

**Geotechnical Engineering Study, North
Gate at Falls Church, Falls Church,
Virginia (DWK Contract Number
07041.D)**

D. W. KOZERA, INC.
PROFESSIONAL ENGINEERS & GEOLOGISTS

June 11, 2007

The Hekemian and Company, Inc.
410 Severn Avenue, Suite 405
Annapolis, MD 21403

Attn: Mr. Christopher P. Bell, Senior Vice President

Subject: Geotechnical Engineering Study, North Gate at Falls Church, Falls Church, Virginia (DWK Contract Number 07041.D)

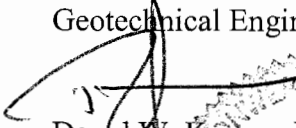
Dear Mr. Bell:

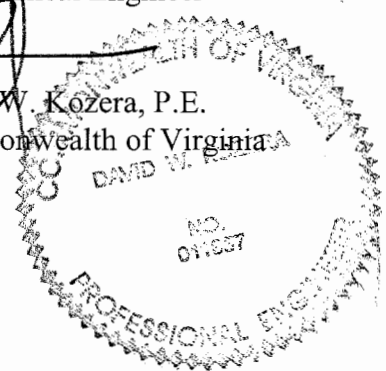
We understand the proposed project consists a four-level residential apartment above an at grade retail level with two levels of below ground parking. This report presents the findings of our geotechnical engineering study and the foundation recommendations for the proposed structure. This geotechnical engineering study was prepared in accordance with our contract dated March 6, 2007.

We appreciate the opportunity to be of service to you on this project. Please feel free to contact us if you have any questions concerning this report.

Very truly yours,
D.W. KOZERA, INC.


Gnana Gunaratnam
Geotechnical Engineer


David W. Kozera, P.E.
Commonwealth of Virginia



cc: SK&A Structural Engineers, PLLC
Attn: Mr. William McLain, P.E.
Email: williamm@skaengineers.com

COMPREHENSIVE GEOTECHNICAL ENGINEERING INVESTIGATION

North Gate at Falls Church
Falls Church, Virginia
DWK Contract Number 07041.D

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EXECUTIVE SUMMARY

The following summary table highlights the important subsurface issues and refers to the appropriate section for more detail.

<u>Topic/Section</u>	<u>Summary</u>
Subsurface Conditions - 3.0	The site is partially covered by a thin layer of surface fill underlain by the residual soils. The residual soils were derived from the weathering of underlying bedrock. The density of the residual soil varies from loose to medium near the surface and becomes increasingly denser with depth.
Groundwater - 3.4	Groundwater was encountered in all of the test borings at approximately EL +289 to EL+301. The water table is expected to fluctuate slightly depending on the amount of precipitation.
Foundation System - 4.2	Spread footings on natural residual soils below EL +285 designed for an allowable bearing pressure of 5 ksf.
Floor Slab - 4.3	Floor slab supported on natural soil or newly compacted fill soils designed for a subgrade modulus of $k=100$ pci.
Excavation Support- 4.6 & 5.4	A free draining excavation support system utilizing soldier piles and tiebacks or rakers can be used for temporary excavation support.
Excavation Subgrade-4.7	Conventional excavation techniques are expected to be suitable. However, hard excavation and ripping into disintegrated rock will be required in the northwest portion of the site.
Subdrainage - 4.3&4.5	A vertical and horizontal subdrainage system will be required behind the below grade building walls and under the parking garage. Redundant sump pumps will be required to ensure continuous operation if the system cannot be drained by gravity.

Construction
Considerations -
5.1, & 5.4, 4.7, &
4.8

Installation of a dewatering system during construction will be required to allow excavation to basement grade.

Footings may need to be undercut if soft residual soils are encountered at footing subgrade. Softening of the underlying soils due to ground or surface water may necessitate the use of "mud-mats" placed immediately upon excavation.

A preconstruction survey of the adjacent buildings should be performed prior to excavation and dewatering.

Monitoring wells near adjacent structures to measure drawdown during dewatering.

Reuse of On-Site
Soils - 4.4

The majority of the on-site cut soils will be available for reuse as compacted fill. Some moderately Plastic Clay soils are expected to be encountered and can be placed below the upper three-feet in nonstructural fills.

1.0 SITE AND PROJECT DESCRIPTION

The project site is located at 472 N. Washington Street at the intersection of N. Washington Street and E. Jefferson Street in Falls Church, Virginia. The site is bounded by private properties to the east and south which consists of single-story residences and commercial properties. The site was used as a funeral home in the past and currently consists of several single and two-story buildings and paved parking areas. We understand that these structures will be demolished to allow the proposed construction.

The topography of the site is such that the site generally slopes up from EL+ 304 in the east side to EL+318 in the west side. The southern portion of the site, which houses a single family house, is at approximately EL+310. The parking area and the funeral home in the northern portion of the site slopes up from EL+304 near the N. Washington Street in the east side to EL+318 in the west side.

The proposed development includes four levels of residential levels above one level of retail and two levels of underground parking. A residential court yard is planned at El +323 on top of the retail area. The lower level parking grade will vary from EL+280 to EL+283.

The proposed floor elevations will require cuts of 24 to 33 feet within the building area. The maximum column load for the proposed building is expected to be 1110 kips.

2.0 OBJECTIVE AND SCOPE

The objective of this study was to evaluate the project site's subsurface conditions, based on the test borings performed and available geologic data.

In order to evaluate the subsurface conditions at the site, we performed 8 soil borings. The drilling was performed by GeoServices Corporation, Inc. We used this information to develop subsurface profiles and our analysis for the recommendations of the building foundation and excavation support system. The test boring data from this study is included in Appendix A. Based on our evaluation of this subsurface data, we prepared this geotechnical report which includes the following:

- a. Review of our test procedures and the results of all testing conducted.
- b. Description of site geologic and groundwater conditions.
- c. Presentation of subsurface soil stratigraphy with pertinent available physical properties.
- d. Recommended geotechnical design parameters including soil strength, density and compressibility as applicable.
- e. Recommendations for a shallow foundation system including allowable soil bearing pressure, anticipated settlements and embedment depth for frost.
- f. Soil improvement techniques to be used for support of foundations, floor slabs and pavements. These may include lime/cement stabilization, soil grouting, aggregate piers, geogrid reinforcement and surcharging techniques.
- g. Recommendations for a deep foundation system including estimated lengths, allowable capacities for driven piles, Auger Pressure Grouted (APG) piles, drilled shafts and lateral and uplift capacities will be provided, if required.
- h. Analyses on the influence of the proposed foundation on the serviceability of adjacent structures including movements and forces (e.g., dewatering, excavation, blasting or pile driving vibrations, etc.).

- i. Slab-on-grade design recommendations for the facility including the modulus of subgrade reaction, k , in pounds per square inch per inch to be used to design the concrete slab-on-grade for the building.
- j. Recommendations for foundation drains and dewatering procedures, if applicable.
- l. Lateral earth pressure diagrams for proposed retaining walls designed with restricted and unrestricted rotation at the top of the wall. Recommendations for temporary/permanent excavation support wall systems will also be provided.
- m. Determination as to whether on-site materials will be suitable for use in control fills, and the extent to which acceptable on-site materials will be available and if off-site borrows will be required.
- n. Site coefficients for seismic classification per IBC.
- o. Recommendations on monitoring construction procedures including construction control measures, as well as recommended installation, monitoring of validation tests or instrumentation.

3.0 SUBSURFACE CONDITIONS

3.1 Regional Geology

The site predominantly consists of residual soils with a thin layer of fill. The residual soils (Stratum B) are derived from the on-site physical and chemical weathering of the underlying bedrock. These soils generally become denser with depth, as they grade into disintegrated rock (Stratum C). In some areas of the site, a thin layer of existing fill soils (Stratum A) was encountered at the surface. These fill soils are believed to be from previous site development. Based on the Geologic map of the area the bedrock below the site is expected to consist of Gneiss, Schist and Metagraywacke.

3.2 Exploration Procedures

A total of 8 borings were performed by us in the project area to evaluate the subsurface conditions at the site. These test borings were drilled by GeoServices Corporation, Inc. between May 8, 2007 and May 15, 2007. The test borings were advanced using hollow stem auger techniques. Standard Penetration Tests (ASTM D-1586) were conducted at changes in strata or at intervals not exceeding five-feet. Records of the test borings are included in Appendix A at the end of this report.

3.3 Subsurface Stratification

The test borings performed in the project area indicate the following generalized stratification:

Stratum	Depth (Feet)	"N" Value	Description
A (Fill)	From the ground surface to depths of 0 to 3-feet.	4 to 15	Sandy Silt and Sandy Silt FILL , with cinder and crushed stone; moist black to brown
B (Residual)	Below Stratum A to a depth of 24 to 40-feet.	4 to 56	Silty SAND (SM) and sandy SILT (ML), moist; brown, contains rock fragments
C (Disintegrated Rock)	Below Stratum B to depth of borings.	60 to 100/2.0"	DISINTEGRATED ROCK moist; brown

3.4 Groundwater

Groundwater was observed in the test borings during and after completion of the drilling from 8.8 to 18.9 feet below ground elevation. Temporary stand pipes were installed at locations B2, B4 and B6 to obtain a stable ground water reading. Based on these ground water readings the long term ground water table is estimated to be between Elevation EL+289 to EL+301.

Fluctuations in the depth of groundwater should be expected based on precipitation, construction activity, and time of year.

3.5 Soil Testing

Three soil samples from the residual profile were selected and tested for moisture content and classification. The results of these tests are included in Appendix B. All the classification tests were performed by Jay Kay Testing. The soil samples tested classify mainly as Silty Sand (SM), and Sandy Silt (ML).

The following table gives a summary of the soil lab test results. See Appendix B for complete soil lab test reports.

Summary of Classification and Moisture Content				
Location	USCS Soil Classification	Depth (ft)	Natural Moisture Content (%)	Plasticity Index
B-2	ML	6.5	27.2	9
B-4	SM	19	14.4	NP
B-8	ML	3.5	20.3	10

Note: NP = Non Plastic

3.6 In-situ Pressuremeter Test

We also performed in-situ pressuremeter tests to evaluate the settlement characteristics of the residual soils at boring location B-7. These tests were performed at depths of 25, 35 and 45-feet below ground surface elevation of EL +316.

The pressuremeter test is performed by advancing the pressure meter probe to the desired depth in a specially predrilled hole. The probe is inflated against the soil and the volume pressure relationship is recorded to evaluate in-situ the soil modulus.

The results of the pressuremeter tests are included as Appendix D of this report.

4.0 GEOTECHNICAL ENGINEERING ANALYSIS

4.1 Discussion

The geotechnical engineering analysis was based on the subsurface information developed by our field investigation as well as civil engineering and structural engineering data supplied to us. We understand that the maximum column load for the building will be 1100 kips. Based on the drawings provided to us, the lowest floor elevation varies from EL +280 to EL +283 for the proposed building. We understand that there will be a courtyard deck at EL +323 above the retail level. This concrete courtyard deck will support the four levels of apartments. The upper levels are expected to be a wood-framed or composite joists. Based on these floor elevations, cuts up to 33-feet will be required to reach the lower floor grade elevations.

4.2 Conventional Spread Footings Foundation

The site is generally suitable for conventional spread footings on natural cut residual soils. It is expected that the site will require 24 to 33-feet of excavation to reach the proposed floor grades. Taking advantage of the stress release due to the excavation, a higher allowable bearing pressure can be used for the spread footing design. The proposed building can be founded on spread footing designed for an allowable bearing pressure of 5.0 ksf when founded on competent residual soils. The following table summarizes the estimated highest footing elevation at the test boring location.

Boring Location	Proposed Floor Elevation (ft)	Existing Grade Elevation (ft)	Expected Cut (ft)	Top of Disintegrated Rock Elevation (ft)	Allowable Bearing Pressure (ksf)	Estimated Highest Footing Elevation (ft)
B1	EL+280	EI+313	33	EL+289	5.0 ksf for footing founded on suitable residual material	Nominal depth below floor slab
B2	EL+280	EL+306	26	EL+277		
B3	EL+280	EL+304	24	EL+265		
B4	EL+283	EL+311	28	EL+282		
B5	EL+283	EL+310	27	EL+271		
B6	EL+283	EL+315	32	EL+281		
B7	EL+283	EL+316	33	EL+276		
B8	EL+283	EI+308	25	EL+269		

If the floor grade elevations are revised in the future, our foundation recommendations will also have to be revised.

If soft or softened residential materials develop during construction, the footing elevations may need to be lowered further depending on the conditions encountered at the time of construction.

When the footings are founded according to the recommendations of this report, a total foundation settlement of one inch and a differential settlement of 0.5 inches per 20-feet can be expected. The total settlement includes an elastic re compression settlement of 0.25-inches due to the recompression of soil upon reloading after excavation.

All footings should be at least 16-inches wide for shear considerations and a maximum slope of 2H:1V should be maintained between the bottom edges of adjacent footings where foundation grades are at different levels. New footings should be placed at the same elevations as adjacent existing footings. Based on the proposed cuts, all footings will satisfy the grout requirements of at least 2.5-feet below final grade.

4.3 Floor Slab Support

The floor slab subgrades are expected to be placed on natural soil and newly placed compacted fill. Prior to placement of the floor slabs, the suitability of the slab subgrades should be determined by proofrolling. Proofrolling should be performed using a loaded 20-ton dump truck (or equivalent heavy-construction equipment) under the observation of a geotechnical engineer from our office. Any additional loose or unsuitable soils found during proofrolling should be removed and replaced with compacted fill.

Floor slabs may be designed using a modulus of subgrade reaction, k , equal to 100 pci. The groundwater table is estimated above the proposed lower floor grades in the underground Parking Garage.

A permanent floor and a subdrainage system will be required under the floor slab-on-grade of the buildings where groundwater is expected within five-feet of the floor grade. In addition, continuous vertical drainage boards will be required for all below grade walls. (See Section 4.5)

4.4 Compacted Fill Requirements

Compacted structural fill should consist of soils classified ML or better in accordance with the Unified Soil Classification System, ASTM D-2487 and as restricted below. Soils meeting this requirement are classified as ML, SC, SM, SP, SW, GM, GC, GP, and GW. Soils used for compacted fill should be free of topsoil and other organics, rubble, rock larger than six-inches in diameter, and other deleterious matter.

Based on the grading plan, a significant amount of cut material will be available from the proposed parking garage excavation. The soils are expected

to vary from Silty Sand to Sandy Silt. Most of these soils meet the requirement for compacted fill. However, a portion of these fine-grained cut materials are expected to consist of high plasticity clay and elastic silts and are required to be tested and approved prior to placement during construction. Any material with a plasticity index larger than 10 or liquid limit greater than 40 percent should not be used in compacted fill or behind the retaining walls or structural fills. However, during construction if any fine-grained moderately plastic soils classifying as CL or MH are encountered, they can be placed a minimum of three-feet below pavement subgrades, or in non-structural grading areas. Some segregation of these soils should be expected during construction.

Compacted structural fill should be placed in approximately horizontal layers, each layer having a loose thickness of not more than eight-inches. Compacted fill should be placed on subgrades which have first been stripped of vegetation, topsoil and soft areas. Proofrolling with a loaded 20-ton truck will delineate soft zones which should be removed prior to fill placement.

All structural fill should be compacted to 95 percent of the maximum dry density in accordance with ASTM D-698, Standard Proctor. The moisture content of the fill soils should be no higher than about three percent of the optimum moisture content of the soil at the time of placement. The suitability of fill materials should be verified in the field. In-place compaction of the soils should be tested on a full-time basis during construction by a representative from our office. Some of these fills are expected to be sensitive to moisture and may be difficult to compact in wet or cold weather conditions. The use of scarification and drying techniques, or additives such as quick lime, kiln dust, fly ash or Portland cement may be useful in expediting fill operations in inclement weather.

