Earth Solutions NW LLC

Geotechnical Engineering
Geology
Environmental Scientists
Construction Monitoring

2005 EARTH SOLUTIONS NW 10 YEARS OF EXCELLENCE BELLEVUE, WA. 2015

GEOTECHNICAL ENGINEERING STUDY
ASTRONICS - PROPOSED NORTH BUILDING ADDITION
12950 WILLOWS ROAD NORTHEAST KIRKLAND, WASHINGTON

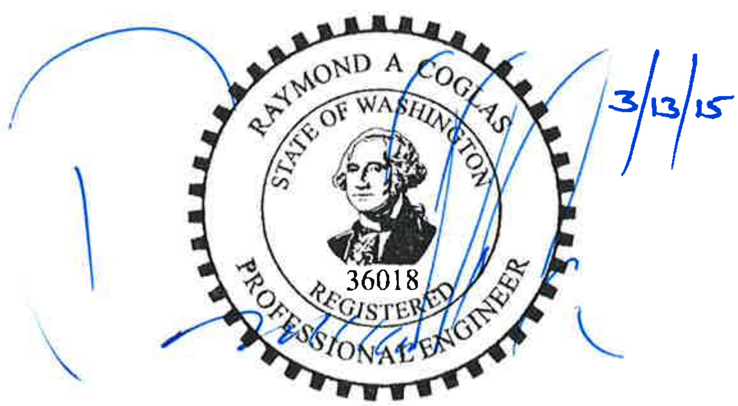
ES-0736.10

1805 - 136th Place N.E., Suite 201 Bellevue, WA 98005
(425) 449-4704 Fax (425) 449-4711
www.earthsolutionsnw.com

PREPARED FOR

ASTRONICS

March 13, 2015



Raymond A. Coglas, P.E.
Principal

GEOTECHNICAL ENGINEERING STUDY
ASTRONICS - PROPOSED NORTH
BUILDING ADDITION
12950 WILLOWS ROAD NORTHEAST
KIRKLAND, WASHINGTON

ES-0736.10

Earth Solutions NW, LLC
1805 – 136th Place Northeast, Suite 201, Bellevue, Washington 98005
Ph: 425-449-4704 Fax: 425-449-4711
Toll Free: 866-336-8710

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

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER06045.0M

Earth Solutions NW LLC

• Geotechnical Engineering
• Construction Monitoring
• Environmental Sciences

March 13, 2015
ES-0736.10

Astronics
12950 Willows Road Northeast
Kirkland, Washington 98034

Attention: Mr. Timothy Borland

Dear Mr. Borland:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled Geotechnical Engineering Study, Astroncis - Proposed North Building Addition, 12950 Willows Road Northeast, Kirkland, Washington". This report presents the results of our geotechnical engineering study for the proposed office building and associated parking garage development.

The addition of a new office building and parking structure is currently proposed throughout the northerly parcels of the Astronics property. The primary geotechnical considerations with respect to the proposed development are related to foundation support and minimizing post-construction settlement of the new building structures. Based on review of the current plans, the first floor level of the proposed office building structure will be approximately elevation 51.0 feet. The northerly garage structure will have a finish floor (southeast corner) of approximately elevation 45.5 feet. Subsurface conditions encountered at the boring and test pit locations reveal native and existing fill deposits consisting primarily of loose to medium dense silt, silty sand and poorly graded sand deposits extending to varying depths. Interbedded deposits of clay are also present. In this respect, the native and existing fill deposits (near surface) can be characterized as having a relatively poor capacity for foundation bearing. As such, the use of aggregate pier foundations is recommended in this study for purposes of developing sufficient bearing capacity below the proposed building structures.

