807/D-32

SUBSURFACE INVESTIGATION
MONUMENT GROUNDS
AND
VISITOR FACILITY
WASHINGTON MONUMENT
WASHINGTON, DC

National Park Service
National Capital Parks - Central
900 Ohio Drive, SW
Washington, DC 20024-2000

Olin Partnership
The Public Ledger Building
150 South Independence Mall West
Philadelphia, PA 19106

Hartman Cox Architects
1074 Thomas Jefferson Street, NW
Washington, DC 20007

Mueser Rutledge Consulting Engineers
225 West 34th Street
New York, NY 10122

June 10, 2002

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June 10, 2002

National Park Service
National Capital Parks - Central
900 Ohio Drive, SW
Washington, DC 20024-2000

Attention: Mr. Arnold Goldstein, Superintendent

Re: Subsurface Investigation
Monument Grounds and Visitor Facility
Washington Monument
MRCE File 9726

Gentlemen:

In accordance with our proposals dated March 13, 2002, we summarize herein the results of our soils and foundation investigation for the Monument Grounds and Visitor Facility at the Washington Monument.

Exhibits

The following exhibits are attached to illustrate our report:

Drawing No. B-1	Boring Location Plan
Drawing No. GS-1	Geologic Section A-A
Drawing No. GS-2	Geologic Sections B-B and C-C
Drawing No. GS-3	Geologic Sections D-D and E-E
Drawing No. GS-4	Geologic Sections F-F and G-G
Drawing No. GS-R	Geotechnical Reference Standards
Table No. 1	Laboratory Data Summary
Appendix A	Boring Logs
Appendix B	Consolidation Test Data - MRCE
Appendix C	Consolidation Test Data by Barber - MRCE Interpretation
Appendix D	1984 Report by MRCE
Appendix E	1973 Report by MRCE

Available Information

The following items used in the preparation of our report were obtained from Hartman Cox Architects and Olin Partnership:

1. A topographic survey of the site dated March 28, 2002, prepared by Wiles Mensch.

2. A drawing of the site indicating the proposed grading and landscape walls.

The following items used in the preparation of our report were obtained from our files:

1. A report entitled *Subsurface Investigation and Foundation Study for Interpretative Facility at the Washington Monument, Washington, DC, National Capital Parks,* dated September 14, 1973, prepared by MRCE for the National Park Service.

2. A report entitled *Settlement Analysis for Washington Monument Grounds Improvement, NPS: D18 (NCR-NACC) (XF54),* dated February 13, 1984, prepared by MRCE for the National Park Service.

3. A report entitled *Loading Limitations, Washington Monument Grounds, Washington, D.C., 1962,"* dated December 31, 1962, prepared by Edward S. Barber, Consulting Engineer, for the Department of the Interior.

4. Logs of borings made in 1930 for a study of the Washington Monument.

Site Description

The Washington Monument is located on a grassy knoll on the National Mall between Constitution and Independence Avenues, between 15th and 17th Streets. The grade around the Monument is approximately Elev. 40 referenced to Mean Sea Level.

Site History

The history of the construction of the Monument is well-documented in a number of works and there is no need to repeat it here. In brief, the foundations were constructed in 1848 and the shaft was begun at the end of 1848. Construction halted in 1854 and resumed in 1878 with underpinning of the original foundations. The underpinning was carried to about Elev. +2. The remainder of the Monument was constructed between 1878 and 1884. Settlement has been monitored throughout its history, but available records date back to 1878. They indicate that total settlement between 1879 and 1992 was about 7 inches, due to the compression of the T1(D) clay. During the 7-year completion of the Monument, 4.5 inches of this settlement occurred. During the subsequent 106 years (1886-1992) settlement has been less than 2.5 inches.

Project Description

The Visitor Facility will consist of a below-grade structure constructed immediately west of the Monument Lodge. It will occupy a footprint area of about 15,000 square feet, with the floor at about Elev. 5.5. Subgrade is expected to be at Elev. +3. An elevator and stairway entrance will be constructed within or adjacent to the Monument Lodge. An underground passageway will be constructed from the Visitor Facility to the Monument, and will enter the Monument's east side below grade.

The planned vehicle barrier system involves a series of low walls, many bordering a new system of paved walkways in combination with a modest regrading over an extensive area around the Monument. The planned walls and paved walkways are shown in bold on Drawing No. B-1 along with existing contours of ground surface elevation. In general, grades tend to be raised one foot or less within 150 feet of the Monument, and raised one to two feet within 150 to 200 feet from the Monument. Fills of two to five feet are planned beyond 200 feet from the Monument on the north, west and southeast, and cuts of up to three feet are planned southwest and northeast of the Monument. The regrading was planned taking into consideration the load change limitations at varying distances from the Monument described in the 1973 report.

Field Exploration

Field work began on February 28, 2002 and finished on March 15, 2002. Six borings were made at the proposed location of the Visitor Facility and one at the Monument Lodge. These borings are identified with a B prefix. Twenty borings were made for the vehicle barrier system, and are identified with a W prefix.

Borings were made by GeoServices Corporation of Forestville, MD, under contract to Grunley-Walsh Construction, JV. All field work was performed under the inspection of our resident engineers, Mr. Michael Weckler and Mr. Oscar Carpio. Boring locations and elevations were provided by the boring contractor's surveyor. Elevations are referenced to the National Geodetic Survey Datum, a mean sea level datum.

Representative soil samples were recovered from the borings with a two-inch split spoon sampler driven with a 140-pound hammer free-falling 30 inches. The number of blows required to advance the sampler through each of three or four six-inch intervals was recorded. The Standard Penetration Test (SPT) resistance, an index of the density of the material sampled, is calculated by summing the blows from the second and third intervals.

B-series borings were advanced and stabilized using weighted drilling fluid and temporary casing, and extended to depths of 50 feet except those in which decomposed rock was sampled, which extended to depths of 85.5 and 89.4 feet. Relatively undisturbed samples of potentially compressible deposits were recovered in two of the borings using three-inch tubes advanced with

a Shelby-type sampler. Piezometers were installed in two of the completed borings to determine present groundwater levels.

W-series borings were advanced using hollow-stem augers. All borings except two extended to depths of 12 feet below existing grade. One boring encountered obstructions and was terminated at five feet and one extended to 16 feet. Relatively undisturbed samples of potentially compressible soils were recovered in four of the borings using three-inch tubes advanced with a Shelby-type sampler.

After completion of the borings, GeoServices Corporation shipped the soil samples to our office. Samples were reexamined in our laboratory and field descriptions were verified or revised as necessary. All soil samples are described in accordance with the system shown on Drawing No. GS-R. Relatively undisturbed samples were subjected to laboratory testing to determine strength and consolidation characteristics. Groundwater levels were recorded during the course of the field work. Readings are shown on the appropriate boring log sheets.

SUBSURFACE CONDITIONS

The results of the boring program are shown on the boring logs attached as Appendix A. The logs include sample number, depth, blow count, individual soil descriptions for each sample and descriptions of drilling operations. Our interpretation of subsurface conditions is illustrated on Geologic Sections A-A through G-G, shown on Drawings Nos. GS-1 through GS-4. Generalized descriptions of the soil strata encountered in the borings are summarized below in order of their occurrence with increasing depth:

Stratum F - Fill

The uppermost material encountered in all of the recent borings is fill ranging in thickness from 2 to greater than 16 feet. Stratum F consists of loose to very compact brown silty fine to medium sand grading to fine to coarse sand, some silt with fine sandy silt, trace to some gravel, trace brick, concrete, clay, vegetation shells.

Stratum T1(A) - Sandy Silt

This stratum was encountered beneath Stratum F in 20 of the recent borings and beneath Stratum T2 in one boring. Measured thicknesses ranged from 2 to 17.7 feet, but the stratum extended beyond the bottom of some of the W-series borings. Stratum T2 was interlensed with Stratum T1(A) in four of the recent borings. Stratum T1(A) consists of loose to medium compact brown fine sandy silt, trace clay, clay pockets, gravel, lignite or stiff brown clayey silt to silty clay, trace to some fine sand, trace gravel, lensed with silty fine sand, and fine sandy clay.

Stratum T2 - Silty Sand

Stratum T2 was encountered beneath Stratum F or T1(A) in nine of the recent borings and extended beyond the bottom of some of the W-series borings. Stratum T2 was also interlensed with Stratum T1(A) in four of the recent borings and lenses ranged in thickness from 2 to 3 feet. Stratum T2 consists of loose to medium compact brown silty fine to medium sand, trace clay, gravel, grading to fine to medium sand, some silt, trace clay, gravel.

Stratum T3 - Sand and Gravel

Stratum T3 was encountered beneath Strata T1(A) and T2 in all B-series borings and ranged in thickness from 17.5 to 24 feet. Stratum T3 consists of compact to very compact brown fine to coarse sandy gravel, trace to some silt, grading to gravelly fine to coarse sand, some silt, with occasional boulders and cobbles.

Stratum T1(D) - Plastic Clay

Stratum T1(D) was encountered beneath Stratum T3 in all B-series borings and ranged up to 43.5 feet in thickness. Stratum T1(D) consists of soft to stiff gray plastic clay to silty clay, trace to some fine sand, trace fine sand layers and pockets, gravel.

Stratum D - Decomposed Rock

Stratum D was encountered in the two B-series borings that extended deeper than 50 feet, at a depths of about 85 feet. Stratum D consists of very compact gray micaceous fine to medium sand, some silt, trace to some rock fragments.

Groundwater

Groundwater was measured in two permanent piezometers installed during the field work. Groundwater levels corresponded to Elev. -5.7. Subsequent readings have shown little change in water level.

LABORATORY TESTING

We performed consolidation testing on three relatively undisturbed samples of T1(D) clay in our laboratory. We performed strength tests on five relatively undisturbed samples of the T1(A) clay and five relatively undisturbed samples of the T1(D) clay. Results are summarized on Table No. 1 and presented in Appendix B.

We analyzed and plotted the results of 44 consolidation tests performed by Edward S. Barber in 1962. Results are presented in Appendix C.

CONCLUSIONS

Based on the results of our field and laboratory programs, we conclude the following:

1. Soil stratigraphy is as presented in earlier reports.

2. Water is at approximately Elev. -6.

3. As deepest excavations are expected to be to about Elev. +3, no dewatering will be required to construct the proposed facilities.

4. As no dewatering is anticipated, there will be no drying of Stratum T1(D), the clay layer which indirectly supports the Monument.

5. Stratum T1(A), the upper clay layer, does not extend beneath the Monument and is above the water table. Thus it may not be fully saturated and if kept dry construction should not disturb its strength.

6. The Visitor Facility walls and columns will bear on soils of Strata T2 and T3. Allowable bearing pressures will be on the order of 2 to 3 TSF on Strata T2 and T3. Support of the floor of this structure on Stratum T1(A) will be considered during final design. We anticipate that the new loads imposed by the building foundations will generally not exceed the weight of the soil removed.

7. The underground passageway from the Visitor Facility to the Monument will bear on Strata F, T1(A) and T2. Allowable bearing pressures will be on the order of 1 to 1.5 TSF in Stratum F, and 1.5 to 2.5 TSF on Strata T1(A) and T2. We anticipate that the new loads imposed by the passageway will not exceed the weight of the soil removed. Given the varying depth of construction, the weight of soil removed ranges from about 0.7 to 1.4 TSF.

8. Braced below-grade walls will be entirely above the water table. They should be designed for lateral pressures of 75 psf per foot of depth below grade plus surcharge loading. Braced walls would include those for the Visitor Center and tunnel. Roof slabs should be designed for 130 pcf per foot of cover, plus the weight of the slab. A surcharge live load should be added to the above design numbers in the event that maintenance vehicles are operated near or above the structure, or that a large event on the Mall could cause crowds to gather near or above the structure.

9. It is our understanding that the Monument Lodge is supported on spread footings bearing about three feet below current grade. This places the footings on Stratum T1(A) soils. Excavation of a full or partial basement to permit construction of the escalator or elevator for entrance to the security facility will require underpinning some or all of the building.

All excavations would be within Strata T1(A) or T3 and above the water table. Underpinning should extend to and bear on Stratum T3. Allowable bearing pressure for underpinning and new footings on Stratum T3 is 3 TSF.

10. Landscape barrier walls will be founded in soils of Strata F, T1(A), and possibly T2. Allowable bearing pressures below these walls should be limited to 1 TSF. Lateral design pressure will vary with slope of the ground behind the wall from 50 psf per foot of depth for a horizontal surface to 65 psf per foot of depth for a slope of 20 degrees above horizontal. A surcharge live load should be added to the above design numbers in the event that maintenance vehicles are operated near or above the walls, or that a large event on the Mall could cause crowds to gather near or above the walls.

11. Our laboratory testing confirmed consolidation parameters used in evaluating settlement in our previous reports.

12. After discounting those tests for which Barber's consolidation test results were irregular, we found good agreement between Barber's results and ours.

13. The results of the strength testing confirmed the shear strength values presented in our 1973 report.

RECOMMENDATIONS

The following recommendations are provided for use in designing the landscape grading at the Washington Monument. As described in the Environmental Assessment (EA) for the project, the cut and fill of soils on the Grounds would be designed to result in no significant change in the soil loads beneath the Monument.

After obtaining new field samples and performing laboratory tests on the soils, and comparing the results of these tests to the data in the 1973 and 1984 we found no changed conditions in the soils that would alter the recommendations made in 1973.

Therefore, the recommendations from MRCE's 1973 report are still valid and are restated below. Note that these recommendations were prepared for a proposed Visitor Facility.

1. *Restrictions must be placed on the net permanent change in loads within a distance of several hundred feet from the center of the Monument. More severe limitations would apply to asymmetrical loads than to loads placed symmetrically on all sides of the Monument since it is the one-sided loading which will produce a tilt of the shaft. More stringent limitations should be applied to the addition of load compared to a reduction of load since an increase in stress beneath the Monument foundation will produce settlements in the range of virgin compression. A permanent net increase in loading*

within 150 feet from the monument center should generally not exceed 1,000 pounds per square foot. If such an additional load were to be placed over a sector of 180 degrees on one side of the foundation it would produce a tilt of the top of the shaft of nearly one inch and detailed studies if its specific effect would be desirable.

2. *The net change in load equals the total dead load plus permanent live load applied by the structure plus any filling or backfilling minus the total weight of excavated soil removed by excavation for the structure. For purposes of appraising the magnitude of loading, the unit weight of excavated soil can be assumed at 130 pounds per cu. ft. If construction of an underground facility produces a net reduction in loading, the average magnitude of this reduced loading should be limited to about 1500 psf asymmetrically or 2000 psf if it is positioned symmetrically around the Monument within a distance of 150 feet from the Monument center. The precise effect of a specific asymmetric loading in producing tilt of the shaft would have to be evaluated in detail when a final scheme is evolved.*

3. *Permanent net changes in load taking place within 63 feet of the Monument center, that is, overlying the projected base of the underpinned foundation, generally should not exceed 500 psf and should be restricted in lateral extent to the least practicable dimensions. For a structure of small dimension such as a passageway or narrow corridor, this 500 psf limit might be relaxed after specific study.* [Note: Anticipated loads in the current 2002 design do not approach 500 psf.] *The magnitude of pressures which are transmitted to soil directly beneath the Monument foundation from wall footings column footings, slabs or other foundation units of the newly constructed facility must be strictly limited. We believe that this pressure increase should not exceed about 1 to 1.5 kips per sq. Ft. The effects of a local or asymmetric increase in pressure beneath the Monument foundation would have to be evaluated in detail for the specific scheme of new construction.*

4. *Beyond 150 feet from the Monument center permanent net changes in load will have little if any effect on the foundation performance of the Monument but net changes exceeding 1500 psf additive load or 2000 psf net reduction in load with lateral dimensions of more than 150 feet asymmetric to the Monument should be kept beyond 200 feet from the Monument center if possible.*

5. *Excavations for construction of the Interpretive Facility* [Note: There was no security element considered in 1973] *should be limited as follows to avoid any possible disturbance to the soils that are carrying the loads of the Monument.*

    a. *Within 115 feet from the Monument center no excavation for construction of the Interpretive Facility should be allowed to extend below Elev. +16, that is, the level of the base of the original stone foundation. The width of such excavations before placing of structure concrete and partial backfilling should not exceed 45 feet.*

b. *Beyond 150 feet from the Monument center temporary excavations for construction can be carried down to as low as Elev. 0 provided the excavation and replacement by construction is carried out in width increments not exceeding about 100 feet.*

c. *Between 115 feet and 150 feet from the Monument center the maximum depth of temporary excavation is defined by a line sloping downward from Elev. +16 with a slope of 1 vertical on 2.6 horizontal and width limitations are intermediate between those stated in a and b.*

d. *Excavation or a widespread structure symmetrically placed which would approach the limitation on maximum load removal must be carried out with great caution. Specifications should require a program of excavation in which load removal on opposite sides of the Monument would be reasonably well balanced at all stages of the operation.*

e. *In general, it would be preferable to stabilize the sides of excavations near the Monument by cutting on sloped banks rather than by driving sheet piling of soldier piles for a cofferdam. Where vertical-wall cofferdams are absolutely necessary these could be formed by soldier piles placed in pre-augered holes.*

MRCE was asked to restate these recommendations in reference to the current designs and in a tabular format which makes it easy to determine what loadings are recommended within each distance range from the Monument center. This results in the following recommendations:

ALLOWABLE LOADING

Distance from Monument center	Allowable permanent net increase	Allowable permanent net decrease	Remarks
up to 63 feet	500 psf	500 psf	Minimize lateral extent 500 psf may be relaxed for small footprint after study
63 to 150 feet	1000 psf	1500 psf asymmetrically	
		2000 psf symmetrically	
150 to 200 feet	1500 psf	2000 psf	limits for asymmetric loading with lateral dimensions of more than 150 feet
200 feet or more	unspecified	unspecified	

Loading is subject to analysis in every case to determine its effects on the subsoils.

ALLOWABLE EXCAVATION

Distance from Monument center	Allowable excavation	Remarks
up to 115 feet	No deeper than Elev. 16	Maximum width open at any time is 45 feet
115 to 150 feet	Following a line from Elev. 16 at 1V:2.6H	Maximum width open at any time is between 45 and about 100 feet, proportional to distance from Monument center
150 feet or more	No deeper than Elev. 0	Maximum width open at any time is about 100 feet

Excavation is subject to notes (d) and (e) of Item 5 above.

Please contact us if you have any questions concerning this report.

