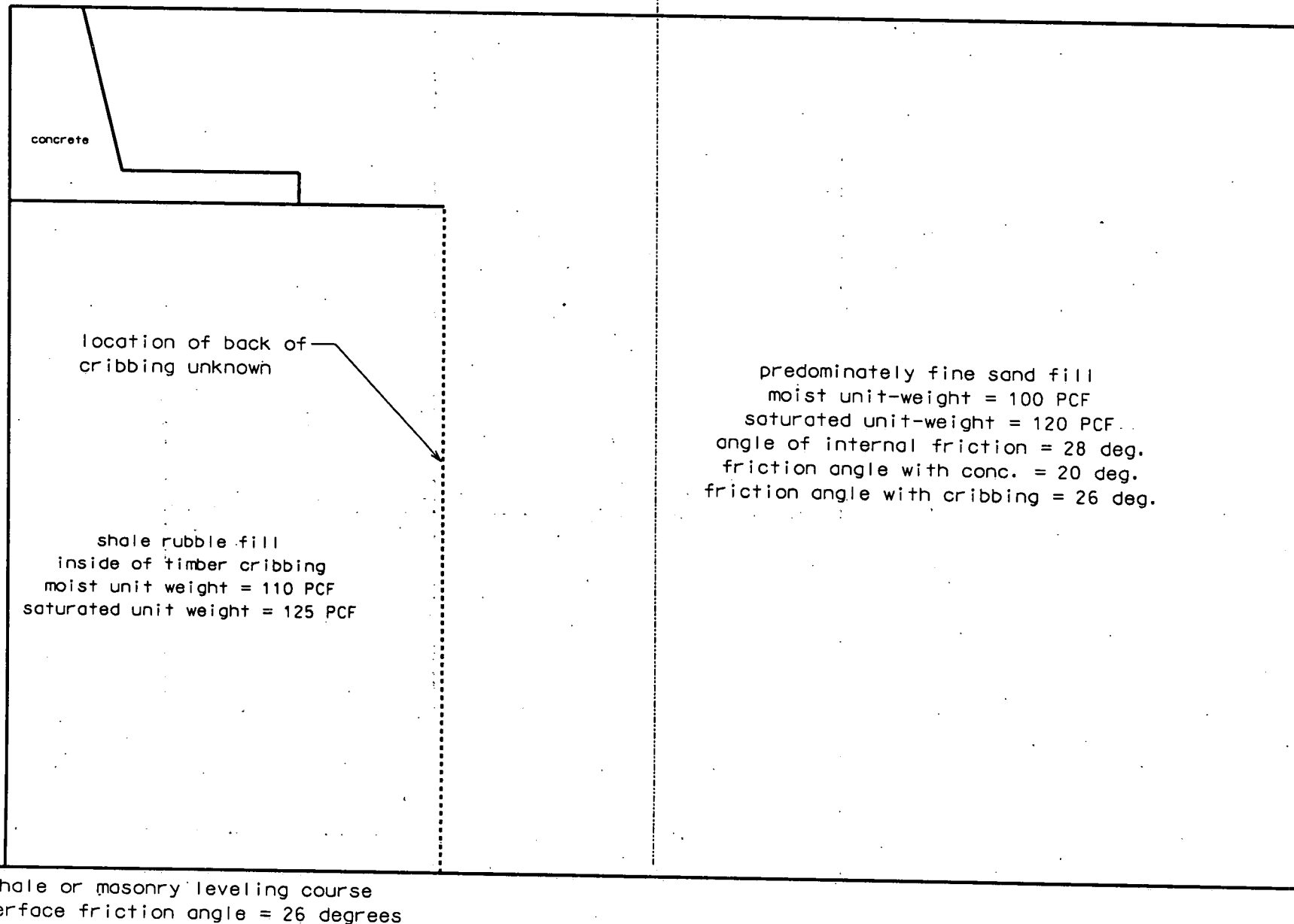


FIGURE 4

ESTIMATED SECTION AT NORTHEAST CORNER

0' 6' 12'

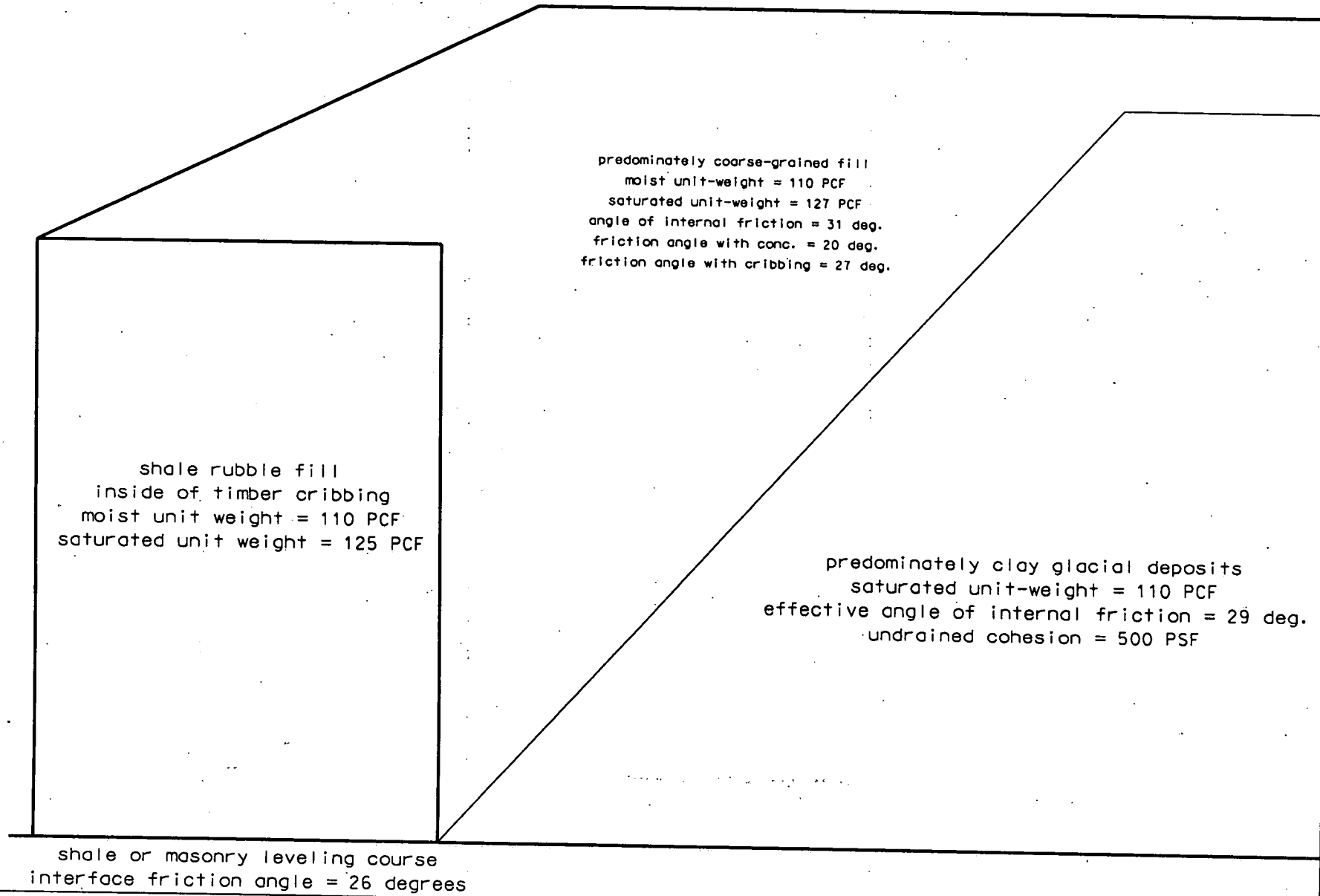
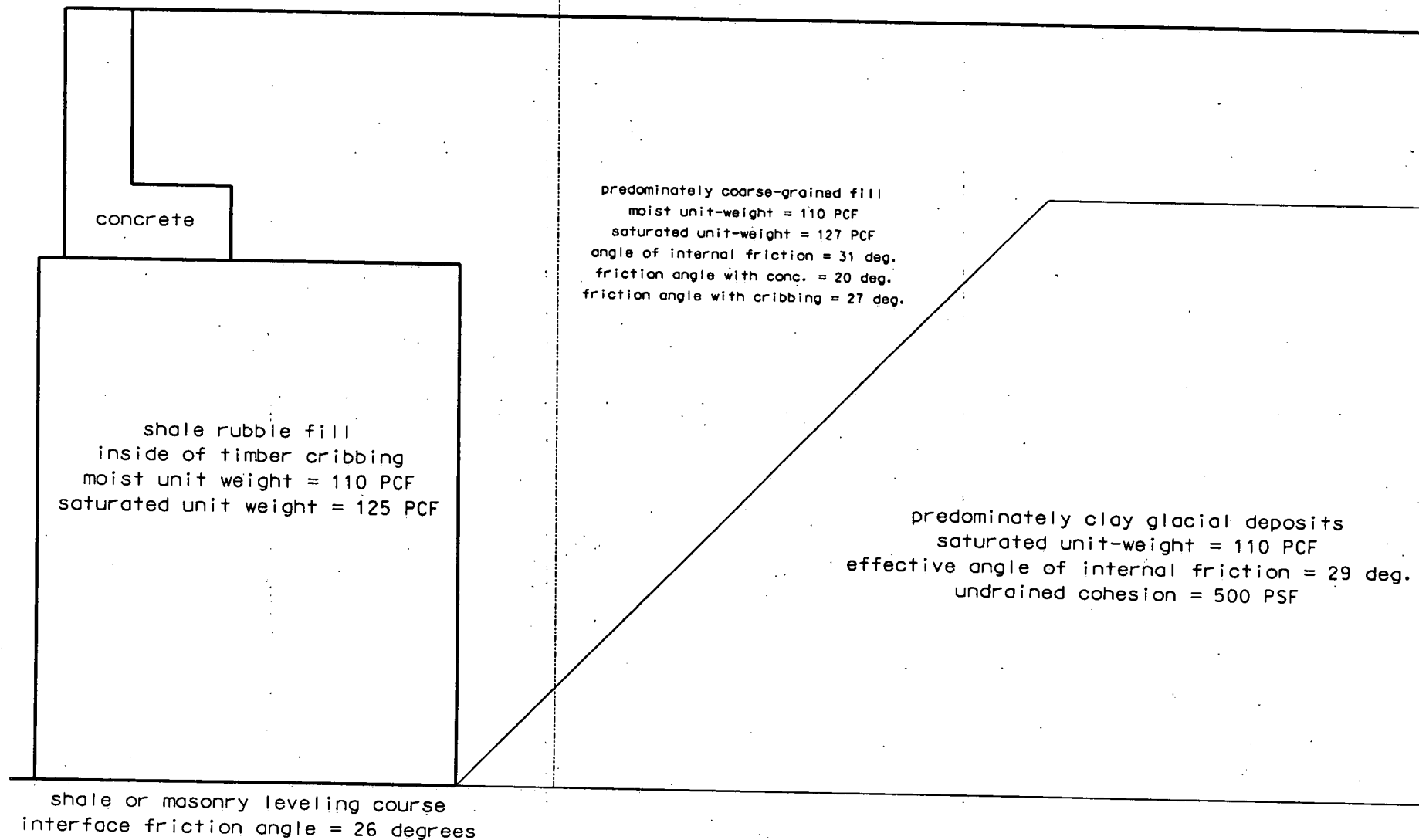


FIGURE 5

ESTIMATED SECTION AT BORING D01-20

0' 6' 12'

Boring D01-20



ESTIMATED SECTION AT BORING D01-21

0' 6' 12'

Boring D01-21

predominately coarse-grained fill
moist unit-weight = 110 PCF
saturated unit-weight = 127 PCF
angle of internal friction = 31 deg.
friction angle with conc. = 20 deg.
friction angle with cribbing = 27 deg.

shale rubble fill
inside of timber cribbing
moist unit weight = 110 PCF
saturated unit weight = 125 PCF

