Earth Solutions NW LLC

Geotechnical Engineering
Geology
Environmental Scientists
Construction Monitoring

GEOTECHNICAL ENGINEERING STUDY
UP-LAKE SHORT PLAT
118XX - 72nd PLACE NORTHEAST
KIRKLAND, WASHINGTON

ES-3467.02

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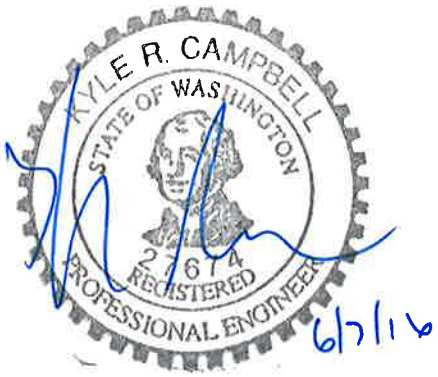
PREPARED FOR

MR. VASILE ANTEMIE

June 7, 2016

Stephen H. Avril
Project Geologist



Kyle R. Campbell, P.E.
Principal

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Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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Earth Solutions NW LLC

- Geotechnical Engineering
- Construction Monitoring
- Environmental Sciences

Mr. Vasile Antemie
15129 Simonds Road Northeast
Kenmore, Washington 98028

Dear Mr. Antemie:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Geotechnical Engineering Study, Up-Lake Short Plat, 118XX - 72nd Place Northeast, Kirkland, Washington". In general, the site is underlain by glacial outwash with areas being underlain by glaciomoraine deposits in portions of the west side of the subject site. The soil consisted of a matrix of poorly graded sand, and silty sand soils. In our opinion, the proposed residential buildings can be supported on conventional continuous and spread footing foundations bearing on competent native soils, re-compacted native soils, or structural fill. Competent soils suitable for support of foundations should be encountered at depths two feet below existing grades at most locations. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material will be necessary.

Groundwater seepage was not observed at any of the test pit locations. However, due to the presence of glacial till in portions of the site, seepage should be expected during grading activities, particularly during winter, and early spring months.

Recommendations for foundation design, site preparation, drainage, and other pertinent recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. If you have questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Stephen H. Avril
Project Geologist

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GEOTECHNICAL ENGINEERING STUDY
UP-LAKE SHORT PLAT
118XX - 72nd PLACE NORTHEAST
KIRKLAND, WASHINGTON

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INTRODUCTION

General

The project area consists of a property located on the west side of 72nd Place Northeast, and south of Northeast 118th Street in Kirkland, Washington. The site is irregular in shape, and is currently undeveloped. Site development plans includes construction of six single-family residential structures, and associated improvements.

The purpose of this study was to explore subsurface conditions across the site and develop geotechnical recommendations for the proposed development. Our scope of services for completing this geotechnical engineering study included the following:

- Site exploration consisting of test pits;
- Laboratory testing of soil samples obtained from the test pits;
- Engineering analyses of data gathered during site exploration, and;
- Preparation of this report.

The following documents/maps were reviewed as part of our report preparation:

- Grading Plan and Cross Sections, Sheet 4 of 5, by RSG Engineering, Co., Dated January 2016;
- Geologic Map of Washington, Northwest Quadrant, Dragovich, Logan, et al, 2002, and;
- King County USDA Soil Conservation Survey (SCS).

Project Description

We understand the property will be redeveloped with six residential lots, access roadways, and associated utility improvements. Final plans for stormwater runoff management were not available at the time of this report production. However, limited infiltration of stormwater runoff generated from impervious surfaces utilizing dry-wells and/or infiltration trenches is being investigated.

Given the topographic change across the sites, grading activities will likely involve cuts and fills of 10 feet or less to establish the final design grades.

Building construction is anticipated to consist of relatively lightly loaded wood framing and slab-on-grade floors. Perimeter foundation loading is expected to range from approximately one to two kips per foot. Slab-on-grade loading is expected to be on the order of 150 psf.

If the above design assumptions are incorrect or change, ESNW should be contacted to review the recommendations in this report. ESNW should review the final design to confirm that the geotechnical recommendations included in this report have been incorporated into the project plans.

SITE CONDITIONS

Surface

The site is located on the west side of 72nd Place Northeast, and south of the intersection with Northeast 118th Street in Kirkland, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map) included in this study. The site is irregular in shape and consists of a single tax parcel. The property is currently undeveloped.

The existing site topography is sloped in nature (descending from Northeast 118th Street surface elevation towards the south), with topographic change on the order of approximately 25 feet.

Subsurface

ESNW representatives observed, logged and sampled ten test pits across the site. The approximate locations of the test pits are depicted on the Test Pit Location Plan (Plate 2). Please refer to the Test Pit logs provided in Appendix A for a more detailed description of the subsurface conditions.

Topsoil

Topsoil was encountered during our subsurface exploration, and ranged in thickness from eight to ten inches. Where topsoil is encountered during site grading activities, it is not suitable for use as structural fill nor should it be mixed with material to be used as structural fill. Topsoil or otherwise unsuitable material can be used in landscaping areas if desired.

Fill

Fill was not encountered at any of the test pit locations. There is the potential for limited amounts of fill surrounding the existing road alignments, and utility trenches on the site. The fill may be suitable for support of foundations; however a representative of ESNW should be retained during the construction phases of the site development to evaluate the suitability of any on-site soils for use as structural fill or bearing of foundations.

