REPORT OF

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING ANALYSIS

300 L STREET, N.E.

WASHINGTON, D.C.

FOR

NEIGHBORHOOD DEVELOPMENT COMPANY

JUNE 1, 2004

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical ◦ Construction Materials ◦ Environmental

June 1, 2004

Mr. Karl Jentoff
Neighborhood Development Company
4110 Kansas Avenue, N.W.
Washington, D.C. 20011

ECS Job No. 9975

Reference: Report of Subsurface Exploration and Geotechnical Engineering Analysis for 300 L Street, N.E., Washington, D.C.

Dear Mr. Jentoff:

As authorized by acceptance of our Proposal No. 19757-GP, dated April 6, 2004, Engineering Consulting Services, Ltd. has completed the subsurface Exploration and Geotechnical Engineering Analysis for the aforementioned project. The results of our subsurface exploration program and geotechnical engineering analysis are contained in the enclosed report.

We appreciate this opportunity to be of service to Neighborhood Development Company and we would be pleased to discuss the results of our subsurface exploration and recommendations contained in the enclosed report with you at your convenience. Also, we recommend that we be afforded the opportunity to present the information contained in this report to the project design team in a meeting to ensure that they fully understand and appreciate the geotechnical requirements of the project. If in the meantime you have any questions with regard to the information contained in the enclosed report, please do not hesitate to contact us.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

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REPORT

PROJECT

Subsurface Exploration and
Geotechnical Engineering Analysis
300 L Street, N.E.
Washington, D.C.

CLIENT

Neighborhood Development Company
4110 Kansas Avenue, N.W.
Washington, D.C. 20011

PROJECT #9975

DATE June 1, 2004

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PROJECT OVERVIEW

Project Location/Description

The project site is bound by L Street, N.E. to the south, 3^{rd} Street, N.E. to the west and Abbey Place, N.E to the east. Specifically the proposed building will be located at 300 L Street, N.E. in Washington, D.C. The site is currently covered in asphalt paving on the eastern third and occupied by buildings on the remainder of the site. The location of the site is shown on the Vicinity Map included on the Boring Location Diagram in the Appendix.

Scope of Work and Proposed Construction

The conclusions and recommendations contained in this report are based on the results of a total of three soil borings performed by Engineering Consulting Services, Ltd. These borings were drilled in the existing parking lot and just south and west of the existing buildings, as shown on the Boring Location Diagram, provided in the Appendix of this report to depths ranging from 70± feet (ECS-1 and ECS-2) to 100± feet (ECS-3). The boring locations were selected and located in the field by ECS, Ltd.

It is our understanding that the proposed site will be developed with a building having approximately 2½ levels below existing grades, and five stories above grade. Based on our discussions with Mr. Mike Weiss with SDG, we understand that the proposed basement will extend approximately 25 feet below existing grades. We also understand that maximum interior loads will be on the order of 650 kips and maximum exterior column loads will be on the order of 450 kips.

The elevations noted on the boring logs, provided in the Appendix, were chosen as site datum elevations and are not true elevations. Should a site plan showing the elevation contours of the site become available, we would be pleased to revise our boring logs accordingly. These elevations should be taken as a site datum elevation.

Purposes of Exploration

The purpose of this study was to explore the soil and groundwater conditions at the site and to develop engineering recommendations to guide design and construction of the proposed project. We accomplished these purposes by:

1. drilling test borings to explore the subsurface soil and groundwater conditions,
2. performing pressuremeter testing to estimate the strength and deformation characteristics of the soils in situ,

3. performing laboratory tests on selected representative soil samples from the borings to evaluate pertinent engineering properties, and
4. analyzing the field and laboratory data for this and earlier explorations to develop appropriate engineering recommendations.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings performed by ECS, Ltd. were drilled with a truck-mounted drill rig. Continuous flight, hollow stem augers were utilized to advance the boreholes. Drilling fluid was not used in this process. However, mud rotary drilling process was only used in the borings where pressuremeter tests were performed. Another advantage to conventional hollow stem drilling is the ability to make more accurate readings of groundwater, which will affect design and construction.

Representative soil samples were obtained by means of the split-barrel sampling procedure in accordance with ASTM Specification D-1586. In this procedure, a 2-inch O.D., split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through a 12-inch interval is termed the Standard Penetration Test (SPT) value and is indicated for each sample on the boring logs. This value can be used as a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, it also indicates the consistency of cohesive soils. This indication is qualitative, since many factors can significantly affect the standard penetration resistance value and prevent a direct correlation between drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

A field log of the soils encountered in the borings was maintained by the drill crew. After recovery, each sample was removed from the sampler and visually classified. Representative portions of each sample were then sealed and brought to our laboratory for further visual examination and laboratory testing.

Pressuremeter Testing Program

In addition to the soil test borings mentioned above, two pressuremeter tests were performed in Boring ECS-1 at depths of 31± feet and 50± feet below the existing site grades.

In the Menard Pressuremeter Test, a radially expanding cylindrical probe is driven or pushed into a 2.5-inch diameter borehole in the soil or rock. After insertion, the probe is expanded incrementally against the side of the hole via pressurized liquid and gas. A known volume of fluid is injected into the probe and the corresponding pressure is noted after 30 and 60 seconds. The volume and pressure readings for each increment are recorded from the console gauges, which remain at the ground surface. The pressure increments are continued until failure of the soil is reached. In the case where the material is rock, the pressure increments are stopped when the safe limits of the system is reached.

By plotting the probe volume versus pressure, a stress-volumetric strain curve is obtained. From this curve, three parameters are obtained for the computation of the soil bearing value and compression. The first parameter is the creep pressure, P_f, which indicates the upper limit of the "pseudo-elastic" zone and indicates the pressure at which movements of the soil particles continue under constant load. The second parameter is the limit pressure, P_1, which is defined as the pressure at which the soil reaches failure. A third parameter is the modulus of deformation, E, which is derived from the slope of the stress-volumetric strain curve in the "pseudo-elastic" zone. The modulus of deformation, E, is used to estimate settlements of the foundation system elements and other loaded areas.

Laboratory Testing Program

Representative soil samples were selected and tested in our laboratory to check field classifications and to determine pertinent engineering properties. The laboratory testing program included visual classifications, moisture content tests, Atterberg Limits tests, grain size analyses and hand penetrometer tests. In the penetrometer test, the unconfined compressive strength of a cohesive soil is estimated by measuring the resistance of the soil sample to penetration by a small, spring calibrated cylinder.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System. The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. A brief explanation of the Unified System is included with this report. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; in situ, the transitions may be gradual.

The soil samples will be retained in our laboratory for a period of 60 days, after which, they will be discarded unless other instructions are received as to their disposition.

EXPLORATION RESULTS

Regional Geology

The natural soils at the site consist of Pleistocene age river terrace deposits consisting of clay, silt, sand and gravel, underlain by sand and clay deposits of the Potomac Group. These terrace and coastal deposits vary in the percentages of sand, silt, clay and gravel, both laterally and vertically. These soils overlie deeper residual materials formed from the in-place physical and chemical weathering of the underlying parent bedrock. The rock in this area is usually at least 100 feet below the ground surface.

Soil Conditions

Below the surficial gravel and existing asphalt, existing fill/possible fill materials were encountered in borings ECS-2 and ECS-3 to depths of approximately 6 feet and 1.5 feet, respectively. These materials consisted primarily of SAND with mixtures of clay and silt, with some gravel. Based on our observation of the samples and on recorded N-values in this material, it is not likely that the existing fill at the site was placed as engineered fill. However, due to the depth of the excavation, the existing fill materials will be removed within the building footprint area by design.

Underlying the fill layer, the soils were consistent with the geologic profile mentioned above. Initially, below the fill in ECS-2 and ECS-3 and below the surficial gravel and asphalt in ECS-1 a moderately to highly plastic CLAY (CL-CH) layer was encountered down to a depth ranging from approximately 28.5 feet to 36 feet below the existing site grades. This layer exhibited soft to hard consistencies with Standard Penetration Test (SPT) N-values of 6 blows per foot (bpf) to 22 bpf.

Below the clay stratum, more granular soils consisting of SAND (SC & SP) with variable amounts of clay and gravel was encountered to depths ranging from approximately 53.5 feet to 55 feet below the existing site grades. These strata exhibited loose to extremely dense relative densities with SPT N-values ranging from 7 bpf to 50/5".

The final stratum encountered consisted of a mixture of laminated SAND (SP) and CLAY (CH), Clayey SAND (SC) and Fine Sandy CLAY (CL-CH) with a variable but distinct presence of Lignite. This layer exhibited medium dense to very dense relative densities for cohesionless soils (SC and SP) and stiff to hard consistencies for cohesive soils (CL-CH and CH). SPT N-values ranged from 27 bpf to 77 bpf.

Groundwater Conditions

Groundwater seepage was observed in Borings ECS-1 and ECS-3 at a depth of approximately 30 feet where as in Boring ECS-2 groundwater (in a perched condition) was noted at approximately 7 feet, below the existing site grades. Observations for groundwater were made during sampling and upon completion of the drilling operations at each boring location. In auger drilling operations, water is not introduced into the boreholes, and the groundwater position can often be determined by observing water flowing into or out of the boreholes. Furthermore, visual observation of the soil samples retrieved during the auger drilling exploration can often be used in evaluating the groundwater conditions.

The groundwater table at the site, and specifically within this area of Washington, D.C., is highly variable and shallow perched water is very likely well above these depths (as noted in Boring ECS-2) and as we have seen on nearby projects, which may be encountered during excavation.

Groundwater control, both temporary and permanent should be anticipated given the depth of the water table. Furthermore, groundwater control must be maintained during construction operations in order to construct the foundations. If adequate groundwater control is not maintained, then the soils will loosen and soften and the contractor will not be able to achieve the designed bearing pressures. To minimize difficulties during the foundation installation phase, the exposed soils will need to be carefully evaluated by auger probing and select testing at various depths below the initial subgrade.

The highest groundwater observations are normally encountered in the late winter and early spring, and our current ground water observations are expected to be near the seasonal maximum water table. Variations in the location of the long-term water table may occur as a result of changes in precipitation, evaporation, surface water runoff, adjacent construction and other factors not immediately apparent at the time of this exploration.

ANALYSIS AND RECOMMENDATIONS

Subgrade Preparation and Earthwork Operations

Initial preparation of the site should consist of complete removal of existing pavements, sidewalks, and portions of existing structures and associated footings that will not be part of the new construction. Further excavation to the design subgrade level should be limited to about 1 foot above the design subgrade. This will allow any equipment required to excavate foundations the ability to negotiate the site on material that will ultimately be removed. We recommend this plan in order to limit undercutting that may be necessary due to the surface disturbance caused by construction traffic and exposure to weather. This is especially important for proper construction of the slab and foundation system.

Upon removal of the protective layer and excavation to the floor subgrade, the building slab areas should be observed by the Geotechnical Engineer of Record or his authorized representative. Any soft or unsuitable materials encountered during the observation should be removed and replaced with an approved backfill material in accordance with the earthwork specifications presented in this report.

Fill used to support any part of the proposed floor slabs should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within ±2% of the optimum moisture content, and compacted to at least 95% of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Test Method. Fills to be 8 feet or more in thickness, if any, should be compacted to a minimum of 98% of the above referenced density.

All fills should consist of an approved material, free of organic matter and debris, rocks greater than 4-inches and have a Liquid Limit and Plasticity Index less that 40 and 20, respectively. Unacceptable fill materials include topsoil and organic materials (OH, OL).

It should be noted that prior to the commencement of fill operations and/or utilization of any off-site borrow materials, the Geotechnical Engineer of Record should be provided with representative samples to determine the material's suitability for use in a controlled compacted fill and to develop moisture-density relationships. In order to expedite the earthwork operations, if off-site borrow materials are required, it is recommended they be comprised of a select granular material which will provide suitable support and be easily compacted and well drained. The contractor should be required to submit fill materials to the Geotechnical Engineer at least 3 days prior to their use in the field to allow for the appropriate testing to be performed.

Areas requiring fill should be well defined, including the limits of the fill zones at the time of fill placement. Grade controls should be maintained throughout the filling operations. All filling operations should be observed on a full-time basis by the Geotechnical Engineer of Record or his authorized representative to determine that minimum compaction requirements are being achieved. A minimum of one compaction test per 2,500-square-foot area should be made for each lift. The elevation and location of the tests should be clearly identified at the time of fill placement. Any area, which fails to meet required compaction should be recompacted and retested until minimum compaction is achieved. Failing test areas may require moisture adjustments in order to achieve minimum compaction.

Fill materials should not be placed on frozen soils or frost-heaved soils and/or soils which have been recently subjected to precipitation. All frozen soils should be removed prior to continuation of fill operations. Borrow fill materials, if required, should not contain frozen materials at the time of placement. All frost-heaved soils should be removed prior to placement of controlled, compacted fill, granular subbase materials, foundation or slab concrete, and asphalt pavement materials.

If any problems are encountered during the earthwork operations, or if site conditions deviate from those encountered during our subsurface exploration, the Geotechnical Engineer should be notified immediately. Only very limited fill is expected on this site due to the nature of the development.

Building Foundations

The proposed design results in the buildings lowest level bearing near the groundwater table. This is potentially significant in that the building is in an area where there will very likely be a charge for combined sewage fee. Often times, the economics of this condition results in buildings being supported by a mat foundation. We point this out, as the investment team should review the economics of this construction with permanent dewatering and spread footings versus a waterproofed mat foundation, at least in the lower elevation of the building.

Spread Footings

If spread footings are chosen, we recommend that the proposed structure, be supported on a shallow foundation system consisting of spread and/or continuous footings. We recommend a net allowable bearing pressure for the shallow foundations be 5,000 pounds per square foot (psf) with a minimum depth of embedment of 3 feet. Soils adequate to support such a design can be identified on the boring logs as those soils with a minimum Standard Penetration Test (SPT) N-value of 8 blows per foot (bpf).

For spread footing supported structures total settlements on the order of 1 inch is anticipated, while differential settlement between any two adjacent columns may approach ¾ inch.

No column or wall footings within the proposed building are expected to be supported on engineered fill. The exception to this will be any ancillary spread footings such as canopy footings and landscape planters or retaining walls. These structures should be designed for a net allowable bearing pressure of 2,000 psf. The 2,000 psf bearing pressure will be applicable to spread footings supported on engineered fill and/or firm natural soils. If disturbed materials or where existing fill materials are present at the footing bearing level, it will be necessary to extend the footings below the depth of disturbed or existing fill materials.