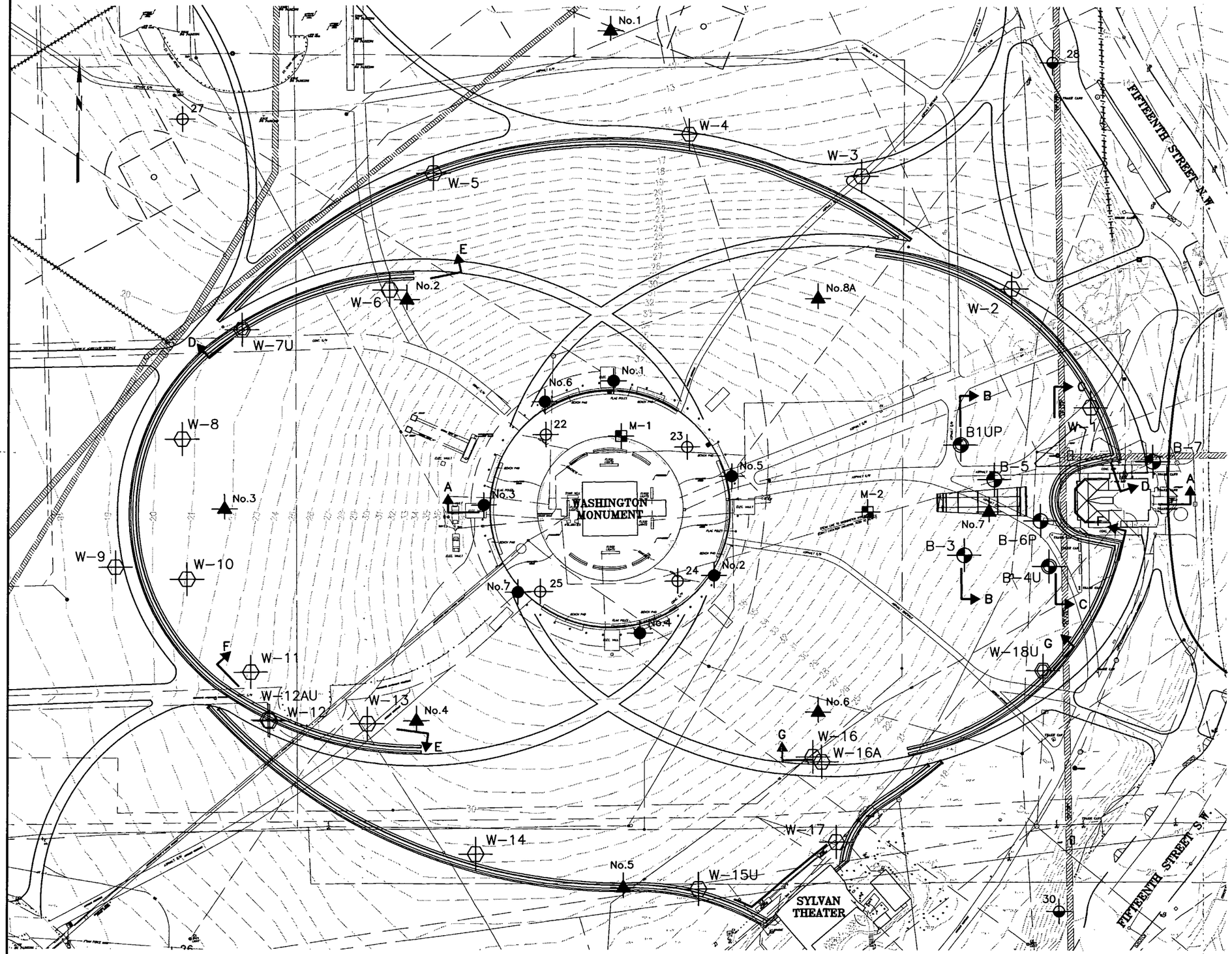
Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

Hugh S. Lacy

DWC:HSL:ltr5a.doc

EXHIBITS



GRAPHIC SCALE

50' 0 50' 100'

BORING LEGEND:

- B-6P – DRY SOIL SAMPLE BORING FOR VISITOR FACILITY MADE IN 2002. P INDICATES PIEZOMETER INSTALLED
- B-1UP – UNDISTURBED SOIL SAMPLE BORING FOR VISITOR FACILITY MADE IN 2002. P INDICATES PIEZOMETER INSTALLED
- W-1 – DRY SOIL SAMPLE BORING FOR RETAINING WALL MADE IN 2002
- W-7U – UNDISTURBED SOIL SAMPLE BORING FOR RETAINING WALL MADE IN 2002
- M-1 – BORING MADE IN 1973
- 24 – BORING MADE IN 1962
- No.1 – INNER RING BORING MADE IN 1930
- No.6 – OUTER RING BORING MADE IN 1930

GENERAL NOTES:

1. FOR GEOLOGIC SECTIONS A-A THRU F-F SEE DRAWING NOS. GS-1 THRU GS-4.
2. BASE PLAN FOR DRAWING NO. B-1 WAS TAKEN FROM A 1991 SITE PLAN SURVEYED BY DEWBERRY AND DAVIS, AND MODIFIED FOR 1995 15TH STREET REALIGNMENT.
3. CONTOURS ARE FOR EXISTING GRADES.
4. ELEVATIONS SHOWN REFER TO THE NATIONAL GEODETIC SURVEY DATUM
5. BORINGS WERE MADE BY GEOSERVICES CORPORATION IN FEBRUARY AND MARCH 2002 UNDER THE INSPECTION OF MRCE.

NATIONAL PARK SERVICE
WASHINGTON DC

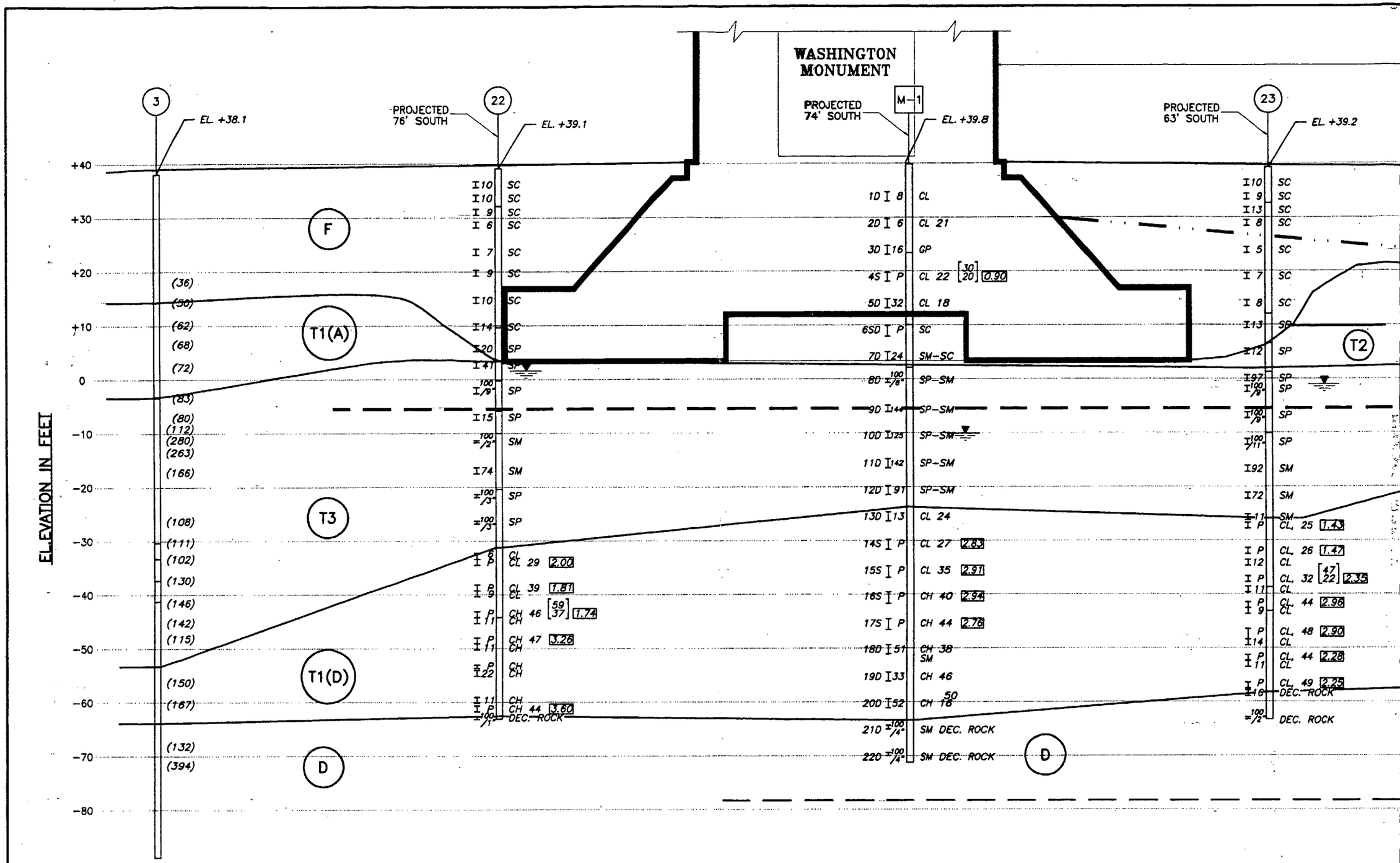
WASHINGTON MONUMENT GROUNDS AND VISITOR FACILITY
WASHINGTON DC

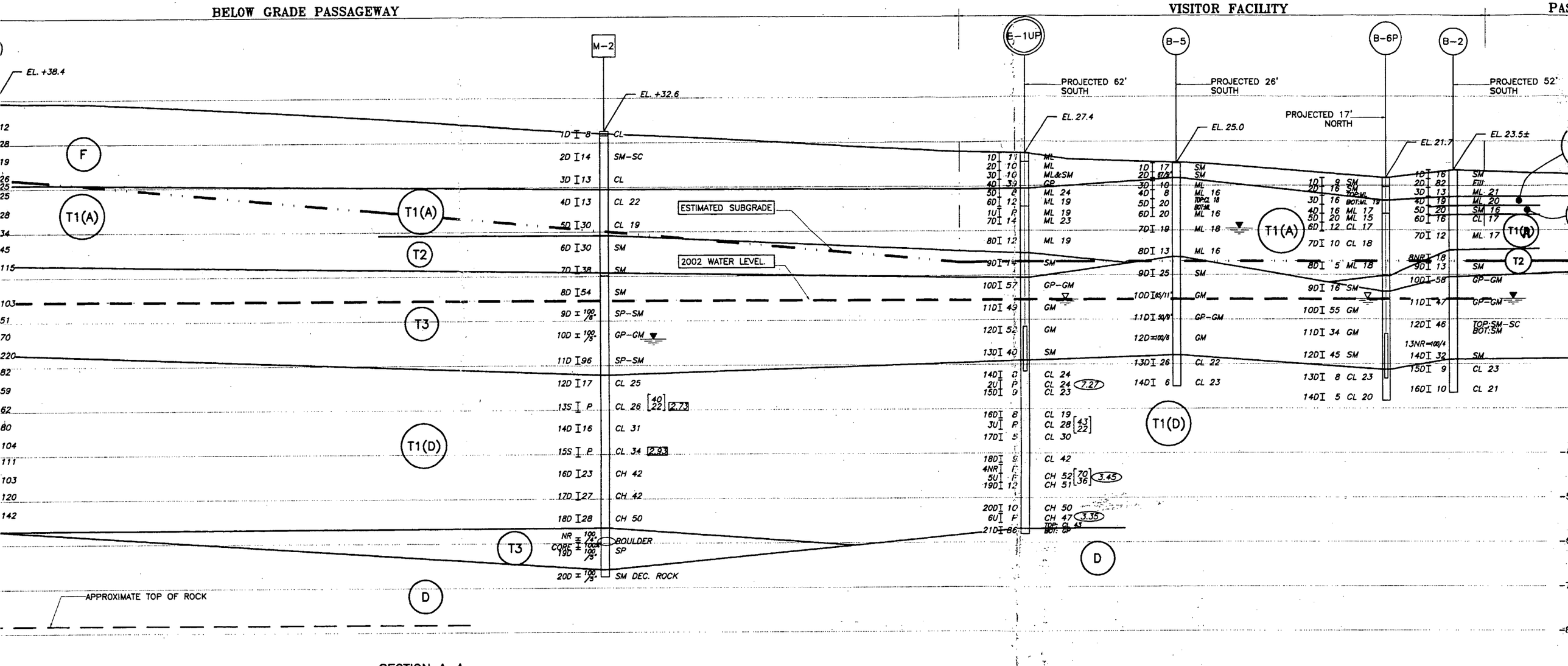
OLIN PARTNERSHIP
PHILADELPHIA PA

HARTMAN COX ARCHITECTS
WASHINGTON DC

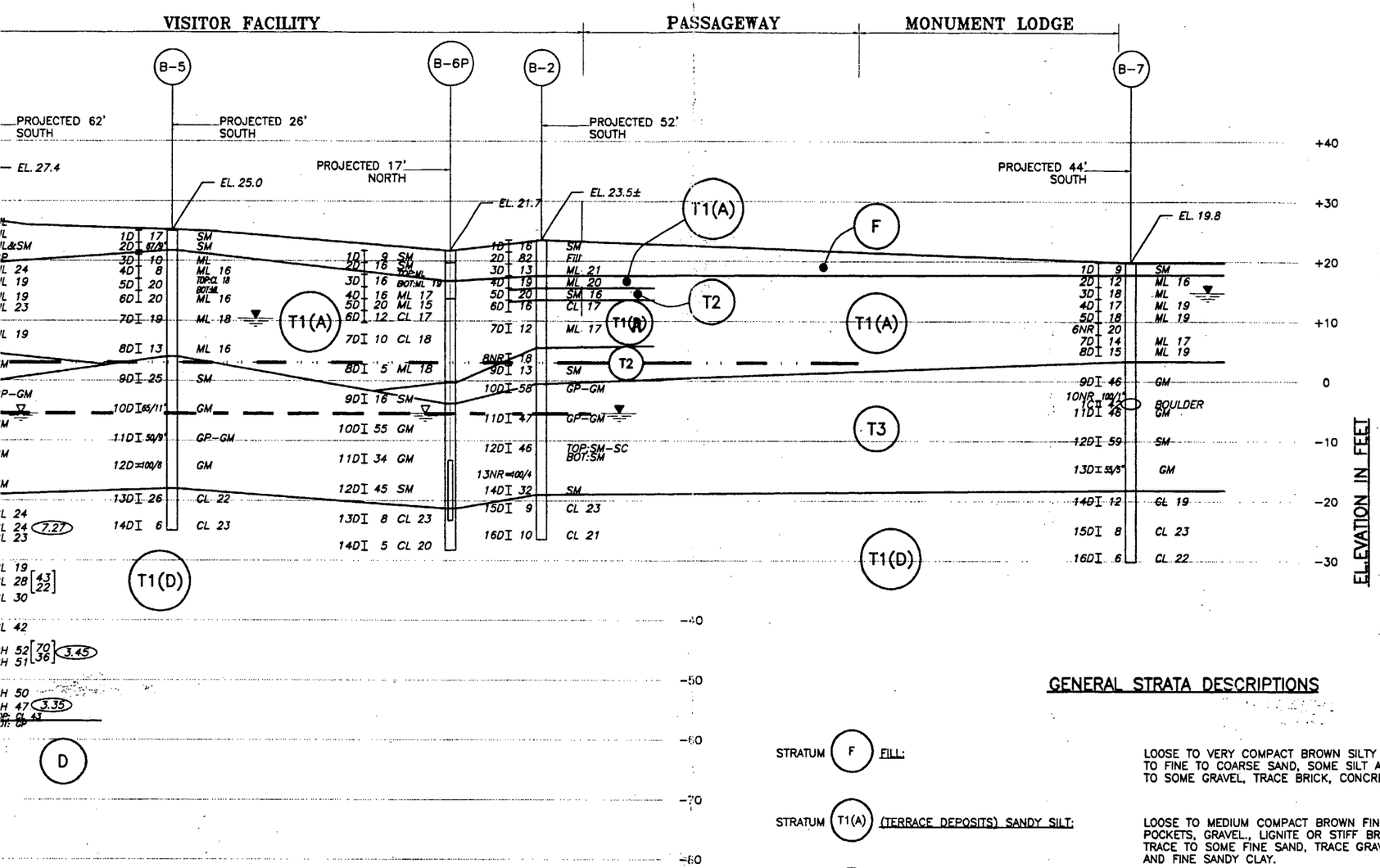
MUESER RUTLEDGE CONSULTING ENGINEERS
14 PENN PLAZA – 225 W. 34TH STREET, NY, NY 10122

SCALE	MADE BY	DATE	FILE NO.
AS SHOWN	C.P.J.	5/02/02	9726
	CH'KD BY A.A.A.	DATE 5/02/02	DRAWING NO.
BORING LOCATION PLAN			B-1


WASHINGTON MONUMENT
3
EL. +38.1
PROJECTED 76' SOUTH
22
EL. +39.1
PROJECTED 74' SOUTH
M-1
EL. +39.8
PROJECTED 63' SOUTH
23
EL. +39.2
ELEVATION IN FEET
+40
+30
+20
+10
0
-10
-20
-30
-40
-50
-60
-70
-80
F
T1(A)
T3
T1(D)
D
T2
(36)
(50)
(62)
(68)
(72)
(83)
(80)
(112)
(280)
(263)
(166)
(108)
(111)
(102)
(130)
(146)
(142)
(115)
(150)
(167)
(132)
(394)
I10 SC
I10 SC
I 9 SC
I 6 SC
I 7 SC
I 9 SC
I10 SC
I14 SC
I20 SP
I41 SP
100/8" SP
I15 SP
100/2" SM
I74 SM
100/3" SP
100/3" SP
P/8 CL
CL 29 2.00
P/9 CL
CL 39 1.81
P/11 CH
CH 46 [59/37] 1.74
P/11 CH
CH 47 3.26
P/22 CH
CH
11 CH
P CH 44 3.60
100/1" DEC. ROCK
10D I 8 CL
20D I 6 CL 21
30 I16 GP
4S I P CL 22 [30/20] 0.90
5D I32 CL 18
6SD I P SC
7D I24 SM-SC
8D 100/8" SP-SM
9D I44 SP-SM
10D I125 SP-SM
11D I142 SP-SM
12D I91 SP-SM
13D I13 CL 24
14S I P CL 27 2.83
15S I P CL 35 2.91
16S I P CH 40 2.94
17S I P CH 44 2.76
18D I51 CH 38
SM
19D I33 CH 46
20D I52 CH 50/18
21D 100/4" SM DEC. ROCK
22D 100/4" SM DEC. ROCK
I10 SC
I 9 SC
I13 SC
I 8 SC
I 5 SC
I 7 SC
I 8 SC
I13 SP
I12 SP
I97 SP
100/8" SP
100/9" SP
100/11" SP
I92 SM
I72 SM
11 SM
I P CL, 25 1.43
I P CL, 26 1.47
I12 CL
I P CL, 32 [47/22] 2.35
I11 CL
I P CL, 44 2.98
I 9 CL
I P CL, 48 2.90
I14 CL
I P CL, 44 2.28
I11 CL
I P CL, 49 2.25
I16 DEC. ROCK
100/2" DEC. ROCK


BELOW GRADE PASSAGEWAY
VISITOR FACILITY
M-2
B-1UP
B-5
B-6P
B-2
EL. +38.4
EL. +32.6
PROJECTED 62' SOUTH
PROJECTED 26' SOUTH
PROJECTED 17' NORTH
PROJECTED 52' SOUTH
EL. 27.4
EL. 25.0
EL. 21.7
EL. 23.5±
F
T1(A)
T2
T3
T1(D)
D
ESTIMATED SUBGRADE
2002 WATER LEVEL.
APPROXIMATE TOP OF ROCK
BOULDER
SP
SM DEC. ROCK

SECTION A–A



NOTES:

1. FOR GENERAL NOTES AND BORING LOCATION PLAN SEE DRAWING NO. B-1.
2. STRATIFICATIONS SHOWN ON GEOLOGIC SECTIONS ARE INFERRED BETWEEN AND BEYOND THE ILLUSTRATED BORINGS AND MAY OR MAY NOT ACCURATEL.Y REPRESENT TRUE SUBSURFACE CONDITIONS.
3. DRILLING MUD LEVEL.S MEASURED IN BORINGS MAY OR MAY NOT REPRESENT ACTUAL GROUND WATER LEVEL.S.
4. SOIL CLASSIFICATIONS WERE MADE BY MRCE AND MAY NOT AGREE WITH THE DRILLER'S CLASSIFICATIONS.
5. SEE DRAWING GS-R FOR BORING LEGEND AND SUMMARY OF UNIFIED SOIL CLASSIFICATION SYSTEM.