Recommendations for foundation design, aggregate piers, site preparation, subsurface drainage and other pertinent geotechnical recommendations are provided in this geotechnical engineering study. The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Raymond A. Coglas, P.E.
Principal

1805 - 136th Place N.E., Suite 201 • Bellevue, WA 98005 • (425) 449-4704 • FAX (425) 449-4711

Table of Contents

ES-0736.10

Table of Contents

Cont'd

ES-0736.10

GRAPHICS

APPENDICES

GEOTECHNICAL ENGINEERING STUDY
ASTRONICS - PROPOSED NORTH
BUILDING ADDITION
12950 WILLOWS ROAD NORTHEAST
KIRKLAND, WASHINGTON

ES-0736.10

INTRODUCTION

General

This geotechnical engineering study was prepared for the proposed Astronics – North Building Addition to be located within the northerly parcels of the current Astronics property (12950 Willows Road Northeast, Kirkland, Washington). The location of the property is illustrated on the Vicinity Map included as Plate 1 of this study. Our scope of services for completing this geotechnical engineering study included the following:

- Recent subsurface investigation and review of previous subsurface data for the purpose of characterizing the site geologic conditions;
- Preparing excavation and earthwork recommendations, including recommendations for temporary slopes, site grading, and backfill, as appropriate;
- Providing foundation and allowable soil bearing capacity recommendations, and an assessment of anticipated construction and post-construction foundation settlements;
- Assessing the on-site soils and suitability for use as structural fill;
- Assessing groundwater levels and providing an assessment of site liquefaction susceptibility;
- Assessing possible geologic hazards and measures for mitigating any identified hazards;
- Providing pavement design recommendations, and;
- Providing additional geotechnical recommendations, as appropriate.

The following documents were reviewed as part of preparing this preliminary geotechnical engineering study:

- Preliminary Site Plan prepared by Craft Architects;
- Preliminary Survey and Site Plans prepared by Barghausen Consulting Engineers;
- City of Kirkland Code – Geologically Hazardous Areas (Ch. 85);
- King County IMap online property resource;
- Composite Geologic Map of King County, Washington Booth et al, 2006, and;
- King County Soil Conservation Survey (NRCS).

Project Description

The addition of a new two to three-story office building and parking structure is currently proposed throughout the northerly parcels of the Astronics property. The approximate building footprint areas are illustrated on the Boring and Test Pit Location Plan (Plate 2). Based on proposed finish grades, the multi-story office building and garage structures will likely incorporate east-facing daylight basement levels. The approximate finish floor elevation of the daylight level for the office building will be on the order of elevation 51.0 feet. At the back of the office building (west side), access to the second floor level will be established at approximately elevation 69.0 feet. Finish floor for the proposed garage structure will be somewhat lower than the office building, with the lowest elevation estimated at elevation 45.5 feet at the southeast corner of the structure.

The buildings will likely consist of a combination of concrete tilt-up, post-tensioned slabs, and light weight framing. The parking garage structure is expected to consist primarily of cast-in-place concrete elements and post-tensioned slabs. Column loads for the proposed office and garage structures are estimated to be on the order of 350 to 750 kips, with the higher loading being attributed to the garage structure. Perimeter wall loads are estimated to be on the order of four to 5 to 8 kips per lineal foot.

Structural fill placement of up to approximately 10 to 12 feet will likely be needed throughout the easterly sides of the property to establish the pad elevations and frontage access roadway. A retaining wall will likely be utilized along the east property boundary to support the structural fills. To establish the basement levels for the proposed buildings along the west, cuts on the order of 8 to 12 feet below existing grades will likely be necessary. Temporary open-cut excavations or shoring will be utilized to construct the excavations. To the west of the proposed building envelopes, cuts on the order of 8 to 12 feet will also likely be necessary to construct the upper paved parking and drive areas behind the buildings. Consistent with the existing Astronics development to the south, rockeries will be utilized along the west margins of the development area to support the proposed pavement area cuts.

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 verify that our geotechnical recommendations have been incorporated into the design.

SITE CONDITIONS

Surface

The subject property is located at the northern terminus of 141st Avenue Northeast just north of the intersection of Willows Road Northeast and 141st Avenue Northeast in Kirkland, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map) included in this study. The site is roughly rectangular in shape with a gross area of approximately six acres. The site is bordered to the east and west by railroad tracks (BNSF right-of-way) and to the north and south by undeveloped parcels. The approximate limits of the property are illustrated on Plate 2 (Boring and Test Pit Location Plan) included in this study. The site is currently undeveloped.