The following guidelines are provided to aid in the field evaluation of suitable soils. Soils adequate to support the 5,000 psf bearing pressure should have a minimum penetration value of 8 blows per foot (bpf). Individual footings must be field verified based on observation and the performance of Dynamic Cone Penetrometer (DCP) tests in individual footing excavations. It is critical that the contractor maintain groundwater control to reduce "step down" caused by construction disturbance, and inundation.

To prevent unnecessary undercuts or stepping down of individual spread footings, the excavation of any individual footing should be stopped 1 foot above the proposed bearing elevation and the subgrade soils evaluated at the proposed bearing elevation by hand augering through the 1 foot of overburden and then testing the soil using a dynamic cone penetrometer or other means. Probing with reinforcing steel and/or steel soil probes are not an acceptable method of evaluating the bearing capacity of the soil. In addition, once the bearing capacity of the soil is determined to be acceptable, immediately prior to excavation of the remaining 1 foot of soil, the reinforcing steel and any other work related to placement of the concrete for the footings should be prepared ahead of time to limit as the time the subgrade soils are exposed to groundwater seepage. If this is not practical, then a 4 inch thick lean concrete mud mat will be required.

Mat Foundation

If a mat foundation is chosen due to the limitations on the feasibility of permanent dewatering systems, we recommend that the proposed building be supported on a mat foundation with below grade walls, which are waterproofed with no provision for external permanent dewatering.

We recommend that the mat foundation be designed for a net contact stress not exceeding 4,000 psf except that the "spot" contact stress can be 5,000 psf in an isolated area with a radius not exceeding 30 feet. We recommend that the mat foundation be designed utilizing a modulus of subgrade reaction, k, equal to 125 tcf, except that 150 tcf may be used in the "spot" stress zone. This modulus of subgrade reaction is based upon an equivalent 12-inch square plate load test. Caution should be used in determining the proper modulus of subgrade reaction to be input into any computerized solution to determine the thickness of the mat. Specifically the modulus of subgrade reaction is a function of the size of the plate on which the test is based, and care must be taken to ensure the use of the proper value of the modulus for the specific computer program formulation being run.

The bearing capacity of the subgrade soils should be confirmed immediately prior to placement of a gravel or concrete working mat. The soils should be observed by an experienced engineering technician working under the direct supervision of a registered professional geotechnical engineer. Any soils which are soft or which become loosened by construction activities or water intrusion should be removed and replaced with a gravel backfill. Proper dewatering of the subgrade soils will be necessary during construction to minimize difficulties during foundation installation. Construction dewatering is discussed in a subsequent section of this report.

The weight of the soil excavated will be greater that the net weight of the building; therefore, the majority of any settlement of the building will be due to one or more of two factors. The first factor being that the soils at the base of the excavation will have a tendency to rebound due to the removal of approximately 25 feet of soil. The soils will re-compress as a result of the loading of the building on the order of magnitude of the rebound. The second potential mechanism that could contribute to settlement of the structure would be if loosened soils are not removed prior to placement of foundation elements. These loosened soils would compress contributing to localized settlements.

With proper monitoring and observations during construction, these contributing factors to settlement can be minimized and/or eliminated. Therefore, settlement of a properly designed and constructed mat foundation should be less than 1 inch with differential settlement not exceeding an angular distortion of 0.002 inch per inch within the mat. We anticipate that some rebound of the subgrade soils may occur during excavation and that recompression of the soils will occur as the building is constructed.

The mat may be placed in one continuous concrete pour or in sections. If the mat is placed in one continuous pour, we recommend that super plasticizers be used in the concrete mix designed to decrease the water to cement ratio, which will in turn, reduce the potential for shrinkage cracks in the mat. Cold joints should not be permitted during placement of the mat concrete.

If the mat is placed in sections, we recommend that the construction joints be designed so as to ensure that the joints are watertight. We recommend that the mat be placed in a checkerboard fashion so that every other square is placed to minimize shrinkage effects. If internal braces (rakers) are utilized for the support of the earth retention system, box outs within the mat will be required due to penetration of the rakers for the mats. The joints in the mat around the rakers should also be constructed using a watertight seal.

Since the soils at the subgrade elevation are moisture and disturbance sensitive, we recommend that an attempt be made to minimize disturbance of the subgrade. The first step of construction should be to install the dewatering system. During excavation operations, we recommend that large excavation equipment be permitted to excavate no deeper than 1 foot above the proposed subgrade elevations. Below this level, smaller excavation equipment or a Gradall should be utilized for final grading which will minimize disturbance of the subgrade. Upon completion of the excavation, a 12-inch gravel working mat, or a 3 to 6-inch lean concrete mud mat, should be used as a working mat, to prevent disturbance of the subgrade soils during reinforcing steel placement and framing.

A properly installed mat, with proper crack control, permits only limited water to migrate to the surface of the mat. However, it is virtually impossible to eliminate all water intrusion in an undrained condition. Therefore, we recommend that the mat be constructed utilizing a full bentonite-waterproofing layer. The bentonite should be placed in accordance with the manufacturer's recommendations. Some post installation leakage is common and should be repaired using injection grouting or as determined by the bentonite installation contractor's warranty.

An alternative to below mat bentonite, or even in addition to this system, is the use of a "false slab" design. The false slab consists of a 4 inch (typical) bearing slab constructed over a drainage medium (Miradrain G100N, or similar). The minor leakage that penetrates the mat is collected in the drainage board and removed by a sump. Typically, the leakage should be less than 5 gallons per minute if no bentonite is used, to even lower rates if the bentonite is used below the mat.

Floor Slab Design (Shallow Foundations)

For the design and construction of any interior lower slabs-on-grade for the proposed structures, we recommend that any soft or unsuitable materials be removed from these areas. The stripped area should be observed by the Geotechnical Engineer of Record or his authorized representative during the time of construction in order to aid in locating all such unsuitable materials, which should be removed. Where new fill material is required to reach the design floor slab subgrade elevation, it should be an approved inorganic material, free of debris. This material should be placed in lifts not exceeding 8 inches in loose thickness, moisture conditioned to within ±2% of the optimum moisture content, and compacted to a minimum of 95% of the maximum dry density determined in accordance with ASTM Specification D-698, Standard Proctor Method.

We recommend that the floor slab be isolated from the foundation footings so that differential settlement of the structure will not induce shear stresses in the floor slab. Furthermore, in order to minimize the crack width of any shrinkage cracks that may develop near the surface of the slab, we recommend mesh reinforcement be included in the design of the floor slab. The mesh should be in the top half of the slab to be effective. Special attention should be given to the surface curing of the slab in order to minimize uneven drying of the slab and associated cracking.

We also recommend that the slabs-on-grade be underlain by a minimum of 4 inches of granular material having a maximum aggregate size of 1.5 inches and no more than 2% fines. This granular layer will facilitate the fine grading of the subgrade and help prevent the rise of water through the floor slab. Prior to placing the granular fill, the floor slab subgrade soils should be properly compacted, and be free of standing water, mud, or frozen soil. Before the placement of concrete, a vapor barrier should be placed on top of the granular material to provide additional moisture protection. If loads for the slab are in excess of 500 psf, this granular layer should be increased to 6 inches.

Below Grade Walls

Design

The below grade walls should be designed to withstand lateral earth pressures and surcharge loads. We recommend that for the mat foundation option, the walls lower than 10 feet below the existing ground surface should be designed for full hydrostatic loads. This will require that the walls be designed for an equivalent fluid pressure of 90 psf per foot of wall height below 10 feet in depth from final exterior grades. These equivalent fluid pressures are unfactored with respect to concrete design. For the spread footing foundation system the walls should be designed for drained conditions using an equivalent fluid pressure of 60 psf per vertical foot of wall height. The 60 psf also applies to the mat option from 0 feet to 10 feet in depth below the ground surface. This recommended lateral earth pressure assumes that the wall will have a drained condition using either free draining granular backfill or manmade drainage materials above the anticipated groundwater elevation. The wall design should also account for any surcharge loads within a 45 degree slope from the base of the wall. A Lateral Earth Pressure Diagram is included in the Appendix of this report.

Since the earth retention system will be required for the site, it is possible "lot line" construction will be used. Under this scenario, the perimeter drain (for the spread footings option) should not be installed exterior to the building, but rather should be installed just interior to the building, as close as feasible to the exterior wall. Also under this scenario, weep holes should be placed at a spacing of no greater than 8 feet on center, generally designed to align between the solider beams of the earth retention system. The weep holes should be a minimum of 1.5 inches in diameter, and should freely drain from the exterior drainage medium to be collected by the perimeter drain line just inside the base of the wall.

Underground Drainage (Spread Footings)

We recommend that the below grade areas be provided with a perimeter and underslab drainage system. This system may consist of perforated or porous wall, closed joint drain tiles located around the perimeter of the below grade area, outside the wall, slightly below the finished floor level. The drain lines should be surrounded by a minimum 6 inches of porous granular material having a gradation compatible with the size of the opening utilized in the drain lines and the surrounding soils to be retained.

We recommend that the perimeter and underslab drain system for the proposed building be designed to flow to one permanent sump. The final location of the permanent sump should preferably be located relatively close to the elevator pit areas. This location takes into account that the elevator pit wall will generally have gravel extending lower than the underslab drainage pipes, if the sump is located away from the elevator areas, which could result in the gravel at the elevator pits creating a reservoir. If the sump is located away from the elevator pit walls then an underslab drain line should be installed to hydraulically connect the water near the top of the elevator pit slab and the sump, to ensure that these areas are properly drained.

The sump pumps should be installed with a full duplex configuration. With an average 25-foot excavation, the pumps should be designed for a minimum combined flow rate of 50 gpm capacity, with each pump rated at not less than 25 gpm. Based on the soils encountered within the borings and the location of the site, we anticipate that the pumps would operate at two-thirds or less of the above specified capacity over the long term and we anticipate a long term pump rate of about 25 to 30 gallon per minute (gpm) or less. A grit collection chamber should be installed upstream of the sump pumps to reduce the amount of granular materials reaching the pumps.

Because moderate to high volumes of water are anticipated, lateral drain lines under the floor slab should be placed at no more than 30 feet on center. Underslab drain lines should have a minimum diameter of 4 inches. Clean out access should be installed at all sharp bends in the underslab drain system.

During construction, the contractor should monitor initial pumping rates so that the final pump size can be confirmed before installation.

Waterproofing

Mat Foundation

Based on the recommendation of full waterproofing of the below grade walls, perimeter drain lines are not required with the mat foundation option. Waterproofing should consist either of bentonite wall panels or continuous waterproofing membranes. The waterproofing should extend from the mat to within 10 feet of the ground surface, from the ground surface to a depth of 10 feet, the wall should be "damp-proofed". Care must be exercised during installation and backfilling to reduce damage to the waterproofing system. Any areas which have become damaged should be repaired or replaced. It is important that the waterproofing be continuous around the entire perimeter of the structure to be effective. Perimeter waterproofing should extend down the sides of the mat to the bottom of the mat.

Water stops should be provided at construction joints at the interface of the perimeter walls with the mat foundation, at adjacent pours of the perimeter walls, and within construction joints within the mat. The design of these water stops and waterproofing is especially critical to providing effective waterproofing. Such joints provide a conduit for water infiltration if not properly waterproofed.

All penetrations through the mat or walls such as floor drains, tiedown anchors, tie backs or other penetrations should incorporate bentonite strips or other water stops to prevent the migration of water along the interface of the penetration with the mat or wall concrete. Even with proper bentonite panels, it is common for some leakage to occur. Therefore, epoxy grouting to seal leaks after completion of construction should be expected.

Spread Footings

Provided the underground drainage system and below grade walls are constructed in accordance with the recommendations above, waterproofing of below grade walls can be limited or possibly eliminated. Since the fluctuation of groundwater may rise several feet above the lower level slab, it may be desirable to have some waterproofing of the exterior below grade walls. However, with a properly drained backfill or manmade drainage material, waterproofing is not required. If waterproofing is used, it may be limited to the lower level of the parking garage.

Excavation Support

Due to the depth of the parking garage excavation required for this project, a temporary excavation system will be required. A free draining system consisting of soldier piles and wood lagging is recommended. The system could be braced externally using tiebacks, if possible. The soldier piles and lagging should be designed for a lateral earth pressure equivalent to 35 times the height of the excavation in pounds per square foot. Spacing of the soldier piles and braces should be determined by a structural analysis. However, we recommend that the maximum center line to center line spacing of the soldier piles not exceed 8 feet. In addition, wooden lagging should have a minimum thickness of 3 inches.

The temporary earth retention system should allow for "stepping down" of the perimeter footings to a maximum of 2 feet below the proposed bearing elevations. In this way, in the event that a step down is required, construction difficulties can be avoided with regard to undermining the installed soldier beams when the footing is being placed.

If tiebacks are used, the tieback anchors must be situated beyond a 45° slope from the base of the excavation. We recommend tiebacks be installed at a maximum downward angle of 30° from the horizontal. We also recommend a performance test be performed on 10% of randomly selected tiebacks. The performance test evaluates the tieback load carrying capacity, deflections during loading, and movements with respect to time. The tieback capacity should be considered adequate when a stable condition is obtained under a particular test load for a duration of 15 minutes. In addition, we recommend that each tieback be proof tested to 120% of its design load and then locked off at 80% of its design load.

In areas where tiebacks are not feasible, an internal bracing system of rakers would be required. Rakers should be braced against toe blocks or other reaction points that have been designed to carry the load.

The contractor should avoid stockpiling excavated materials immediately adjacent to the excavation walls. We recommend that stockpile materials be kept back from the excavation a minimum distance equal to one-half the excavation depth to avoid surcharging the excavation walls. If this is impractical due to space constraints, the excavation walls should be retained with bracing design for the anticipated surcharge loading.

Due to the extremely dense nature of some of these deeper soils, predrilling of the solider piles may be required in some areas. The earth retention contractor should drive probe piles (which can be used for production if properly located and extended to design depth) to determine areas where predrilling will be required.

