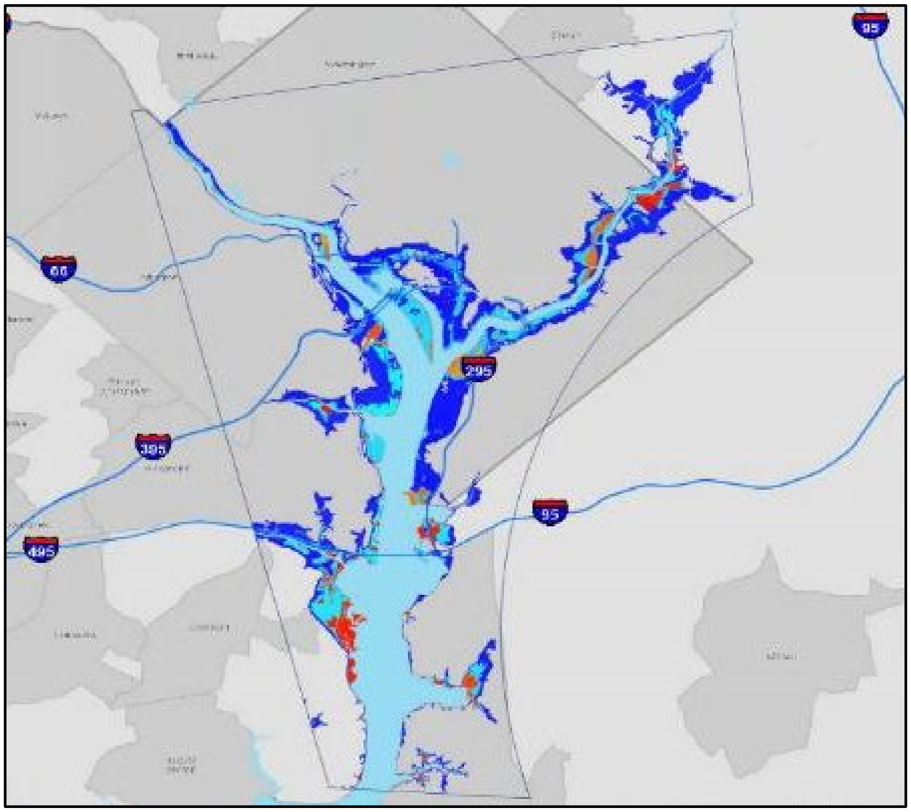
Metropolitan Washington District of Columbia Coastal Storm Risk Management Feasibility Study

Appendix D: Geotechnical Analysis



Northern Virginia

May 2022

US Army Corps of Engineers
Baltimore District

Metropolitan Washington
Council of Governments

TABLE OF CONTENTS

1. INTRODUCTION

The purpose of this report is to summarize results of the preliminary desktop study of the existing geotechnical information at the various sites associated with the Metropolitan Washington District of Columbia Coastal Storm Risk Management Feasibility Study (DC Coastal). This desktop study focused on areas where structural measures are proposed, specifically Alternatives 4b (Ronald Reagan Washington National Airport (Reagan Airport) flood walls and perimeter road elevation), 4c (Arlington Water Pollution Control Plant flood wall), 5a (Four Mile Run flood wall and levee), and 5c (Greater Belle Haven Neighborhood flood wall and levee). Information and discussion in this report was developed through a desk study of existing geotechnical information and it is intended for use by design engineers and planners to evaluate feasibility alternatives for the proposed flood control structures. Information in this report is not intended for use in construction contract documents. A project area map is provided below in Figure 1-1.

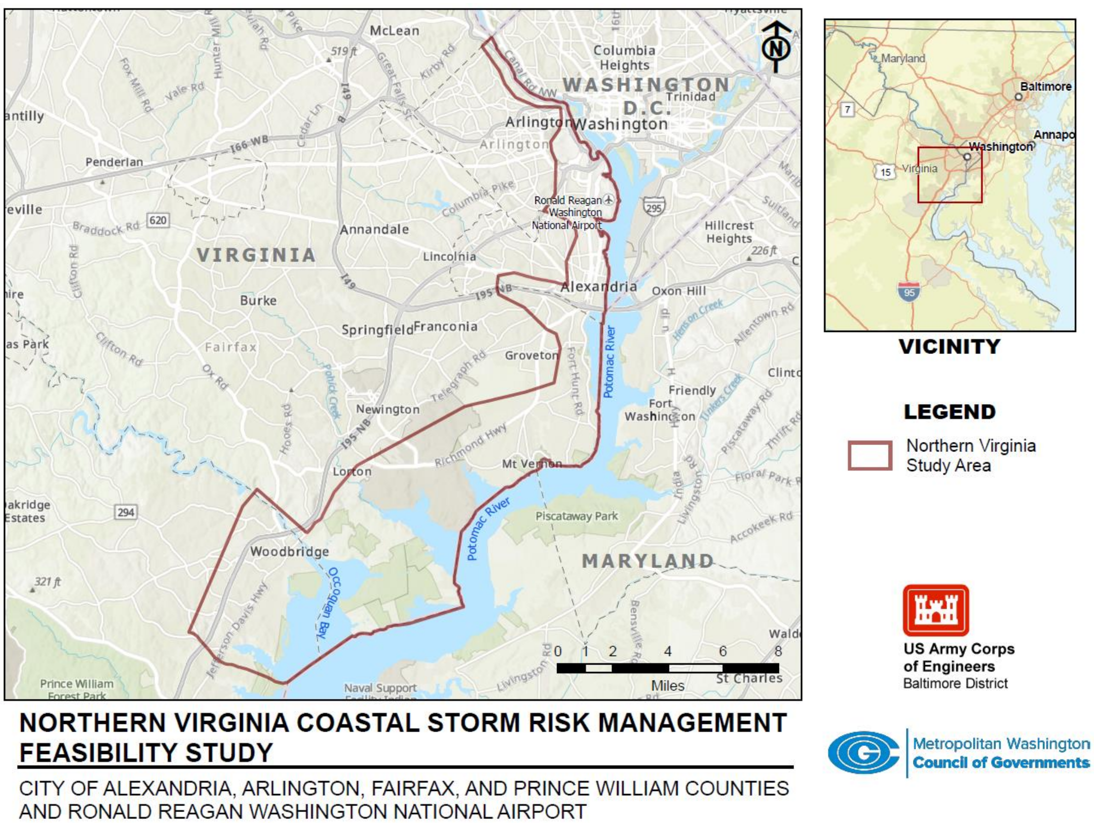


Figure 1-1 – Project Area Map

2. PREVIOUS GEOTECHNICAL STUDIES

A desktop study revealed that a number of previous geotechnical studies have been performed either within or in close proximity to the limits of each of the four areas where structural measures are proposed for flood damage reduction. The geotechnical data obtained from these previous studies is described below in the Existing Geotechnical Information section, and is included in Attachment A.

3. GEOLOGY

3.1 Regional Geology

All of the sites associated with the project lie withing the Coastal Plain physiographic province of Virginia, specifically in the lowland subprovince, which is characterized as a flat, low-lying region along major rivers and near the Chesapeake Bay. The study area is characterized by Mesozoic-era, quaternary sediments consisting of sand, mud, and gravel.

3.2 Local Geology

3.2.1 Reagan Airport

Based on the soil survey of Arlington County, Virginia (USDA-NRCS, 2022) shown in Figure 3.1, the soils within the proposed project limits of Reagan Airport consist of the Urban land-Udorthents complex (12). The soil properties include 2 to 15 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table also greater than 80 inches. These soils are presumed to consist of fill material placed during land reclamation efforts for the construction of Reagan Airport.

Figure 3-1 – Soil Survey Map of Reagan Airport

3.2.2 Arlington Water Pollution Control Plant

Based on the soil survey of Arlington County, Virginia (USDA-NRCS, 2022) shown in Figure 3-2, the soils within the proposed project limits of the Arlington Water Pollution Control Plant consist of the Urban land-Udorthents complex (12) and the Udorthents, loamy complex (13). As noted above, the Urban land-Udorthents complex soil properties include 2 to 15 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table also greater than 80 inches. The Udorthents, loamy complex soil properties are similar, including 0 to 10 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table also greater than 80 inches.

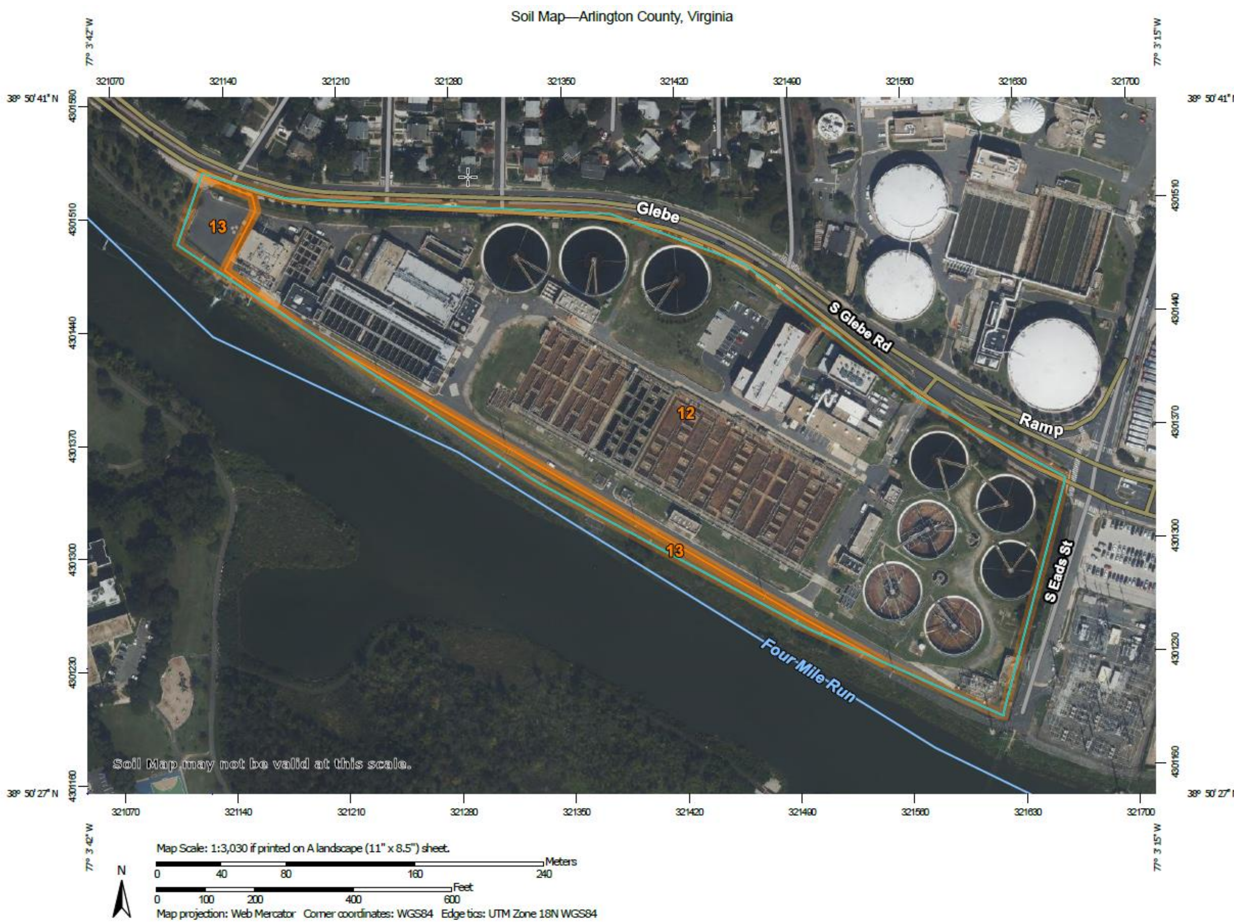


Figure 3-2 – Soil Survey Map of Arlington Water Pollution Control Plant

3.2.3 Four Mile Run

Based on the soil survey of Alexandria City, Virginia (USDA-NRCS, 2022) shown in Figure 3-3, the soils within the proposed project limits of Four Mile Run consist of Grist Mill sandy loam (40) and Woodstown sandy loam (109B), as well as a segment of Urban land (95) in the northwestern corner of the site. Grist Mill sandy loam properties include 0 to 25 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table ranging from 24 to 79 inches. Grist Mill sandy loam is a well-drained material that originates from earthy fill of fluviomarine deposits. Woodstown sandy loam properties include 2 to 7 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table ranging from 18 to 42 inches. Woodstown sandy loam is a moderately well drained material that originates from fluviomarine deposits.

Figure 3-3 – Soil Survey Map of Four Mile Run

3.2.4 Belle Haven

Based on the soil survey of Fairfax County, Virginia (USDA-NRCS, 2022) shown in Figure 3-4, the soils within the proposed project limits of Belle Haven consist of Grist Mill sandy loam (40), Grist Mill-Matapeake (45B), Grist Mill-Woodstown (47B), Gunston silt loam (48A), Honga peat (60A), Matapeake silt loam (76B), Mattapex loam (77B), Urban Land-Grist Mill (98), and Urban land (95). Grist Mill sandy loam properties were discussed above in Section 3.2.3. Grist Mill-Matapeake soil properties include 0 to 15 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table ranging from 24 to 79 inches. Grist Mill-Matapeake is a well-drained material that originates from earthy fill of fluviomarine deposits. Grist Mill-Woodstown soil properties include 0 to 20 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table ranging from 24 to 79 inches. Grist Mill-Woodstown is also a well-drained material that originates from earthy fill of fluviomarine deposits. Gunston silt loam soil properties include 0 to 2 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table ranging from 8 to 30 inches. Gunston silt loam is a somewhat poorly drained material that originates from fluviomarine deposits. Honga peat soil properties include 0 to 1 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table of about 0 inches. Honga peat is a very poorly drained material that originates from organic material over loamy alluvium. Matapeake silt loam soil properties include 2 to 7 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table greater than 80 inches. Matapeake silt loam is a well-drained material that originates from fluviomarine deposits. Mattapex silt loam soil properties include 2 to 7 percent slopes, depth to restrictive features greater than 80 inches, and depth to water table of 24 to 36 inches. Mattapex silt loam is a moderately well drained material that originates from fluviomarine deposits. Urban Land-Grist Mill soil properties include 0 to 25percent slopes, depth to restrictive features greater than 80 inches, and depth to water table of 24 to 79 inches. Urban Land-Grist Mill is a well-drained material that originates from earthy fill of fluviomarine deposits.

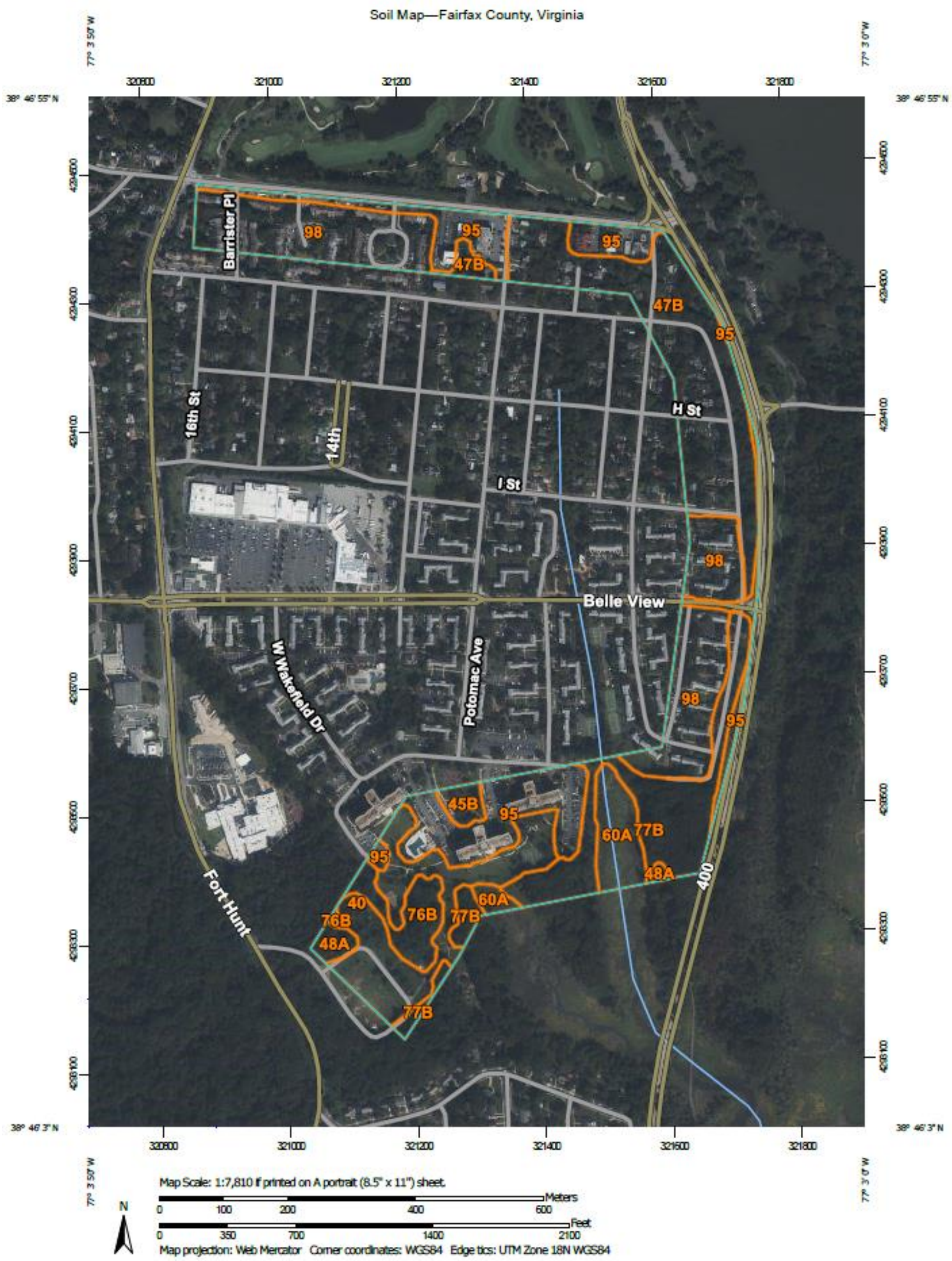


Figure 3-4 – Soil Survey Map of Belle Haven

4. TOPOGRAPHY

The Coastal Plain is an area of low elevation and low relief characterized by narrow well-drained ridges, broad poorly-drained flats, and marine coastal areas. The coastal areas consist of marshland and wetlands adjacent to the Potomac River. The natural terrain in the vicinity of the proposed project areas is flat, with much of the area near sea level.

5. EXISTING GEOTECHNICAL INFORMATION

This section provides an overview of the existing geotechnical information available for the locations where structural flood control measures are proposed. No information was obtained for locations not listed below. Borings that happen to have fallen along or adjacent to proposed flood wall or levee structures were used to create basic soil profiles to depict the subsurface conditions beneath the flood control structures. These soil profiles are presented in Attachment A, along with the boring logs and associated subsurface exploration plans, and soils laboratory data, as available. In general, the subsurface conditions from the soil borings are consistent with the USDA soil survey data outlined in Section 3.

5.1 Reagan Airport

A series of 25 soil borings were performed for the South Area Roads Project No. 3 project by the Metropolitan Washington Airports Authority at Reagan Airport. A boring location plan and boring logs were included in a plan set dated 1 November 1994. A second series of 8 soil borings for the South Area Roads Project No. 4B project was also performed and was provided along with a partial boring location plan in a plan set dated 17 August 1999. Soil borings were advanced to depths ranging from 17 to 65 feet below grade. The soil borings from both of these past projects were located in the southwestern area of the airport property.

The subsurface conditions disclosed by the South Area Roads borings consisted of an upper stratum of fill material that ranged from 7 to 22 feet thick. The fill stratum was underlain by an organic silt stratum in some locations, and by clayey sand interbedded with sandy clay in other locations. Where penetrated, the organic silt stratum ranged from 9 to 34.5 feet thick and was underlain by a sand stratum. This sand stratum was penetrated in one of the 65-foot-deep borings and was underlain by a stratum of clay in which the boring was terminated.

The fill stratum consisted of grey-brown to black sand with varying percentages of gravel, silt and clay and contained concrete, asphalt, wood, and glass fragments. Standard penetration test (SPT) N-values collected in the fill stratum ranged widely from 2 blows per foot (bpf) to 100 bpf, indicating a range of relative densities from very loose to very dense. There was no observed trend in the observed N-values with depth, indicating that the fill material is of highly variable composition and was likely placed in an uncontrolled manner.

The organic silt stratum consisted of green-grey clayey silt with trace sand, mica, and fibrous organic material. SPT N-values collected in the organic silt stratum ranged from weight of sampling hammer (W.O.H.) to 2 bpf, indicating a very soft consistency. Considering the observed consistency and organic content, the organic silt is believed to be highly compressible.

It should be noted that although the organic silt stratum was only encountered in the deeper borings, it is likely present beneath the fill stratum in the shallower borings that did not advance through the fill.

The clayey sand/sandy clay stratum consisted of brown to grey sand and clay in near equal proportions. SPT N-values in the clayey sand/sandy clay ranged from 10 bpf to 14 bpf with an average value of 11 bpf in the primarily coarse-grained material, which corresponds to a medium dense material, and from 13 bpf to 26 bpf with an average value of 21 bpf in the primarily fine-grained material, which corresponds to a very stiff consistency.

The sand stratum underlying the organic silt consisted of grey to grey-green fine to medium sand with trace to some fines. SPT N-values in the sand ranged from 3 bpf to 100 bpf, with lower N-values consistently observed in the upper portion of the stratum that then increase with depth. The observed N-values correspond to a range of relative densities from very loose to very dense.

The clay stratum beneath the sand stratum was encountered at a depth of 63 feet below grade and consisted of grey-green silty clay with an SPT N-value of 22, corresponding to a very stiff consistency.

5.2 Arlington Water Pollution Control Plant and Four Mile Run

A series of 105 soil borings and 6 test pits were performed along Four Mile Run during the 1978 subsurface exploration for the Four Mile Run Flood Control Project Channel Improvements. These soil borings were located along the north and south banks of Four Mile Run between Interstate Route 95 on the west and U.S. Route 1 on the east, with several borings located along the proposed alignment of flood wall and levee structures on the Arlington Wastewater Treatment Plant and Four Mile Run sites. Approximately one-third of the 1978 soil borings were sampled using a 3-inch outer diameter split spoon sampler, while the remaining two-thirds were sampled using a standard 2-inch outer diameter split spoon.

5.2.1 Arlington Water Pollution Control Plant

Eight borings located along the proposed flood wall alignment were reviewed to evaluate the subsurface conditions beneath the structure. The subsurface conditions disclosed by these eight borings consist of an upper stratum of fill material that ranged from 5 to 23 feet thick that was underlain by an organic silt stratum. The organic silt stratum was penetrated in five of the eight borings, where the stratum ranged from 10 to 14 feet thick and extended to between 16.5 and 21 feet below grade. The remaining three borings terminated in the organic silt stratum at depths ranging from 25 to 40 feet below grade. Where penetrated, the organic silt was underlain by a sand and gravel stratum.

The fill stratum consisted of grey-brown to black sandy silt with varying percentages of gravel, and clay and contained concrete, brick, wood, cinders, and glass fragments. Standard penetration test (SPT) N-values collected in the fill stratum ranged widely from 4 bpf to 92 bpf, indicating a range of relative densities from loose to very dense. There was no observed trend in the observed N-values with depth, indicating that the fill material is of highly variable composition and was likely placed in an uncontrolled manner.

The organic silt stratum consisted of dark brown to green-grey clayey silt with trace sand, mica, and fibrous organic material. SPT N-values collected in the organic silt stratum ranged from 3 bpf to 15 bpf with an average value of 7 bpf, indicating a medium consistency. Considering the observed consistency and organic content, the organic silt is believed to be highly compressible.

The sand and gravel stratum underlying the organic silt consisted of brown-grey gravelly fine to medium sand with varying amounts of fines. SPT N-values in the sand and gravel ranged from 8 bpf to 38 bpf with an average value of 23 bpf, indicating a medium-dense relative density.

5.2.2 Four Mile Run

Fourteen borings located along the proposed flood wall and levee alignment were reviewed to evaluate the subsurface conditions beneath the structures. The subsurface conditions disclosed by these fourteen borings are similar to those encountered on the north side of Four Mile Run beneath the Arlington Wastewater Treatment Plant flood wall, with an upper stratum of fill material overlying organic silt and sand and gravel. However, two additional soil strata were observed beneath the proposed Four Mile Run flood control structures: an upper stratum of clayey sand, and a deeper stratum of sandy silt. The fill stratum was encountered in all but four of the fourteen evaluated soil borings, ranging in thickness from 2.5 to 14.5 feet. The clayey sand stratum was encountered beneath the fill in five borings and beginning at ground surface in one boring. The clayey sand ranged from 3 to 14.5 feet thick where penetrated, and one boring terminated in the clayey sand at 25 feet below grade. The organic silt stratum was encountered in eleven of the fourteen evaluated borings, typically beneath the fill or clayey sand strata. However, the organic silt was encountered beginning at ground surface in three borings located in Four Mile Run Park adjacent to existing wetlands. The organic silt was consistently underlain by the sand and gravel stratum, wherein the majority of the borings were terminated at depths ranging from 25 to 30 feet below grade. The sand and gravel stratum was penetrated in four of the evaluated soil borings and was underlain by the sandy silt stratum. Five of the evaluated soil borings terminated in the sandy silt stratum at depths ranging from 30 to 60 feet below grade.

The fill stratum consisted of grey-brown to black sandy silt with varying percentages of gravel, and clay and contained concrete, brick, wood, cinders, and glass fragments. Standard penetration test (SPT) N-values collected in the fill stratum ranged from 3 bpf to 17 bpf, indicating a range of relative densities from loose to medium dense. There was no observed trend in the observed N-values with depth, indicating that the fill material is of highly variable composition and was likely placed in an uncontrolled manner.

The clayey sand stratum consisted of brown to grey sand and clay in near equal proportions. SPT N-values in the clayey sand ranged from 6 bpf to 39 bpf with an average value of 21 bpf which corresponds to a medium dense material.

The organic silt stratum consisted of dark brown to green-grey clayey silt with trace sand, mica, and fibrous organic material. SPT N-values collected in the organic silt stratum ranged from 2 bpf to 11 bpf with an average value of 7 bpf, indicating a medium consistency. Considering the observed consistency and organic content, the organic silt is believed to be highly compressible.

The sand and gravel stratum underlying the organic silt, fill, or clayey sand consisted of brown-grey gravelly fine to medium sand with varying amounts of fines. SPT N-values in the sand and gravel ranged from 6 bpf to 22 bpf with an average value of 11 bpf, indicating a medium-dense relative density.

The sandy silt stratum consisted of green-grey sandy silt. SPT N-values in the sandy clay ranged from 16 bpf to 67 bpf with an average value of 42 bpf, which corresponds to a hard consistency.

5.3 Belle Haven

The available geotechnical data was somewhat limited for the Belle Haven site, consisting of two soil borings (B-9A and B-10A) performed as part of a small subsurface exploration for the Final Flood Damage Reduction Analysis for Belle Haven Watershed, prepared by the USACE Baltimore District. The two soil borings are located in the central portion of the Belle Haven site, with one boring near the alignment of the proposed flood wall.

The subsurface conditions disclosed by the Belle Haven borings consisted of an upper stratum of fill material that ranged from 2.5 to 12 feet thick. The fill stratum was underlain by a 9-foot-thick sandy clay stratum in one of the two borings (B-10A). Beneath the sandy clay in boring B-10A and the fill in B-9A is a 20 to 24.5-foot-thick stratum of silty sand, followed by a sand and gravel stratum wherein the borings were terminated at 50 feet below grade.

The fill stratum consisted of grey-brown sand and silt with varying percentages of gravel and clay and contained trace amounts of asphalt fragments. Standard penetration test (SPT) N-values collected in the fill stratum ranged from 2 bpf to 7 bpf with an average value of 5 bpf, indicating a loose relative density.

The sandy clay stratum consisted of brown clay with sand. SPT N-values in the sandy clay ranged from 3 bpf to 6 bpf with an average value of 5 bpf, which corresponds to a soft to medium consistency.

The silty sand stratum consisted of brown silty medium to fine sand with trace gravel. SPT N-values collected in the silty sand stratum ranged from weight of sampling hammer (W.O.H.) to 12 bpf, with lower N-values observed in the upper portion of the stratum that then increase with depth. The observed range of SPT N-values corresponds to a range of relative densities from very loose to medium dense.

The sand and gravel stratum consisted of light- to orange-brown sand and gravel with trace to some fines. Standard penetration test (SPT) N-values collected in the sand and gravel stratum ranged from 12 bpf to 28 bpf with an average value of 18 bpf, indicating a medium-dense relative density.