Native Soil

Underlying the topsoil, native soils consisting predominately of medium dense to dense poorly graded sand (Unified Soil Classification, SP), and dense silty sand with gravel (SM) were encountered extending to the maximum exploration depth of ten feet below existing grades. The soil density was observed to increase with depth.

Areas underlain by glacial till-like soils were observed in the western portion of the subject site. This material was observed to consist of dense silty sand with gravel (SM) on a limited scale at test pit locations TP-107 and TP-108. However, upon review of the Soil Conservation Survey (SCS) for the region, this material may be more indicative of glaciomoraine deposits, considering the isolated nature of the geologic feature. This feature was observed at the test pit locations within an area on-site, where a ridge-like topographic formation is present; and is indicative of a lateral moraine.

Geologic Setting

The referenced geologic map resource identifies glacial outwash (Qgo) deposits across the site and surrounding areas. The referenced SCS soil survey identifies Alderwood gravelly sandy loam (AgC) series soils across the entirety of the site. Alderwood gravelly sandy loam soils are typically comprised of glacial outwash underlain by glaciomoraine deposits and exist in a well-drained condition.

The soil conditions observed at the test pit locations are consistent with the SCS description for the site.

Groundwater

Groundwater was not observed at the test pit locations during the fieldwork (May 2016). Despite the lack of groundwater observed during our fieldwork, seepage should be expected in deeper excavations at this site, particularly during the winter, spring and early summer months. Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the wetter, winter months.

DISCUSSION AND RECOMMENDATIONS

General

In our opinion, construction of the proposed residential development is feasible from a geotechnical standpoint. The proposed residential buildings can be supported on conventional continuous and spread footing foundations bearing on competent native soils, re-compacted native soils, or structural fill.

Slab-on-grade floors should be supported on dense native soil or structural fill. Competent soils suitable for support of foundations should be encountered at depths of two feet below existing grades. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material will be necessary. Recommendations for foundation design, site preparation, drainage, and other pertinent geotechnical recommendations are provided in the following sections of this study.

This study has been prepared for the exclusive use of Vasile Antemie and his representatives. No warranty, expressed or implied, is made. This study has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area.

Site Preparation and Earthwork

Site preparation activities will involve site clearing and stripping, and implementation of temporary erosion control measures. The primary geotechnical considerations associated with site preparation activities include building pad subgrade preparation, retaining wall construction, underground utility installations, and preparation of pavement subgrade areas.

Temporary construction entrances and drive lanes, consisting of at least 12 inches of quarry spalls can be considered in order to minimize off-site soil tracking and to provide a stable access entrance surface. Erosion control measures should consist of silt fencing placed along the down gradient side of the site. Soil stockpiles should be covered or otherwise protected to reduce soil erosion. Temporary sedimentation ponds or other approaches for controlling surface water runoff should be in place prior to beginning earthwork activities.

Topsoil and organic-rich soil was not encountered at the boring locations. If topsoil and organic-rich soil is encountered, it is not suitable for foundation support, nor is it suitable for use as structural fill. Topsoil or organic-rich soil can be used in non-structural areas if desired.

Subgrade conditions expected to be exposed throughout the proposed building and pavement areas will likely be comprised of poorly graded sand (SP), and silty sand with gravel (SM). After the completion of site stripping and rough grading activities ESNW recommends a proofroll utilizing a fully loaded solo dump truck in order to determine the suitability of the exposed native soils for support of foundations and roadways. ESNW should be retained during this phase of earthwork to observe the proofroll and other earthwork activities. The soils exposed throughout subgrade areas should be compacted to structural fill specifications prior to constructing the foundation, slab, and pavement elements. The subgrade throughout pavement areas should be compacted as necessary and exhibit a firm and unyielding condition when subjected to the proofrolling with a loaded solo dump truck.

Structural fill soils placed throughout foundation, slab, and pavement areas should be placed over a firm base. Loose or otherwise unsuitable areas of native soil exposed at subgrade elevations should be compacted to structural fill requirements or overexcavated and replaced with a suitable structural fill material. Where structural fill soils are used to construct foundation subgrade areas, the soil should be compacted to the requirements of structural fill described in the following section. Foundation subgrade areas should be protected from disturbance, construction traffic, and excessive moisture. Where instability develops below structural fill areas, use of a woven geotextile below the structural fill areas may be required. A representative of ESNW should observe structural fill placement in foundation, slab, and pavement areas.

Wet Season Grading

Groundwater was not observed at any of the test pit locations. However, the on-site soil has a moderate sensitivity to moisture in our opinion. If grading takes place during the wetter winter or spring months, a contingency in the project budget should be included to allow for export of native soil and import of structural fill as described below.

In-situ Soils

The silty sand soils and poorly graded sand soils encountered throughout the majority of the test sites have a moderate sensitivity to moisture, and were generally in a moist condition at the time of the exploration (May 2016). In this respect, the in-situ soils may not be suitable for use as structural fill if the soil moisture content is more than 3 percent above the optimum level at the time of construction. In general, soils encountered during the site excavations that are excessively over the optimum moisture content will require moisture conditioning prior to placement and compaction. Conversely, soils that are below the optimum moisture content will require moisture conditioning through the addition of water prior to use as structural fill. If the in-situ soils are determined to not be suitable for use as structural fill, then use of a suitable imported soil may be necessary. In our opinion, a contingency should be included in the project budget for exporting unsuitable soil and importing structural fill; or moisture conditioning recommendations can be provided upon request based on field observations during the construction phase of on-site work.