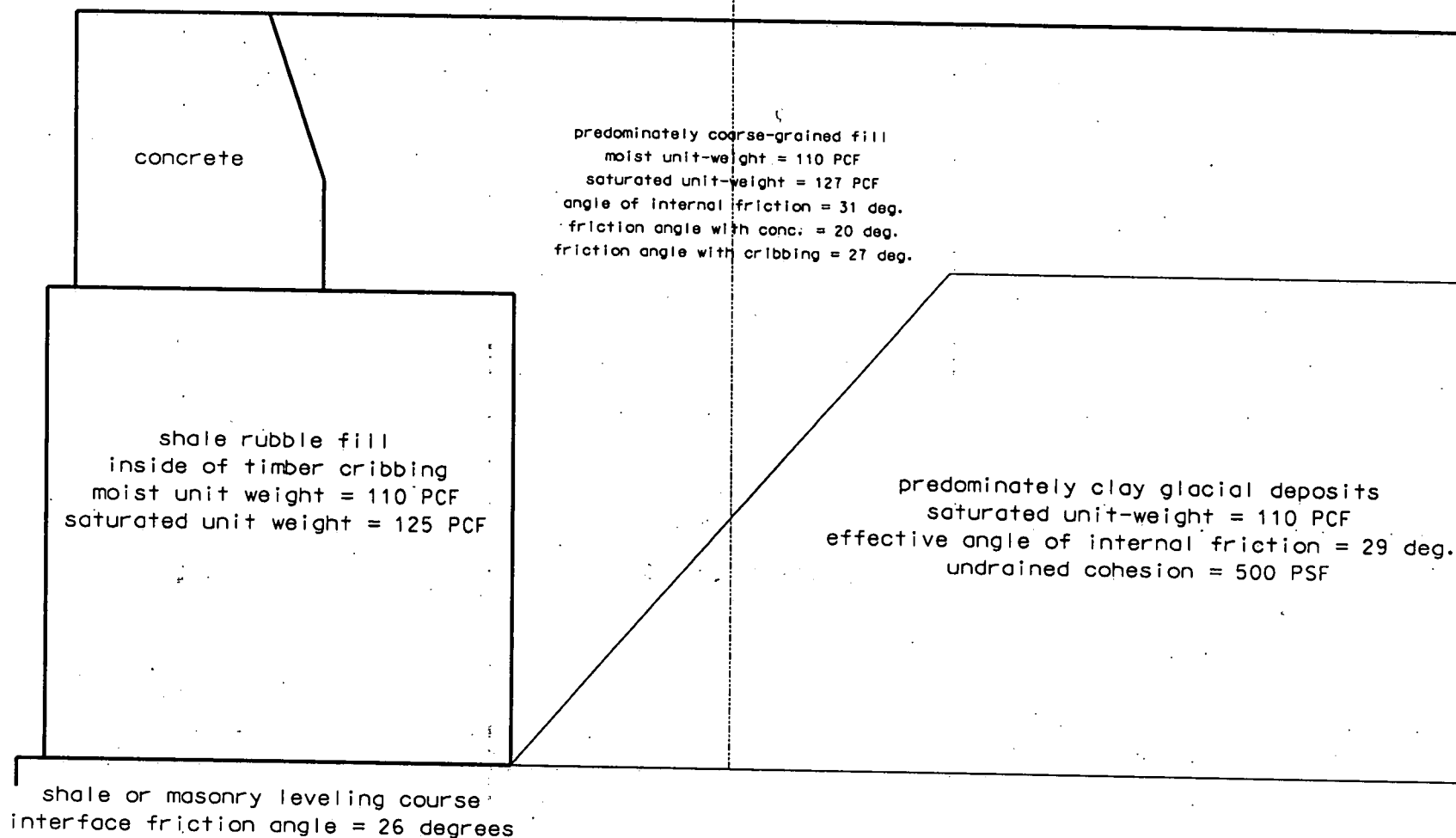
predominately clay glacial deposits
saturated unit-weight = 110 PCF
effective angle of internal friction = 29 deg.
undrained cohesion = 500 PSF

shale or masonry leveling course
interface friction angle = 26 degrees

ESTIMATED SECTION AT BORING D01-22

0' 6' 12'

Boring D01-22



ESTIMATED SECTION AT BORING D01-23

0' 6' 12'

Boring D01-23

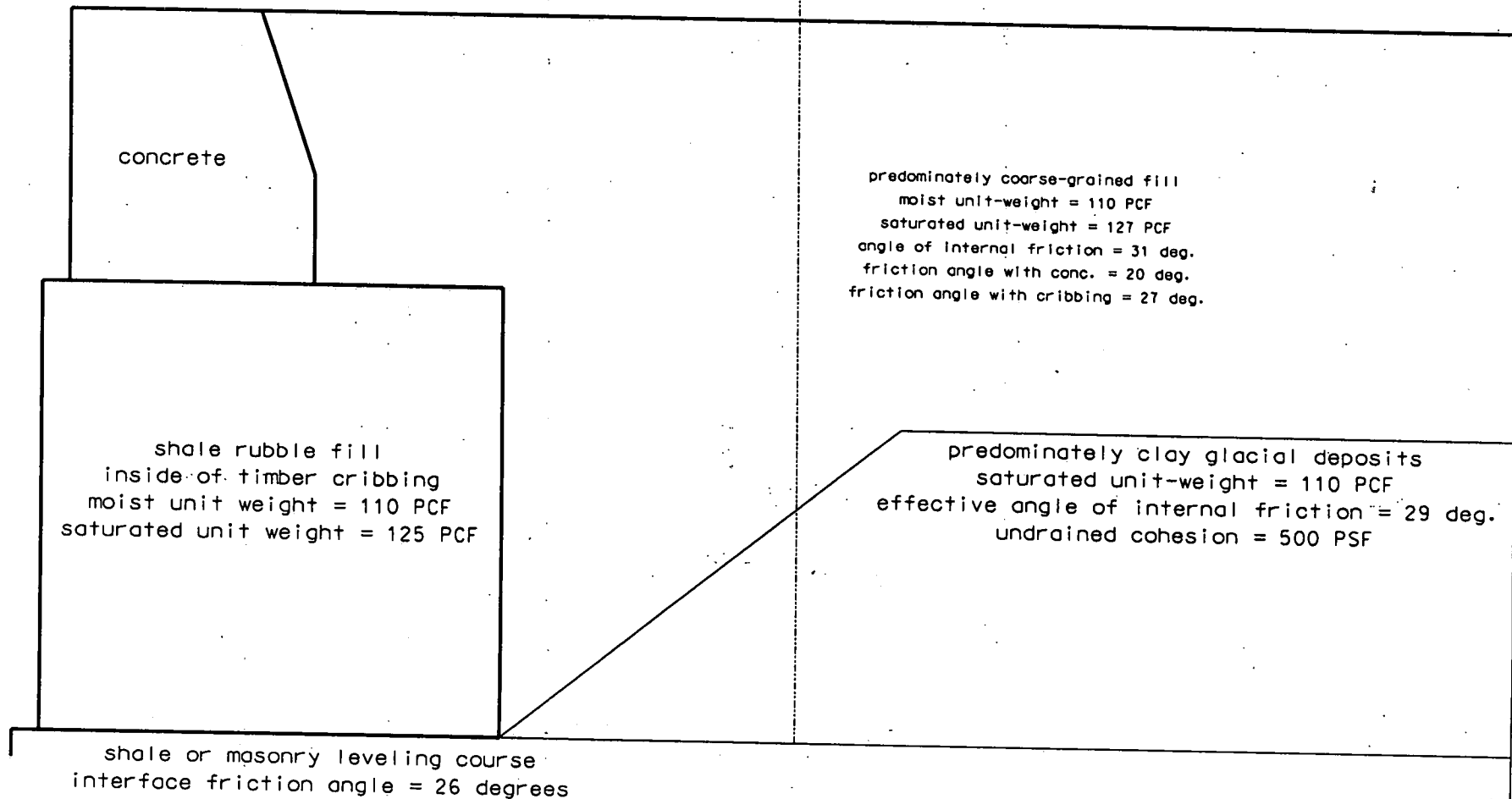


FIGURE 9

RATIONALE FOR SOIL PARAMETER ESTIMATES INCLUDED ON FIGURES 2 THROUGH 9

Predominately clay glacial deposits:

Based on Atterberg Limits testing, the plasticity index was conservatively assumed to be approximately 16. Based on Fig. 2-4 of EM 1110-2-2502, the drained angle of internal friction may be assumed to be approximately 29 – 30 degrees.

Based on engineering judgement, the unit-weight of a soft to medium, saturated, silty clay with low plasticity may be assumed to be within the range of 110 – 120 PCF.

Based on the N values at Boring DC01-16 and engineering judgement, an undrained cohesion of 1000 PSF may be assumed.

Based on the N values at the balance of the borings, the laboratory unconfined compressive strength, and engineering judgement, an undrained cohesion of 500 PSF may be assumed.

Predominately coarse-grained fill:

The borings indicated that in general, this material consists of loose, silty, shale sand/gravel.

The relative density of this loose material may be assumed to be approximately 30% (EM 1110-1-1903, page 3-3). From Table 6 of NAVFAC 7.1-22, the maximum void ratio for silty sand and gravel can be assumed to be approximately 0.85, and the minimum void ratio may be assumed to be approximately 0.14. At 30% relative density, the corresponding void ratio is 0.64. Assuming a specific gravity for shale gravel of 2.7, the corresponding saturated unit-weight at a void ratio of 0.64 is 127 PCF.

At a water content of 7%, which is representative of the sample of the fill taken from above the water at Boring D01-20, the moist-unit weight is calculated to be 110 PCF.

Assuming a USCS classification for the material as SW, based on Fig. 3-1 of EM 1110-2-2504, the angle of internal friction at a relative density of 30% may be assumed to be 31 degrees.

At the contact with the timber crib, assuming timber/gap construction, $\frac{1}{2}$ of the area will be fill on fill, and $\frac{1}{2}$ of the area will be fill on timber. For fill on fill, the friction angle will match the angle of internal friction for the fill (31 degrees). For fill on timber, the friction angle can be assumed to be approximately $0.76 \times \phi$ (EM 1110-2-2504, Table 3-2), or 24 degrees. The average of 31 and 24 is 27 degrees.

At the contact with concrete, according to NAVFAC page 7.2-63, for formed concrete against silty sand/gravel mixture, the range for the friction angle is 17-22 degrees. Use 20 degrees.

Predominately fine sand fill (Boring D01-19):

The boring indicated that in general, this material consists of very loose to loose fine sand fill.

The relative density of this loose material may be assumed to be approximately 20% (EM 1110-1-1903, page 3-3). From Table 6 of NAVFAC 7.1-22, the maximum void ratio for clean, fine/coarse sand can be assumed to be approximately 0.95, and the minimum void ratio may be assumed to be approximately 0.20. At 20% relative density, the corresponding void ratio is 0.8. Assuming a specific gravity for sand of 2.65, the corresponding saturated unit-weight at a void ratio of 0.8 is 120 PCF.

Assuming a water content of 7%, the moist-unit weight is calculated to be 100 PCF.

Assuming a USCS classification for the material as SP, based on Fig. 3-1 of EM 1110-2-2504, the angle of internal friction at a relative density of 20% may be assumed to be 28 degrees.

At the contact with the timber crib, assuming timber/gap construction, $\frac{1}{2}$ of the area will be fill on fill, and $\frac{1}{2}$ of the area will be fill on timber. For fill on fill, the friction angle will match the angle of internal friction for the fill (28 degrees). For fill on timber, the friction angle can be assumed to be 24 degrees (EM 1110-2-2504, Table 3-2). The interface friction angle may be assumed to be the average between 28 and 24 degrees, or 26 degrees.

At the contact with concrete, based on NAVFAC page 7.2-63, use 20 degrees.

Shale rubble fill within the timber cribbing:

Assume the material is similar to typical backfill materials encountered (loose, silty, sandy, shale gravel). The unit-weight will be similar to that of the predominately coarse-grained fill.

Sand fill atop the concrete:

Based on engineering judgement, the unit-weight of the dense, partially saturated sand, may be assumed to be 120 PCF.

Interface at bottom of timber cribbing:

The interface is assumed to consist primarily of fill within the cribbing atop shale or a masonry leveling course. The cribbing fill is assumed to consist of silty gravel/sand. Treating the shale or masonry leveling course as formed concrete, according to NAVFAC page 7.2-63, the range of the interface friction angle is 22-26 degrees. Use 26 degrees.

APPENDICES

APPENDIX A



**Contract
Drilling
and
Testing**

BUFFALO OFFICE

5167 South Park Avenue
Hamburg, NY 14075

Phone: (716) 649-8110

Fax: (716) 649-8051

**Site Investigation Report
Union Ship Canal
Rehabilitation Project
Buffalo, New York**

PREPARED FOR:
United States Department of Army
Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207

PREPARED BY:
SJB SERVICES, INC.
April 2002

SJB-BD 02-016

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(518) 899-7491

Cortland, NY
(607) 758-7182

Cuba, NY
(716) 968-9686

Falconer, NY
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Rochester, NY
(585) 359-2730

Syracuse, NY
(315) 698-7359

Gilbert, PA
(610) 681-8500

Site Investigation Report Union Ship Canal Rehabilitation Project Buffalo, New York

I. INTRODUCTION

SJB Services Inc. drilling personnel were present at various locations along the Union Ship Canal in Buffalo, New York to perform several types of surface and subsurface investigations. This work was requested and authorized by Mr. Gene Lenhardt of the United States Army Corps of Engineers, Buffalo District, 1776 Niagara Street in Buffalo, New York. The work was completed during the time period of February 4th through 20th 2002.

The work scope for this project consisted of a total of ten test pits, twelve test borings and three thinwall structure cores at various locations around the existing canal. Individual exploration locations were staked out during a site visit with USACE representatives Mr. Gene Lenhardt, Mr. Reed Vetovitz and Mr. Jim Bruzbuszski prior to drilling. Investigation locations were referenced to survey stationing along the south wall of the canal previously completed by the USACE. Differential leveling procedures were utilized to obtain surface elevations at the boring locations. Elevations were referenced to a PK nail set at the southeast corner of the canal wall. This survey hub was designated "HPT-2" and was assumed to have an elevation of 595.00'. The actual "as completed" investigation locations are illustrated on the attached plan in Appendix 'A'. In addition, a hand-held global positioning device manufactured by Magellan Company (Magellan GPS 315) was used to obtain latitude and longitude at work locations. This information is limited to the accuracy available to the Magellan instrument, and is included in Appendix "A".

II METHOD OF INVESTIGATION

a. Test Pits

A rubber tired Case 580L backhoe was utilized to complete the ten test pits at the site. The test pits were excavated around and adjacent to the existing canal in an attempt to determine the condition of the canal wall structure. Representative samples of the fill strata were collected in glass quart jars from various depths throughout the test pit. Sketches and test pit logs based on visual observations made at the site are included in Appendix 'B' of this report.

b. Test Borings

Rubber tired truck-mounted CME-55 and track carrier ATV CME-850 rotary drill rigs manufactured by Central Mine Equipment were used to complete the test borings at the site. Standard drilling techniques were employed to advance 4 1/4" inside diameter hollow stem augers equipped with a center plug through the fills and overburden soils encountered at the site. Disturbed soil samples were obtained on a continuous basis throughout the test boring by driving a 24-inch long by 2-inch outside diameter (O.D.) split spoon soil sampler into the soils below the bottom of the augers utilizing a 140-lb drop hammer in accordance with ASTM D-1586.