4.5 Subdrainage Requirements

Water level observations made during our investigation in the test borings indicate the groundwater levels to be approximately EL +289 to EL+301. The proposed parking garage floor elevation is set at EL +280 to EL+283. A subdrainage system collecting groundwater around the wall and from under the floor is recommended to maintain groundwater below the floor level.

The floor need not be designed for hydrostatic water pressure if subdrainage is installed as detailed herein. However, walls and floor below-grade should have a vapor barrier placed below/outside to minimize moisture vapor transmission through the concrete.

General requirements of the drainage system are as follows:

The subdrainage system should consist of four-inch diameter corrugated polyethylene tubing according to ASTM D-405 with a maximum size width of 1/4-inch. Tubing should be placed with slots down using straight sections and standard available connections.

Drainage lines may be placed without a slope with inverts at least six-inches below final floor subgrades. The subdrainage system may drain by gravity or to a drainage line providing that provisions are made to avoid back pressures from acting in the event storm sewers flow full. A maximum spacing of 20-feet between subdrainage lines below the floor slab should be maintained.

The use of a waterproofing membrane directly below the floor slab is recommended to provide a moisture vapor barrier and a system to minimize vapor transmission through the floor slab in areas where a floor covering (carpet or tile) is placed over the concrete slab. The transmission of water vapor through concrete slabs and walls should be minimized to prevent damage to floor and wall finishes. This membrane can be placed directly on the washed gravel drainage layer. All utility penetration should be sealed in accordance with the manufacturer's recommendations.

A uniformly graded stone filter should be placed around the drainage line. This stone filter should have uniform gradation and AASHTO M43 Size No. 7 is recommended. The stone drainage filter should also be wrapped in filter fabric. The filter fabric shall have an apparent opening size of greater than an equivalent opening size of the No. 70 sieve.

It should be noted that inspection of the system should occur and the system may require flushing at periodic intervals if soil particles infiltrate the pipes. Cleanouts should be incorporated into the subdrainage system after each right angle bend to allow flushing of the system.

All the below grade walls should have a drainage board within two-feet of the ground surface, and the ground must be sloped away from the wall to divert surface runoff away from the walls. A typical underfloor and behind the wall drainage diagram is included as Figure Number 3 to this report. If the subdrainage system cannot gravity drain to the storm water drainage, sump pits and sump pumps will be required. Since the pumps will have to run continuously, a redundant pump system will also be required. For initial design purposes a flow rate of 75-gallons per minute can be used. This flow rate should be confirmed during construction by measuring the discharge rates from the dewatering system.

4.6 Excavation Support System and Lateral Earth Pressure

A temporary excavation support system will likely be required around the site to allow for the excavation for the parking garage. Based on the available grade plans and the proposed floor grade elevations, cuts up to 35-feet will be required. Unless the excavation sides can be sloped shallower than 1V:2.5H, an excavation support system will be required. The wall design should consider the effect of any surcharge due to adjacent buildings. The wall design should consider the potential undercutting requirements for the footings near the wall.

A temporary braced/tied back free draining H-pile soldier pile wall with wood lagging can be used for temporary excavation support if a temporary dewatering system will be in place to keep the ground water level below the bottom of the cut. A pile spacing of six to eight-feet on center is considered appropriate. The number braces, pile embedment, brace force, lagging thickness and connection details have to be designed by a qualified professional engineer. The designer shall present all the calculations including active and passive earth pressure and the surcharge calculations for review. The soldier piles will likely extend into the disintegrated rock and may have to be drilled and grouted to obtain the required toe embedment. If a tieback system is to be used temporary right of way will be required to extend the tie backs under the surrounding roads and private properties.

The recommended lateral earth pressure diagram for the braced/tied-back temporary excavation wall is attached as Figure Number 2C to this report. The lateral earth pressure diagram for a basement wall with restrained head condition is provided in Figure number 2A to this report. The lateral earth pressure diagram for a cantilevered wall is provided in Figure number 2B to this report. The wall design should make allowance for foundation excavation and undercutting adjacent to the wall. The wall designer should ensure that the soldier pile embedment provides for a sufficient Factor of Safety against global failure and basal heave. The following soil parameter can be used to design the excavation support system.

Soil Type	Friction Angle/ (degree)	Cohesion/ (psf)	Unit weight/ (pcf)
Residual Soil N<15	26	None	110
Residual Soils N>15	30	None	120

We expect that cut slopes of 2.5H:1V will be feasible within the natural profile above the water table, and fill slopes of up to 2.5H:1V may be feasible when fills are placed in a controlled manner in accordance with the proper

compaction specifications.

Topsoil used for permanent earth slopes is not expected to be stable on slopes steeper than 3H:1V due to its lower strength and general inability to be properly compacted. It may be possible to place excess topsoil in deep fill areas, where settlements are not critical.

4.7 Excavation and Adjacent Buildings

Based on the available data the floor grade elevations vary from EL +283 to EL+280 in the two level parking garage area. Generally the material expected at the excavated subgrade appears to be suitable to support construction activity. However, these materials will quickly deteriorate if exposed to water and repeated construction traffic.

We expect that conventional excavation equipments are suitable under most part of the site to reach the proposed floor elevations. However, hard excavation or ripping into disintegrated rock should be expected specially near boring B1 and B4. Please note that disintegrated rock is defined as residual material with SPT values greater than 60 blows per foot.

Provisions should be made for blasting if hard rock is encountered within the disintegrated rock profile. If required, blasting should be performed prior to the commencement of footings and construction.

A pre-excavation survey of the existing adjacent houses and structures should be performed prior to excavation. Existing conditions of these structures should be documented.

4.8 Dewatering

The groundwater table is expected to be 9 to 20-feet above the bottom of the excavation. A comprehensive dewatering system will be required to keep the ground water level below the bottom of the footing during construction. A series of perimeter well points connected to a vacuum pump is considered suitable for this project. The ground water table should be lowered to at least five-feet below the floor subgrade elevation to facilitate footing excavation and construction. The dewatering contractor shall determine the number of well point stages and spacing required to achieve this level of dewatering. We believe a two stage vacuum system with a well point spacing of five-feet will be appropriate. The dewatering contractor shall determine the drawdown near the adjacent structures and if the drawdown near the adjacent structures would exceed 10-feet, the need for a cut-off wall around the site should be evaluated to keep this drawdown within 10-feet at the closest structures. A drawdown of 10-feet near the structure will cause an additional estimated settlement of 0.15-inches for the closest structures assuming that the same soil conditions encountered at this site extend to the surrounding areas. The structural capacity

of the adjacent structures should be evaluated to take this additional estimated settlement under a draw down of 10-feet. The effect of drawdown on the adjacent buildings should be monitored during dewatering. The nearest house is reported to be 35-feet from the property line. It is recommended to place a monitoring well adjacent to this structure to measure the drawdown at this point during the dewatering operation.

4.9 Seismic Design Parameters

Seismic design parameters were determined using the 2000 International Building Code. The IBO Software named “Code Central” provides Earthquake Spectral Response Acceleration Maps. Following are the mapped site coefficient values for the project site at Zip Code 22046.

Seismic Site Spectral Response Accelerations Mapped Values for Soil Factors of 1.0		
Description	Period (Sec)	SA
Short Period Spectral Response Acceleration S_s	0.2	0.18g
1 Second Spectral Response Acceleration S_1	1.0	0.063g

Based on the results of subsurface exploration, the site soil is defined as Site Class C per Table 1615.1.1. For this defined class with the above-indicated mapped spectral acceleration values, the following are the Site Coefficient values per Table 1615.1 and Table 1615.2.

Site Class & Characteristics and Site Coefficients	
Site Class	C
Soil Profile	Very Dense Soil and Soft Rock
Site Coefficient (F_a)	1.2
Site Coefficient (F_v)	1.7
0.2 Second Maximum Spectral Response Acceleration (S_m)	0.216g
1.0 Second Maximum Spectral Response Acceleration (S_{m1})	0.108g
0.2 Second Design Spectral Response Acceleration (S_{ds})	0.144g
1.0 Second Design Spectral Response Acceleration (S_{d1})	0.072g

Complete results of Spectral Acceleration with varying period is given in Appendix C.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Earthwork

Significant amounts of cuts are expected for the underground parking garage. Traditional earth moving equipment is considered suitable for excavation for the parking garage. However, disintegrated rock was encountered at or above the proposed floor elevation in boring logs B4, B1 and B6. Difficult excavation or ripping of disintegrated rock should be expected. Excavation for the parking garage will encounter a high water table and dewatering will be required. The residual soils are expected to deteriorate quickly when exposed to water and repeated construction traffic and working platform may be required.

5.2 Spread Footings

Footings should be lowered through the soft natural soils where encountered. Care should be exercised during the excavation for all footings/foundations to minimize disturbance of the bearing soils. If the footing subgrades are disturbed, the subgrades should be lowered to undisturbed soils. We recommend that footings be excavated and poured the same day in order to avoid ponding of surface runoff water in footing excavations and to avoid other disturbances such as freezing, extreme moisture variations (wetting or drying), etc. Soils that are soft or exposed to water should be expected at the footing subgrade. Footing subgrades consisting of loose sands and silts will be easily disturbed during the placement of reinforcing steel and a mud mat consisting of three-inches of lean concrete will be required immediately after excavation to footing subgrade level. Footing subgrade consisting of disintegrated rock will not require a mud mat.

5.3 Compacted Fill

Compacted structural fill for building support should meet the requirements as outlined in this report. All compacted structural fill and backfill should be compacted to 95 percent of the maximum dry density per ASTM D-698. Moisture conditioning, such as wetting or drying, should be expected to be required depending on the time of year construction occurs. Soil additives such as lime, cement or kiln dust may be used to expedite compaction in soils above the optimum moisture for compaction. Please note no compaction test was performed on the on-site soils.

5.4 Inspection and Testing

Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions will vary from those encountered in the test borings, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, construction observations should be performed by a geotechnical engineer from our office who is familiar with the intent of the recommendations presented herein to evaluate whether the conditions anticipated in design actually exist, or so the recommendation's presented herein can be modified as necessary. Observations and testing should include full-time observations of the excavation of unsuitable soils and footing subgrades, and compaction testing of compacted structural fill and footing backfill.

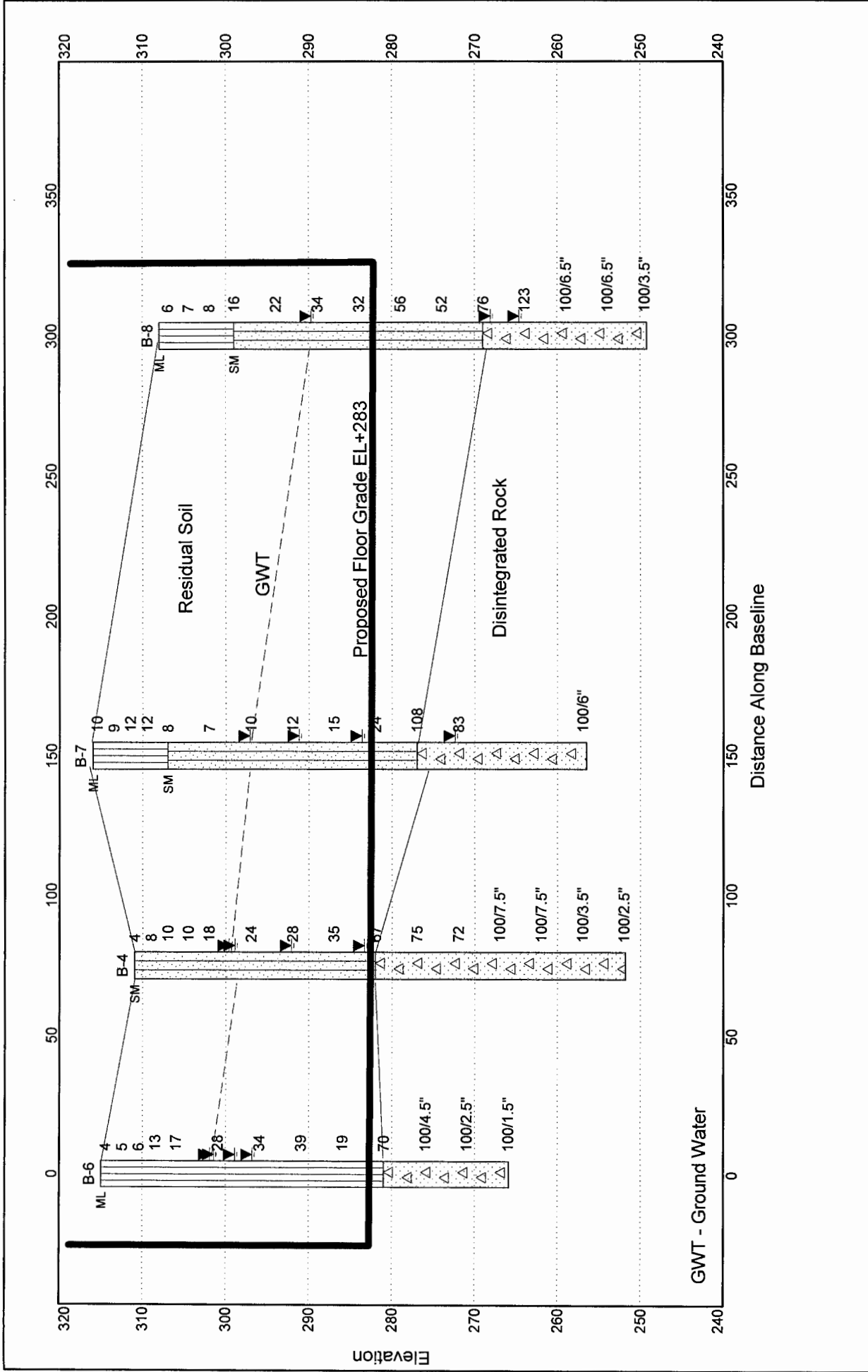
6.0 GENERAL AND LIMITATIONS

The analyses and recommendations submitted in this report are based on the information revealed by this exploration as described herein. An attempt has been made to provide for normal contingencies, but the possibility remains that unexpected conditions may be encountered during construction. This report does not reflect any variations which may occur beyond the locations of the test borings. Since the nature and extent of variations may not become evident until during the course of construction, an allowance should be established to account for possible additional costs that may be required to construct the foundations as recommended herein. Additional costs may be incurred for various reasons including variations of the subsurface conditions and groundwater levels from those observed in the test borings, unsuitable soils encountered at subgrade level, etc.

This report is based on information on the proposed structure made available to us at the time this report was prepared. We would appreciate an opportunity to review the plans and specifications as they pertain to the recommendations contained in this report in order to determine if any changes in concept affects our recommendations, and to submit our comments to you based on this review.