Imported Soils

Imported soil intended for use as structural fill should consist of a well graded granular soil with a moisture content that is at or near the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well graded granular soil with a fines content of 5 percent or less defined as the percent passing the #200 sieve, based on the minus three-quarter inch fraction.

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, and roadway areas. Fills placed to construct permanent slopes and throughout retaining wall and utility trench backfill areas are also considered structural fill. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of 90 percent, based on the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D-1557). Soil placed in utility trenches, pavement areas and in the upper 12 inches of slab-on-grade areas should be compacted to a relative compaction of at least 95 percent. Additionally, more stringent compaction specifications may be required for utility trench backfill zones, depending on the responsible utility district or jurisdiction.

Foundations

Based on the results of our study, the proposed residential structures can be supported on conventional spread and continuous footings bearing on competent native soils, re-compacted native soils, or structural fill. Based on the soil conditions encountered at the test sites, competent native soils suitable for support of foundations should be encountered at depths below two feet. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soils to the specifications of structural fill, or overexcavation and replacement with structural fill, may be necessary.

Provided foundations will be supported as described above, the following parameters can be used for design of new foundations:

- Allowable soil bearing capacity — 2,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40

A one-third increase in the allowable soil bearing capacity can be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of about one-half inch is anticipated. The majority of the settlements should occur during construction, as dead loads are applied.

Seismic Design Considerations

The 2012 IBC recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.1-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

In our opinion the site has a low susceptibility to liquefaction, given the relative density of the soil underlying the site and the lack of a near-surface groundwater table.

Slab-On-Grade Floors

Slab-on-grade floors for residential buildings constructed at this site should be supported on a firm and unyielding subgrade. Where feasible, the existing native soils exposed at the slab-on-grade subgrade level can be compacted in place to the specifications of structural fill. Unstable or yielding areas of the subgrade should be recompacted or overexcavated and replaced with suitable structural fill prior to construction of the slab. A capillary break consisting of a minimum of four inches of free draining crushed rock or gravel should be placed below the slab. The free draining material should have a fines content of 5 percent or less (percent passing the #200 sieve, based on the minus three-quarter inch fraction). Based on our observations, we recommend native soils on the subject site that have a fines content of less than 5 percent may be used as capillary break material. In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the manufacturer's specifications.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters can be used for retaining wall design:

- Active earth pressure (yielding condition) — 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge for passenger vehicles (where applicable) — 70 psf (rectangular distribution)
- Passive resistance — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40
- Seismic surcharge (active condition) — 6H (where H equals retained height)

Additional surcharge loading from adjacent foundations, sloped backfill, or other loads should be included in the retaining wall design. Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Retaining walls should be backfilled with free draining material that extends along the height of the wall, and a distance of at least 18 inches behind the wall. The upper one foot of the wall backfill can consist of a less permeable soil, if desired. A perforated drain pipe should be placed along the base of the wall, and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3.

Drainage

Groundwater was not observed during the fieldwork (May 2016). However, areas of perched seepage should be anticipated in deeper site excavations, particularly during winter, spring, and early summer months. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and to provide recommendations to reduce the potential for instability related to seepage effects. Where fills will be placed against the outwash/till contact, subsurface drains must be installed.

In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided as Plate 4.

Infiltration Evaluation

Dry wells, and infiltration trenches are being investigated as a part of the development regarding stormwater runoff management. Infiltration testing was previously performed on-site in general accordance with the 2009 King County Surface Water Design Manual, Chapter 5.4. ESNW representatives conducted a site visit on August 11, 2014 to excavate test pits using a trackhoe and operator retained by the client, at locations within the potential infiltration areas. EPA falling-head infiltration testing was conducted during our site visit.

Falling head testing was conducted for three consecutive 30 minute intervals at each of the three test pit locations on the east side of 72nd Place Northeast.

Testing was completed at depths of three to four feet in order to demonstrate the infiltration rates of the individual strata within the subgrade. Measured infiltration rates were 8.0 in/hour at one test pit location, over 21.0 in/hour at another test pit location, and 11.0 in/hour at a third test pit location.

Samples of the soil obtained from the test pits were analyzed in our laboratory for USDA textural classification.

The poorly graded sand (SP) soil collected at the test pit location located in the shoulder of 72nd Place Northeast is classified by the USDA analysis as a coarse sand. Coarse sands in the Simplified Method for determining the design infiltration rate by the King County Surface Water Design Manual, should be given the long term plugging factor of 1.0. In our opinion, these rates can be applied to the majority of the soil-types observed on the site (where poorly graded sand is encountered).

The poorly graded gravel with silt and sand (GP) at one of the adjacent test pit locations is classified by the USDA textural analysis as an extremely gravelly fine sand. The long term plugging factor of 0.8 should be used for the soil at this location.

We recommend using the above-mentioned textural classification (where applicable for each soil type encountered on individual lots) for design of the dry wells and/or infiltration trenches.

The following factors must be used when designing the infiltration trenches on the subject site using the Simplified Method as described in the King County Surface Water Design Manual Chapter 5.4.1. The equation is as follows: I(design) = I(measured) x F(testing) x F(geometry) x F(plugging)

Pursuant with the King County Surface Water Design manual, the calculated infiltration rate must not exceed 20 inches per hour.