Soil sampling was done in this manner from the existing ground surface to the bottom of the test boring. Representative portions of the recovered split spoon samples were placed in 8-oz. glass jars, pertinent drilling information was noted on the jar lid and retained for possible further testing.

Bedrock was encountered at approximately 24.0-feet to 33.0-feet across the site. A triple tube/split inner tube wireline core barrel equipped with a rotary diamond rock core bit was used to

obtain NQ-'3' (1.775-inch O.D. nominal recovered core sample) bedrock samples from test boring DC01-16 completed at the site. A photograph of the recovered rock core sample is included in Appendix 'D'.

Test pit and test boring logs were prepared on-site by this writer based on the recovered overburden and bedrock samples. Features such as color, consistency, texture and composition of the recovered samples were noted, and drill logs prepared based on this information. The test boring logs are attached in Appendix 'C' of this report.

Upon completion of the continuously sampled test borings at the site, four additional borings (U01-17, U01-21, U01-21A and U01-23), were advanced for the purpose of obtaining undisturbed Shelby tube samples of the soft clay soils encountered during drilling. Initially, the boring was augered to the depth selected by Mr. Lenhardt. A 3-inch diameter by 30-inch long standard Shelby tube was then attached to the drill rods, and hydraulically pressed into the clay strata. The down pressure used to push the tube was observed on the rig's hydraulic gauge and noted on the drill logs. The tube was allowed to remain in place approximately 30-minutes (or more) and then turned to shear off the sample and retrieved. The tube was then sealed internally with wax, capped at both ends, taped with duct tape and resealed with wax.

c. Thin wall structure cores

A portable coring machine and diamond thin wall core barrel was used to obtain 4-inch nominal diameter core samples from three locations on the existing structure. Cores C01-12 and C01-13 were advanced to a depth of approximately 48-inches into the structure. Core C01-14 was terminated at 36-inches due to encountering a possible metal reinforcing bar. Photographs of recovered thin wall structure cores are attached in Appendix 'D'.

III GENERAL SITE CONDITIONS

In general, the subsurface conditions encountered typically consisted of iron ore pellets, slag, cinder, silt and shale fills underlain by clays and shale bedrock. Peat was also noted in several of the test boring locations.

All "D" series test borings were advanced to sampler refusal on shale bedrock. A 5-foot run of NQ-'3" size bedrock core was obtained from boring DC01-16. The bedrock consisted of middle Devonian age shale, and was noted to be sound, thinly bedded with no pieces over 4-inches in length recovered.

One boring (A01-9) was an 'auger only' test bore, that is advanced for the purpose of determining at what depth penetration refusal occurred. This bore was located on top of the existing structure, and was completed at 6.5-feet below grade.

Laboratory testing consisting of moisture content, Atterberg limits, grain size analysis and unconfined compressive strength was performed on selected recovered samples. The following tables summarize the laboratory testing results.

Table 1 Laboratory Test Results Union Ship Canal								
Sample Number	Depth	Moisture Content	Atterberg Limits			Grain Size Distribution		
			LL	PL	PI	% Gravel	% Sand	% Fines
D01-19	16-18	35.8%	NP	NP	NP	0.7	90.3	9.0
D01-20	4-6	7.3%	NP	NP	NP	34.1	54.3	11.6
D01-20	12-14	13.5%	NP	NP	NP	62.9	29.9	7.2
D01-22	12-14	12.6%	NP	NP	NP	34.7	56.5	8.8
D01-23	10-12	12.8%	NP	NP	NP	40.8	47.7	11.5
U01-17	28-30	31.0%	35	19	16	---	---	---
U01-23	22-24	14.8%	16	11	5	---	---	---

Table 2 Laboratory Test Results Unconfined Compressive Strength Testing			
Boring/Sample No.	Depth	Maximum Load (lbs)	Unc. Compressive Strength (psi)
U01-23 (Shelby Tube)	22' - 24'	---	10.10
C01-12 (Structure core)	14" - 21"	65,100	6090
C01-13	3" - 10"	103,320	9560
C01-13	39" - 46"	74,400	6850
C01-14	17" - 24"	92,080	8610

Laboratory test results are attached in Appendix 'E' of this report.

Please consult the attached boring logs for more specific details such as "N" values, soil classification and water level conditions.

The stratification lines shown on the boring logs are approximate, where as in-situ the changes between strata may be more gradual. The subsurface information represented by the attached logs indicates the conditions present only at the location or depth of each sample taken at the borehole specified.

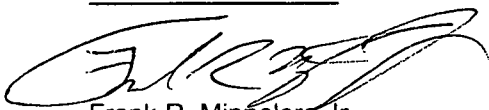
The following pages contain data recorded in the field by our on-site geologist. The data, along with the recovered soil and rock core samples, their visual classification, associated laboratory testing and photographs constitutes this subsurface investigation report.

All recovered samples will be delivered to the Buffalo District office of the U.S. Army Corps of Engineers for storage unless directed otherwise.

It has been a pleasure working with you on this project. If you have any questions, or wish to discuss this report further, please contact our office at any time.

If we can be of further service to you, please let us know. SJB Services Inc. offers a full range of construction testing services (concrete, asphalt, soil and steel) should you have a need for these items at a later date.

SJB SERVICES INC.


Frank R. Minnolera Jr.
Staff Geologist

APPENDIX B
TEST PIT LOGS



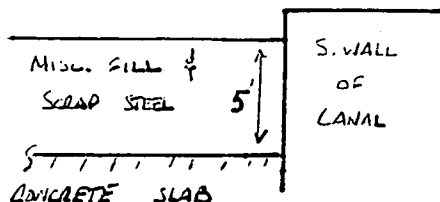
TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 1650
TIME FINISHED 1720

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'B'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Miscellaneous FILL consisting of Steel Rebar, Slag, Iron Ore and Black Silt	E-M
2'		
3'		
4'		
5'		
6'	Test Pit Terminated at 5.0' (Concrete Slab Encountered)	
7'		
8'		
9'		
10		
11'		
12'		
13'		



ABBREVIATIONS

F - FINE GR-GRAY
C - COARSE BR-BROWN
M-MEDIUM YEL-YELLOW
F/M-FINE TO MEDIUM
F/C-FINE/COARSE

PROP USED

TRACE (TR.) 0-10%
LITTLE (LI.) 10 - 20%
SOME (SO.) 20 - 35%
AND 35 - 50%



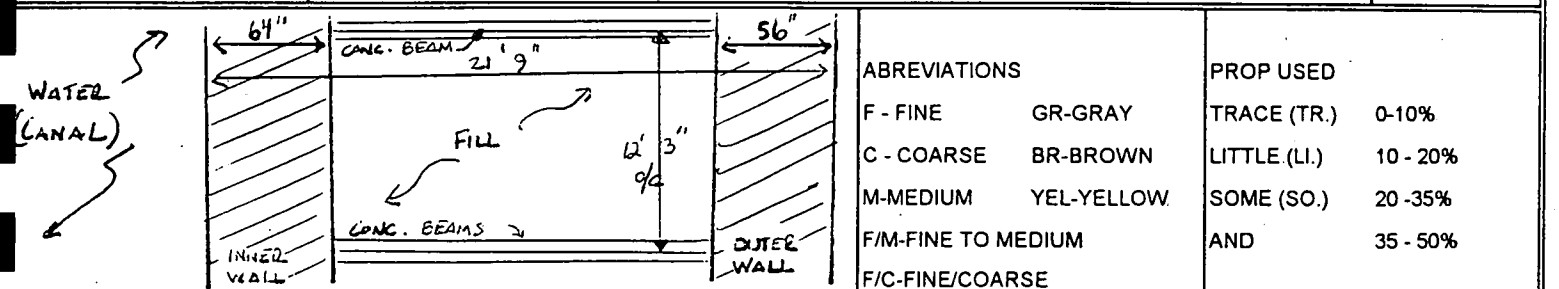
TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 1415
TIME FINISHED 1510

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'C-1'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Red-Brown IRON ORE Pellets and Silt (moist, FILL)	M
2'	Brown-Black and Gray SLAG (moist, FILL)	
3'		
4'	Test Pit Terminated at 3.0'	
5'		
6'		
7'		
8'		
9'		
10		
11'		
12'		
13'		





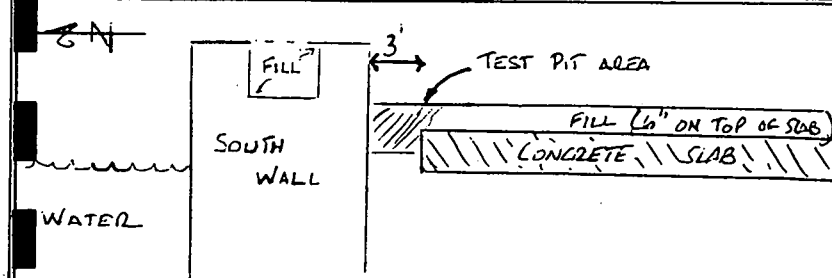
TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 1515
TIME FINISHED 1535

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'C-2'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Red-Brown IRON ORE Pellets and Silt	M ↓
2'	Test Pit Terminated at 1.5' (Concrete Slab Encountered - could not excavate)	
3'		
4'		
5'		
6'		
7'		
8'		
9'		
10		
11'		
12'		
13'		



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F - FINE GR-GRAY
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LITTLE (LI.) 10 - 20%
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AND 35 - 50%



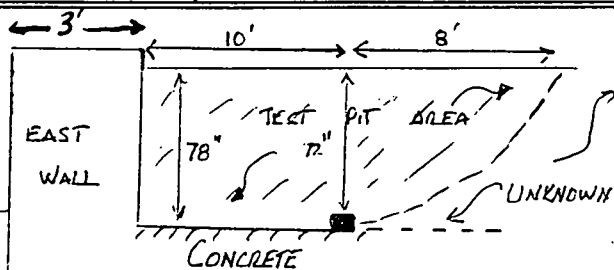
TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 1300
TIME FINISHED 1515 (Both D-1 + D-2)

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'D-1'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Brown-Black CINDERS and f-c Sand, tr. organics, tr. wood (moist, FILL)	E-M
2'		
3'		
4'		
5'		
6'		
7'	Test Pit Terminated at 6.0' (Concrete Slab Encountered)	
8'		
9'		
10'		
11'		
12'		
13'		



ABBREVIATIONS

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C - COARSE BR-BROWN
M-MEDIUM YEL-YELLOW
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LITTLE (LI.) 10 - 20%
SOME (SO.) 20 -35%
AND 35 - 50%

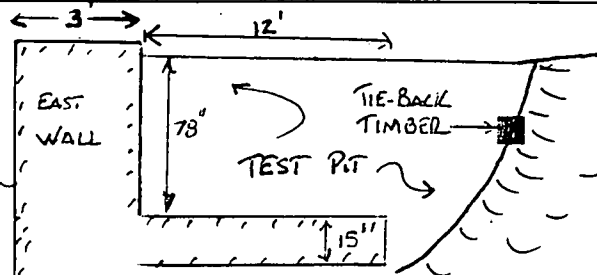


TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT	UNION SHIP CANAL	DATE:	2/5/02
CLIENT	USACE	LOCATION	
CONTRACTOR		TEST PIT NO.	TEST PIT 'D-2'
FIELD REP		PROJECT NO.	BD-02-016
		WEATHER / TEMP	COLD, WINDY 15°
EXCAVATION EQUIP		OPERATOR	R. BROWN
GROUND ELEV		MAKE/ MODEL	CASE / 580L
TIME STARTED	1300	CAPACITY	
TIME FINISHED	1415 (Both D-1 + D-2)	REACH	

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Black CINDERS and f-c Sand, tr. organics, tr. wood (moist, FILL)	
2'		
3'		
4'		
5'		
6'		
7'	Test Pit Terminated at 6.5' (Concrete Slab Encountered)	
8'		
9'		
10		
11'		
12'		
13'		



ABREVIATIONS

F - FINE	GR-GRAY
C - COARSE	BR-BROWN
M-MEDIUM	YEL-YELLOW
F/M-FINE TO MEDIUM	
F/C-FINE/COARSE	

PROP USED

TRACE (TR.)	0-10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

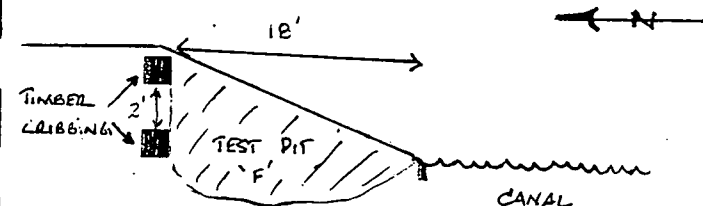


TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716) 649-8051

PROJECT	UNION SHIP CANAL	DATE:	2/5/02
CLIENT	USACE	LOCATION	
CONTRACTOR		TEST PIT NO.	TEST PIT 'F'
FIELD REP		PROJECT NO.	BD-02-016
		WEATHER / TEMP	COLD, WINDY 15°
EXCAVATION EQUIP		OPERATOR	R. BROWN
GROUND ELEV		MAKE/ MODEL	CASE / 580L
TIME STARTED	1000	CAPACITY	
TIME FINISHED	1020	REACH	