FIGURE NUMBER 1

Subsurface Profiles

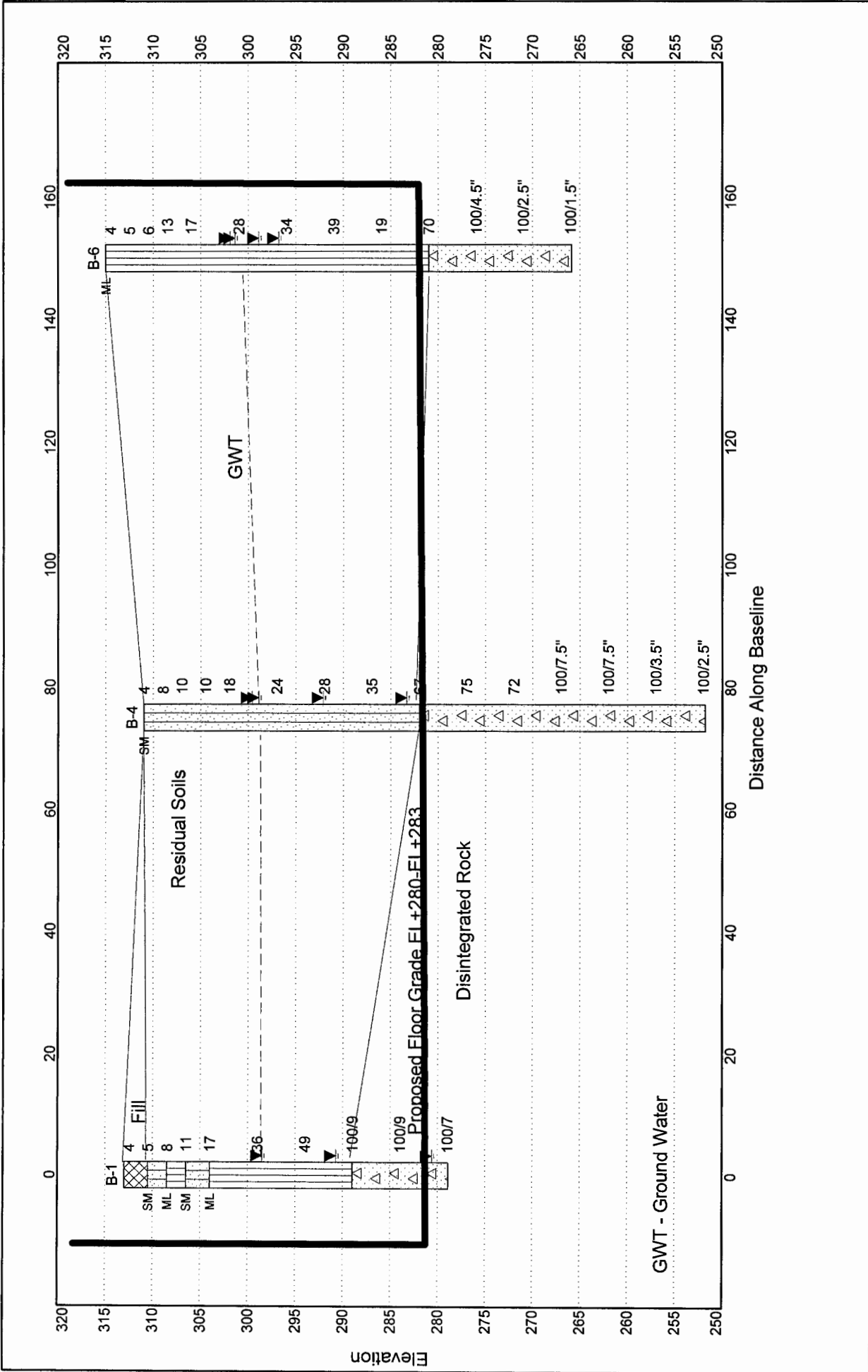


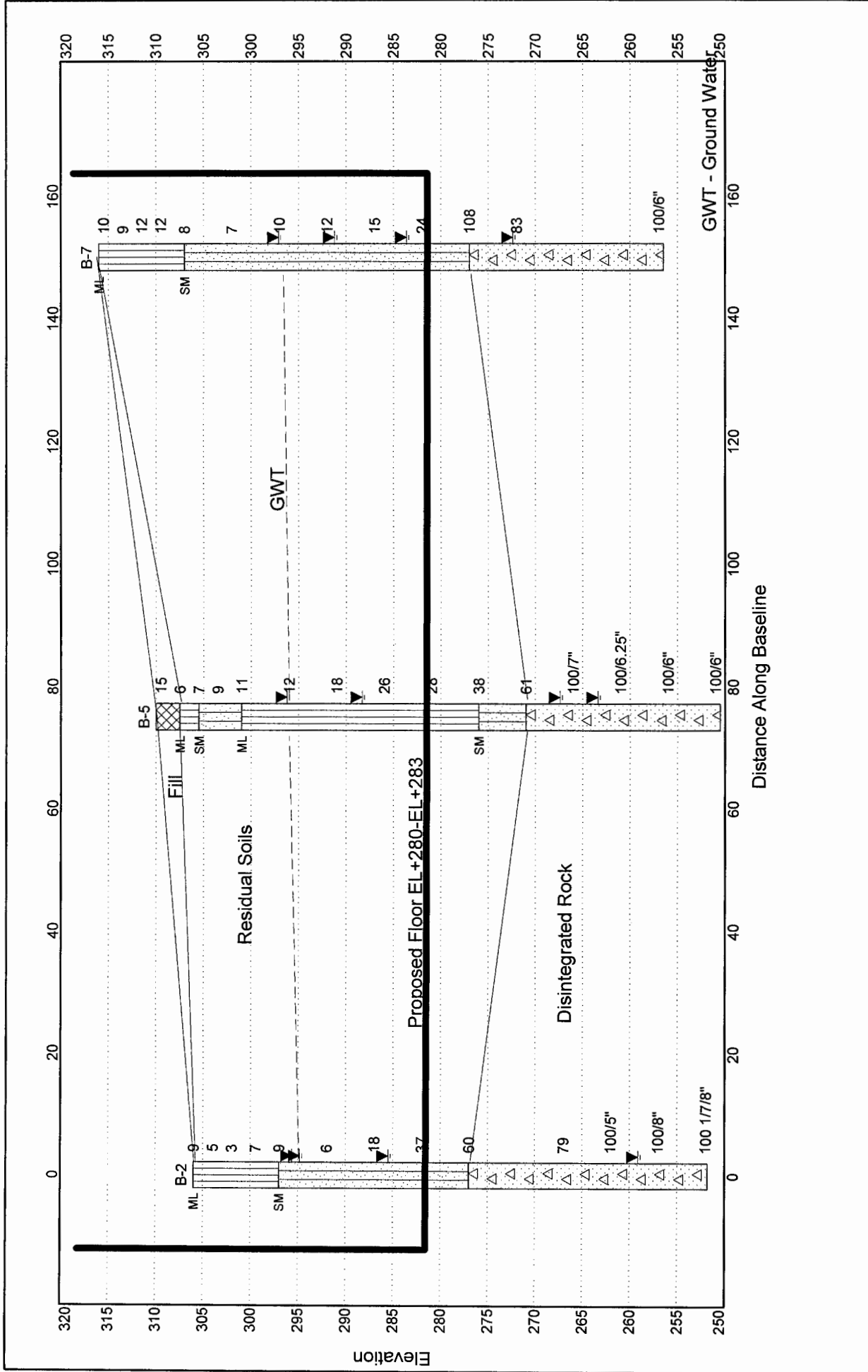
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SUBSURFACE PROFILE

North Gate at Falls Church
 North Gate at Falls Church

Contract No.	Date	Drawing No.
07041.D	May 07	1



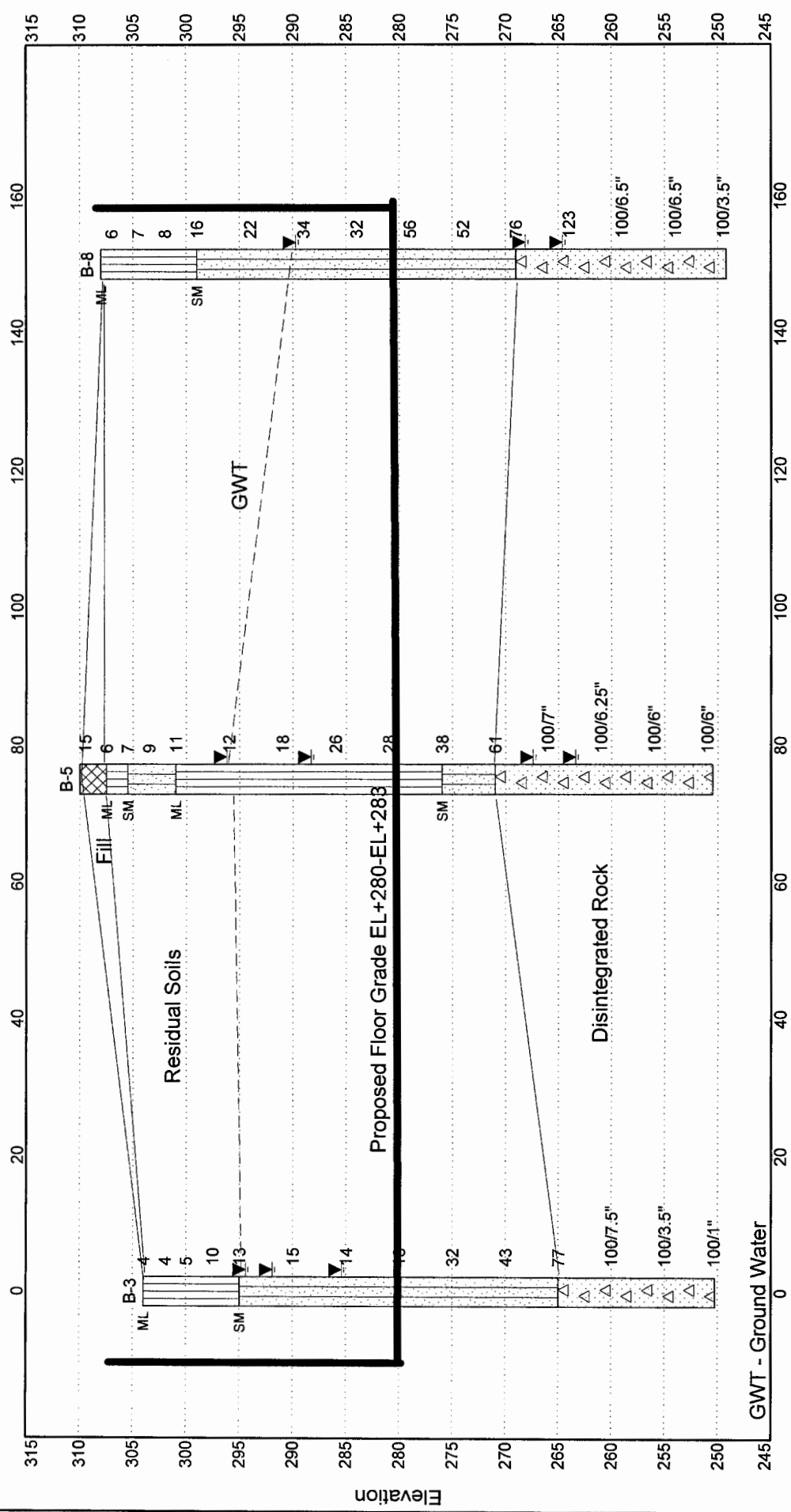


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SUBSURFACE PROFILE

North Gate at Falls Church
 North Gate at Falls Church

Contract No.	Date	Drawing No.
07041.D	May 07	1



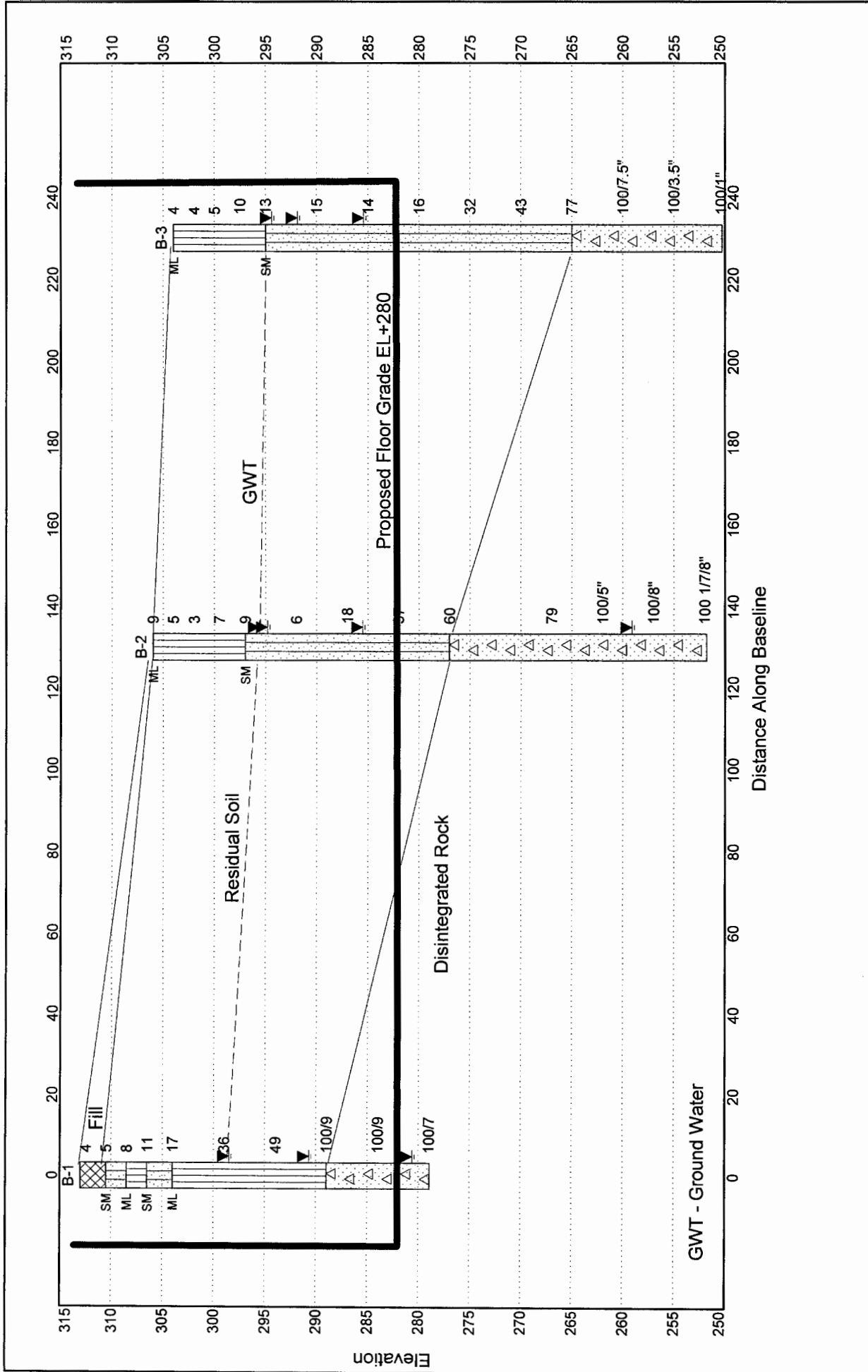
Distance Along Baseline

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North Gate at Falls Church
 North Gate at Falls Church