GENERAL STRATA DESCRIPTIONS

STRATUM (F)	FILL:	LOOSE TO VERY COMPACT BROWN SILTY FINE TO MEDIUM SAND GRADING TO FINE TO COARSE SAND, SOME SILT AND FINE SANDY SILT, TRACE TO SOME GRAVEL, TRACE BRICK, CONCRETE, CLAY, VEGETATION, SHELLS.
STRATUM (T1(A))	(TERRACE DEPOSITS) SANDY SILT:	LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT , TRACE CLAY, CLAY POCKETS, GRAVEL., LIGNITE OR STIFF BROWN CLAYEY SILT TO SILTY CLAY TRACE TO SOME FINE SAND, TRACE GRAVEL, LENSED WITH SILTY FINE SAND, AND FINE SANDY CLAY.
STRATUM (T2)	(TERRACE DEPOSITS) SILTY SAND:	MEDIUM COMPACT BROWN SILTY FINE TO MEDIUM SAND, GRADING TO FINE TO MEDIUM SAND, SOME SILT, TRACE CLAY, GRAVEL.
STRATUM (T3)	(TERRACE DEPOSITS) SAND AND GRAVEL:	COMPACT TO VERY COMPACT BROWN FINE TO COARSE SANDY GRAVEL, TRACE TO SOME SILT, GRADING TO GRAVELLY FINE TO COARSE SAND, SOME SILT, WITH OCCASIONAL BOULDERS AND COBBLES
STRATUM (T1(D))	(TERRACE DEPOSITS) PLASTIC CLAY:	SOFT TO STIFF GRAY PLASTIC CLAY TO SILTY CLAY, TRACE TO SOME FINE SAND, TRACE FINE SAND LAYERS AND POCKETS, GRAVEL.
STRATUM (D)	(WISSAHICKON SCHIST) DECOMPOSED ROCK:	VERY COMPACT GRAY MICACEOUS FINE TO MEDIUM SAND, SOME SILT, TRACE TO SOME ROCK FRAGMENTS

GRAPHIC SCALE

20' 10' 0 20' 40'

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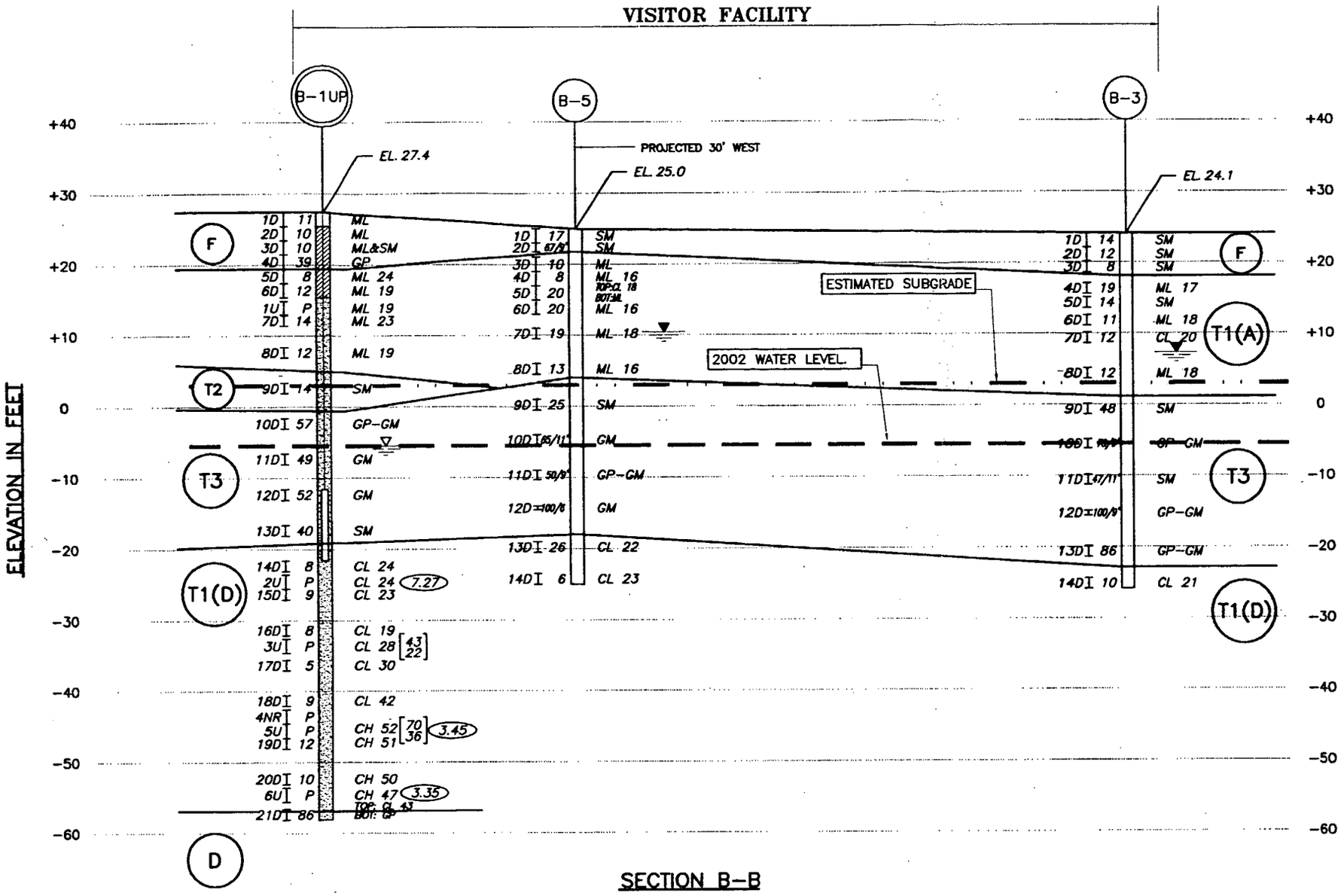
GEOLOGIC SECTION A-A

DRAWING NO. GS-1



SECTION B-B

STRATUM (F) FILL:

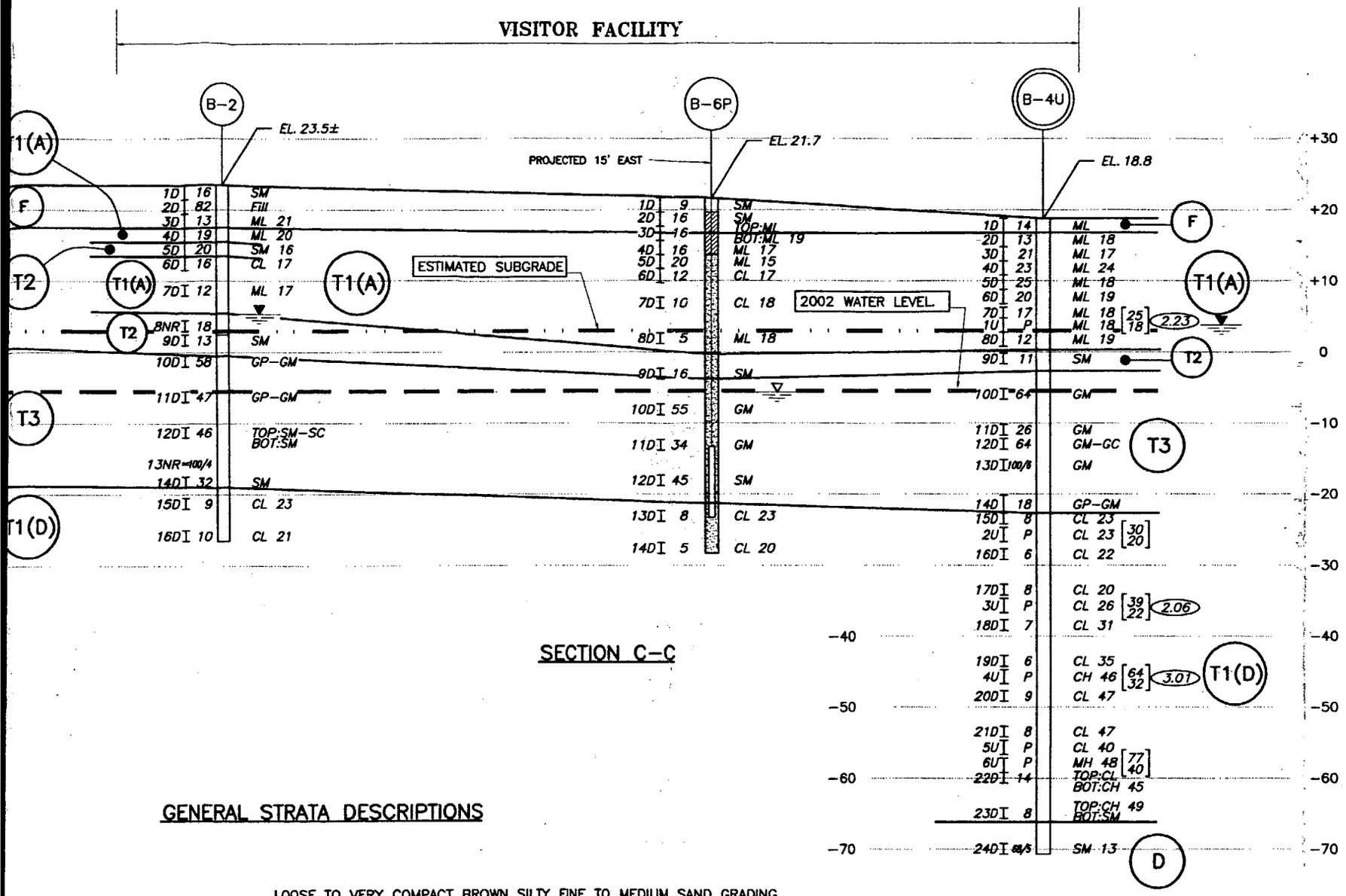
STRATUM (T1(A)) (TERR

STRATUM (T2) (TERR

STRATUM (T3) (TERR

STRATUM (T1(D)) (TERR

STRATUM (D) (WISS



SECTION C-C

GENERAL STRATA DESCRIPTIONS

LOOSE TO VERY COMPACT BROWN SILTY FINE TO MEDIUM SAND GRADING TO FINE TO COARSE SAND, SOME SILT AND FINE SANDY SILT, TRACE TO SOME GRAVEL, TRACE BRICK, CONCRETE, CLAY, VEGETATION, SHELLS.

ACE DEPOSITS) SANDY SILT: LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT , TRACE CLAY, CLAY POCKETS, GRAVEL, LIGNITE OR STIFF BROWN CLAYEY SILT TO SILTY CLAY TRACE TO SOME FINE SAND, TRACE GRAVEL, LENSED WITH SILTY FINE SAND, AND FINE SANDY CLAY.

ACE DEPOSITS) SILTY SAND: MEDIUM COMPACT BROWN SILTY FINE TO MEDIUM SAND, GRADING TO FINE TO MEDIUM SAND, SOME SILT, TRACE CLAY, GRAVEL

ACE DEPOSITS) SAND AND GRAVEL: COMPACT TO VERY COMPACT BROWN FINE TO COARSE SANDY GRAVEL, TRACE TO SOME SILT, GRADING TO GRAVELLY FINE TO COARSE SAND, SOME SILT, WITH OCCASIONAL BOULDERS AND COBBLES

ACE DEPOSITS) PLASTIC CLAY: SOFT TO STIFF GRAY PLASTIC CLAY TO SILTY CLAY, TRACE TO SOME FINE SAND, TRACE FINE SAND LAYERS AND POCKETS, GRAVEL

AHICKON SCHIST) DECOMPOSED ROCK: VERY COMPACT GRAY MICACEOUS FINE TO MEDIUM SAND, SOME SILT, TRACE TO SOME ROCK FRAGMENTS

NOTES:

1. FOR GENERAL NOTES AND BORING LOCATION PLAN SEE DRAWING NO. B-1.
2. STRATIFICATIONS SHOWN ON GEOLOGIC SECTIONS ARE INFERRED BETWEEN AND BEYOND THE ILLUSTRATED BORINGS AND MAY OR MAY NOT ACCURATELY REPRESENT TRUE SUBSURFACE CONDITIONS.
3. DRILLING MUD LEVELS MEASURED IN BORINGS MAY OR MAY NOT REPRESENT ACTUAL GROUND WATER LEVELS.
4. SOIL CLASSIFICATIONS WERE MADE BY MRCE AND MAY NOT AGREE WITH THE DRILLER'S CLASSIFICATIONS.
5. SEE DRAWING GS-R FOR BORING LEGEND AND SUMMARY OF UNIFIED SOIL CLASSIFICATION SYSTEM.

GRAPHIC SCALE

20' 10' 0 20' 40'

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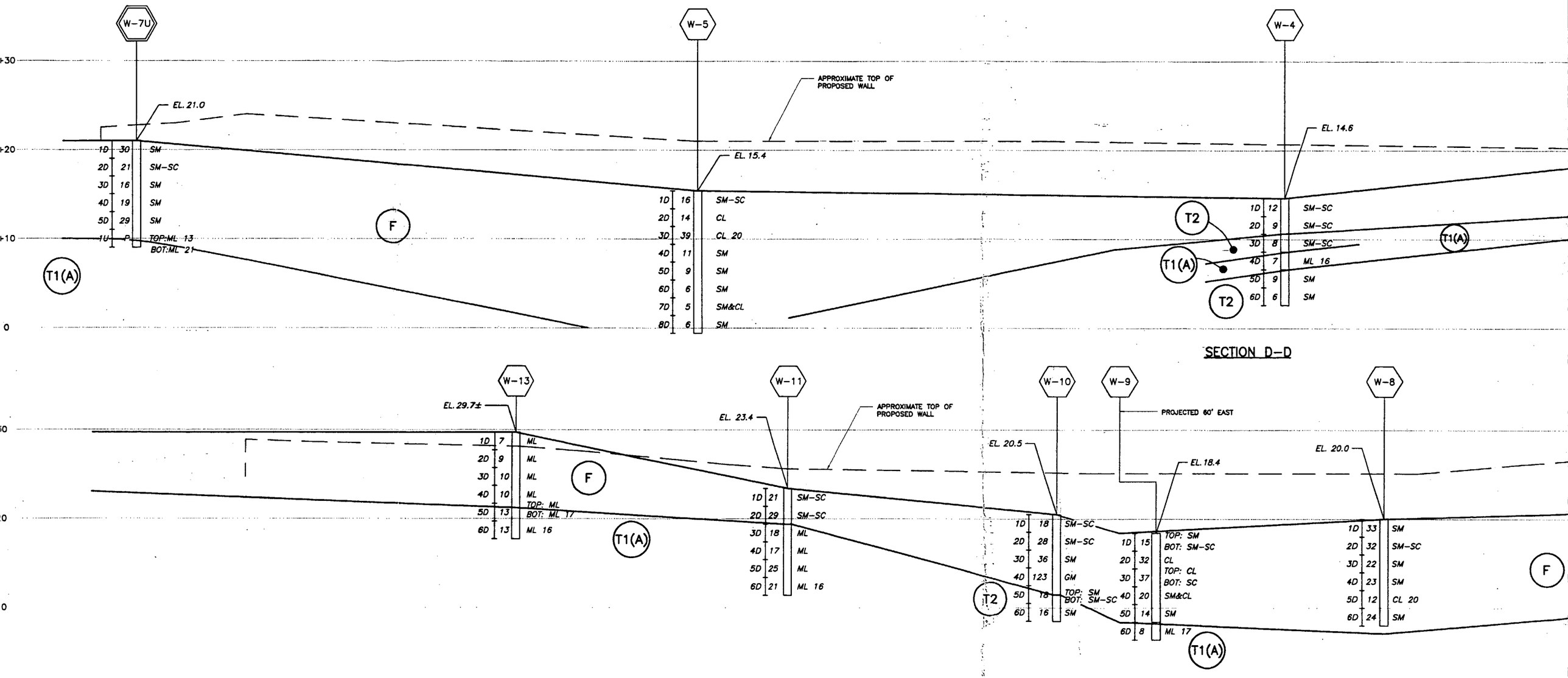
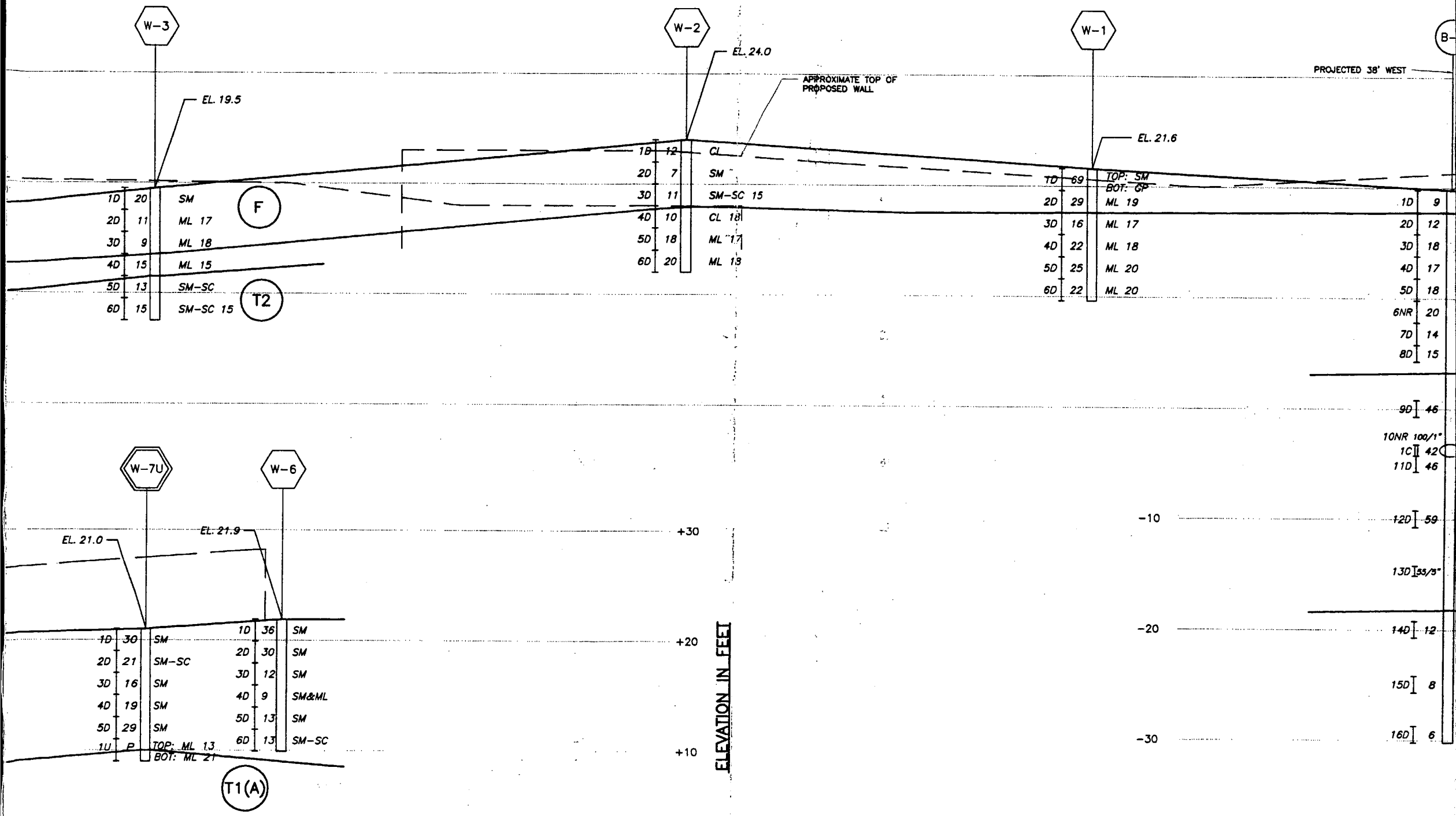
GEOLOGIC SECTIONS
B-B AND C-C