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Gray-Black SHALE, tr. concrete, tr. wood fragments (moist-wet, FILL)	E-M
2'		
3'		
4'		
5'		
6'		
7'	Test Pit Completed at 6.0'	
8'		
9'		
10'		
11'		
12'		
13'		



ABBREVIATIONS

F - FINE GR-GRAY
C - COARSE BR-BROWN
M-MEDIUM YEL-YELLOW
F/M-FINE TO MEDIUM
F/C-FINE/COARSE

PROP USED

TRACE (TR.) 0-10%
LITTLE (LI.) 10 - 20%
SOME (SO.) 20 - 35%
AND 35 - 50%



TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT	UNION SHIP CANAL	DATE:	2/4/02
CLIENT	USACE	LOCATION	
CONTRACTOR		TEST PIT NO.	TP - G
FIELD REP		PROJECT NO.	BD-02-016
		WEATHER / TEMP	COLD, WINDY, 15°
EXCAVATION EQUIP		OPERATOR	R. BROWN
GROUND ELEV		MAKE/ MODEL	CASE / 580 L
TIME STARTED	1430	CAPACITY	
TIME FINISHED	1530	REACH	

DEPTH	SOIL DESCRIPTION	EXCAV EFFORT	REMARK NO.
1'	Black CINDERS and f-c Slag, tr. brick, tr. shale (moist, FILL)	E - M	
2'			
3'			
4'	Brown-Black SHALE (moist, FILL)		
5'			
6'			
7'	Test Pit Complete at 6.0' (No free standing water encountered at completion)		
8'			
9'			
10			
11'			
12'			
13'			
14'			

ABBREVIATIONS		PROP USED	
F - FINE	F/M - FINE TO MEDIUM	TRACE (TR.)	0-10%
C - COARSE	F/C-FINE/COARSE	LITTLE (LI.)	10 - 20%
GR - GRAY	M - MEDIUM	SOME (SO.)	20 -35%
BN - BROWN	V-VERY	AND	35 - 50%
YEL-YELLOW			

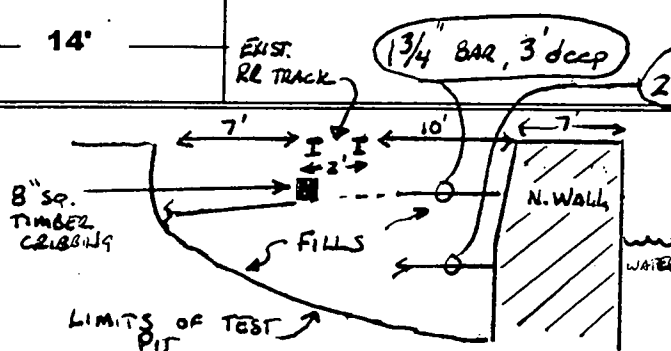


TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT	UNION SHIP CANAL	DATE	2/4/02
CLIENT	USACE	LOCATION	
CONTRACTOR		TEST PIT NO.	TP - H
FIELD REP		PROJECT NO.	BD-02-016
		WEATHER / TEMP	COLD, WINDY, 15°
EXCAVATION EQUIP		OPERATOR	R. BROWN
GROUND ELEV		MAKE/ MODEL	CASE / 580L
TIME STARTED	1145	CAPACITY	
TIME FINISHED	1400	REACH	

DEPTH	SOIL DESCRIPTION	EXCAV EFFORT	REMARK NO.
1'	Brown-Black & Red Cinders and Slag, tr. ash (moist, FILL)	MED	
2'			
3'			
4'	Gray-Black SHALE Rock (moist, FILL)		
5'			
6'			
7'			
8'	Test Pit Complete at 8.0' (Water noted infiltrating at 8.0')		
9'			
10'			
11'			
12'			
13'			
14'			



ABBREVIATIONS		PROP USED	
F - FINE	F/M - FINE TO MEDIUM	TRACE (TR.)	0-10%
C - COARSE	F/C-FINE/COARSE	LITTLE (LI.)	10 - 20%
GR - GRAY	M - MEDIUM	SOME (SO.)	20 - 35%
BN - BROWN	V-VERY	AND	35 - 50%
YEL-YELLOW			



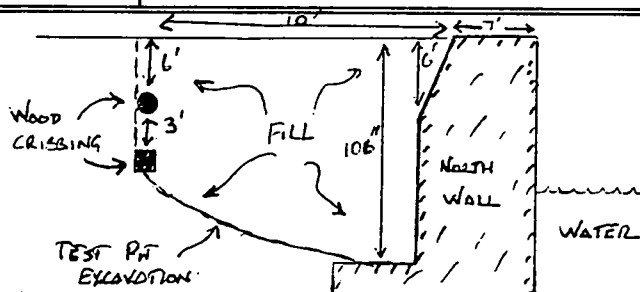
TEST PIT FIELD LOG

Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 0815
TIME FINISHED 0945

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'I'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Red-Black CINDERS and Slag, tr. iron ore fragments (moist, FILL)	E-M
2'		
3'		
4'		
5'	Black CINDERS and f-c Sand (moist, FILL)	
6'		
7'		
8'		
9'		
10'	Red-Brown and Black SHALE Rock (moist, FILL) Becomes wet at 10.0'	
11'		
12'	Test Pit Completed at 10.5' (Caved in due to water)	
13'		



ABBREVIATIONS

F - FINE GR-GRAY
C - COARSE BR-BROWN
M-MEDIUM YEL-YELLOW
F/M-FINE TO MEDIUM
F/C-FINE/COARSE

PROP USED

TRACE (TR.) 0-10%
LITTLE (LI.) 10 - 20%
SOME (SO.) 20 - 35%
AND 35 - 50%



TEST PIT FIELD LOG

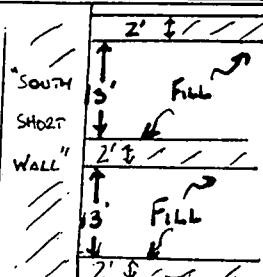
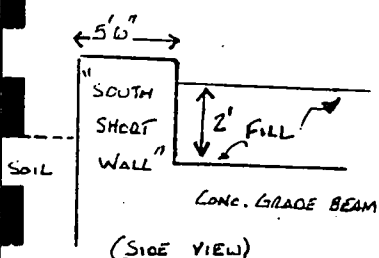
Western New York Office
5167 South Park Avenue
Hamburg, NY 14075
(716) 649-8110 (716)649-8051

PROJECT UNION SHIP CANAL
CLIENT USACE
CONTRACTOR
FIELD REP
EXCAVATION EQUIP
GROUND ELEV
TIME STARTED 1330
TIME FINISHED 1430

DATE: 2/5/02
LOCATION
TEST PIT NO. TEST PIT 'J'
PROJECT NO. BD-02-016
WEATHER / TEMP COLD, WINDY 15°
OPERATOR R. BROWN
MAKE/ MODEL CASE / 580L
CAPACITY CY
REACH FT

DEPTH	SOIL DESCRIPTION	EXCAV. EFFORT
1'	Red-Brown and Black SILT and f-c Sand, with Slag, Wood, Brick and Steel Fragments, Oily Sheen and "Red" Tinted Water noted in Test Pit	E-M
2'		
3'		
4'		
5'		
6'		
7'	Test Pit Terminated at 6.0' (Caved in due to Water)	
8'		
9'		
10		
11'	Water Stabilized at Approximately 2.0' Below Grade	
12'		
13'		

(PLAN VIEW)



ABBREVIATIONS

F - FINE GR-GRAY
C - COARSE BR-BROWN
M-MEDIUM YEL-YELLOW
F/M-FINE TO MEDIUM
F/C-FINE/COARSE

PROP USED

TRACE (TR.) 0-10%
LITTLE (LI.) 10 - 20%
SOME (SO.) 20 - 35%
AND 35 - 50%

APPENDIX C
SUBSURFACE BORING LOGS

START	2/13/02
FINISH	2/13/02
SHEET 1	OF 1

SJB SERVICES, INC.
SUBSURFACE LOG



HOLE NO.	A01-9
SURF. ELEV	
G.W. DEPTH	See Notes

PROJECT:	USACE - UNION SHIP CANAL
PROJ. NO.:	BD-02-016

LOCATION: STA 19 + 25 O/S 8' S OF N WALL FACE

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
								Start time 1230
		AU	GER				FILLS	
5								End time 1242
10							Boring complete with Auger Refusal at 6.5'	No Free Standing Water Encountered at Boring Completion
15								
20								
25								
30								
35								
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION:

DRILLER: M. KUKOLECA

DRILL RIG TYPE : CME 850

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
 START 2/14/02
 FINISH 2/14/02
 SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG



HOLE NO: D01-16
 SURF. ELEV 590.1
 G.W. DEPTH See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 2 + 65 10' S OF S CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
							Miscellaneous FILL	Start Time 0845 8 7/8" Roller Bit used to advance through Concrete Slab Concrete Slab ≈ 3' Thick
							Concrete Slab	
5	1	1	2					
		2	3		4	0.5	Brown-Black SHALE Rock and Silt (moist, FILL)	
	2	5	10					
		5	3		15	1.2		
	3	1	1				Brown-Black Silty CLAY, little f-c Sand, tr. shale, tr. peat (moist-wet, FILL)	
10		5	7		6	1.0		
	4	1	2				Black SHALE rock and Silt (wet, FILL)	
		4	2		6	1.0		
	5	3	8					End Drilling 1400 NQ '3' Size Rock Core Run #1 24.0' to 29.0' REC = 90% RQD = 0% No Pieces over 4" in length Loss 0.5'
		6	2	14	8	1.0		
15	6	10	4					
		3	4	7	8	1.0	Brown PEAT (moist, loose, PT)	
	7	3	7				Gray Silty CLAY, tr. sand (moist-wet, medium, CL)	
		4	3	11	8	1.2		
	8	1	5				Contains some f-c Sand, tr. gravel	
20		4	2	9	8	1.0		
	9	1	5				Contains little f-c Gravel, tr. shale	
		9	50/0.4	14	11	1.3	Black SHALE Rock (moist)	
								Boring Complete at 29.0' Coring Stated 1440 150 - 200 Lbs down Pressure used during Coring Coring Ended 1510
25							Black SHALE Rock, medium hard, sound, thinly bedded	
30								
35								
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION:

DRILLER: M. KUKOLECA

DRILL RIG TYPE: CME 850

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/12/02

FINISH

2/13/02

SHEET

1

OF

1

SJB SERVICES, INC. **SUBSURFACE LOG**



HOLE NO.

D01-17

SURF. ELEV

592.8

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 18 + 80 5' S OF S CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/5	5/12	12/18	N	REC		
	1	3	33	50/0.	REF	0.9	Red-Brown IRON ORE Pellets and Silt (moist, FILL)	
	2	25	30				Black SLAG and Silt, tr ore fragments (moist, FILL)	
		15	13		45	1.6		
5	3	6	7					Oily Sheen Noted in Sample #3
		12	10		19	1.7		
	4	10	13				Blue and White LIME and Slag (moist, FILL)	
		14	13		27	1.5		
	5	6	5					
10		3	5		8	1.0		
	6	5	1				Black f-c SAND and Silt, tr. wood (wet, FILL)	
		1	3		2	1.0		
	7	8	7				Brown-Black and Gray SHALE (wet, FILL)	
		3	5		10	1.0		
15	8	7	2				Brown Silty CLAY, tr. sand (wet, FILL)	
		1	1		3	1.0		
	9	WOR	11.0	50/0.3	REF	0.1		Wood noted in Shoe of Spoon
	10	2	3				Brown-Black WOOD (wet, FILL)	
20		3	3		6	0.2		End Drilling 1550 on 2/12/02
	11	5	4					Augers at 20.0'
		3	6		7	0.1		Free Standing Water at 13.0' at 0845 on 2/13/02
	12	5	4					
		6	9		10	0.5		
25	13	68	10					
		16	16		26	0.0		
	14	6	6				Brown Silty CLAY, tr. sand (wet, medium, CL)	
		6	6		12	1.8		
	15	2	3					
30		2	1		5	1.6		
	16	1	1				Becomes Varved Red-Brown and Gray, Contains occasional Silt Seams	
		2	2		3	1.4		
	17	1	2					End Drilling at 1015
		13	50/0.4		15	1.3	Black SHALE Rock (moist)	
35								
							Boring Complete with Sample Spoon Refusal at 33.9'	Free Standing Water Recorded at 24.0' at 1045 on 2/13/02
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION:

DRILLER: M. KUKOLECA

DRILL RIG TYPE: CME 850

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE: _____
 START 2/15/02
 FINISH _____
 SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG



HOLE NO. U01-17
 SURF. ELEV _____
 G.W. DEPTH See Notes

PROJECT: USACE - UNION SHIP CANAL
 PROJ. NO.: BD-02-016

LOCATION: STA 18 +75
O/S 5' South of South Canal wall

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5							FILLS (Refer to boring D01-17 log for detail)	Start Drilling 1300
								Boring advanced for purpose of obtaining undisturbed samples
15	AUGER						FILLS (Refer to boring D01-17 log for detail)	Tube ST-1 Pushed 28.0' - 30.0' Tube pushed 1418 300-350 Lbs. down pressure Pulled at 1445 Recovery = 0.75'
20							FILLS (Refer to boring D01-17 log for detail)	Tube ST-2 Pushed 30.0' - 32.0' Tube pushed 1505 650 Lbs. down pressure Pulled at 1535 Recovery = 0.3'
25							FILLS (Refer to boring D01-17 log for detail)	
30	1 TUBE						FILLS (Refer to boring D01-17 log for detail)	
35	2 TUBE						FILLS (Refer to boring D01-17 log for detail)	
40							FILLS (Refer to boring D01-17 log for detail)	

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: Mike Kukoleca

DRILL RIG TYPE: CME 55

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

Boring Complete at 32.0'

End Drilling at 1535

START	<u>2/13/02</u>		
FINISH	<u>2/13/02</u>		
SHEET	1	OF	1

SJB SERVICES, INC.
SUBSURFACE LOG



HOLE NO.	D01-18
SURF. ELEV	595.0
G.W. DEPTH	See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 19 + 25 13' S OF N CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER				SOIL OR ROCK CLASSIFICATION	NOTES	
			0/8	8/12	12/18	N			REC
	/	1	4	8			Brown and White f-c SAND, tr. slag, tr. cinders (moist, FILL)	Start time 1145	
			13	17		21			1.4
	/	2	13	13					
			11	11		24			1.8
5	/	3	6	8					
			9	11		17	2.0	Gray Weathered CONCRETE (moist)	End time 1215
		4	100	/0.5		REF	0.5		
10									
15									
20									
25									
30									
35									
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION:

DRILLER: M. KUKOLECA

DRILL RIG TYPE : CME 850

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/12/02

FINISH

2/12/02

SHEET

1

OF

1

SJB SERVICES, INC. **SUBSURFACE LOG**



HOLE NO.