Based on conditions encountered at the test pit locations explored by ESNW, adequate separation will be maintained between the facility bottom and the seasonal groundwater table. Because no indications of a shallow, static groundwater table were observed at the test pit locations during the recent fieldwork, in our opinion, a mounding analysis is not warranted. However, further in-situ infiltration testing may be required to ascertain the rates at specific locations on-site where the proposed infiltration facilities are to be sited.

ESNW should be retained to review the finalized plans for the subject site in regards to stormwater management; and observe the conditions during construction to assure the subsurface conditions have not changed in a way to adversely affect the performance of the proposed infiltration systems. Furthermore, ESNW should be retained during construction to provide conformation infiltration testing within the individual infiltration facilities to determine whether the infiltration rates are as anticipated.

Excavations and Slopes

The Federal Occupation Safety and Health Administration (OSHA) and the Washington Industrial Safety and Health Act (WISHA) provide soil classification in terms of temporary slope inclinations. Based on the soil conditions encountered where groundwater seepage is exposed, are classified as Type C by OSHA/WISHA. Temporary slopes over four feet in height in Type C soils must be sloped no steeper than 1.5H:1V (Horizontal:Vertical). The presence of perched groundwater may cause caving of the temporary slopes due to hydrostatic pressure. The firm sandy soil below four feet, and where groundwater is not observed are classified as Type B. Temporary slopes over four feet in height in Type B soils must be sloped no steeper than 1H:1V. The very dense silty sand soil encountered within the western portion of the site is classified as Type A. Temporary slopes over four feet in height in Type A soils must be sloped no steeper than .75H:1V.

ESNW should observe site excavations to confirm the soil type and allowable slope inclination. If the recommended temporary slope inclination cannot be achieved, temporary shoring may be necessary to support excavations.

Permanent slopes should maintain a gradient of 2H:1V, or flatter, and should be planted with vegetation to enhance stability and to minimize erosion. A representative of ESNW should observe temporary and permanent slopes to confirm the slope inclinations, and to provide additional excavation and slope recommendations, as necessary.

Site Reconnaissance

A representative of ESNW performed a visual inspection of the sloped areas on the subject site. No signs of instability were observed on and around the subject site in the form of hummocky terrain, tension cracks, slope down-sets, or surface seeps. Were these features present, it would be indicative of global slope instability on the subject site. However, ESNW observed no signs of slope instability during our site visit (May 2016).

Utility Support and Trench Backfill

In our opinion, the soils anticipated to be exposed in utility excavations should generally be suitable for support of utilities. Organic or highly compressible soils encountered in the trench excavations should not be used for supporting utilities. The native soils are moisture sensitive and will therefore be difficult to use as structural trench backfill if the moisture content of the soil is high. Moisture conditioning of the soils will likely be necessary prior to use as structural backfill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable City of Kirkland specifications. Seepage should be anticipated within utility trench excavations. Caving of the trench sidewalls due to hydrostatic pressure should be anticipated by the contractor where seepage is encountered..

Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To provide adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted as recommended in the "Site Preparation and Earthwork" section of this report. It is possible that soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas of unsuitable or yielding subgrade conditions will require remedial measures such as overexcavation, cement treatment, placement of a geotextile and thicker crushed rock or structural fill sections prior to pavement.

For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections can be considered:

- Two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB), or;
- Two inches of HMA placed over three inches of asphalt treated base (ATB).

For relatively high volume, heavily loaded pavements subjected to moderate to high, loaded truck traffic, the following preliminary pavement sections can be considered:

- Three inches of hot-mix asphalt (HMA) placed over six inches of crushed rock base (CRB), or;
- Three inches of HMA placed over four and one half inches of asphalt treated base (ATB).

The HMA, ATB and CRB materials should conform to WSDOT specifications. All soil base material should be compacted to at least 95 percent of the maximum dry density. Final pavement design recommendations can be provided once final traffic loading has been determined.

LIMITATIONS

The recommendations and conclusions provided in this geotechnical engineering study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is not expressed or implied. Variations in the soil and groundwater conditions observed at the test locations may exist, and may not become evident until construction. ESNW should reevaluate the conclusions in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.

Reference:
King County, Washington
Map 505
By The Thomas Guide
Rand McNally
32nd Edition