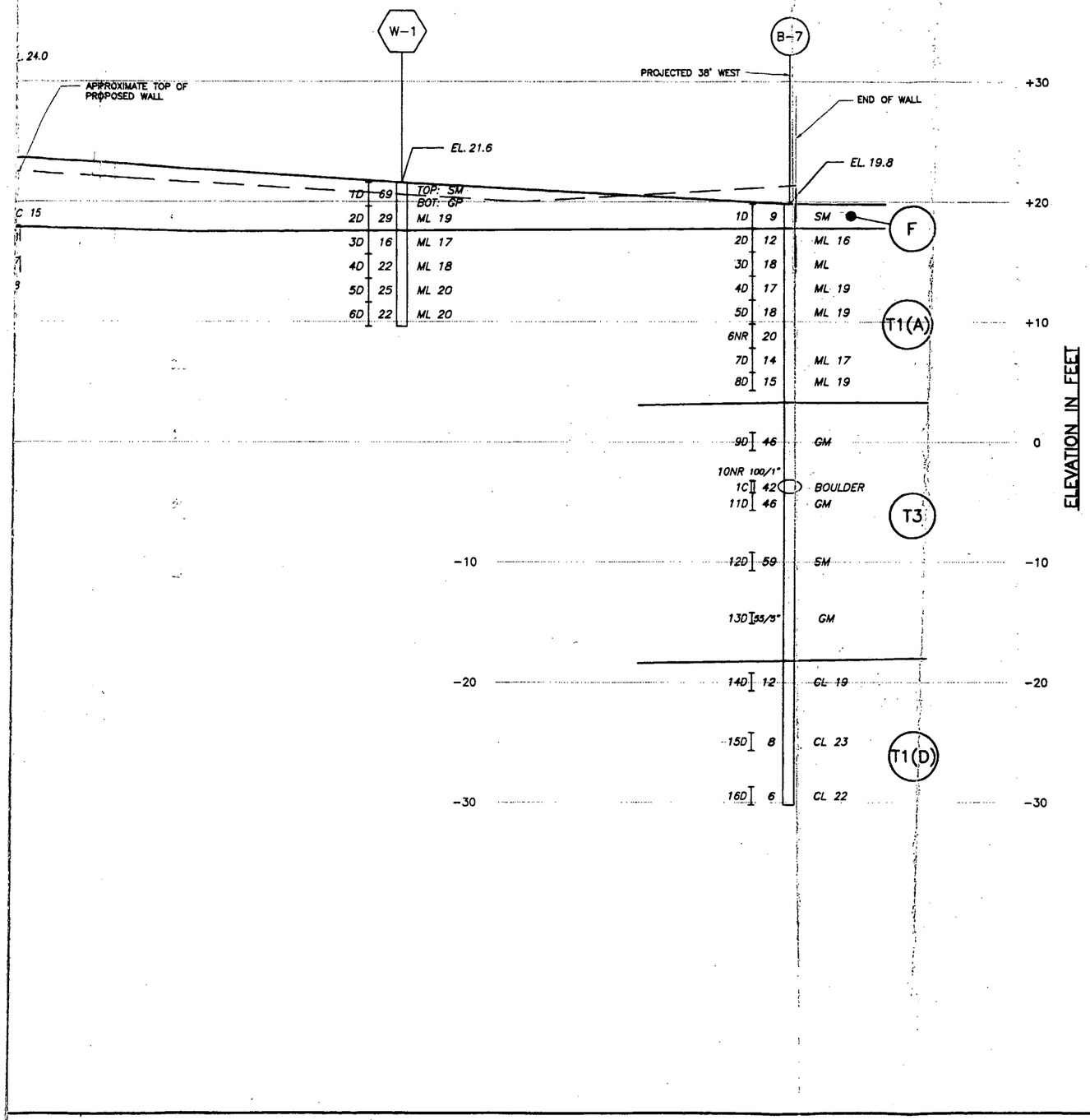
DRAWING NO. GS-2



SECTION D-D

SECTION E-E


W-3
W-2
W-1
B-
EL. 19.5
EL. 24.0
APPROXIMATE TOP OF PROPOSED WALL
EL. 21.6
PROJECTED 38' WEST
1D 20 SM
2D 11 ML 17
3D 9 ML 18
4D 15 ML 15
5D 13 SM-SC
6D 15 SM-SC 15
F
T2
1D 12 CL
2D 7 SM
3D 11 SM-SC 15
4D 10 CL 18
5D 18 ML 17
6D 20 ML 13
TD 69 TOP: SM BOT: GP
2D 29 ML 19
3D 16 ML 17
4D 22 ML 18
5D 25 ML 20
6D 22 ML 20
1D 9
2D 12
3D 18
4D 17
5D 18
6NR 20
7D 14
8D 15
9D 46
10NR 100/1"
1C 42
11D 46
12D 59
13D 35/3"
14D 12
15D 8
16D 6
W-7U
W-6
EL. 21.0
EL. 21.9
1D 30 SM
2D 21 SM-SC
3D 16 SM
4D 19 SM
5D 29 SM
1U P TOP: ML 13 BOT: ML 21
1D 36 SM
2D 30 SM
3D 12 SM
4D 9 SM&ML
5D 13 SM
6D 13 SM-SC
T1(A)
+30
+20
+10
0
-10
-20
-30
ELEVATION IN FEET



NOTES:

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GENERAL STRATA DESCRIPTIONS

STRATUM (F)	FILL:	LOOSE TO VERY COMPACT BROWN SILTY FINE SAND, GRADING TO FINE TO COARSE SAND, SOME SILT, TRACE TO SOME GRAVEL, AND GRAVELLY FINE TO COARSE SAND SOME SILT, TRACE CLAY. CLAY POCKETS AND LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT GRADING TO STIFF CLAYEY SILT, SILTY CLAY AND FINE SANDY CLAY WITH VARYING AMOUNTS OF BRICK, CONCRETE, CINDERS, SHELLS, LIGNITE, VEGETATION
STRATUM (T1(A))	(TERRACE DEPOSITS) SANDY SILT:	LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT TRACE CLAY, CLAY POCKETS, GRAVEL GRADING TO STIFF BROWN CLAYEY SILT TO SILTY CLAY, SOME FINE SAND.
STRATUM (T2)	(TERRACE DEPOSITS) SILTY SAND:	LOOSE TO MEDIUM COMPACT BROWN SILTY FINE SAND, TRACE CLAY, GRAVEL GRADING TO FINE SAND, SOME SILT, TRACE CLAY, CLAY POCKETS AND SEAMS.
STRATUM (T3)	(TERRACE DEPOSITS) SAND AND GRAVEL:	COMPACT TO VERY COMPACT BROWN FINE TO COARSE SANDY GRAVEL, TRACE TO SOME SILT, GRADING TO GRAVELLY FINE TO COARSE SAND, SOME SILT, WITH OCCASIONAL BOULDERS AND COBBLES
STRATUM (T1(D))	(TERRACE DEPOSITS) PLASTIC CLAY:	SOFT TO STIFF GRAY PLASTIC CLAY TO SILTY CLAY, TRACE TO SOME FINE SAND, TRACE FINE SAND LAYERS AND POCKETS, GRAVEL

GRAPHIC SCALES

VERTICAL: 5' 2.5' 0 5' 10'

HORIZONTAL: 20' 10' 0 20' 40'

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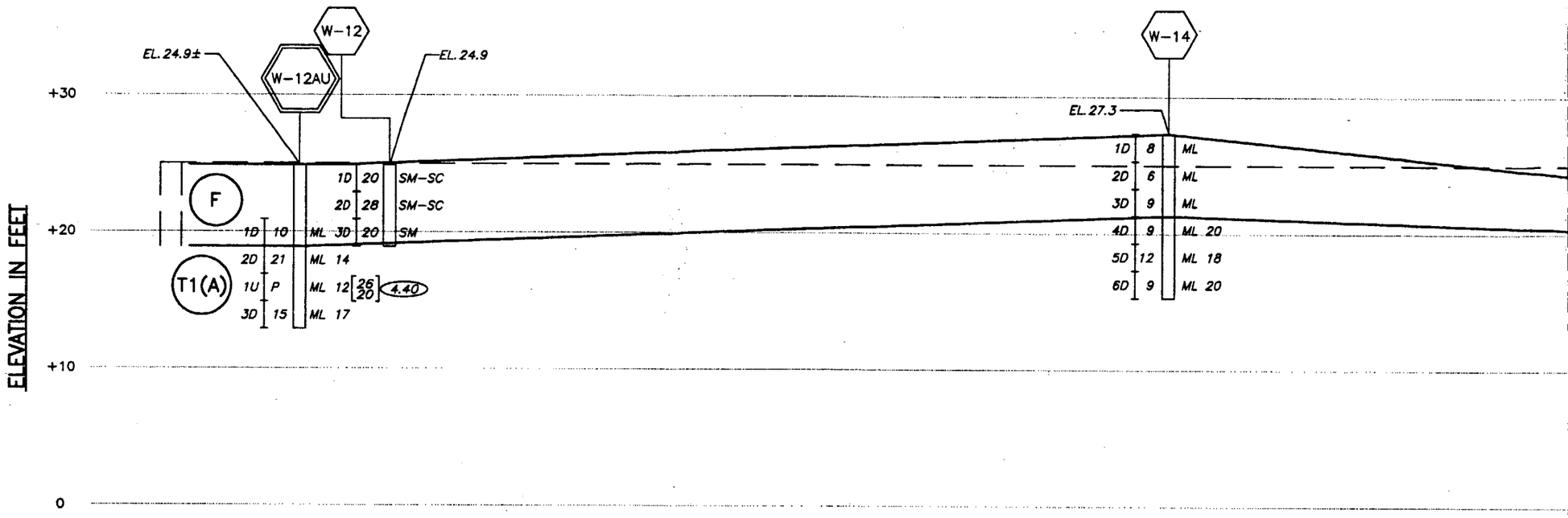
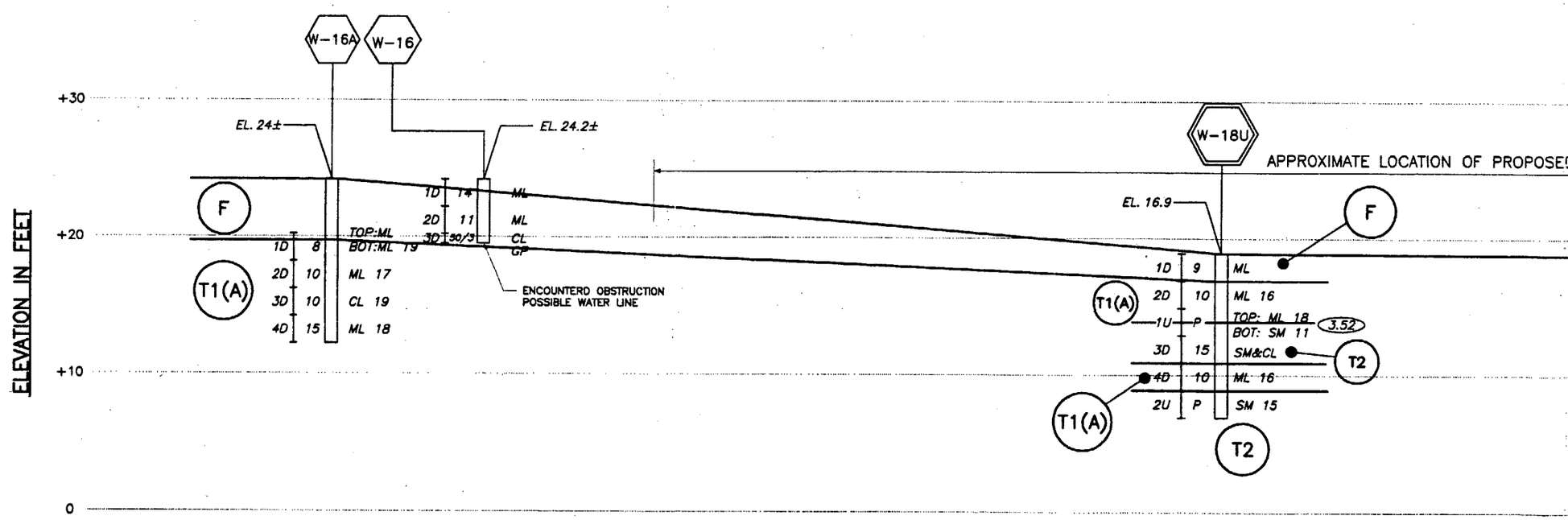
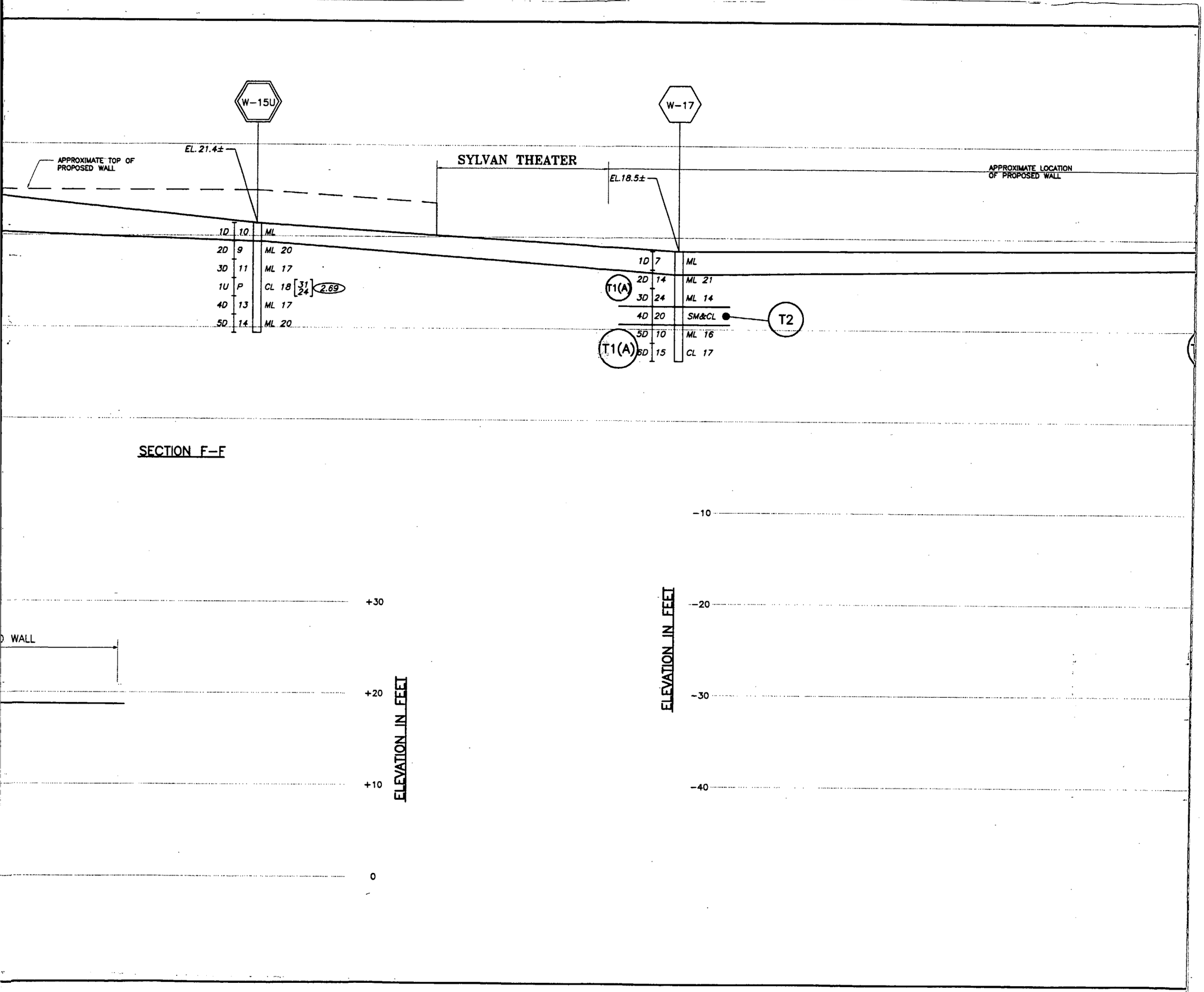
GEOLOGIC SECTIONS D-D AND E-E