6. GROUNDWATER

Groundwater levels encountered at the time of drilling were recorded on the boring logs of the previous subsurface explorations and are summarized below:

- Reagan Airport: groundwater depth range of 4.5 to 11.3 feet below grade, corresponding to an elevation range of EL 7.2 to EL 0.4.
- Arlington Water Pollution Control Plant: groundwater depth range of 4.5 to 14 feet below grade, corresponding to an elevation range of EL 2.7 to EL -0.9.
- Four Mile Run: groundwater depth range of 0 to 11.5 feet below grade, corresponding to an elevation range of EL 8.0 to EL -0.4.
- Belle Haven: groundwater depth range of 1.2 to 5.7 feet below grade, corresponding to an elevation range of EL 4.4 to EL 3.8.

It should be noted that as all of the sites of the proposed flood protection measures are near tidally influenced waterways, and so the groundwater levels will be affected by the tidal cycle as well as seasonal variation.

7. SEISMICITY

The seismic hazard in Arlington and Fairfax Counties is low. Virginia is not located near tectonic plate boundaries; however, the commonwealth does host three seismic zones, defined as "an area of seismicity probably sharing a common cause" by the U.S. Geological Survey. The closest seismic zone to the project area is the Central Virginia Seismic Zone (CVSV), which stretches from Richmond to Charlottesville and has been recognized as an area of long-term, low-magnitude seismic activity. The largest earthquake to hit Virginia in the past 30 years was a magnitude 5.8 event in Mineral, VA on 8/23/11, approximately 90 miles southwest of the Arlington area. Other recorded seismic events near the Arlington area are summarized in Table 7-1 below.

Table 7-1 – Summary of Past Seismic Events Near Proposed Project Site

Date	Location	Magnitude	Distance to Arlington Area (miles)
8/4/2021	Clarksville, MD	2.1	40
8/17/2018	Belmont, VA	1.3	30
8/9/2015	Crofton, MD	1.9	30
5/6/2008	Ravensworth, VA	2.0	15
9/29/1997	Manassas, VA	2.5	30

8. FLOOD RISK MANAGEMENT STRUCTURES

Flood risk management structures under consideration for this project include earthen levees, concrete T-walls, and concrete I-walls to be constructed in various orientations among the four sites to employ structural flood control measures. Additional ancillary structures include aluminum stop log closure gates, elevated curbing, and concrete box culverts with pump stations. Wall heights for the proposed I-wall and T-wall structures are expected to range from 3 to 13 feet. Levee heights are expected to range from 1.5 to 7 feet, corresponding to a base width range of 9 to 42 feet based on a 2.5 horizontal to 1 vertical side slopes.

9. GEOTECHNICAL CONCERNS

Based on a review of the available subsurface information, three primary geotechnical items of concern arise: the nature of the existing fill material, the presence of the highly compressible organic silt stratum, and the loose state of the fill and natural soil deposits encountered at the Belle Haven site.

Fill material was encountered at all four of the project sites. The variable composition and density of the fill is typical of urban environments, particularly in low-lying areas that were reclaimed for their original construction as is the case for Reagan Airport. Fills placed during land reclamation are often placed with little to no engineering controls or compactive effort, resulting in a material with poor engineering characteristics that is unsuitable for the support of new loading associated with pavements or shallow foundations. It is therefore necessary to consider improving the fill material to correspondingly improve its engineering properties or bypass the fill through the use of deep foundation systems to support new structures.

Possible ground improvement methods for the improvement of the fill stratum include excavation of the fill and replacement with suitable structural fill, rapid impact compaction to densify fill strata whose thickness is up to 10 feet, and deep dynamic compaction for fill strata in excess of 10 feet thick. Potential deep foundation systems for flood management structures include driven and drilled piles, micropiles, and drilled shaft elements, all of which can effectively bypass fill and compressible soil strata and transfer structural loading to suitable underlying soils.

The presence of highly compressible organic cohesive material is not uncommon in waterfront construction, where sometimes thick alluvial deposits of soft, fine-grained material are found. The nature of flood control structures is to raise grade, whether through the construction of earthen levees or concrete T-wall or I-wall structures. Design and construction of the proposed levee and wall systems will need to include detailed settlement and global stability analyses to properly evaluate the short- and long-term effects of the compressible stratum on the structure's performance.

The loose state of the fill and natural materials disclosed in the two Belle Haven soil borings is of particular concern due to the primarily cohesionless nature of the soil profile. Granular soils in a loose state of relative density are subject to liquefaction under seismic loading and can become the controlling factor in geotechnical design. A related challenge associated with the loose, granular nature is the elevated hydraulic conductivity of the soil mass and resulting seepage implications beneath flood control structures during storm events.

10. RECOMMENDATIONS FOR ADDITIONAL SUBSURFACE EXPLORATION

Additional geotechnical subsurface exploration activities are necessary to supplement the available geotechnical data and enable the proper design and construction of the proposed flood control structures. Subsurface exploration activity should follow the guidance in EM 1110-2-1913, Design and Construction of Levees, and is expected to consist of field exploration activity including but not limited to soil borings, cone penetrometer soundings, geophysical testing, and in situ strength testing. Per the EM, spacing of soil borings usually varies from 200 to 1,000 feet, with closer spacings in expected problematic areas and wider spacings in non-problematic areas. Boring depths must extend beyond any soft, compressible strata and into firm material. Boring depths will likely be greatest for locations closest to the Potomac River waterfront where the depth and thickness of compressible strata will be greatest, and could range from 50 to 75 feet or more. Boring depth in more upland locations will likely range from 35 to 50 feet.

11. REFERENCES

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USACE EM 1110-2-1913, Design and Construction of Levees, 30 April 2000.

12. ATTACHMENTS

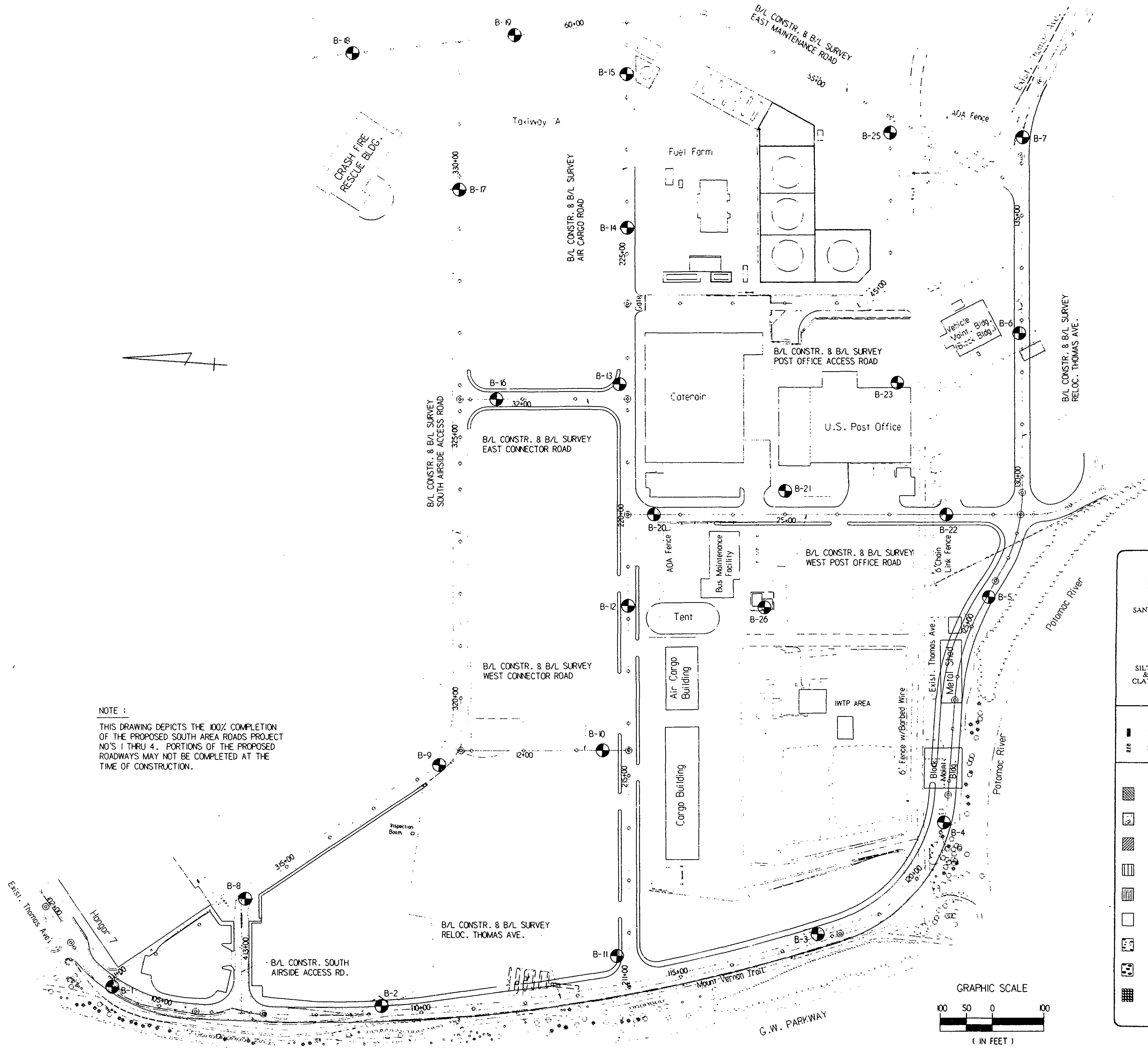
12.1 Attachment A – Existing Geotechnical Data

12.1.1 Reagan Airport

12.1.2 Arlington Water Pollution Control Plant and Four Mile Run

12.1.3 Belle Haven

12.1.1 – Reagan Airport Geotechnical Data



NOTE :
THIS DRAWING DEPICTS THE 100% COMPLETION OF THE PROPOSED SOUTH AREA ROADS PROJECT NO'S 1 THRU 4. PORTIONS OF THE PROPOSED ROADWAYS MAY NOT BE COMPLETED AT THE TIME OF CONSTRUCTION.

BORING SCHEDULE

	Boring No.	Roadway	Station	Offset	Existing Ground Elev.
FOR BORING LOGS SEE SHEET C7.2	B-1	Relocated Thomas Ave.	104+04	4' RT.	13.7
	B-2	Relocated Thomas Ave.	109+25	15' LT.	11.8
	B-3	Relocated Thomas Ave.	117+75	12' LT.	11.0
BORING LOGS NOT PROVIDED	B-4	Relocated Thomas Ave.	121+20	0	12.0
	B-5	Relocated Thomas Ave.	125+66	5' RT.	14.8
	B-6	Relocated Thomas Ave.	132+75	5' LT.	8.3
	B-7	Relocated Thomas Ave.	136+50	0	10.4
FOR BORING LOGS SEE SHEET C7.2	B-8	South Airside Access Rd.	314+00	7' RT.	12.7
	B-9	South Airside Access Rd.	318+50	0	12.6
	B-10	West Connector Road	10+50	0	14.7
	B-11	Air Cargo Road	211+56	23' LT.	14.0
BORING LOGS NOT PROVIDED	B-12	Air Cargo Road	218+25	0	13.0
	B-13	Air Cargo Road	222+50	15' LT.	13.6
	B-14	Air Cargo Road	225+50	0	11.7
	B-15	Air Cargo Road	228+45	0	11.6
	B-16	East Connector Road	32+50	0	13.0
	B-17	South Airside Access Rd.	329+75	0	11.8
	B-18	East Maintenance Road	64+25	0	14.1
	B-19	East Maintenance Road	61+15	0	12.8
	B-20	West Post Office Road	27+50	0	12.6
	B-21	West Post Office Road	25+00	45' RT.	12.2
	B-22	West Post Office Road	21+90	0	11.0
	B-23	Relocated Thomas Ave.	131+80	240' LT.	10.4
	B-25	Post Office Access Rd.	48+30	0	8.2
	B-26	West Post Office Road	25+40	178' LT.	10.8

CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

	NO. OF BLOWS, N	RELATIVE DENSITY
SANDS:	0-4	Very Loose
	5-10	Loose
	11-30	Firm
	31-50	Dense
	OVER 50	Very Dense

		CONSISTENCY
SILTS & CLAYS:	0-2	Very Soft
	3-4	Soft
	5-8	Firm
	9-15	Stiff
	16-30	Very stiff
	31-50	Hard
	OVER 50	Very Hard

PARTICAL SIZE IDENTIFICATION

BOULDERS:		Greater than 300 mm
COBBLES:		75 mm to 300 mm
GRAVEL:	Coarse	- 19.0 mm to 75 mm
	Fine	- 4.75 mm to 19.0 mm
SANDS:	Coarse	- 2.00 mm to 4.75 mm
	Medium	- 0.425 mm to 2.00 mm
	Fine	- 0.075 mm to 0.425 mm
SILTS & CLAYS:		Less than 0.075 mm

KEY TO DRILLING SYMBOLS

- Undisturbed Sample
- Split Spoon Sample
- Water Table 24 HR.
- Water Table at Time of Drilling
- C Caved Depth
- Loss of Drilling Water

KEY TO SOIL CLASSIFICATIONS

- FILL
- CL - Low plasticity inorganic clays
- CH - High plasticity inorganic clays
- ML - Low plasticity inorganic silts
- MH - High plasticity inorganic silts
- SP - Poorly graded sands
- SW - Well graded sands
- GP - Poorly graded gravels
- DECOMPOSED ROCK - A transitional material between soil and rock which retains the relict structure of the parent rock
- GW - Well graded gravels
- OL - Low plasticity organic silts and clays
- OH - High plasticity organic silts and clays
- SM - Silty sands
- GM - Silty gravels
- SC - Clayey sands
- GC - Clayey gravels
- SP-SM - Typical Dual Classification

NO.	REVISION	DATE

Johnson, Mirmiran & Thompson, P.A.
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS
72 LOVETON CIRCLE SPARKS, MD. 21152
(410) 329-3100

COMMONWEALTH OF VIRGINIA
DANIEL T. CHENG
020282
PROFESSIONAL ENGINEER
11/1/94

DATE	NOVEMBER 1, 1994
SCALE	1" = 100'
DESIGNED	D.A.L.
CHECKED	D.A.L.
DRAWN	A. DANIEL
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

ENGINEERING DIVISION
DESIGN BRANCH

SOUTH AREA ROADS PROJECT No. 3

WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.

BORING LOCATION PLAN

DRAWING NUMBER
DCA-3017-47

SHEET NUMBER
C7.1

TEST BORING RECORD — B-1

DEPTH (FT.)	DESCRIPTION
0.0–0.5	GRAVEL
0.5–9.8	FILL - brown clayey fine sand with little to trace fine gravel
9.8–13.0	Very soft gray clayey SILT(ML-MH) with little fine sand
13.0–19.0	Very soft gray clayey SILT (MH)
19.0–23.0	Loose gray clayey SAND(SC) with some si
23.0–27.0	Firm clayey fine to coarse SAND(SC)

ELEVATION (FT.): 13.7, 8.7, 3.7, -1.3, -6.3, -11.3, -16.3

PENETRATION - BLOWS/FOOT: 6, 11, 18, 3, 2, 2, 3, 11

BORING TERMINATED AT 27', 4-2-92.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Dorian Duval
Driller's Helper: Jorge Del-Cid
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-1
DATE DRILLED	April 2, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-2

DEPTH (FT.)	DESCRIPTION
0.0–0.6	ASPHALT
0.6–0.8	GRAVEL BASE
0.8–7.0	FILL - brown clayey fine to medium sand with little fine to medium gravel
7.0–17.0	Firm brown fine to medium SAND(SC) with some to little clay

ELEVATION (FT.): 11.8, 6.8, 1.8, -3.2, -8.2, -13.2, -18.2

PENETRATION - BLOWS/FOOT: 28, 26, 31, 11, 10, 14, 11

BORING TERMINATED AT 17', 4-7-92.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Paul Welty
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-2
DATE DRILLED	April 7, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-3

DEPTH (FT.)	DESCRIPTION
0.0–0.3	ASPHALT
0.3–3.0	FILL - brown fine to medium sandy clay with trace fine gravel
3.0–5.0	FILL - brown gray clayey medium sand
5.0–7.5	FILL - brown fine to medium sandy clay
7.5–10.0	FILL - brown clayey fine to medium sand with little fine to coarse gravel
10.0–12.5	Stiff brown gray fine sandy CLAY(CL) with trace organics
12.5–17.0	Firm brown clayey SAND (SC)

ELEVATION (FT.): 11.0, 6.0, 1.0, -4.0, -9.0, -14.0, -19.0

PENETRATION - BLOWS/FOOT: 11, 15, 6, 20, 13, 12

BORING TERMINATED AT 17', 4-7-92.

Note: Boring dry at time of drilling and to caved depth at 24 hours.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Paul Welty
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-3
DATE DRILLED	April 7, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-8

DEPTH (FT.)	DESCRIPTION
0.0–0.6	ASPHALT
0.6–5.0	FILL - brown clayey medium sand with some fine to coarse gravel
5.0–13.0	Firm gray tan fine to medium sandy CLAY (CL) with trace fine gravel
13.0–17.0	Loose tan fine to medium SAND(SC) with some clay

ELEVATION (FT.): 12.7, 7.7, 2.7, -2.3, -7.3, -12.3, -17.3

PENETRATION - BLOWS/FOOT: 24, 17, 6, 10, 5, 9

BORING TERMINATED AT 17', 4-10-92.

Note: Final water level is 15 minutes after end of boring.
ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-8
DATE DRILLED	April 10, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-9

DEPTH (FT.)	DESCRIPTION
0.0–0.5	ASPHALT
0.5–1.5	GRAVEL BASE
1.5–5.0	FILL - tan orange clayey medium sand with some fine to coarse gravel
5.0–7.0	FILL - tan brown clayey fine to medium sand
7.0–17.0	Loose to firm tan brown fine to medium SAND (SC) with little clay

ELEVATION (FT.): 12.6, 7.6, 2.6, -2.4, -7.4, -12.4, -17.4

PENETRATION - BLOWS/FOOT: 33, 40, 30, 7, 15, 10

BORING TERMINATED AT 17', 4-10-92.

Note: Water level shown is at time of boring and 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-9
DATE DRILLED	April 10, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-10

DEPTH (FT.)	DESCRIPTION
0.0–2.5	ASPHALT
2.5–5.0	FILL - brown clay with little fine sand and trace fine gravel
5.0–7.5	FILL - brown gray clayey fine to medium sand
7.5–9.0	FILL - brown gray clayey fine to medium sand with some fine to coarse gravel
9.0–13.0	Firm gray medium SAND (SC) with little fine gravel and little to trace clay
13.0–17.0	Loose to firm brown fine to coarse SAND (SM) with some silt

ELEVATION (FT.): 14.7, 9.7, 4.7, -0.4, -5.4, -10.4, -15.4

PENETRATION - BLOWS/FOOT: 17, 21, 28, 21, 10

BORING TERMINATED AT 17, 4-10-92.

Note: Final water level is 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-10
DATE DRILLED	April 10, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

TEST BORING RECORD — B-11

DEPTH (FT.)	DESCRIPTION
0.0–0.3	ASPHALT
0.3–7.5	FILL - brown fine to medium sandy clay
7.5–13.0	Very stiff brown fine to medium sandy CLAY(CL)
13.0–17.0	Loose to firm gray fine to medium SAND(SC) with little clay

ELEVATION (FT.): 14.0, 9.0, 4.0, -1.0, -6.0, -11.0, -16.0

PENETRATION - BLOWS/FOOT: 10, 16, 12, 24, 26, 10

BORING TERMINATED AT 17, 4-7-92.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Paul Welty
Logged by: J.C. Giese

REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

BORING NUMBER	B-11
DATE DRILLED	April 7, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

NOTE : FOR BORING LOCATIONS SEE BORING LOCATON PLAN

NO.	REVISION	DATE

Johnson, Mirmiran & Thompson, P.A.
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS
72 LOVETON CIRCLE SPARKS, MD. 21152
(410) 329-3100

COMMONWEALTH OF VIRGINIA
DANIEL I. CHENG
020282
PROFESSIONAL ENGINEER
11/1/94

DATE	NOVEMBER 1, 1994
SCALE	NONE
DESIGNED	M.R.M.
CHECKED	D.A.L.
DRAWN	L.E.E.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

ENGINEERING DIVISION
DESIGN BRANCH

SOUTH AREA ROADS PROJECT No. 3

WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.

BORING LOGS

DRAWING NUMBER: DCA-3017-48

SHEET NUMBER: C7.2

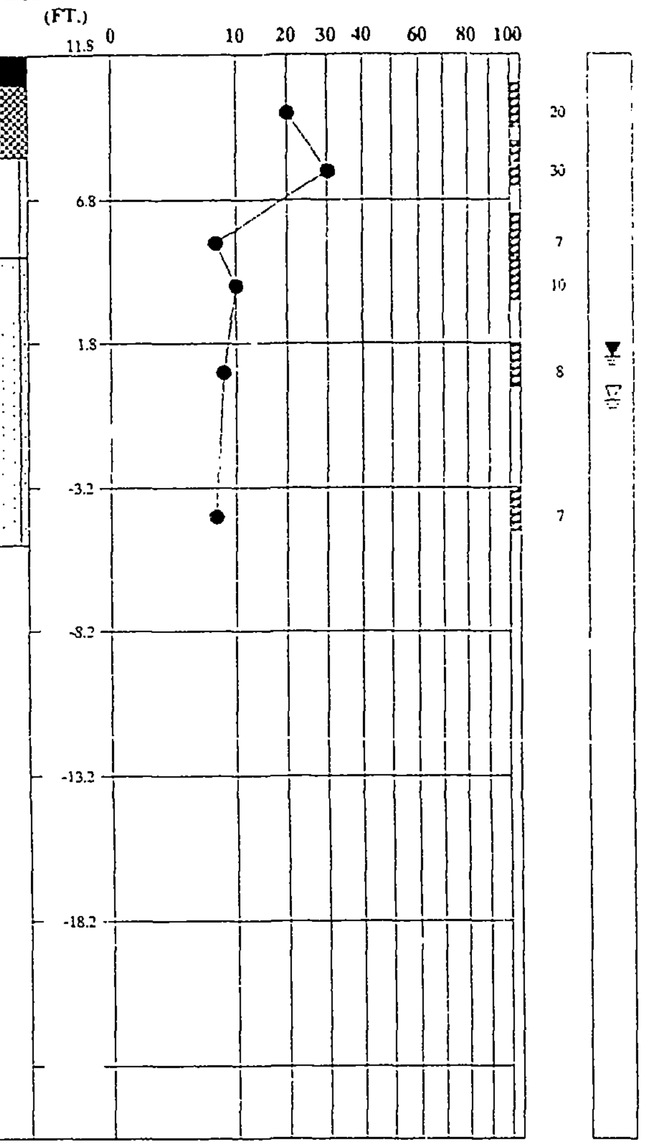
B-17

DEPTH (FT.)	DESCRIPTION
0.0 – 1.0	ASPHALT
1.0 – 3.5	FILL - brown tan gray clayey medium sand with little gravel
3.5 – 7.0	Loose to firm brown medium SAND (SM) with trace clay and trace fine gravel
7.0 – 17.0	Loose brown gray fine SAND (SM) with little silt

BORING TERMINATED AT 17, 4-14-92.

Note: Final water level shown is 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-17
DATE DRILLED	April 14, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

B-18

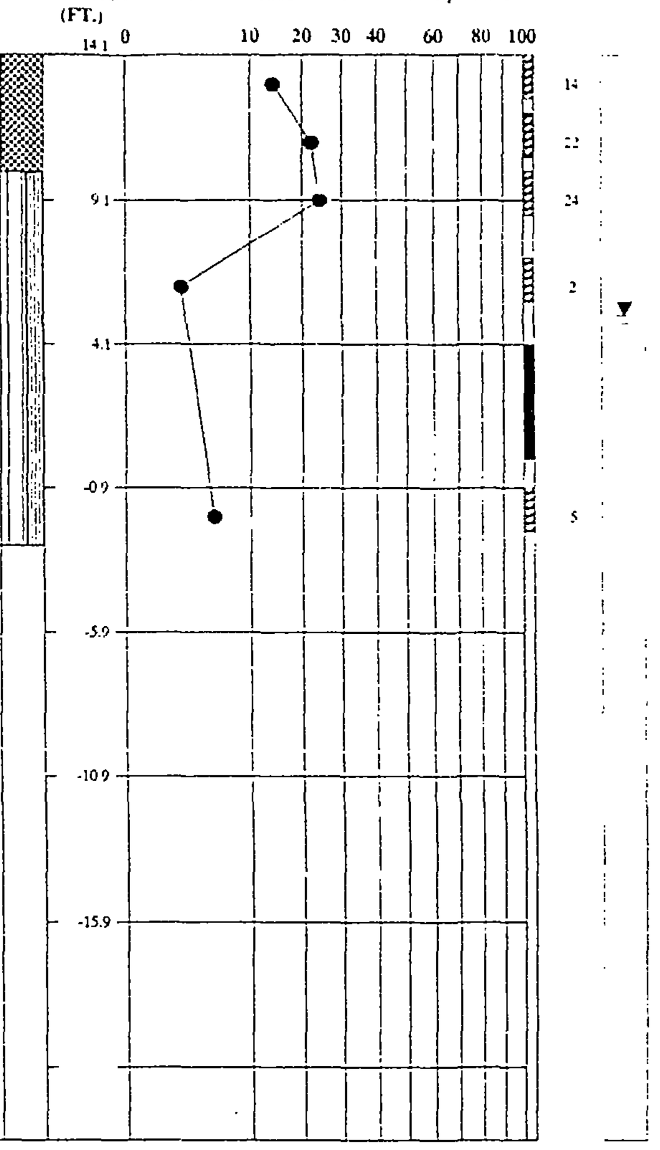
DEPTH (FT.)	DESCRIPTION
0.0 – 4.0	FILL - brown fine to medium sandy clay with trace fine gravel
4.0 – 17.0	Very stiff to soft dark gray clayey silt (ML-MH) with little fine sand, trace organics

BORING TERMINATED AT 17, 4-13-92.

Notes:

1. Boring dry at time of drilling.
2. Water level shown is at time of boring and 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-18
DATE DRILLED	April 13, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

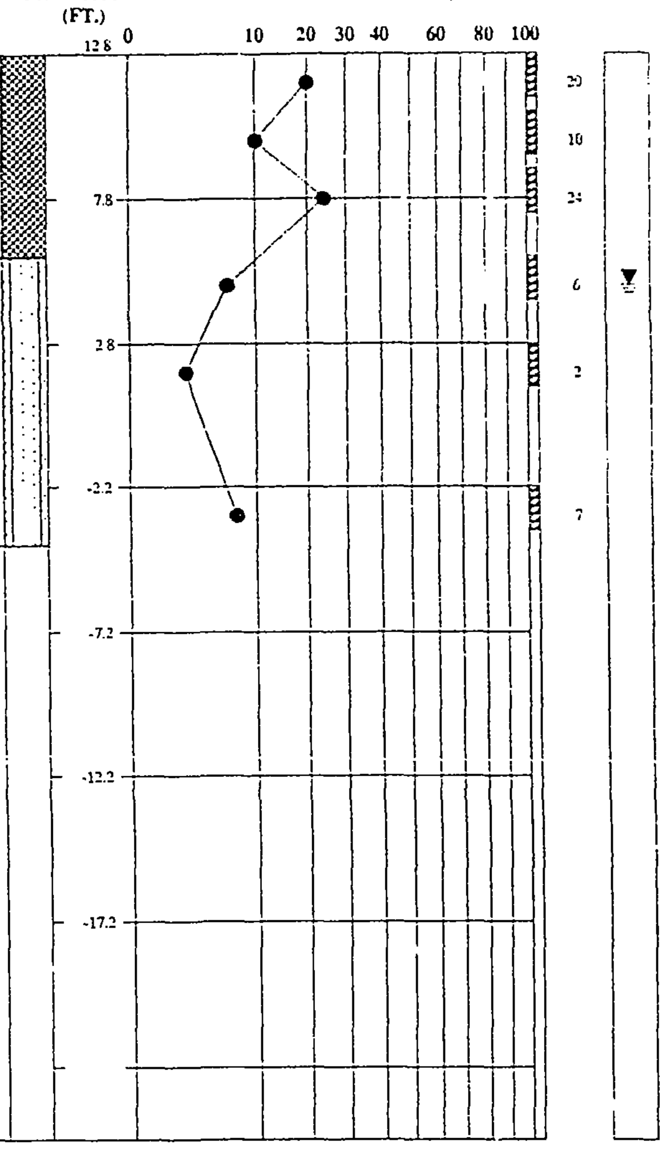
B-19

DEPTH (FT.)	DESCRIPTION
0.0 – 7.0	FILL - brown medium sand with little fine gravel, trace clay
7.0 – 17.0	Loose gray brown fine to medium SAND (SM) with little silt

BORING TERMINATED AT 17, 4-13-92.