Excavation Dewatering

Excavation dewatering is critical for construction of the foundations. We anticipate that a combination of sump pits, deep wells, trenching and sump pumping operations can adequately control the groundwater to a level at least 4 feet below the final slab elevation, and at least 1 foot below planned footing subgrade. Although the use of the deep wells in the clays and sands observed in the borings will be marginal, the wells, if properly installed and placed, can effectively reduce the volume of water infiltrating the temporary earth retention system and subsequently reduce the amount of trenching and sump pit operations.

We anticipated that construction dewatering can be handled by first installing at least three deep wells. If feasible, a fourth well should be installed near the center of the site, although the exact means and methods of dewatering should be designed by the contractor. These wells should be installed prior to any excavation operations to a depth of approximately 50 feet, below existing site grades. This will aid in reducing the amount of water infiltrating into the site. These wells should likely be pumped continuously during the excavation operations. In addition to the three deep wells, at a minimum, a trench along the perimeter of the excavation should be installed, as soon as practical based an excavation rates, to intercept water coming into the site. Additional trenching operations will be necessary depending on the time of year and also the time in which the deep wells and perimeter trench were installed and allowed to operate.

The sump pits should consist of trenching operations and construction of shallow wells, which may consist of the placement of 55-gallon drums perforated about its perimeter and wrapped in filter fabric. The fine grained soils encountered on this site are moisture sensitive and are susceptible to erosion through groundwater seepage or surface water runoff. Adequate groundwater control and siltation control measures should be maintained throughout the earthwork operations. Individual spread footing excavations should be opened and poured as soon as possible, generally within 4 hours in order to reduce the effect of loosening of the soils due to the unbalanced hydrostatic conditions.

Vibrations During Pile Installation Operations

Based on our understanding of the projects in the vicinity we strongly recommend that the owner commission the performance of a pre-construction survey on all buildings within one-half block of the construction area. It has been our experience that such pre-condition surveys can usually help prevent frivolous claims as a result of pre-existing damages that were not apparent to nearby property owners until they began to observe their building following the initiation of deep excavation or piles installation operations. We recommend that owners or property managers be invited to accompany the engineering crews on the survey of the building, and to receive a copy of the survey. Naturally, if there is any damage to the nearby buildings, this survey can be beneficial in helping develop an equitable resolution.

The preconstruction survey should be performed prior to initiation of excavation activities or piles installation. The survey should consist of a photographic or video record of the interior and exterior of adjacent structures to document the condition of the structures and vibrations monitoring prior to initiation of development activities. The preconstruction survey may also include the installation and initial measurements of slope inclinometer devices required to monitor movements of the temporary excavation support system. Such a survey may aid in limiting or eliminating claims of damage to nearby structures allegedly caused by the proposed construction. We would be pleased to discuss the level of documentation required and to provide these services.

During pile driving operations, the nearest buildings should be monitored to verify that the vibration caused by the pile driving operation does not cause damage to the existing buildings. A peak particle velocity of 1.0 inch per second can be used for initial suitability criteria for the allowable peak velocity.

Site Seismic Classification (IBC)

In October 2003, the District of Columbia adopted the 2000 International Building Code (IBC) as the code for building developments. Based upon our interpretation of the IBC 2000, we recommend a seismic site Class E for the soil conditions at the subject property. It is possible that the site could demonstrate a site Class D rating with additional geotechnical in situ testing/exploration and analysis.

Construction Considerations

The design of the site dewatering system and the earth retention system design and underpinning will be major considerations for this project. On other projects in the Washington, D.C. area, we have observed excessive settlement of adjacent structures and streets due to poor workmanship during construction of the earth retention system, as well as excessive lateral deflections of the earth retention system. In addition, we have observed a failure of an earth retention system which resulted in settlement of an adjacent building. Since many construction claims arise from adjacent property owners whose structures have been damaged or are perceived to be damaged due to deep excavations, we recommend that Engineering Consulting Services, Ltd. review the proposed earth retention system design for conformance with the recommendations contained in this report.

Because of the proximity of adjacent structures, we recommend that a preconstruction survey of the adjacent structures be performed prior to excavation and building activities. We recommend that the adjacent buildings be monitored for settlement and deflection during excavation and construction activities. You may also want to consider monitoring of other structures and the earth retention system.

We have recommended the installation of deep wells for dewatering during construction. The wells should be installed prior to the initiation of excavation operations, and should be installed just outside the excavation limits. However, based on the anticipated grain size distribution of some of the soils encountered at the proposed foundation bearing elevation, the deep wells are anticipated to be only marginally effective in dewatering the site during construction due to the percentage of fines (silt and clay) anticipated and should be supplemented with a sump pit and pumping operation, including French Drains.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain open for too long a time. Therefore, foundation concrete should be placed the same day that the foundation bearing grade is exposed. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom immediately prior to placement of concrete. We recommend that a 4-inch thick "mud-mat" of "lean" concrete be placed on the bearing soils before the placement of reinforcing steel.

In a dry and undisturbed state, the majority of the soil at the site will provide good subgrade support for fill placement and construction operations. However, these soils are considered moisture and disturbance sensitive. When wet, these soils will degrade quickly with disturbance from contractor operations. Therefore, good site drainage should be maintained during earthwork operations which will help maintain the integrity of the soil.

Special Qualifications

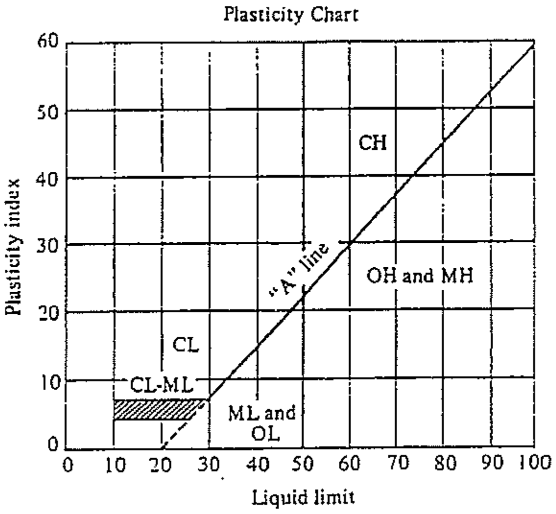
The pressuremeter tests used in the evaluation of this site are a specialized geotechnical tool which requires special expertise to accurately analyze the test data. Therefore, we can take no responsibility for the misinterpretation of our analysis by others unfamiliar with the pressuremeter engineering or its applications or full inspections performed by others. Because of this, we recommend that Engineering Consulting Services, Ltd. observe the foundation excavations and bearing subgrade.

Closing

We recommend that the construction activities be monitored by the Geotechnical Engineer of Record to provide the necessary overview and to check the suitability of the subgrade soils for supporting the foundations. We would be most pleased to provide these services.

APPENDIX

Unified Soil Classification System (ASTM D-2487)

Major Divisions			*Group Symbols*	*Typical Names*	*Laboratory Classification Criteria*		
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)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 per cent GW, GP, SW, SP More than 12 per cent GM, GC, SM, SC 5 to 12 per cent *Borderline* cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a] d u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line with P.I. greater than 7	
	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		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a] d u	Silty sands, sand-silt mixtures		Atterberg limits above "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
Fine-grained soils (More than half material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	 Plasticity Chart		
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt	Peat and other highly organic soils			

[a] Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; the suffix u used when L.L. is greater than 28.

[b] Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

From Winterkorn and Fang, 1975

REFERENCE NOTES FOR BORING LOGS

I. Drilling and Sampling Symbols:

SS – Split Spoon Sampler
ST – Shelby Tube Sampler
RC – Rock Core: NX, BX, AX
PM – Pressurmeter
DC – Dutch Cone Penetrometer

RB – Rock Bit Drilling
BS – Bulk Sample of Cuttings
PA – Power Auger (no sample)
HSA – Hollow Stem Auger
WS – Wash Sample

Standard Penetration (Blows/Ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch O.D. split spoon sampler, as specified in ASTM D-1586. The blow count is commonly referred to as the N-value.

II. Correlation of Penetration Resistances to Soil Properties:

Relative Density-Sands. Silts

SPT-N	Relative Density
0- 3	Very Loose
4- 9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
over 80	Extremely Dense

Consistency of Cohesive Soils

Unconfined Compressive Strength, Qp, tsf	Consistency
under 0.25	Very Soft
0.25-0.49	Soft
0.50-0.99	Firm
1.00-1.99	Stiff
2.00-3.99	Very Stiff
4.00-8.00	Hard
over 8.00	Very Hard

III. Unified Soil Classification Symbols:

GP	Poorly Graded Gravel
GW	Well Graded Gravel
GM	Silty Gravel
GC	Clayey Gravels
SP	Poorly Graded Sands
SW	Well Graded Sands
SM	Silty Sands
SC	Clayey Sands

ML - Low Plasticity Silts
MH - High Plasticity Silts
CL - Low Plasticity Clays
CH - High Plasticity Clays
OL - Low Plasticity Organics
OH. - High Plasticity Organics
CL - ML - Dual Classification
(Typical)

IV. Water Level Measurement Symbols:

WL - --Water Level
WS - While Sampling
WD - While Drilling

AB - After Boring but Before Casing Removal
AC - After Casing Removal
WCI - Wet Cave In
DCI - Dry Cave In

The water levels are those water levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clays and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-1	1 OF 3

PROJECT NAME
300 L STREET, NE

ARCHITECT-ENGINEER
HICKOK WARNER COLE

SITE LOCATION
WASHINGTON, DC

DESCRIPTION OF MATERIAL
ENGLISH UNITS
SURFACE ELEVATION 100

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

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

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

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

SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)
1	SS	18	6
2	SS	18	8
3	SS	18	12
4	SS	18	14
5	SS	18	16
6	SS	18	16
7	SS	18	16
8	SS	18	18

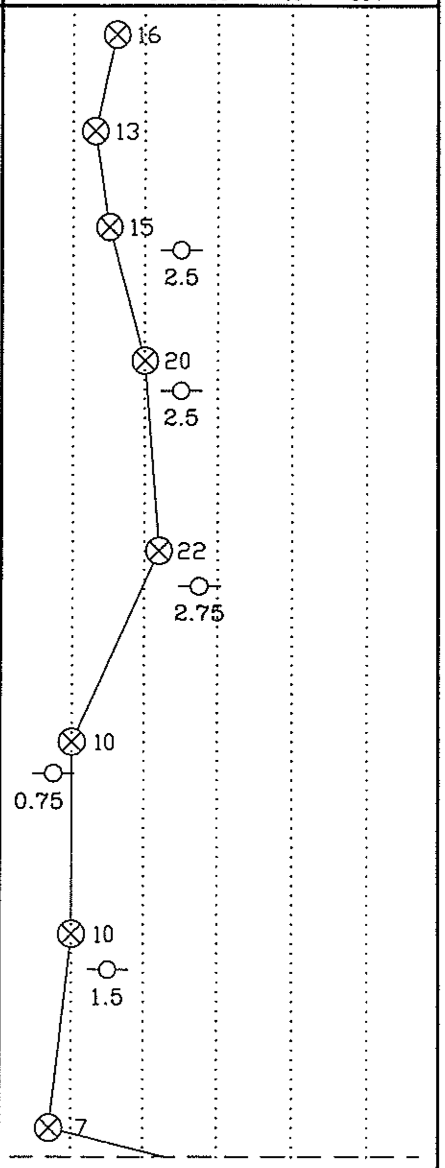
Asphalt Depth 2"

Gravel Depth 6"

Clayey SAND, With Gravel, Orangish Brown, Moist, Medium Dense, (SC)

CLAY, Light Brown to Gray, Moist to Wet, Medium Stiff to Very Stiff, (CL-CH)

Clayey SAND, Tan and Gray, Moist to Wet, Loose to Medium Dense, (SC)



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

▽WL 30.0'	WS OR [✓ WD]	BORING STARTED 05-09-04	
▽WL(AB) 30.0' ▼WL(AC)		BORING COMPLETED 05-09-04	CAVE IN DEPTH @ 40.0'
▽WL		RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

RC (05-25-04) RC (06-01-04)

MZortmon(05/25/2004)

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-1	2 OF 3

PROJECT NAME	ARCHITECT-ENGINEER
300 L STREET, NE	HICKOK WARNER COLE

ECS LTD

SITE LOCATION
WASHINGTON, DC

DESCRIPTION OF MATERIAL

ENGLISH UNITS

SURFACE ELEVATION 100

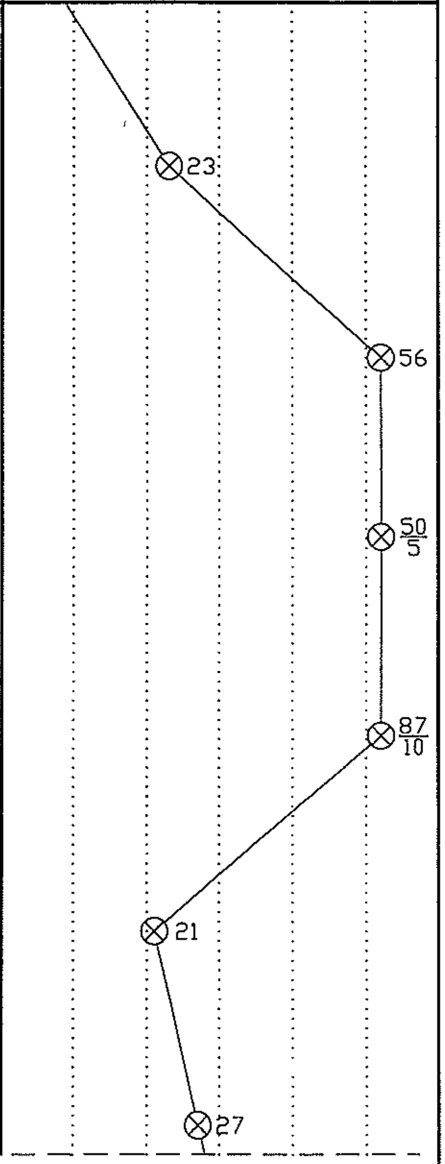
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)
30					Clayey SAND, Tan and Gray, Moist to Wet, Loose to Medium Dense, (SC)		
	9	SS	18	14	SAND, Trace Clay and Gravel, Tan to Gray, Moist, Medium Dense to Extremely Dense, (SP)		
35							65
	10	SS	18	14			
40							60
	11	SS	11	10			
45							55
	12	SS	16	12			
50							50
	13	SS	18	18			
55					CLAY and SAND Laminations, Gray, Moist to Wet, Medium Dense and Stiff, (SP-CH)		45
	14	SS	18	18			
60							