DRAWING NO. GS-3

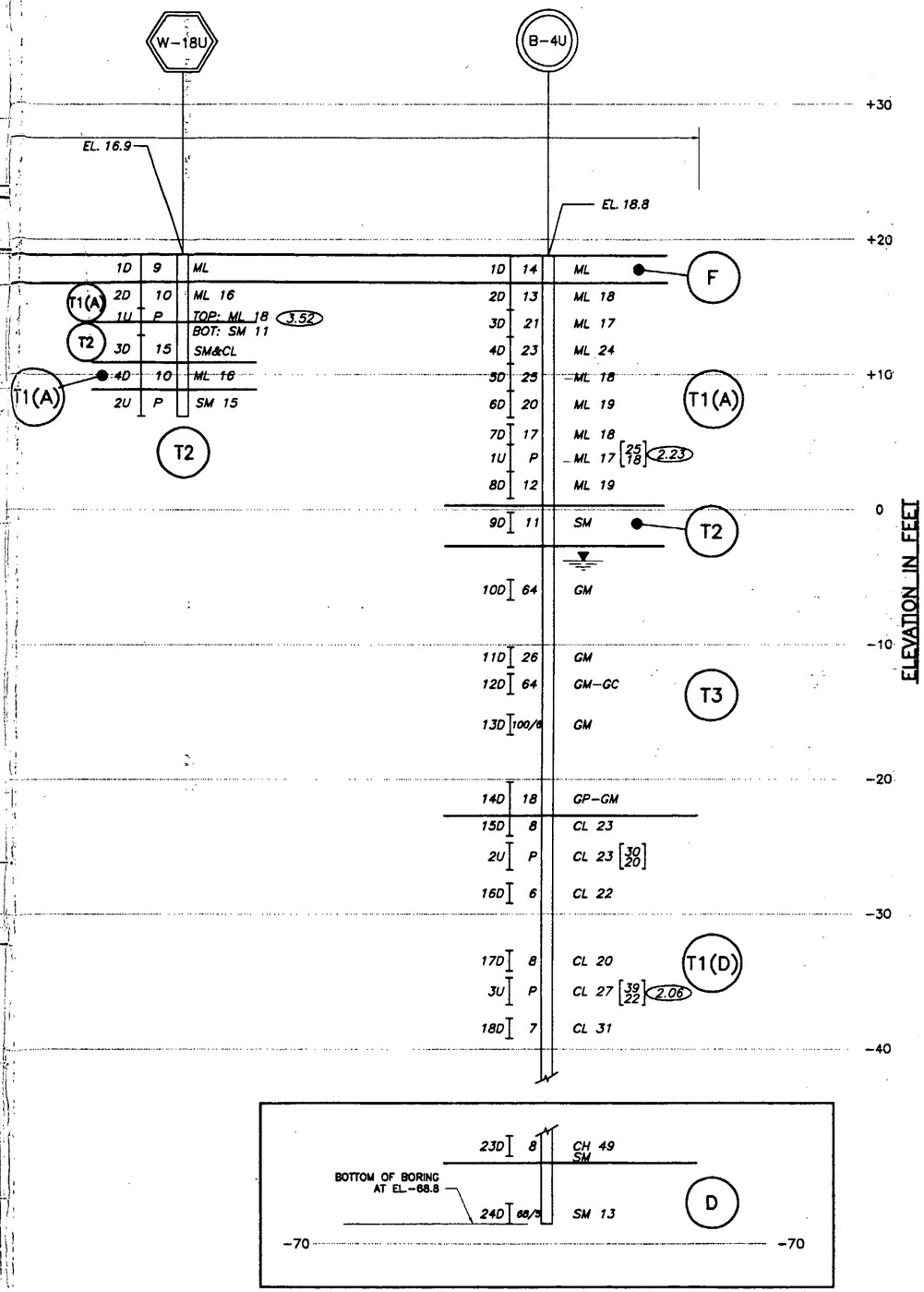

ELEVATION IN FEET
+30
+20
+10
0
W-12
W-12AU
EL. 24.9±
EL. 24.9
W-14
EL. 27.3
F
T1(A)
1D 10 ML
2D 21 ML 14
1U P ML 12
3D 15 ML 17
1D 20 SM-SC
2D 28 SM-SC
3D 20 SM
[26/20]
4.40
1D 8 ML
2D 6 ML
3D 9 ML
4D 9 ML 20
5D 12 ML 18
6D 9 ML 20


ELEVATION IN FEET
+30
+20
+10
0
W-16A
W-16
EL. 24±
EL. 24.2±
W-18U
APPROXIMATE LOCATION OF PROPOSE
EL. 16.9
F
T1(A)
1D 8 TOP:ML
BOT:ML 19
2D 10 ML 17
3D 10 CL 19
4D 15 ML 18
1D 14 ML
2D 11 ML
3D 50/3 CL
GP
ENCOUNTERD OBSTRUCTION
POSSIBLE WATER LINE
1D 9 ML
2D 10 ML 16
1U P TOP: ML 18
BOT: SM 11
3.52
3D 15 SM&CL
4D 10 ML 16
2U P SM 15
T2

SECTION G-G


W-15U
W-17
EL. 21.4±
APPROXIMATE TOP OF PROPOSED WALL
SYLVAN THEATER
EL. 18.5±
APPROXIMATE LOCATION OF PROPOSED WALL
1D 10 ML
2D 9 ML 20
3D 11 ML 17
1U P CL 18 [31/24] 2.69
4D 13 ML 17
5D 14 ML 20
1D 7 ML
2D 14 ML 21
3D 24 ML 14
4D 20 SM&CL
5D 10 ML 16
6D 15 CL 17
T1(A)
T1(A)
T2
WALL
+30
+20
+10
0
ELEVATION IN FEET
-10
-20
-30
-40
ELEVATION IN FEET

SECTION F-F



NOTES:

1. FOR GENERAL NOTES AND BORING LOCATION PLAN SEE DRAWING NO. B-1.
2. STRATIFICATIONS SHOWN ON GEOLOGIC SECTIONS ARE INFERRED BETWEEN AND BEYOND THE ILLUSTRATED BORINGS AND MAY OR MAY NOT ACCURATELY REPRESENT TRUE SUBSURFACE CONDITIONS.
3. SOIL CLASSIFICATIONS WERE MADE BY MRCE AND MAY NOT AGREE WITH THE DRILLER'S CLASSIFICATIONS.
4. SEE DRAWING GS-R FOR BORING LEGEND AND SUMMARY OF UNIFIED SOIL CLASSIFICATION SYSTEM.

GENERAL STRATA DESCRIPTIONS

STRATUM F	FILL:	LOOSE TO VERY COMPACT BROWN SILTY FINE SAND, GRADING TO FINE TO COARSE SAND, SOME SILT WITH FINE SANDY SILT, TRACE TO SOME GRAVEL, AND GRAVELLY FINE TO COARSE SAND SOME SILT, TRACE CLAY. CLAY POCKETS AND LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT GRADING TO STIFF CLAYEY SILT, SILTY CLAY AND FINE SANDY CLAY WITH VARYING AMOUNTS OF BRICK, CONCRETE, CINDERS, SHELLS, LIGNITE, VEGETATION.
STRATUM T1(A)	(TERRACE DEPOSITS) SANDY SILT:	LOOSE TO MEDIUM COMPACT BROWN FINE SANDY SILT TRACE CLAY, CLAY POCKETS, GRAVEL GRADING TO STIFF BROWN CLAYEY SILT TO SILTY CLAY, SOME FINE SAND.
STRATUM T2	(TERRACE DEPOSITS) SILTY SAND:	LOOSE TO MEDIUM COMPACT BROWN SILTY FINE SAND, TRACE CLAY, GRAVEL GRADING TO FINE SAND, SOME SILT, TRACE CLAY, CLAY POCKETS AND SEAMS.
STRATUM T3	(TERRACE DEPOSITS) SAND AND GRAVEL:	COMPACT TO VERY COMPACT BROWN FINE TO COARSE SANDY GRAVEL, TRACE TO SOME SILT, GRADING TO GRAVELLY FINE TO COARSE SAND, SOME SILT, WITH OCCASIONAL BOULDERS AND COBBLES.
STRATUM T1(D)	(TERRACE DEPOSITS) PLASTIC CLAY:	SOFT TO STIFF GRAY PLASTIC CLAY TO SILTY CLAY, TRACE TO SOME FINE SAND, TRACE FINE SAND LAYERS AND POCKETS, GRAVEL.
STRATUM D	(WISSAHICKON SCHIST) DECOMPOSED ROCK:	VERY COMPACT GRAY MICACEOUS FINE TO MEDIUM SAND, SOME SILT, TRACE TO SOME ROCK FRAGMENTS.

GRAPHIC SCALES

VERTICAL: 5' 2.5' 0 5' 10'

HORIZONTAL: 20' 10' 0 20' 40'

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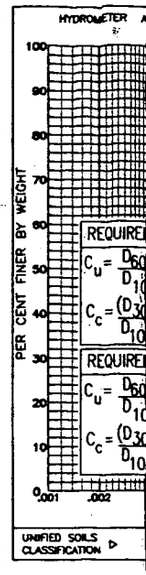
GEOLOGIC SECTIONS F-F AND G-G

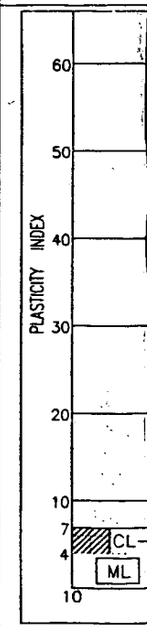
DRAWING NO. GS-4

UNIFIED SOIL CLASSIFICATION (INCLUDING IDENTIFICATION AND DESCRIPTION)

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 3 IN. AND BASING FRACTIONS ON ESTIMATED WEIGHTS)		
1	2		3	4	5		
COARSE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE. (FOR VISUAL CLASSIFICATION, THE 1/4 -IN. SIZE MAY BE USED AS EQUIVALENT TO THE NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.		
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.		
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE.	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	WIDE RANGE IN GRAIN SIZES AND SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES.		
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.	PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING.		
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT-MIXTURES.	NONPLASTIC FINES OR FINES WITH LOW PLASTICITY (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES.	PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		
FINE-GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE THE NO. 200 SIEVE SIZE IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE					IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN NO. 40 SIEVE SIZE		
					DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PL)
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, SANDY SILTS, ROCK FLOUR, OR CLAYEY SILTS WITH SLIGHT PLASTICITY.	NONE TO SLIGHT	QUICK TO SLOW	NONE
			CL	INORGANIC CLAYS, OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS.	MEDIUM TO HIGH	NONE TO VERY SLOW	MEDIUM
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.	SLIGHT TO MEDIUM	SLOW	SLIGHT
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.	SLIGHT TO MEDIUM	SLOW TO NONE	SLIGHT TO MEDIUM
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.	HIGH TO VERY HIGH	NONE	HIGH
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.	MEDIUM TO HIGH	NONE TO VERY SLOW	SLIGHT TO MEDIUM
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS.	READILY IDENTIFIED BY COLOR, ODOR, SPONGY FEEL AND FREQUENTLY BY FIBROUS TEXTURE.		

BOUNDARY CLASSIFICATIONS: SOILS POSSESING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS, I.E.: SP-SC POORLY GRADED SAND WITH CLAY BINDER.





TERMINOLOGY USED IN MRCE SOIL DESCRIPTIONS

DEGREE OF COMPACTION FOR NON-PLASTIC SOIL

DEGREE OF COMPACTION	BLOWS* PER FOOT
LOOSE	0 TO 10
MEDIUM COMPACT	11 TO 29
COMPACT	30 TO 50
VERY COMPACT	GREATER THAN 50

* STANDARD PENETRATION RESISTANCE USING 140 LB. HAMMER FREE FALLING 30 INCHES TO DRIVE A 2 INCH O.D. SPLIT-SPOON SAMPLER.

CONSISTENCY OF CLAY AND CLAYEY SILT +

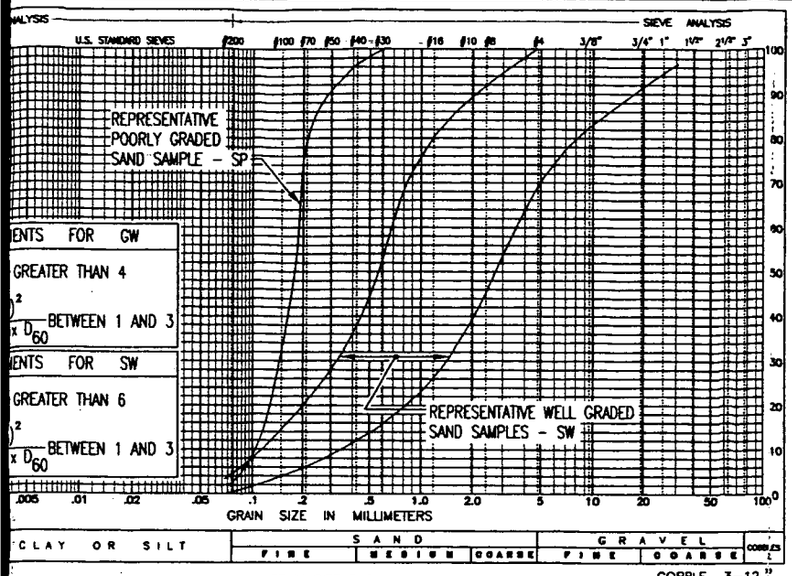
CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TSF)	IDENTIFICATION CHARACTERISTICS
SOFT	LESS THAN 0.5	EASILY REMOLDED WITH SLIGHT FINGER PRESSURE
MEDIUM	0.5 TO 1.0	REQUIRES SUBSTANTIAL PRESSURE FOR REMOLDING
STIFF	1.0 TO 4.0	DIFFICULT TO REMOLD WITH FINGERS
HARD	GREATER THAN 4.0	CANNOT BE REMOLDED WITH FINGERS

\+ NONPLASTIC SILTS ARE DESCRIBED USING DEGREE OF COMPACTION AS PRESENTED FOR NON-PLASTIC SOIL.

DESCRIPTION OF CONSTIT PERCENTAGES AS USED IN SAMPLE CLASSIFICATION

1% TO 12% - "TRACE"
13% TO 30% - "SOME"
31% TO 49% - ADJECTIVE SOIL GRO (EG. SAND
EQUAL AMOUNT - "AND" (EG. SAND

LABORATORY CLASSIFICATION CRITERIA

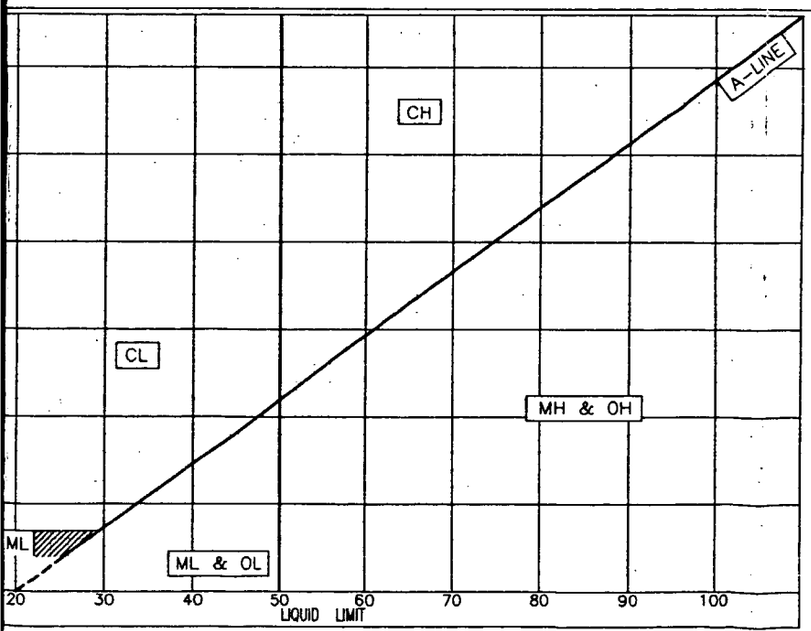


GRAIN SIZE PLOT

ENTS FOR GW	
GREATER THAN 4	
$\frac{(D_{30})^2}{D_{10} \times D_{60}}$	BETWEEN 1 AND 3
ENTS FOR SW	
GREATER THAN 6	
$\frac{(D_{30})^2}{D_{10} \times D_{60}}$	BETWEEN 1 AND 3

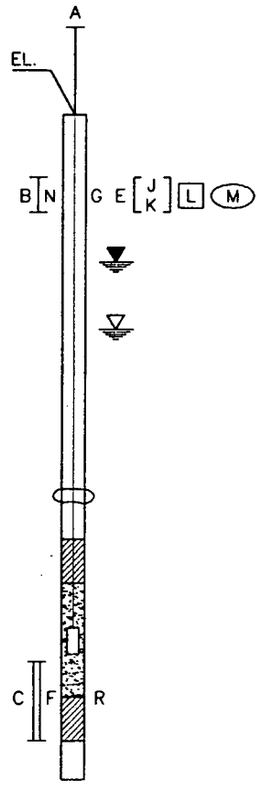
DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN NO. 200 SIEVE SIZE) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS:

LESS THAN 5%	GW, GP, SW, SP
MORE THAN 12%	GM, GC, SM, SC
5% TO 12%	BORDERLINE CASES REQUIRING USE OF DUAL SYMBOLS, I.E.: SP-SM, GP-GM.



PLASTICITY CHART FOR CLASSIFICATION OF FINE GRAINED SOILS

UENT SOIL NS	
FORM OF UP Y)	
AND GRAVEL)	



BORING LEGEND

A – NUMBER, TYPE AND LOCATION OF BORING

EL. – GROUND SURFACE ELEVATION AT BORING

B – NUMBER AND TYPE OF SAMPLE

- D – DRY SAMPLE TAKEN WITH 2 INCH O.D. SPLIT SPOON
- U – UNDISTURBED SAMPLE TAKEN WITH 3 INCH O.D. FIXED PISTON TYPE SAMPLER
- UD – UNDISTURBED SAMPLE EXTRUDED IN FIELD AND PLACED IN JAR DUE TO POOR RECOVERY OR DISTURBANCE
- S – THIN TUBE SAMPLE TAKEN WITH SHELBY TUBE SAMPLER
- W – WASH SAMPLE
- NR – NO RECOVERY

I – LENGTH OF SAMPLE ATTEMPT

N – STANDARD PENETRATION RESISTANCE. NUMBER OF BLOWS FROM 140 LB. HAMMER FREE FALLING 30 INCHES REQUIRED TO DRIVE 2 INCH O.D. SPLIT SPOON SAMPLER ONE FOOT AFTER INITIAL PENETRATION OF 6 INCHES, UNLESS A SPECIFIC PENETRATION IS INDICATED.

- P – PRESSED OR PUSH SAMPLE
- WH – SAMPLE TAKEN UNDER WEIGHT OF HAMMER AND RODS
- WR – SAMPLE TAKEN UNDER WEIGHT OF RODS

E – AVERAGE NATURAL WATER CONTENT OF SAMPLE, IN PERCENT OF DRY WEIGHT

G – UNIFIED SOIL CLASSIFICATON GROUP SYMBOL OF SAMPLE

[J / K] = ATTERBERG LIQUID LIMIT VALUE / ATTERBERG PLASTIC LIMIT VALUE

[L] – COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONFINED COMPRESSION TEST

(M) – COMPRESSIVE STRENGTH IN TSF DETERMINED FROM UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

▼ – GROUNDWATER LEVEL OBSERVED IN BORING
* – MUD LEVEL

▽ – GROUNDWATER LEVEL OBSERVED IN PIEZOMETER

C – ROCK CORE NUMBER

‖ – LENGTH OF CORE RUN

F – LENGTH OF CORE RECOVERED EXPRESSED AS A PERCENT OF THE LENGTH OF CORE RUN

R – ROCK QUALITY DESIGNATION–THE SUM OF THE LENGTHS OF PIECES OF RECOVERED CORE WHICH ARE EQUAL TO OR GREATER THAN FOUR INCHES IN LENGTH, EXPRESSED AS A PERCENTAGE OF THE TOTAL LENGTH OF CORE RUN. LENGTHS ARE MEASURED BETWEEN IN-SITU SEPARATIONS AND MECHANICAL BREAKS RESULTING FROM CORING ARE IGNORED.