Contract No.	Date	Drawing No.
07041.D	May 07	1



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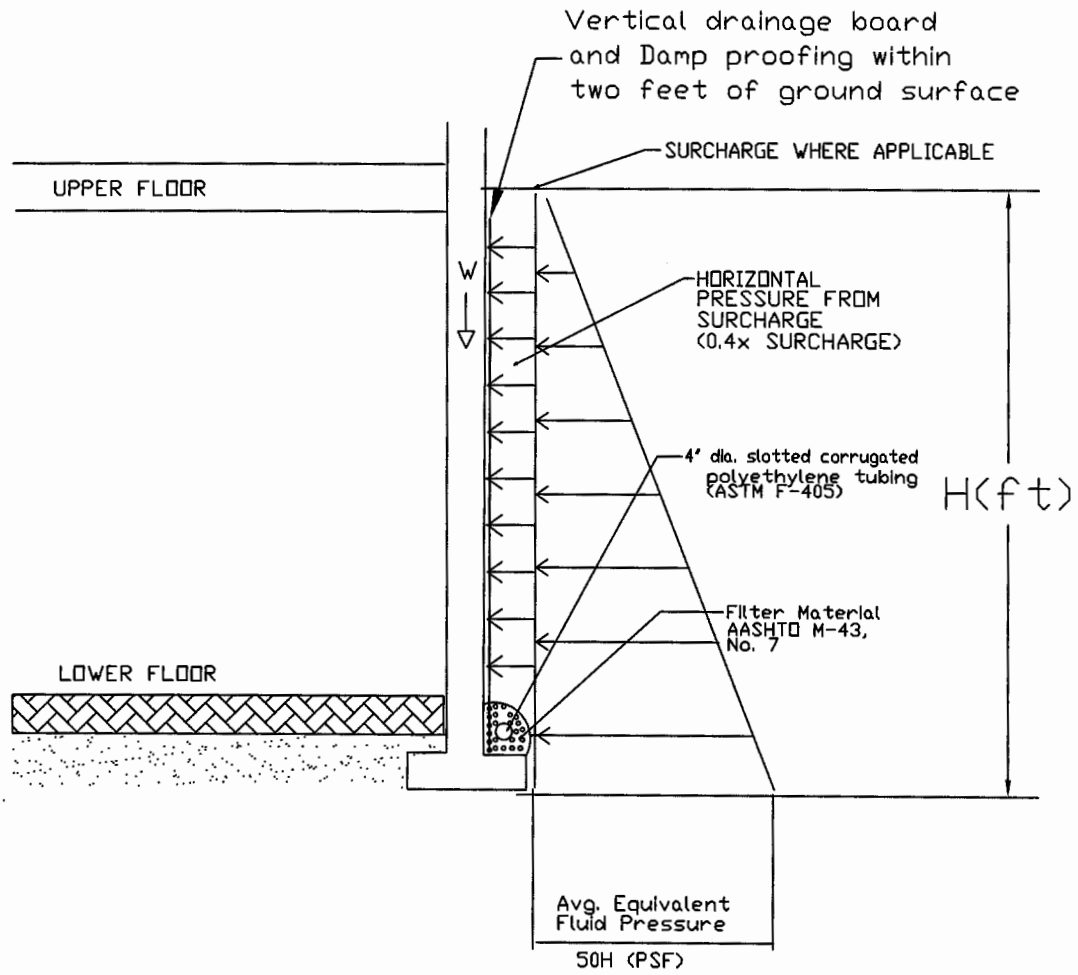
SUBSURFACE PROFILE

North Gate at Falls Church
 North Gate at Falls Church

Contract No.	Date	Drawing No.
07041.D	May 07	1

FIGURE NUMBER 2

Lateral Earth Pressure Diagram



WALLS MUST BE BRACED PRIOR TO BACKFILLING
 BACKFILL TO CONSIST OF SOIL CLASSIFIED AS SM OR BETTER
 PER ASTM D2487

Partially Restrained below grade wall



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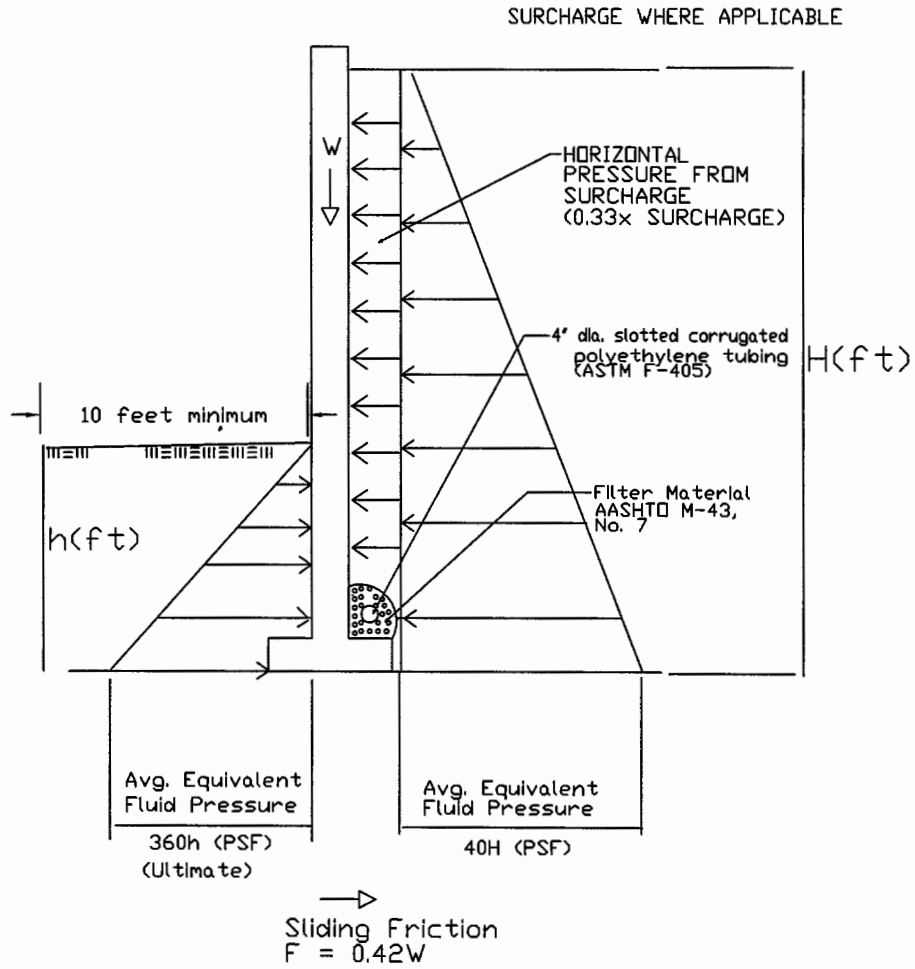
LATERAL EARTH PRESSURE DIAGRAM
 BASEMENT WALL

NORTH GATE AT FALLS CHURCH
 FALLS CHURCH VA

CONTRACT NO 07041.D

DATE: MAY 30, 2007

FIGURE NO 2A



BACKFILL TO CONSIST OF SOIL CLASSIFIED SM OR BETTER PER ASTM D2487

WALL MUST BE BRACED PRIOR TO BACKFILLING



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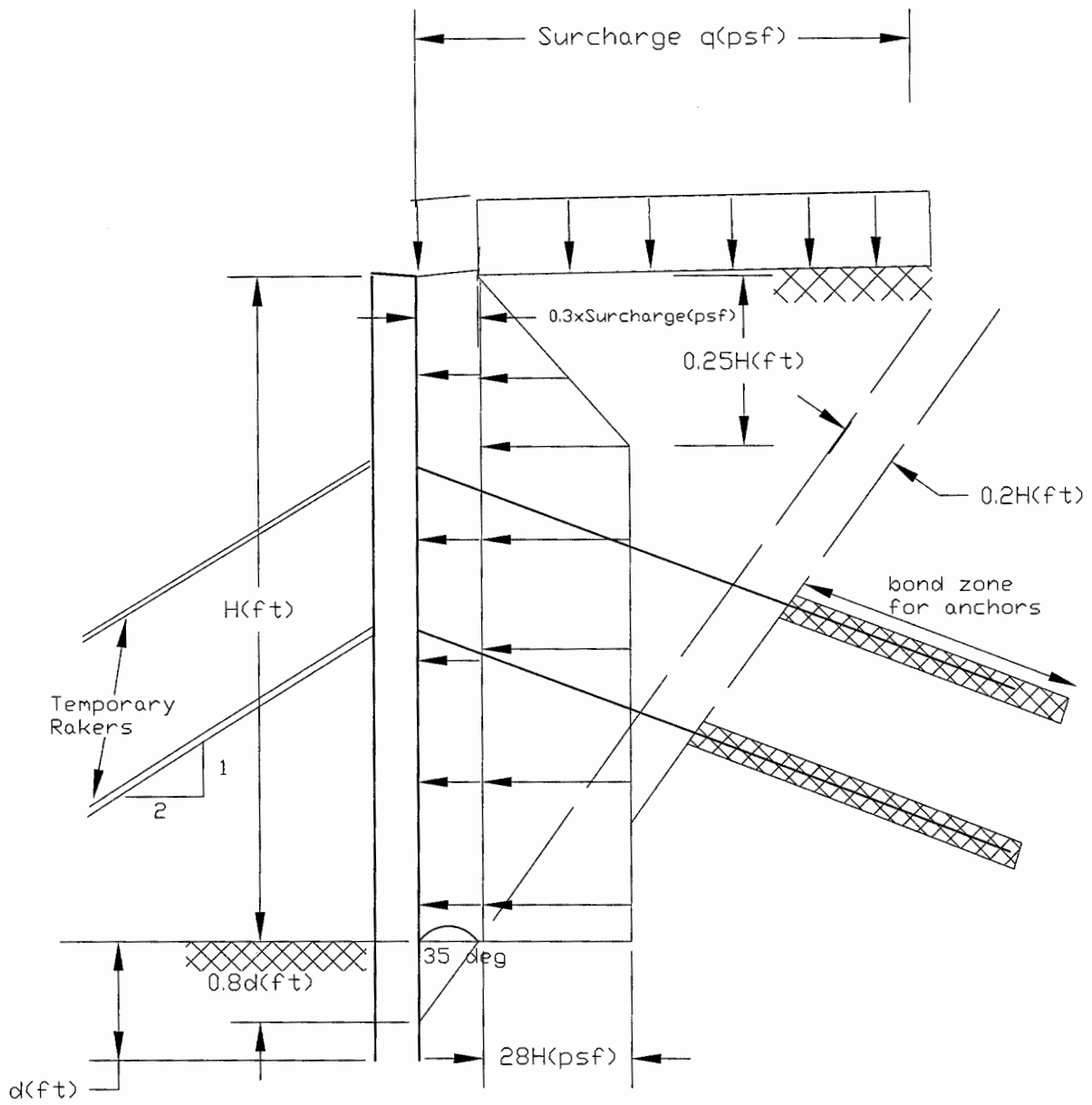
LATERAL EARTH PRESSURE DIAGRAM
 RETAINING WALL

NORTH GATE AT FALLS CHURCH
 FALLS CHURCH VA

CONTRACT No 07041.D

DATE: MAY 30, 2007

FIGURE NO 2B



General Notes

The designer should determine the pile embedment, tie back/raker force, number of tie back/raker levels etc.



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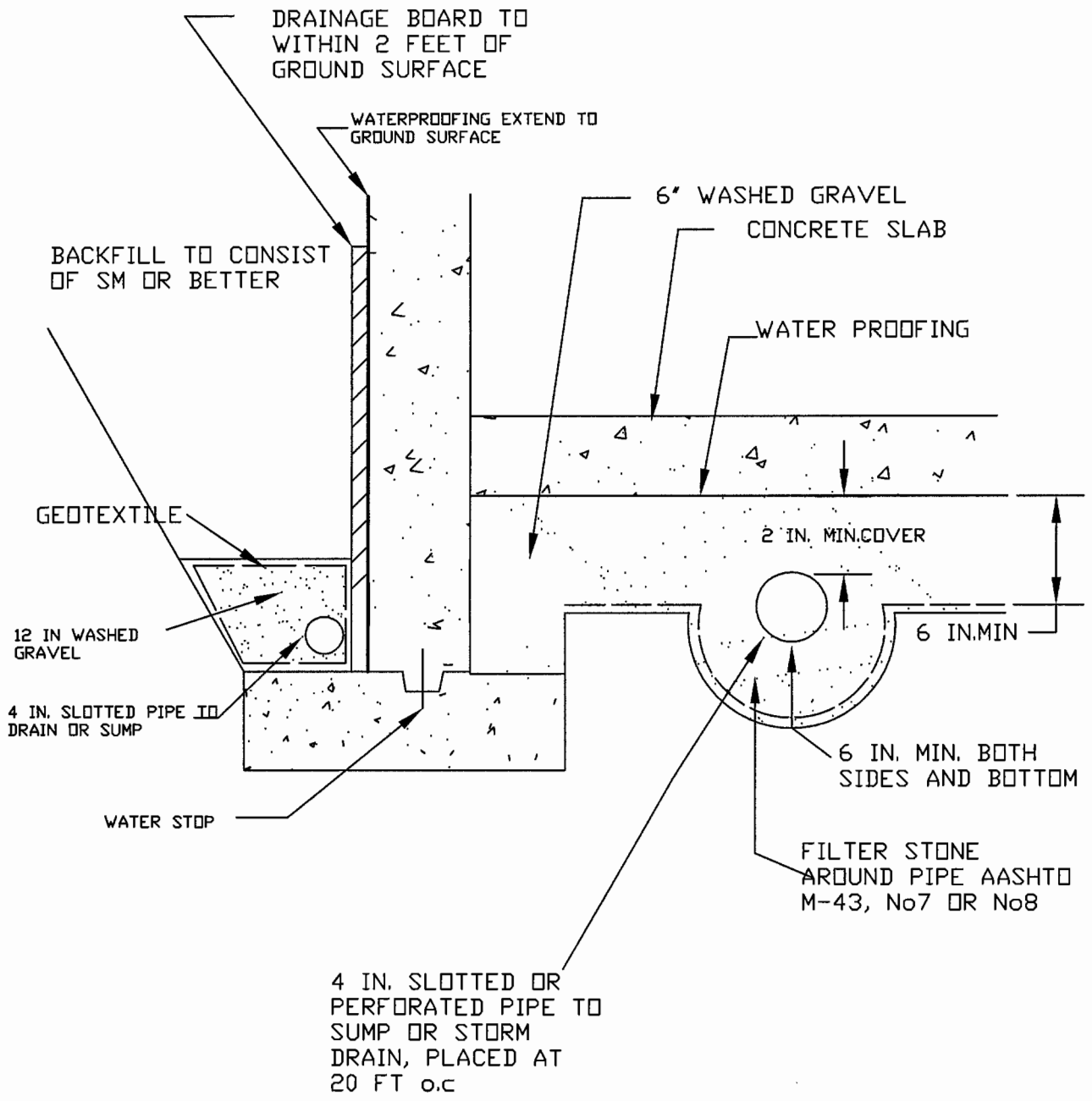
TYPICAL TEMPORARY EXCAVATION SUPPORT SYSTEM SECTION

North Gate at Falls Church

CONTRACT NUMBER	07041.D
DATE	05/25/2007
FIGURE NUMBER	2C

FIGURE NUMBER 3

Typical Subdrainage Detail



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TYPICAL SUB-DRAINAGE DETAIL

NORTH GATE AT FALLS CHURCH FALLS CHURCH, VA	
CONTRACT NO	07041.D
DATE:	MAY 29, 2007
FIGURE NO	5

APPENDIX A

Subsurface Investigation Report

APPENDIX A
DESCRIPTION OF SUBSURFACE EXPLORATION PROCEDURES

North Gate at Falls Church
Falls Church, Virginia
(DWK Contract Number 07041.D)

1.0 Test Borings

The test borings are advanced by turning an auger with a center opening of 2-1/2 or 3-1/4-inches. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hallow stem auger by standard methods. No water was introduced into the borings using this procedure.

2.0 Standard Penetration Tests

Testing is performed by driving a two-inch O.D., 1-3/8-inch I.D. sampling spoon through three, six inch intervals or as indicated, using a 140-pound hammer falling inches according to ASTM D-1556.

3.0 Locations and Grades

The test borings were staked in the field by us. Ground surface elevations were estimated by us from the site grade plan.