The topography across the development portions of the site gently descends to the east with several relatively level benched areas trending roughly north-south extending the length of the property. More steeply sloping areas are present to the west of the planned development areas. There is approximately 40 to 60 feet of elevation change across the site (east-west between property lines). There is a steep elevation change descending from the western railroad tracks with the site leveling out before it descends again to the railroad tracks located east of the site. In general, it appears the central and eastern portions of the property have been modified and altered to varying degrees as a result of previous development and grading activities.

It appears as part of previous development activities on the site, a series of drainage ditches have been established. Areas of runoff, and possible seepage from the topographically higher west side of the property are being collected to varying degrees at some locations across the site. Vegetation throughout the majority of the site is varied, consisting of areas of mature evergreen trees and field grass. Portions of the site were previously used as a soil stockpile storage area during the prior (south) development activities (current Astroncis building site).

Cross Sections

For preliminary design purposes, two representative cross sections (A-A' and B-B') were developed through the building sites. The cross sections are provided on Plate 3 of this study. The cross sections do not fully depict the variations in existing surface topography and related features. However, the cross sections provide a reasonable representation of the proposed building levels relative to existing grade. The cross sections also approximately depict the areas where cuts and fills will be needed to establish the lower and upper paved parking and drive areas to the east and west of the building sites.

Subsurface

Six borings were drilled and twelve test pits were excavated across the site for purposes of assessing soil conditions, and for purposes of characterizing and classifying the site soils. Please refer to the boring and test pit logs provided in Appendix A for a more detailed description of the subsurface conditions.

Previous fill stockpiles and grading activities throughout the central and west portions of the property have produced areas of existing fill. From observations and subsurface investigations, the existing fill depths range between approximately 6 to 18 feet. The existing fill material consist primarily of loose silty sand and silt soils with occasional gravel.

In general, underlying the existing fill, the subsurface investigations revealed a varied sequence of sandy silt (Unified Soil Classifications ML), silt (ML), lean clay (CL), silty sand (SM), silty sand with gravel (SM), and poorly graded sand (SP). These deposits generally increased in relative density (or consistency) with depth. However, in general, the upper 10 to 20 feet of the soil deposits throughout the site are characterized as variable with respect to soil relative density (or consistency). This variability is an important consideration with respect evaluating soil bearing capacity and post-construction settlement potential (as discussed later in this study).

Geologic Setting

Based on review of the previously referenced Geologic Map of King County, it glacial till (Qvt) advance sand (Qva) and pre-Fraser (fine grained) deposits are mapped throughout much of the site and surrounding areas. Review of the Soil Survey of King County (NRCS) indicates the presence of Everett Gravelly Sandy Loam (EvC) deposits throughout the north and central portions of the site and surrounding areas. To the west and south of the subject site, deposits of Alderwood Gravelly Sandy Loam (AgD 15 to 30 percent slopes) are identified. Based on our findings at the test sites, Alderwood and Everett type soils underlain with finer grained silt and clay deposits were primarily encountered. Based on the soil conditions encountered during our fieldwork, the native soils are generally consistent with the geologic designations and the NRCS characterization.

Groundwater

The groundwater table was observed in borings B-103 and B104 at a depth of approximately 28.5 feet below existing grade at the time of our fieldwork (March, 2007). Subsequent boring investigations completed in February 2015 did not identify groundwater conditions at-depth. However, the presence of shallower zones of groundwater seepage should be expected in the site excavations. In general, significantly deep building pad cuts are not proposed for this project. In this respect, we anticipate groundwater seepage conditions exposed during excavation for the building sites can be managed through standard construction technicques (sumps / interceptor trenches). However, efforts to collect surface water runoff and possible shallow groundwater seepage throughout the topographically higher west portions of the site should be evaluated prior to major grading activities. Runoff from the topographically higher areas to the west of the site could impact the development areas if provisions to collect this runoff are not further assessed and mitigated, as necessary. It is also important to note that 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.