NORTH

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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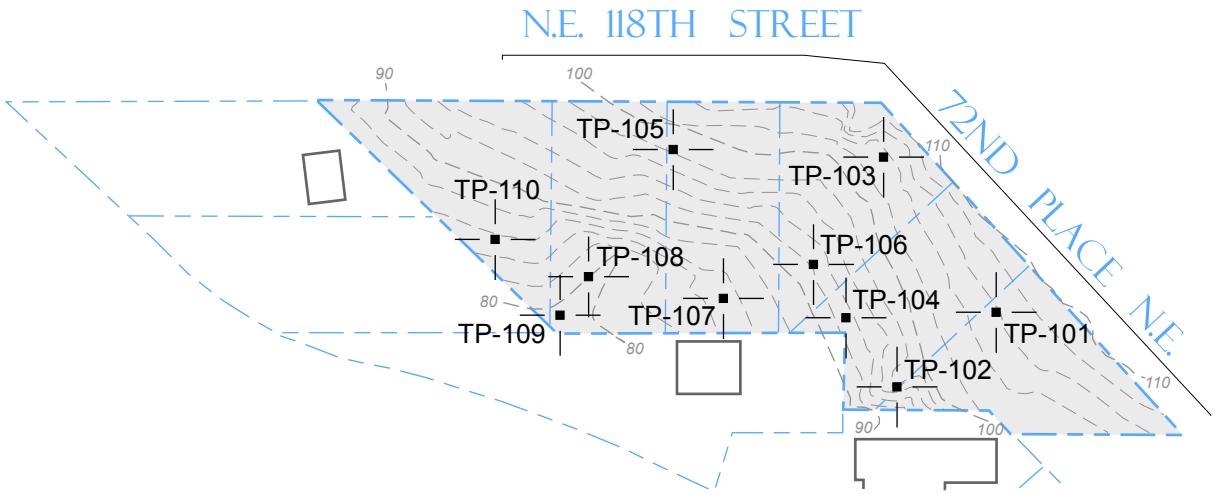
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

Vicinity Map
Up-Lake Short Plat
King County, Washington

Drwn.	MRS	Date 05/19/2016	Proj. No. 3467.02
Checked	SHA	Date May 2016	Plate 1



LEGEND

TP-101 — Approximate Location of ESNW Test Pit, Proj. No. ES-3467.02, May 2016

Subject Site

Existing Building

NORTH

0 50 100 200

1"=100' Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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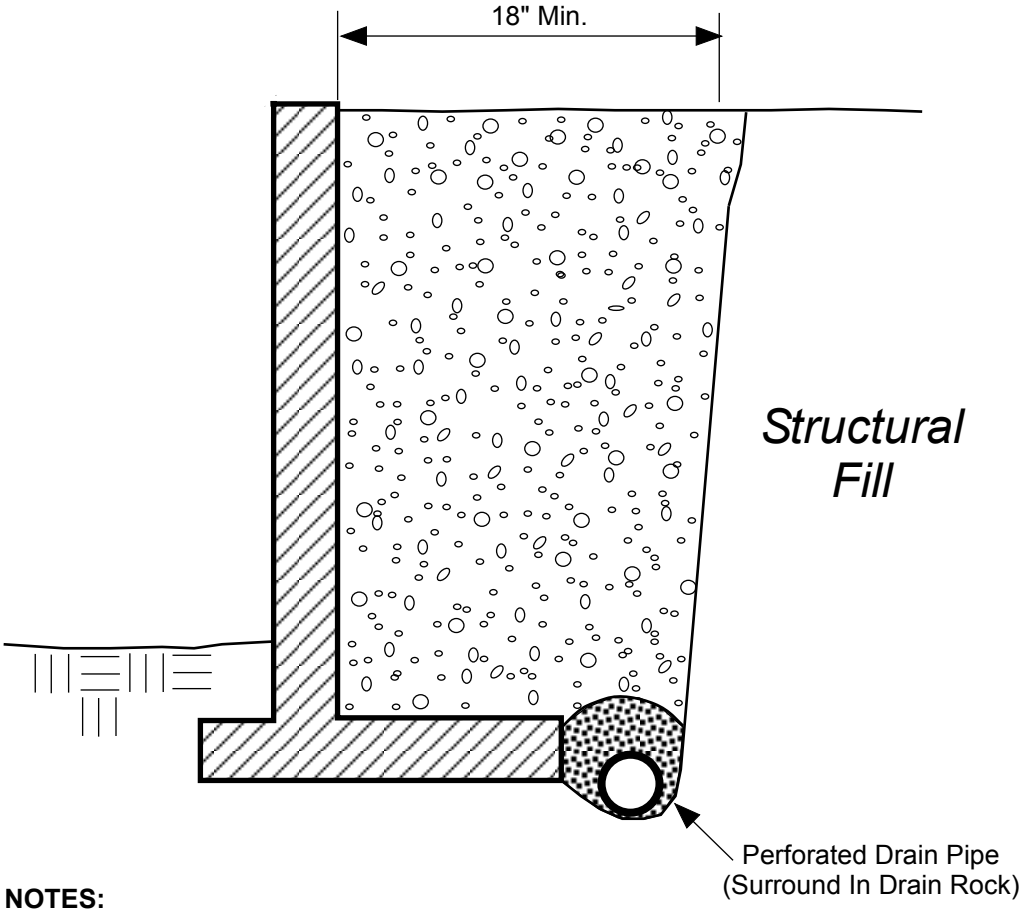
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

Test Pit Location Plan
Up-Land Short Plat
King County, Washington

Drwn. MRS	Date 05/19/2016	Proj. No. 3467.02
Checked SHA	Date May 2016	Plate 2



NOTES:

- Free Draining Backfill should consist of soil having less than 5 percent fines. Percent passing #4 should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free Draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1" Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