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

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

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

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



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

▽WL 30.0' WS OR [✓ WD]	BORING STARTED 05-09-04	
▽WL(AB) 30.0' ▼WL(AC)	BORING COMPLETED 05-09-04	CAVE IN DEPTH @ 40.0'
▽WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

CLIENT NEIGHBORHOOD DEVELOPMENT CO.	JOB # 9975	BORING # ECS-1	SHEET 3 OF 3	ECS LTD
PROJECT NAME 300 L STREET, NE	ARCHITECT-ENGINEER HICKOK WARNER COLE			
SITE LOCATION WASHINGTON, DC				

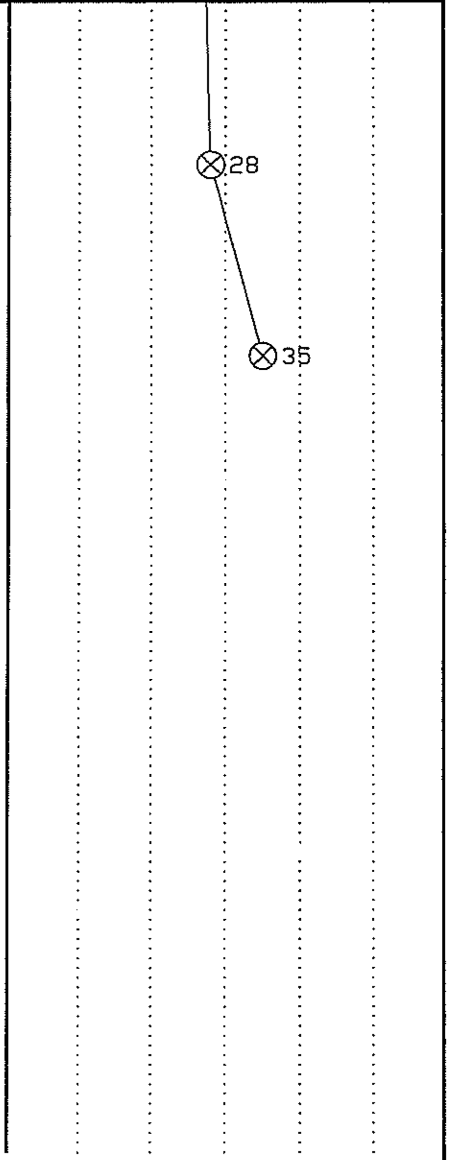
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS SURFACE ELEVATION 100	WATER LEVELS	ELEVATION (FT)
60					CLAY and SAND Laminations, Gray, Moist to Wet, Medium Dense and Stiff, (SP-CH)		
	15	SS	18	18			
65							35
	16	SS	18	18			
70					END OF BORING @ 70.00'		30
75							25
80							20
85							15
90							

-○- CALIBRATED PENETROMETER TONS/FT.^{2}
1 2 3 4 5+

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

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

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



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

▽WL 30.0' WS OR WD	BORING STARTED 05-09-04	
▼WL(AB) 30.0' ▼WL(AC)	BORING COMPLETED 05-09-04	CAVE IN DEPTH @ 40.0'
▽WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-2	1 OF 3

PROJECT NAME	ARCHITECT-ENGINEER
300 L STREET, NE	HICKOK WARNER COLE

SITE LOCATION
WASHINGTON, DC

DESCRIPTION OF MATERIAL

ENGLISH UNITS

SURFACE ELEVATION 100

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

Gravel Depth 4"

SAND, With Clay, Trace Gravel, Brown, Wet to Saturated, Medium Dense, (SC– Possible Fill)

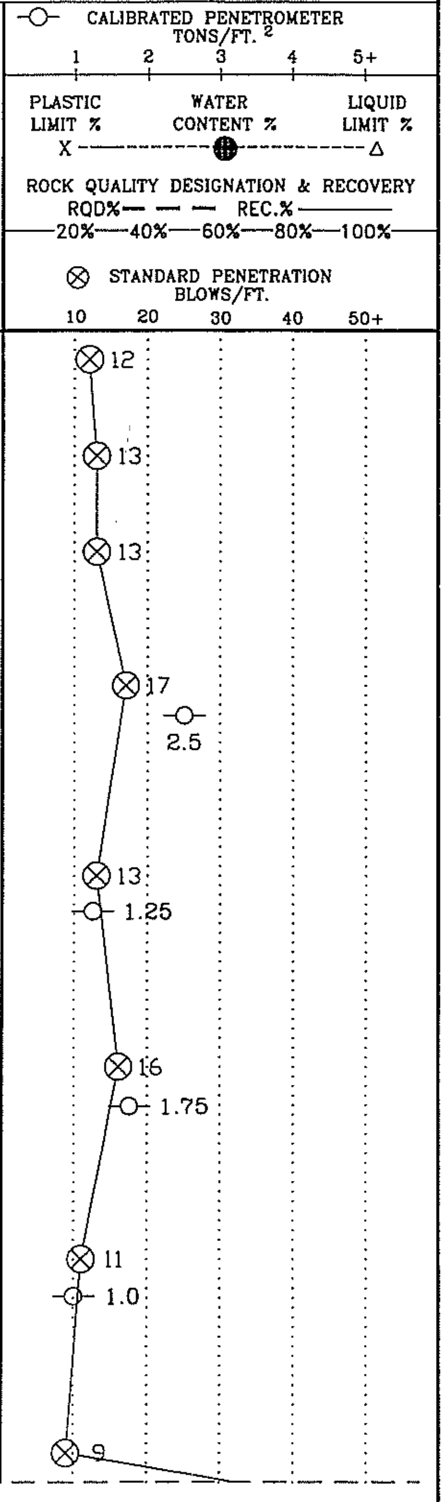
CLAY, Light Brown, Moist to Saturated, Very Stiff to Stiff, (CL–CH)

Clayey SAND, Trace Gravel, Gray and Tan, Wet, Loose to Dense, (SC)

WATER LEVELS

ELEVATION (FT)

95
90
85
80
75



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

▽WL 7.0' WS OR WD	BORING STARTED	05-06-04	
▼WL(AB) 3.0' ▼WL(AC)	BORING COMPLETED	05-06-04	CAVE IN DEPTH @ 13.0'
▽WL	RIG 750	FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

RC (05-25-04) RC (06-01-04)

MZorlman(05/25/2004)

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-2	2 OF 3

PROJECT NAME	ARCHITECT-ENGINEER
300 L STREET, NE	HICKOK WARNER COLE

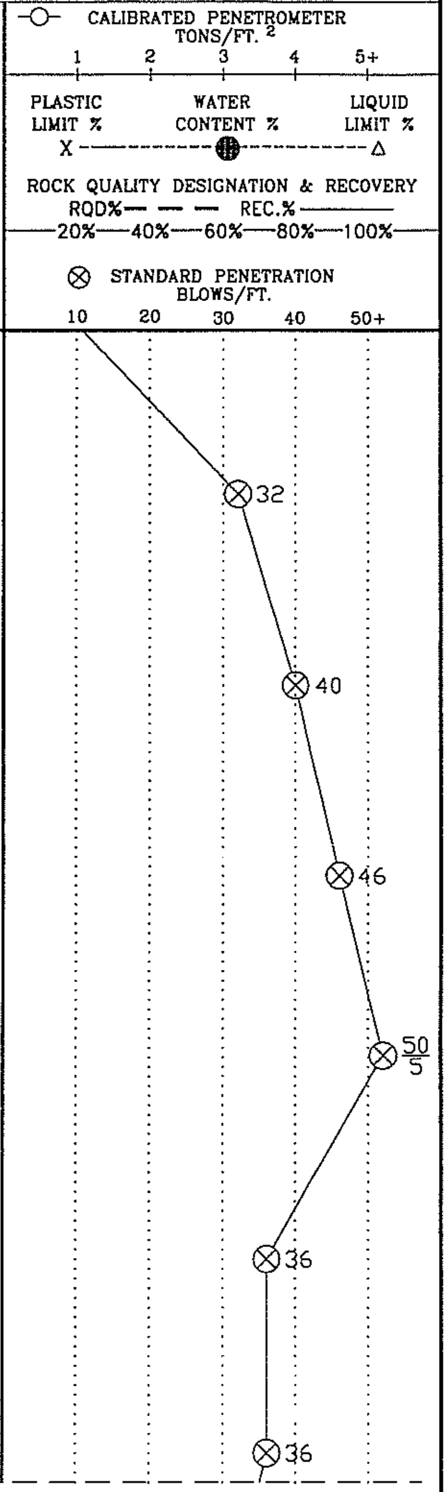
SITE LOCATION
WASHINGTON, DC

DESCRIPTION OF MATERIAL

ENGLISH UNITS

SURFACE ELEVATION 100

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
30					Clayey SAND, Trace Gravel, Gray and Tan, Wet, Loose to Dense, (SC)	
	9	SS	18	16		
35						65
	10	SS	18	14		
40						60
	11	SS	18	14		
45					SAND, Trace Gravel, Tan, Moist, Extremely Dense, (SP)	55
	12	SS	11	5		
50						50
	13	SS	18	18	Clayey SAND, With Lignite, Gray, Moist, Dense to Very Dense, (SC)	
55						45
	14	SS	18	18		
60						



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

WL 7.0' WS OR WD	BORING STARTED 05-06-04	
WL(AB) 3.0' WL(AC)	BORING COMPLETED 05-06-04	CAVE IN DEPTH @ 13.0'
WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

CLIENT NEIGHBORHOOD DEVELOPMENT CO.	JOB # 9975	BORING # ECS-2	SHEET 3 OF 3
PROJECT NAME 300 L STREET, NE	ARCHITECT-ENGINEER HICKOK WARNER COLE		
SITE LOCATION WASHINGTON, DC			

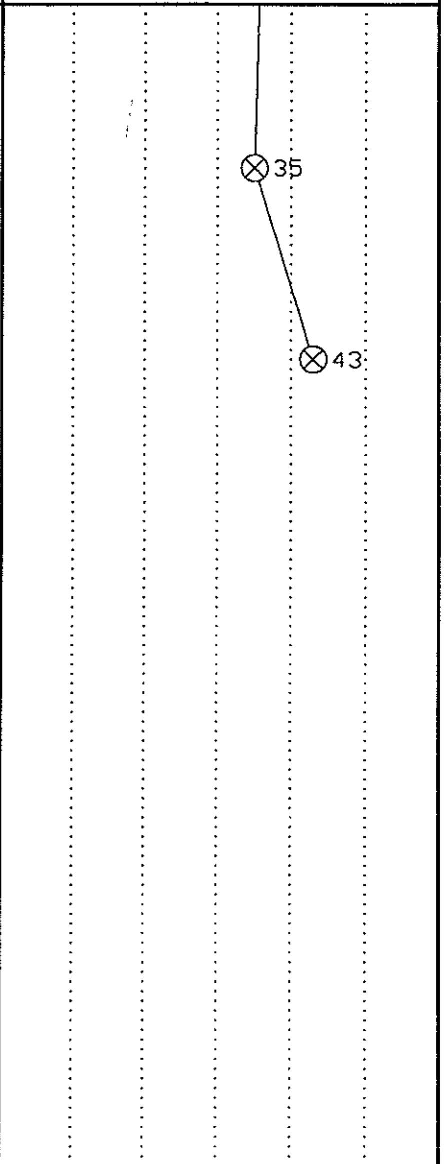
-O- CALIBRATED PENETROMETER TONS/FT.^{2}
1 2 3 4 5+

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

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

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

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS SURFACE ELEVATION 100	WATER LEVELS	ELEVATION (FT)
60					Clayey SAND, With Lignite, Gray, Moist, Dense to Very Dense, (SC)		
	15	SS	18	14			
65							35
	16	SS	18	16			
70					END OF BORING @ 70.00'		30
75							25
80							20
85							15
90							



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

▽WL 7.0' WS OR (WD)	BORING STARTED 05-06-04	
▽WL(AB) 3.0' ▼WL(AC)	BORING COMPLETED 05-06-04	CAVE IN DEPTH @ 13.0'
▽WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-3	1 OF 4

PROJECT NAME
300 L STREET, NE

ARCHITECT-ENGINEER
HICKOK WARNER COLE

SITE LOCATION
WASHINGTON, DC

DESCRIPTION OF MATERIAL

ENGLISH UNITS

SURFACE ELEVATION 100

SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)
1	SS	18	10
2	SS	18	10
3	SS	18	14
4	SS	18	14
5	SS	18	18
6	SS	18	18
7	SS	18	18
8	SS	18	16
9	SS	18	18

Gravel Depth 4"

Clayey SAND, With Gravel, Gray, Moist, Medium Dense, (SC-FILL)