▨ IMPERVIOUS SEAL

SAND FILTER SURROUNDING PIEZOMETER INTAKE ELEMENT

INTAKE ELEMENT

COBBLE OR BOULDER

REVISED – SEPTEMBER, 2001

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34TH STREET – 14 PENN PLAZA
NEW YORK, NY 10122

GEOTECHNICAL REFERENCE STANDARDS

DRAWING NO. GS–R

TABLE NO. 1

SUMMARY OF LABORATORY TEST DATA

SAMPLE IDENTIFICATION					CLASSIFICATION PROPERTIES								PHYSICAL PROPERTIES												
										UNIFIED SOIL CLASSIFICATION SYSTEM			STRENGTH						CONSOLIDATION						
BORING NUMBER	SAMPLE NUMBER	ELEVATION, FT.	STRATUM DESIGNATION	SOIL TYPE	AVERAGE NATURAL WATER CONTENT, W_n, %	LIQUID LIMIT, W_L, %	PLASTICITY INDEX, I_p, %	NATURAL WATER CONTENT OF LIMIT SAMPLE, W_n, %	SPECIFIC GRAVITY OF SOLIDS, G_s	GROUP SYMBOL	% SAND (< #4 > #200 SIEVE)	% FINES (< #200 SIEVE)	TYPE OF TEST	COMPRESSIVE STRENGTH (σ_1-σ_3), TSF	CONFINING PRESSURE σ_3, TSF	STRAIN AT FAILURE, %	NATURAL WATER CONTENT, W_n, %	WATER CONTENT AT END OF TEST, W_f, %	NATURAL WATER CONTENT, W_n, %	INITIAL VOID RATIO, e_o	EXISTING OVERBURDEN STRESS, P_o, TSF	ESTIMATED PRECONSOLIDATION STRESS, P_c, TSF	COMPRESSION INDEX, C_c	SWELLING INDEX, C_s	VOID RATIO AT START OF SWELL, e_r
B-1UP	9D	2.7	T2						2.98	SM	70	28													
	2U	-24.6	T1(D)		24								UU	7.27	2.22	15.8	23.9	23.9							
	3U	-33.6	T1(D)		27	43	21	27.5	2.73	CL									26.8	0.736	3.4	7.0	0.34	0.09	0.382
	5U	-45.6	T1(D)		49	70	34	45.6	2.66	CH			UU	3.45	2.79	4.0	46.3	46.2	46.2	1.270	3.5	8.5	0.74	0.15	0.631
	6U	-54.6	T1(D)		47								UU	3.35	3.04	4.1	47.2	46.9							
B-4U	1U	3.8	T1(A)		18	25	7	19.5		CL-ML			UU	2.23	0.78	7.2	18.7	18.9							
	2U	-25.7	T1(D)		23	30	10	23.3		CL															
	3U	-35.7	T1(D)		26	39	17	26.0		CL			UU	2.06	2.09	6.3	25.3	25.3							
	4U	-45.7	T1(D)		46	64	32	52.0	2.70	CH			UU	3.01	2.35	4.5	43.8	44.7							
	6U	-58.2	T1(D)		48	77	37	47.1	2.72	MH									47.3	1.360	3.4	9.5	0.75	0.16	0.685
W-7U	1U	10.0	T1(A)		17								UU	2.15	0.57	10.8	17.6	17.5							
W-12AU	1U	15.9	T1(A)		12	25.9	6	12.3		CL-ML			UU	4.40	0.47	2.4	12.9	13.4							
W-15U	1U	14.4	T1(A)		18	31	9	19.3		CL			UU	2.65	0.37	4.0	18.5	18.8							
W-18U	1U	11.9	T1(A)		18								UU	3.52	0.26	6.3	19.3	19.4							
	2U	5.9	T2		15					SM	56	44													

STRATA DESIGNATIONS

T1(A) - SANDY SILT

T2 - SILTY SAND

T1(D) - PLASTIC CLAY

NOTES

1. All tests summarized were performed in the laboratory of Mueser Rutledge Consulting Engineers.
2. The sample elevation is the average of the sampling interval.
3. Ground surface elevations at borings are:

BORING NO.	GROUND SURFACE ELEVATION
B-1UP	27.4
B-4UP	18.8
W-7U	21.0
W-12AU	24.9
W-15U	21.4
W-18U	16.9

4. "Average natural water content" is a weighted average of all material tested.
5. Strength tests performed were:

   UU - Unconsolidated Undrained Triaxial Compression

6. Strength tests were performed on a specimen 2.8 inches in diameter with a height to diameter ratio of approximately 2 at a rate of strain of approximately 1% per minute.
7. Confining pressure for UU and CU compression tests is equivalent to 80 percent of estimated vertical effective overburden stress, unless otherwise noted.
8. Compression Index, Cc = slope of the virgin compression portion of the e-log p curve.
9. Recompression Index, Cs = slope of the rebound portion of the e-log p curve.
10. Most probable preconsolidation stress, Pc is determined by the Casagrande method of construction.
11. Minimum preconsolidation stress, Pmin, is the pressure ordinate at the intersection of the extension of the virgin compression portion of the e-log P curve with the initial void ratio.

MUESER RUTLEDGE CONSULTING ENGINEERS
225 WEST 34TH STREET, NEW YORK, N.Y. 10122

WASHINGTON MONUMENT

WASHINGTON DC

APPENDIX A

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-1UP
SHEET 1 OF 4
FILE NO. 9726B
SURFACE ELEV. 27.4
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION: WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:20	1D	0.0	4-7	Brown fine to coarse sandy silt, trace			18	
03-05-02		2.0	4-5	vegetation (Fill) (ML)			17	
Tuesday	2D	2.0	4-4	Red brown fine sandy silt, trace clay, brick			21	
Clear		4.0	6-21	(Fill) (ML)	F		70	*Drilled ahead of
30°F	3D	4.0	4-5	Brown fine sandy silt & silty fine sand, trace		5		casing then drove
		6.0	5-9	gravel (Fill) (ML&SM)				casing.
	4D	6.0	10-10	White quartz gravel, some fine to coarse			10*	
		8.0	29-8	sand, trace silt (Fill) (GP)		8	83*	
	5D	8.0	4-4	Stiff brown clayey silt, some fine sand (ML)			37*	WC=24
		10.0	4-6			10	106*	
	6D	10.0	3-5	Brown fine sandy silt, trace clay (ML)			11*	pp=1.5 WC=19
		12.0	7-9				18*	
	1U	12.5	PUSH=23"	Do 6D (ML)			19*	pp>4.5, WC=19
		14.4	REC=22"				19*	
	7D	14.5	4-5	Brown fine sandy silt, trace clay (ML)	T1(A)	15	16*	WC=23
		16.0	9				40*	
							25*	
							26*	
							27*	
	8D	19.0	4-6	Do 7D (ML)		20	31*	WC=19
		20.5	6				34*	
							35*	
						22.5	30*	
							33*	
	9D	24.0	3-6	Brown silty fine to medium sand, trace clay,		25	34*	
		25.5	8	clay pockets, gravel (SM)	T2		49*	
							47*	
						28	35*	
							38*	
	10D	29.0	21-24	Brown fine to coarse sandy gravel, trace silt		30	40*	
		30.5	33	(GP-GM)			42*	
							82*	
							175*	
							230*	
	11D	34.0	30-19	Red brown fine to coarse sandy gravel,		35	67*	
14:30		35.5	30	some silt (GM)			95*	
15:30					T3		62*	
03-06-02							64*	
Wednesday							33*	Hard drilling, from
Clear	12D	39.0	100/6"-22	Do 11D (GM)		40	75*	39' - 44'.
50°F		40.5	30				104*	
							135*	
							210*	
							200*	
	13D	44.0	16-20	Brown gravelly fine to coarse sand, some		45	149*	Hard drilling from
		45.5	20	silt (SM)			145*	44'-46.5.
						46.5	71*	
							70*	
							72*	
	14D	49.0	2-4	Medium gray silty clay, trace gravel, fine to	T1(D)	50	USED	pp=0.7, WC=24
		50.5	4	medium sand pockets (CL)			REVERT	
							↓	

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-1UP
SHEET 2 OF 4
FILE NO. 9726B
SURFACE ELEV. 27.4
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
Cont'd							USED	
03-06-02	2U	51.0	PUSH=24"	Stiff gray silty clay, trace fine sand, gravel			REVERT	pp=1.3, TV=0.6
Wednesday		53.0	REC=10"	(CL)				WC=24
Clear	15D	53.0	1-4	Medium gray silty clay (CL)				pp=0.5, WC=23
50°F		54.5	5			55		
	16D	58.0	1-4	Stiff gray silty clay, some fine to medium				pp=1.1, WC=19
		59.5	4	sand, tr fine to medium sand pockets (CL)		60		
	3U	60.0	PUSH=24"	Stiff gray silty clay, some fine to medium				pp=1.5, TV=0.8
		62.0	REC=14"	sand, trace gravel (CL)				WC=28
	17D	63.0	2-2	Medium gray silty clay (CL)				pp=1.0, WC=30
		64.5	3			65		
					T1(D)			
	18D	68.0	2-3	Stiff gray silty clay, some fine sand layers,				pp=1.4, WC=42
		69.5	6	trace lignite seams (CL)		70		
	4NR	70.0	PUSH=24"	No recovery				
		72.0	REC=0"					
	5U	72.0	PUSH=24"	Stiff gray clay, trace fine sand (CH)				pp=2.8, TV=0.9
		74.0	REC=17"					WC=52
	19D	74.0	3-5	Stiff gray clay, some fine sand, trace fine		75		pp=2.2, WC=51
		75.5	7	sand seams (CH)				
	20D	79.0	3-4	Stiff gray clay, trace fine sand, fine sand		80		pp=2.1 WC=50
		80.5	6	seams (CH)				
	6U	81.0	PUSH=24"	Do 20D, trace gravel (CH)				pp=2.5, TV=1.1
		83.0	REC=23"					WC=47
							▽	21D Top pp=1.7
	21D	84.0	12-32	Top: Stiff gray silty clay, trace fine sand,	D	84.5		WC=43
14:30		85.5	54	fine sand seams, gravel (CL)		85.5		End of Boring at
				Bot 12": Gray gneiss fragments (GP)				85.5'.
								pp=Pocket
						90		Penetrometer
								Unconfined Compres-
								sive Strength in tsf.
								TV=Torvane Shear
						95		Strength in tsf.
								WC=Water Content
								in percent of dry
								weight.
						100		

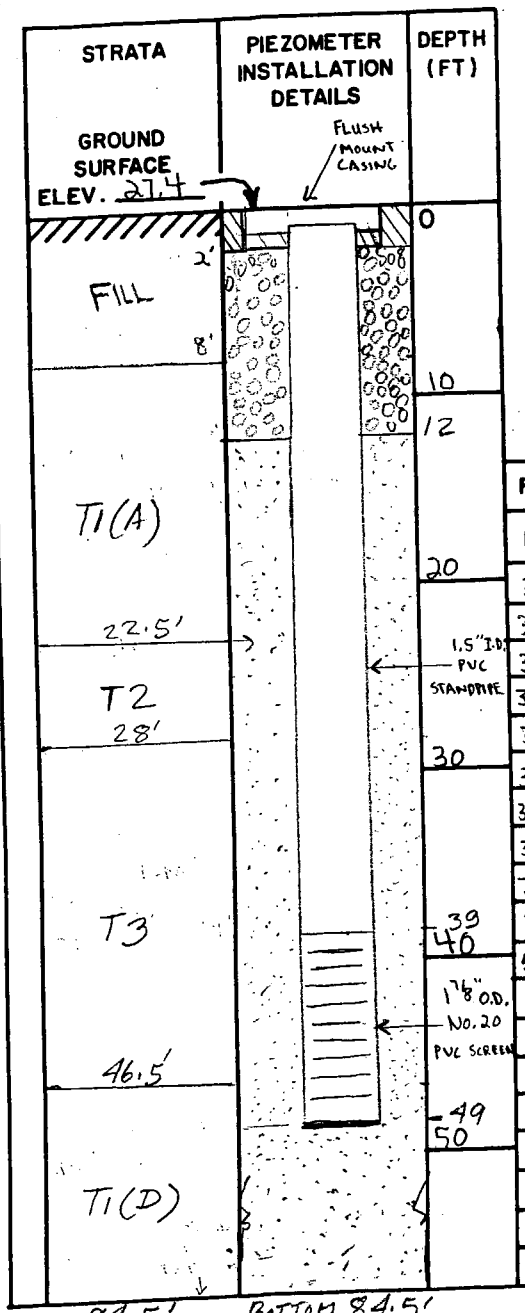
SHEET 3 OF 4
FILE NO. 9126B
SUBCODE

MUESER RUTLEDGE CONSULTING ENGINEERS

PIEZOMETER RECORD

PROJECT WASHINGTON MONUMENT VISITOR CENTER PIEZOMETER NO. B-1UP
LOCATION WASHINGTON D.C.
PIEZOMETER LOCATION
DATE OF INSTALLATION 3/1/02
☐ SEE SKETCH ON BACK
RES. ENG. M. WECKLER

PIEZOMETER TYPE SLOTTED PVC



INTAKE POINT

depth to bottom, ft = 84.5
depth to top, ft = 12.0
length, ft = 72.5 = L
diameter, in = 4 1/2 (3-7/8), ft = = 2R

STANDPIPE/RISER

elevation of rim, ft = 27.2
diameter, in = 1.5, ft = 0.125 = 2r

READING TIME		DEPTH - RIM TO WATER	ELEVATION OF WATER	REMARKS
DATE	CLOCK			
3/7/02	8:15	30.7	-3.5	FIRST READING
3/7/02	14:00	32.9	-5.7	
3/8/02	15:15	32.97	-5.8	1-DAY READING
3/11/02	6:45	33.02	-5.82	4-DAY READING
3/12/02	13:30	32.91	-5.71	5-DAY READING
3/13/02	14:30	32.89	-5.69	READING FOLLOWING .16 HR RAINFALL
3/14/02	13:30	32.89	-5.69	
3/15/02	6:15	32.89	-5.69	COORDINATED READING W/P2
3/15/02	13:00	32.85	-5.65	
3/16/02	8:00	32.89	-5.69	
5/15/02	8:06	33.4	-6.0	

GROUND SURFACE ELEV. 27.4

Sand Bentonite
Gravel Grout

PIEZOMETER NO. B-1UP

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-1UP
SHEET 4 **OF** 4
FILE NO. 9726B
SURFACE ELEV. 27.4
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO 49	
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER 3" SHELBY HEAD
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD REVERT

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

*CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-6-02	14:30	85.5	49	26.7	MUD LEVEL UPON COMPLETION.
3-7-02	5:30	85.5	49	33.7	OVERNIGHT READING IN BORING.

PIEZOMETER INSTALLED [X] YES [ ] NO SKETCH SHOWN ON SHEET 3 of 4

STANDPIPE:	TYPE	SCHEDULE 40 PVC	ID, IN.	1-1/2	LENGTH, FT. 38.8	TOP ELEV.	27.2
INTAKE ELEMENT:	TYPE	NO. 20 SLOTTED PVC	OD, IN.	1-7/8	LENGTH, FT. 10	TIP ELEV.	-21.6
FILTER:	MATERIAL	NO. 2 SAND	OD, IN.	4-1/2 & 3-7/8	LENGTH, FT. 72.5	BOT. ELEV.	-57.1

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	73.5	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.	12	NO. OF 3" UNDISTURBED SAMPLES	5
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS INSTALLED PIEZOMETER.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-4-02

BORING NO. B-1UP

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-2
SHEET 1 OF 2
FILE NO. 9726B
SURFACE ELEV. 23.5±
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:15	1D	0.0	5-6	Brown silty fine to coarse sand, some			16	Grass at surface.
03-11-02		2.0	10-16	gravel, trace brick, vegetation (Fill) (SM)			45	* Drilled ahead of
Monday	2D	2.0	16-69	Brown concrete fragments, some fine to	F		52	casing then drove
Clear		4.0	13-32	coarse sand (Fill)			67*	casing.
40°F	3D	4.0	6-7	Brown fine sandy silt, trace clay, clay seams		5	6*	WC=21
		6.0	6-8	(Fill) (ML)		6	7*	
	4D	6.0	6-8	Stiff brown clayey silt, some fine sand (ML)	T1(A)		12*	pp=3.5, WC=20
		8.0	11-11			8	19*	
	5D	8.0	5-10	Brown silty fine to medium sand, trace clay,	T2		21*	WC=16
		10.0	10-14	fine sandy silt pockets (SM)		10	20*	
	6D	10.0	5-8	Stiff brown silty clay, some fine to medium			9*	pp=2.2, WC=17
		12.0	8-11	sand, trace gravel, fine sand pockets (CL)			10*	
							13*	
					T1 (A)		13*	
	7D	14.0	4-5	Stiff brown clayey silt, some fine sand (ML)		15	14*	pp=2.3, WC=17
		15.5	7				30*	
							20*	
						18	31*	
							35*	
	8NR	19.0	5-10	No recovery		20	54*	
		20.5	8				65	
	9D	21.0	8-8	Brown fine to medium sand, some silt, trace	T2		124	
		22.5	5	gravel (SM)			119	Rig chatter from
						24	175*	24' to 42.5'.
	10D	24.0	23-29	Gray black fine to coarse sandy gravel,		25	100*	
		25.5	29	trace silt, silt pockets (GP-GM)			115*	
							173*	
							178*	
							178*	
	11D	29.0	17-22	Gray fine to coarse sandy gravel, trace silt		30	26*	
		30.5	25	(GP-GM)			34*	
							315*	
					T3		70*	pp=Pocket
							98*	Penetrometer
	12D	34.0	15-15	Top: Brown fine to coarse sand, some silt,		35	119*	Unconfined Compres-
		35.5	31	clay pockets, trace gravel, clay (SM-SC)			140*	sive Strength in tsf.
				Bot: Brown red brown gravelly fine to			200*	
				coarse sand, some silt, trace clay pockets			392*	WC=Water Content
				(SM)			USED	in percent of dry
	13NR	39.0	100/4"	No recovery		40	MUD	weight.
		39.3						
	14D	41.0	23-17	Brown gravelly fine to coarse sand, some				
		42.5	15	silt (SM)		42.5		REC=4" In second
								attempt.
	15D	44.0	4-4	Medium gray silty clay, trace fine sand (CL)		45		pp=1.0, WC=23
		45.5	5		T1(D)			
	16D	48.5	3-4	Medium gray silty clay, trace fine to coarse				pp=0.8, WC=21
14:00		50.0	6	sand pockets & layers, gravel (CL)		50		
								End of Boring at
								50'.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-2
SHEET 2 **OF** 2
FILE NO. 9726B
SURFACE ELEV. 23.5±
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO 40	
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD BENTONITE, QUIK - GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

* CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-11-02	14:00	50	40	23.2	MUD LEVEL UPON COMPLETION.
3-12-02	5:20	50	40	28.9	OVERNIGHT READING.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	50	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-12-02