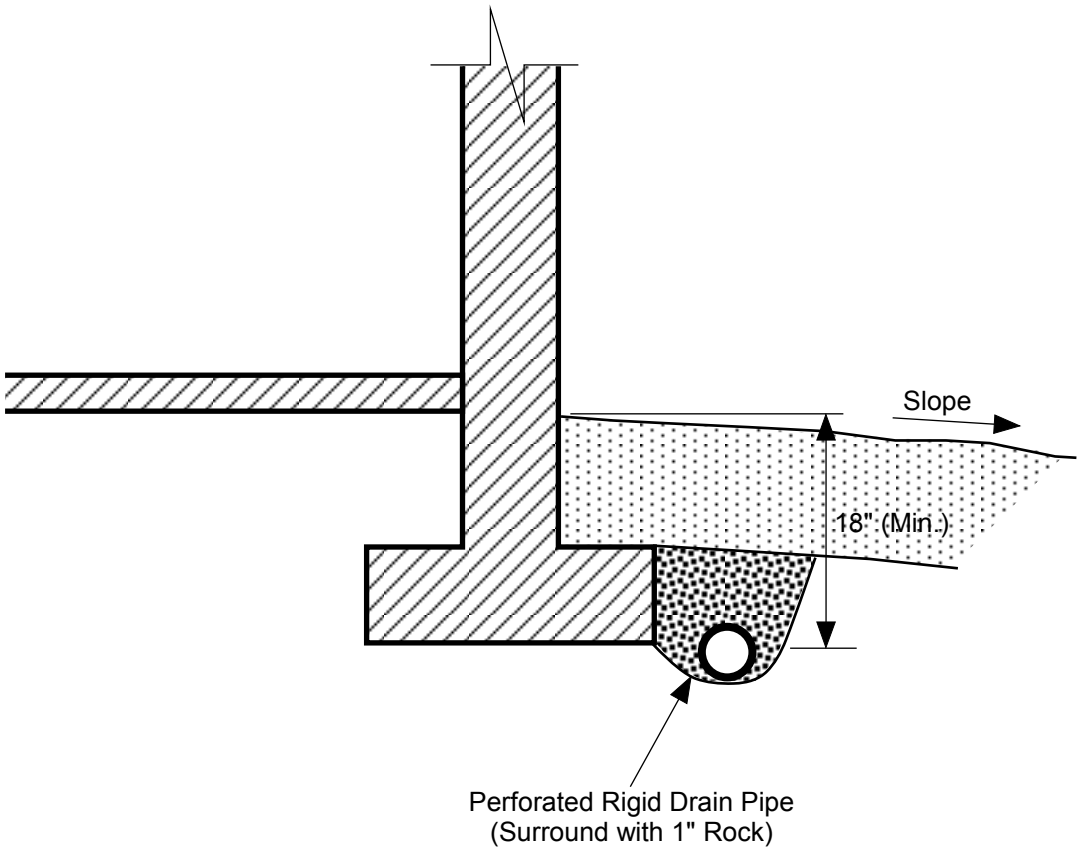
Free Draining Structural Backfill

1 inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

RETAINING WALL DRAINAGE DETAIL
Up-Land Short Plat
King County, Washington

Drwn. MRS	Date 05/20/2016	Proj. No. 3467.02
Checked SHA	Date May 2016	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

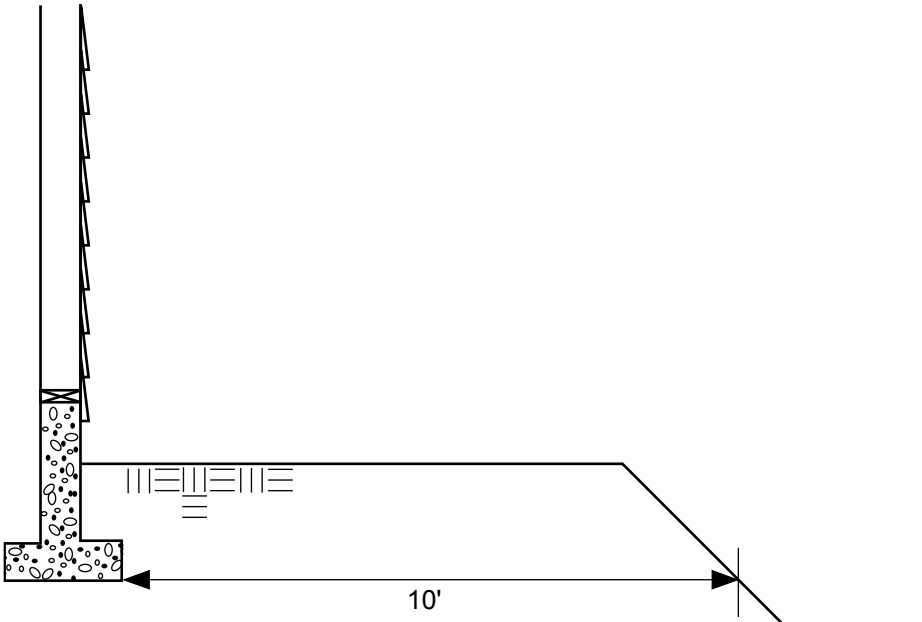
Surface Seal; native soil or other low permeability material.