D01-19

SURF. ELEV

595.4

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 20 + 40 50' N OF S CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5	1	3	7				Gray CONCRETE Fragments, tr. brick (moist, FILL)	Start time 0830 Fills appear to be dredged material Characteristic Oily Sheen and Odor noted in Samples #6 thru #15
		8	10		15	1.3		
	2	4	20				White and Black SLAG and Ash (moist, FILL)	
		5	4		25	1.2		
	3	4	5					
10		4	5		9	1.9		
	4	6	6					
		7	4		13	1.7	Black PEAT and fine Sand (moist, FILL)	
	5	17	7				Blue Black and White SLAG and Ash (wet, FILL)	
		4	3		11	1.4		
15	6	5	7				Black fine SAND, little Silt, tr. organics (wet, FILL)	
		4	4		11	1.9		
	7	3	3					
		2	2		5	2.0		
	8	2	1					
20		2	2		3	0.7		
	9	3	2					
		1	3		3	2.0		
	10	1	2					
		2	2		4	1.3		
25	11	1	3					
		3	3		6	1.8		
	12	9	8					
		7	5		15	1.9		
	13	1	3					
30		3	3		6	1.0		
	14	5	2					
		2	3		4	2		
	15	1	1					
		3	2		4	1.0		
35	16	5	7				Black SLAG and Cinders, tr. wood, tr. ash, tr. iron fragments (wet, FILL)	
		7	13		14	1.5		
	17	19	9					
		9	7		18	1.6		
	18	WOR	/1.0				Black SHALE Rock (moist)	
40		10	50/0.2		10	1.1		
							Boring Complete with Sample Spoon Refusal at 35.7'	

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: M. KUKOLECA

DRILL RIG TYPE:

CME 850

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

End Drilling at 1150

Free Standing Water
Recorded at 10.3' at 1230 -
Augers in Boring over
Lunch

DATE:

START

2/11/02

FINISH

2/11/02

SHEET

1

OF

1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO.

D01-20

SURF. ELEV

594.5

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 13 + 42 O/S 20' N OF N CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES			
		0/6	6/12	12/18	N	REC					
	1	1	8				Brown-Black CINDERS and Silt, tr. slag, tr. ash (moist, FILL)	Start time 1235			
		9	6		17	1.2					
		2	5	4							
		3	3		7	1	Black SHALE Rock (moist, FILL)				
	5	3	4								
		4	4		8	1.3					
	4	8	4				(wet)				
		3	7		7	1.1					
		5	4	4							
10		3	2		7	1.0					
		6	3	2							
		2	2		4	1.0					
	7	6	4								
		2	2		6	1.2					
	15	8	3	4							
		8	9	12	X	0.5					
		9	6	4							
		3	5	7	X	0.7					
	10	8	5								
		6	2	11	X	0					
	20		6	7	14	X				0.1	
	12	7	3								
		3	6	6	16	1.1					
	25	13	11	8							
		8	9		16	1.1					
	14	12	3								
		2	4		5	0.9					
	15	3	2				Gray Silty CLAY, occasional Peat Seams (moist, CL) Contains tr-little f-c Sand, tr. shale (soft)				
	30	3	12		5	0.7					
		16	5	6	50/0.	REF					
							Black SHALE rock (moist)	End time 1450			
							Boring Complete with Sample Spoon Refusal at 31.2'	Free Standing Water Recorded at 11.1' at Boring Completion			
	35										
40											

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: M. KUKOLECA

DRILL RIG TYPE: CME 850

CLASSIFICATION:

VISUAL BY GEOLOGIST.

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START 2/8/02

FINISH 2/8/02

SHEET 1 OF 1

SJB SERVICES, INC. SUBSURFACE LOG



HOLE NO. D01-21

SURF. ELEV 594.9

G.W. DEPTH See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 12 + 21 0/S 24' N OF N CANAL WALL

PROJ. NO.: BD-02-016

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5	1	16	52				Brown-Black and Gray SLAG and Cinders (moist, FILL)	Start time 1330
		20	13		72	1.3		
	2	20	11					
		11	6		22	1.0	Contains tr. concrete fragments	
	3	5	4				Brown-Black CINDERS and Silt, tr. wood, tr. ash (moist, FILL)	
10		4	3		8	1.2		
	4	4	4					
		4	5		8	1.5		
	5	2	3				Brown-Gray SILT and Shale Rock (moist, FILL)	
		6	3		9	1.3		
15	6	6	6					
		8	6		14	1.1		
	7	9	6				Black SHALE Rock (wet, FILL)	
		5	8		11	1.2		
	8	9	9					
20		4	6		13	1.3		No Recovery Sample #10
	9	6	6					
		5	4		11	1.2		
	10	20	20					
		27	6		47	0.0		
25	11	13	4				Brown-Black PEAT and Silt (moist, loose, PT)	
		3	3		7	1.6		
	12	3	2					
		2	3		4	0.0		
	13	3	1				Gray Silty CLAY, tr. sand (moist)	Very Poor Recovery Sample #12 - Clay in Shoe of Spoon
30		1	1		2	1.3	Contains little-some f-c Sand, tr. gravel (moist, very soft)	
	14	6	10				(stiff)	
		6	3		16	2.0		
	15	13	45	50/0.	REF	0.0		
35	16	100	/0.0		REF	0.0		
40							Boring Complete with Sample Spoon Refusal at 30.0'	Augers left in Borehole over Weekend

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION:

DRILLER: M. KUKOLECA

DRILL RIG TYPE: CME 850

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/18/02

FINISH

SHEET

1

OF

1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO.

U01-21

SURF. ELEV

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 12 & 21

PROJ. NO.: BD-02-016

25' North of North Canal wall

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/5	6/12	12/18	N	REC		
5							FILLS (REFER TO BORING D01-21 LOG FOR DETAILS)	Boring advanced for purpose of obtaining undisturbed samples
10							FILLS (REFER TO BORING D01-21 LOG FOR DETAILS)	Start time 0830
15							FILLS (REFER TO BORING D01-21 LOG FOR DETAILS)	Tube ST-1 Pushed 24.0' - 26.0' 350 Lbs. Down pressure Pushed at 1138 pulled at 1215 No Recovery
20							FILLS (REFER TO BORING D01-21 LOG FOR DETAILS)	Tube ST-2 Pushed 26.0' - 28.0' 250 Lbs. Down pressure 26.0' - 27.5' 650 Lbs. Down pressure 27.5' - 28.0' Pushed at 1330 Pulled at 1400 No Recovery
25	1	TUBE					BORING TERMINATED AT 28.0' 1400HRS	
30	2	TUBE					BORING TERMINATED AT 28.0' 1400HRS	
35							BORING TERMINATED AT 28.0' 1400HRS	
40							BORING TERMINATED AT 28.0' 1400HRS	

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: Mike Kukoleca

DRILL RIG TYPE: CME 55

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/18/02

FINISH

SHEET

1

OF

1

SJB SERVICES, INC. SUBSURFACE LOG



HOLE NO.

U01-21A

SURF. ELEV

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 12 & 21

PROJ. NO.: BD-02-016

27' North of North Canal Wall

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5							FILLS (REFER TO BORING D01-21 LOG FOR DETAILS)	Boring advanced for purpose of obtaining undisturbed samples
								Start time 1505
								Tube pushed 1525
								Tube ST-1
								Pushed 24.0' - 26.0'
								300 Lbs. Down pressure
								pulled at 1545
								No Recovery
25	1						BORING TERMINATED AT 26.0'	End time 1545

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: Mike Kukoleca

DRILL RIG TYPE: CME 55

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
 START 2/7/02
 FINISH 2/7/02
 SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG



HOLE NO. D01-22
 SURF. ELEV 594.9
 G.W. DEPTH See Notes

PROJECT: USACE - UNION SHIP CANAL
 PROJ. NO.: BD-02-016

LOCATION: STA 10+62 O/S 24'
North of North canal wall

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5	1	26	26				Gray-Black and Brown SLAG and Cinders, tr. brick (moist, FILL)	Start Time 1400
		21	9		47	1.7		
	2	10	7				Red-Brown IRON ORE and Slag (moist, FILL)	
		10	9		17	1.1		
	3	13	9					
		9	7		18	0.7		
10	4	4	4					
		2	2		6	0.6		
	5	2	4				Black SHALE Rock (moist, FILL)	
		5	3		9	1.0	(wet)	
	6	2	2					
		5	2		7	1.0		
15	7	2	12					
		10	5		22	1.5		
	8	5	4					
		9	10		13	1.7		
	9	11	8					
		7	5		15	1.6		
20	10	3	4				Brown PEAT and Organics (moist, loose, PT)	WOH = Weight of Hammer and Rods End Drilling at 1550
		4	8		8	1.2		
	11	1	1				Gray Silty CLAY, tr. sand, occasional Peat Seams (moist-wet, very soft, CL)	
		1	2		2	1.7		
	12	5	5				Becomes Olive-Gray (medium)	
		4	5		9	1.6		
25	13	WOH	/1.0					
		2	2		2	2.0	Contains little f-c Sand, tr-little f-c Gravel (soft)	
	14	4	8	50/0.2	REF	1.2	Gray-Black SHALE Rock Fragments	
30							Boring complete with Auger Refusal at 25.5' and Sample Spoon-Refusal at 26.9'	Augers left in ground overnight Free Standing Water Recorded at 15.7' at 1315 on 2/8/02
35								
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: R. BROWN

DRILL RIG TYPE: CME 850

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/7/02

FINISH

2/7/02

SHEET

1

OF

1

SJB SERVICES, INC. SUBSURFACE LOG



HOLE NO.

D01-23

SURF. ELEV

594.4

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 7+13 O/S 27'

PROJ. NO.: BD-02-016

North of North canal wall

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5	1	35	25				Red-Brown and Black SLAG and Cinders, tr. ash, tr. steel (moist, FILL)	Start Time 0940
		25	14		50	2.0		
	2	8	7					
		11	15		18	1.1	Red-Brown IRON ORE Fragments and Slag, tr. shale (moist, FILL)	
	3	4	4					
10		5	3		9	0.7		
	4	4	5				White-Brown and Black ASH and Cinders, tr. shale, tr. slag (moist, FILL)	
		6	5		11	1.3		
	5	5	5					
		6	3		11	1.3	Black SHALE Rock Fragments and Silt (moist, FILL)	
15	6	5	18					
		20	20		38	1.7		
	7	18	16					
		12	9		28	1.6		
	8	4	3				(wet)	
20		4	3		7	0.8		
	9	4	4					
		7	6		11	1.0		
	10	5	5				Gray Silty CLAY and Shale, tr. peat, tr. wood (moist, medium, CL)	
		2	3		7	0.7		
25	11	2	2					End Drilling at 1200
		2	2		4	1.2	Contains tr. shale (soft)	
	12	WOR	1.5					
					WOR	2.0	(very soft)	
	13	1	2					
30		11	9		13	1.3		
	14	8	60/0.4		REF		Gray-Black SHALE Rock (moist)	
35								Augers left in ground over lunch Free Standing Water Recorded at 8.8' 1/2 Hour after Completion of Drilling
40								

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: R. BROWN

DRILL RIG TYPE: CME 850

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:

START

2/15/02

FINISH

SHEET 1 OF 1

SJB SERVICES, INC. SUBSURFACE LOG



HOLE NO.