Note: Water level shown is at time of boring and 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-19
DATE DRILLED	April 13, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

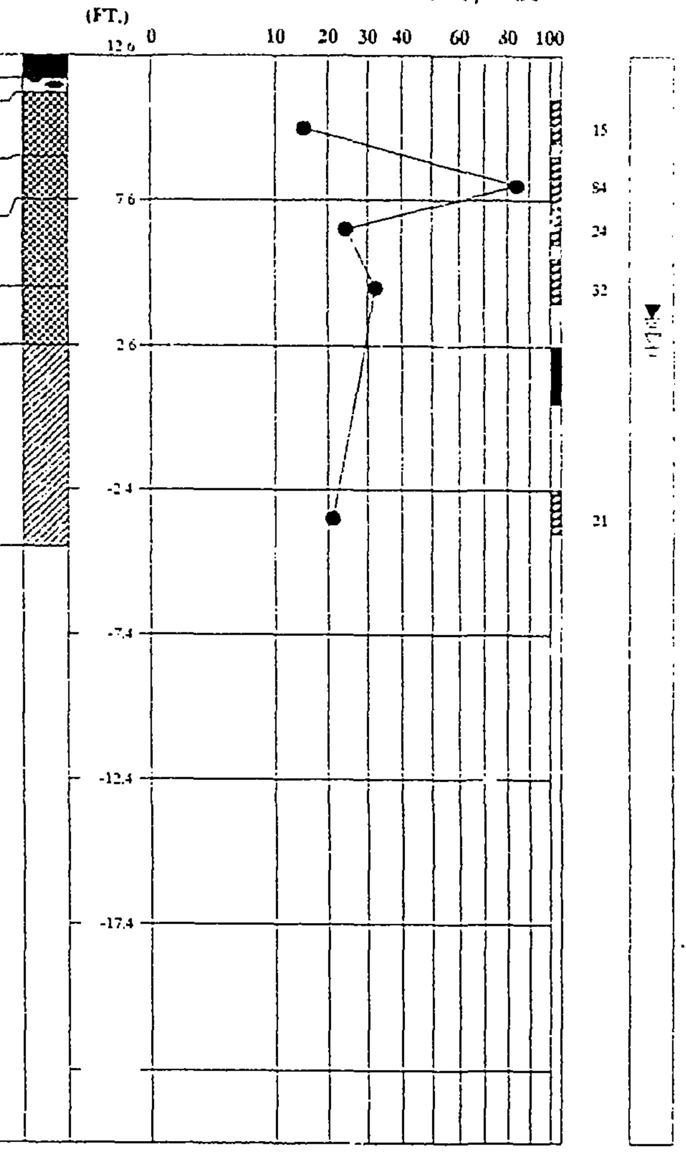
B-20

DEPTH (FT.)	DESCRIPTION
0.0 – 0.8	ASPHALT
0.8 – 1.3	GRAVEL BASE
1.3 – 3.5	FILL - brown and gray fine to medium sandy clay
3.5 – 5.0	FILL - brown clayey fine to medium sand with little fine gravel
5.0 – 8.0	FILL - brown fine to medium sandy clay with little fine gravel
8.0 – 10.0	FILL - brown fine to medium sand with little fine gravel, little clay
10.0 – 17.0	Firm brown-gray clayey SAND(SC)

BORING TERMINATED AT 17, 4-9-92.

Note: Final water level shown is 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-20
DATE DRILLED	April 9, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

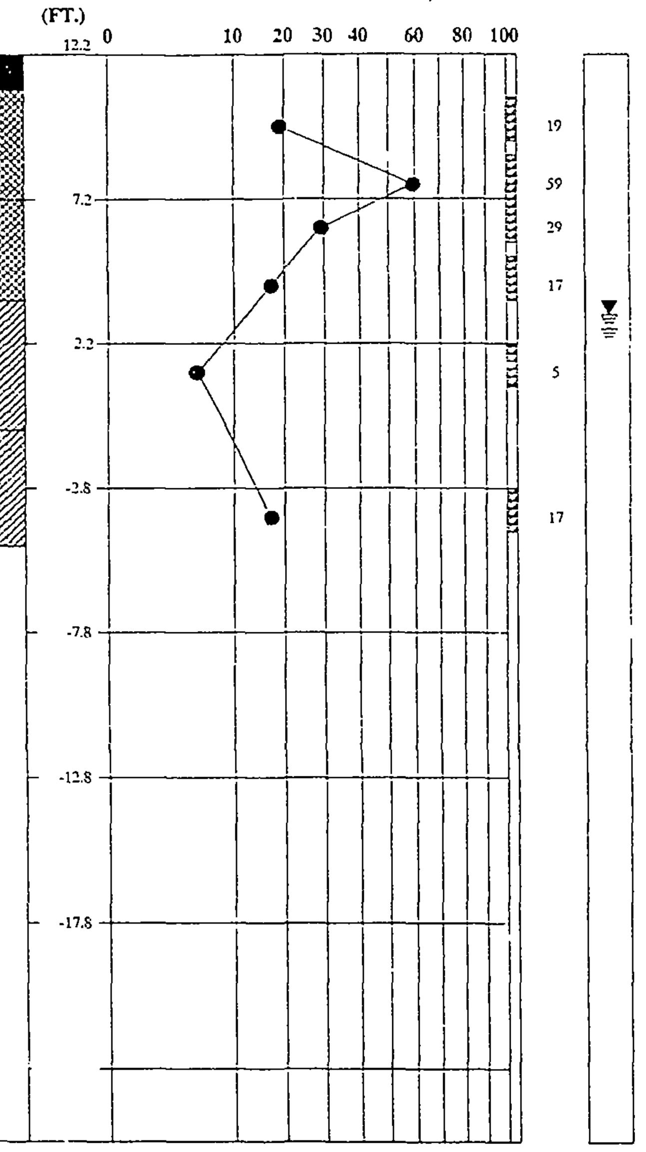
B-21

DEPTH (FT.)	DESCRIPTION
0.0 – 1.2	ASPHALT
1.2 – 5.0	FILL - brown clayey fine to medium sand changing to sandy clay with little fine gravel
5.0 – 8.5	FILL - gray clayey silt with little fine sand and trace fine gravel
8.5 – 13.0	Loose dark brown clayey fine SAND (SC)
13.0 – 17.0	Firm brown SAND (SC) with little to trace clay

BORING TERMINATED AT 17, 4-13-92.

Note: Final water level shown is 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-21
DATE DRILLED	April 13, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

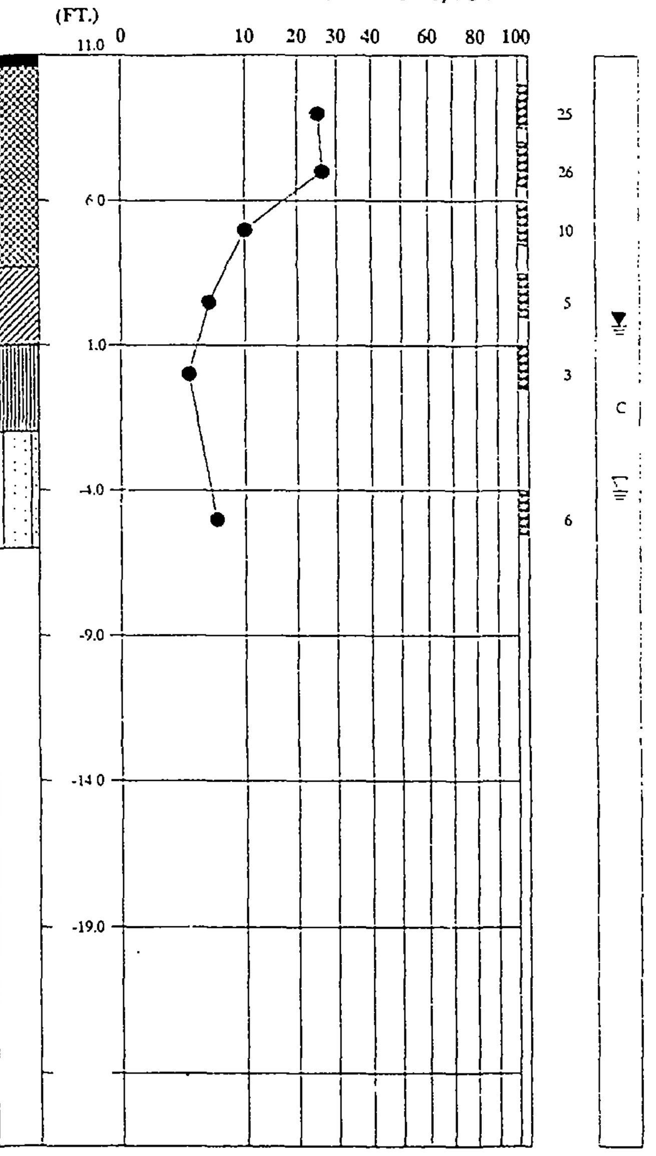
LAW ENGINEERING

B-22

DEPTH (FT.)	DESCRIPTION
0.0 – 0.4	ASPHALT
0.4 – 7.3	FILL - brown fine to medium sand with some clay and little fine gravel
7.3 – 10.0	Loose brown gray clayey fine to medium SAND(SC)
10.0 – 13.0	Soft gray clayey SILT(MH) with trace fine sand
13.0 – 17.0	Loose gray silty fine to medium SAND(SM)

BORING TERMINATED AT 17, 4-3-92.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Donan Duval
Driller's Helper: Jorge Del-Cid
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-22
DATE DRILLED	April 3, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

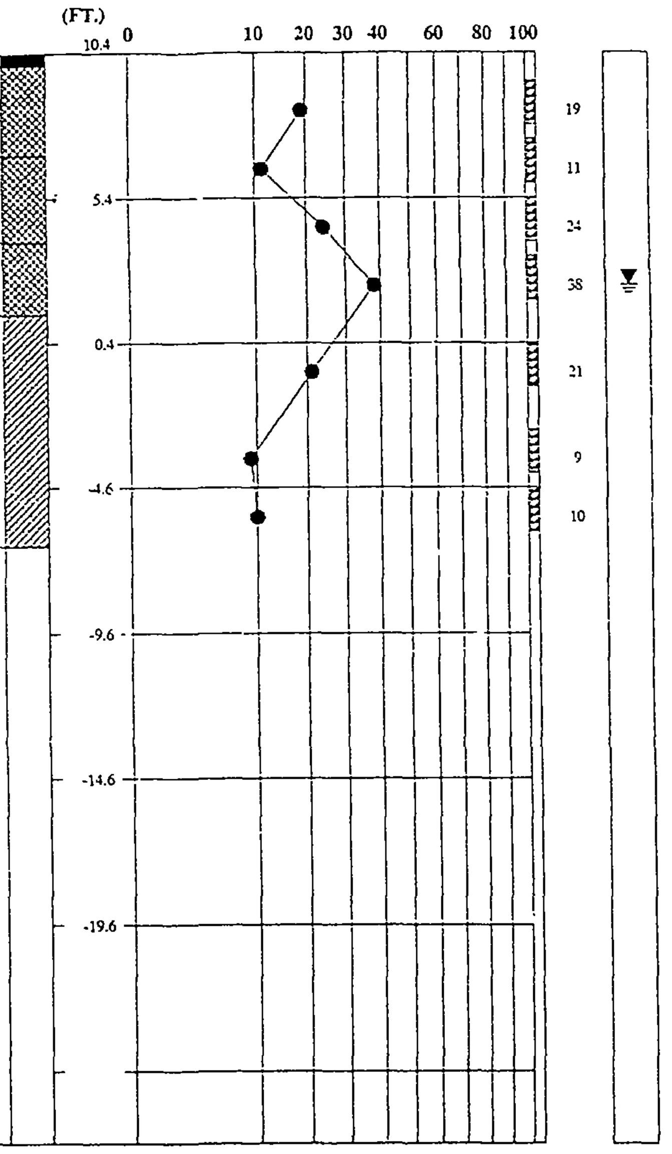
LAW ENGINEERING

B-23

DEPTH (FT.)	DESCRIPTION
0.0 – 0.4	ASPHALT
0.4 – 3.5	FILL - brown clayey fine to medium sand with trace fine gravel
3.5 – 6.5	FILL - gray fine to medium sandy silt with little fine gravel and trace organics
6.5 – 9.0	FILL - tan fine to medium sand with some clay and little fine gravel
9.0 – 17.0	Loose to to firm tan fine to medium SAND (SC) with little coarse sand and fine gravel and little to trace clay

BORING TERMINATED AT 17, 4-6-92.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-23
DATE DRILLED	April 6, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

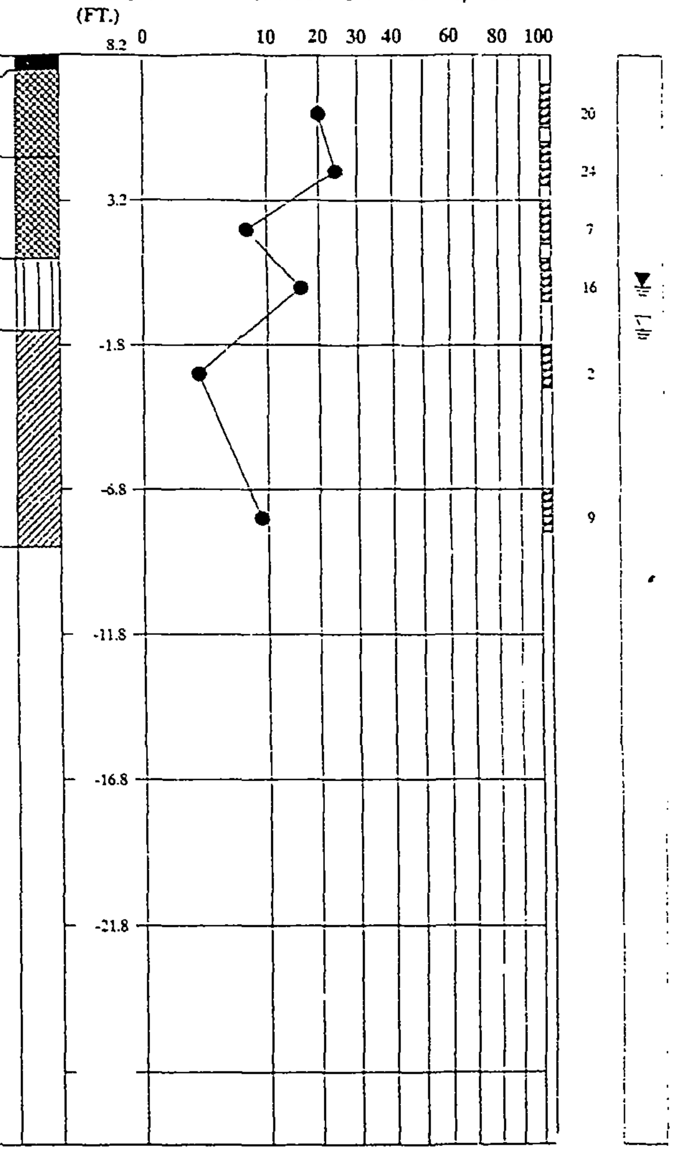
LAW ENGINEERING

B-25

DEPTH (FT.)	DESCRIPTION
0.0 – 0.5	ASPHALT
0.5 – 3.5	FILL - brown gray medium sand with some clay and little fine gravel
3.5 – 7.0	FILL - gray fine sandy clay with little fine gravel
7.0 – 9.5	Very stiff gray fine sandy SILT(ML)
9.5 – 17.0	Loose gray fine to medium SAND(SC) with little clay

BORING TERMINATED AT 17, 4-9-92.
Note: Final water level shown is 15 minutes after end of boring.

ATV Rig
Drilling Method: Hollow Stem Augers
Driller: Thomas Chew
Driller's Helper: Kevin Hammond
Logged by: J.C. Giese



REMARKS:

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED ABOVE

TEST BORING RECORD

BORING NUMBER	B-25
DATE DRILLED	April 9, 1992
PROJECT NUMBER	482-9352-01
PROJECT	National Airport, South Area Roads
PAGE 1 OF 1	

LAW ENGINEERING

NO.	REVISION	DATE

Johnson, Mirmiran & Thompson, P.A.
ENGINEERS - PLANNERS - SURVEYORS - LANDSCAPE ARCHITECTS
72 LOVETON CIRCLE SPARKS, MD. 21152
(410) 329-3100

COMMONWEALTH OF VIRGINIA
DANIEL T. CHENG
020282
PROFESSIONAL ENGINEER
5-11-93

DATE	MARCH 10, 1993
SCALE	NONE
DESIGNED	M.R.M.
CHECKED	D.A.L.
DRAWN	L.E.E.
ACCEPTED	D.F.K.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

ENGINEERING DIVISION DESIGN BRANCH

SOUTH AREA ROADS
WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.

BORING LOGS

DRAWING NUMBER	DCA-3016-40
SHEET NUMBER	C7.2

INDEX OF DRAWINGS

SHEET COUNT	DRAWING NO.	SHEET NO.	SHEET TITLE
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2 OF 52	DJCC0001	C0.1	INDEX OF DRAWINGS AND KEY MAP
3 OF 52	DJCC0002	C0.2	PROJECT OVERVIEW
4 OF 52	DJCC0003	C0.3	LEGEND, GENERAL NOTES, AND ABBREVIATIONS
5 OF 52	DJCC1001	C1.1	SITE ACCESS AND CONSTRUCTION STAGING PLAN
6 OF 52	DJCC1002	C1.2	GEOMETRIC LAYOUT
7 OF 52	DJCC1003	C1.3	MAINTENANCE OF TRAFFIC GENERAL NOTES AND DETAILS
8 OF 52	DJCC1004	C1.4	FAR PART 77 SURFACE PLAN
9 OF 52	DJCC1005	C1.5	FAR PART 77 SURFACE PLAN
10 OF 52	DJCC1006	C1.6	MAINTENANCE OF TRAFFIC AND PHASING PLAN PHASE I AND II
11 OF 52	DJCC1007	C1.7	MAINTENANCE OF TRAFFIC AND PHASING PLAN PHASE IIB AND IIC
12 OF 52	DJCC1008	C1.8	MAINTENANCE OF TRAFFIC AND PHASING PLAN PHASE III AND IV
13 OF 52	DJCC1009	C1.9	ROADWAY AND STORM DRAIN PLAN 1
14 OF 52	DJCC1010	C1.10	ROADWAY AND STORM DRAIN PLAN 2
15 OF 52	DJCC1011	C1.11	ROADWAY AND STORM DRAIN PLAN 3
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17 OF 52	DJCC1013	C1.13	DRAINAGE AREA MAP
18 OF 52	DJCC1014	C1.14	STORMWATER POLLUTION PREVENTION
19 OF 52	DJCC1015	C1.15	STORMWATER POLLUTION PREVENTION NOTES AND DETAILS
20 OF 52	DJCC1016	C1.16	STORMWATER POLLUTION PREVENTION DETAILS
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34 OF 52	DJCC4003	C4.3	PERMANENT AOA SECURITY FENCE DETAILS
35 OF 52	DJCC4004	C4.4	STORM DRAIN PROFILES AND DETAILS
36 OF 52	DJCC4005	C4.5	STORM DRAIN DETAILS
37 OF 52	DJCC4006	C4.6	STORM DRAIN DETAILS
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40 OF 52	DJCC7001	C7.1	BORING LOGS
41 OF 52	DJCC7002	C7.2	BORING LOGS
42 OF 52	DJCC7003	C7.3	BORING LOGS
43 OF 52	DJCC7004	C7.4	BORING LOGS
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45 OF 52	DJCS1002	S1.2	SEDIMENT COLLECTION CULVERT TYPICAL SECTION AND DETAILS
46 OF 52	DJCS1003	S1.3	MISCELLANEOUS DETAILS
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48 OF 52	DJCE1002	E1.2	ELECTRICAL ENCLOSURE DETAILS
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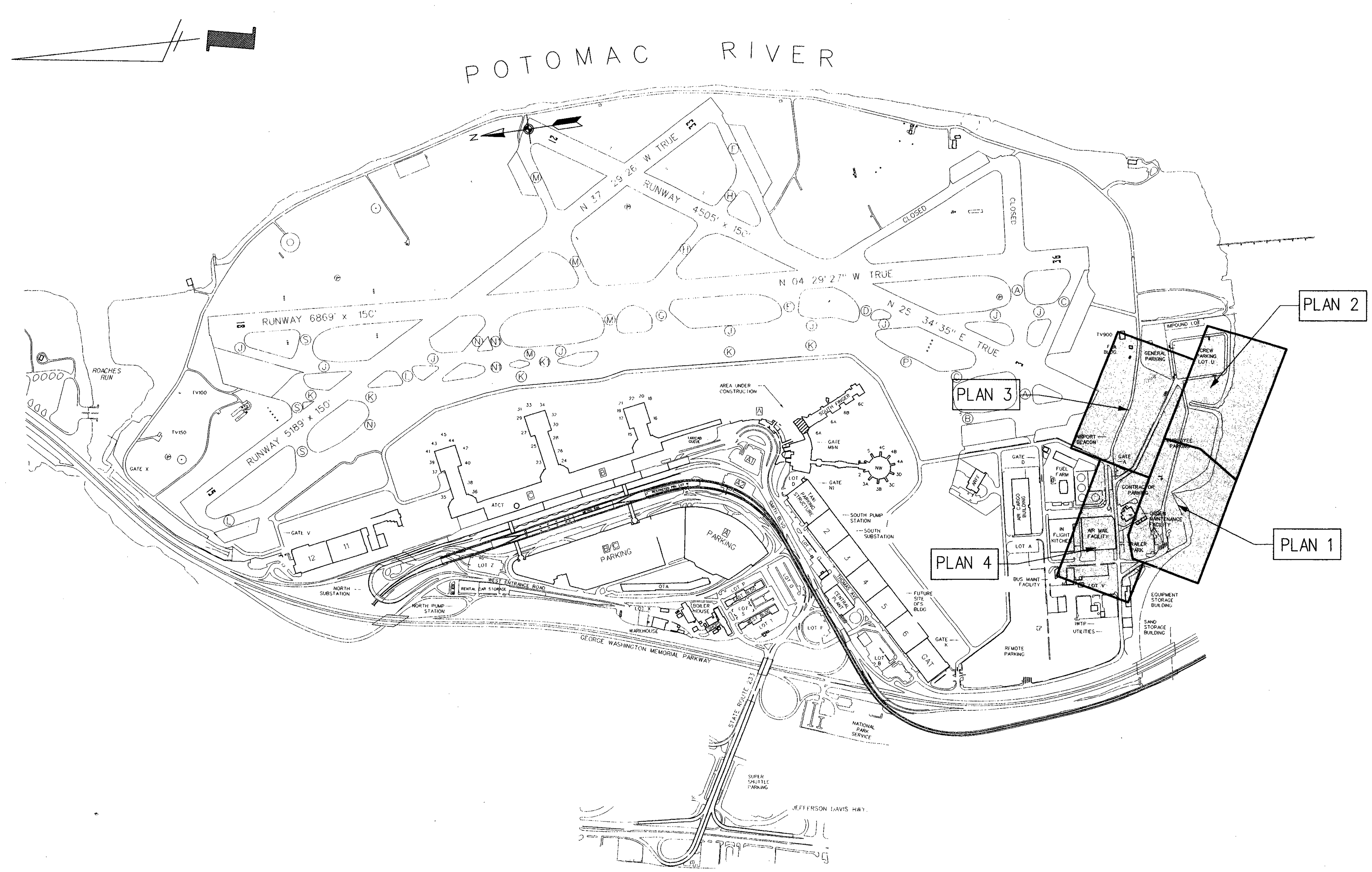


KEY MAP

500 250 0 500 1000

SCALE: 1"=500'

NO.	REVISION	DATE

JMT
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

DATE	AUG 17, 1999
SCALE	AS NOTED
DESIGNED	C.D.L.
DRAWN	E.B.B. CHECKED D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

8-17-99

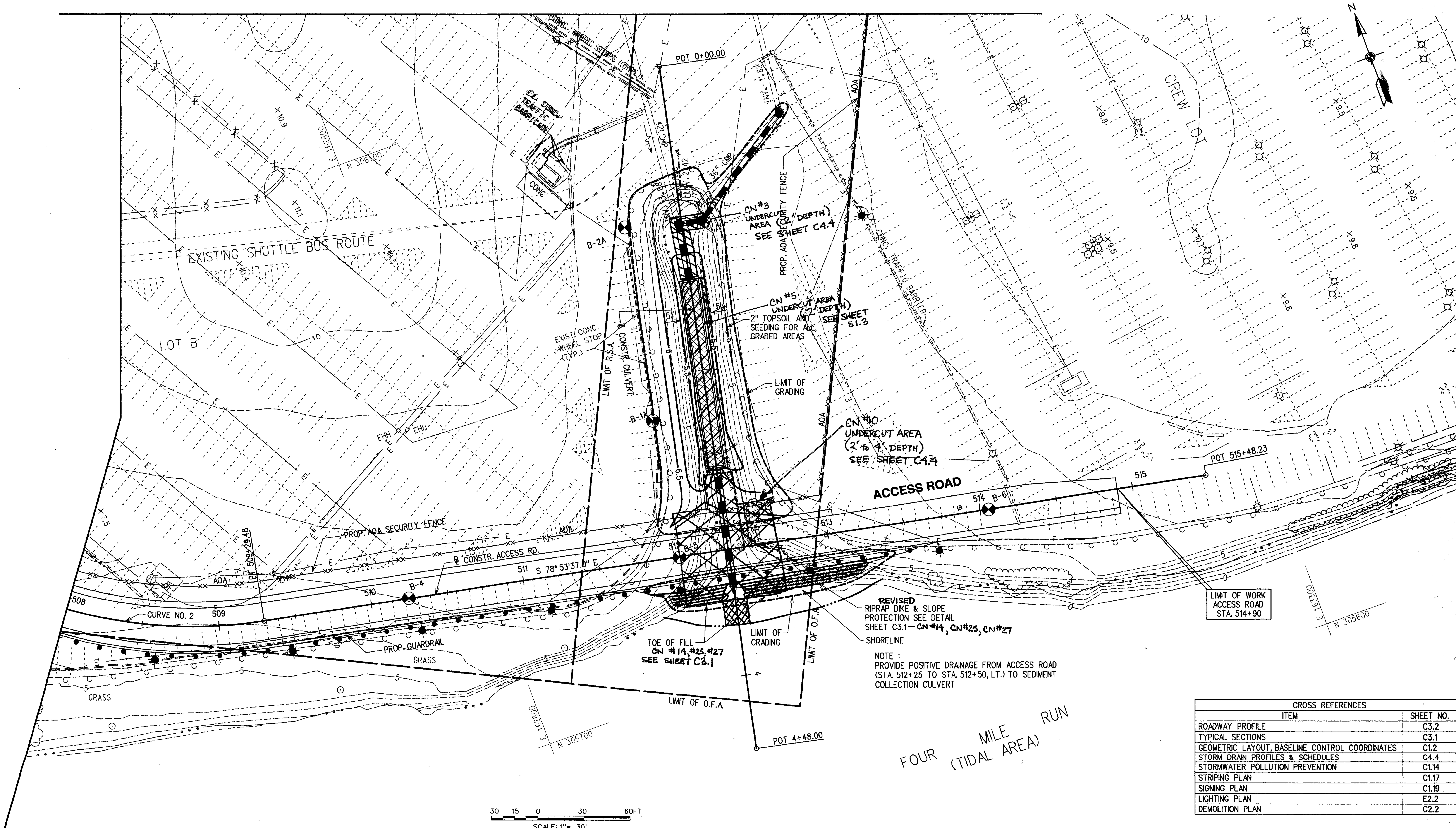
METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

OFFICE OF ENGINEERING DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS
PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
INDEX OF DRAWINGS AND KEY MAP

DRAWING NUMBER
DJCC0001

SHEET NUMBER
C0.1
sh 2 of 52



NOTE :
PROVIDE POSITIVE DRAINAGE FROM ACCESS ROAD (STA. 512+25 TO STA. 512+50, LT.) TO SEDIMENT COLLECTION CULVERT

CROSS REFERENCES	
ITEM	SHEET NO.
ROADWAY PROFILE	C3.2
TYPICAL SECTIONS	C3.1
GEOMETRIC LAYOUT, BASELINE CONTROL COORDINATES	C1.2
STORM DRAIN PROFILES & SCHEDULES	C4.4
STORMWATER POLLUTION PREVENTION	C1.14
STRIPING PLAN	C1.17
SIGNING PLAN	C1.19
LIGHTING PLAN	E2.2
DEMOLITION PLAN	C2.2