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Baltimore, Maryland

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TEST BORING LOG

Boring No.: **B-1**
Contract No.: **07041.D**
Page: **1 of 1**

Project: **North Gate at Falls Church**
Location: **North Gate at Falls Church**
Fallschurch, VA

Ground Surf. El. (±): **313.0**
Date Started : **5-15-07**
Date Completed : **5-15-07**
Contractor : **GeoServices Corp.,**
Driller : **S. Gonzalez**
Rig : **cme 55**
Drill Method : **2 1/4 HSA**
Inspector : **G. Gunaratnam**

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-15	10:30	32.4	34.0	---
Completion	5-15	10:45	22.3	None	33.6
Casing Pulled	5-16	13:40	14.5	None	26.0

Depth (ft)	Surf. Elev. 313.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0		1	2-2-2	4				sandy silt, silty sand, cinders, FILL, moist, black-brown	FILL	A	
310		2	2-2-3	5			SM	SILTY SAND, moist, brown	Residual	B	Poor Recovery at 2.5'
5		3	3-3-5	8			ML	SANDY SILT, moist, brown			
305		4	4-5-7	11			SM	SILTY SAND, moist, brown			
10		5	5-7-10	17				SANDY SILT, moist, brown			
300								trace rock fragments at 14.0'	Residual		
15		6	11-15-21	36			ML	contains rock fragments at 19.0'			
295									Disintegrated Rock	C	
25		8	34-66/3 1/2"	100/9				DISINTEGRATED ROCK, moist, brown			
285		9	100/3 1/2"	100/9							
30									Disintegrated Rock		
280		10	100/1 1/4"	100/7							
								Refusal, Bottom of Test Boring at 34.1'			

TEST BORING LOG 07041.GPJ KOZERA.GDT 5/21/07



D. W. KOZERA, INC.
Baltimore, Maryland

PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: **B-2**
Contract No.: 07041.D
Page: 1 of 1

Project: **North Gate at Falls Church**
Location: **North Gate at Falls Church**
Fallschurch, VA

Ground Surf. El. (±): 306.0
Date Started : 5-11-07
Date Completed : 5-11-07
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-11	09:15	46.9	49.0	---
Completion	5-11	09:35	20.5	54.0	---
Casing Pulled	5-11	10:10	10.4	54.0	---
	5-14	06:40	11.2	54.0	---

Depth (ft)	Surf. Elev. 306.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	305	1	2-4-5	9				SANDY SILT, moist, brown, trace roots and rock fragments at 0.0'	Residual	B	Poor Recovery at 2.0'
		2	3-2-3	5				trace rock fragments at 2.0'			
5	300	3	1-1-2	3			ML				
		4	2-3-4	7							
10	295	5	3-4-5	9	▼			SILTY SAND, moist, brown			
15	290	6	2-3-3	6					Disintegrated Rock	C	
20	285	7	5-9-9	18			SM				
25	280	8	8-15-22	37							
30	275	9	12-27-33	60				DISINTEGRATED ROCK, moist, brown			
35	270	10	19-42-58/5"					trace quartz fragments at 34.0'			
40	265	11	23-34-45	79							
45	260	12	100/5"	100/5"	▽						
50	255	13	53-47/2"	100/8"							
		14	100/1 7/8"	100 1/7/8"				Refusal, Bottom of Test Boring at 54.2'			

TEST_BORING_LOG_07041.GPJ_KOZERA.GDT_5/21/07



D. W. KOZERA, INC.
Baltimore, Maryland

PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: **B-3**
Contract No.: **07041.D**
Page: **1 of 1**

Project: **North Gate at Falls Church**
Location: **North Gate at Falls Church**
Fallschurch, VA

Ground Surf. El. (±): **304.0**
Date Started : **5-8-07**
Date Completed : **5-9-07**
Contractor : **GeoServices Corp.,**
Driller : **S. Gonzalez**
Rig : **cme 55**
Drill Method : **2 1/4 HSA**
Inspector : **G. Gunaratnam**

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-9	06:55	18.6	19.0	---
Completion	5-9	08:50	12.1	53.6	---
Casing Pulled	5-9	09:25	9.6	None	39.3
	5-10	06:30	8.8	None	30.1

Depth (ft)	Surf. Elev. 304.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0		1	1-2-2	4				sandy silt, (prob. fill), moist, brown	Residual	B	
		2	2-2-2	4			SANDY SILT, moist, brown,				
5	300	3	2-2-3	5			contains trace rock fragments at 2.0'				
		4	3-5-5	10	▼						
10	295	5	4-6-7	13			ML	SILTY SAND, moist, brown			
		6	4-7-8	15							
15	290										
20	285	7	5-5-9	14	▽						
		8	5-7-9	16			SM				
25	280										
30	275	9	10-16-16	32							
		10	13-17-26	43							
35	270										
40	265	11	9-26-51	77				DISINTEGRATED ROCK, moist, brown	Disintegrated Rock	C	
45	260	12	66-34/1	100/7.5"							
		13	100/3 1/2	100/3.5"							
50	255	14	100/1"	100/1"				Refusal, moist, gray Bottom of Test Boring at 53.7'			



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Baltimore, Maryland

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TEST BORING LOG

Boring No.: **B-4**
Contract No.: 07041.D
Page: 1 of 1

Project: North Gate at Falls Church
Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±): 311.0
Date Started :
Date Completed :
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-14	08:30	27.7	29.0	---
Completion	5-14	10:00	18.9	59.0	---
Casing Pulled	5-14	10:35	11.4	59.0	---
	5-15	06:30	12.1	59.0	---

Depth (ft)	Surf. Elev. 311.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	310	1	2-2-2	4				SILTY SAND, moist, brown, contains roots at 0'			
		2	4-3-5	8							
5	305	3	3-5-5	10							
		4	3-5-5	10							
10	300	5	4-8-10	18							
					▼			contains trace rock fragments at 14.0'			
15	295	6	3-11-13	24			SM		Residual		
								contains quartz fragments at 19.0'			
20	290	7	10-13-15	28							
25	285	8	10-14-21	35							
					▽						
30	280	9	13-23-44	67				DISINTEGRATED ROCK, moist, brown trace rock fragments at 29.0'			
35	275	10	18-31-44	75							
40	270	11	23-31-41	72					Disintegrated Rock		
45	265	12	65-35/1 1/2	100/7.5"							
50	260	13	69-31/1 1/2	100/7.5"							
55	255	14	100/3 1/2	100/3.5"							
		15	100/2 1/2	100/2.5"							
								Bottom of Test Boring at 59.2'			

TEST BORING LOG 07041.GPJ KOZERA.GDT 5/21/07



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TEST BORING LOG

Boring No.: B-5
Contract No.: 07041.D
Page: 1 of 1

Project: North Gate at Falls Church
Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±): 310.0
Date Started : 5-11-07
Date Completed : 5-11-07
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-11	11:40	42.6	44.0	---
Completion	5-11	12:20	46.6	59.0	---
Casing Pulled	5-11	12:50	21.7	None	44.2
	5-14	06:35	13.8	None	31.4

Depth (ft)	Surf. Elev. 310.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	310	1	5-7-8	15				sandy silt, silty sand, crushed stone, FILL, moist, brown	Fill	A	
		2	4-3-3	6			ML	SANDY SILT, moist, brown	Residual	B	
5	305	3	2-3-4	7			SM	SILTY SAND, moist, brown			
		4	3-4-5	9							
10	300	5	3-6-5	11				SANDY SILT, moist, brown, contains trace rock fragments at 9.0'			
15	295	6	5-5-7	12	▼						
20	290	7	6-8-10	18			ML				
25	285	8	7-10-16	26				contains trace quartz fragments at 29.0'			
30	280	9	10-12-16	28							
35	275	10	11-17-21	38			SM	SILTY SAND, moist, brown			
40	270	11	17-25-36	61				DISINTEGRATED ROCK, moist, brown	Disintegrated Rock	C	
45	265	12	57-43/1"	100/7"							
50	260	13	89-11/1/4"	100/6.25"				trace rock fragments at 49.0'			
55	255	14	100/6"	100/6"							
		15	100/6"	100/6"							
								Bottom of Test Boring at 59.5'			

TEST BORING LOG 07041.GPJ KOZERA.GDT 5/21/07



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TEST BORING LOG

Boring No.: B-6
Contract No.: 07041.D
Page: 1 of 1

Project: North Gate at Falls Church
Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±): 315.0
Date Started : 5-14-07
Date Completed : 5-15-07
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-15	07:05	13.6	34.0	---
Completion	5-15	08:15	18.2	49.0	---
Casing Pulled	5-15	08:45	16.1	49.0	---
	5-16	13:15	13.1	49.0	---

Depth (ft)	Surf. Elev. 315.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0 - 315								SANDY SILT, moist, brown		B	
		1	2-1-3	4							
		2	3-2-3	5							
5 - 310		3	2-3-3	6							
		4	5-6-7	13							
10 - 305		5	6-9-8	17							
					▼						
15 - 300		6	7-11-17	28			ML	contains trace rock fragments at 19.0'	Residual		
20 - 295		7	10-15-19	34							
25 - 290		8	9-15-24	39							
30 - 285		9	9-9-10	19							
35 - 280		10	19-31-39	70				DISINTEGRATED ROCK, moist, brown		C	
40 - 275		11	100/4 1/2"	100/4.5'					Disintegrated Rock		
45 - 270		12	100/2 1/2"	100/2.5'							
		13	100/1 1/2"	100/1.5'				Refusal, Bottom of Test Boring at 49.1'			

TEST BORING LOG 07041.GPJ KOZERA.GDT 5/21/07



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Baltimore, Maryland

PROFESSIONAL ENGINEERS & GEOLOGISTS

TEST BORING LOG

Boring No.: B-7
Contract No.: 07041.D
Page: 1 of 1

Project: North Gate at Falls Church
Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±): 316.0
Date Started : 5-9-07
Date Completed : 5-9-07
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-9	11:15	32.4	39.0	---
Completion	5-9	12:00	43.6	59.0	---
Casing Pulled	5-9	12:25	24.8	None	32.6
	5-10	06:25	18.9	None	29.7

Depth (ft)	Surf. Elev. 316.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0	315	1	5-5-5	10				SANDY SILT, moist, brown	Residual	B	
		2	2-4-5	9							
5	310	3	3-5-7	12			ML				
		4	4-6-6	12							
10	305	5	3-4-4	8			SILTY SAND, moist, brown				
		6	3-3-4	7							
15	300				▼						
20	295	7	4-4-6	10							
		8	5-5-7	12			SM				
25	290										
30	285	9	6-7-8	15							
		10	7-11-13	24	▽						
35	280										
40	275	11	12-21-87	108				DISINTEGRATED ROCK, moist, brown	Disintegrated Rock	C	
		12	20-31-52	83				contains trace rock fragments at 44.0'			
45	270										
		13	100/4 1/2'								
50	265										
		14	100/5 1/2'					contains trace quartz fragments at 54.0'			
55	260										
		15	100/6"	100/6"							
								Bottom of Test Boring at 59.5'			

TEST_BORING_LOG_07041.GPJ_KOZERA.GDT_5/21/07



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TEST BORING LOG

Boring No.: B-7 PM

Contract No.: 07041.D

Page: 1 of 1

Project: North Gate at Falls Church

Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±):

Date Started : 5-10-07

Date Completed : 5-10-07

Contractor : GeoServices Corp.,

Driller : S. Gonzalez

Rig : cme 55

Drill Method : 3 1/4 HSA

Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered					
Completion					
Casing Pulled					

Depth (ft)	Surf. Elev.	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0								Augered to 21.8', washed down with 3" Roller Bit to 27.4'			
5											
10											
15											
20											
25								Pressure Meter Test 1st			
30								Augered to 31.8', washed down with 3" Roller Bit to 37.4'			
35								Pressure Meter Test 2nd			
40								Augered to 41.8, washed down with 3" Roller Bit to 47.01'			
45								Pressure Meter Test 3rd			

TEST_BORING_LOG_07041.GPJ_KOZERA.GDT_5/18/07



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Baltimore, Maryland

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TEST BORING LOG

Boring No.: **B-8**
Contract No.: 07041.D
Page: 1 of 1

Project: North Gate at Falls Church
Location: North Gate at Falls Church
Fallschurch, VA

Ground Surf. El. (±): 308.0
Date Started : 5-8-07
Date Completed : 5-8-07
Contractor : GeoServices Corp.,
Driller : S. Gonzalez
Rig : cme 55
Drill Method : 2 1/4 HSA
Inspector : G. Gunaratnam

GROUNDWATER OBSERVATIONS

	Date	Time	Depth	Casing	Caved
Encountered	5-8	10:40	43.4	44.0	---
Completion	5-8	11:25	None	58.5	---
Casing Pulled	5-8	11:50	39.9	None	50.4
	5-9	06:45	18.3	None	43.9

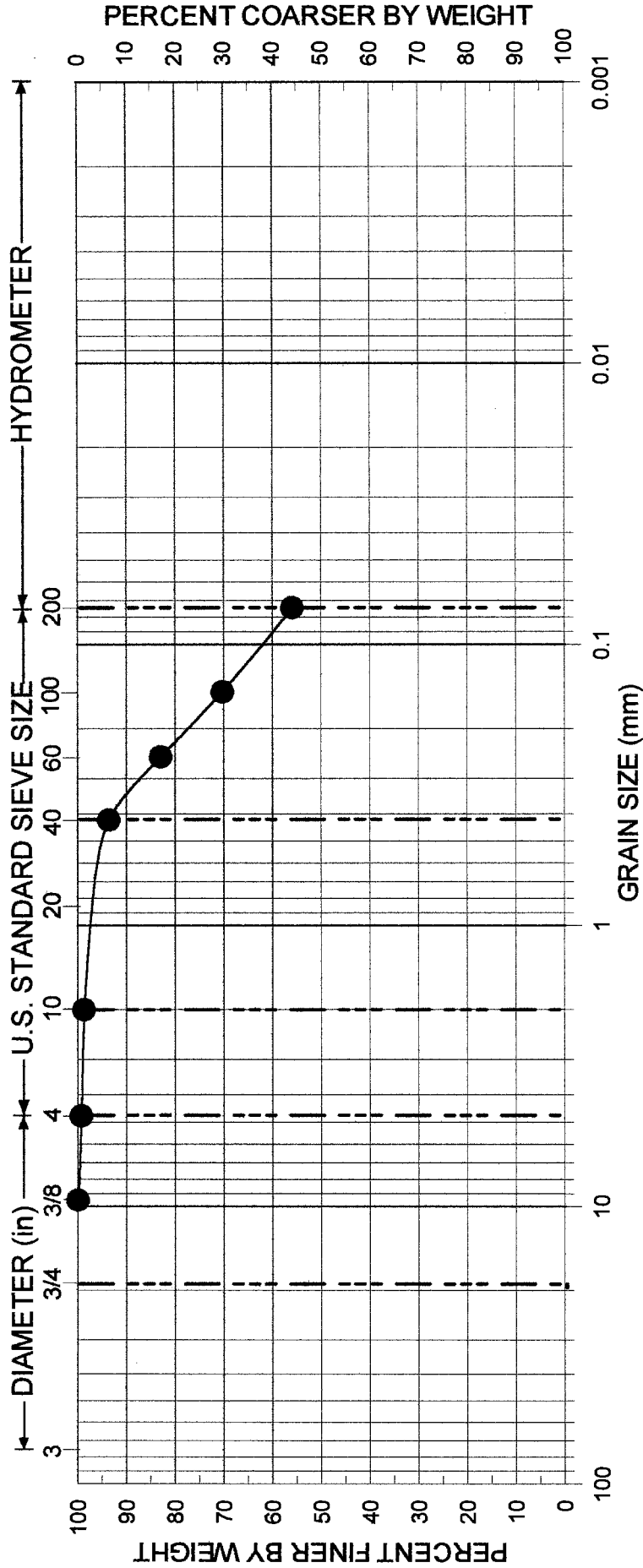
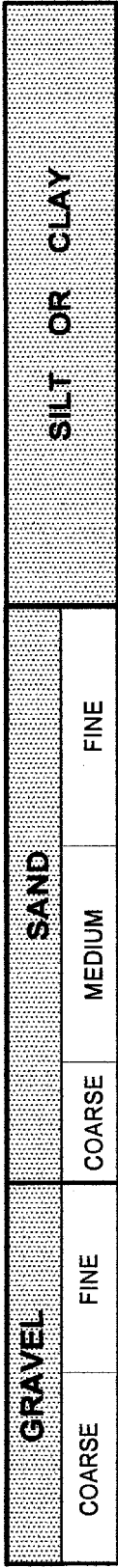
Depth (ft)	Surf. Elev. 308.0	Samples	Blow Counts	"N" Value	Water Level	Graphic	USCS	Description	Formation	Stratum	Remarks
0								SANDY SILT, moist, brown		B	
305		1	1-3-3	6							
5		2	2-3-4	7			ML				
300		3	3-3-5	8							
10		4	4-6-10	16				SILTY SAND, moist, brown, contains trace quartz fragments at 9.0'			
295		5	6-8-14	22							
290		6	9-13-21	34	▼				Residual		
285		7	8-13-19	32			SM				
25		8	13-23-33	56				trace rock fragments at 34.0'			
280		9	12-21-31	52							
35		10	21-35-41	76				DISINTEGRATED ROCK, moist, brown, contains quartz fragments at 39.0'		C	
40		11	7-25-98	123	▽				Disintegrated Rock		
265		12	78-22/1/2"	100/6.5"							
45		13	84-16/1/2"	100/6.5"							
260		14	100/3 1/2"	100/3.5"							
50								Bottom of Test Boring at 58.8'			
255											
55											
250											