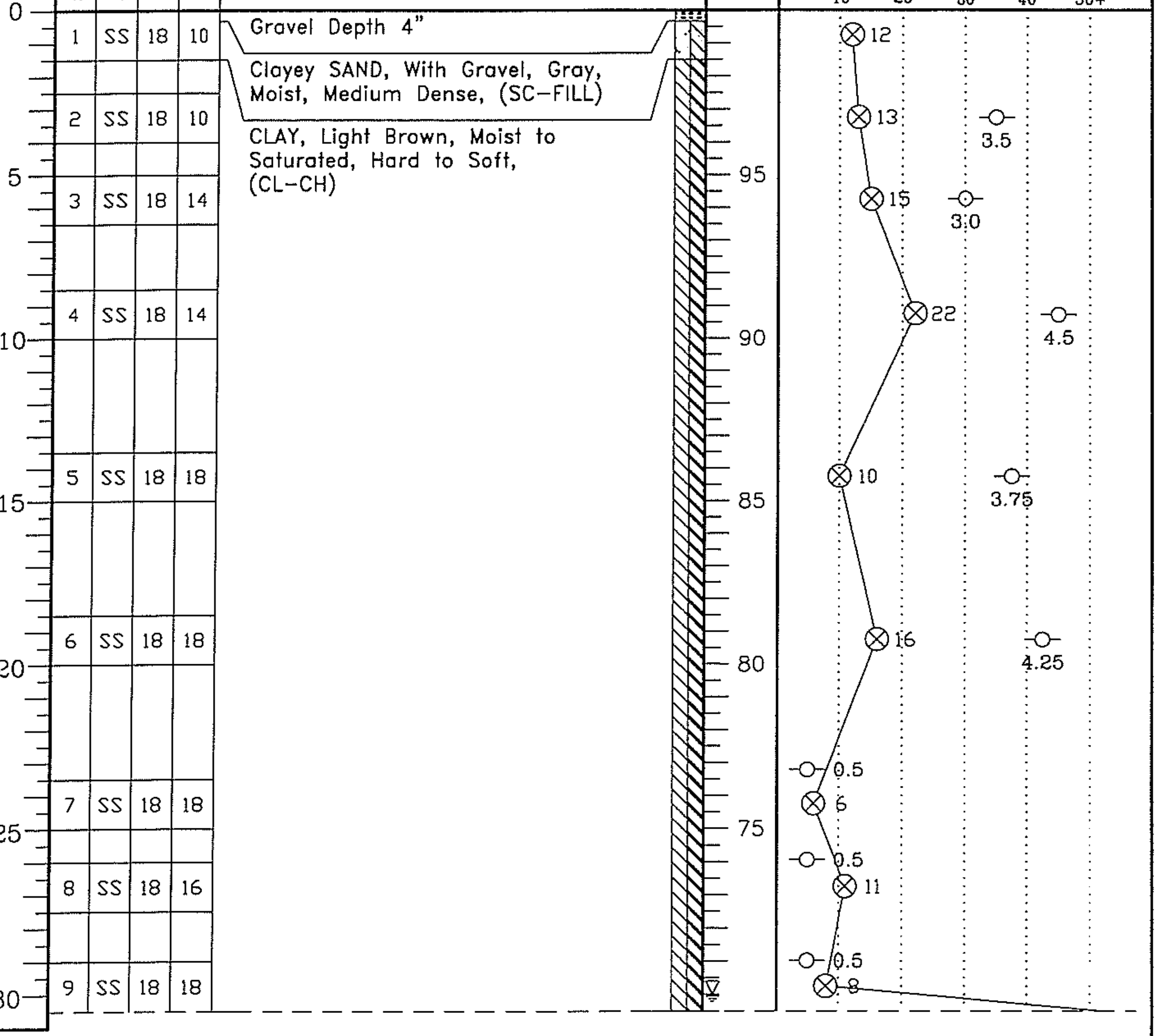
CLAY, Light Brown, Moist to Saturated, Hard to Soft, (CL-CH)

-○- CALIBRATED PENETROMETER TONS/FT.^{2}
1 2 3 4 5+

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

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

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



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

▽WL 30.0'	WS OR [✓ WD]	BORING STARTED	05-06-04
▽WL(AB)	▼WL(AC)	BORING COMPLETED	05-06-04
▽WL		RIG 750	FOREMAN D&S

CAVE IN DEPTH @

DRILLING METHOD HOLLOW STEM AUGER

RC (05-25-04) RC (06-01-04)

MZortmon(05/25/2004)

CLIENT	JOB #	BORING #	SHEET
NEIGHBORHOOD DEVELOPMENT CO.	9975	ECS-3	2 OF 4

PROJECT NAME: 300 L STREET, NE

ARCHITECT-ENGINEER: HICKOK WARNER COLE

SITE LOCATION: WASHINGTON, DC

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

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

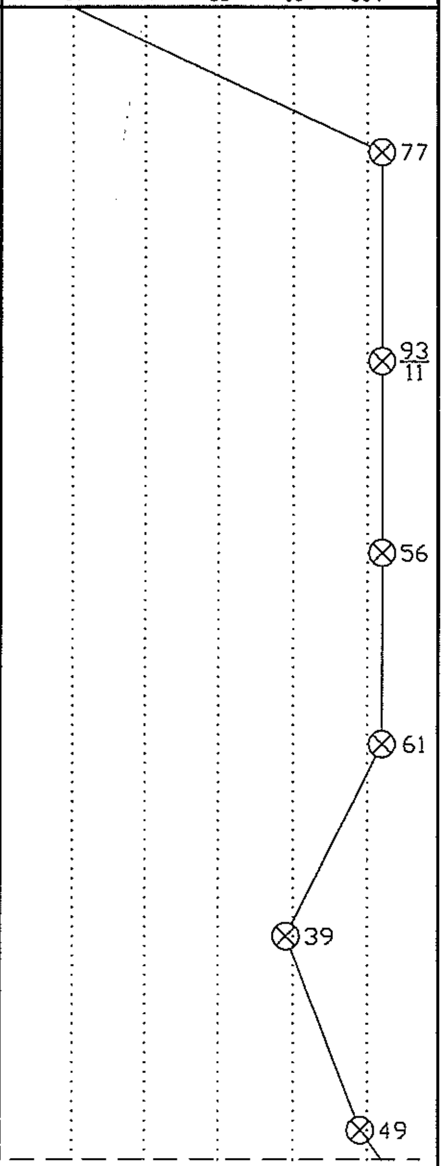
ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC.% ——— 20% 40% 60% 80% 100%

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

ENGLISH UNITS

SURFACE ELEVATION 100

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
30					CLAY, Light Brown, Moist to Saturated, Hard to Soft, (CL-CH)			
	10	SS	18	8	Gravelly SAND, Trace Clay, Light Brown, Wet, Extremely Dense to Very Dense, (SP)			77
35							65	
	11	SS	17	4				93/11
40							60	
	12	SS	18	12	SAND, With Clay, Trace Gravel, Orangish Brown, Moist to Wet, Very Dense to Dense, (SP-SC)			56
45							55	
	13	SS	18	8				61
50							50	
	14	SS	18	18				39
55					Fine Sandy CLAY, With Lignite, Gray, Moist, Hard, (CL-CH)		45	
	15	SS	18	18				49
60								



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

▽WL 30.0' WS OR [✓ WD]	BORING STARTED 05-06-04	
▽WL(AB) ▼WL(AC)	BORING COMPLETED 05-06-04	CAVE IN DEPTH @
▽WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

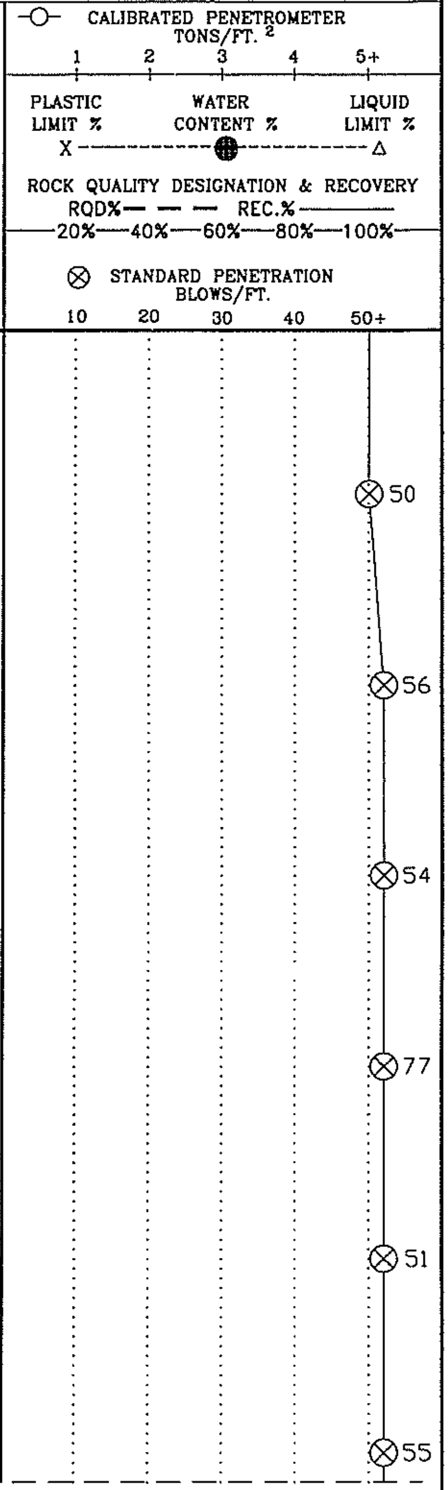
CLIENT NEIGHBORHOOD DEVELOPMENT CO.	JOB # 9975	BORING # ECS-3	SHEET 3 OF 4	ECS LTD
PROJECT NAME 300 L STREET, NE	ARCHITECT-ENGINEER HICKOK WARNER COLE			
SITE LOCATION WASHINGTON, DC				

DESCRIPTION OF MATERIAL

ENGLISH UNITS

SURFACE ELEVATION 100

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ELEVATION (FT)
60					Fine Sandy CLAY, With Lignite, Gray, Moist, Hard, (CL-CH)	
	16	SS	18	16		
65						35
	17	SS	18	16		
70						30
					Clayey SAND, Gray, Moist, Dense to Very Dense, (SC)	
	18	SS	18	18		
75						25
	19	SS	18	15		
80						20
	20	SS	18	16		
85						15
	21	SS	18	14		
90						



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

∇ WL 30.0' WS OR WD	BORING STARTED 05-06-04	
∇ WL(AB) ▼ WL(AC)	BORING COMPLETED 05-06-04	CAVE IN DEPTH ⊛
∇ WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

RC (05-25-04) RC (06-01-04)

MZorman(05/25/2004)

CLIENT NEIGHBORHOOD DEVELOPMENT CO.	JOB # 9975	BORING # ECS-3	SHEET 4 OF 4
PROJECT NAME 300 L STREET, NE	ARCHITECT-ENGINEER HICKOK WARNER COLE		
SITE LOCATION WASHINGTON, DC			

ECS LTD

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

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

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

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

ENGLISH UNITS

SURFACE ELEVATION 100

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	STANDARD PENETRATION BLOWS/FT.
90					Clayey SAND, Gray, Moist, Dense to Very Dense, (SC)			
	22	SS	18	16				⊗60
95							5	
	23	SS	18	16				⊗64
100					END OF BORING @ 100.00'		0	
105							−5	
110							−10	
115							−15	
120								

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

▽WL 30.0' WS OR [✓ WD]	BORING STARTED 05-06-04	
▽WL(AB) ▼WL(AC)	BORING COMPLETED 05-06-04	CAVE IN DEPTH @
▽WL	RIG 750 FOREMAN D&S	DRILLING METHOD HOLLOW STEM AUGER

RC (05-25-04) RC (06-01-04)

MZorlman(05/25/2004)

Engineering Consulting Services, Ltd.

Chantilly, Virginia

Pressuremeter Testing Summary

Date: 05/13/2004

Project Number: 9975

Project Name: 300 L Street, N.W.