U01-23

SURF. ELEV

G.W. DEPTH

See Notes

PROJECT: USACE - UNION SHIP CANAL

LOCATION: STA 7 + 13

PROJ. NO.: BD-02-016

27' North of North wall

DEPTH FT.	SAMPL NO.	BLOWS ON SAMPLER					SOIL OR ROCK CLASSIFICATION	NOTES
		0/8	8/12	12/18	N	REC		
5							FILLS (REFER TO BORING D01-23 LOG FOR DETAILS)	Start Time 0900 Boring advanced for purpose of obtaining undisturbed samples
10							FILLS (REFER TO BORING D01-23 LOG FOR DETAILS)	Tube ST-1 Pushed 20.0' - 22.0' Tubes pushed 1015 600-750 Lbs. Down pressure pulled at 1030 Recovery 1.0'
15							FILLS (REFER TO BORING D01-23 LOG FOR DETAILS)	Tube ST-2 Pushed 22.0' - 24.0' Tube pushed 1050 350 Lbs. Down pressure Pulled at 1115 Recovery 1.3'
20	1	TUBE					Boring Complete at 24.0'	End Drilling 1135
25	2	TUBE					Boring Complete at 24.0'	
30							Boring Complete at 24.0'	
35							Boring Complete at 24.0'	
40							Boring Complete at 24.0'	

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

DRILLER: Mike Kukoleca

DRILL RIG TYPE:

CME 55

CLASSIFICATION:

VISUAL BY GEOLOGIST

METHOD OF INVESTIGATION

ASTM D-1586 USING HOLLOW STEM AUGERS

APPENDIX E
LABORATORY TEST RESULTS



**Contract
Drilling
and
Testing**

BUFFALO OFFICE

5167 South Park Avenue
Hamburg, NY 14075

Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

Attached are the results of laboratory testing conducted on various samples from the above referenced project. A representative of the U.S.A.C.E chose samples contained in this report.

The testing conducted was as follows:

ASTM D-422: Particle Size Analysis of Soils

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

ASTM D-2166: Unconfined Compressive Strength of Cohesive Soil

ASTM C-42: Obtaining & Testing Drilled Cores & Sawed Beams of Concrete

SJB Services, Inc. Drill Crew obtained the sample from the project site. Samples were received at the SJB Services, Inc. laboratory on March 5, 2002 where they were processed for testing.

If the reviewer should have any questions concerning this report, please do not hesitate to contact our office at any time.

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

Ray J. Kron
Vice President Testing Services

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Cuba, NY

Falconer, NY

Rochester, NY

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PROJECT: Union Ship Canal

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**SECTION
LTR-1**

**SHELBY TUBE
SAMPLES**

U01-17, ST-1: 28' – 30'

U01-23, ST-2: 22' – 24'



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Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016
REPORT NO.: LTR-1A

SAMPLE NUMBER: 02-162

SAMPLE IDENTIFICATION: Shelby Tube ST-1: 28' - 30'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
31.0 %	35	19	16

SAMPLE NUMBER: 02-163

SAMPLE IDENTIFICATION: Shelby Tube ST-2: 22' - 24'

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock
ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index
14.8 %	16	11	5

ASTM D-2166: Unconfined Compressive Strength of Cohesive Soil

Unconfined Strength: 10.10 psi

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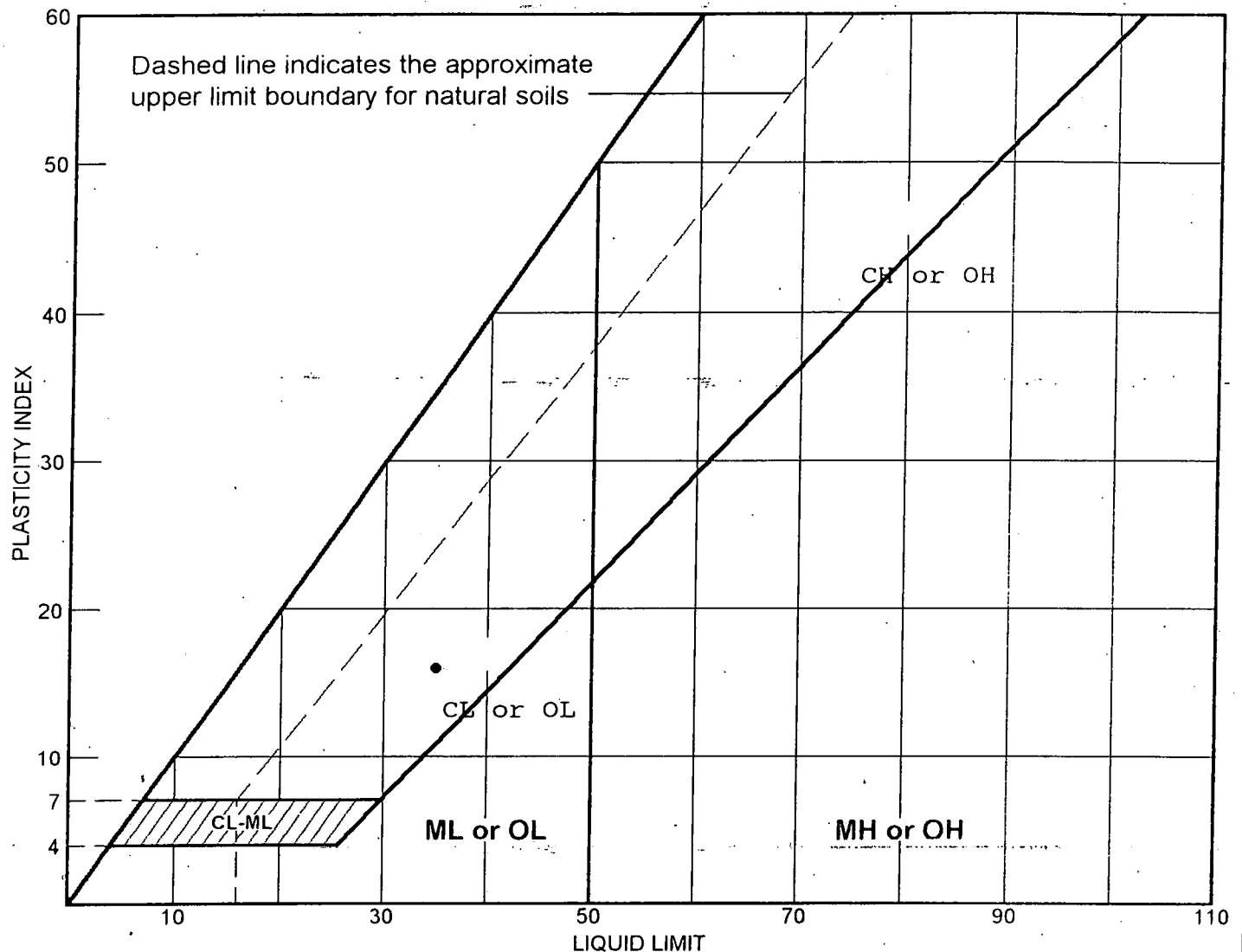
Syracuse, NY

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Gilbert, PA

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LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
•	SHELBY	02-162	28' - 30'	31.0	19	35	16	CL

LIQUID AND PLASTIC LIMITS TEST REPORT

SJB
SERVICES, INC.

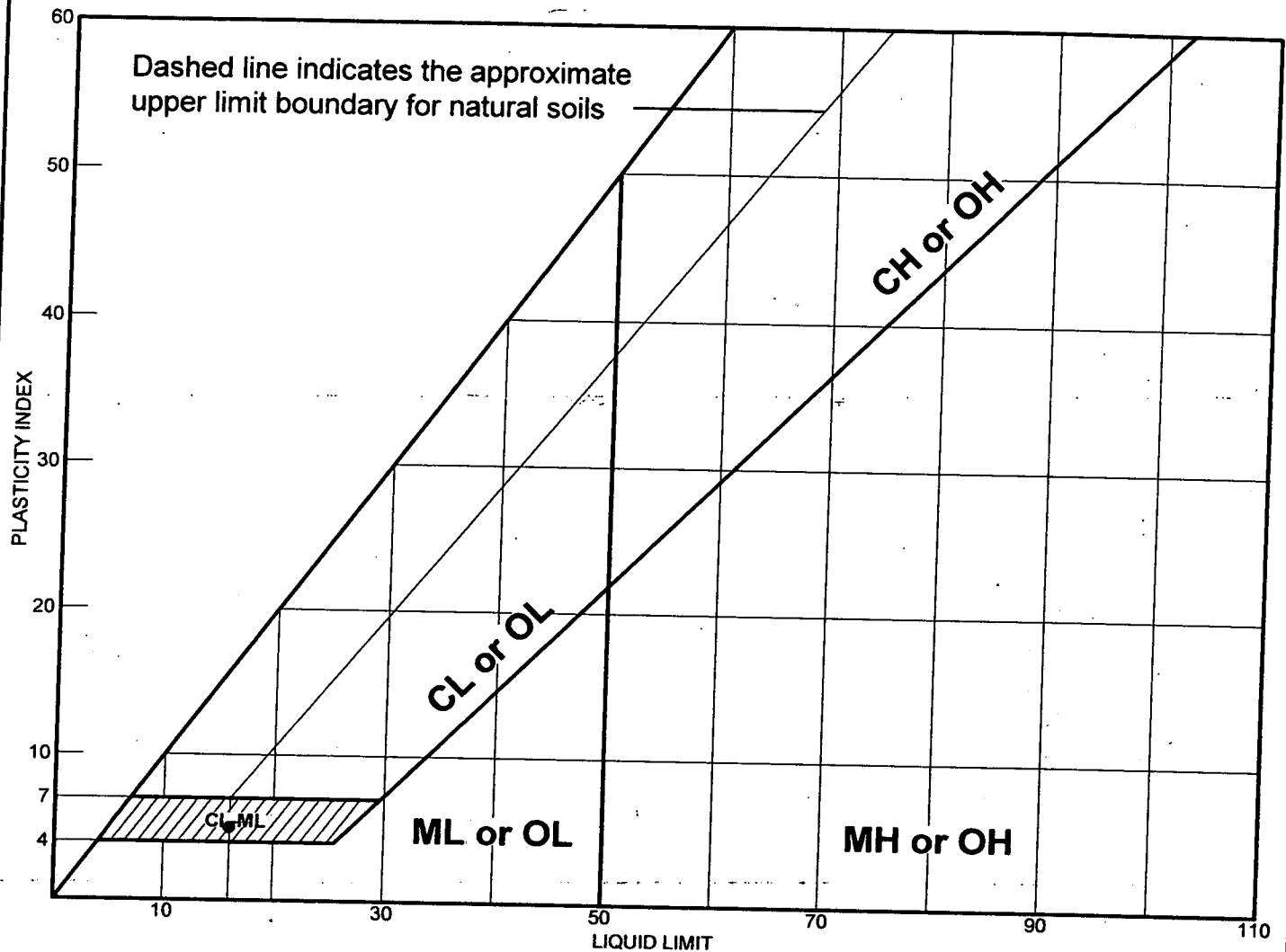
Client: U.S.A.C.E.

Project: UNION SHIP CANAL

Project No.: BD02-016

Plate

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
	16	11	5			

Project No. BD-02-029 Client: USACOE

Project: Union Ship Canal

Source: Shelby Tube U01-23 Sample No.: 02-183 Elev./Depth: 22'-24'

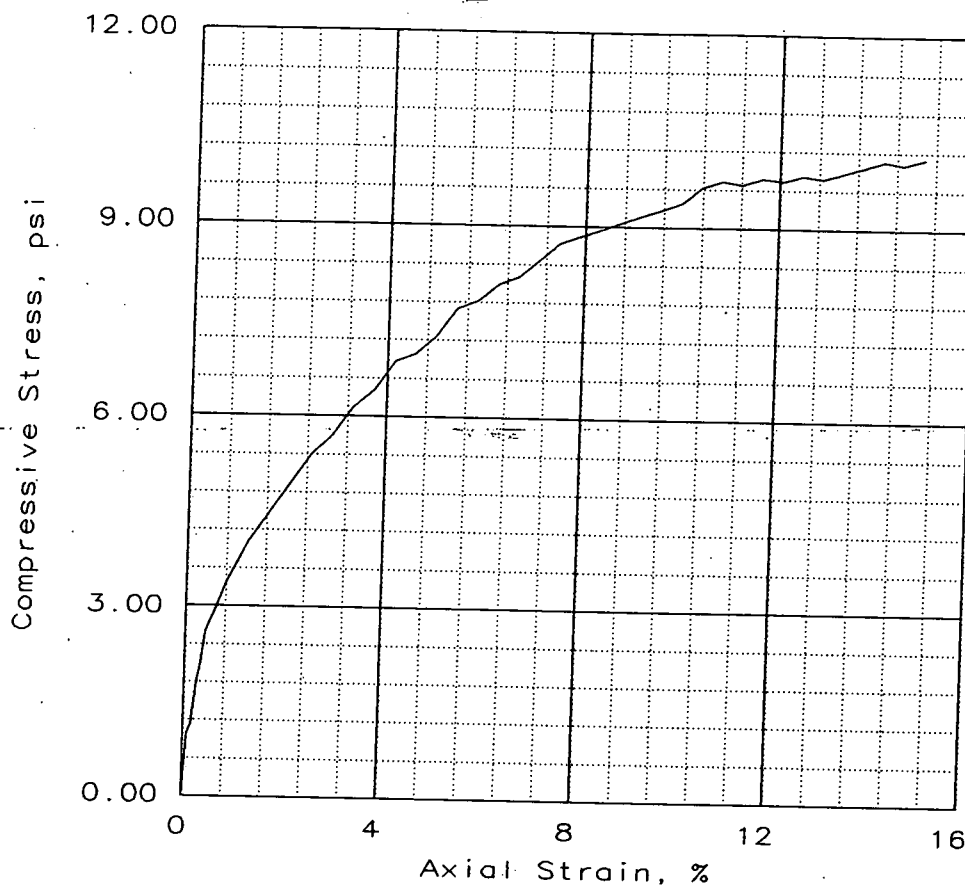
Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

SJB SERVICES, INC.