TEST BORING LOG 07041.GPJ KOZERA.GDT 5/21/07

APPENDIX B

Soil Laboratory Testing

PROJECT NAME: North Gate at Falls Church
LOCATION: Falls Church, Virginia
DWK CONTRACT NUMBER: 07041.D



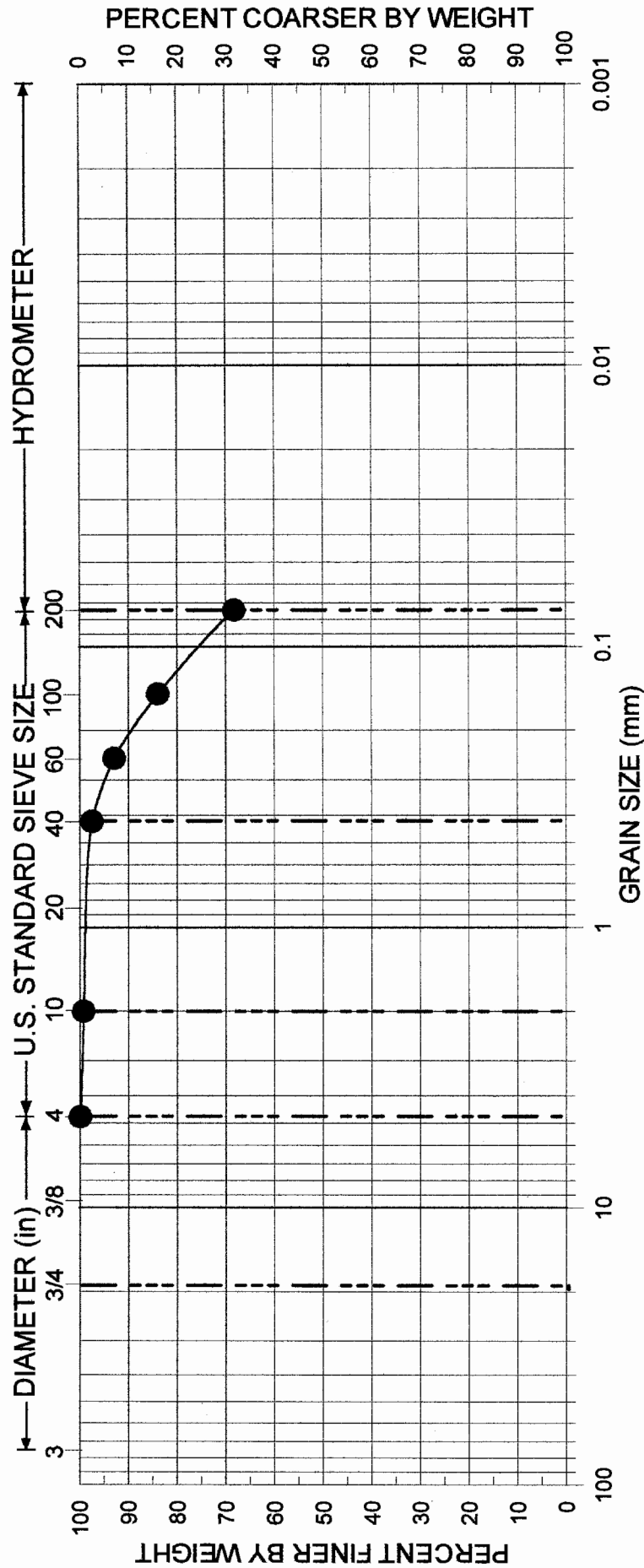
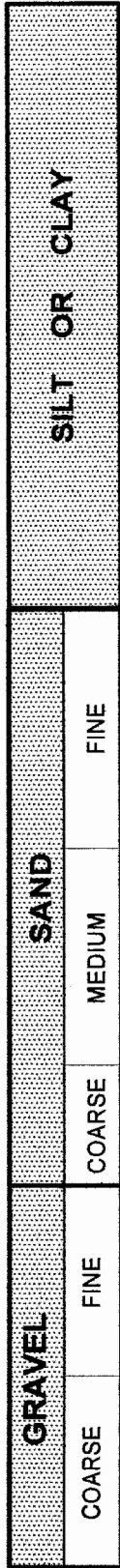
BORING NUMBER		SAMPLE DEPTH (ft)	MC (%)	LL	PL	PI	SOIL DESCRIPTION	
●	B-8	Jar	3.5	20.3	34	24	10	Orange brown sandy SILT (ML) [A-4]

GRADATION ANALYSIS

TESTED BY: JMK
 CHECKED BY: GG
 DATE: 5-21-07
 SHEET: 3 of 3

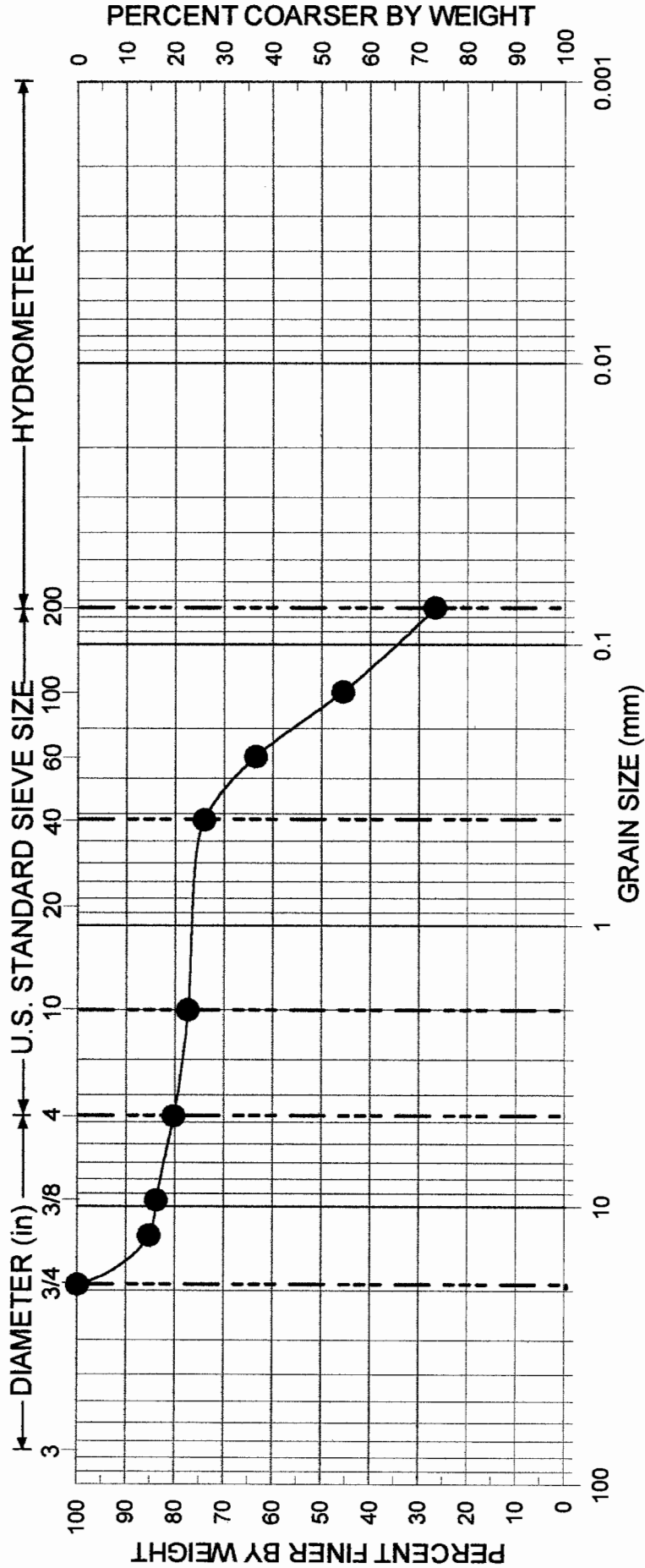
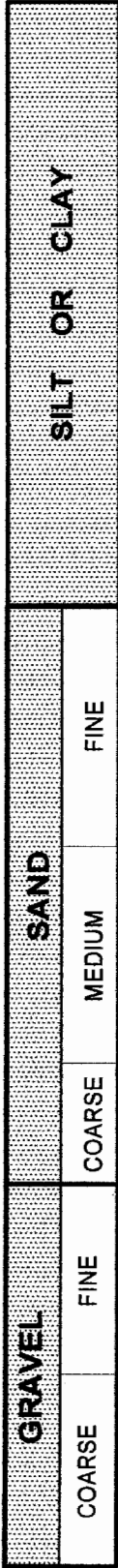
JAY KAY TESTING
 Taneytown, Maryland

PROJECT NAME: North Gate at Falls Church
LOCATION: Falls Church, Virginia
DWK CONTRACT NUMBER: 07041.D



GRADATION ANALYSIS		TESTED BY: JMK	DATE: 5-21-07
		CHECKED BY: GG	SHEET: 1 of 3
B-2		Light brown sandy SILT (ML) [A-5]	
KEY NUMBER	SAMPLE DEPTH (ft)	MC (%)	SOIL DESCRIPTION
B-2	6.5	27.2	Light brown sandy SILT (ML) [A-5]
	Jar	42	
		33	
		9	
JAY KAY TESTING Taneytown, Maryland			

PROJECT NAME: North Gate at Falls Church
LOCATION: Falls Church, Virginia
DWK CONTRACT NUMBER: 07041.D



BORING NUMBER		SAMPLE DEPTH (ft)	MC (%)	LL	PL	PI	SOIL DESCRIPTION
●	B-4	19.0	14.4	31	NP	NP	Brown silty SAND with rock (SM) [A-2-4]

GRADATION ANALYSIS

TESTED BY: JMK
 CHECKED BY: GG
 DATE: 5-21-07
 SHEET: 2 of 3

JAY KAY TESTING
 Taneytown, Maryland

APPENDIX C

Seismic Design Parameters

North Gate At Falls Church
Date and Time: 5/29/2007 3:39:49 PM

MCE Parameters - Conterminous 48 States
Zip Code - 22046 Central Latitude = 38.886222
Central Longitude = -077.179045

Data are based on the 0.10 deg grid set

Period (sec)	SA (%g)	
0.2	018.0	Map Value, Soil Factor of 1.0
1.0	006.3	Map Value, Soil Factor of 1.0

MCE Parameters x Specified Soil Factors

0.2	021.6	Soil Factor of 1.20
1.0	010.7	Soil Factor of 1.70

MCE Parameters - Conterminous 48 States
Zip Code - 22046 Central Latitude = 38.886222
Central Longitude = -077.179045

Data are based on the 0.10 deg grid set

Period (sec)	SA (%g)	
0.2	018.0	Map Value, Soil Factor of 1.0
1.0	006.3	Map Value, Soil Factor of 1.0

MCE Parameters x Specified Soil Factors

0.2	021.6	Soil Factor of 1.20
1.0	010.7	Soil Factor of 1.70

MCE Parameters - Conterminous 48 States
Zip Code - 22046 Central Latitude = 38.886222
Central Longitude = -077.179045

Data are based on the 0.10 deg grid set

Period (sec)	SA (%g)	
0.2	018.0	Map Value, Soil Factor of 1.0
1.0	006.3	Map Value, Soil Factor of 1.0

MCE SPECTRUM x SOIL FACTORS

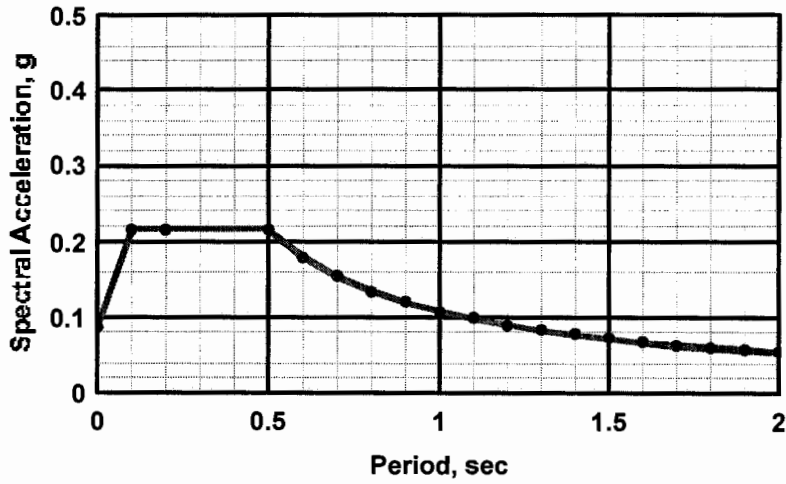
Fa = 1.20

Fv = 1.70

Period (sec)	SA (%g)	
0.000	008.6	0.4FaSs
0.100	021.6	To
0.200	021.6	T=0.2, FaSs
0.499	021.6	Ts
0.500	021.5	
0.600	017.9	
0.700	015.4	
0.800	013.4	
0.900	012.0	
1.000	010.8	T=1.0, FvS1
1.100	009.8	
1.200	009.0	
1.300	008.3	
1.400	007.7	
1.500	007.2	
1.600	006.7	

1.700	006.3
1.800	006.0
1.900	005.7
2.000	005.4

Maximum Considered Earthquake Ground Motion
 Fa = 1.20 F1 = 1.70
 Zip Code = 22046
 Central Lat. = 38.886222 deg Central Long. = -77.179045 deg



Period, sec	Sa, g
0.00	0.086
0.10	0.216
0.20	0.216
0.50	0.216
0.50	0.215
0.60	0.179
0.70	0.154
0.80	0.134
0.90	0.120
1.00	0.108
1.10	0.098
1.20	0.090
1.30	0.083
1.40	0.077
1.50	0.072
1.60	0.067
1.70	0.063
1.80	0.060
1.90	0.057
2.00	0.054