PLAN 2

NO.	REVISION	DATE
CN #3	UNDERCUT @ MANHOLES 2-1 AND 2-2	3/23/00
CN #5	UNDERCUT @ STORMWATER DRAINAGE CULVERT	3/23/00
CN #10	UNDERCUT @ ROADWAY SECTION IN OUTFALL #017	4/04/00
CN #14	REVISED SLOPE @ OUTFALL #017	5/25/00
CN #25	ADDITIONAL SLOPE @ OUTFALL	7/13/00
CN #27	54" RCP CHANNEL EXCAVATION	8/8/00

JMT
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

COMMONWEALTH OF VIRGINIA
DANIEL T. CHENG
020282
8-17-99
PROFESSIONAL ENGINEER

DATE	AUG 17, 1999
SCALE	1" = 30'
DESIGNED	C.D.L.
DRAWN	E.B.B. CHECKED D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

OFFICE OF ENGINEERING DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS
PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
GRADING PLAN

DRAWING NUMBER
DJCC1012

SHEET NUMBER
C1.12
sh 16 of 52

DRAINAGE STRUCTURES SCHEDULE			
NUMBER	* STATION	TYPE	T.G. ELEV.
MH 2-1	STA. 1+05, 14.0' LT.	STANDARD PRECAST 60" MH	6.00
MH 2-2	STA. 1+05, 2.0' RT.	STANDARD PRECAST 96" MH	5.76
EW 2-1	STA. 3+41, ℄	PRECAST ENDWALL FOR 54" CIRCULAR PIPE CULVERT	---

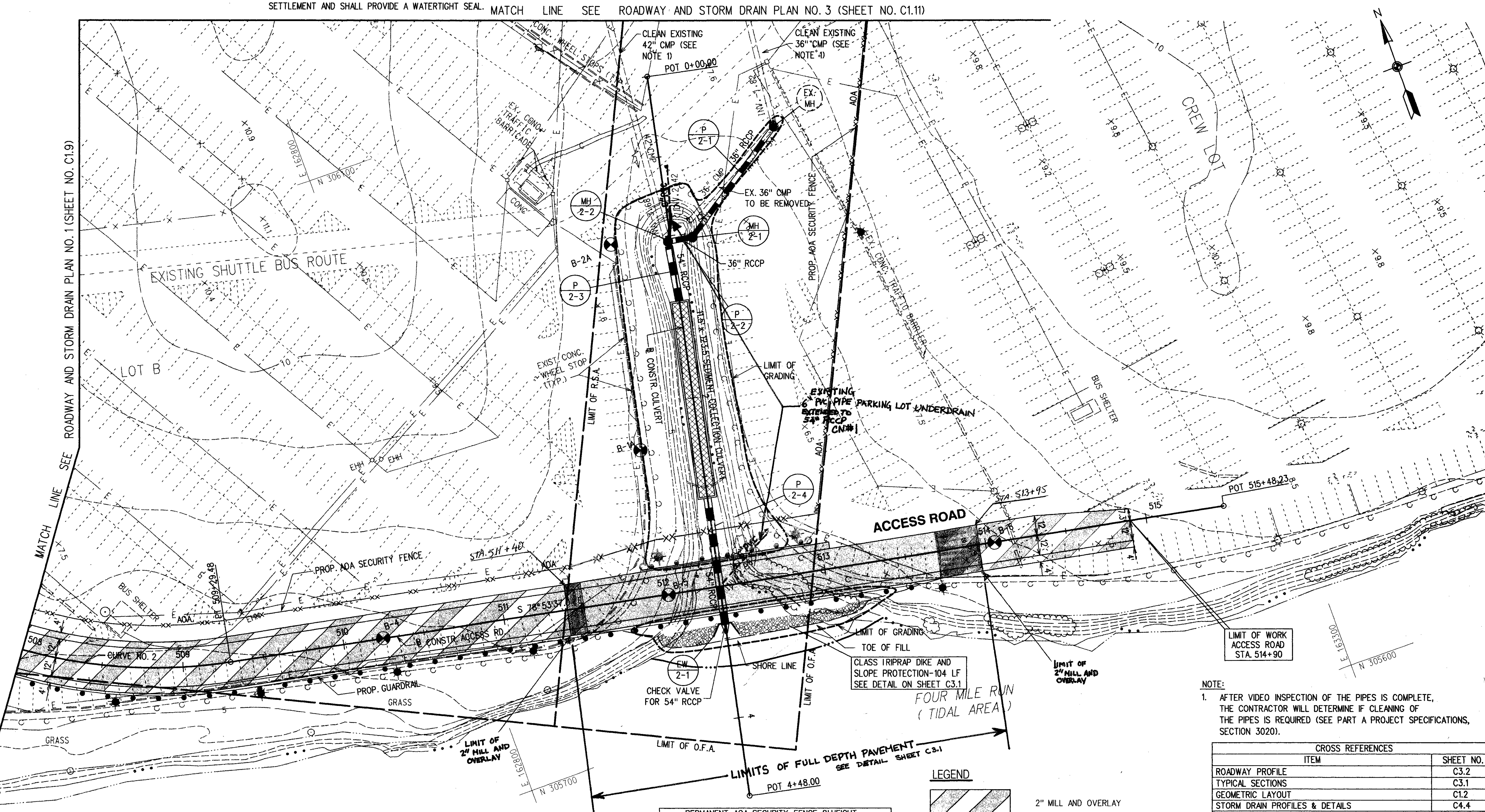
* BASELINE CONSTRUCTION CULVERT

PIPE SCHEDULE				
NUMBER	TYPE	LENGTH	INVERT IN	INVERT OUT
P 2-1	36" RCCP	83.0'	-1.91	-2.71
P 2-2	36" RCCP	13.0'	-2.81	-2.91
P 2-3	54" RCCP	36.0'	-3.73	-3.94
P 2-4	54" RCCP	79.0'	0.25	-0.16

NOTE: CONNECTION BETWEEN SEDIMENT COLLECTION CULVERT AND PIPES P 2-3 AND P 2-4 SHALL BE RESILIANT TO SHEAR CAUSED BY DIFFERENTIAL SETTLEMENT AND SHALL PROVIDE A WATERTIGHT SEAL.

MATCH LINE SEE ROADWAY AND STORM DRAIN PLAN NO. 3 (SHEET NO. C1.11)

MATCH LINE SEE ROADWAY AND STORM DRAIN PLAN NO. 1 (SHEET NO. C1.9)



CURVE NO. 2

Δ = 46° 45'42.8"
D = 19° 00' 00.0 "
R = 301.56 '
T = 130.38'
L = 246.12'
E = 26.98 '

NOTE:

1. AFTER VIDEO INSPECTION OF THE PIPES IS COMPLETE, THE CONTRACTOR WILL DETERMINE IF CLEANING OF THE PIPES IS REQUIRED (SEE PART A PROJECT SPECIFICATIONS, SECTION 3020).

CROSS REFERENCES	
ITEM	SHEET NO.
ROADWAY PROFILE	C3.2
TYPICAL SECTIONS	C3.1
GEOMETRIC LAYOUT	C1.2
STORM DRAIN PROFILES & DETAILS	C4.4
STORMWATER POLLUTION PREVENTION	C1.14
PAVEMENT MARKING PLAN	C1.18
SIGNING PLAN	C1.20
ELECTRICAL AND LIGHTING PLAN	E2.2
DEMOLITION PLAN	C2.2
GRADING PLAN	C1.12

LEGEND

2" MILL AND OVERLAY

PERMANENT AOA SECURITY FENCE

PROPOSED GUARDRAIL

PROPOSED LIGHT POLE

PERMANENT AOA SECURITY FENCE, 8' HEIGHT (SEE SHEET NO. C4.3)	
STATION	LENGTH
508+00, 26' LT. TO 512+99, 26' LT.	499 L.F.
512+99, 26' LT. TO 513+78, 330.0' LT.	314 L.F.

W-BEAM GUARDRAIL, STD. GR-2 (SEE SHEET NO. C4.1 & C4.2)		
STATION TO STATION	LENGTH	REMARKS
508+00, 16' RT. TO 513+66, 16' RT.	566 L.F.	MEET EX. GUARDRAIL

30 15 0 30 60FT

SCALE: 1"= 30'

PLAN 2

NO.	REVISION	DATE
CN#1	Extend Existing 6" PVC Underdrain Outfalls	3/21/00

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72 Loveton Circle Baltimore, Maryland 21152-0949

COMMONWEALTH OF VIRGINIA
DANIEL T. CHENG
Daniel T. Cheng
020282
8-17-99
PROFESSIONAL ENGINEER

DATE	AUG 17, 1999
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DESIGNED	C.D.L.
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METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

OFFICE OF ENGINEERING DESIGN DEPARTMENT

DRAWING TITLE

SOUTH AREA ROADS
PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
ROADWAY AND STORM DRAIN PLAN

DRAWING NUMBER
DJCC1010

SHEET NUMBER
C1.10
sh 14 of 52

FILE : M:\runway3\ps02sar4.dgn
DATE : JUNE 16, 1999 - 10:50AM

KEY TO SYMBOLS AND DESCRIPTIONS

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of material is LARGER than No 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel - sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel - sand - silt mixtures.
			GC	Clayey gravels, gravel - sand - clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No 4 Sieve Size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand - silt mixtures
			SC	Clayey sands, sand - clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts and with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS (Liquid limit GREATER than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

SILT OR CLAY	SAND			GRAVEL		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

No 200 — No 40 — No 10 — No 4 — 3/4" — 3" — 12"

U.S. STANDARD SIEVE SIZE

Reference: The Unified Soil Classification System, Corps of Engineers, U.S. Army Technical Memorandum No. 3-357, Vol. 1. March. 1953 (Revised April. 1960)

Undisturbed Sample	Auger Cuttings
Split Spoon Sample	Bulk Sample
Rock Core	Crandall Sampler
Dilatometer	Pressure Meter
Packer	No Recovery
Water Table at time of drilling	Water Table after 24 hours

Correlation of Penetration Resistance with Relative Density and Consistency

SAND & GRAVEL		SILT & CLAY	
No. of Blows	Relative Density	No. of Blows	Consistency
0 - 4	Very Loose	0 - 1	Very Soft
5 - 10	Loose	2 - 4	Soft
11 - 20	Firm	5 - 8	Firm
21 - 30	Very Firm	9 - 15	Stiff
31 - 50	Dense	16 - 30	Very Stiff
Over 50	Very Dense	Over 31	Hard

KEY TO SYMBOLS AND DESCRIPTIONS

LAW
LAWGIBB Group Member

SOIL TEST BORING RECORD — B-1

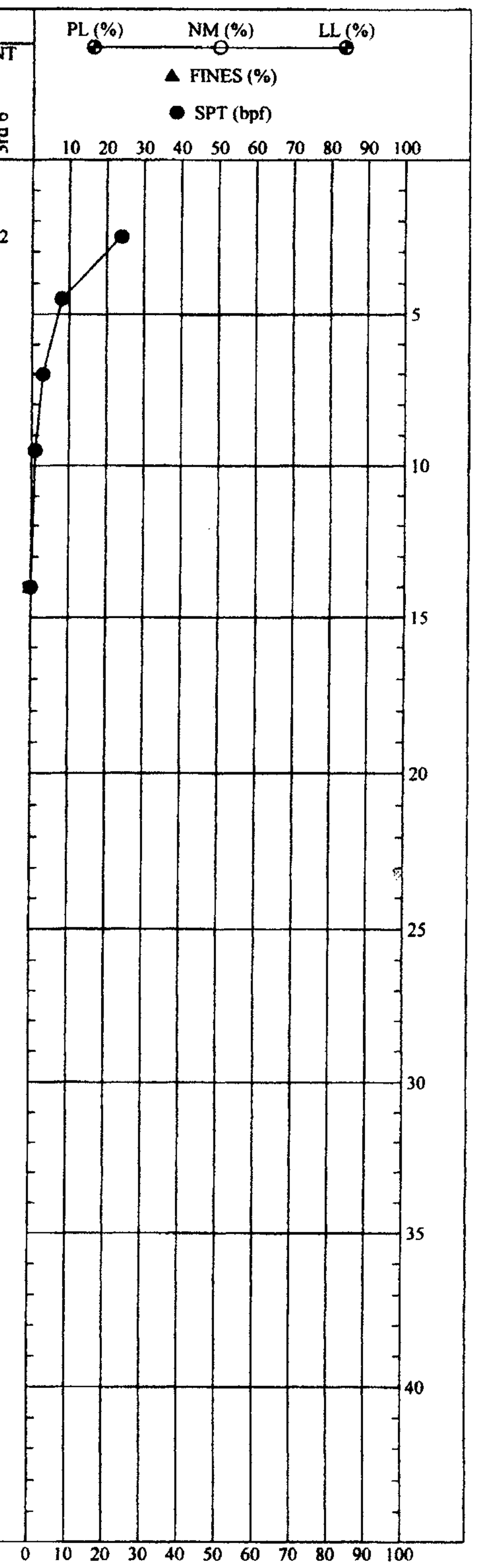
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	ASPHALT: 18 inches	8.5
	FILL - sampled as loose to firm brown fine to medium sand, some silt, little to some gravel, moist	
5		3.5
	- very loose, some clay below 6 feet	
	Very loose gray fine to medium SAND (SM), little to some silt, wet	
10	Very soft gray SILT (ML), trace fine sand, wet	-1.5
	Very soft gray clayey SILT (MH), trace fine sand, wet	
15	BORING TERMINATED AT 15.0 FEET.	-6.5
20		-11.5
25		-16.5
30		-21.5
35		-26.5
40		-31.5
45		-36.5

NOTES:
1. Ground water was encountered at 9.1 feet on 10/10/98.
2. Cave-in depth was measured at 9.2 feet on 10/10/98.

SAMPLES IDENT	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6")
SPT - 1	Split spoon	13-12-12 N=24
SPT - 2	Split spoon	4-2-6 N=8
SPT - 3	Split spoon	2-2-1 N=3
SPT - 4	Split spoon	1-1-0 N=1
SPT - 5	Split spoon	WOH/18"



20310 82222.GPJ LAW GIBB.GDT 11/16/98

DRILLER: LAW M Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT South Area Roads and Pipe Extension
BORING NO. B-1

DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222

PAGE 1 OF 1

LAW
LAWGIBB Group Member

SOIL TEST BORING RECORD — B-2

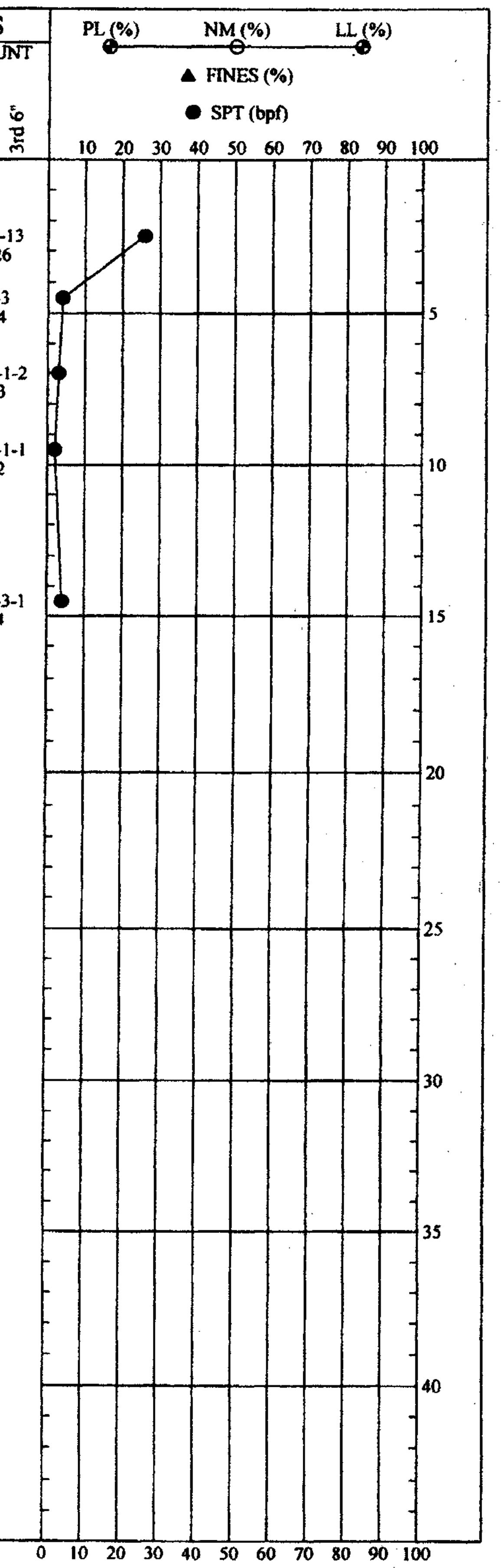
SOIL CLASSIFICATION AND REMARKS

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	ASPHALT: 18 inches	7.1
	FILL - sampled as very loose to firm gray-brown fine to medium sand, some silt, trace to some clay, little gravel, moist to wet	
5	- petroleum odor at 5 feet and at 8.5 feet	2.1
	Very loose gray silty fine SAND (SM), wet	
10		-2.9
	- fine to medium SAND (SP), trace silt below 13.5 feet	
15	- blue-green silty fine SAND (SM) at 15 feet BORING TERMINATED AT 15 FEET.	-7.9
20		-12.9
25		-17.9
30		-22.9
35		-27.9
40		-32.9
45		-37.9

NOTES:
1. Ground water was encountered at 8 feet on 11/10/98.
2. Cave-in depth was measured at 9.5 feet on 11/10/98.

SAMPLES IDENT	TYPE	N-COUNT (1st 6" 2nd 6" 3rd 6")
SPT - 1	Split spoon	13-13-13 N=26
SPT - 2	Split spoon	2-1-3 N=4
SPT - 3	Split spoon	WOH-1-2 N=3
SPT - 4	Split spoon	WOH-1-1 N=2
SPT - 5	Split spoon	WOH-3-1 N=4



20310 82222.GPJ LAW GIBB.GDT 11/16/98

DRILLER: LAW M Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

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SOIL TEST BORING RECORD

PROJECT South Area Roads and Pipe Extension
BORING NO. B-2

DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222

PAGE 1 OF 1

LAW
LAWGIBB Group Member

NOTE:

REFER TO ROADWAY AND STORMDRAIN PLANS, SHEET NO.'S C1.9 AND C1.10 FOR SOIL BORING LOCATIONS.

NO.	REVISION	DATE

JMT
JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

DANIEL T. CHENG
Daniel T. Cheng
8-17-99

DATE	AUG 17, 1999
SCALE	1"=30'-0"
DESIGNED	C.D.L.
DRAWN	E.B.B. CHECKED D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

OFFICE OF ENGINEERING
DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS
PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
BORING LOGS

DRAWING NUMBER
DJCC7001

SHEET NUMBER
C7.1
sh 40 of 52

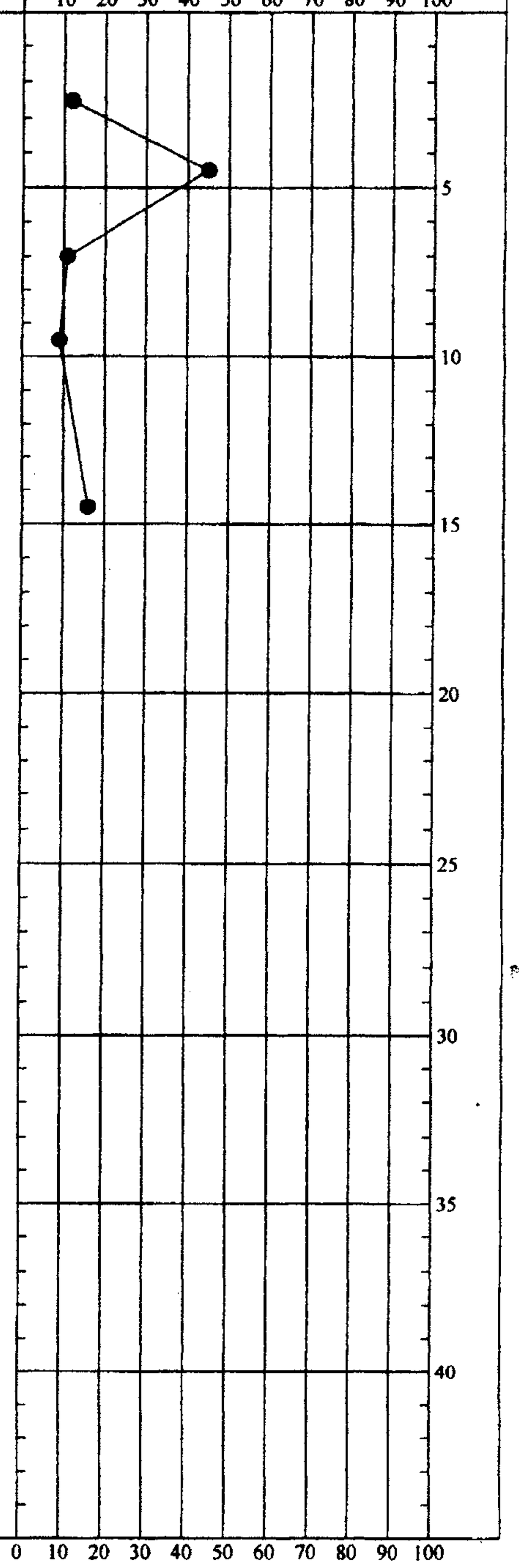
SOIL TEST BORING RECORD — B-6

SOIL CLASSIFICATION AND REMARKS — SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	ELEV (ft)	SOIL CLASSIFICATION AND REMARKS
0	7.5	ASPHALT: 12 inches
		FILL - sampled as loose to dense gray-brown fine to medium sand, some silt, little to some gravel, little to some concrete, trace to some clay, trace wood, moist to wet
15	-7.5	**BORING TERMINATED AT 15 FEET.**

SAMPLE IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 1	2-5-7 N=12
SPT - 2	12-17-28 N=45
SPT - 3	4-3-8 N=11
SPT - 4	4-4-5 N=9
SPT - 5	12-8-8 N=16

NOTES:
1. Ground water was encountered at 6.5 feet on 11/10/98.
2. Cave-in depth was measured at 11.5 feet on 11/10/98.



20310 82222.GPJ LAW_GIBB.GDT 11-16-98

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

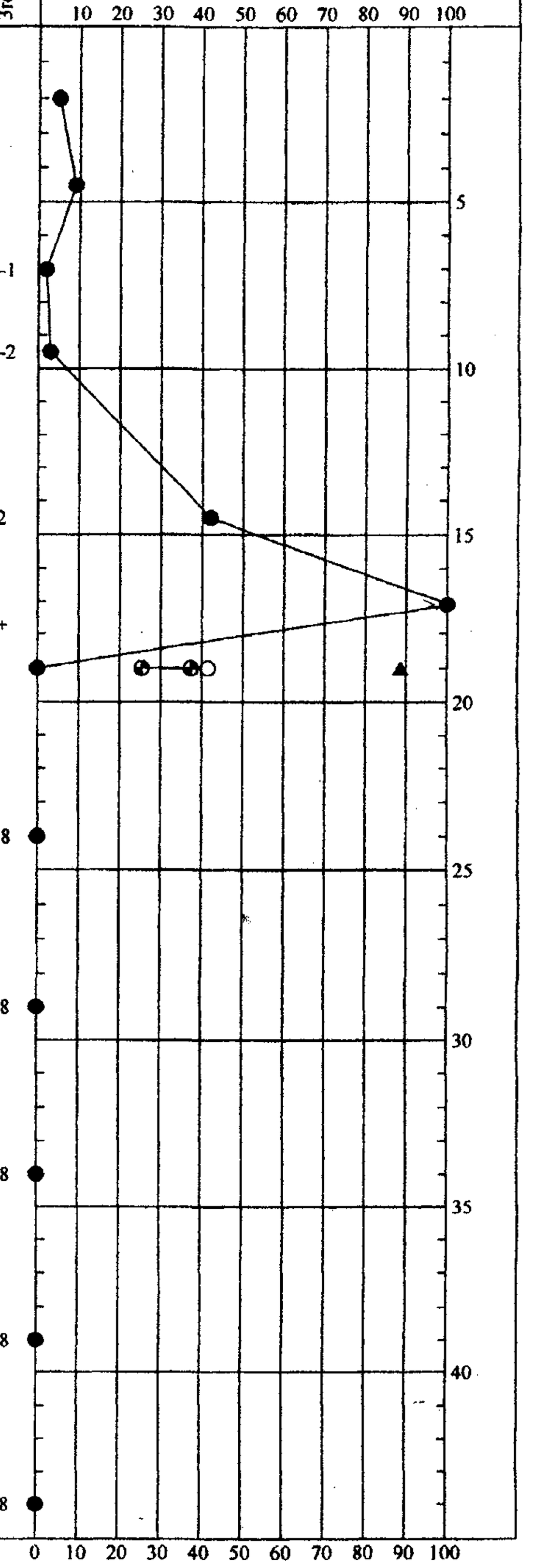
PROJECT: South Area Roads and Pipe Extension
BORING NO.: B-6
DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222
PAGE 1 OF 1

LAW — LAWGIBB Group Member

SOIL TEST BORING RECORD — B-1A (Page 1 of 2)

DEPTH (ft)	ELEV (ft)	SOIL CLASSIFICATION AND REMARKS
0	6.9	ASPHALT: 4 inches
		BASE: 8 inches
		FILL: sampled as LOOSE gray, green, black fine to medium sand, little mica, some silt, some gravel, moist
		FILL: sampled as LOOSE brown sandy gravel, little clay, moist
		FILL: sampled as VERY LOOSE dark gray-brown clayey fine to medium sand, some gravel, moist
		FILL: sampled as SOFT dark gray clayey silt, trace fine sand, moist
		FILL: sampled as asphalt and concrete fragments
		VERY SOFT green, gray, black clayey SILT (MH), trace to little fine sand, trace mica, moist to wet
45	-38.1	

SAMPLE IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 1	4-2-3 N=5
SPT - 2	2-4-5 N=9
SPT - 3	WOH-1-1 N=2
SPT - 4	WOH-1-2 N=3
SPT - 5	6-20-22 N=42
SPT - 6	100/3 N=100+
SPT - 7	WOH N=0
SPT - 8	WOH/18 N=0
SPT - 9	WOH/18 N=0
SPT - 10	WOH/18 N=0
SPT - 11	WOH/18 N=0
SPT - 12	WOH/18 N=0



SMM REVISED 20310 82222-01.GPJ LAW_JLF.GDT 6/9/99

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: 3.25" ID HSA
HOLE DIA.:
Logged by: C. Tin
Checked by:
REMARKS:

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SOIL TEST BORING RECORD

PROJECT: South Area Roads Box Culvert - DCA
BORING NO.: B-1A
DRILLED: May 24, 1999
PROJ. NO: 20310-8-2222.01
PAGE 1 OF 2

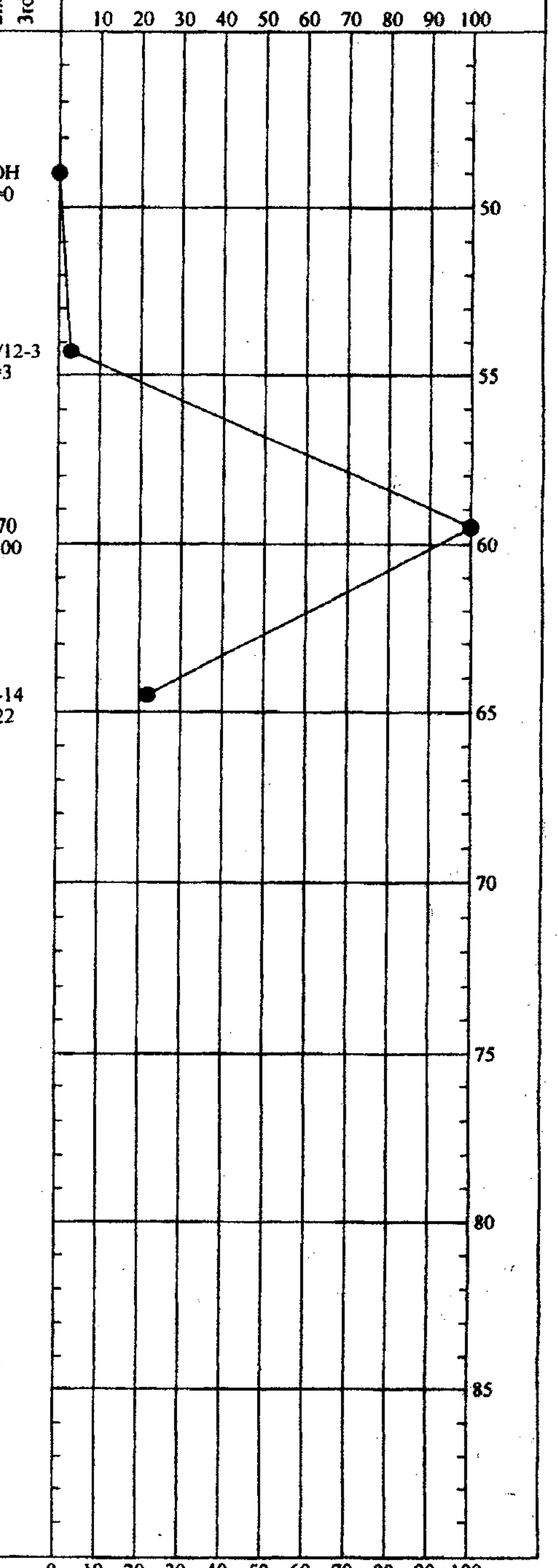
LAW — LAWGIBB Group Member

SOIL TEST BORING RECORD — B-1A (Page 2 of 2)

DEPTH (ft)	ELEV (ft)	SOIL CLASSIFICATION AND REMARKS
45	-38.1	VERY SOFT green, gray, black clayey SILT (MH), trace to little fine sand, trace mica, moist to wet
		LOOSE gray fine to medium SAND (SP), trace clay, wet
		VERY DENSE gray fine to medium SAND (SP), trace clay, wet
		VERY STIFF gray-green silty CLAY (CL), trace fine sand, little gravel, moist
65	-58.1	**BORING TERMINATED AT 65.0 FEET BELOW GROUND SURFACE (BGS) ON 5/24/99.**

SAMPLE IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 13	WOH N=0
SPT - 14	WOH/12-3 N=3
SPT - 15	30-70 N=100
SPT - 16	18-8-14 N=22

NOTES:
1. Ground water level was measured at 6.5 feet bgs on 5/24/99.
2. Cave-in depth was measured at 51.7 feet bgs on 5/24/99.