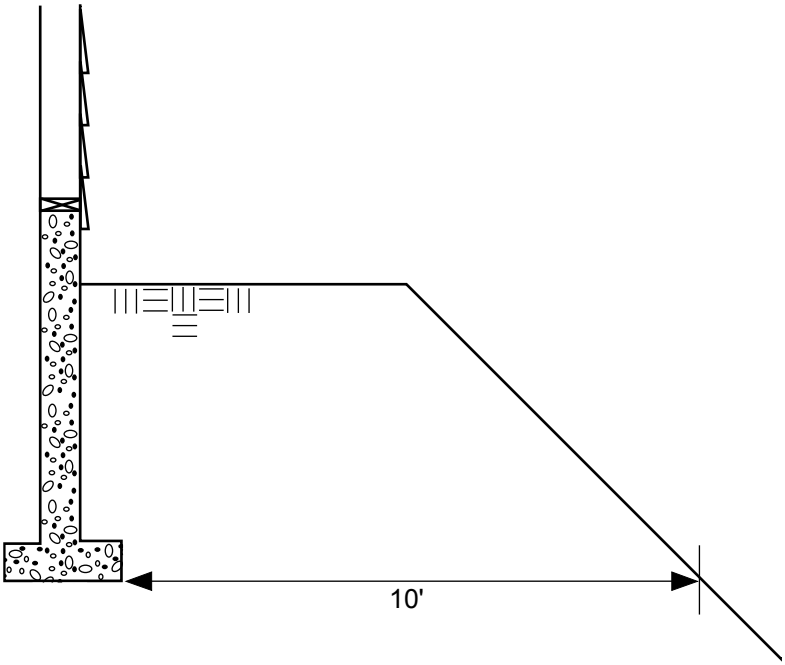
1" Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Monitoring and Environmental Sciences

FOOTING DRAIN DETAIL
Up-Lake Short Plat
King County, Washington

Drwn. MRS	Date 05/20/2016	Proj. No. 3467.02
Checked SHA	Date May 2016	Plate 4





Earth Solutions NW LLC

Geotechnical Engineering, Construction Monitoring and Environmental Sciences

FOUNDATIONS ADJACENT TO SLOPES

Up-Lake Short Plat

King County, Washington

Drwn.	GLS	Date	06/07/2016	Proj. No.	3467.02
Checked	SHA	Date	June 2016	Plate	5

Appendix A

Subsurface Exploration

ES-3467.02

The subsurface conditions at the site were explored by excavating a total of ten test pits excavated with a track hoe across accessible portions of the property. The subsurface explorations were completed in May of 2016. The approximate test pit locations are illustrated on Plate 2 of this report. Logs of the test pits are provided in this Appendix. The test pits were advanced to a maximum depth of ten feet below existing grades.

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	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
				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
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-101

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	
			SP		Brown poorly graded SAND, medium dense, moist
		MC = 8.00%			-becomes dense
					-light iron oxide staining
					-silt lense
5					
					-increased moisture content
		MC = 23.90%		8.0	
					Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 8.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-102

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	Brown poorly graded SAND, medium dense, moist
5			SP		-increased gravel content, becomes dense
		MC = 3.80%			
10		MC = 2.60%		10.0	Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 10.0 feet.

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Fax: 425-449-4711

TEST PIT NUMBER TP-103

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	
			SP		Brown poorly graded SAND, medium dense, moist -becomes dense
5		MC = 7.40%		5.5	
					Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 5.5 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-104

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL
				0.7	
					Brown poorly graded SAND, medium dense, moist
					-becomes dense
			SP		-increased sand
5					
		MC = 4.30%			
				7.0	-increased density
					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 7.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-105

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	
			SP		Brown poorly graded SAND, medium dense, moist -increased gravel content, becomes dense -decreased soil content
5		MC = 2.80%		5.5	
					Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 5.5 feet.

Earth Solutions NW
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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-106

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL	0.7	TOPSOIL
			SP		Brown poorly graded SAND, medium dense, moist
					-becomes dense
5					-increased gravel content
				6.0	
			SM		Brown silty SAND with gravel, dense, moist
		MC = 16.10% Fines = 13.70%		8.0	[USDA Classification: gravelly loamy SAND]
					Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 8.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-107

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
					0.7
			SP		Brown poorly graded SAND, medium dense, moist
		MC = 7.10%			-decreased silt content
5					5.0
			SM		Brown silty SAND with gravel, very dense, moist (Glacial Till)
					8.0
					Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 8.0 feet.

Earth Solutions NW
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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-108

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": field grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	
			SP		Brown poorly graded SAND, medium dense, moist
					-becomes dense
		MC = 4.10%		3.0	
			SM		Brown silty SAND with gravel, very dense, moist (Glacial Till)
5		MC = 17.60%		5.5	
					Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 5.5 feet.

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-109

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 10": ivy
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.9	
			SM		Brown silty SAND with gravel, medium dense, moist
					-becomes dense, decreased fines content
				3.5	
5		MC = 5.00% Fines = 5.00%	SP-SM		Brown poorly graded SAND with silt and gravel, dense, moist
					[USDA Classification: very gravelly coarse SAND]
				7.0	
					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 7.0 feet.

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TEST PIT NUMBER TP-110

CLIENT Vasile Antemie
PROJECT NAME Up-Lake Short Plat
PROJECT NUMBER 3467.02
PROJECT LOCATION King County, Washington
DATE STARTED 5/9/16 **COMPLETED** 5/9/16
GROUND ELEVATION _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR Client Provided
GROUND WATER LEVELS:
EXCAVATION METHOD _____
AT TIME OF EXCAVATION ---
LOGGED BY SHA **CHECKED BY** SHA
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 8": ivy
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		TOPSOIL, loose, moist
				0.7	
					Brown poorly graded SAND, medium dense, moist
					-decreased silt content
			SP		
5					
		MC = 8.60%			
				7.0	
					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 7.0 feet.