APPENDIX D

Pressure Meter Test Results

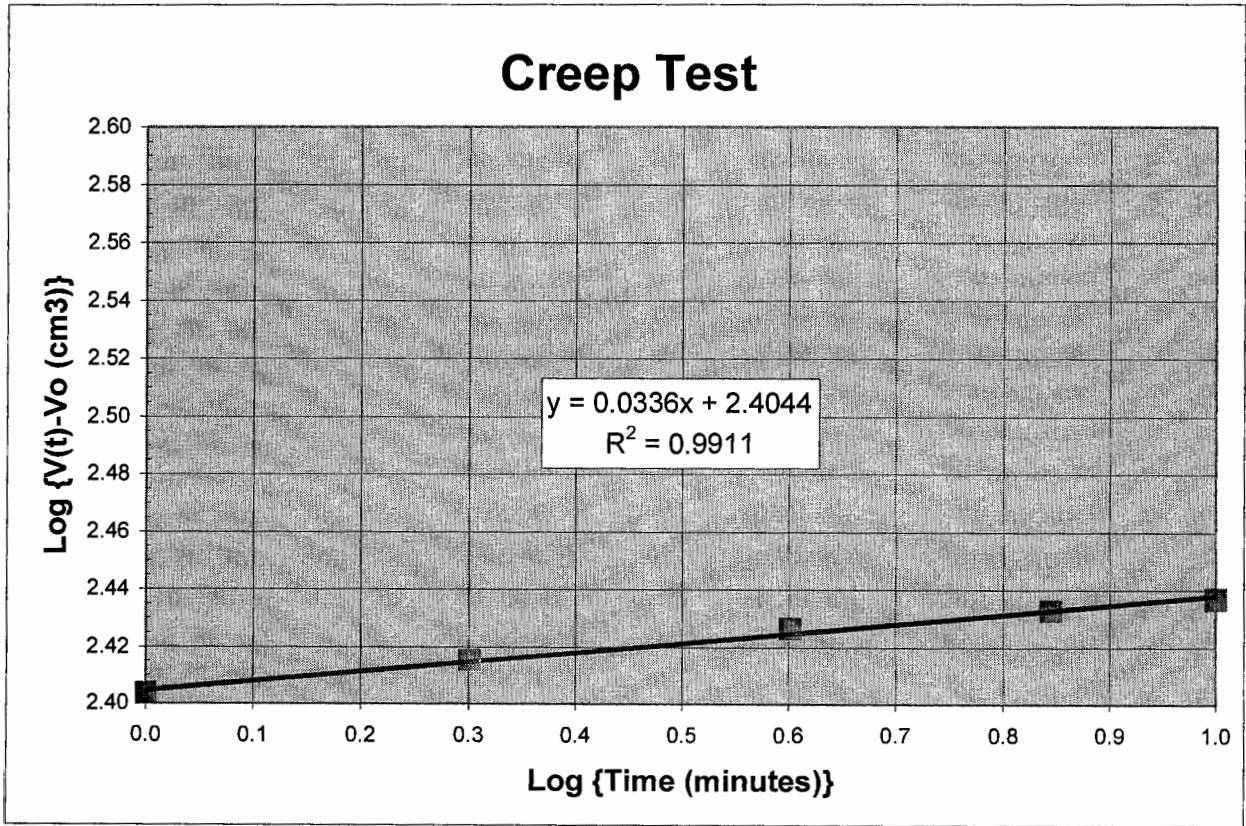
Pressuremeter Creep Test

Project: North Gate of Falls Church
 Sounding No.: B-7
 Test Depth: 25 feet
 Holding Gauge Pressure = 3.30 bars
 Corrected Pressure = 3.83 bars
 Initial Probe Radius = 3.69 cm
 Initial Probe Length = 46 cm
 Initial Volume of Probe = 1968 cm³
 Probe Radius Contacting Borehole = 3.69 cm
 Initial Borehole Volume, V₀ = 1968 cm³

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm ³)	Total Probe Volume (cm ³)	V(t)-V ₀ (cm ³)	Log [V(t)-V ₀] (cm ³)
1	0.000	253.10	2220.81	253.10	2.403
2	0.301	260.13	2227.84	260.13	2.415
4	0.602	267.00	2234.71	267.00	2.427
7	0.845	270.92	2238.63	270.92	2.433
10	1.000	273.4	2241.11	273.40	2.437

$$E_0(t)/E_0(t=1 \text{ min}) = \{t/1\}^{-n}$$

$$n = 0.0336$$

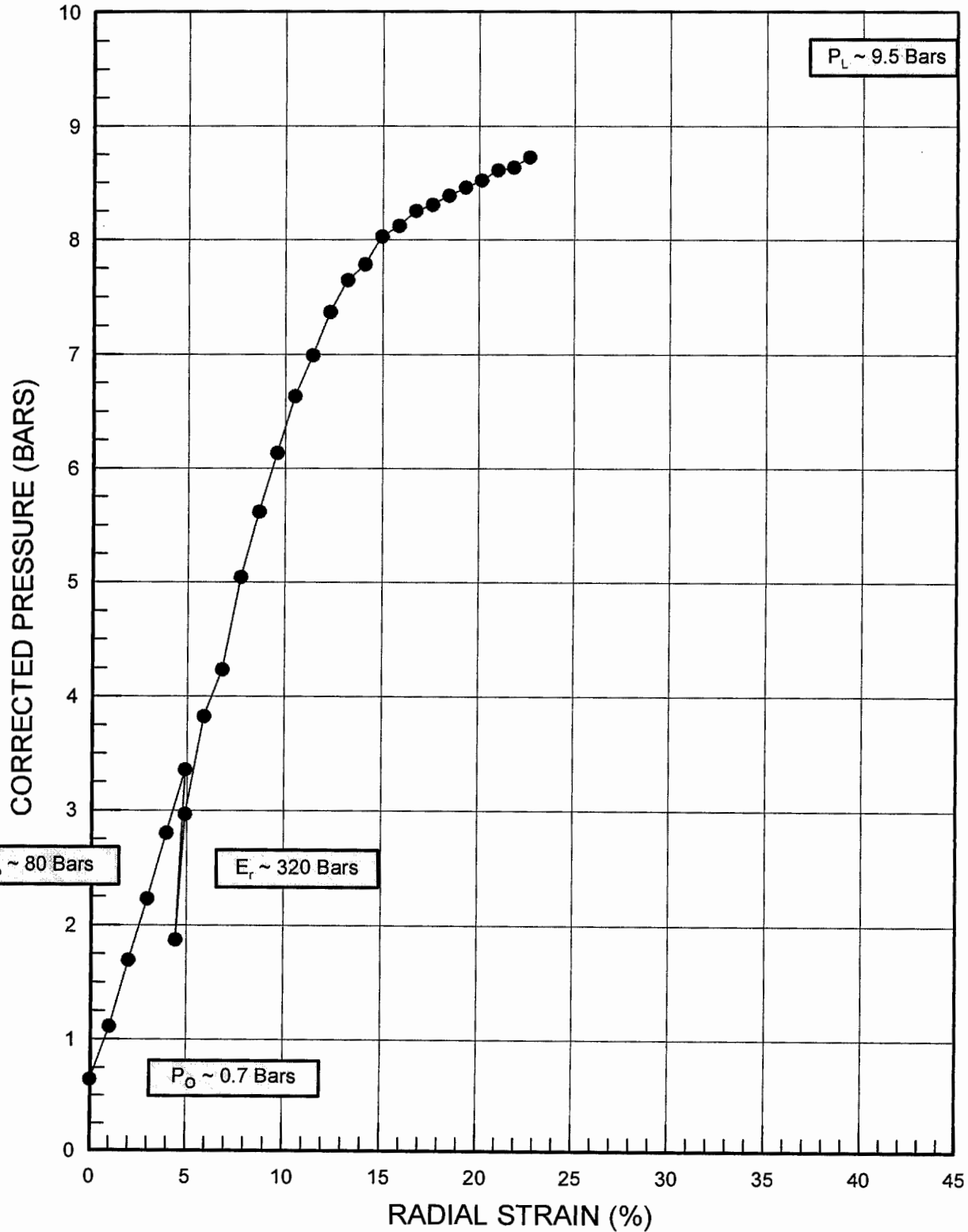


PROJECT: North Gate of Falls Church
LOCATION: Falls Church, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
TEST DATE: 5-10-07

BORING: B-7
DEPTH: 25.0 Ft.

PRESSUREMETER TEST RESULTS



North Gate of Falls Church -- Boring B-7 -- 25.0 Ft.

POINT NUMBER	VOLUME MEASUREMENT	PRESSURE MEASUREMENT	CORR. VOL. INCREASE (cm ³)	dR/Ro (%)	CORRECTED PRESSURE (bar)
1	0.00	-0.140	0.000	0.00	0.646
2	40.00	0.390	39.502	1.00	1.116
3	80.00	1.030	78.900	1.99	1.696
4	120.00	1.610	118.355	2.96	2.228
5	160.00	2.220	157.782	3.93	2.802
6	200.00	2.810	197.227	4.89	3.356
7	180.00	1.310	178.083	4.43	1.874
8	200.00	2.420	197.594	4.90	2.966
9	240.00	3.300	236.766	5.85	3.826
10	280.00	3.730	276.362	6.79	4.236
11	320.00	4.560	315.582	7.72	5.044
12	360.00	5.160	355.018	8.65	5.620
13	400.00	5.700	394.510	9.57	6.136
14	440.00	6.210	434.031	10.48	6.634
15	480.00	6.580	473.683	11.39	6.992
16	520.00	6.970	513.317	12.29	7.370
17	560.00	7.260	553.044	13.18	7.648
18	600.00	7.410	592.903	14.08	7.786
19	640.00	7.660	632.668	14.96	8.028
20	680.00	7.760	672.574	15.84	8.120
21	720.00	7.900	712.442	16.71	8.252
22	760.00	7.960	752.386	17.57	8.304
23	800.00	8.050	792.301	18.43	8.386
24	840.00	8.130	832.226	19.29	8.458
25	880.00	8.200	872.160	20.13	8.520
26	920.00	8.300	912.066	20.98	8.612
27	960.00	8.330	952.038	21.81	8.634
28	1000.00	8.430	991.944	22.64	8.726
Po =	0.70 bar	Pl =	9.50 bar	Pl* =	8.80 bar
Eo =	78 bar	Er =	320 bar	Eo/Pl* =	8.9

□

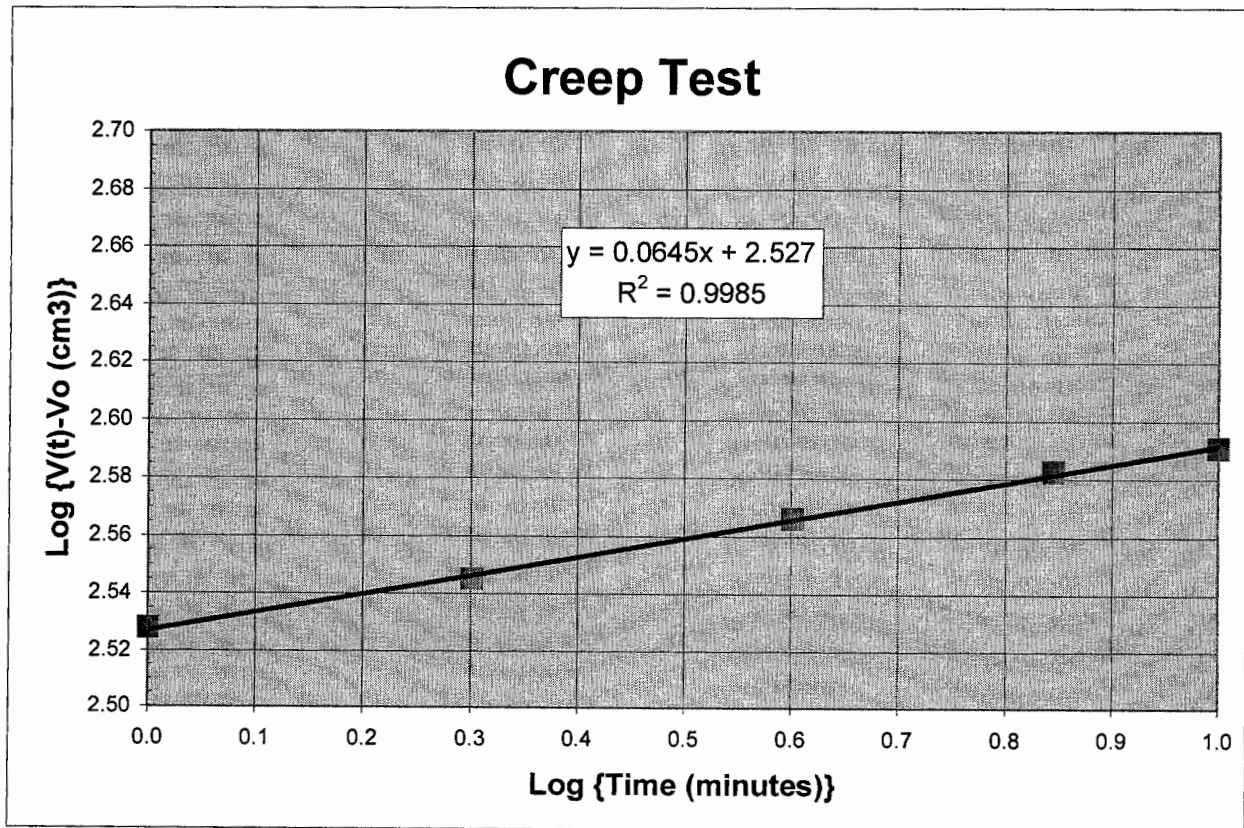
Pressuremeter Creep Test

Project: North Gate of Falls Church
 Sounding No.: B-7
 Test Depth: 35 feet
 Holding Gauge Pressure = 6.95 bars
 Corrected Pressure = 7.73 bars
 Initial Probe Radius = 3.69 cm
 Initial Probe Length = 46 cm
 Initial Volume of Probe = 1968 cm³
 Probe Radius Contacting Borehole = 3.69 cm
 Initial Borehole Volume, V₀ = 1968 cm³