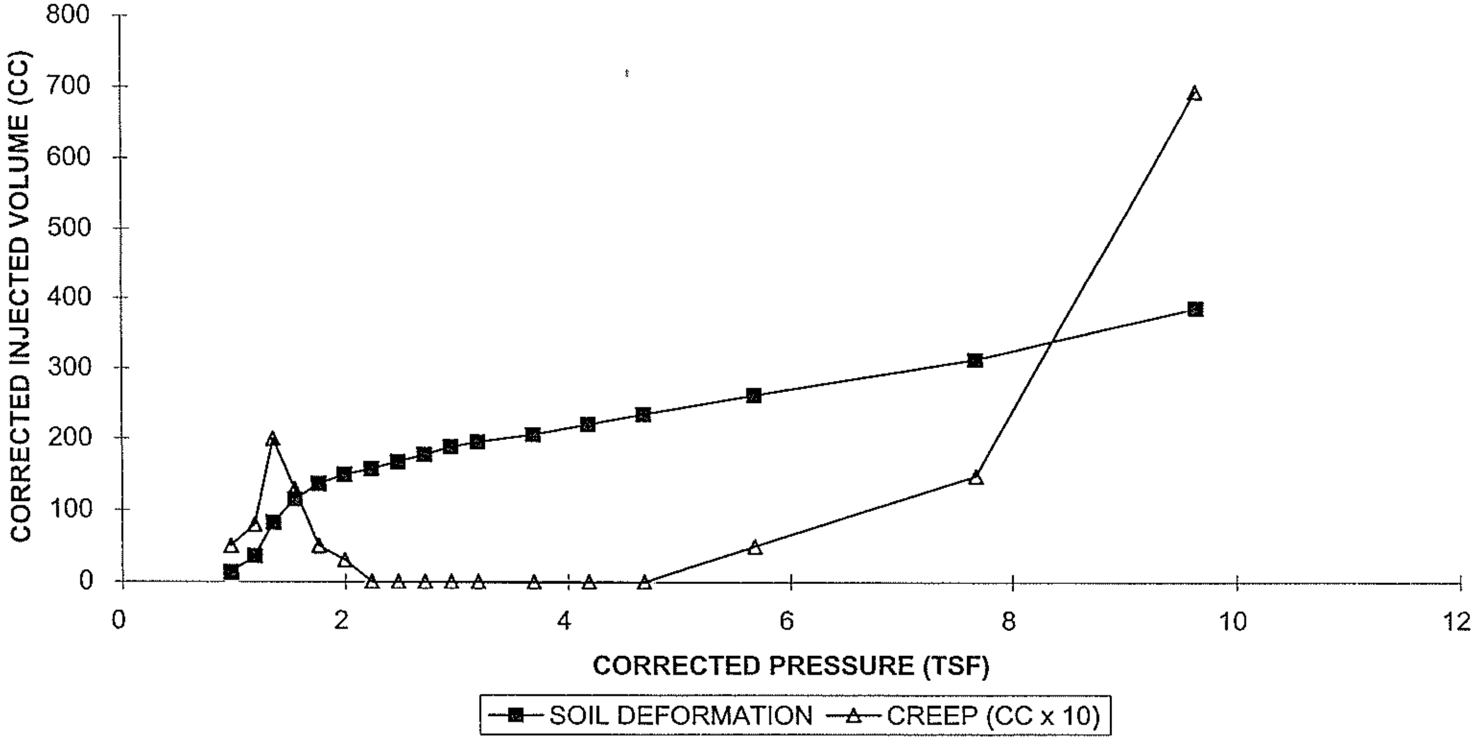
Project Engineer: MRZ

Principal Engineer: MPA

Summary By: SSS

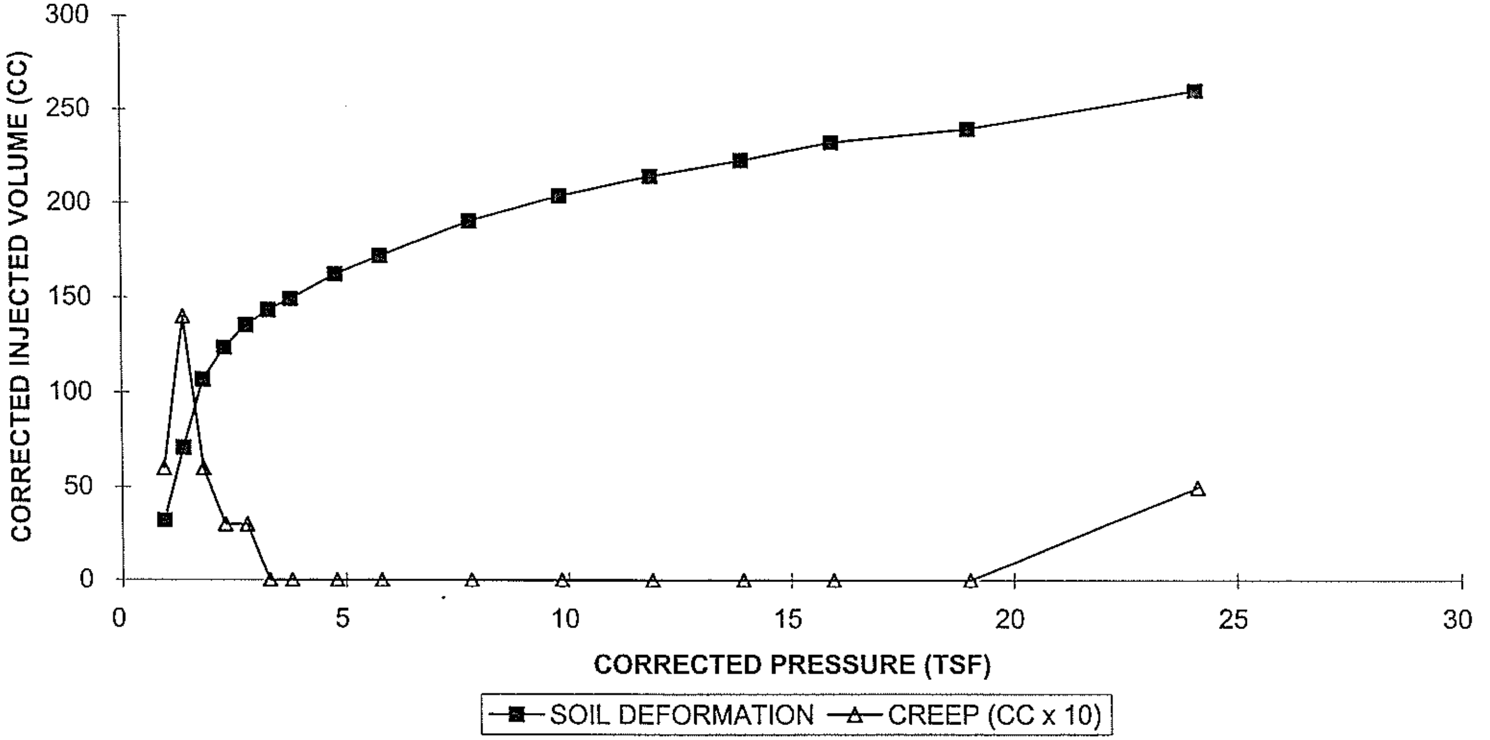
Boring Number	Depth (feet)	Elevation (feet)	Depth to Water (feet)	Water Elevation (feet)	USCS	P_f	P_l	E_d	E_r	"N"	E_d / P_l	E_d / E_r	E_d / "N"	P_l / P_f
B-3	31	69	28	72	CL	4.5	11	76		8	6.91		9.50	2.44
B-3	50	50	28	72	SP	20	25	453		50	18.12		9.06	1.25

Notes:



Boring No:	B-3	Depth:	31
Soil Description:	CLAY, with F. Sand and Silt, Greenish Br., Wet, Loose	"N":	8
Classification:	CL		

Project:	**300 L Street, N.W.**	**Engineering Consulting Services, Ltd.**
Project No.:	**9975**	**Chantilly, Virginia**
Date:	**05/07/2004**	**Pressure Meter Data Reduction**



Boring No:	B-3	Depth:	50
Soil Description:	SAND, Tr. Silt, Br., Wet, Ext. Dense	"N":	50
Classification:	SP		

Project:	**300 L Street, N.W.**	**Engineering Consulting Services, Ltd.**
Project No.:	**9975**	**Chantilly, Virginia**
Date:	**05/07/2004**	**Pressure Meter Data Reduction**

Engineering Consulting Services, Ltd
Chantilly, Virginia

Pressuremeter Data Reduction Program
Menard G-Am Pressuremeter

Date: 05/07/2004

Project No.: 9975 Project: 300 L Street, N.W.
Boring No: B-3
Pressuremeter Test No.: PM-2
USCS Classification: SP
Soil Description: SAND, Tr. Silt, Br., Wet, Ext. Dense

Tested By: SSS
Project Engineer MRZ
Principal Engineer: MPA

Test Parameters

Ground Elevation (feet)	Test Depth (feet)	Test Elevation (feet)	GWT Depth (feet)	GWT Elevation (feet)	Height of Console (feet)	Distance Console to Probe (feet)	Distance Console to GWT (feet)	"N" Value
100.0	50.0	50.0	28.0	72.0	3.0	53.0	31.0	50

REMARKS: Possible borhole geometry issue (bell shape). Probe blew at 23 bar.B17

Water Head Depth: 31.00 ft. Water Correction: 0.98 bars

Pressure. Reading (bars)	Corrected Pressure (tsf)	Field Volume Readings 30 sec. (cc)	60sec. (cc)	Corrected Volume Readings 30 sec. (cc)	60 sec. (cc)	Creep (cc)	Incremental Modulus (tsf)
0.00	0.94	20.00	26.00	26.00	32.00	6.00	0
0.50	1.38	51.00	65.00	56.90	70.90	14.00	18
1.00	1.82	95.00	101.00	100.80	106.80	6.00	21
1.50	2.30	115.00	118.00	120.70	123.70	3.00	49
2.00	2.79	127.00	130.00	132.60	135.60	3.00	73
2.50	3.29	138.00	138.00	143.50	143.50	0.00	113
3.00	3.79	144.00	144.00	149.40	149.40	0.00	154
4.00	4.79	157.00	157.00	162.20	162.20	0.00	144
5.00	5.80	167.00	167.00	172.00	172.00	0.00	192
7.00	7.81	186.00	186.00	190.60	190.60	0.00	206
9.00	9.84	200.00	200.00	204.20	204.20	0.00	290
11.00	11.88	211.00	211.00	214.80	214.80	0.00	381
13.00	13.92	220.00	220.00	223.40	223.40	0.00	476
15.00	15.96	230.00	230.00	233.00	233.00	0.00	431
18.00	19.02	238.00	238.00	240.40	240.40	0.00	851
23.00	24.12	255.00	260.00	256.40	261.40	5.00	508

Deformation Modulus, E_d: 453 (TSF) **Limit Pressure, P_l:** 25.0 (TSF)
Rebound Modulus, E_r: (TSF) **Failure Press., P_f:** 20.0 (TSF)

Engineering Consulting Services, Ltd.

Chantilly, Virginia

Laboratory Testing Summary

Date: 5/27/04

Project Number: 9975

Project Name: 300 L Street, NE

Project Engineer: MRZ

Principal Engineer: MPA

Summary By: HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
ECS-1	S-1	0 - 1.5	12.5									
ECS-1	S-2	2.5 -4.0	7.0									
ECS-1	S-3	5.0 - 6.5	20.5									
ECS-1	S-4	8.5 - 10.0	22.6									
ECS-1	S-5	13.5 - 15.0	22.9									
ECS-1	S-6	18.5 - 20.0	30.1	CL	45	21	24	95.9				
ECS-1	S-7	23.5 - 25.0	28.5									
ECS-1	S-8	28.5 - 30.0	29.1	SC	32	20	12	45.5				
ECS-1	S-9	33.5 - 35.0	29.4									
ECS-1	S-10	38.5 - 40.0	17.1									
ECS-2	S-7	23.5 - 25.0	24.0	CL	27	17	10	51.5				
ECS-2	S-8	28.5 - 30.0	24.4	SC	26	17	9	40.4				
ECS-3	S-1	0 - 1.5	8.1									
ECS-3	S-2	2.5 -4.0	22.1									
ECS-3	S-3	5.0 - 6.5	20.6									
ECS-3	S-4	8.5 - 10.0	19.5									
ECS-3	S-5	13.5 - 15.0	27.2									
ECS-3	S-6	18.5 - 20.0	25.7									
ECS-3	S-7	23.5 - 25.0	21.0									
ECS-3	S-8	28.5 - 30.0	26.9									
ECS-3	S-9	33.5 - 35.0	26.8									

Summary Key:

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

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

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

NP = Non Plastic

Engineering Consulting Services, Ltd.

Chantilly, Virginia

Laboratory Testing Summary

Project Number: 9975 **Project Name:** 300 L Street, NE **Date:** 5/27/04

Project Engineer: MRZ **Principal Engineer:** MPA **Summary By:** HNT

Boring Number	Sample Number	Depth (feet)	Moisture Content (%)	USCS	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
ECS-3	S-10	38.5 - 40.0	11.5									

Summary Key:

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

Hyd = Hydrometer
Con = Consolidation
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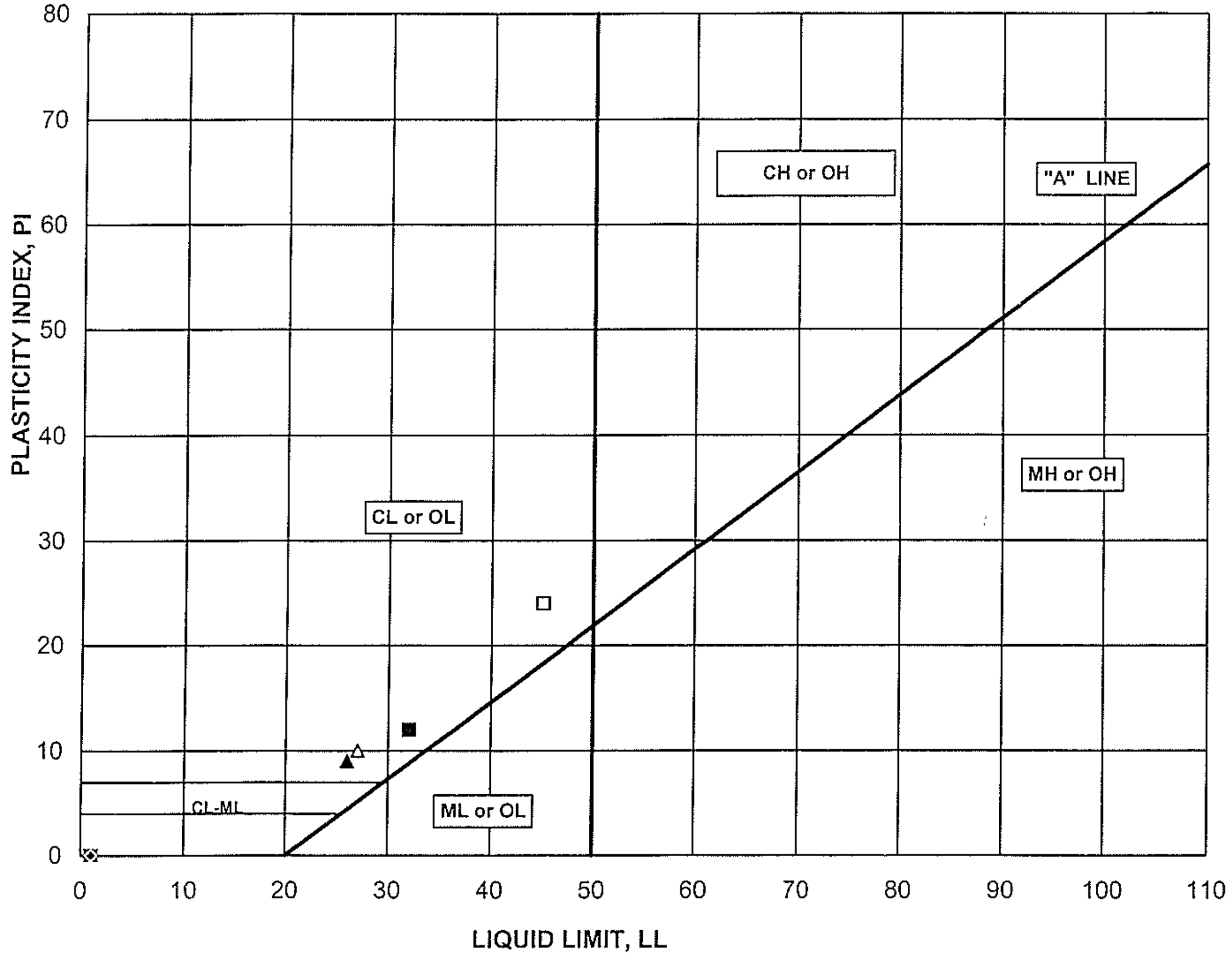


BORING/ SAMPLE No.	DEPTH (feet)	TEST SYMBOL	DESCRIPTION	WATER CONTENT (%)	LL	PL	PI
ECS-1 / S-6	23.5-25.0	□	Lean Sand(CL)L/Grayish Brown	28.5	45	21	24
ECS-1 / S-8	28.5-30	■	Clayey Sand Tr/Mica(CL)Yellowish Brown	29.1	32	20	12
ECS-2 / S-7	23.5-25.0	△	Sandy Lean Clay Tr/Mica(SC)Yellowih Brc	24.0	27	17	10
ECS-2 / S-8	28.5-30	▲	Clayey Sand Tr/Mica(CL)Yellowish Brown	24.4	26	17	9
/		X			-	-	-
/		○			-	-	-
/		●			-	-	-
/		◇			-	-	-
/		◆			-	-	-
/		+			-	-	-
		X					