Appendix B

Laboratory Test Results

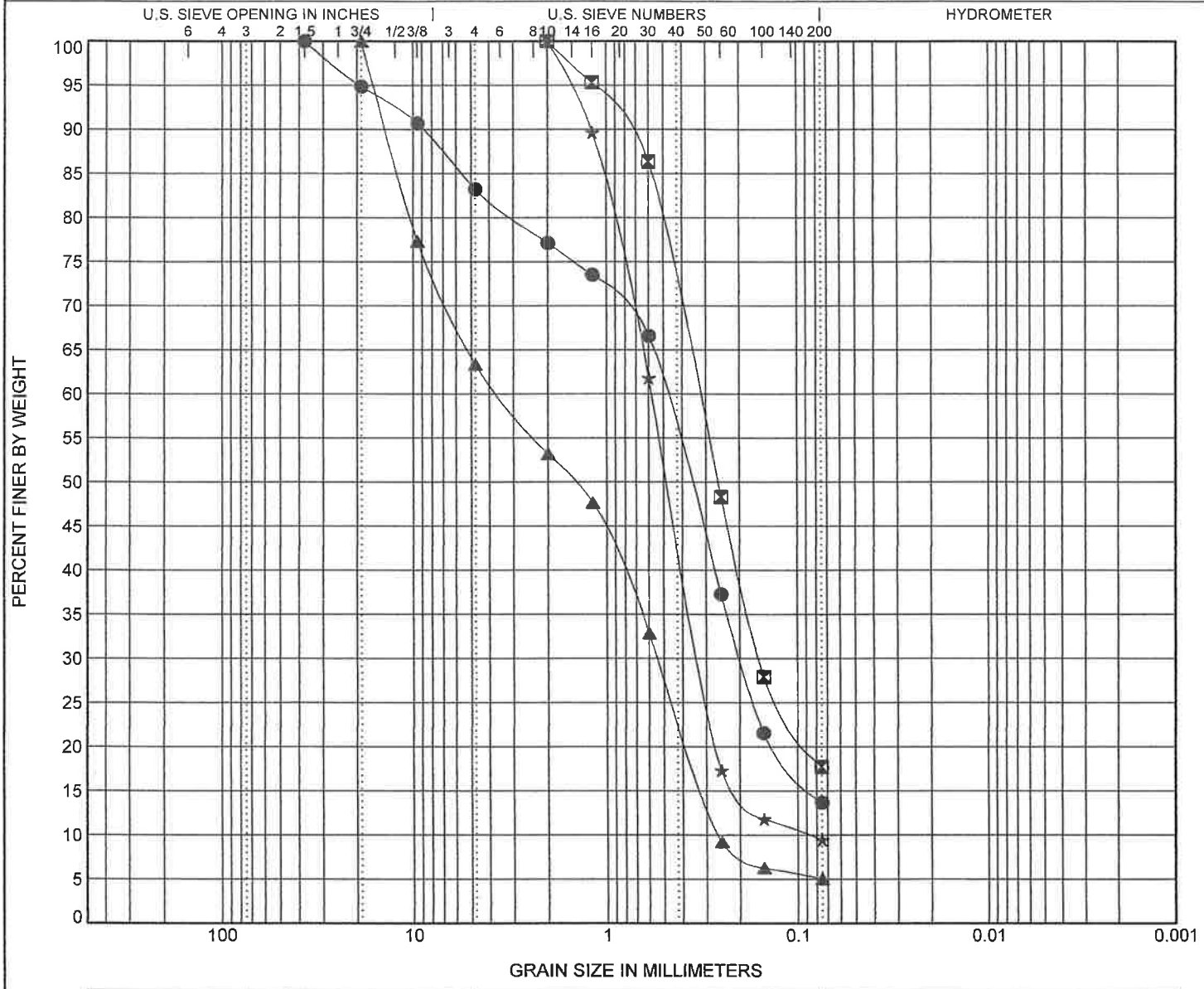
ES-3467.02

Earth Solutions NW, LLC
1805 136th PL NE
Bellevue WA 98005
Telephone: 4252843300

GRAIN SIZE DISTRIBUTION

CLIENT Vasile Antemie **PROJECT NAME** Up-Lake Short Plat

PROJECT NUMBER ES-3467.02 **PROJECT LOCATION** King Co



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-106	8.00ft.	USDA: Gray Gravelly Loamy Sand. USCS: SM with Gravel.		
⊠ TP-106	8.00ft.	Gray Gravelly Loamy Sand		
▲ TP-109	5.00ft.	USDA: Gray Very Gravelly Coarse Sand. USCS: SP-SM with Gravel.	0.32	13.89
★ TP-109	5.00ft.	Gray Very Gravelly Coarse Sand	2.02	6.60

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-106	8.0ft.	37.5	0.493	0.197					13.7	
⊠ TP-106	8.0ft.	2	0.327	0.158					17.7	
▲ TP-109	5.0ft.	19	3.573	0.54	0.257				5.0	
★ TP-109	5.0ft.	2	0.579	0.321	0.088				9.5	

GRAIN SIZE USDA ES-3467.02.GPJ GINT US LAB.GDT 5/18/16

Report Distribution

ES-3467.02

EMAIL ONLY

Mr. Vasile Antemie
15129 Simonds Road Northeast
Kenmore, Washington 98028