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm ³)	Total Probe Volume (cm ³)	V(t)-V ₀ (cm ³)	Log [V(t)-V ₀] (cm ³)
1	0.000	337.07	2304.78	337.07	2.528
2	0.301	350.82	2318.53	350.82	2.545
4	0.602	368.20	2335.91	368.20	2.566
7	0.845	382.51	2350.22	382.51	2.583
10	1.000	389.79	2357.50	389.79	2.591

$$E_0(t)/E_0(t=1 \text{ min}) = \{t/1\}^{-n}$$

$$n = 0.0645$$

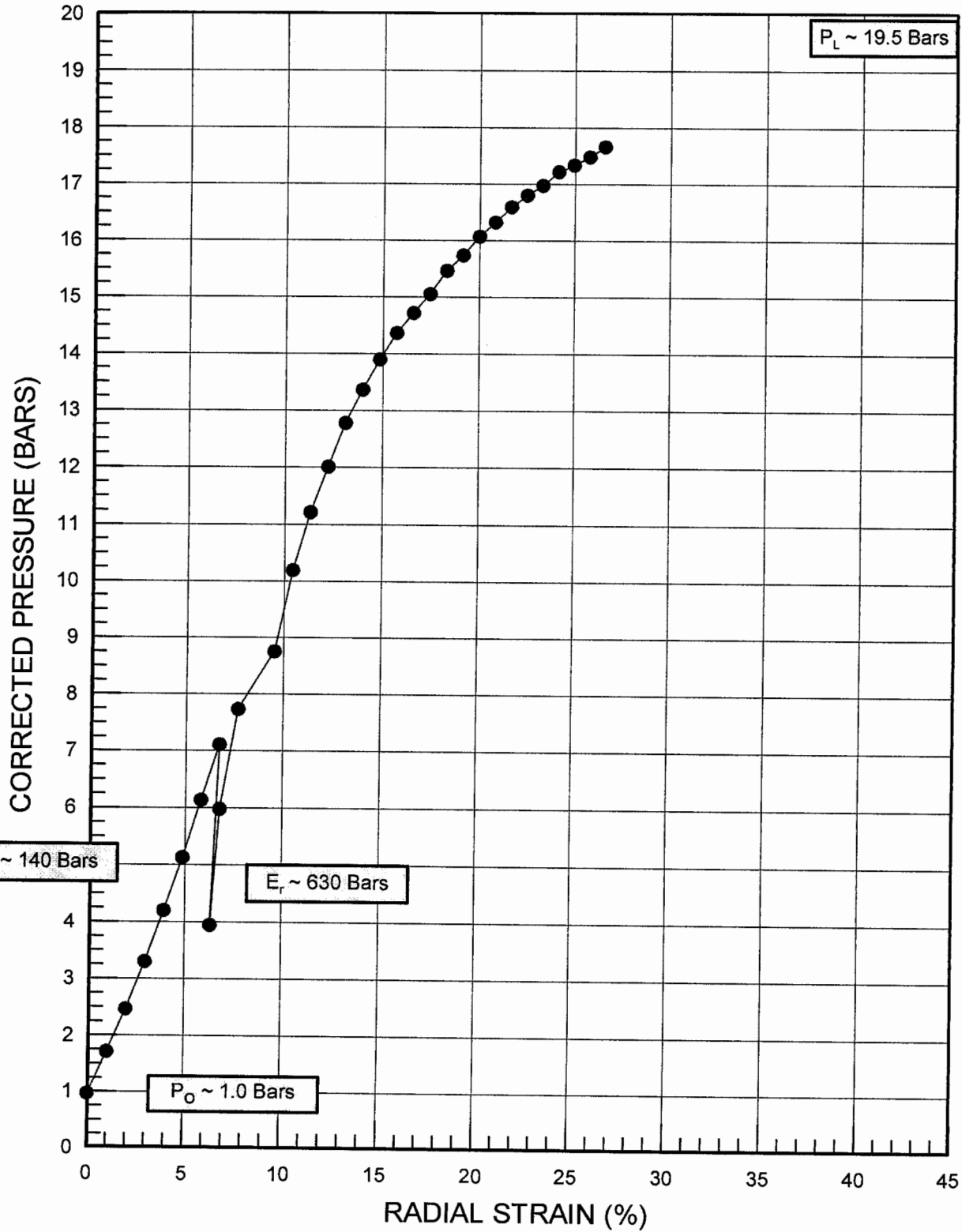


PROJECT: North Gate of Falls Church
LOCATION: Falls Church, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
TEST DATE: 5-10-07

BORING: B-7
DEPTH: 35.0 Ft.

PRESSUREMETER TEST RESULTS



North Gate of Falls Church -- Boring B-7 -- 35.0 Ft.

POINT NUMBER	VOLUME MEASUREMENT	PRESSURE MEASUREMENT	CORR. VOL. INCREASE (cm ³)	dR/Ro (%)	CORRECTED PRESSURE (bar)
1	0.00	-0.120	0.000	0.00	0.965
2	40.00	0.690	39.239	0.99	1.715
3	80.00	1.500	78.477	1.97	2.465
4	120.00	2.380	117.650	2.95	3.297
5	160.00	3.320	156.766	3.91	4.201
6	200.00	4.280	195.864	4.86	5.125
7	240.00	5.310	234.896	5.80	6.135
8	280.00	6.300	273.965	6.73	7.105
9	260.00	3.130	255.774	6.30	3.945
10	280.00	5.170	275.027	6.76	5.975
11	320.00	6.950	313.354	7.67	7.733
12	400.00	8.020	392.348	9.52	8.755
13	440.00	9.470	430.985	10.41	10.193
14	480.00	10.500	470.017	11.30	11.211
15	520.00	11.310	509.256	12.20	12.009
16	560.00	12.090	548.523	13.08	12.777
17	600.00	12.690	587.959	13.97	13.365
18	640.00	13.230	627.451	14.84	13.897
19	680.00	13.710	667.000	15.71	14.369
20	720.00	14.070	706.661	16.58	14.721
21	760.00	14.410	746.342	17.44	15.053
22	800.00	14.830	785.947	18.30	15.465
23	840.00	15.110	825.684	19.15	15.737
24	880.00	15.450	865.364	19.99	16.069
25	920.00	15.710	905.120	20.83	16.321
26	960.00	15.990	944.857	21.66	16.593
27	1000.00	16.210	984.650	22.49	16.805
28	1040.00	16.390	1024.481	23.31	16.977
29	1080.00	16.640	1064.246	24.13	17.219
30	1120.00	16.770	1104.123	24.94	17.341
31	1160.00	16.920	1143.982	25.75	17.483
32	1200.00	17.110	1183.804	26.55	17.665
Po =	1.00 bar	Pl =	19.50 bar	Pl* =	18.50 bar
Eo =	143 bar	Er =	626 bar	Eo/Pl* =	7.7

□

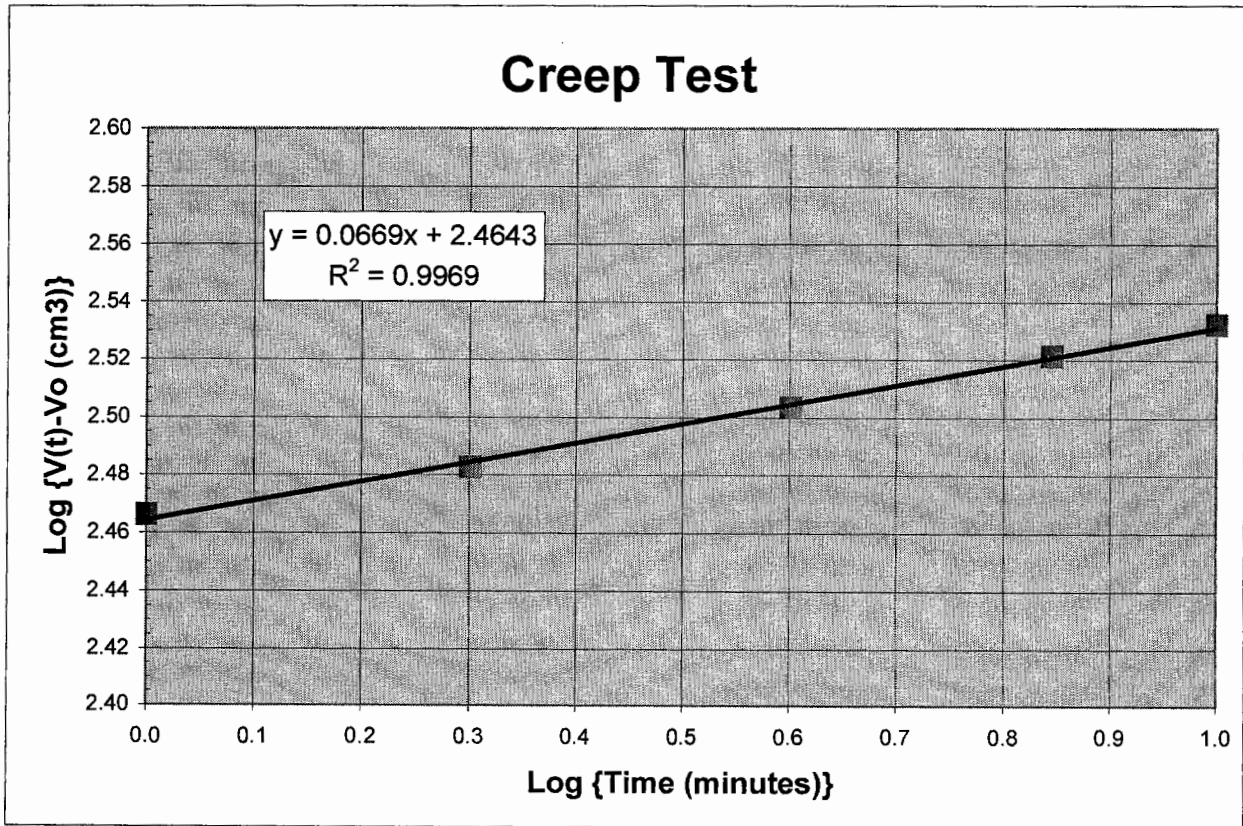
Pressuremeter Creep Test

Project: North Gate of Falls Church
 Sounding No.: B-7
 Test Depth: 45 feet
 Holding Gauge Pressure = 7.20 bars
 Corrected Pressure = 8.03 bars
 Initial Probe Radius = 3.69 cm
 Initial Probe Length = 46 cm
 Initial Volume of Probe = 1968 cm³
 Probe Radius Contacting Borehole = 3.69 cm
 Initial Borehole Volume, V₀ = 1968 cm³

Time (minutes)	Log (Time) (minutes)	Volume Increase (cm ³)	Total Probe Volume (cm ³)	V(t)-V ₀ (cm ³)	Log [V(t)-V ₀] (cm ³)
1	0.000	292.42	2260.13	292.42	2.466
2	0.301	303.83	2271.54	303.83	2.483
4	0.602	318.60	2286.31	318.60	2.503
7	0.845	332.02	2299.73	332.02	2.521
10	1.000	340.55	2308.26	340.55	2.532

$$E_0(t)/E_0(t=1 \text{ min}) = \{t/1\}^{-n}$$

$$n = 0.0669$$

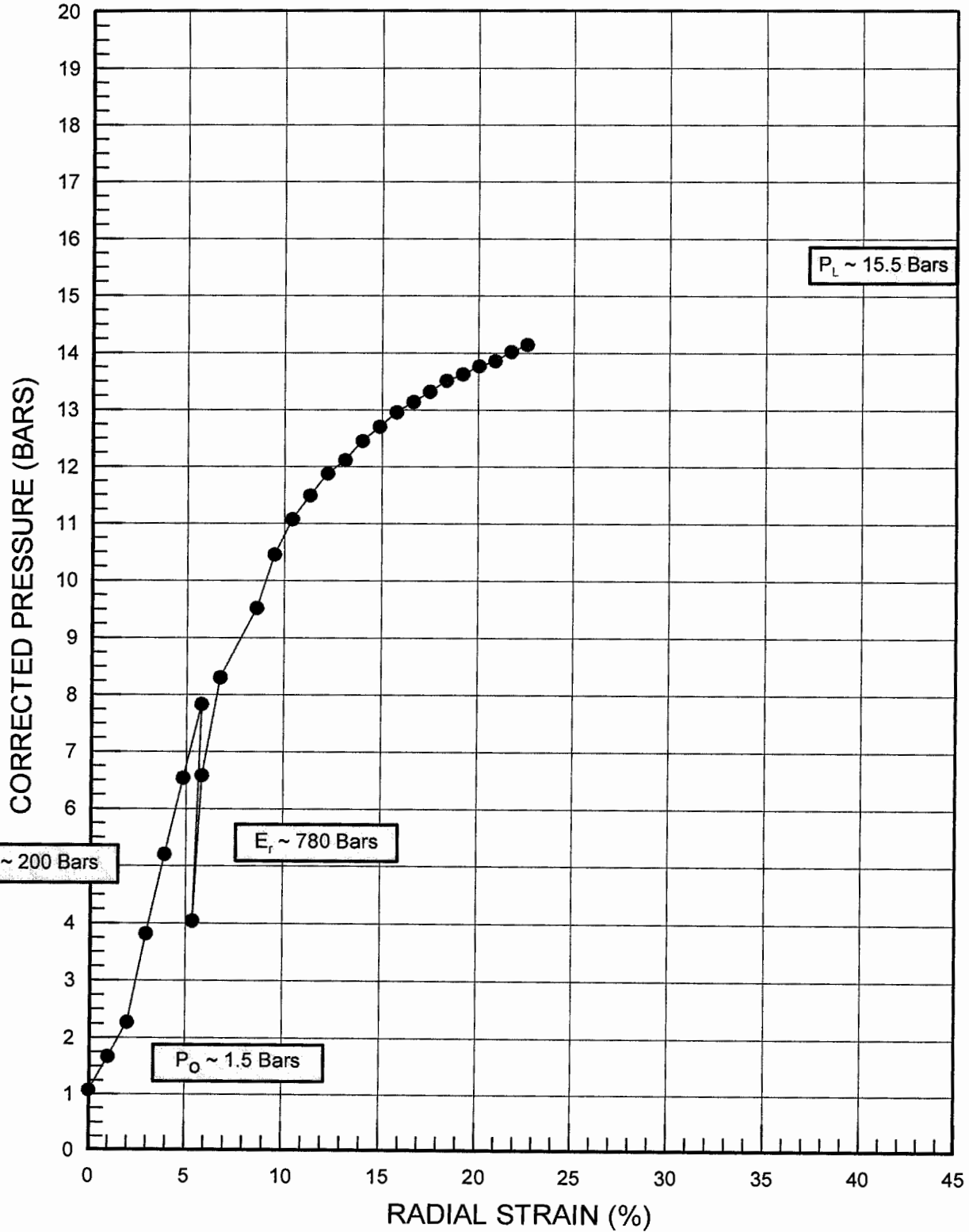


PROJECT: North Gate of Falls Church
LOCATION: Falls Church, Virginia

IN-SITU SOIL TESTING, L.C.
ENGINEER: R. Failmezger
TEST DATE: 5-10-07

BORING: B-7
DEPTH: 45.0 Ft.

PRESSUREMETER TEST RESULTS



North Gate of Falls Church -- Boring B-7 -- 45.0 Ft.

POINT NUMBER	VOLUME MEASUREMENT	PRESSURE MEASUREMENT	CORR. VOL. INCREASE (cm ³)	dR/Ro (%)	CORRECTED PRESSURE (bar)
1	0.00	-0.310	0.000	0.00	1.074
2	40.00	0.350	39.380	1.00	1.674
3	80.00	1.010	78.759	1.98	2.274
4	120.00	2.600	117.265	2.94	3.816
5	160.00	4.020	155.930	3.89	5.200
6	200.00	5.390	194.642	4.83	6.534
7	240.00	6.710	233.401	5.76	7.834
8	220.00	2.910	215.569	5.34	4.044
9	240.00	5.460	234.576	5.79	6.584
10	280.00	7.200	272.941	6.71	8.304
11	360.00	8.460	351.756	8.57	9.518
12	400.00	9.420	390.854	9.48	10.454
13	440.00	10.050	430.262	10.39	11.072
14	480.00	10.480	469.857	11.30	11.490
15	520.00	10.880	509.481	12.20	11.878
16	560.00	11.130	549.246	13.10	12.116
17	600.00	11.480	588.917	13.99	12.454
18	640.00	11.740	628.673	14.87	12.706
19	680.00	12.000	668.429	15.75	12.958
20	720.00	12.190	708.250	16.62	13.140
21	760.00	12.380	748.071	17.48	13.322
22	800.00	12.580	787.883	18.34	13.514
23	840.00	12.700	827.771	19.19	13.626
24	880.00	12.850	867.630	20.04	13.768
25	920.00	12.950	907.536	20.88	13.860
26	960.00	13.120	947.376	21.72	14.022
27	1000.00	13.250	987.254	22.55	14.144
Po =	1.50 bar	Pl =	15.50 bar	Pl* =	14.00 bar
Eo =	203 bar	Er =	779 bar	Eo/Pl* =	14.5

□