SMM REVISED 20310 82222-01.GPJ LAW_JLF.GDT 6/9/99

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: 3.25" ID HSA
HOLE DIA.:
Logged by: C. Tin
Checked by:
REMARKS:

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SOIL TEST BORING RECORD

PROJECT: South Area Roads Box Culvert - DCA
BORING NO.: B-1A
DRILLED: May 24, 1999
PROJ. NO: 20310-8-2222.01
PAGE 2 OF 2

LAW — LAWGIBB Group Member

NOTE:
REFER TO ROADWAY AND STORMDRAIN PLANS, SHEET NO.'S C1.9 AND C1.10 FOR SOIL BORING LOCATIONS.

NO.	REVISION	DATE

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

DANIEL T. CHENG
Daniel T. Cheng
8-17-99

DATE	AUG 17, 1999
SCALE	1"=30'-0"
DESIGNED	LAW
DRAWN	E.B.B. CHECKED D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY
OFFICE OF ENGINEERING
DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
BORING LOGS

DRAWING NUMBER
DJCC7003

SHEET NUMBER
C7.3
sh 42 of 52

SOIL TEST BORING RECORD — PAGE 1 OF 2

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	FILL: sampled as LOOSE gray-green sandy gravel, little clay, moist	7.2
	FILL: sampled as VERY LOOSE tan, gray, black clayey fine to medium sand, some gravel, moist	
5	FILL: sampled as LOOSE TO VERY FIRM dark gray clayey fine to medium sand, little gravel, moist	2.2
10		-2.8
	VERY SOFT TO SOFT green, gray, black clayey SILT (MH), trace to some fine sand, trace mica, moist to wet	
15		-7.8
20		-12.8
25		-17.8
30		-22.8
35		-27.8
40		-32.8
45		-37.8

SAMPLES IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6")
SPT - 1	6-4-3 N=7
SPT - 2	2-1-1 N=2
SPT - 3	2-10-20 N=30
SPT - 4	5-5-5 N=10
SPT - 5	1/18-5-5 N=10
SPT - 6	WOH-1-1 N=2
SPT - 7	WOR-WOH/1 N=0
SPT - 8	WOH/18 N=0
SPT - 9	WOH/18 N=0
SPT - 10	WOR/12-WO N=0
SPT - 11	WOR-WOH/1

PL (%) NM (%) LL (%)
▲ FINES (%)
● SPT (bpf)
0 10 20 30 40 50 60 70 80 90 100

SMM REVISED 20310 82222-01 GPJ LAW JLF.GDT 6/9/99

DRILLER:	LAW M. Potter
EQUIPMENT:	CME-55
METHOD:	3.25" ID HSA
HOLE DIA.:	
Logged by:	C. Tin
Checked by:	
REMARKS:	

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SOIL TEST BORING RECORD

PROJECT South Area Roads Box Culvert - DCA
BORING NO. B-2 A
DRILLED: May 25, 1999
PROJ. NO: 20310-8-2222.01
PAGE 1 OF 2

LAW
LAWGIBB Group Member

SOIL TEST BORING RECORD — PAGE 2 OF 2

SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
45	VERY SOFT TO SOFT green, gray, black clayey SILT (MH), trace to some fine sand, trace mica, moist to wet	-37.8
50		-42.8
	VERY LOOSE dark gray, brown, white fine to coarse SAND (SC), little to some clay, little gravel, wet	
55		-47.8
60		-52.8
	VERY DENSE dark gray, brown, white fine to coarse SAND (SC), little to some clay, little gravel, wet	
65	**BORING TERMINATED AT 65.0 FEET BELOW GROUND SURFACE (BGS) ON 5/25/99.**	-57.8
70		-62.8
75		-67.8
80		-72.8
85		-77.8
90		-82.8

NOTES:
1. Ground water level was measured at 8.0 feet bgs on 5/25/99.
2. Cave-in depth was measured at 52.5 feet bgs on 5/25/99.

SAMPLES IDENT	N-COUNT (1st 6" 2nd 6" 3rd 6")
	N=0
SPT - 12	WOR/12-WO N=0
SPT - 13	1/18 N=0
SPT - 14	2-0-3 N=3
SPT - 15	30-33-37 N=70

PL (%) NM (%) LL (%)
▲ FINES (%)
● SPT (bpf)
0 10 20 30 40 50 60 70 80 90 100

SMM REVISED 20310 82222-01 GPJ LAW JLF.GDT 6/10/99

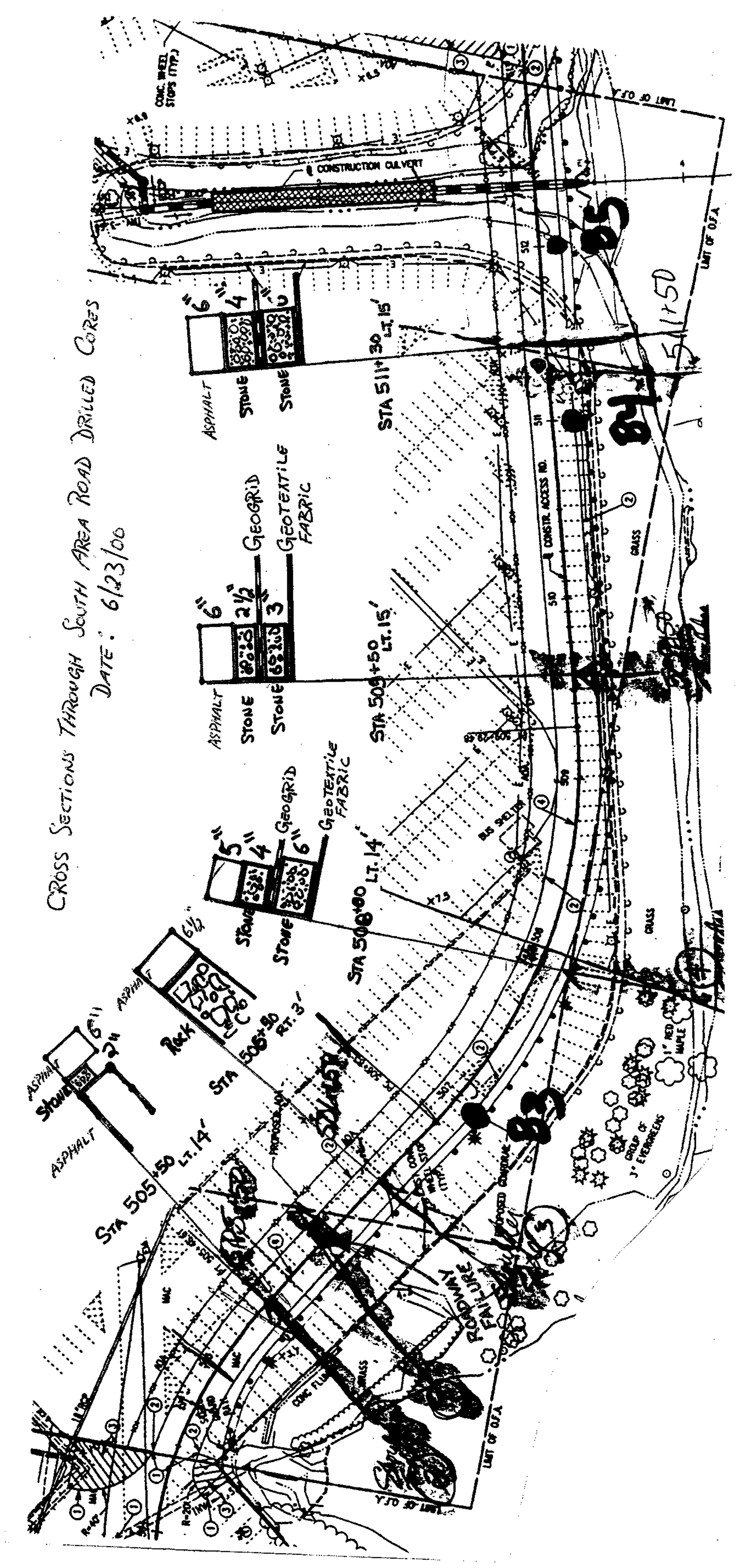
DRILLER:	LAW M. Potter
EQUIPMENT:	CME-55
METHOD:	3.25" ID HSA
HOLE DIA.:	
Logged by:	C. Tin
Checked by:	
REMARKS:	

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT South Area Roads Box Culvert - DCA
BORING NO. B-2 A
DRILLED: May 25, 1999
PROJ. NO: 20310-8-2222.01
PAGE 2 OF 2

LAW
LAWGIBB Group Member



EXISTING PAVEMENT BORINGS
(N.T.S.)

NOTE: ADDITIONAL BORINGS WERE TAKEN DUE TO ROADWAY FAILURE AT ≈ STA 506+00 APPROX. 2 WEEKS AFTER VEHICLE LOADS WERE IMPOSED ON THE NEW ROADWAY SURFACE. SEE SHEET C1.9 FOR LOCATION OF REPAIRED ROADWAY SECTION. (CN #22).

NOTE:
REFER TO ROADWAY AND STORMDRAIN PLANS, SHEET NO.'S C1.9 AND C1.10 FOR SOIL BORING LOCATIONS.

NO.	REVISION	DATE
CN #22	REPAIR EXISTING ROADWAY SUBGRADE	6/19/00

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

DANIEL T. CHENG
PROFESSIONAL ENGINEER
020252
8-17-99

DATE	AUG 17, 1999
SCALE	1"=30'-0"
DESIGNED	LAW
DRAWN	E.B.B.
CHECKED	D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY
OFFICE OF ENGINEERING DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS
PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT
WASHINGTON, D.C.
BORING LOGS

DRAWING NUMBER
DJCC7004

SHEET NUMBER
C7.4
sh 43 of 52

FILE: m:\runway3\de10asar4.dgn DATE: 03-Aug-99 16:03

SOIL TEST BORING RECORD — B-3

SOIL CLASSIFICATION AND REMARKS

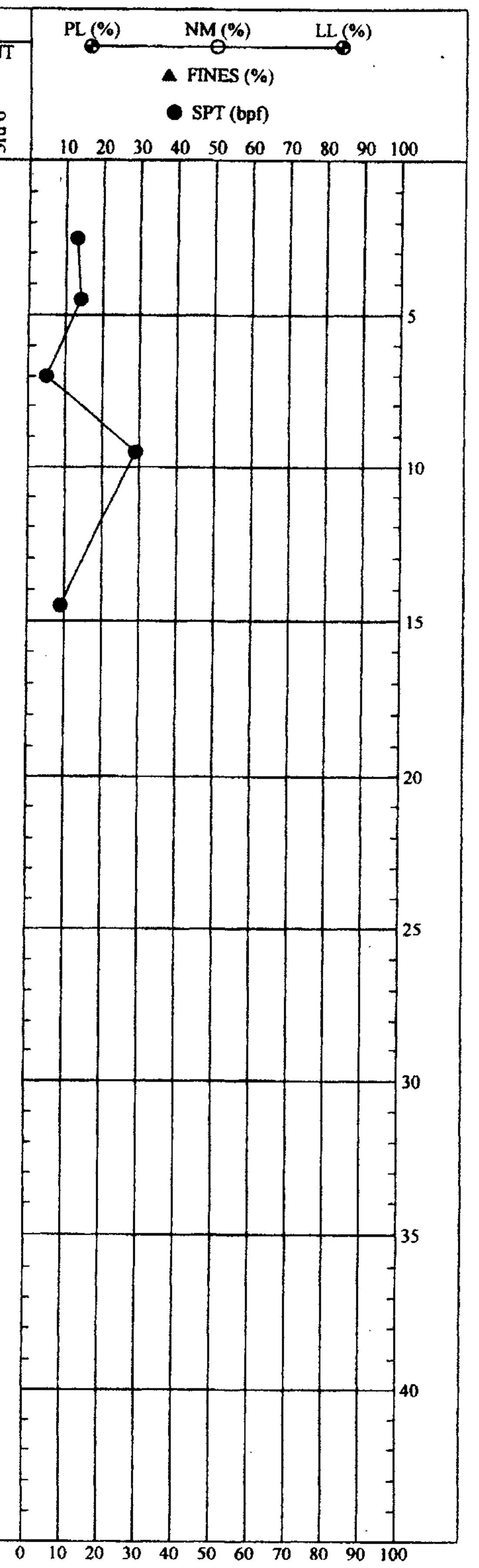
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	ASPHALT: 6 inches	5.9
	BASE: 6 inches	
	FILL - sampled as loose to firm gray-brown fine to medium sand, some silt, some gravel, moist	
5		0.9
	- micaceous from 6 to 7.5 feet	
	- black to gray rock fragments, little fine to medium sand, little silt, wet from 8.5 to 10 feet	
10		-4.1
	- trace glass at 13.5 feet	
15	BORING TERMINATED AT 15 FEET.	-9.1
20		-14.1
25		-19.1
30		-24.1
35		-29.1
40		-34.1
45		-39.1

NOTES:
1. Ground water was encountered at 4.5 feet on 11/10/98.
2. Cave-in depth was measured at 9 feet on 11/10/98.

SAMPLES

IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 1	12-7-6 N=13
SPT - 2	12-6-8 N=14
SPT - 3	4-3-2 N=5
SPT - 4	7-10-19 N=29
SPT - 5	6-4-5 N=9



20310 82222.GPJ LAW GIBB.GDT 11/16/98

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT South Area Roads and Pipe Extension
BORING NO. B-3
DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222
PAGE 1 OF 1

LAW
LAWGIBB Group Member

SOIL TEST BORING RECORD — B-4

SOIL CLASSIFICATION AND REMARKS

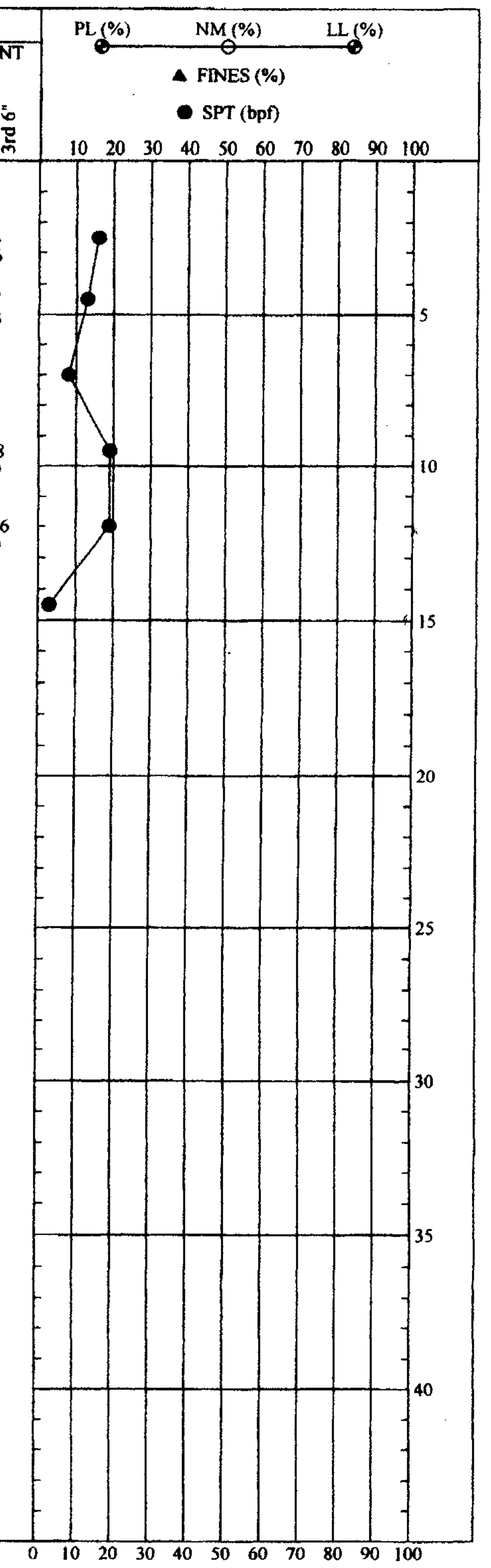
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	ASPHALT: 6 inches	6.7
	BASE: 6 inches	
	FILL - sampled as loose to firm gray-brown fine to medium sand, some silt, some gravel, trace to little brick, moist to wet	
5		1.7
10		-3.3
15	BORING TERMINATED AT 15 FEET.	-8.3
20		-13.3
25		-18.3
30		-23.3
35		-28.3
40		-33.3
45		-38.3

NOTES:
1. Ground water was encountered at 5.5 feet on 11/10/98.
2. Cave-in depth was measured at 10.5 feet on 11/10/98.

SAMPLES

IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 1	9-8-8 N=16
SPT - 2	9-6-7 N=13
SPT - 3	1-2-6 N=8
SPT - 4	3-1-18 N=19
SPT - 5	18-13-6 N=19
SPT - 6	1-2-1 N=3



20310 82222.GPJ LAW GIBB.GDT 11/16/98

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT South Area Roads and Pipe Extension
BORING NO. B-4
DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222
PAGE 1 OF 1

LAW
LAWGIBB Group Member

SOIL TEST BORING RECORD — B-5

SOIL CLASSIFICATION AND REMARKS

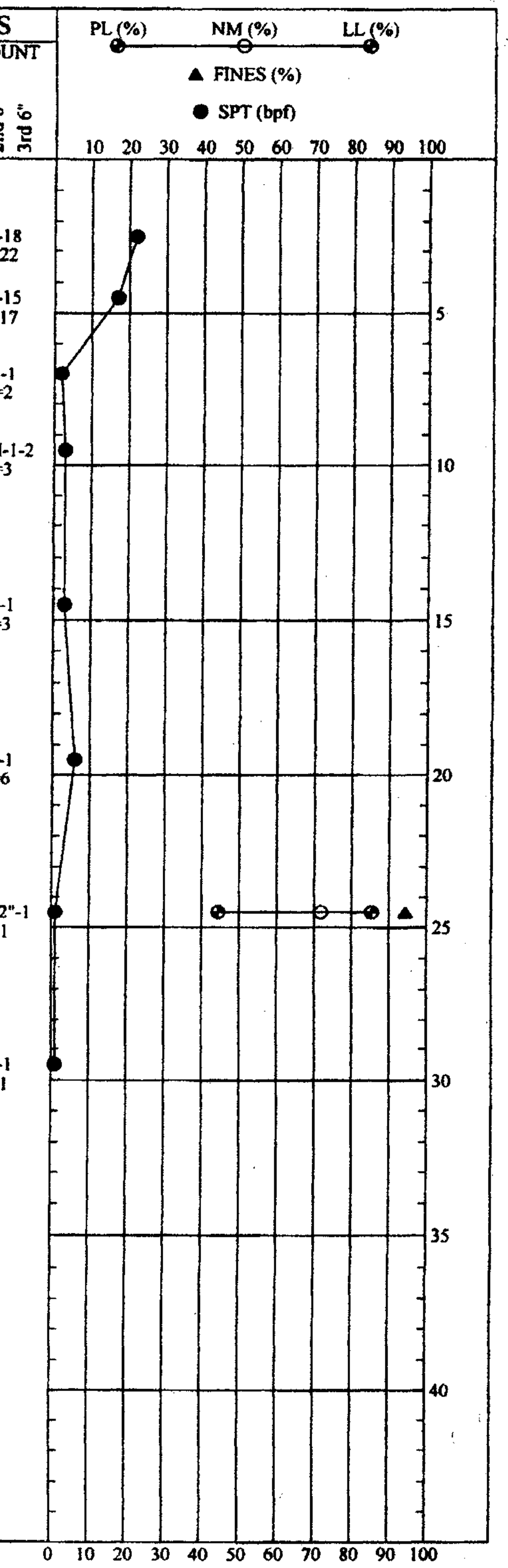
SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS BELOW.

DEPTH (ft)	SOIL CLASSIFICATION AND REMARKS	ELEV (ft)
0	TOPSOIL: 3 inches	6.0
	FILL - sampled as very loose to firm gray-brown-black fine to medium sand, some silt, some gravel, trace to little clay, trace to little brick fragments, trace asphalt, trace concrete, moist	
5		1.0
	- wet below 8.5 feet	
10		-4.0
15		-9.0
20		-14.0
	Very soft gray clayey SILT (MH), trace fine sand, wet	
25		-19.0
30	BORING TERMINATED AT 30 FEET.	-24.0
35		-29.0
40		-34.0
45		-39.0

NOTES:
1. Ground water was encountered at 4.5 feet on 11/10/98.
2. Cave-in depth was measured at 9 feet on 11/10/98.

SAMPLES

IDENT	N-COUNT (1st 6" - 2nd 6" - 3rd 6")
SPT - 1	6-4-18 N=22
SPT - 2	3-2-15 N=17
SPT - 3	4-1-1 N=2
SPT - 4	WOH-1-2 N=3
SPT - 5	4-2-1 N=3
SPT - 6	1-5-1 N=6
SPT - 7	WOH/12"-1 N=1
SPT - 8	1-0-1 N=1



20310 82222.GPJ LAW GIBB.GDT 11/17/98

DRILLER: LAW: M. Potter
EQUIPMENT: CME-55
METHOD: HSA
HOLE DIA.: 3-1/4"
Logged by: E. Leipski
Checked by:
REMARKS:

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BEWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA MAY BE GRADUAL.

SOIL TEST BORING RECORD

PROJECT South Area Roads and Pipe Extension
BORING NO. B-5
DRILLED: November 10, 1998
PROJ. NO: 20310-8-2222
PAGE 1 OF 1

LAW
LAWGIBB Group Member

NOTE:
REFER TO ROADWAY AND STORMDRAIN PLANS, SHEET NO.'S C1.9 AND C1.10 FOR SOIL BORING LOCATIONS.

NO.	REVISION	DATE

JOHNSON, MIRMIRAN & THOMPSON
Engineering A Brighter Future
72 Loveton Circle Baltimore, Maryland 21152-0949

Daniel T. Cheng 8-17-99

DATE	AUG 17, 1999
SCALE	1"=30'-0"
DESIGNED	C.D.L.
DRAWN	E.B.B. CHECKED D.A.L.
ACCEPTED	D.R.H.
SUBMITTED	D.A.J.
APPROVED	F.D.H.

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY
OFFICE OF ENGINEERING DESIGN DEPARTMENT

DRAWING TITLE
SOUTH AREA ROADS PROJECT 4B
RONALD REAGAN WASHINGTON NATIONAL AIRPORT WASHINGTON, D.C.
BORING LOGS

DRAWING NUMBER
DJCC7002

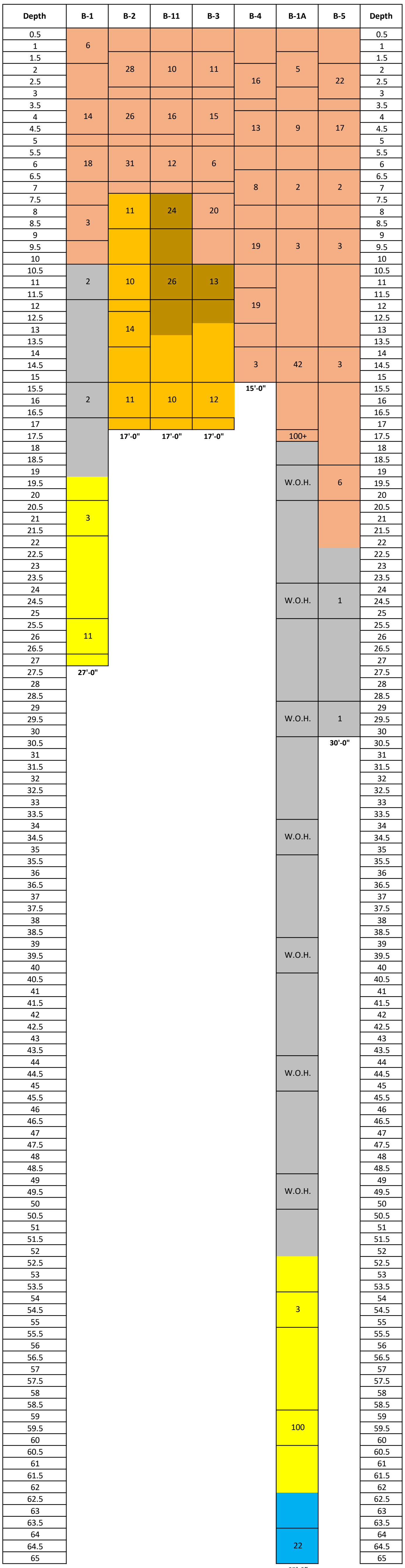
SHEET NUMBER
C7.2
sh 41 of 52

DC Coastal Geotechnical Data Summary

Reagan International Airport

South Area Roads - Project 3B and 4B

Drill Year	1992	1992	1992	1992	1998	1998	1998
G.S. EL	13.7	11.8	14	11	6.7	6.9	6
GW Depth (ft)	6.5	10.2	11.3	dry	5.5	6.5	4.5
GW EL	7.2	1.6	2.7	N/A	1.2	0.4	1.5

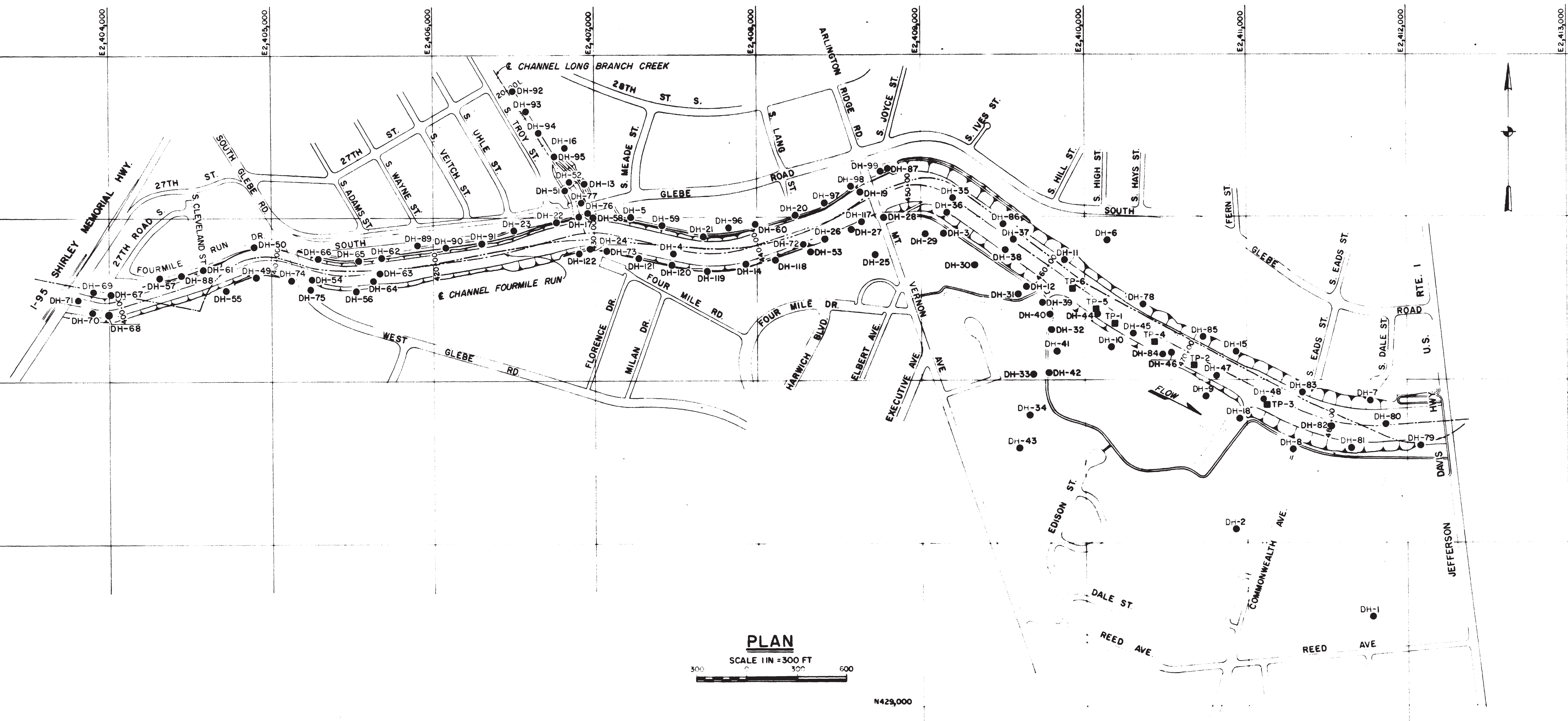


N-Value Summary				
Stratum		MIN	MAX	AVG
FILL		2	100	16
Sandy CLAY		13	26	21
Clayey SAND		10	14	11
Organic SILT/CLAY		W.O.H	2	1
SAND & GRAVEL		3	100	29
CLAY		22	22	22