Figure Number 02-183

UNCONFINED COMPRESSION TEST



SAMPLE NO.:	1		
Unconfined strength, psi	10.10		
Undrained shear strength, psi	5.05		
Failure strain, %	15.0		
Strain rate, in/min	0.0450		
Water content, %	14.8		
Wet density, pcf	144.6		
Dry density, pcf	126.0		
Saturation, %	113.0		
Void ratio	0.3580		
Specimen diameter, in	2.80		
Specimen height, in	6.01		
Height/diameter ratio	2.15		

Description:

LL = 16 PL = 11 PI = 5 GS = 2.74 Type: Undisturbed

Project No.: BD-02-029

Date: 3-15-02

Remarks:

Client: USACOE

Project: Union Ship Canal

Location: U01-23 ST-2 22'-24'

UNCONFINED COMPRESSION TEST
SJB SERVICES, INC.

SECTION LTR-2

SPLIT SPOON SAMPLES

D01-19, S-9: 16' – 19'

D01-20, S-3: 4' – 6'

D01-20, S-7: 12' – 14'

D01-22, S-7: 12' – 14'

D01-23, S-6: 10' – 12'



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Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

REPORT NO.: LTR-2A

SAMPLE NUMBER: 02-164

SAMPLE IDENTIFICATION: Split Spoon Sample
Boring D01-19, S-9: 16' - 19'

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	Percent Passing
1/2"	100.0
1/4"	99.8
#4	99.3
#10	97.0
#20	90.6
#40	72.1
#100	24.7
#200	9.0

PERCENT COMPONENTS

GRAVEL	SAND	SILT	CLAY
0.7%	90.3%	9.0%	0.0%

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

Moisture Content = 35.8 %

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

UNABLE TO PERFORM PLASTIC LIMIT, THEREFORE SAMPLE WAS NON-PLASTIC

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Phone: (716) 649-3110
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Particle Size Distribution Report

Project: UNION SHIP CANAL

Project No.: BD02-016

Client: U.S.A.C.E.

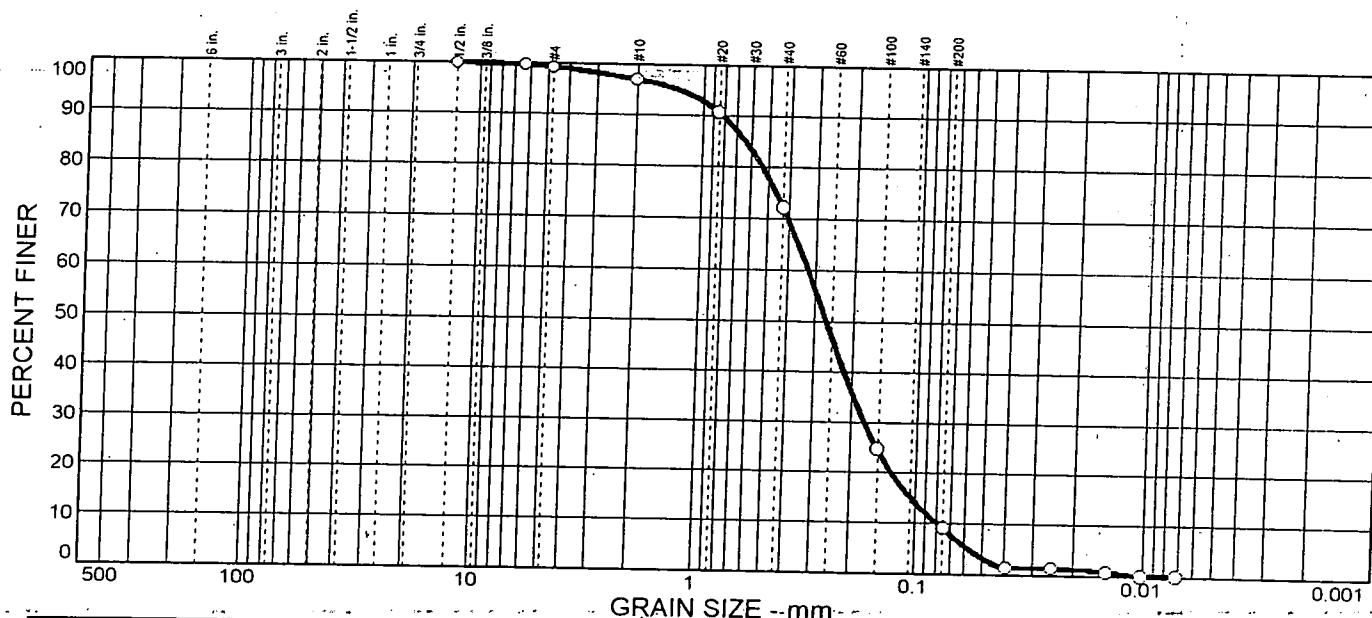
Sample No: 02-164

Source of Sample: SPLIT SPOON SAMPLE

Date: 3/26/02

Location: BORING D01-19: S-9: 16' - 19'

Elev./Depth: 16' - 19'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.7	2.3	24.9	63.1	9.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.5 in.	100.0		
.25 in.	99.8		
#4	99.3		
#10	97.0		
#20	90.6		
#40	72.1		
#100	24.7		
#200	9.0		

Soil Description		
BROWN SAND, TRACE SILT & GRAVEL		
Atterberg Limits		
PL=	LL=	PI= NP
Coefficients		
D ₈₅ = 0.639	D ₆₀ = 0.324	D ₅₀ = 0.264
D ₃₀ = 0.172	D ₁₅ = 0.105	D ₁₀ = 0.0798
C _u = 4.05	C _c = 1.15	
Classification		
USCS= SP-SM	AASHTO= A-3	
Remarks		
LTR-2A		
SAMPLED BY: SJB		
DATE RECEIVED: 3/5/02		

* (no specification provided)

Plate

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Falconer, NY

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Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

REPORT NO.: LTR-2B

SAMPLE NUMBER: 02-165

SAMPLE IDENTIFICATION: Split Spoon Sample
Boring D01-20, S-3: 4' - 6'

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	Percent Passing
3/4"	100.0
1/2"	97.5
1/4"	77.2
#4	65.9
#10	38.6
#20	26.5
#40	20.2
#100	14.0
#200	11.6

PERCENT COMPONENTS			
GRAVEL	SAND	SILT	CLAY
34.1%	54.3%	7.7%	3.9%

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

Moisture Content = 7.3 %

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

UNABLE TO PERFORM PLASTIC LIMIT, THEREFORE SAMPLE WAS NON-PLASTIC

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Hamburg, NY 14075

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Fax: (716) 649-8051

Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

REPORT NO.: LTR-2C

SAMPLE NUMBER: 02-166

SAMPLE IDENTIFICATION: Split Spoon Sample

Boring D01-20, S-7: 12' - 14'

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	Percent Passing
1"	100.0
3/4"	79.7
1/2"	57.8
1/4"	41.3
#4	37.1
#10	24.6
#20	17.0
#40	12.8
#100	8.9
#200	7.2

PERCENT COMPONENTS			
GRAVEL	SAND	SILT	CLAY
62.9%	29.9%	3.0%	4.2%

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

Moisture Content = 13.5 %

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

UNABLE TO PERFORM PLASTIC LIMIT, THEREFORE SAMPLE WAS NON-PLASTIC

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Particle Size Distribution Report

Project: UNION SHIP CANAL

Project No.: BD02-016

Client: U.S.A.C.E.

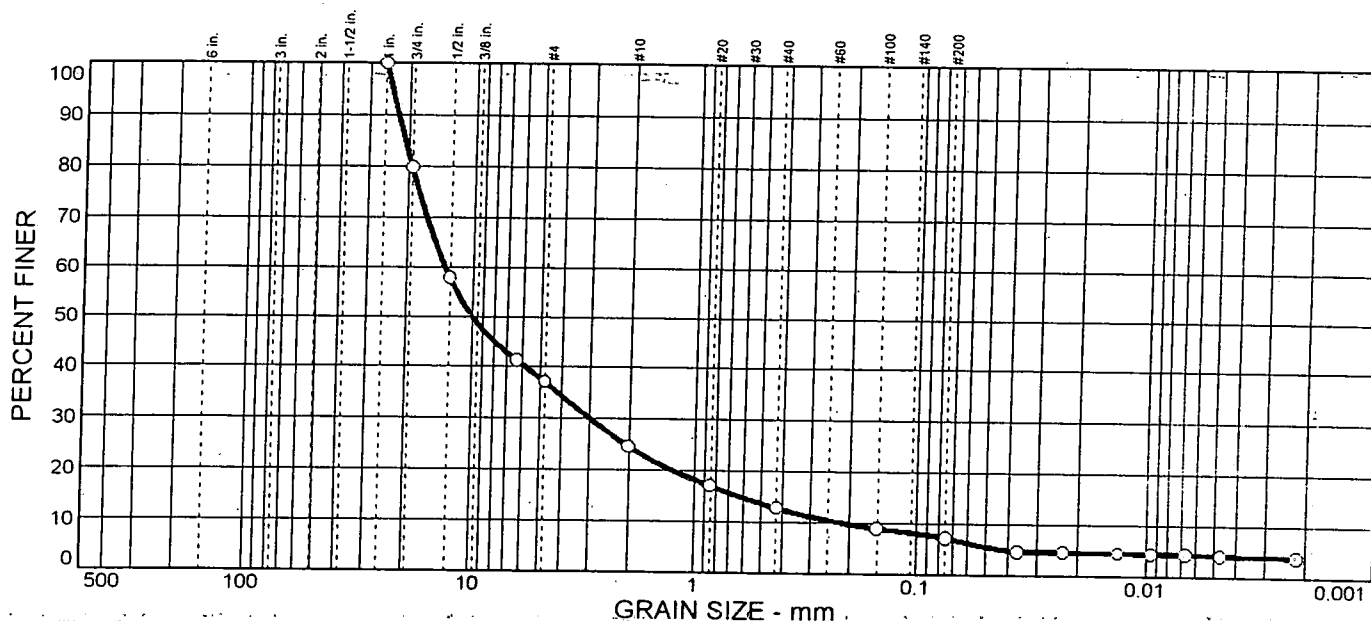
Sample No: 02-166

Source of Sample: SPLIT SPOON SAMPLE

Date: 3/26/02

Location: BORING D01-20, S-7: 12' - 14'

Elev./Depth: 12' - 14'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	20.3	42.6	12.5	11.8	5.6	3.0	4.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	79.7		
.5 in.	57.8		
.25 in.	41.3		
#4	37.1		
#10	24.6		
#20	17.0		
#40	12.8		
#100	8.9		
#200	7.2		

* (no specification provided)

Soil Description

BROWN GRAVEL, SOME SAND, TRACE SILT & CLAY

Atterberg Limits

PL=

LL=

PI= NP

Coefficients

D₈₅= 20.6

D₆₀= 13.4

D₅₀= 10.1

D₃₀= 2.97

D₁₅= 0.626

D₁₀= 0.220

C_u= 60.81

C_c= 2.99

Classification

USCS= GW-GM

AASHTO= A-1-a

Remarks

LTR-2C

SAMPLED BY: SJB

DATE RECEIVED: 3/26/02

Plate

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Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

REPORT NO.: LTR-2D

SAMPLE NUMBER: 02-167

SAMPLE IDENTIFICATION: Split Spoon Sample
Boring D01-22, S-7: 12' - 14'

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	Percent Passing
3/4"	100.0
1/2"	95.4
1/4"	78.1
#4	65.3
#10	37.8
#20	22.4
#40	15.9
#100	10.7
#200	8.8

PERCENT COMPONENTS			
GRAVEL	SAND	SILT	CLAY
34.7%	56.5%	5.4%	3.4%

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

Moisture Content = 12.6 %

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

UNABLE TO PERFORM PLASTIC LIMIT, THEREFORE SAMPLE WAS NON-PLASTIC

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Particle Size Distribution Report

Project: UNION SHIP CANAL

Project No.: BD02-016

Client: U.S.A.C.E.