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-3
SHEET 1 OF 2
FILE NO. 9726B
SURFACE ELEV. 24.1
RES. ENGR. OSCAR CARPIO

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:30	1D	0.0	4-8	Brown silty fine to medium sand, trace			15	Grass on top of
02-28-02		2.0	6-5	gravel, coarse sand, grass (Fill) (SM)			27	surface.
Thursday	2D	2.0	4-4	Brown fine to coarse sand, some silt,	F		29	
Clear		4.0	8-14	gravel, trace brick, vegetation (Fill) (SM)			USED	
20°F	3D	4.0	4-4	Brown gravelly fine to coarse sand, some		5	MUD	Possible wash.
		5.5	4	silt, trace shells, clay (Fill) (SM)		6		
	4D	7.0	4-8	Brown fine sandy silt, trace clay, clay				WC=17
		8.5	11	pockets, lignite (ML)				
	5D	9.0	5-6	Brown silty fine sand (SM)		10		
		10.5	8					
	6D	11.5	4	Brown gray fine sandy silt, trace clay, mica				WC=18
		13.0	5-6	(ML)				
					T1(A)			
	7D	14.0	4-6	Stiff brown fine sandy clay, trace mica (CL)		15		WC=20
		15.5	6					
	8D	19.0	4-4	Brown fine sandy silt, trace clay, gravel		20		WC=18
		20.5	8	(ML)				
						23		
	9D	24.0	7-21	Top: Brown silty fine sand, trace gravel,		25		
		25.5	27	coarse sand (SM)				
				Bot: Brown gravelly fine to coarse sand,				
				some silt (SM)				
10:30	10D	29.0	30-44	Brown fine to coarse sandy gravel, trace silt		30		
07:30		30.3	26/3"	(GP-GM)				
03-01-02								
Friday					T3			
Clear								
30°F	11D	34.0	53-32	Brown fine to medium sand, some silt,		35		
		35.4	15/5"	cemented sand, trace gravel, coarse sand				
				(SM)				pp=Pocket
								Penetrometer
								Unconfined Compres-
	12D	39.0	86-14/3"	Brown fine to coarse sandy gravel, trace silt		40		sive Strength in tsf.
		39.7		(GP-GM)				
								WC=Water Content
								in percent of dry
								weight.
	13D	44.0	23-18	Do 12D (GP-GM)		45		
		45.5	68					
						47		
	14D	48.5	5-5	Medium gray silty clay, trace gravel, fine to	T1(D)			pp=0.5, WC=21
13:00		50.0	5	coarse sand (CL)		50		End of Boring at
								50'.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-3
SHEET 2 **OF** 2
FILE NO. 9726B
SURFACE ELEV. 24.1
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO 39	
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD BENTONITE

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

* CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-1-02	13:30	50	39	17.4	MUD LEVEL UPON COMPLETION.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	50	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER OSCAR CARPIO DATE 3-1-02

BORING NO. B-3

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-4U
SHEET 2 OF 3
FILE NO. 9726B
SURFACE ELEV. 18.8
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS USED / REVERT	REMARKS
Cont'd								
03-08-02	17D	51.5	3-4	Medium gray silty clay, some fine to				pp=0.8, WC=20
Friday		53.0	4	medium sand, trace f-m sand pockets (CL)				
Clear	3U	53.5	PUSH=24"	Stiff gray silty clay, trace fine to medium				pp=1.3, TV=0.7
60°F		55.5	REC=23"	sand (CL)		55		WC=27
	18D	56.5	2-3	Medium gray silty clay, some fine sand (CL)				PP=0.8, WC=31
		58.0	4					
						60		
	19D	61.5	1-2	Stiff gray silty clay, trace fine sand (CL)				pp=1.0, WC=35
		63.0	4					
	4U	63.5	PUSH=24"	Stiff gray brown silty clay, some fine sand,				pp=2.8, WC=46
		65.5	REC=23"	trace gravel (CH)		65		
	20D	66.5	2-4	Stiff gray silty clay, some fine sand, trace	T1(D)			pp=1.5, WC=47
		68.0	5	lignite (CL)				
						70		
	21D	71.5	2-3	Stiff gray silty clay, some fine sand, trace				pp=0.9, WC=47
		73.0	5	lignite, fine sand seams (CL)				pp=1.5, TV=0.6
	5U	73.5	PUSH=24"	Stiff gray silty clay, trace fine sand (CL)				WC=40
		75.5	REC=6"			75		
	6U	76.0	PUSH=24"	Stiff gray silt, trace fine sand (MH)				pp=2.8, TV=1.0
		78.0	REC=22"					WC=49
	22D	78.0	5-6	Top: Stiff gray fine to medium sandy clay,				
		79.5	8	trace gravel, fine sand layers (CL)		80		22D Bot pp=1.0
				Bot: Stiff gray clay, trace fine sand, fine				WC=45
				sand pockets (CH)				
	23D	83.0	3-6	Top: Stiff gray clay (CH)				
		85.0	2-5	Bot: Gray micaceous silty fine to medium		85		23D Top pp=1.25
				sand, trace gravel, rock fragments, gray				WC=49
				silty clay pockets (SM)	D			
							▽	WC=13
13:15	24D	88.0	32-68/5"	Gray micaceous fine to medium sand, some				End of Boring at
		89.4		silt, trace rock fragments (Decomposed		89.4		89.5'.
				Rock) (SM)				
								pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						95		
								TV=Torvane Shear Strength in tsf.
						100		WC=Water Content in percent of dry weight.

BORING NO. B-4UP

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-4U
SHEET 1 OF 3
FILE NO. 9726B
SURFACE ELEV. 18.8
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:15	1D	0.0	4-6	Brown fine sandy silt, trace vegetation (Fill)	F		23	Grass at surface.
03-07-02		2.0	8-10	(ML)		2	72	
Thursday	2D	2.0	6-6	Brown fine sandy silt (ML)			62	WC=18
Clear		4.0	7-11				62	
60°F	3D	4.0	6-9	Stiff brown clayey silt, some fine sand (ML)		5	8	pp=3.25, WC=17
		6.0	12-15				20*	
	4D	6.0	8-9	Do 3D (ML)			16*	pp=0.5, WC=24
		8.0	14-15				17*	
	5D	8.0	6-10	Brown red brown fine sandy silt, trace clay			22*	pp=2.8, WC=18
		10.0	15-19	(ML)		10	23*	
	6D	10.0	7-9	Do 5D (ML)			12*	pp=3.75, WC=19
		12.0	11-14		T1(A)		13*	
	7D	12.5	4-7	Brown fine sandy silt, trace gravel, mica			18*	pp=1.5, WC=18
		14.0	10	(ML)			16*	
	1U	14.0	PUSH=24"	Brown fine sandy silt,trace clay, gravel (ML)		15	21*	pp=1.5, TV=0.4
		16.0	REC=11"				16*	WC=17
	8D	16.0	5-5	Brown fine sandy silt, trace clay, gravel			16*	pp=1.5, WC=19
		18.0	7	(ML)			19*	
						18.5	24*	*Drilled ahead of
	9D	19.0	5-5	Brown fine to medium sand, some silt (SM)	T2	20	30*	casing and then drove
		20.5	6				50*	casing.
						21.5	52*	
							167*	
							185*	
	10D	24.0	36-34	Brown fine to coarse sandy gravel, some		25	110*	
		25.5	30	silt (GM)			100*	
							93*	
							135*	
							115*	
	11D	29.0	17-14	Do 10D (GM)		30	75*	
		30.5	12		T3		75*	
	12D	31.0	23-23	Brown fine to coarse sandy gravel, some			79*	
		32.5	41	clay (GM-GC)			132*	
							180*	
	13D	34.0	100/6"	Brown fine to coarse sandy gravel, some		35		
		34.5		silt, trace clay (GM)				
							210*	
							374*	
							USED	
	14D	39.0	11-9	Brown fine to coarse sandy gravel, trace silt		40	REVERT	
		41.5	9	((GP-GM)				
	15D	41.5	3-4	Stiff gray silty clay, trace fine sand (CL)		41.5		pp=1.4, WC=23
		43.0	4					
	2U	43.5	PUSH=24"	Soft gray silty clay, trace fine sand, gravel				pp=0.4, WC=23
14:30		45.5	REC=6"	(CL)		45		
15:30	16D	46.5	2-3	Medium gray silty clay, trace fine sand, fine	T1(D)			pp=0.5, WC=22
03-08-02		48.0	3	sand pockets (CL)				
Friday								
Clear						50		
60°F								

BORING NO. B-4U

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-4U
SHEET 3 **OF** 3
FILE NO. 9726B
SURFACE ELEV. 18.8
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO	41.5
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER 3" SHELBY HEAD
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD REVERT

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

*CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-8-02	13:00	89.5	41.5	11.9	MUD LEVEL UPON COMPLETION.
3-11-02	5:30	89.5	41.5	22.6	MUD LEVEL AFTER WEEKEND.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	77.4	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.	12	NO. OF 3" UNDISTURBED SAMPLES	4
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

BORING NO. B-4U

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-5
SHEET 1 OF 2
FILE NO. 9726B
SURFACE ELEV. 25.0
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:00	1D	0.0	7-8	Brown silty fine to medium sand, trace			38	Grass at surface.
03-04-02		2.0	9-12	gravel, grass, clay (Fill) (SM)	F		67	
Monday	2D	2.0	33-40	Brown fine o medium sand, some silt, trace			72	REC=6"
Clear		3.3	27/3"	gravel, vegetation, shells, mica (Fill) (SM)		3.3	55	* Drilled ahead of
30°F	3D	4.0	7-5	Brown fine sandy silt, trace clay, lignite		5	11*	casing and then
		6.0	5-5	(ML)			12*	drove casing.
	4D	6.0	3-4	Do 3D (ML)			14*	WC=16
		8.0	4-4			8	15*	
	5D	8.0	5-8	Top 12": Stiff gry brn si cl, tr f-m sand (CL)			25*	5D top pp=3.7,
		10.0	12-18	Bot: Brown fine sandy silt, trace clay (ML)		10	26*	WC=18
	6D	10.0	8-9	Brown fine sandy silt, trace clay (ML)			16*	WC=16
		12.0	11-17		T1(A)		13*	
							10*	
							10*	
	7D	14.0	6-8	Gray silt, some fine sand, trace clay, clay		15	15*	pp=4.25, WC=18
		15.5	11	pockets (ML)			11*	
							12*	
							10*	
							11*	
	8D	19.0	6-6	Brown fine sandy silt, trace clay, clay		20	16*	WC=16
		20.5	7	pockets (ML)		21	14*	
							22*	
							23*	
							35*	
	9D	24.0	13-13	Reddish brown silty fine to medium sand,		25	51*	
		25.5	12	some gravel, trace coarse sand (SM)			39*	
							145*	
	10D	29.0	35-35	Brown fine to coarse sandy gravel, some	T3	30	USED	
		30.4	30/5"	silt (GM)			MUD	Rig chatter from
								31' to 34'.
	11D	34.0	50-37	Brown fine to coarse sandy gravel, trace		35		
		35.3	13/3"	silt, clay pockets (GP-GM)				Rig chatter from
								37' to 39'.
								Rig chatter from
	12D	39.0	100/6"	Brown fine to coarse sandy gravel, some		40		40' to 42'.
		39.5		silt (GM)				pp=Pocket
								Penetrometer
						43		Unconfined Compres-
								sive Strength in tsf.
	13D	44.0	17-17	Stiff gray silty clay (CL)		45		pp=1.4, WC=22
		45.5	9					
					T1(D)			WC=Water Content
								in percent of dry
	14D	48.5	3-2	Soft gray silty clay, trace fine sand (CL)				weight.
14:30		50.0	4			50		14D pp=0.3, WC=23
								End of boring at 50'.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-5
SHEET 2 **OF** 2
FILE NO. 9726B
SURFACE ELEV. 25.0
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED [X] YES [ ] NO			
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO	29
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD BENTONITE

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

* CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-4-02	14:20	50	29	11.4	MUD LEVEL UPON COMPLETION.
3-5-02	6:30	50	29	14.6	OVERNIGHT MUD LEVEL.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	50	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-5-02

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-6P
SHEET 1 OF 3
FILE NO. 9726B
SURFACE ELEV. 21.7
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:30	1D	0.0	3-4	Brown silty fine to medium sand, trace			14	Grass at surface.
03-14-02		2.0	5-5	brick, vegetation (Fill) (SM)			31	*Drilled ahead of
Overcast	2D	2.0	6-6	Brown silty fine sand, trace white rock	F		40	casing and then
Morning		4.0	10-12	fragments (Fill) (SM)			94	drove casing.
Clear	3D	4.0	7-8	Top: Brn f sandy silt, tr clay, veg (Fill) (ML)		5	PUSH	
Afternoon		6.0	8-9	Bot: Stiff brn cl silt, tr fine sand (ML)			17*	3D Bot: pp=3.5
60°F	4D	6.0	4-7	Brown fine sandy silt, trace clay (ML)			17*	WC=19
		8.0	9-13				16*	4D pp=4.0, WC=17
	5D	8.0	6-10	Brown red brown fine sandy silt, trace clay			17*	5D WC=15
		10.0	10-11	(ML)		10	21*	
	6D	10.0	3-5	Stiff brown red brown silty clay, some fine			17*	pp=2.8, WC=17
		12.0	7-8	sand (CL)			14*	
					T1(A)		14*	
							11*	
	7D	14.0	3-4	Stiff brown silty clay, trace fine sand (CL)		15	16*	pp=2.3, WC=18
		15.5	6				12*	
							8*	
							6*	
							5*	
	8D	19.0	3-2	Medium stiff brown clayey silt, some fine		20	7*	WC=18
		20.5	3	sand (ML)			8*	
						22	7*	
							18*	
					T2		18*	pp=Pocket
	9D	24.0	5-6	Brown silty fine to medium sand, trace		25	19*	Penetrometer
		25.5	10	gravel (SM)		25.5	37*	Unconfined Compres-
							51*	sive Strength in tsf.
							138*	
							266*	WC=Water Content
	10D	29.0	20-18	Brown coarse to fine sandy gravel, some		30	87/6"	in percent of dry
		30.5	37	silt (GM)			USED	weight.
							MUD	
	11D	34.0	21-18	Gray white brown coarse to fine sandy	T3	35		
		35.5	16	gravel, some silt, trace black rock				
				fragments (GM)				
								Rig chatter at 25.7'
	12D	39.0	24-23	Brown coarse to fine sand, some gravel, silt		40		to 39'.
		40.5	22	(SM)				
						43		
	13D	44.0	2-4	Stiff gray silty clay, trace fine sand, lignite,		45		pp=1.0, WC=23
		45.5	4	gravel (CL)				
					T1(D)			
	14D	48.5	2-2	Medium gray silty clay, some fine sand (CL)				pp=0.7, WC=20
13:00		50.0	3			50		
								End of Boring at
								50'.

BORING NO. B-6P

SHEET 2 OF 3
FILE NO. 9726B
SUBCODE

MUESER RUTLEDGE CONSULTING ENGINEERS

PIEZOMETER RECORD

PROJECT WASHINGTON MONUMENT VISITOR CENTER PIEZOMETER NO. B-6P

LOCATION WASHINGTON D.C.

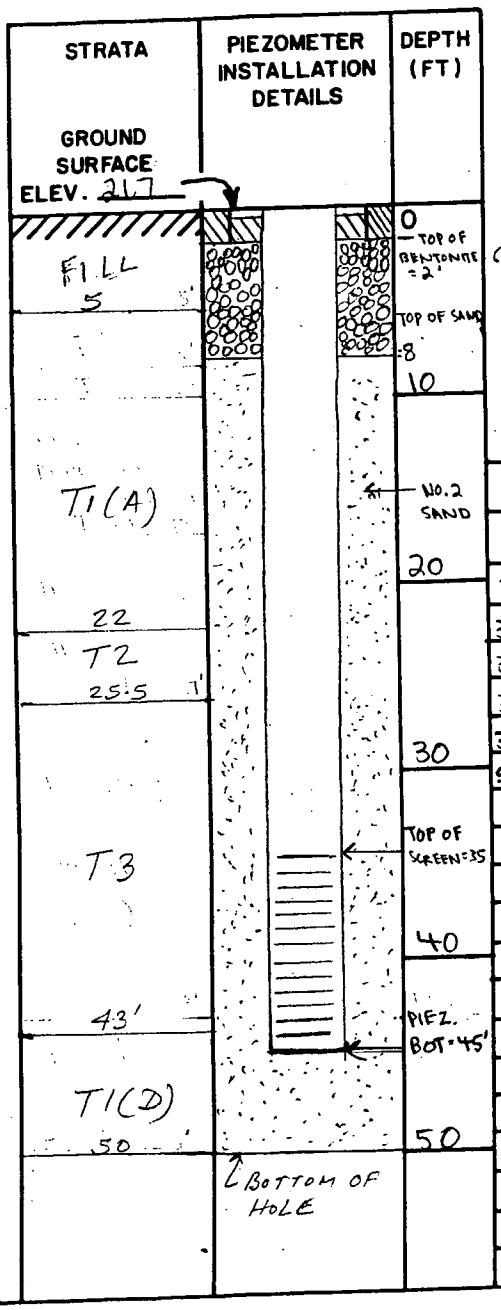
PIEZOMETER LOCATION

DATE OF INSTALLATION 3/14/02

☐ SEE SKETCH ON BACK

RES. ENG. M. WECKLER

PIEZOMETER TYPE SLOTTED PVC



INTAKE POINT

depth to bottom, ft = 50

depth to top, ft = 8

length, ft = 42 = L

diameter, in = 4½ & 3-7/8, ft = _____ = 2R

STANDPIPE/RISER

elevation of rim, ft = 21.5

diameter, in = 1½, ft = 0.125 = 2r

READING TIME		DEPTH – RIM TO WATER	ELEVATION OF WATER	REMARKS
DATE	CLOCK			
3/14/02	14:15	4.00	17.5	INITIAL READING
3/15/02	6:15	27.15	-5.65	OVERNIGHT READING
3/15/02	12:43	27.15	-5.65	~24 HR READING
3/15/02	12:50	27.15	-5.65	READING AFTER RISING HEAD TEST
3/16/02	8:00	27.15	-5.65	
5/15/02	7:50	27.8	-6.1	

Sand Bentonite

Gravel Grout

GROUND SURFACE ELEV. 21.7

PIEZOMETER NO. B-6P

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-6P
SHEET 3 **OF** 3
FILE NO. 9726B
SURFACE ELEV. 21.7
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO	29.5
SKID		HYDRAULIC		DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD REVERT

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

* CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-14-02	13:10	50	29	2.2	MUD LEVEL UPON COMPLETION.