12.1.2 – Arlington Water Pollution Control Plant and Four Mile Run Geotechnical Data

CORPS OF ENGINEERS

U. S. ARMY



PLAN

SCALE 1 IN = 300 FT

300 0 300 600

REV	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA
FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

SUBSURFACE EXPLORATION PLAN

DRAWING NUMBER 15768-1 PLATE B-1

SCALE AS SHOWN DATE 1 MAY 1978 SHEET 73

DH-1
N429,540 — EL. 10.0± — E2,411,765

Elevation	Description
05.0	A mixture of Rock FRAGMENTS w/sand & silt (GM)
00.0	Lt brown sandy clayey SILT (ML-CL)
-05.0	Brown sandy CLAY (CL)
-11.5	Dk gray organic gravelly silty CLAY (CL)
-15.0	Dk gray organic clayey silty GRAVEL (GM-GC)

BB 38.9 DS

WR - Weight of drilling rods

DH-2
N430,080 — EL. 13.0± — E2,410,920

Elevation	Description
08.0	Brown & gray gravelly silty SAND w/pieces of brick (SM)
06.5	Gravelly sandy CLAY (CL)
04.0	Gray sandy SILT (ML)
-07.1	Black org. gravelly silty SAND (SM) w/pcs cans
	Lt gray gravelly clayey SAND (SC)
	Tan silty sandy GRAVEL (GM)

FILL DS 24.8 BB

P - Denotes pressed shelby tube

DH-3
N431,900 — EL. 11.0± — E2,409,140

Elevation	Description
08.0	Brown sandy CLAY (CL)
06.2	Brown & white gravelly sandy CLAY (CH)
-00.5	Dk gray SILT (MH)
-04.5	Dark gray organic SILT w/pcs decomposed wood (OH)
-06.0	Gray SILT (MH)
-09.0	Gray & brown organic SILT w/wood (OH)
-10.5	Dk gray mica. gravelly silty SAND (SM-H)
-13.0	Clayey sandy GRAVEL (GC)
-14.0	Gray clayey SILT (MH)
	Lt gray silty SAND (SM)

33.5 22.6 37.4 35.5 61.9 34.1 22.6 BB DS

P - Denotes pressed shelby tube

DH-4
N431,775 — EL. 15.0± — E2,407,480

Elevation	Description
11.5	Lt brown gravelly silty SAND (SM)
10.0	Br mica sandy clayey SILT w/rock frag (ML-CL)
06.4	Brown micaceous clayey SILT (ML-CL)
00.0	Lt brown sandy GRAVEL (GM)
-04.5	Lt gray sandy SILT (MH)
-07.5	Lt gray sandy clayey SILT (ML-CL)

34.1 BB DS

DH-5
N432,000 — EL. 15.0± — E2,407,220

Elevation	Description
09.9	Brown silty CLAY w/broken glass & cinders (CL)
07.5	Brown & gray clayey GRAVEL (GC)
05.0	Brown & gray organic clayey SILT (ML)
-04.0	Gray silty CLAY w/roots (CL)
-08.0	Gray & red clayey SILT (ML-CL)
-10.0	Gray, brown & red sandy CLAY (CL)

Auger 24.0 BB FILL DS

DH-6
N431,860 — EL. 10.0± — E2,410,135

Elevation	Description
05.0	Brown & gray clayey SAND (SC)
02.7	Dk brown organic clayey SILT (OH)
-05.5	Gray silty CLAY (CL)
-10.0	Gray silty CLAY (CH)
-13.6	Lt brown silty clayey sandy GRAVEL (GM-GC) w/boulders
-15.0	Brown silty sandy GRAVEL (GM)

49.0 BB FILL DS

WR - Weight of drilling rods

DH-7
N430,875 — EL. 14.7 — E2,411,763

Elevation	Description
09.7	Dk gray brown silt sand, gravel cinders, brick, glass, cans, & slag
04.7	Dk gray-brn silt, sand, gravel, cinders, brick, glass, cans, slag & considerable vegetation
00.7	Dk gray-brn silt sand gravel cinders, brick, glass, cans & slag
-08.3	Dk gray organic CLAY (OH)
-12.8	Dk brownish gray organic SILT with matted hair roots (OH)
-23.8 / -25.3	Dk brownish gray organic SILT with gray pockets of sand, embedded gravel and matted hair roots (OH)

BB FILL DS

DH-8
N430,575 — EL. 08.0 — E2,411,288

Elevation	Description
05.0	Mottled lenses of clayey SAND & CLAY w/gravel, vegetation, cinders, slag & coal
03.2	Mottled lenses of clayey SAND (SC) and CLAY (CL) w/gravel & vegetation
02.0	Brown, yellowish-brown & gray clayey SAND w/occ. gravel and vegetation (SC)
-07.0	Silty clayey SAND (SC-SM)
-10.0	Brown sandy CLAY w/ gravel (CL)
-12.0 / -13.5	Lt gray-brown silty SAND w/occ gravel (SM)
	Brown organic sandy SILT (OH)
-18.0	Brown organic sandy SILT with occ pieces of vegetation (OH)
-24.0	Gray silty gravelly SAND (SM)
-27.0	

WH P BB DS 8(0.5)

DH-8A was put down adjacent to DH-8 for the purpose of obtaining additional undisturbed samples.

DH-9
N430,900 — EL. 02.6 — E2,410,745

Elevation	Description
02.6 (11-2-71)	Brn sandy CLAY (CL) w/gray org SILT (OH) & decayed vegetation
00.0	Dk gray organic CLAY with vegetation (OH)
-02.9	Organic clayey SILT with vegetation (OH)
-05.4	Dk gray-black PEAT (PT)
-09.4	Dk gray organic SILT with decayed vegetation (OH)
-12.9	Dk gray organic sandy SILT w/roots & decayed vegetation (OH)
-16.4	Gray silty clayey SAND w/ tr roots (SC-SM)
-19.4	Dk gray organic CLAY with pieces of gravel (OH)
-22.4	

P WH BB DS

DH-10
N431,202 — EL. 03.8 — E2,410,158

Elevation	Description
03.8 (11-2-71)	Br mica sandy CLAY w/roots (CL)
00.8	Br & gray organic SILT w/decomposed vegetation (OH)
01.2 / 02.2	Gray organic sandy SILT with vegetation (OH)
	Dk gray organic silty SAND with decayed vegetation, occ pieces grav (SM)
-05.2	Dk gray organic sandy SILT with decayed vegetation (OH)
-11.2	Dk gray organic silty SAND with decayed vegetation (SM)
-16.7	Silty sandy GRAVEL (GM) & clayey SAND (SC)
-18.2	Organic CLAY w/cobbles gravel, sand & silt (CH)
-19.7	Gray-yell-brn sandy CLAY w/ gravel (CL)
-21.2	

P WH BB DS

DH-11
N431,735 — EL. 06.6 — E2,409,875

Elevation	Description
	Stratified silty SAND (SM), sandy CLAY (CL) and dk gray SILT (OH) w/vegetatn.
01.6 (10-21-71)	Alternating brn. organic sandy CLAY (CL) and dk gray clayey SILT (OH) w/vegetatn.
-02.4	Dk gray organic clay SILT w/tr. sand (OH)
-04.9	Dk brn-black organic SILT w/decayed vegetation (OH)
-07.9	Organic silty SAND (SM) w/org. sandy SILT (OH)
-09.9	Clayey SAND (SC) w/ lenses of silty SAND & vegetation, occ. gravel
-10.4	Gray & brown silty sandy GRAVEL (GW-GM) with boulder
17.4	Gray w/yellow brown sandy SILT (ML)
-18.4	

P BB DS

DH-12
N431,565 — EL. 08.5 — E2,409,634

Elevation	Description
07.5	Brown sandy CLAY (CL) TOPSOIL
	Brown gravelly silty SAND with clay seams (SM)
03.3	Brn silty SAND (SM) w/organic clay seams (OH)
02.0	Gray-yellow-brown organic CLAY with decayed vegetation, tr sand (OH)
00.0 (10-28-71)	
-03.0	
-04.5	Dk gray organic sandy SILT (OH) w/ brn silty SAND (SM)
	Dk gray organic sandy SILT (OL) with lenses silty SAND (SP-SM) and decayed vegetation
-13.0	
-14.5	Tan & lt gray silty sandy GRAVEL (GP-GM)
-16.5	Gray yellow-brown silty SAND with occ gravel (SM)

P BB DS

DH-13
N432,200 — EL 20.0 — E2,406,940

Elevation	Description
	Brown & gray gravelly clayey SAND with occ vegetation (SC)
14.0	Brown sandy silty GRAVEL (GM) with thin strata CLAY (CL) & occ vegetation
11.0	Gray silty SAND with some clay gravel and vegetation (SM)
06.0	Brown silty sandy GRAVEL (GM) with laminated CLAY (CL)
01.0	Red & blue gray CLAY w/gravel laminated (CL)
	Red & bluish gray clayey SILT with sand trace & vegetation traces (MH)
-05.0	

P BB DS 61(0.5) 100+

DH-14
N431,710 — EL 14.8 — E2,407,925

Elevation	Description
11.8	Brown gravelly silty SAND (SM) with thin gray CLAY (CL) lenses
08.8	Brown gravelly silty SAND (SM) w/ organic sandy SILT (OL), roots leaves & wood frag.
06.6	Alternating brn silty SAND (SM) & gray organic sandy SILT (OH) w/tr veget., occ gravel
05.8	Dk gray organic sandy SILT with decayed vegetation (OH)
00.3	Gray-brn CLAY (CL) w/ sandy SILT (ML) & occ grav.
	Gray-yellow-tan silty SAND (SM)
-09.0	Gray silty SAND (SM) & dk blue gray CLAY (CL)
-10.2	Brn & dk bluish gray sandy CLAY (CL)

P BB DS 68 (0.5)

DH-15
N431,178 — EL. 06.9 — E2,410,932

Elevation	Description
03.9	Brn micaceous sandy SILT w/vegetation tr gravel and thin lenses of dk. gray org. silt
00.4	Dk. gray sandy silty CLAY with pieces of glass, brick & wood
-02.1	Dk. gray organic CLAY (OH) w/some PEAT (PT) & trace sand and vegetation
-05.1	Dk. gray & brown organic sandy clayey SILT with decayed vegetation and carbonaceous matter (OH)
-14.1	Silty SAND (SP-SM)
-19.1	

P BB DS

DH-16
N432,420 — EL. 19.1 — E2,406,818

Elevation	Description
17.1	Brn gravelly silty SAND (SM)
14.6	Dk. brown gravelly silty clayey SAND (SC-SM)
	Red-blue-gray CLAY with trace of sand & gravel (CH)
08.1	Reddish-blue-gray sandy CLAY (CL)
-05.9	

Rock Bit BB DS

DH-17
N432,000 — EL. 11.4 — E2,406,905

Elevation	Description
11.4 (10-20-71)	Brown gravelly silty SAND (SM) with cobbles
06.4	Blue-gray CLAY (CL) & brown silty sandy GRAVEL (GM)
03.9	Blue gray red-brown sandy CLAY (CL)
-09.6	Blue-gray & brown CLAY with blue gray sandy SILT lenses (CL)
-13.6	

Rock Bit BB DS

DH-18
N430,765 — EL. 03.0 — E2,410,953

Elevation	Description
03.0 (11-5-71)	Dk gray & brown organic CLAY with roots, vegetation and trace of sand (OH)
-06.0	Dark gray organic sandy clayey SILT with vegetation (OH)
-18.5	Dk gray brown organic CLAY (OH) with thin lenses silty SAND (SP-SM) with decayed vegetation
23.0 / -23.0	Gray-brown silty gravelly SAND (SM)

P WH BB DS

SUBSURFACE EXPLORATION NOTES

1. LETTER SYMBOLS SUCH AS GC, SC, AND CL ARE IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM OF THE DEPARTMENT OF DEFENSE (MIL-STD-619B).

2. DRILL HOLES (DH) WERE ACCOMPLISHED USING THE FOLLOWING PROCEDURES. THE PROCEDURE ABBREVIATION IS SHOWN IN THE RIGHT-HAND MARGIN OF EACH BORING LOG.

SPT - ADVANCED BY STANDARD PENETRATION TEST PROCEDURE USING A 1-3/8" I.D. x 2'-8" LONG SPLIT SPOON. THIS SAMPLE SPOON WAS ADVANCED BY A 140# HAMMER FALLING 30". BLOW COUNTS REPRESENT 0.5' OF DRIVE UNLESS OTHERWISE INDICATED.

DS - ADVANCED BY DRIVE BORING PROCEDURE USING A 3" I.D. x 5'0" LONG SPOON FOR DISTURBED SAMPLES. THE SAMPLE SPOON WAS ADVANCED BY A 300# HAMMER FALLING 18". BLOW COUNTS REPRESENT 1.0' OF DRIVE UNLESS OTHERWISE INDICATED.

3. THE GROUNDWATER LEVEL SHOWN ON THE LOGS REPRESENTS THE LEVEL AT WHICH WATER HAD STABILIZED IN THE HOLE; IT IS NOT NECESSARILY THE LEVEL AT WHICH WATER WAS FIRST ENCOUNTERED IN THE DRILLING OPERATION. GROUNDWATER LEVELS MAY VARY DEPENDING UPON SEASONAL FLUCTUATIONS AND PRECIPITATION INTENSITIES.

4. WATER CONTENTS SHOWN IN THE RIGHT-HAND COLUMN OF THE BORING LOGS ARE WATER CONTENTS (% OF DRY WEIGHT) OF THE TOTAL SAMPLE OF SOIL.

5. TEST PITS (TP) WERE MACHINE DUG.

SYMBOLS

- Silty SAND (SM)
- Clayey SAND (SC)
- SAND (SP or SW)
- Silty or sandy CLAY (CL)
- CLAY (CH) highly compressible
- Organic CLAY (OH)
- SILT (ML)
- SILT (MH) highly elastic
- Organic SILT (OL)
- Clayey GRAVEL (GC)
- Silty GRAVEL (GM)
- GRAVEL (GP or GW)
- PEAT (PT)

LEGEND

EL. 14.0 ← TOP OF GROUND ELEVATION

N431,654 — E2,404,451 ← LOCATION

DEPTH IN FEET	ELEVATION	SYMBOL	DESCRIPTION	BLOW COUNTS & % CORE RECOVERY	WATER CONTENT
	12.6		TOPSOIL	WH	15.3
	09.5		Brown sandy CLAY with gravel (CL)	P	18
10	07.0 / 05.0		Brown clayey GRAVEL (GC)	BB	

Ground water / Date of reading

Weight of Hammer — Water content — Pressed sample — Bottom of boring — Blow counts (See notes)

Note - Sampling method is shown in the right-hand margin.

14.0± = Estimated elevation

REV	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA

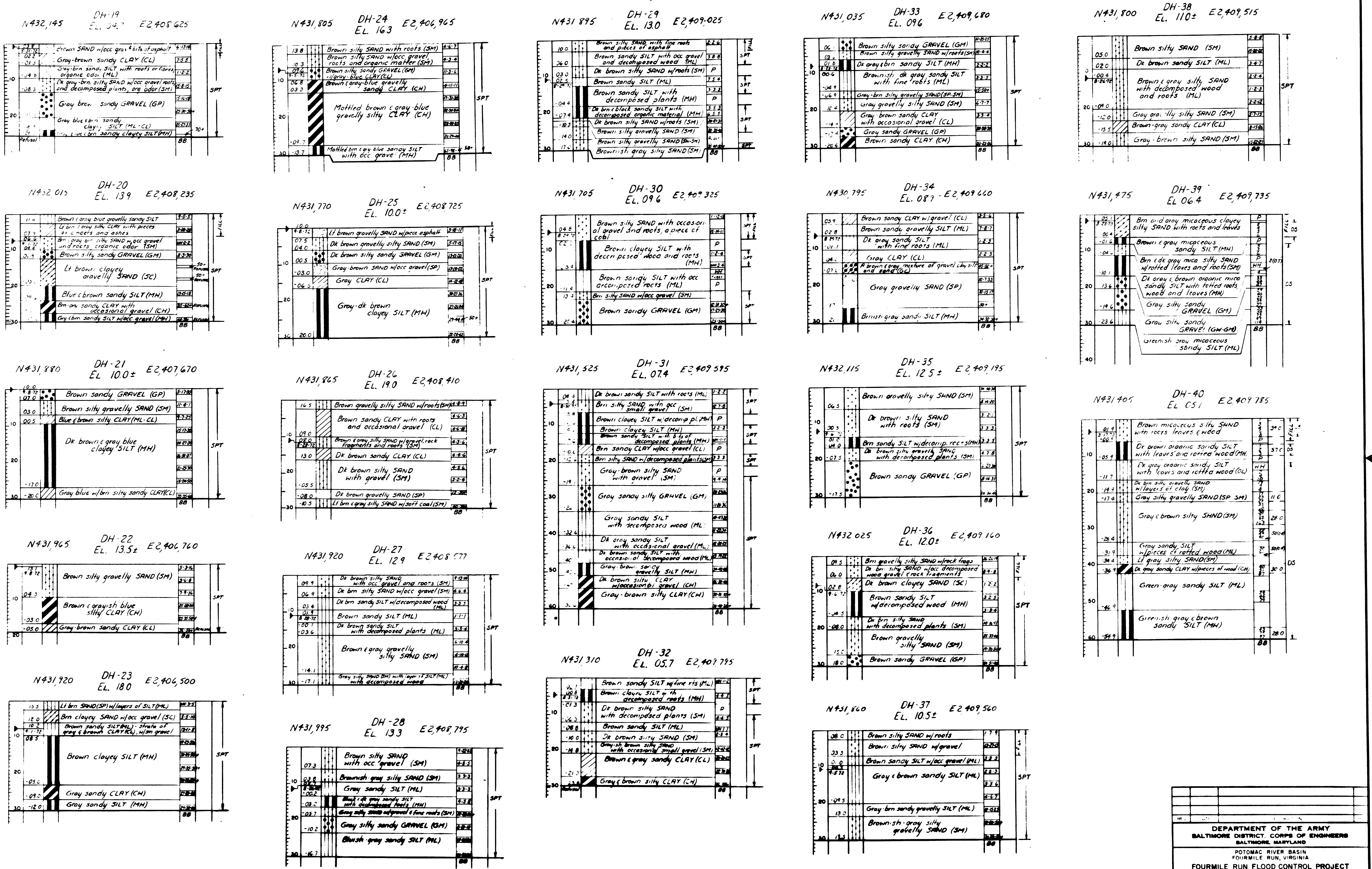
FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

FOUNDATION EXPLORATION
LOGS OF CORE BORINGS - SHEET 1

15768-1 | B-2

AS SHOWN | 1 MAY 1978 | 74

CORPS OF ENGINEERS U.S. ARMY



DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA
FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

FOUNDATION EXPLORATION
LOGS OF CORE BORINGS-SHEET 2

15768-1 B-3

AS SHOWN | 1 MAY 1978 | 75

DH-41
N431,175 — EL. 05.3 — E2,409,830

- 02.0 / 3-13-73 — Brn gray & black clayey SILT with roots, leaves and occasional gravel (organic matter)(MH)
- -02.7 — Gray & brown silty sandy GRAVEL (GP)
- -06.7 — Gray and brown sandy CLAY (CH)
- -17.7 — Pink, brn. & gray sandy SILT (MH)
- -21.7 — Brn & gray sandy SILT (ML)
- -24.7 — BB

47.0 DS; 25.0 DS; 30.0 DS; 35.0

DH-42
N431,040 — EL. 04.6 — E2,409,780

- 3-20-73 — Brown micaceous sandy SILT (MH)
- 02.6 — Brown & black organic sandy silty GRAVEL (GM)
- -01.4 — Gray-brown sandy SILT (ML)
- Gray-brown gravelly silty SAND (SM)
- 06.9 — Brn silty sandy GRAVEL (GP-GM)
- Brown & gray micaceous silty sandy GRAVEL (GM)
- -18.5 — Gray & brown sandy SILT (ML)
- -22.4 — Brown & greenish gray silty SAND (SM)
- -33.9 — Greenish gray sandy SILT (MH)
- -43.9 — Greenish-gray silty CLAY (CH)
- -46.4 — BB

65.0; 72.0 DS; 10.0; 26.0; 31.0; DS and Rock Bit

DH-43
N430,585 — EL 14.3 — E2,409,600

- TOPSOIL, GRASS, ROOTS LEAVES AND WOOD
- 08.3 — Gray & brn mica sandy CLAY (CH)
- 05.3 — Red-brn. sandy clayey GRAVEL (GC)
- 3-20-73 — Red-brn mica sandy CLAY (CL)
- 02.3 — Gray & red-brn. sandy clayey GRAVEL (GC-H)
- -01.7 — Brn & gray gravelly silty CLAY (CH)
- -07.2 — Tan silty sandy GRAVEL (GW)
- Brown & gray micaceous sandy CLAY with trace of gravel (CL)
- -15.7 — BB

23.5; 12.4; 58 (0.2); 6.7; 35.3; DS

DH-44
N431,404 — EL. 12.5 — E2,410,071

- 09.5 — Brown micaceous SAND
- 07.0 / 3-14-73 — Brn micaceous gravelly SAND
- 03.5 — Dk gray clayey silty SAND w/scattered gravel, rotted wood and leaves
- Gray & brown sandy SILT w/wood pieces of rotted leaves & roots
- -02.5 — BB

16.0; 47.0; FILL DS

DH-45
N431,281 — EL 13.5 — E2,410,294

- 10.5 — Brown micaceous gravelly silty SAND with rotted wood, roots & leaves
- 06 / 3-14-73 — Brown micaceous clayey silty SAND with rotted wood and leaves
- Dk brn & gray mica sandy CLAY with decomposed leaves & roots
- -01.5 — BB

24.0; 33.0; FILL DS

DH-46
N431,162 — EL. 13.0 — E2,410,528

- 09.0 — Brown micaceous silty SAND with occ. gravel rotted roots and leaves
- 03.0 — Gray & brown mica sandy silty GRAVEL w/pieces of bricks, metal and glass
- -02.0 — Dark gray micaceous sandy CLAY with rotted leaves and roots
- BB — Ground water not encountered - 3/15/73

29.0; 44.0; FILL DS

DH-47
N431,028 — EL. 13.4 — E2,410,811

- 08.4 — Brown micaceous silty SAND
- 05.6 / 3-15-73 — Brown & black silty sandy GRAVEL w/pieces of blk coal rotted wood 70% broken glass
- 03.4
- -01.6 — Brown and black gravelly silty SAND with rotted wood brick, and glass
- BB

13.0; 100 (0.6); 29.0; FILL DS

DH-48
N430,882 — EL. 15.4 — E2,411,103

- 10.4 — Brn micaceous silty SAND with grass, sm roots, leaves & wood
- 05.4 — Brown & black gravelly silty SAND with 40% broken glass
- 00.4 — Brown & black gravelly silty SAND with glass leaves and rotted wood
- BB — Ground water not encountered - 3/15/73

20.0; 23.0; FILL DS

DH-49
N 431,635 — EL 32.8 — E 2,404,908

- ASPHALT ROAD
- 23.8 — Gray & brown sandy CLAY (CL)
- 20.8 / 4-10-73 — Dk brown micaceous silty SAND (SM)
- 18.8 — Brown & gray micaceous silty gravelly SAND (SP-SM)
- 15.3 — Greenish-gray micaceous sandy SILT (ML)
- 10.8 — Greenish-gray micaceous gravelly clayey SAND (SC-H)
- 06.3 — Gray micaceous silty SAND (SM)
- -19.2 — Gray mica gravelly SAND (SW-SM) with small cobbles
- -23.7 — Greenish-gray micaceous silty SAND (SM)
- -26.7 — BB

22.0; 17.0; 28.0; 19.0; 22.0; SPT

DH-50
N 431,820 — EL. 20.3 — E 2,404,895

- 20.3 / 4-18-73 — Brown mica silty sandy GRAVEL (GM) with cobbles
- 17.8 — Greenish-gray mica gravelly clayey SAND (SC)
- 12.8 — Greenish gray micaceous sandy SILT (ML)
- 09.3 — Greenish-gray mica sandy SILT with scattered gravel (ML)
- -00.7 — Dk gray mica sandy CLAY (CH)
- -03.1 — Dk gray mica silty SAND (SM)
- -09.7 — Dk gray mica silty SAND (SP-SM)
- -18.7 — Gray mica silty gravelly SAND (SM) with cobbles
- -23.2 — Gray mica gravelly silty SAND (SM) with cobbles
- -27.7 — Gray mica silty gravelly SAND (SM) with cobbles
- -30.7 — BB

29.0; 32.0; 21.0; 14.0; SPT

DH-51
N 432,160 — EL 16.6 — E 2,406,815

- 16.6 / 4-2-73 — Brown clayey SAND with roots
- 13.6 — Brown gravelly clayey SAND with pieces of rotted wood (SC)
- 09.1 — Brown silty gravelly SAND (SP)
- 04.6 — Brn & gray clayey SAND (SC-H)
- -12.4 — Brn & gray silty SAND (SM-H)
- -21.9 — Grayish-green clayey SILT (ML)
- -25.4 — Gray silty SAND (SP-SM)
- -33.4 — BB

18.8; 25.0; 26.0; 22.5; FILL; SPT & Rock Bit

DH-52
N 432,215 — EL 20.4 — E 2,406,840

- 20.0 — TOPSOIL GRASS & ROOTS
- 16.9 — Sandy clayey GRAVEL w/pieces of brick
- 16.4 / 4-3-73 — Brown gravelly silty SAND (SM)
- 12.9 — Gray & brown sandy SILT (ML)
- 06.4 — Gray & brown sandy CLAY (CH)
- -17.1 — Gray clayey SILT (ML)
- -23 — Brn & gray sandy CLAY (CH)
- -27 — Greenish-gray gravelly silty SAND (SM)
- -29.6 — BB

15.2; 26.4; 32.2; 21.2; 19.4; FILL; SPT & Rock Bit

DH-53
N 431,790 — EL 18.1 — E 2,408,335

- TOPSOIL GRASS & ROOTS
- 15.1 — Gray & brown mica gravelly clayey SAND w/pieces of glass
- 10 — Brown sandy gravelly CLAY (CL)
- 03.7 / 4-6-73 — Brown mica sandy SILT with organic matter (ML)
- -01.9 — Brown sandy gravelly SILT with organic materials (ML)
- -07.4 — Tan & gray silty SAND (SM)
- -12.4 — Greenish gray silty CLAY (CL)
- -18 — Gray & brown sandy SILT (MH)
- -31.9 — BB

13.0; 25; 32.0; 26.0; SPT

DH-54
N 431,620 — EL 29.6 — E 2,405,258

- 29.2 — ASPHALT
- 26.6 — Micaceous gravelly sandy CLAY (CL) with cobbles
- 22 — Gray & brown gravelly clayey SAND (SC) with cobbles
- 20.3 / 4-17-73 — Brown mica gravelly silty SAND (SM) with cobbles
- 17.6 — Gray & reddish-brown sandy CLAY (CH)
- 13.1 — Greenish gray micaceous sandy SILT (ML)
- -0.4 — Gray micaceous silty SAND (SM) with few cobbles
- -21.4 — BB