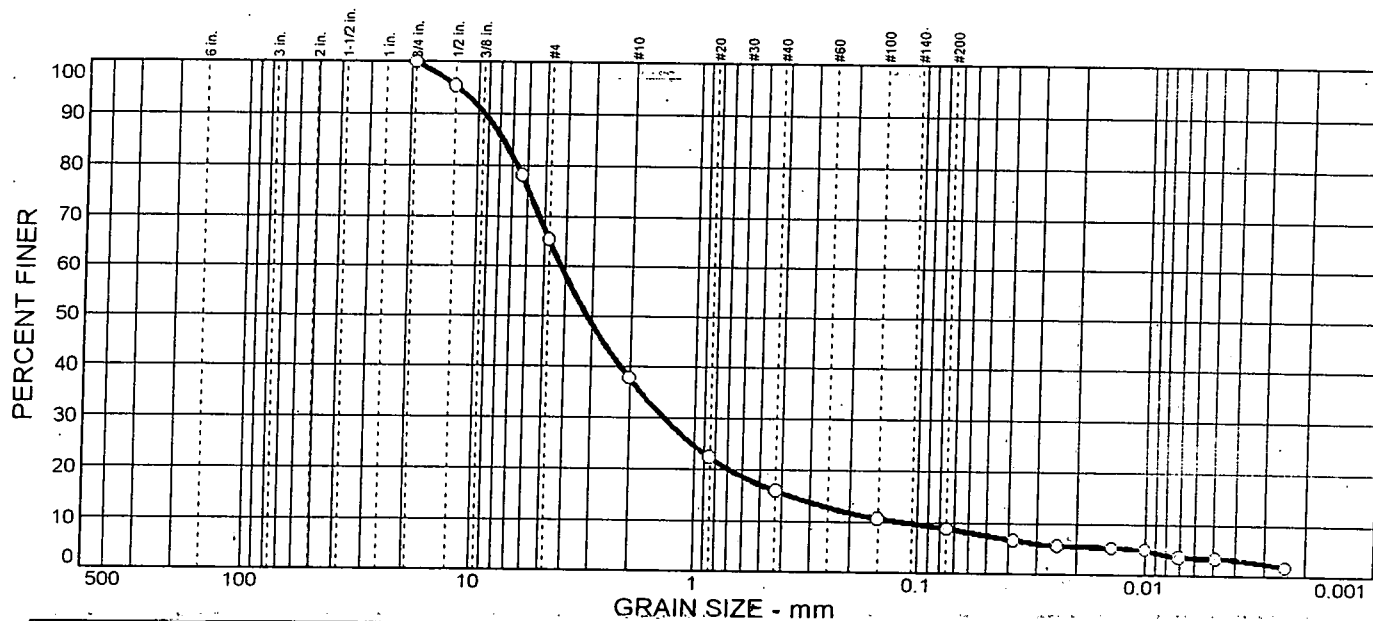
Sample No: 02-167

Source of Sample: SPLIT SPOON SAMPLE

Date: 3/26/02

Location: BORING D01-22, S-7: 12' - 14'

Elev./Depth: 12' - 14'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	34.7	27.5	21.9	7.1	5.4	3.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	95.4		
.25 in.	78.1		
#4	65.3		
#10	37.8		
#20	22.4		
#40	15.9		
#100	10.7		
#200	8.8		

* (no specification provided)

Soil Description

SAND, SOME GRAVEL, TRACE SILT & CLAY

Atterberg Limits

PL= LL= PI= NP

Coefficients

D₈₅= 7.73 D₆₀= 4.18 D₅₀= 3.15
D₃₀= 1.38 D₁₅= 0.372 D₁₀= 0.118
C_u= 35.38 C_c= 3.85

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

LTR-2D
SAMPLED BY: SJB
DATE RECEIVED: 3/5/02

Plate

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Laboratory Test Report

PROJECT: Union Ship Canal

CLIENT: U.S.A.C.E.

DATE: April 15, 2002

PROJECT NO.: SJB-BD02-016

REPORT NO.: LTR-2E

SAMPLE NUMBER: 02-168

SAMPLE IDENTIFICATION: Split Spoon Sample
Boring D01-23, S-6: 10' - 12'

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	Percent Passing
3/4"	100.0
1/2"	92.5
1/4"	68.7
#4	59.2
#10	39.3
#20	27.0
#40	20.5
#100	14.2
#200	11.5

PERCENT COMPONENTS			
GRAVEL	SAND	SILT	CLAY
40.8%	47.7%	7.2%	4.3%

ASTM D-2216: Laboratory Determination of Water (Moisture) Content of Soil & Rock

Moisture Content = 12.8 %

ASTM D-4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soil

UNABLE TO PERFORM PLASTIC LIMIT, THEREFORE SAMPLE WAS NON-PLASTIC



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Particle Size Distribution Report

Project: UNION SHIP CANAL

Project No.: BD02-016

Client: U.S.A.C.E.

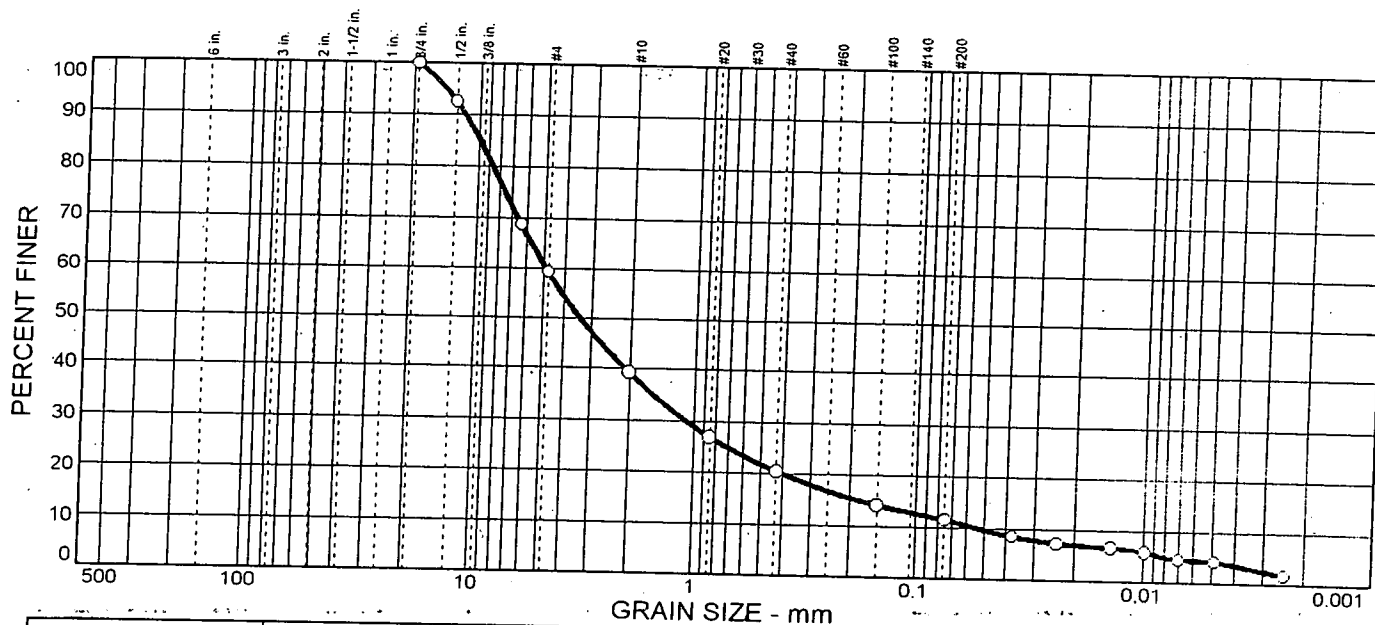
Sample No: 20-168

Source of Sample: SPLIT SPOON SAMPLE

Date: 3/26/02

Location: BORING D01-23, S-6: 10' - 12'

Elev./Depth: 10' - 12'



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	40.8	19.9	18.8	9.0	7.2	4.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75 in.	100.0		
.5 in.	92.5		
.25 in.	68.7		
#4	59.2		
#10	39.3		
#20	27.0		
#40	20.5		
#100	14.2		
#200	11.5		

Soil Description		
SAND & GRAVEL, TRACE SILT & CLAY		
Atterberg Limits		
PL=	LL=	PI= NP
Coefficients		
D ₈₅ = 9.91	D ₆₀ = 4.88	D ₅₀ = 3.37
D ₃₀ = 1.09	D ₁₅ = 0.178	D ₁₀ = 0.0536
C _u = 91.03	C _c = 4.53	
Classification		
USCS= SP-SM	AASHTO= A-1-a	
Remarks		
LTR-2E		
SAMPLED BY: SJB		
DATE RECEIVED: 3/5/02		

* (no specification provided)

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**SECTION
LTR-3**

**CONCRETE CORE
SAMPLES**

C01-12: 14" – 21"

C01-13: 3" – 10"

C01-13: 39" – 46"

C01-14: 17" – 24"



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Report of Compressive Strength of Concrete Cores ASTM C-42

PROJECT: Union Ship Canal

PROJECT NO.: BD02-016

CLIENT: U.S.A.C.E.

REPORT NO.: LTR-3A

LOCATION: Union Ship Canal

CORE LOCATION: Core run C01-12: 14" - 21"

CORE IDENTIFICATION NO.
C01-12-14

DATE OF CONCRETE PLACEMENT: unknown

LAB IDENTIFICATION NO.
02-169

DATE CORE WAS REMOVED: unknown

DATE OF TESTING: March 25, 2002

AGE OF CORE: unknown

MOISTURE CONDITION WHEN TESTED: as received

ORIGINAL CORE LENGTH: 7.00"

TRIMMED CORE LENGTH: 7.00"

CAPPED CORE LENGTH: 7.35"

AVERAGE CORE DIAMETER: 3.69"

GROSS SECTIONAL AREA: 10.694

MAXIMUM LOAD: 65100 lbs.

CORRECTED COMPRESSIVE STRENGTH: 6090 psi

ADDITIONAL REMARKS:

$l/d = 1.992$

correction factor = 1.000

APARENT MAXIMUM AGGREGATE SIZE: 3/4" gravel

DIRECTION OF TEST LOAD WITH RESPECT TO
THE HORIZONTAL SURFACE OF MEMBER OF CAST: unknown

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

Ray J. Kron
Vice President Testing Services

Albany, NY Cortland, NY
131 899-7491 (607) 758-7182

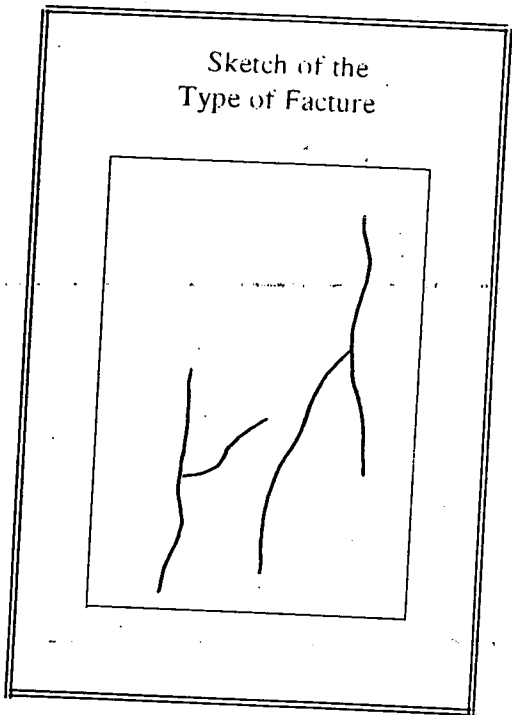
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Report of Compressive Strength of Concrete Cores ASTM C-42

PROJECT: Union Ship Canal

PROJECT NO.: BD02-016

CLIENT: U.S.A.C.E.

REPORT NO.: LTR-3B

LOCATION: Union Ship Canal

CORE IDENTIFICATION NO.

CORE LOCATION: Core run C01-13: 3" - 10"

C01-13-3

DATE OF CONCRETE PLACEMENT: unknown

LAB IDENTIFICATION NO.

02-170

DATE CORE WAS REMOVED: unknown

DATE OF TESTING: March 25, 2002

AGE OF CORE: unknown

MOISTURE CONDITION WHEN TESTED: as received

ORIGINAL CORE LENGTH: 7.09"

TRIMMED CORE LENGTH: 7.09"

CAPPED CORE LENGTH: 7.25"

AVERAGE CORE DIAMETER: 3.71"

CROSS SECTIONAL AREA: 10.810

MAXIMUM LOAD: 103320 lbs.

CORRECTED COMPRESSIVE STRENGTH: 9560 psi

ADDITIONAL REMARKS:

$l/d = 1.995$

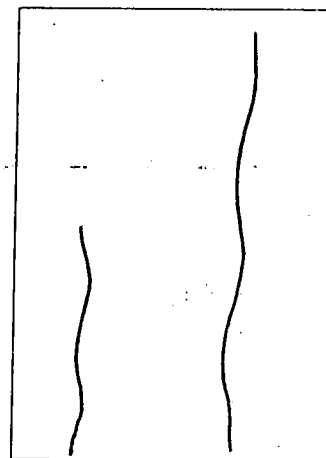
correction factor = 1.000

APPARENT MAXIMUM AGGREGATE SIZE: $\frac{3}{4}$ " gravel

DIRECTION OF TEST LOAD WITH RESPECT TO

THE HORIZONTAL SURFACE OF MEMBER OF CAST: unknown

Sketch of the
Type of Fracture



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Report of Compressive Strength of Concrete Cores ASTM C-42

PROJECT: Union Ship Canal

PROJECT NO.: BD02-016

CLIENT: U.S.A.C.E.

REPORT NO.: LTR-3C

LOCATION: Union Ship Canal

CORE IDENTIFICATION NO.

CORE LOCATION: Core run C01-13: 39" - 46"

C01-13-39

DATE OF CONCRETE PLACEMENT: unknown

LAB IDENTIFICATION NO.

02-171

DATE CORE WAS REMOVED: unknown

DATE OF TESTING: March 25, 2002

AGE OF CORE: unknown

MOISTURE CONDITION WHEN TESTED: as received

ORIGINAL CORE LENGTH: 7.28"

TRIMMED CORE LENGTH: 7.28"

CAPPED CORE LENGTH: 7.47"

AVERAGE CORE DIAMETER: 3.72"

CROSS SECTIONAL AREA: 10.869

MAXIMUM LOAD: 74400 lbs.

CORRECTED COMPRESSIVE STRENGTH: 6850 psi

ADDITIONAL REMARKS:

$l/d = 2.008$

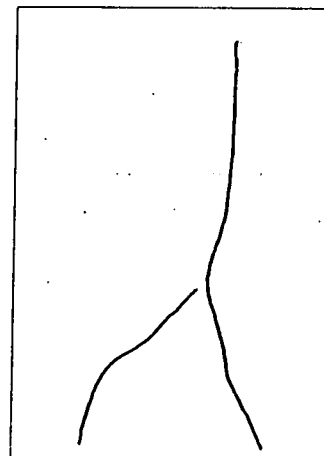
correction factor = 1.000

APPARENT MAXIMUM AGGREGATE SIZE: $\frac{3}{4}$ " gravel

DIRECTION OF TEST LOAD WITH RESPECT TO

THE HORIZONTAL SURFACE OF MEMBER OF CAST: unknown

Sketch of the
Type of Failure



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