PIEZOMETER INSTALLED [X] YES [ ] NO SKETCH SHOWN ON SHEET 2 OF 3

STANDPIPE:	TYPE	SCHEDULE 40 PVC	ID, IN.	1-1/2	LENGTH, FT. 34.8	TOP ELEV.	21.5
INTAKE ELEMENT:	TYPE	NO. 20 SLOTTED PVC	OD, IN.	1-7/8	LENGTH, FT. 10	TIP ELEV.	-23.3
FILTER:	MATERIAL	NO. 2 SAND	OD, IN.	4-1/2 & 3-7/8	LENGTH, FT. 42	BOT. ELEV.	-28.3

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	50	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS PIEZOMETER INSTALLED.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-14-02

BORING NO. B-6P

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. B-7
SHEET 1 OF 2
FILE NO. 9726B
SURFACE ELEV. 19.8
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT VISITOR CENTER
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:00	1D	0.0	3-4	Brown silty fine to medium sand, some	F		13	
03-12-02		2.0	5-5	gravel, trace coarse sand, vegetation (Fill)		2	23	
Tuesday	2D	2.0	5-4	Stiff brown fine sandy silt, trace clay (ML)			25	pp=3.8, WC=16
Overcast		4.0	8-11				65*	
50°F	3D	4.0	6-9	Brown silty clay, some fine sand, trace		5		
		6.0	9-11	gravel (CL)			5*	
	4D	6.0	5-7	Very stiff brown clayey silt, some fine sand			25*	pp=2.9, WC=19
		8.0	10-10	(ML)			21*	
	5D	8.0	5-7	Do 4D, trace gray clay pockets (ML)			23*	pp=3.3, WC=19
		10.0	11-15		T1(A)	10	25*	
	6NR	10.0	8-9	No recovery			20*	
		12.0	11-15				22*	
	7D	12.0	7-6	Brown fine sandy silt, trace clay, clay			17*	WC=17
		14.0	8-32	pockets, gravel (ML)			18*	
	8D	14.0	6-6	Brown fine sandy silt, trace clay, gravel		15	14*	WC=19
		15.5	9	(ML)			85*	*Drilled ahead of
						16.5	67*	casing and then
							74*	drove casing.
							120*	
	9D	19.0	16-19	Gray black brown fine to coarse sandy		20	117*	
		20.5	27	gravel, some silt (GM)			240*	
							410*	Possible boulder
	10NR	23.0	100/1"	No recovery			340*	from 23' to 24'.
13:00		23.1					570*	
11:00	1C	23.1	REC=42%	Gray hard gneiss; boulder		25	225*	
03-13-02		24.0			T3		52*	
Wednesday	11D	24.0	23-25	Brown fine to coarse sandy gravel, some			40*	
Rain		25.5	21	silt (GM)			145*	
Overnight							132*	
	12D	29.0	29-29	Brown gravelly coarse to fine sand, some		30	188*	
		30.5	30	silt (SM)			132*	
							125*	pp=Pocket
							114*	Penetrometer
							108*	Unconfined Compres-
	13D	34.0	45-55/5"	Gray brown coarse to fine sandy gravel,		35	110*	sive Strength in tsf.
		34.9		some silt (GM)			117*	
							210*	WC=Water Content
						38	287*	in percent of dry
							270*	weight.
	14D	39.0	8-6	Soft gray silty clay, some gravel, fine sand		40	250*	pp=0.4, WC=19
14:30		40.5	6	(CL)			USED	
17:30							MUD	
03-14-02								
Thursday					T1(D)			
Overcast	15D	44.0	3-4	Soft gray silty clay, trace fine sand (CL)		45		pp=0.4, WC=23
Morning		45.5	4					
50°F								
	16D	48.5	2-2	Medium gray silty clay, trace fine sand (CL)				WC=22
18:45		50.0	4			50		End of Boring at 50'.

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. B-7
SHEET 2 **OF** 2
FILE NO. 9726B
SURFACE ELEV. 19.8
DATUM NGSD

PROJECT WASHINGTON MONUMENT VISITOR CENTER
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[X] YES [ ] NO		
TRUCK	CME-55	MECHANICAL		DIA., IN 4	DEPTH, FT. FROM 0	TO	39
SKID		HYDRAULIC	X	DIA., IN.	DEPTH, FT. FROM	TO	
BARGE		OTHER		DIA., IN.	DEPTH, FT. FROM	TO	
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL NX DOUBLE TUBE
CORE BIT NX DIAMOND
DRILL RODS AW

DRILLING MUD USED [X] YES [ ] NO
DIAMETER OF ROTARY BIT, IN. 3-7/8
TYPE OF DRILLING MUD BENTONITE, QUIK - GEL

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN.

* CASING HAMMER, LBS. 140 AVERAGE FALL, IN. 30
*SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

*MECHANICAL HAMMER USED.

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
3-13-02	9:00	23	23	6	OVERNIGHT READING.
3-13-02	14:25	40.5	39	4.6	END OF DAY READING.
3-14-02	15:20	40.5	39	5	OVERNIGHT READING.
3-14-02	16:15	50	39	5.3	MUD LEVEL UPON COMPLETION.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	49.1	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN BOULDER	LIN. FT.	0.9	OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER STEVE WINGET HELPERS JOHN PERSINGER
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-14-02

BORING NO. B-7

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-1
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 21.6
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:00	1D	0.0	3-28	Top: Brn f-c sand, sm silt, tr veg (Fill) (SM)			AUGER	Grass at surface.
03-07-02		2.0	41-11	Bot 6": Gray gravel, sm f-m sand (Fill) (GP)	F			
Thursday	2D	2.0	12-20	Brown fine sandy silt, trace clay, vegetation				WC=19
Clear		4.0	9-6	(Fill) (ML)		4		
60°F	3D	4.0	4-6	Brown fine sandy silt, trace clay (ML)		5		WC=17
		6.0	10-13					
	4D	6.0	5-9	Do 3D (ML)				WC=18
		8.0	13-16		T1(A)			
	5D	8.0	7-11	Do 3D (ML)				WC=20
		10.0	14-16			10		
	6D	10.0	7-9	Do 3D (ML)				pp=3.2 WC=20
07:45		12.0	13-17			12		
								End of Boring at 12'.
						15		
								pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						20		
								WC=Water Content in percent of dry weight.
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-1
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 21.6
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK CME-45
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED [ ] YES [X] NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	12	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

BORING NO. W-1

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-2
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 24.0
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:50	1D	0.0	4-6	Brown silty clay, sm f sand layers, tr brick,			AUGER	Grass at surface.
03-07-02		2.0	6-7	concrete, cinders, veg (Fill) (CL)				
Thursday	2D	2.0	4-3	Brown silty fine sand, some fine sandy clay				
Clear		4.0	4-9	layers, trace gravel, brick (Fill) (SM)	F			
60°F	3D	4.0	4-5	Brown silty fine to medium sand, trace clay,		5		WC=15
		6.0	6-8	gravel (Fill) (SM-SC)		6		
	4D	6.0	4-5	Stiff brown fine sandy clay (CL)				pp=1.8, WC=18
		8.0	5-9					
	5D	8.0	6-8	Brown fine sandy silt, trace clay, gravel				pp=1.3, WC=17
		10.0	10-11	(ML)	T1(A)	10		
	6D	10.0	6-9	Brown fine sandy silt, trace clay (ML)				WC=18
08:15		12.0	11-13			12		End of Boring at 12'.
								pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						15		
								WC=Water Content in percent of dry weight.
						20		
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-2
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 24.0
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK CME-45
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED [ ] YES [X] NO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO
DIA., IN. DEPTH, FT. FROM TO

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	12	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

BORING NO. W-2

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-3
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 19.5
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
08:55	1D	0.0	4-9	Brown silty f-m sand, some gravel, trace			AUGER	Grass at surface.
03-07-02		2.0	11-9	brick, clay layers, vegetation (Fill) (SM)				
Thursday	2D	2.0	4-6	Brown fine sandy silt, trace clay, brick (Fill)	F			WC=17
Clear		4.0	5-8	(ML)				
60°F	3D	4.0	6-4	Brown fine sandy silt, trace clay, clay		5		WC=18
		6.0	5-5	pockets, gravel (Fill) (ML)		6		
	4D	6.0	4-6	Brown fine to medium sandy silt, trace clay,				WC=15
		8.0	9-11	coarse sand, gravel (ML)	T1 (A)	8		
	5D	8.0	7-6	Brown silty fine sand, trace clay (SM-SC)				
		10.0	7-10			10	∀	
	6D	10.0	7-7	Do 5D, trace gravel (SM-SC)	T2			WC=15
09:25		12.0	8-10			12		End of Boring at 12'.
								WC=Water Content in percent of dry weight.
						15		
						20		
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-3
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 19.5
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK CME-45
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED [ ] YES [X] NO
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. ____ AVERAGE FALL, IN. ____
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ____ ID, IN. ____ LENGTH, FT. ____ TOP ELEV. ____
INTAKE ELEMENT: TYPE ____ OD, IN. ____ LENGTH, FT. ____ TIP ELEV. ____
FILTER: MATERIAL ____ OD, IN. ____ LENGTH, FT. ____ BOT. ELEV. ____

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 12
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.

NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

BORING NO. W-3

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-4
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 14.6
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
09:35	1D	0.0	3-6	Brown silty fine sand, trace clay, gravel,			AUGER	Grass at surface.
03-07-02		2.0	6-8	clay layers, vegetation (Fill) (SM-SC)	F			
Thursday	2D	2.0	4-4	Brown silty fine sand, trace clay, brick (Fill)				
Clear		4.0	5-5	(SM-SC)		4		
60°F	3D	4.0	5-4	Brown silty fine sand, trace clay, clay layers	T2	5		
		6.0	4-5	(SM-SC)		6		
	4D	6.0	4-3	Brown fine sandy silt, trace clay, fine sand	T1(A)			WC=16
		8.0	4-8	lenses (ML)		8		
	5D	8.0	6-5	Brown silty fine sand, trace clay, clay seams				
		10.0	4-5	(SM)	T2	10	▼	
	6D	10.0	4-3	Brown fine sand, some silt, trace clay				End of Boring at
10:30		12.0	3-4	pockets (SM)		12		12'.
						15		WC=Water Content in percent of dry weight.
						20		
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-4
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 14.6
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK CME-45
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED [ ] YES [X] NO
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [ ] YES [X] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. ____ AVERAGE FALL, IN. ____
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ____ ID, IN. ____ LENGTH, FT. ____ TOP ELEV. ____
INTAKE ELEMENT: TYPE ____ OD, IN. ____ LENGTH, FT. ____ TIP ELEV. ____
FILTER: MATERIAL ____ OD, IN. ____ LENGTH, FT. ____ BOT. ELEV. ____

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 12
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.

NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

BORING NO. W-4

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-5
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 15.4
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
10:30	1D	0.0	3-8	Brn silty fine sand, sm fine sandy clay			AUGER	Grass at surface.
03-07-02		2.0	8-9	pockets, tr clay, brick, gvl (Fill) (SM-SC)				
Thursday	2D	2.0	3-6	Brown fine sandy clay, tr cinders (Fill) (CL)				
Clear		4.0	8-9					
60°F	3D	4.0	4-27	Brown silty clay, some fine sand, trace		5		pp=3.5, WC=20
		6.0	12-9	gravel, roots (Fill) (CL)				
	4D	6.0	4-5	Brown silty f sand, trace clay, clay pockets,				
		8.0	6-6	brick, lignite (Fill) (SM)	F			
	5D	8.0	3-4	Top: Brn si f sand, sm cl pkts, brk (Fill) (SM)				
		10.0	5-6	Bot 6': Brn f-m sand, sm silt (Fill) (SM)		10		
	6D	10.0	4-3	Brown silty fine sand, trace clay pockets,				Sample moist at bottom 6".
		12.0	3-5	brick, gravel (Fill) (SM)				End of Boring at 12'.
	7D	12.0	3-2	Brown silty fine sand, some fine sandy clay				
		14.0	3-3	pockets, trace brick, gravel (Fill) (SM&CL)				
	8D	14.0	2-2	Brown fine to medium sand, some silt, trace		15		
11:15		16.0	4-3	brick, clay pockets, gravel (Fill) (SM)		16		pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						20		WC=Water Content in percent of dry weight.
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-5
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 15.4
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG
TRUCK CME-45
SKID
BARGE
OTHER

TYPE OF FEED DURING CORING
MECHANICAL
HYDRAULIC
OTHER

CASING USED [ ] YES [X] NO
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____
DIA., IN. ____ DEPTH, FT. FROM ____ TO ____

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. ____ AVERAGE FALL, IN. ____
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ____ ID, IN. ____ LENGTH, FT. ____ TOP ELEV. ____
INTAKE ELEMENT: TYPE ____ OD, IN. ____ LENGTH, FT. ____ TIP ELEV. ____
FILTER: MATERIAL ____ OD, IN. ____ LENGTH, FT. ____ BOT. ELEV. ____

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING LIN. FT. 16
3.5" DIA. U-SAMPLE BORING LIN. FT.
CORE DRILLING IN ROCK LIN. FT.

NO. OF 3" SHELBY TUBE SAMPLES
NO. OF 3" UNDISTURBED SAMPLES
OTHER:

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-7-02

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-6
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 21.9
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
06:30	1D	0.0	7-10	Brown silty f-c sand, some gravel, trace			AUGER	Grass at surface.
03-07-02		2.0	26-14	clay, vegetation (Fill) (SM)				
Thursday	2D	2.0	15-16	Brown gravelly f-c sand, some silt, trace				
Clear		4.0	14-17	clay pkts, brick (Fill) (SM)				
60°F	3D	4.0	14-8	Brown fine to coarse sand, some gravel,		5		
		6.0	4-6	silt, trace cinders (Fill) (SM)	F			
	4D	6.0	5-4	Int brn f-m sand, sm silt, gvl, tr clay pkts,				
		8.0	5-8	brk & blk f sandy silt, tr cl (Fill) (SM&ML)				
	5D	8.0	5-6	Brown silty fine sand, some clay pockets,				
		10.0	7-9	trace gravel (Fill) (SM)		10		
	6D	10.0	7-6	Brown silty fine sand, some clay layers,				End of Boring at
07:00		12.0	7-8	trace gravel, clay (Fill) (SM-SC)		12		12'.
						15		
						20		
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-6
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 21.9
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED	[ ] YES [X] NO		
TRUCK	CME-45	MECHANICAL		DIA., IN.		DEPTH, FT. FROM	TO
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM	TO
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM	TO
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 6"

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	12	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.		NO. OF 3" UNDISTURBED SAMPLES	
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-8-02

BORING NO. W-6

MUESER RUTLEDGE CONSULTING ENGINEERS
BORING LOG

BORING NO. W-7U
SHEET 1 OF 2
FILE NO. 9726A
SURFACE ELEV. 21.0
RES. ENGR. MICHAEL WECKLER

PROJECT: WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION : WASHINGTON, D.C.

DAILY PROGRESS	SAMPLE NO.	SAMPLE DEPTH	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	STRATA	DEPTH	CASING BLOWS	REMARKS
07:10	1D	0.0	4-12	Brown f-c sand, some silt, gravel, trace			AUGER	Grass at surface.
03-07-02		2.0	18-22	brick, vegetation (Fill) (SM)				
Thursday	2D	2.0	8-11	Brn f-m sand, sm gravel, silt, fine sandy clay				
Clear		4.0	10-14	pockets, trace clay (Fill) (SM-SC)				
60°F	3D	4.0	7-8	Brown f-m sand, sm cinders, silt, trace		5		
		6.0	8-12	brick, gravel, mica, clay pkts (Fill) (SM)	F			
	4D	6.0	7-9	Brown red brn f-m sand, sm gravel, silt, tr				
		8.0	10-18	cinders, brick, clay (Fill) (SM)				
	5D	8.0	11-15	Brn red brn silty f-c sand, sm gravel, clay				
		10.0	14-9	pockets, trace brick, cinders (Fill) (SM)		10	▽	1U Top pp=3.0
	1U	10.0	PUSH=24"	Top: Brn f-c sandy silt, some gravel, trace		11		WC=13
08:00		12.0	REC=19"	clay (Fill) (ML)	T1A	12		1U Bot pp=2.0
				Bot: Stiff brn clayey silt, sm f sand, tr				TV=0.7, WC=21
				gravel (ML)				
						15		End of Boring at 12'.
								pp=Pocket Penetrometer Unconfined Compressive Strength in tsf.
						20		
								TV=Torvane Shear Strength in tsf.
								WC=Water Content in percent of dry weight.
						25		
						30		
						35		
						40		
						45		
						50		

MUESER RUTLEDGE CONSULTING ENGINEERS

BORING NO. W-7U
SHEET 2 **OF** 2
FILE NO. 9726A
SURFACE ELEV. 21.0
DATUM NGSD

PROJECT WASHINGTON MONUMENT GROUND IMPROVEMENTS
LOCATION WASHINGTON, D.C.
BORING LOCATION SEE BORING LOCATION PLAN

BORING EQUIPMENT AND METHODS OF STABILIZING BOREHOLE

TYPE OF BORING RIG		TYPE OF FEED DURING CORING		CASING USED [ ] YES [X] NO			
TRUCK	CME-45	MECHANICAL		DIA., IN.		DEPTH, FT. FROM	TO
SKID		HYDRAULIC		DIA., IN.		DEPTH, FT. FROM	TO
BARGE		OTHER		DIA., IN.		DEPTH, FT. FROM	TO
OTHER							

TYPE AND SIZE OF:
D-SAMPLER 2" O.D. SPLIT SPOON
U-SAMPLER 3" SHELBY HEAD
S-SAMPLER
CORE BARREL
CORE BIT
DRILL RODS AW

DRILLING MUD USED [ ] YES [X] NO
DIAMETER OF ROTARY BIT, IN.
TYPE OF DRILLING MUD

AUGER USED [X] YES [ ] NO
TYPE AND DIAMETER, IN. HOLLOW STEM O.D. 7.5"

CASING HAMMER, LBS. AVERAGE FALL, IN.
SAMPLER HAMMER, LBS. 140 AVERAGE FALL, IN. 30

WATER LEVEL OBSERVATIONS IN BOREHOLE

DATE	TIME	DEPTH OF HOLE (FEET)	DEPTH OF CASING (FEET)	DEPTH TO WATER (FEET)	CONDITIONS OF OBSERVATION
					NO OBSERVATIONS MADE.

PIEZOMETER INSTALLED [ ] YES [X] NO SKETCH SHOWN ON

STANDPIPE: TYPE ID, IN. LENGTH, FT. TOP ELEV.
INTAKE ELEMENT: TYPE OD, IN. LENGTH, FT. TIP ELEV.
FILTER: MATERIAL OD, IN. LENGTH, FT. BOT. ELEV.

PAY QUANTITIES

3.5" DIA. DRY SAMPLE BORING	LIN. FT.	10	NO. OF 3" SHELBY TUBE SAMPLES	
3.5" DIA. U-SAMPLE BORING	LIN. FT.	2	NO. OF 3" UNDISTURBED SAMPLES	1
CORE DRILLING IN ROCK	LIN. FT.		OTHER:	

BORING CONTRACTOR GEOSERVICES CORP.
DRILLER RONALD STIDHAM HELPERS BILLY LUTTRELL
REMARKS BOREHOLE WAS GROUTED UPON COMPLETION.
RESIDENT ENGINEER MICHAEL WECKLER DATE 3-8-02

BORING NO. W-7U