19.0; 27.0; 30.0; 21.0; SPT

DH-55
N431,560 — EL 35.2 — E 2,404,720

- 34.7 — ASPHALT ROAD
- 31.2 — Gry-blk-brn gravelly sandy CLAY (CL)
- 27.2 — Gray & brown gravelly clayey SAND (SC)
- 22.2 — Gray mica silty gravelly SAND (SP-SM) with boulders
- 21.2 / 4-11-73 — Greenish-gray micaceous gravelly clayey SAND (SC-H)
- 13.2 — Greenish-gray micaceous clayey SAND (SC)
- 04.2 — Greenish gray micaceous silty SAND (SM)
- -16.8 — BB

7.0; 28.0; 27.0; 20.0; SPT

DH-56
N431,513 — EL 35.6 — E 2,405,522

- 35.3 — ASPHALT
- 32 — Micaceous sandy gravelly CLAY w/cobbles
- 28.1 — Gray-reddish brn micaceous gravelly clayey SAND
- 25.1 — Gray brown & black gravelly clayey SAND with odor metal, pieces of glass
- 20 / 4-19-73 — Reddish brn & dark gray micaceous clayey SAND (SC)
- 19 — Gray & brn silty sandy GRAVEL (GM) with cobbles
- 14 — Brown & gray sandy CLAY (CH)
- 01 — Gray micaceous sandy SILT (ML)
- Gray micaceous sandy CLAY (CH) with occ cobbles
- -12.4 — Gray micaceous silty gravelly SAND (SP-SM) with occ. cobbles
- -24 — BB

22.0; 33.0; 40.0; 18.0; FILL; SPT

DH-57
N 431,337 — EL 33.6 — E 2,404,318

- Brown mica silty gravelly SAND with pieces of glass and cobbles
- 26.4 / 4-12-73 — Brown & gray micaceous sandy SILT (ML)
- 26.1 — Brown & gray micaceous silty SAND (SM)
- -03.9 — BB

8.0; 30.0; 19.0; FILL; SPT

DH-58
N 431,994 — EL 17.0 — E 2,406,995

- Brown mica gravelly clayey SAND with small roots (SC)
- 14.0 — Brown micaceous gravelly clayey SAND (SC)
- 10.2 / 4-20-73 — Micaceous silty gravelly SAND (SP-SM) with cobbles
- 02.0 — Brown & gray sandy SILT (MH)
- -26.5 — Gray micaceous silty SAND (SM)
- -29.5 — BB

15.0; 25.0; 29.0; SPT

DH-59
N431,944 — EL 15.1 — E 2,407,411

- ASPHALT
- 14.2 — Gray & brown micaceous silty sandy GRAVEL (GM) with cobbles
- 08 / 4-13-73 — Blk-gray-brn micaceous gravelly sandy SILT (MH) with cobbles
- 07 — Brown silty gravelly SAND (SM) with cobbles
- 03.1 — Gray & brown gravelly sandy CLAY (CL) with cobbles
- -01.4 — Gray & brown sandy CLAY (CL)
- -14 — Gray & brn sandy SILT (MH)
- -19.4 — Gray & reddish-brown sandy CLAY (CL)
- -23.9 — Gray & reddish-brown sandy SILT (MH)
- -31.4 — BB

26.0; 22.0; 27.0; SPT

DH-60
N431,950 — EL 14.1 — E2,407,980

- 13.9 — ASPHALT
- 07.5 / 4-20-73 — Brown silty gravelly SAND (SM) with cobbles
- 06.6 — Gray & brown mica sandy SILT (ML) w/pieces of rotten wood, clay & gravel
- 02.1 — Blk & brown silty SAND (SM) w/pieces of rotted wood
- -02.4 — Brown & gray sandy CLAY (CH)
- -06.9 — Brown & gray clayey SILT (MH)
- -11.4 — Gray & reddish-brown gravelly sandy SILT (MH)
- -20.4 — Gray & reddish brown silty CLAY (CH)
- -24.4 — Brown & gray micaceous sandy CLAY (CH)
- -29.4 — Gry & red-brn silty CLAY (CH)
- -32.4 — BB

13.0; 32.0; 28.0; 27.0; SPT

DH-61
N431,688 — EL. 22.8 — E2,404,581

- 20.8 / 4-19-73 — Brn mica silty sandy GRAVEL (GM)
- Brown & greenish gray micaceous clayey SAND (SC)
- 10.8 — Brown & gray clayey silty SAND (SM-H)
- 06.3 — Brown & gray micaceous silty SAND (SM)
- -19.2 — Mica silty SAND (SM) with cobbles
- BB

24.0; 29.0; 19.0; SPT

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA
FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

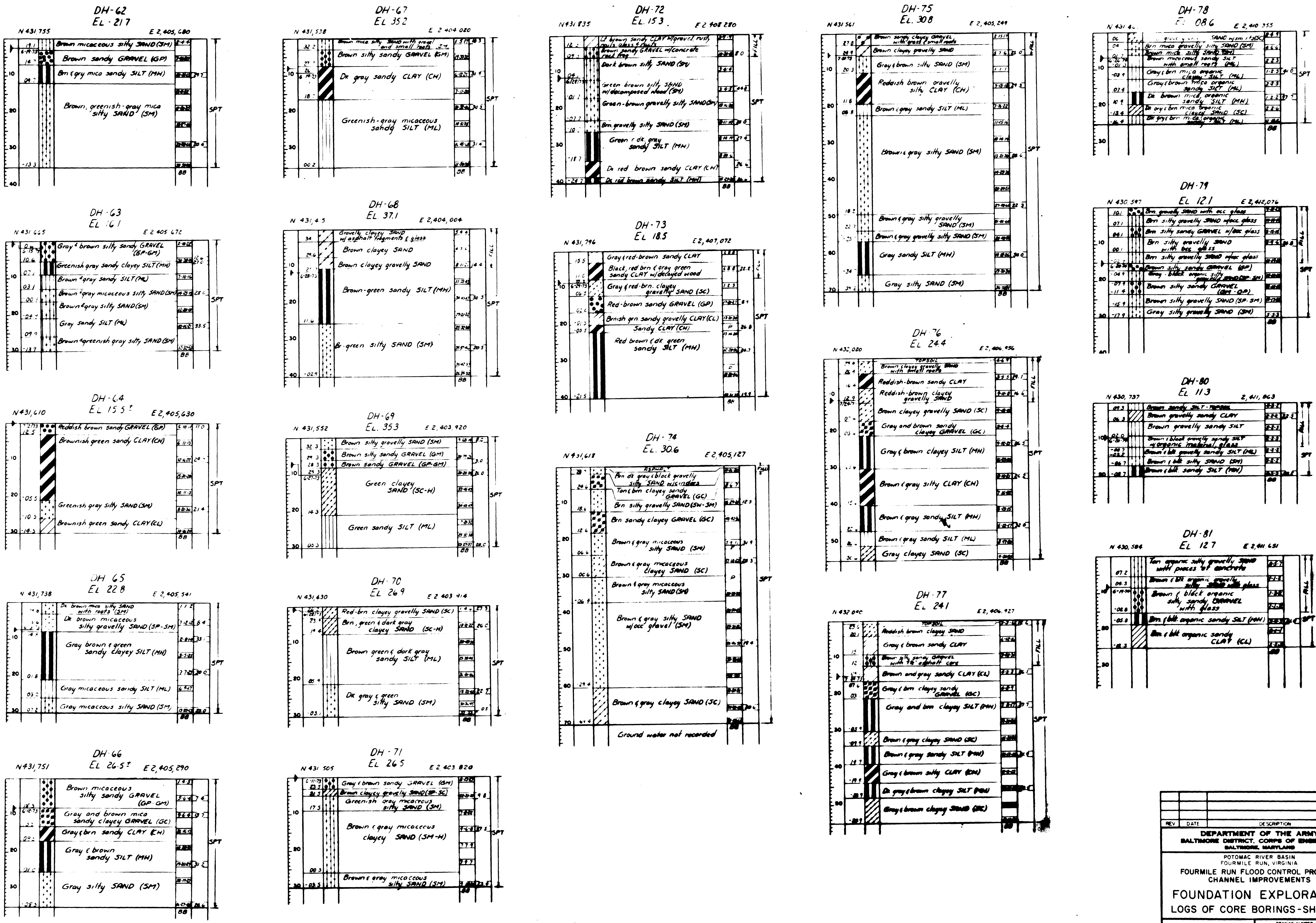
FOUNDATION EXPLORATION
LOGS OF CORE BORINGS-SHEET 3

15768-1 | B-4

AS SHOWN | 1 MAY 1978 | 76

CORPS OF ENGINEERS

U.S. ARMY



REV	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA

FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

FOUNDATION EXPLORATION

LOGS OF CORE BORINGS-SHEET 4

DRAWING NUMBER 15768-1 PLATE B-5

SCALE AS SHOWN DATE 1 MAY 1978 SHEET 77

15

CORPS OF ENGINEERS | U S ARMY

DH-82
EL 10.1
N 430 7.7 | E 2,411,528

- Brown silty gravelly SAND with broken cinder blocks
- Brown silty SAND
- Brown & black organic sandy CLAY with glass and wood
- Brown & black organic silty sandy GRAVEL w/pieces of rock
- Brown sandy SILT (MH)
- Brown sandy CLAY (CL)
- Brown & black organic sandy CLAY (CL)

FILL / SPT / BB

DH-83
EL 06.6
N 430,925 | E 2,411,344

- Tan sandy SILT - TOPSOIL
- Brown gravelly silty SAND with pieces of wood & glass
- Brown & blk organic sandy CLAY with pieces of decomp. wood
- Brown sandy SILT with pieces of decomposed wood
- Brown & black organic sandy CLAY with metal & concrete
- WOOD
- Gra silty sandy GRAVEL with small roots, metal, wood, conc.
- Dk brown mica organic sandy CLAY (CH)

FILL / SPT / BB

DH-84
EL 08.0
N 431,151 | E 2,410,474

- Brown silty SAND
- Brown gray & black organic SILT (MH)
- Brown gray silty CLAY (CL)
- Brn blk organic sandy SILT (MH)
- Gry & blk organic sandy CLAY (CL)
- Gray blk organic sandy SILT (MH)
- Gray silty SAND (SM)

FILL / SPT / BB

DH-85
EL 06.7
N 431,268 | E 2,410,728

- Brown mica gravelly clayey SAND with small roots
- Micaceous sandy SILT w/small roots
- Dk brn mica organic clayey SILT with rotted wood & roots
- Dk brn mica organic sandy SILT (ML)
- Dk brn mica organic clayey SILT (ML)
- Dk brn mica organic sandy SILT (MH)
- Dk brn mica organic sandy SILT (MH-H)
- Dk brn mica organic silty SAND (SM-H)
- Dk brn mica organic clayey SILT (OL)

SPT / BB

DH-86
EL -00.7
N 431,458 | E 2,409,509

- FILL FOR RAMP - NO SAMPLE
- Brown sandy SILT
- Brown silty SAND
- Brown silty sandy GRAVEL (GP-GM)
- Brown & gray gravelly silty SAND (SM)

SPT / BB

DH-87
EL 16.4
N 432,295 | E 2,408,803

- Brn silty gravelly SAND
- Brn gravelly silty SAND
- Brown sandy CLAY
- Brown & blk organic sandy SILT (MH)
- Gray silty gravelly SAND (SM)
- Gray silty SAND (SM)
- Gray sandy SILT (ML)

FILL / SPT

DH-88
EL 30.2
N 431,654 | E 2,406,451

- Red & brown sandy CLAY (CL) with topsoil & pieces of brick
- Brown micaceous sandy CLAY (CL)
- Gray and brown gravelly sandy CLAY (CL)
- Gray and tan micaceous clayey gravelly SAND (SC)
- Brown and green gravelly micaceous sandy CLAY (CL)
- Brown and green gravelly micaceous silty clayey SAND (SM-SC)
- Gray and green silty SAND (SM)
- Brown and green clayey SAND (SC)
- Green and brown gravelly sandy clayey SILT (ML-CL)
- Brown and green silty SAND (SM)
- Green sandy SILT (ML)
- Brown and gray SILT (ML)
- Greenish gray silty SAND (SM)

SPT / BB

DH-89
EL 23.8
N 431,835 | E 2,405,907

- Brown micaceous silty SAND (SM) w/ topsoil
- Brown micaceous gravelly silty SAND (SM)
- Brown and green micaceous clayey SAND (SC)
- Brown and green micaceous silty SAND (SM)
- Green micaceous sandy SILT (ML)
- Green micaceous silty SAND (SM)
- Grayish green sandy CLAY (CH)
- Green silty SAND (SM)
- Greenish gray sandy SILT (ML)
- Greenish gray silty SAND (SM)
- Green and gray sandy SILT (ML)

DR = Dropped Rods.

SPT / BB

DH-90
EL 19.9
N 431,816 | E 2,406,079

- Dark grayish brown micaceous gravelly silty SAND (SM) w/ topsoil
- Brown micaceous clayey SAND (SC)
- Brown micaceous silty SAND (SM)
- Brown and tan silty gravelly SAND (SP-SM)
- Brown silty clayey sandy GRAVEL (GM-GC)
- Brown and green sandy CLAY (CH)
- Brown and green sandy SILT (ML)
- Grayish green gravelly sandy CLAY (CH) w/ wood
- Grayish green sandy CLAY (CH)

SPT / BB

DH-91
EL 19.7
N 431,843 | E 2,406,303

- Brown micaceous gravelly sandy SILT (ML) with topsoil
- Brown micaceous clayey SAND (SC)
- Brown micaceous gravelly clayey silty SAND (SM-SC)
- Green and reddish sandy CLAY (CH)
- Green and red clayey SILT (MH) w/ trace cinders
- Green and reddish brown sandy CLAY (CH)
- Brown and green sandy SILT (MH)
- Green and dark brown sandy SILT (MH)
- Grayish green and brown micaceous sandy CLAY (CH)
- Brown and green silty SAND (SM)
- Brown and grayish green micaceous sandy SILT (ML)
- Brown and green micaceous sandy CLAY (CH)
- Grayish green micaceous sandy SILT (ML)
- Grayish green micaceous sandy CLAY (CH)

SPT / BB

DH-92
EL 23.8
N 432,777 | E 2,406,500

- Brown sandy gravelly SILT (ML) with topsoil & roots
- Brown gravelly sandy CLAY (CL) w/ BOULDER at 2.5'
- Brown clayey gravelly SAND (SC)
- Tan and brown silty sandy GRAVEL (GP-GM)
- Dark red & brown clayey micaceous sandy silty GRAVEL (GM-GC)
- Brown micaceous silty sandy GRAVEL (GP-GM)
- BOULDER 8.0 & 9.5
- White and gray silty gravelly SAND (SP-SM)
- Gray and brown gravelly sandy CLAY (CL)
- Gray and brown gravelly sandy CLAY (CH)
- Greenish brown sandy CLAY (CH)

SPT / BB

DH-93
EL 21.8
N 432,448 | E 2,406,580

- Dark brown sandy SILT (ML) with topsoil & glass
- Brown sandy CLAY (CL) with pieces of glass
- Brown clayey SAND (SC)
- Brown and tan silty gravelly SAND (SP-SM)
- Brown clayey sandy GRAVEL (GM-GM)
- Brown silty gravelly SAND (SM)
- Gray silty GRAVEL (GM)
- Brown silty sandy GRAVEL (GM)
- Gray and brown clayey silty sandy GRAVEL (GM-GC)
- Brown gravelly clayey SAND (SC)
- Dark brown and green sandy CLAY (CH)

SPT / BB

DH-94
EL 19.7
N 432,519 | E 2,406,655

- Brown silty SAND (SM) with topsoil
- Brown sandy CLAY (CL)
- Gray and brown sandy SILT (ML) with rotted wood
- Brown clayey sandy SILT (ML-CL) with rotted wood
- Brown sandy CLAY (CL) with rotted wood
- Brown and greenish brown sandy CLAY (CH)

SPT / BB

DH-95
EL 17.9
N 432,373 | E 2,406,752

- CONCRETE FILL and TOPSOIL **
- Brown sandy SILT (ML)
- Brown clayey gravelly SAND (SC)
- Brown and green silty CLAY (CH)
- Brown and green sandy SILT (MH)
- Brown green and gray sandy CLAY (CH)

** Field inspectors classification.

SPT / BB

DH-96
EL 14.7
N 431,931 | E 2,407,823

- BLACKTOP **
- Black and grayish brown gravelly sandy SILT (ML) with coal & pieces of glass
- Green and brown micaceous gravelly clayey SAND (SC)
- Green and brown sandy CLAY (CH)

** Field inspectors classification

FILL / SPT / BB

DH-97
EL 10.7
N 432,086 | E 2,408,414

- BLACKTOP **
- Brown and gray micaceous sandy SILT (ML) with cinders, glass and rotted wood
- Brown and greenish gray silty gravelly SAND (SM)
- Brown and grayish green sandy SILT (MH)
- Brown and green sandy SILT (ML)

WH = Weight of Hammer.
DR = Dropped Rods
** = Field inspectors classification.

Auger / FILL / SPT / BB

DH-98
EL 12.0
N 432,190 | E 2,408,577

- BLACKTOP **
- Red and tan silty gravelly SAND (SM)
- Gray and reddish brown sandy clayey GRAVEL (GC)
- Gray and brown sandy gravelly CLAY (CL)
- Gray and brown clayey sandy GRAVEL (GC)
- Brown clayey silty sandy GRAVEL (GM-GC)
- Dark brown and gray silty sandy GRAVEL (GM)
- Greenish brown clayey silty sandy GRAVEL (GM-GC)
- Grayish brown silty gravelly SAND (SP-SM)
- Brown silty sandy GRAVEL (GP-GM)
- Green, brown, and gray sandy SILT (MH)

** Field inspectors classification

SPT / BB

DH-99
EL 13.1
N 432,280 | E 2,408,750

- TOPSOIL **
- Brown micaceous silty SAND **
- Greenish and grayish brown sandy SILT (MH) with occasional gravel and rotted wood.
- Reddish brown and gray silty gravelly SAND (SM)
- Yellow and brown silty SAND (SM)
- Brown and green sandy SILT (MH)
- Grayish green micaceous silty SAND (SM)
- Gray and brown sandy SILT (MH)

** Field inspectors classification.

Auger / SPT / BB

DH-117
EL 14.6
N 431,964 | E 2,408,640

- Brown and gray micaceous clayey SAND **
- Brown and gray micaceous clayey SAND (SC)
- Gray micaceous silty SAND (SM)
- Gray micaceous clayey silty SAND (SM-SC)
- Gray and dark gray gravelly sandy SILT (ML)
- Grayish tan silty sandy GRAVEL (GM)
- Grey and brown clayey silty sandy GRAVEL (GM-GC)
- Green and tan silty gravelly SAND (SM)
- Green silty sandy GRAVEL (GP-GM)
- Gray and green gravelly clayey SAND (SC)
- Gray and green sandy SILT (ML)
- Gray and green sandy CLAY (CH)
- Green clayey SILT (MH)
- Green and brown sandy SILT (ML)
- Green clayey SAND (SC)

DR = Dropped Rods
** Field inspectors classification

Auger / SPT / BB

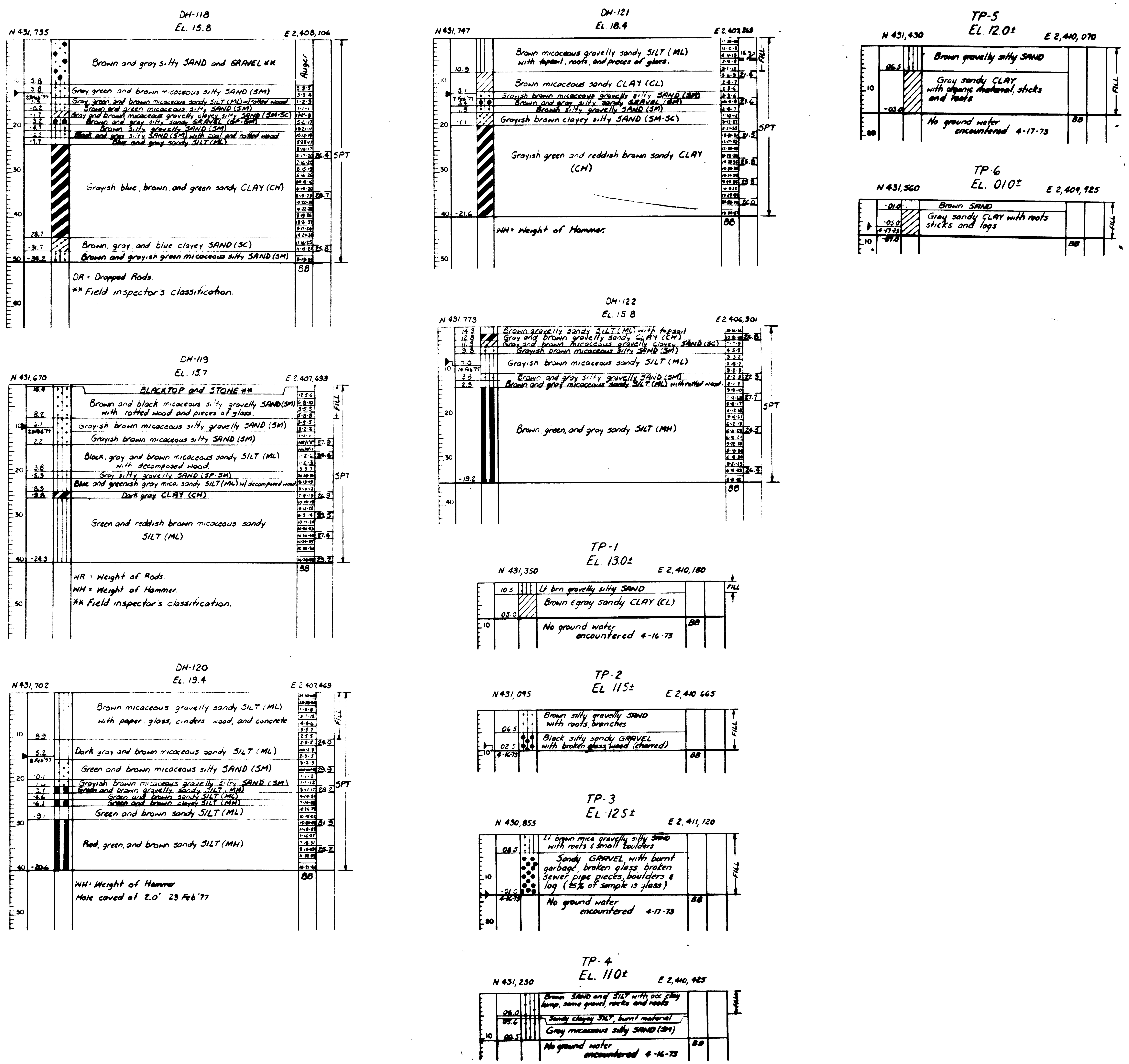
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA
FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

FOUNDATION EXPLORATION
LOGS OF CORE BORINGS - SHEET 5

15768-1 | B-6

AS SHOWN | 1 MAY 1978 | 78



REV.	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND

POTOMAC RIVER BASIN
FOURMILE RUN, VIRGINIA

FOURMILE RUN FLOOD CONTROL PROJECT
CHANNEL IMPROVEMENTS

FOUNDATION EXPLORATION
LOGS OF CORE BORINGS-SHEET 6

15768-1 B-7

AS SHOWN | 1 MAY 1978 | 79

DC Coastal Geotechnical Data Summary

Arlington Wastewater Treatment Plant Flood Wall

Four Mile Run Flood Control Project Channel Improvements - 1978

G.S. EL	10.5	6.6	10	8.6	6.7	6.9	6.6	14.7
GW Depth	10.5	5	7.3	7	4.5	6.5	7.5	14
GW EL	0	1.6	2.7	1.6	2.2	0.4	-0.9	0.7

Depth	DH-37	*DH-11*	*DH-6*	DH-78	DH-85	*DH-15*	DH-83	*DH-7*	Depth
0.5		5	10			5		17	0.5
1	16			13	7		11		1
1.5		5	21			15		36	1.5
2									2
2.5		10	20			9		22	2.5
3									3
3.5		6	29			14		11	3.5
4					7				4
4.5	40	4	34	12		40	10	9	4.5
5									5
5.5		4	5			50		6	5.5
6									6
6.5		2	10			14		6	6.5
7									7
7.5		4	5			4		8	7.5
8	6			5	4		4		8
8.5		4	4			7		7	8.5
9									9
9.5			3			4		6	9.5
10		PUSH							10
10.5			2			4		13	10.5
11							5		11
11.5	5	3	37	6		5		17	11.5
12					3				12
12.5		3	10					12	12.5
13									13
13.5		3	6			PUSH	6	7	13.5
14									14
14.5		2	10		4			17	14.5
15	9			4					15
15.5		2	W.O.R.			3		17	15.5
16									16
16.5		4	2			4		9	16.5
17							7		17
17.5			7			2		4	17.5
18		PUSH			4				18
18.5	15		11	8				4	18.5
19						PUSH			19
19.5		11	17					5	19.5
20									20
20.5		26	13			5	92	6	20.5
21					5				21
21.5		35	28			5		3	21.5
22	38			##					22
22.5		31	10			7		3	22.5
23									23
23.5		41	17			8		4	23.5
24									24
24.5		24	34		12	8	7	5	24.5
25									25
25.5	##								25.5
26									26
26.5								PUSH	26.5
27									27
27.5									27.5
28								5	28
28.5									28.5
29								6	29
29.5	##								29.5
30								6	30
									30.5
								7	31
									31.5
								10	32
									32.5
								13	33
									33.5
								6	34
									34.5
								9	35
									35.5
								8	36
									36.5
								9	37
									37.5
								12	38
									38.5
									39
									39.5
									40
	30-'0"	**25'-0"**	**25'-0"**		**25'-0"**	**25'-0"**	**25'-0"**	**40'-0"**	

N-Value Summary - 2-inch spoon				
Stratum		MIN	MAX	AVG
FILL		4	92	17
Organic SILT/CLAY		3	15	7
SAND & GRAVEL		8	38	23

N-Value Summary - 3-inch spoon				
Stratum		MIN	MAX	AVG
FILL		3	50	13
Organic SILT/CLAY		W.O.R.	37	6
SAND & GRAVEL		5	41	20

Denotes an Illegible Number on the Historic Drawings

DC Coastal Geotechnical Data Summary

Four Mile Run Flood Wall and Levee

Four Mile Run Flood Control Project Channel Improvements - 1978

	DH-26	DH-27	DH-117	DH-28	DH-3	DH-38	DH-12	DH-39	DH-40	DH-32	DH-41	DH-42	DH-18	DH-8
G.S. EL	19	12.9	14.6	13.3	11	11	8.5	6.4	5.1	5.7	5.3	4.6	3	8
GW Depth	11	11	11.5	11.5	5	11.4	8.5	1.3	3.2	5.1	3.3	0.9	0	4.8
GW EL	8	1.9	3.1	1.8	6	-0.4	0	5.1	1.9	0.6	2	3.7	3	3.2