Applicable ASTM: D-4318

Project: 300 L Street, NE

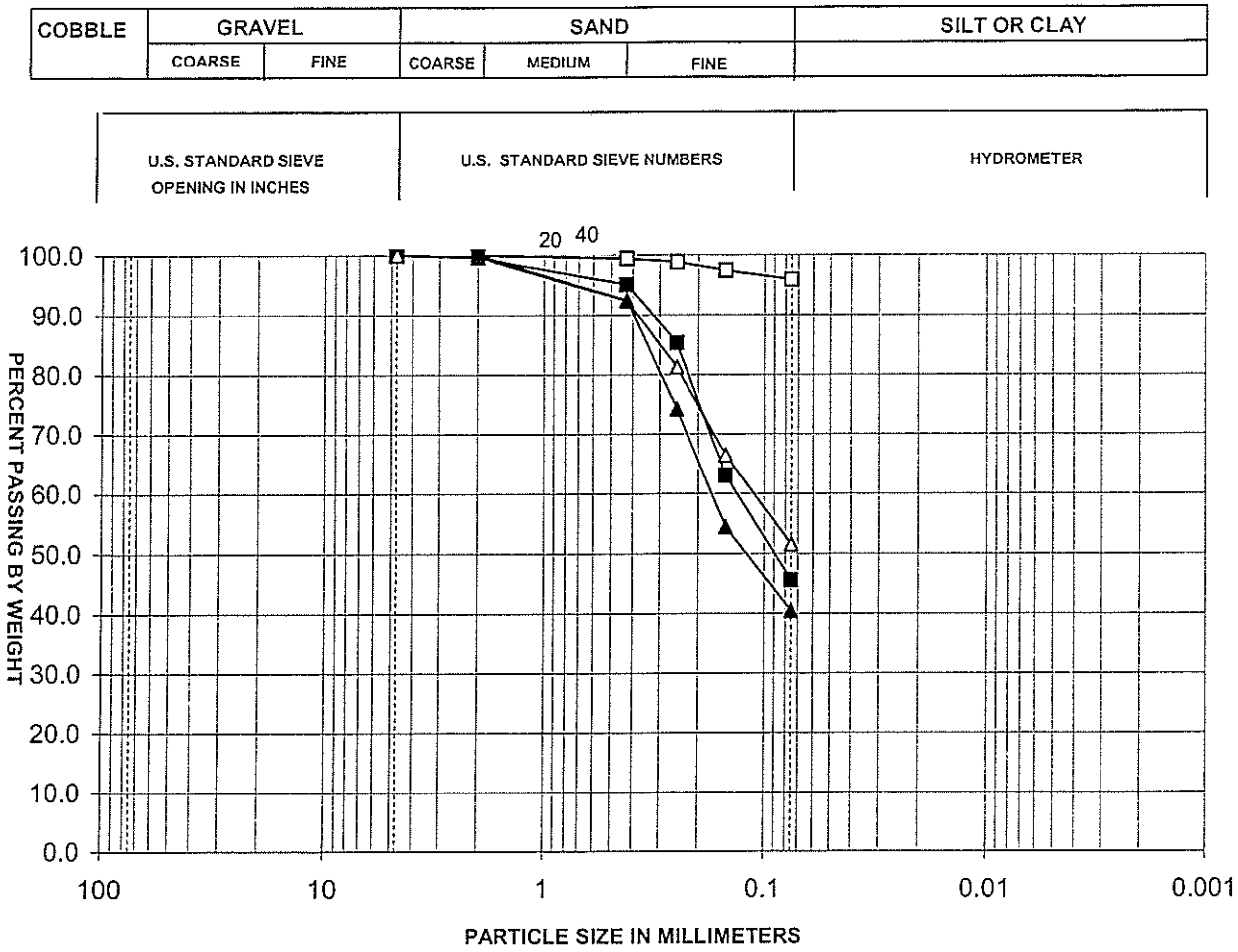
Project No.: 9975

Date: 5/26/04

Engineering Consulting Services Ltd.

Chantilly, Virginia

Plasticity Chart



Boring/ Sample No.	Depth (feet)	Symbol	LL	PI	Description
ECS-1 S-6	23.5-25.0	□	45	24	Lean Clay(CL)L/Grayish Brown
ECS-1 S-8	23.5-25	■	32	12	Clayey Sand Tr/Mica(SC)Yellowish L/ Brown
ECS-2 S-7	23.5-25.0	△	27	10	Sandy Lean Clay Tr/Mica(SC)Yellowih Brown
ECS-2 S-8	28.5-30	▲	26	9	Clayey Sand Tr/Mica(SC)Yellowish L/.Brown

Applicable ASTM: D-422

Project: 300 L Street N.E.

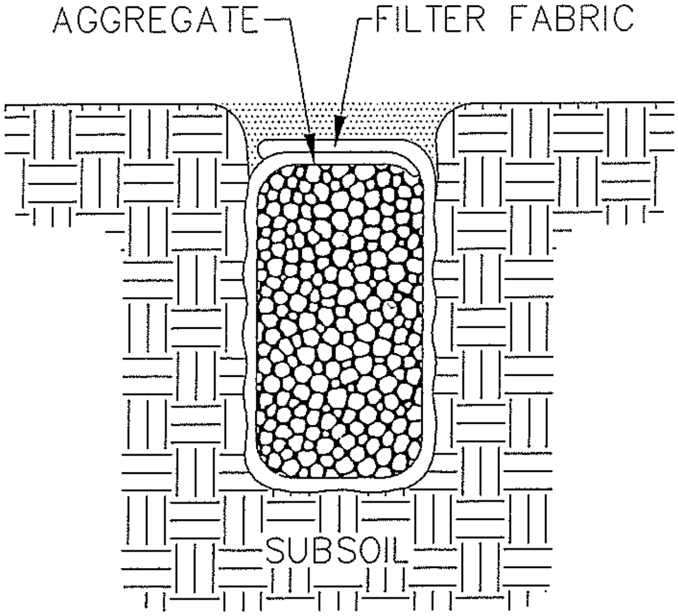
Project No: 9975

Date: 05/27/04

Engineering Consulting Services, Ltd
Chantilly, Virginia

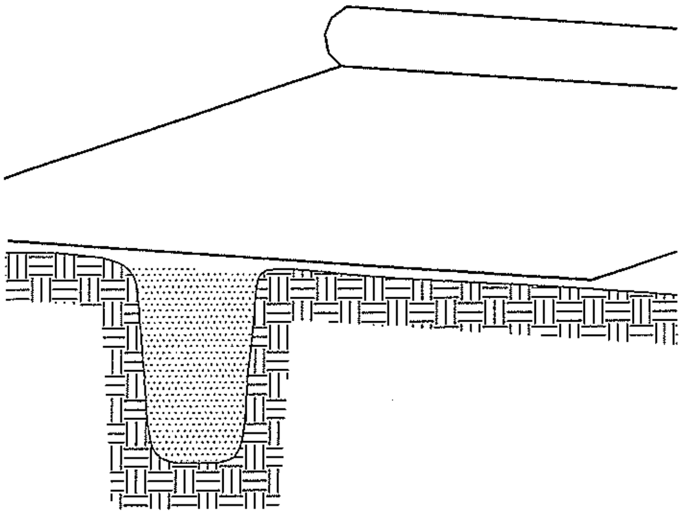
Grain Size Analysis

FINAL CONFIGURATION



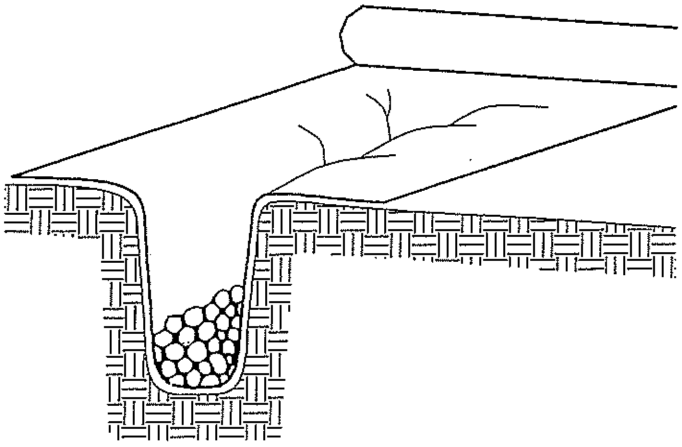
SUBDRAIN USING FILTER FABRIC

STEP 1



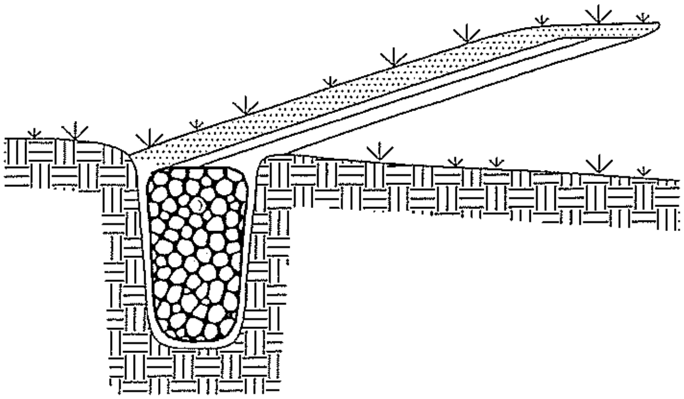
FABRIC IS UNROLLED
DIRECTLY OVER TRENCH

STEP 2



THE TRENCH IS FILLED
WITH AGGREGATE

STEP 3



THE FABRIC IS LAPPED CLOSED
AND COVERED WITH SOIL

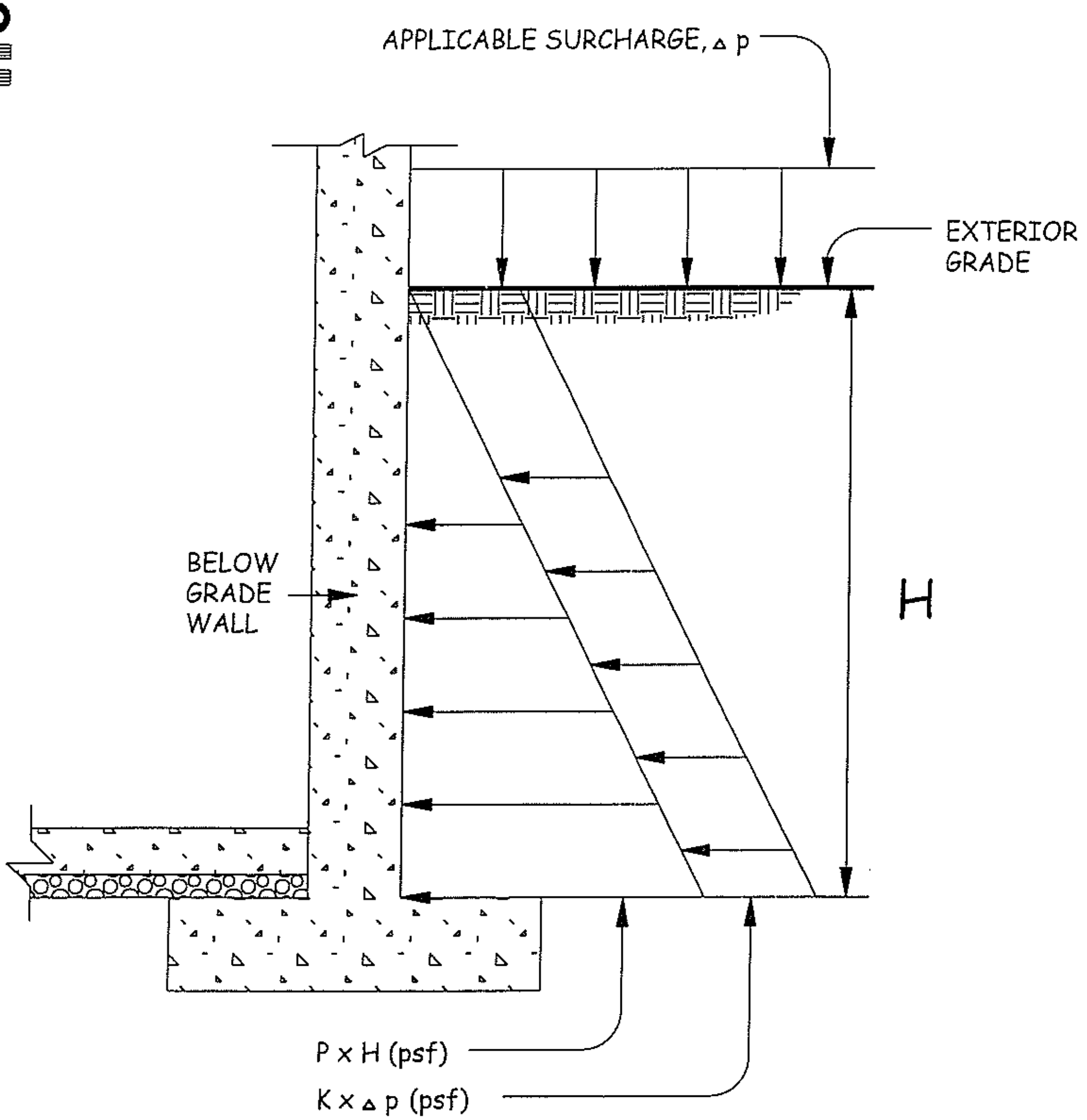
ECS LTD

14000 THUNDERBOLT PLACE
SUITE R
CHANTILLY, VA. 22021
703/471-8400
FAX/834-5527

FRENCH DRAIN INSTALLATION PROCEDURE

FRENDR.RAC

ECS LTD



SOIL TYPE	TYPICAL K VALUE ACTIVE	AT-REST
SILT (ML)	0.4	0.5
GRANULAR (SP)	0.3	0.4

LEGEND:

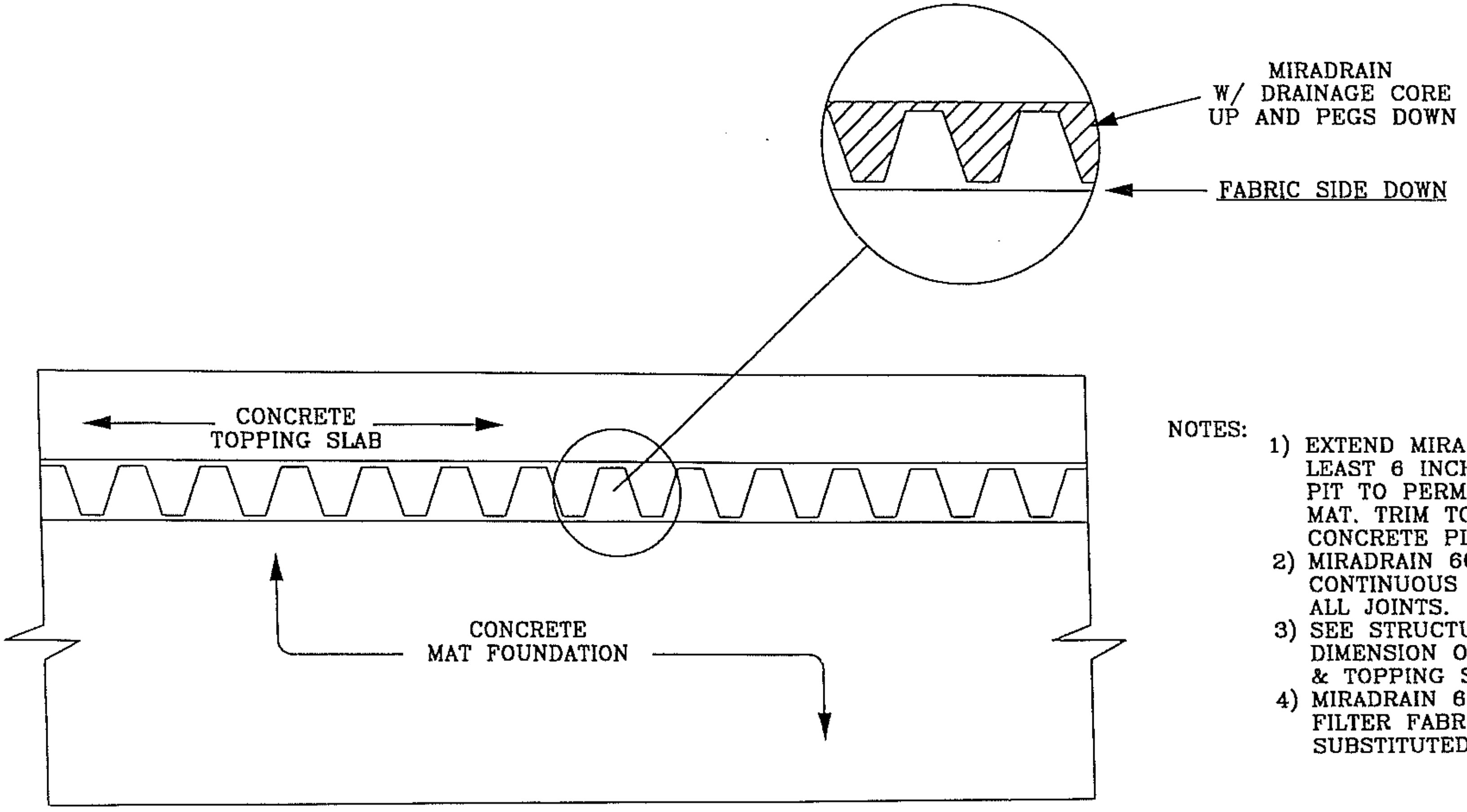
P = LATERAL EARTH PRESSURE

H = HEIGHT OF BACKFILL

Δ p = SURCHARGE

K = HORIZONTAL EARTH PRESSURE COEFFICIENT

LATERAL EARTH PRESSURE DIAGRAM ©



NOTES:

1) EXTEND MIRADRAIN 6000 AT LEAST 6 INCHES INTO SUMP PIT TO PERMIT DRAINAGE OF MAT. TRIM TO FLUSH AFTER CONCRETE PLACEMENT.
2) MIRADRAIN 6000 SHALL BE CONTINUOUS & LAPPED AT ALL JOINTS.
3) SEE STRUCTURAL DRAWINGS FOR DIMENSION OF FOUNDATION MAT & TOPPING SLAB.
4) MIRADRAIN 6000 WITHOUT FILTER FABRIC MAY BE SUBSTITUTED.

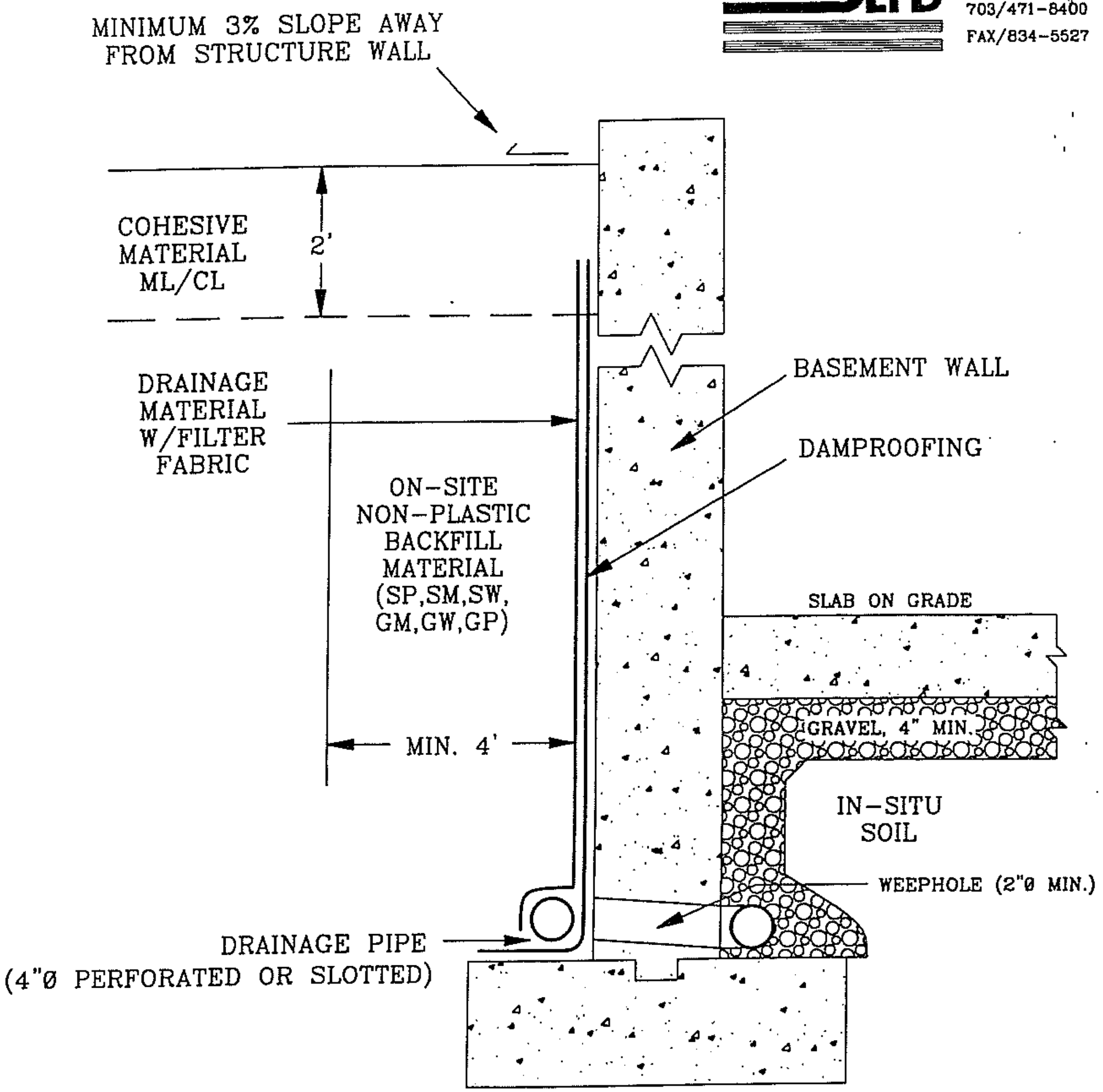
MAT DRAINAGE DETAIL

(N.T.S.)

ECS LTD

MATDRN.DWG REV 9-18-01

ECS LTD
14000 THUNDERBOLT PLACE
SUITE R
CHANTILLY, VA. 22021
703/471-8400
FAX/834-5527



PERIMETER DRAINAGE SYSTEM
FOR IN GROUND SUMP SYSTEM
(DRAINBOARD OPTION-ENCL. 3)

NOTES:

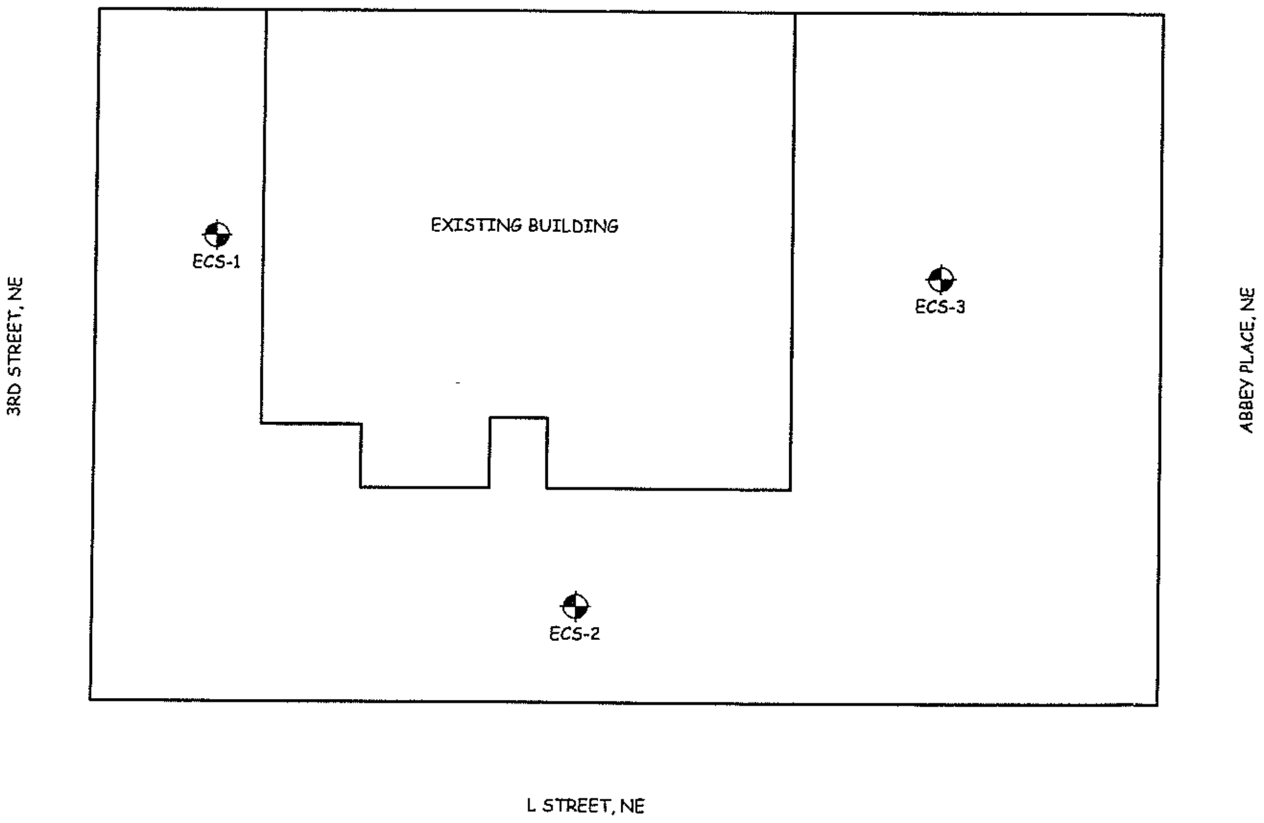
1) AN ACCEPTABLE GRAVEL BACKFILL MATERIAL, I.E. SP, SM, SW, GP, GM, GW, MAY BE SUBSTITUTED FOR THE DRAINAGE BOARD ADJACENT TO THE WALL.

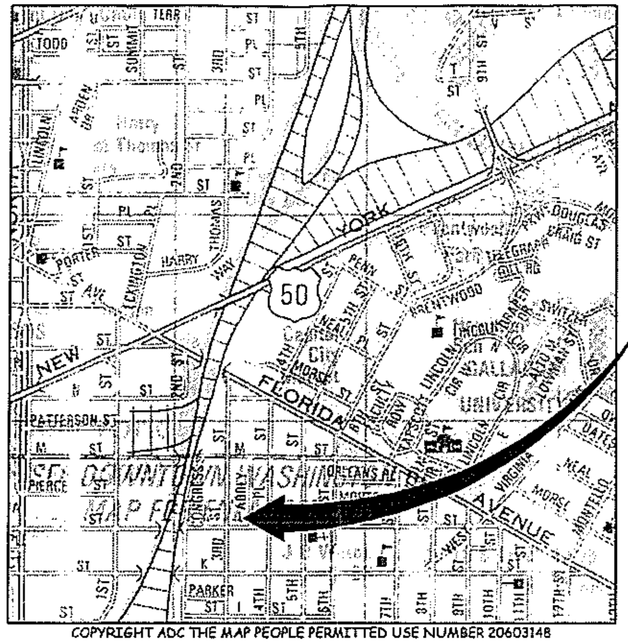
2) PERIMETER DRAIN TO BE DISCHARGED TO SUMP OR ACCEPTABLE DRAIN OUTFALL.

3) CAP DRAIN ADJACENT TO WALL WITH 2 FT. OF MOST CLAYEY SOIL ON SITE TO MINIMIZE SURFACE WATER INTRUSION.

4) EXTERIOR DRAIN DISCHARGES THROUGH WEEPS TO INTERIOR DRAIN WHICH DISCHARGE TO SUMP PIT AND PUMP. WATER IS TO BE PUMPED TO STORM SEWER.

UNDRSLAB.RAC





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VICINITY MAP

NTS

LEGEND:

⊕ APPROX. BORING LOCATION

300 L STREET, NE

WASHINGTON, DC

ECS LTD
ENGINEERING
CONSULTING
SERVICES, LTD.

BORING LOCATION DIAGRAM

NEIGHBORHOOD DEVELOPMENT CO.

ECS REVISIONS

ENGINEER MRZ	DRAFTING RAC
SCALE	NTS
PROJECT NO.	9975
SHEET	1 OF 1
DATE	05-25-04