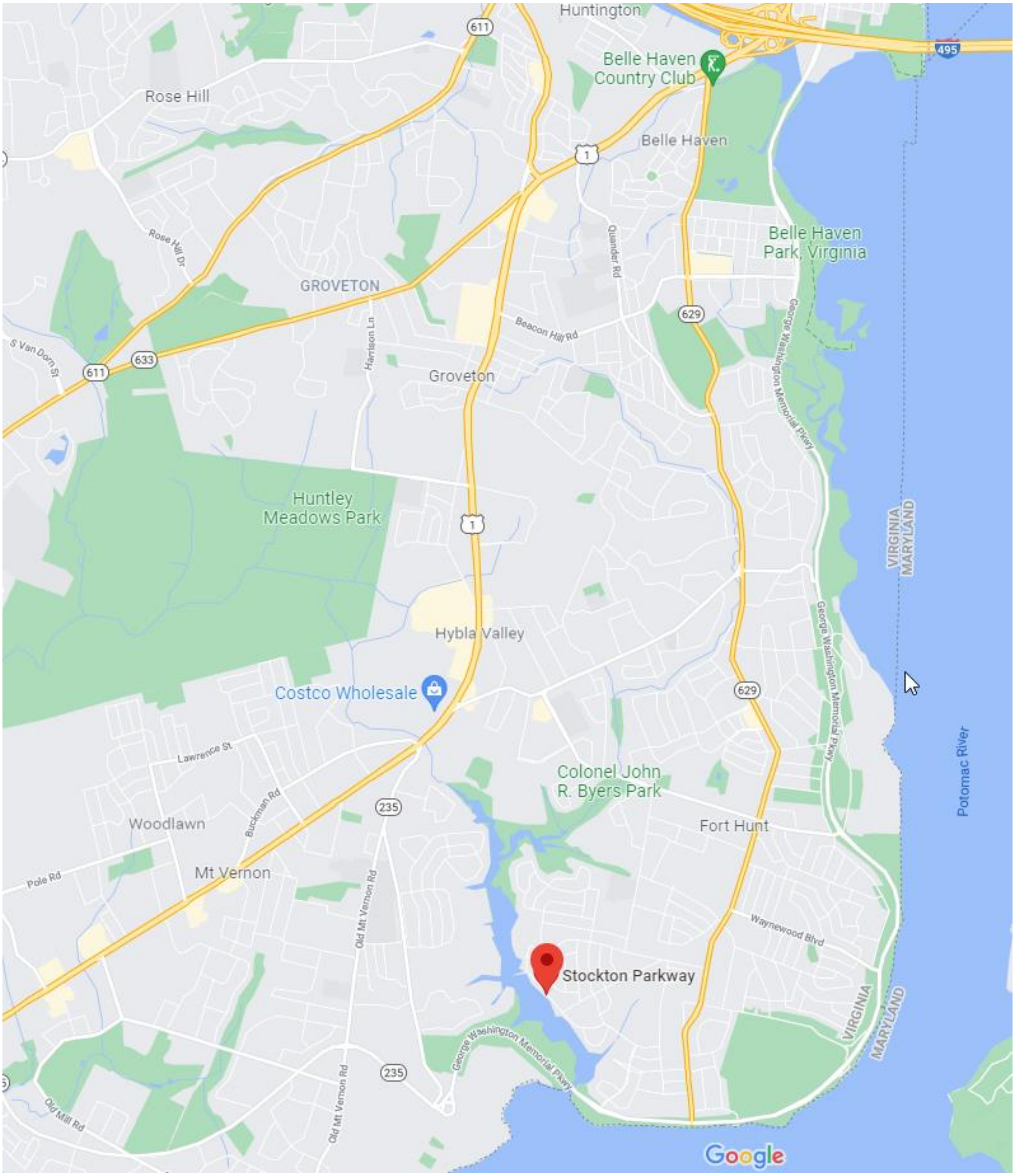
Depth	DH-26	DH-27	DH-117	DH-28	*DH-3*	*DH-38*	*DH-12*	*DH-39*	*DH-40*	DH-32	*DH-41*	*DH-42*	*DH-18*	*DH-8*	Depth
0.5					5		4		1					7	0.5
1	17	27		##		16		PUSH		3		PUSH			1
1.5					9		7		3		PUSH			12	1.5
2								2					PUSH		2
2.5					16		15		4			W.O.H.		5	2.5
3								4							3
3.5					7		21		6		W.O.H.	2		5	3.5
4								5							4
4.5	9	10		8	5	44	27		8	9	2	2		3	4.5
5								6							5
5.5					2		10				6	2	W.O.H.	5	5.5
6									PUSH						6
6.5					3		11							3	6.5
7								PUSH			PUSH				7
7.5					4		10					PUSH		3	7.5
8	16	8		6		11			1		13				8
8.5					3		12	5		PUSH				4	8.5
9									2		20	6			9
9.5					3		12	5					PUSH	3	9.5
10									3		14	10			10
10.5								6						2	10.5
11	9	2	6	6		6			PUSH	9		4			11
11.5					PUSH		PUSH							4	11.5
12												31	2		12
12.5			6					PUSH	W.O.H.						12.5
13					3		2				PUSH	24	3	W.O.H.	13
13.5	10	7		11		5			2						13.5
14			4		5		3				11	19	5	3	14
14.5								W.O.H.	4	2					14.5
15					7		4				29	26			15
15.5			21					4	10						15.5
16										7	27	24	PUSH	PUSH	16
16.5									17						16.5
17	11	14	21	##	PUSH	14	PUSH	33			70	26			17
17.5									7						17.5
18								44				16	2		18
18.5			22		18		3		4						18.5
19								47				27	2	PUSH	19
19.5					43		4		17	##					19.5
20			26									20	3		20
20.5	6	22		##	48	22	13	29	23		36				20.5
21												22	5	4	21
21.5			17		56			40	27		87				21.5
22										##		33	5	7	22
22.5					18		6	25	35						22.5
23			26									27	4	8	23
23.5					51		21	39	10						23.5
24												61	4		24
24.5	50/4	12	39	##	66	41	21	57	30		34			PUSH	24.5
25															25
25.5					25'-0"	25'-0"	25'-0"	33	56	##	60		PUSH		25.5
26			16												26
26.5								50	95						26.5
27														W.O.H.	27
27.5			16					73	163				27'-0"		27.5
28															28
28.5								97			33				28.5
29			22											7	29
29.5	##	##		##				114		##	57				29.5
30												26			30
30.5	30-'0"	30-'0"	24	30-'0"				30-'0"	28	30-'0"	30-'0"				30.5
31												54		PUSH	31
31.5									##						31.5
32			46												32
32.5									90						32.5
33															33
33.5			59											PUSH	33.5
34															34
34.5															34.5
35			54												35
35.5									##			29		35'-0"	35.5
36															36
36.5			67						61			86			36.5
37															37
37.5															37.5
38			42												38
38.5															38.5
39															39
39.5			48												39.5
40															40
40.5			40'-0"									26			40.5
41															41
41.5									40			42			41.5
42															42
42.5									31			42			42.5
43															43
43.5									47						43.5
44															44
44.5															44.5
45															45
45.5												32			45.5
46															46
46.5												45			46.5
47															47
47.5									29						47.5
48															48
48.5									46						48.5
49															49
49.5									79						49.5
50															50
50.5												50'-0"			50.5
51															51
51.5															51.5
52															52
52.5															52.5
53															53
53.5															53.5
54															54
54.5															54.5
55															55
55.5															55.5
56															56
56.5															56.5
57															57
57.5									43						57.5
58															58
58.5									94						58.5
59															59
59.5									97						59.5
60															60
									60'-0"						

N-Value Summary - 2-inch spoon				
Stratum		MIN	MAX	AVG
FILL		3	17	9
Clayey SAND		6	39	21
Organic SILT/CLAY		2	11	7
SAND & GRAVEL		6	22	11
CLAY/SILT		16	67	42

N-Value Summary - 3-inch spoon				
Stratum		MIN	MAX	AVG
FILL		1	44	10
Clayey SAND		W.O.H.	41	8
Organic SILT/CLAY		W.O.H.	13	4
SAND & GRAVEL		4	163	37
CLAY/SILT		11	97	48

Denotes an Illegible Number on the Historic Drawings

12.1.3 – Belle Haven Geotechnical Data


Huntington
611
495
Belle Haven
Country Club
Rose Hill
Belle Haven
1
Rose Hill Dr
Belle Haven
Park, Virginia
Quander Rd
GROVETON
629
Beacon Hill Rd
S Van Dorn St
611
633
Harrison Ln
Groveton
George Washington Memorial Pkwy
Huntley
Meadows Park
1
VIRGINIA
MARYLAND
Hybla Valley
Costco Wholesale
629
Potomac River
Lawrence St
Colonel John
R. Byers Park
Buckman Rd
235
Woodlawn
Fort Hunt
Mt Vernon
Pole Rd
Old Mt Vernon Rd
Waynewood Blvd
Stockton Parkway
George Washington Memorial Pkwy
VIRGINIA
MARYLAND
235
Old Mt Vernon Rd
Old Mill Rd
Google

Appendix D – Soil Borings

CLIENT	JOB #	BORING #	SHEET
FAIRFAX COUNTY	10252B	B-9A	1 OF 2

ECS LLC MID-ATLANTIC

PROJECT NAME: FAIRFAX COUNTY SEWER SAGS

ARCHITECT–ENGINEER: HAZEN AND SAWYER, P.C.

SITE LOCATION: FAIRFAX COUNTY, VA. I STREET @ 13TH STREET

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION 100%

SURFACE ELEVATION: 5

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)
0	1	SS	18	18
	2	SS	18	16
5	3	SS	18	16
10	4	SS	18	14
15	5	SS	18	8
20	6	SS	18	14
25	7	SS	18	16
30	8	SS	18	16

Topsoil Depth 2"

Clayey SAND, With Gravel, Trace Roots, Dark Brown to Gray, Moist, Very Loose to Loose, (SC–FILL)

CLAY, Trace Sand and Roots, Orangish Brown, Moist to Wet, Very Soft to Soft, (CL–Possible Fill)

Silty SAND, Trace Mica, Light Brown, Moist to Wet, Very Loose, (SM)

SAND, Trace Fine Gravel, Brown, Moist, Loose to Medium Dense, (SP)

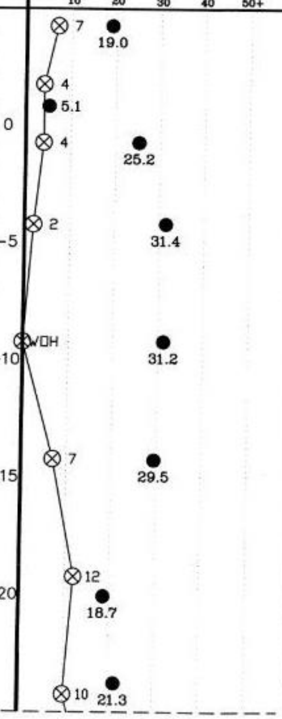
WATER LEVELS / ELEVATION (FT): 0, –5, –10, –15, –20

CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+



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THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 6.5' WS OR BD	BORING STARTED 11–17–06	
WL(BCR) 25.0' WL(ACR)	BORING COMPLETED 11–17–06	CAVE IN DEPTH ● 50.0'
WL	RIG CME45C FOREMAN CONNELLY	DRILLING METHOD HOLLOW STEM AUGER

CLIENT	JOB #	BORING #	SHEET
FAIRFAX COUNTY	10252B	B-9A	2 OF 2

ECS LLC MID-ATLANTIC

PROJECT NAME: FAIRFAX COUNTY SEWER SAGS

ARCHITECT-ENGINEER: HAZEN AND SAWYER, P.C.

SITE LOCATION: FAIRFAX COUNTY, VA. I STREET @ 13TH STREET

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION: 5

-O- CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— (20% 40% 60% 80% 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION (BLOWS/FT.)	WATER CONTENT %
30–37					SAND, Trace Fine Gravel, Brown, Moist, Loose to Medium Dense, (SP)			
35	9	SS	18	16		-30	11	21.3
37–50					Silty SAND, With Gravel, Orangish Brown, Moist, Medium Dense, (SM)			
40	10	SS	18	16		-35	12	9.8
45	11	SS	18	12		-40	23	10.4
50	12	SS	18	12		-45	28	8.2
50					END OF BORING @ 50.00'			
55						-50		
60								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 6.5'	WS OR WD	BORING STARTED 11-17-06	
WL(BCR) 25.0' WL(ACR)		BORING COMPLETED 11-17-06	CAVE IN DEPTH @ 50.0'
WL		RIG CME45C FOREMAN CONNELLY	DRILLING METHOD HOLLOW STEM AUGER

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CLIENT	JOB #	BORING #	SHEET
FAIRFAX COUNTY	10252B	B-10A	1 OF 2

ECS LLC MID-ATLANTIC

PROJECT NAME: FAIRFAX COUNTY SEWER SAGS

ARCHITECT-ENGINEER: HAZEN AND SAWYER, P.C.

SITE LOCATION: FAIRFAX COUNTY, VA. BELLE VIEW BLVD.

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION: 10

-O- CALIBRATED PENETROMETER TONS/FT.² (1, 2, 3, 4, 5+)

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % Δ

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— (20% 40% 60% 80% 100%)

⊗ STANDARD PENETRATION BLOWS/FT. (10, 20, 30, 40, 50+)

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)	STANDARD PENETRATION (BLOWS/FT.)	WATER CONTENT %
0	1	SS	18	12	Asphalt Depth 3"; Gravel Depth 6"		6	14.3
2	2	SS	18	18	Fine Sandy SILT, With Gravel, Trace Asphalt, Brown to Dark Brown, Moist, Loose, (ML-FILL)		5	23.5
5	3	SS	18	18	Lean CLAY, With Sand, Trace Mica, Brown, Moist to Wet, Soft to Medium Stiff, (CL)	5	6	27.1 (PL 19, LL 31)
10	4	SS	18	14		0	3	32.8
12					Silty SAND, Trace Clay, Brown, Moist to Wet, Very Loose, (SM)			
15	5	SS	18	10		-5	1	25.6
17					Fine Sandy SILT, Light Brown, Moist to Wet, Very Loose, (ML)			
20	6	SS	18	16		-10	3	33.2
22					SAND, Trace Clay, Brown, Moist to Wet, Very Loose to Loose, (SP)			
25	7	SS	18	16		-15	4	26.2
30	8	SS	18	18			7	23.7

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 7.5'	WS OR WD	BORING STARTED 11-14-06	
WL(BCR) 38.0' WL(ACR)		BORING COMPLETED 11-14-06	CAVE IN DEPTH @ 50.0'
WL		RIG CME45C FOREMAN CONNELLY	DRILLING METHOD HOLLOW STEM AUGER

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CLIENT	JOB #	BORING #	SHEET
FAIRFAX COUNTY	10252B	B-10A	2 OF 2

ECS LLC MID-ATLANTIC

PROJECT NAME: FAIRFAX COUNTY SEWER SAGS

ARCHITECT-ENGINEER: HAZEN AND SAWYER, P.C.

SITE LOCATION: FAIRFAX COUNTY, VA. BELLE VIEW BLVD.

-O- CALIBRATED PENETROMETER TONS/FT.² 1 2 3 4 5+

PLASTIC LIMIT % X — WATER CONTENT % ● — LIQUID LIMIT % △

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

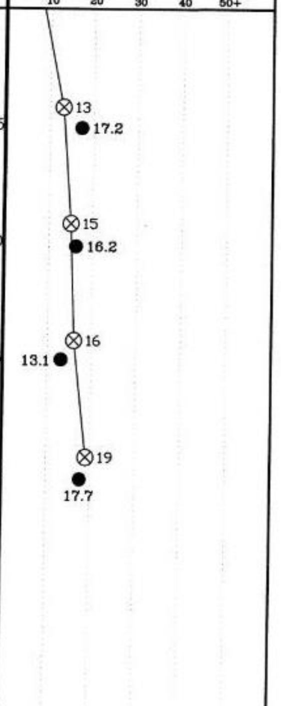
⊗ STANDARD PENETRATION BLOWS/FT. 10 20 30 40 50+

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION (100%)

SURFACE ELEVATION: 10

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
30					SAND, Trace Clay, Brown, Moist to Wet, Very Loose to Loose, (SP)	
					SAND, With Fine Gravel, Brown to Dark Brown, Moist to Wet, Medium Dense, (SP)	
35	9	SS	18	16		-25
40	10	SS	18	14		-30
					Gravelly SAND, Trace Clay, Light Brown, Moist, Medium Dense, (SP)	
45	11	SS	18	16		-35
50	12	SS	18	14		-40
					END OF BORING @ 50.00'	
55						-45
60						



THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES IN-SITU THE TRANSITION MAY BE GRADUAL

WL 7.5'	WS OR WD	BORING STARTED 11-14-06	
WL(BCR) 38.0' WL(ACR)		BORING COMPLETED 11-14-06	CAVE IN DEPTH ● 50.0'
WL		RIG CME45C FOREMAN CONNELLY	DRILLING METHOD HOLLOW STEM AUGER

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Temporary Piezometer No.	Date	Approx. Elevation of Temporary Piezometer (ft)	Water Level (ft)	Approx. Water Elevation (ft)
B6-2A	11/21/2006	5	1.7	3.3
B8-1A	11/21/2006	6.6	1.9	4.7
B8-2A	11/21/2006	12.6	10.3	2.3
B9-A	11/21/2006	5	1.3	3.7
B10-A	11/21/2006	10	6.0	4.1
B6-2A	11/29/2006	5	1.2	3.8
B8-1A	11/29/2006	6.6	1.2	5.4
B8-2A	11/29/2006	12.6	9.9	2.7
B9-A	11/29/2006	5	1.2	3.8
B10-A	11/29/2006	10	5.7	4.4

ECS Mid-Atlantic, LLC
Chantilly, Virginia
Laboratory Testing Summary

Project Number: 10252-B **Project Name:** Fairfax County Sewer Sags **Date:** 11/27/06

Project Engineer: TKM **Principal Engineer:** KAH **Summary By:** HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction: Maximum Density (pcf)	Compaction: Optimum Moisture (%)	CBR Value	Other
B-10A	S-1	0-1.5	14.3									
B-10A	S-2	2.5-4.0	23.5									
B-10A	S-3	5.0 - 6.5	27.1	CL	31	19	12	77.0				
B-10A	S-4	8.5 - 10.0	32.8									
B-10A	S-5	13.5 - 15.0	25.6									
B-10A	S-6	18.5 - 20.0	33.2									
B-10A	S-7	23.5 - 25.0	26.2									
B-10A	S-8	28.5 - 30.0	23.7									
B-10A	S-9	33.5 - 35.0	17.2									
B-10A	S-10	38.5 - 40.0	16.2									
B-10A	S-11	43.5 - 45.0	13.1									
B-10A	S-12	48.5 - 50.0	17.7									
B9-A	S-1	0-1.5	19.0									
B9-A	S-2	2.5-4.0	5.1									
B9-A	S-3	5.0 - 6.5	25.2									
B9-A	S-4	8.5 - 10.0	31.4									
B9-A	S-5	13.5 - 15.0	31.2	SM	NP	NP	NP	33.6				
B9-A	S-6	18.5 - 20.0	29.5									
B9-A	S-7	23.5 - 25.0	18.7									
B9-A	S-8	28.5 - 30.0	21.3									
B9-A	S-9	33.5 - 35.0	21.3									

Summary Key:
SA = See Attached
S = Standard Proctor
M= Modified Proctor
V = Virginia Test Method
OC = Organic Content

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Staibilization

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ECS Mid-Atlantic, LLC
Chantilly, Virginia
Laboratory Testing Summary

Project Number: 10252-B **Project Name:** Fairfax County Sewer Sags **Date:** 11/27/06

Project Engineer: TKM **Principal Engineer:** KAH **Summary By:** HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction: Maximum Density (pcf)	Compaction: Optimum Moisture (%)	CBR Value	Other
B9-A	S-10	38.5 - 40.0	9.8									
B9-A	S-11	43.5 - 45.0	10.4									
B9-A	S-12	48.5 - 50.0	8.2									
B6-2A	S-1	0-1.5	12.2									
B6-2A	S-2	2.5-4.0	19.9									
B6-2A	S-3	5.0 - 6.5	23.4									
B6-2A	S-4	8.5 - 10.0	14.5									
B6-2A	S-5	13.5 - 15.0	25.8									
B6-2A	S-6	18.5 - 20.0	26.8	SM	NP	NP	NP	31.1				
B6-2A	S-7	23.5 - 25.0	38.3									
B6-2A	S-8	28.5 - 30.0	35.6									
B6-2A	S-9	33.5 - 35.0	37.8									
B6-2A	S-10	38.5 - 40.0	36.6									
B6-2A	S-11	43.5 - 45.0	44.2									
B6-2A	S-12	48.5 - 50.0	34.2									

Summary Key:
SA = See Attached
S = Standard Proctor
M= Modified Proctor
V = Virginia Test Method
OC = Organic Content

Hyd = Hydrometer
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UCS = Unconfined Compression Soil
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LS = Lime Stabilization
CS = Cement Staibilization

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ECS Mid-Atlantic, LLC
Chantilly, Virginia
Laboratory Testing Summary

Project Number: 10252-B **Project Name:** Fairfax County Sewer Sags **Completed Date:** 11/29/06

Project Engineer: TKM **Principal Engineer:** KAH **Summary By:** HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction Maximum Density (pcf)	Compaction Optimum Moisture (%)	CBR Value	Other
8A-2A	S-10	38.5 - 40.0	46.0									
8A-2A	S-11	43.5 - 45.0	43.3									
8A-2A	S-12	48.5 - 50.0	258.8									

Summary Key:
SA = See Attached
S = Standard Proctor
M= Modified Proctor
V = Virginia Test Method
OC = Organic Content

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Stabilization

NP = Non Plastic

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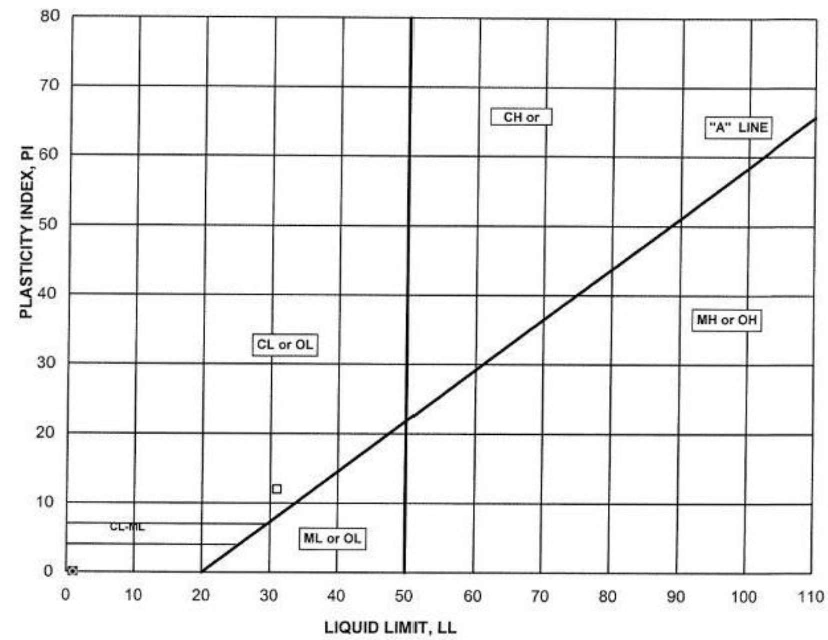

BORING/ SAMPLE No.	DEPTH (feet)	TEST SYMBOL	DESCRIPTION	WATER CONTENT (%)	LL	PL	PI
B-10A / S-3	5.0-6.5	□	Lean Clay w/Sand Tr/Mica Yellowish Brown (CL)	27.1	31	19	12
B9-A / S-5	13.5-15.0	■	Silty Sand Tr/Mica Yellow Brown (SM)	31.2	NP	NP	NP
B6-2A / S-6	18.5-20.0	△	Silty Sand Tr/Mica Grayish Brown (SM)	26.8	NP	NP	NP
/		▲			-	-	-
/		X			-	-	-
/		○			-	-	-
/		●			-	-	-
/		◇			-	-	-
/		◆			-	-	-
/		+			-	-	-
		X					

Project:	Fairfax County Sewer Sags	ECS Mid-Atlantic, LLC
Project No.:	10252-B	Chantilly, Virginia
Date:	11/22/06	Plasticity Chart

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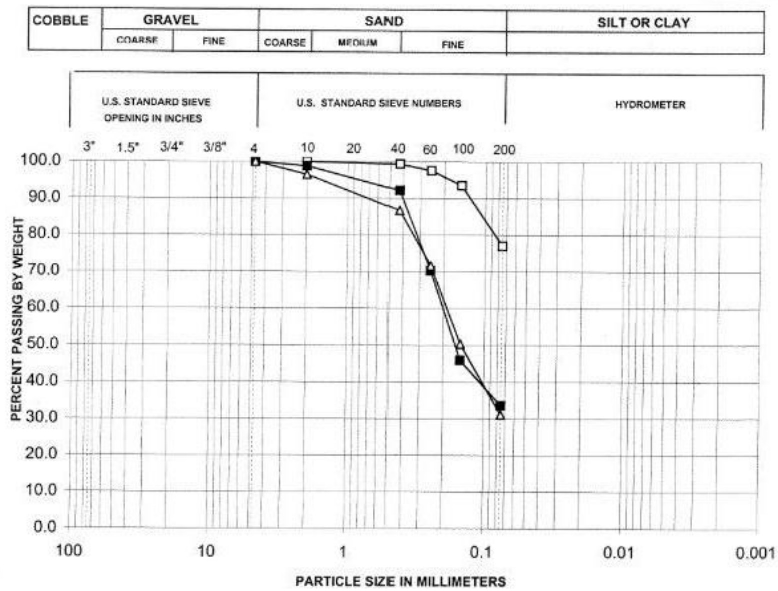

Boring/ Sample No.	Depth (feet)	Symbol	LL	PI	Description
B-10A S-3	5.0-6.5	□	31	12	Lean Clay w/Sand Tr/Mica Yellowish Brown (CL)
B-9A S-5	13.5-15.0	■	NP	NP	Silty Sand Tr/Mica Yellow L/Brown (SM)
B6-2A S-6	18.5-20.0	△	NP	NP	Silty Sand Grayish Brown (SM)
		▲			

Applicable ASTM: D-422

Project: Fairfax County Sewer Sags

Project No: 10252-B

Performed Date: 11/22/06

ECS MID-ATLANTIC, LLC

Chantilly, Virginia

Grain Size Analysis

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ECS LTD

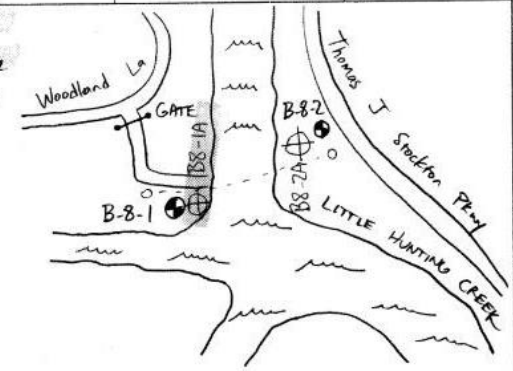
ENGINEERING CONSULTING SERVICES, LTD.

CALCULATION SHEET

PROJECT: Fairfax Co Sewer Sags			FIGURE NO.
TITLE: BLD - Sites 8, 9, 10, 12			JOB NO.
			SCALE:
BY:	DATE:	APPROVED BY:	DATE

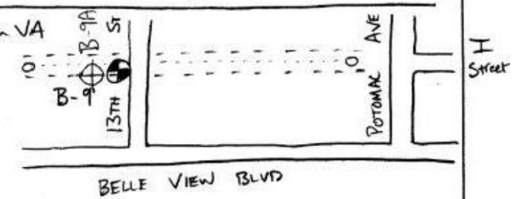
SITE 8: Little Hunting Creek between Woodland Lane + Thomas J. Stockton Parkway

2 Borings: B-8-1
B-8-2



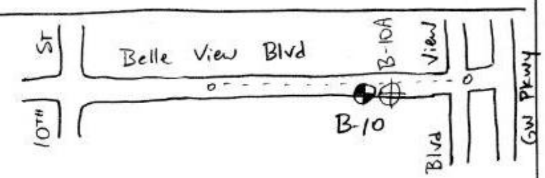
SITE 9: 13th + I Streets, Huntington VA

1 Boring: B-9



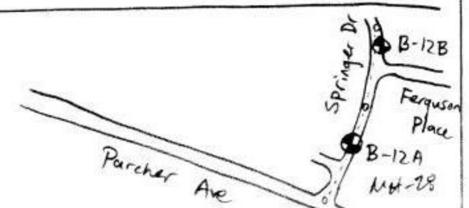
SITE 10: Belle View Blvd

1 Boring: B-10



SITE 12: Springer Dr, Herndon VA

2 Borings: B-12A
B-12B



DC Coastal Geotechnical Data Summary

Belle Haven Flood Wall and Levee

Final Flood Damage Reduction Analysis for Belle Haven Watershed - 2006

Depth	B-9A	B-10A
0.5		
1	7	6
1.5		
2		
2.5		
3		
3.5	4	5
4		
4.5		
5		
5.5		
6	4	6
6.5		
7		
7.5		
8		
8.5		
9		
9.5	2	3
10		
10.5		
11		
11.5		
12		
12.5		
13		
13.5		
14		
14.5	W.O.H.	1
15		
15.5		
16		
16.5		
17		
17.5		
18		
18.5		
19		
19.5	7	3
20		
20.5		
21		
21.5		
22		
22.5		
23		
23.5		
24		
24.5	12	4
25		
25.5		
26		
26.5		
27		
27.5		
28		
28.5		
29		
29.5	10	7
30		
30.5		
31		
31.5		
32		
32.5		
33		
33.5		
34		
34.5	11	13
35		
35.5		
36		
36.5		
37		
37.5		
38		
38.5		
39		
39.5	12	15
40		
40.5		
41		
41.5		
42		
42.5		
43		
43.5		
44		
44.5	23	16
45		
45.5		
46		
46.5		
47		
47.5		
48		
48.5		
49		
49.5	28	19
50		
	50'-0"	50'-0"

N-Value Summary				
Stratum		MIN	MAX	AVG
FILL		2	7	5
Sandy CLAY		3	6	5
Silty SAND		W.O.H.	12	6
SAND & GRAVEL		12	28	18