CRITICAL AREAS REVIEW

As part of our report preparation, we reviewed Chapter 85 of the City of Kirkland Zoning Code (Geologically Hazardous Areas) to assess if any potential critical areas, that meet current critical area definitions, are present on the subject site, and to provide recommendations for mitigating soil instability or excessive erosion, as appropriate. As part of our review, the King County I-Map resource was also reviewed.

Seismic Hazard Area Assessment

Based on our review of the referenced IMap online resource, seismic hazard areas are identified across the extreme westerly portions the subject property. The subject property is located topographically higher than the Sammamish Valley floor located immediately to the east of the property. In general, the liquefaction susceptibility of the Sammamish Valley area would be characterized as moderate to high. However, based on the subsurface conditions encountered at the test sites throughout the subject property, we would characterize the liquefaction susceptibility of the native soils as low.

Landslide Hazard Area Assessment

Based on our overall review of the City of Kirkland and King County I-Map online resources, landslide hazard areas are identified directly west of the subject property. Based on site reconnaissance, the primary hazard with respect to landslide activity would be associated with areas to the west of the site (directly above and below the existing railroad alignment). No evidence of large scale slope movements or landslide activity was observed as part of our investigation. With respect to the proposed development activities, the majority of the planned activity along the west side of the site will consist of retaining wall construction and related drainage improvements. In this respect, based on our review and involvement with the previous development to the south (existing Astroncis buildings), the planned development activities will likely decrease the potential for slope instability of the site slopes due to the improved soil retention and drainage. ESNW should review the final site grading plans to confirm that appropriate site development methods are incorporated into site designs and to provide additional geotechnical recommendations, as appropriate.

Erosion Hazard Area Assessment

Based on our review of the referenced map resources, erosion hazard areas are identified directly west of the subject property. In our opinion, the site soils would present a moderate to severe erosion hazard. Best Management Practices (BMPs) consistent with current code requirements should be incorporated into final site designs. At a minimum, silt fencing should be placed along the entire down-slope development envelope. Construction entrances should be surfaced with quarry spalls to minimize off-site tracking of silt and soil generated during site construction. ESNW should review the proposed Temporary Erosion and Sedimentation Control (TESC) plans to see that appropriate means of controlling off-site sedimentation are implemented and to provide supplemental recommendations, as necessary. Final design plans should properly accommodate stormwater runoff and direct it away from the slopes or into a properly designed collection system.

DISCUSSION AND RECOMMENDATIONS

General

In our opinion, the planned office building and garage structure development is feasible from a geotechnical standpoint. The primary geotechnical considerations with respect to the planned development activities are related to foundation support and minimizing post-construction settlements. Although the native soil deposits can be characterized as having a relatively low capacity for compression, unacceptable settlement of these deposits could occur as the office building and garage structure foundation loads are applied. As such, the use of aggregate pier foundations is recommended in this study for purposes of developing sufficient bearing capacity (at-depth), and for purposes of minimizing post-construction settlements. Recommendations for aggregate piers and foundations are discussed in the *Foundations* section of this study. In our opinion, the lower basement levels for the office building and garage structure can be constructed as a slab-on-grade without aggregate pier support, provided the slabs are supported on a compacted structural fill base.

Site drainage will need to be addressed prior to the grading activities and fill placement to ensure runoff and seepage zones are controlled and directed around the building sites, where necessary. Recommendations for foundation design, site preparation, subsurface drainage and other pertinent geotechnical recommendations are provided in this preliminary geotechnical engineering study.

This geotechnical engineering study has been prepared for the exclusive use of Astronics and their representatives. The study has been prepared specifically for the subject project. 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

The primary considerations with respect to earthwork are related to the cuts and structural fill placement throughout the proposed building and pavement areas. As previously discussed, fills up to approximately 10 to 12 feet are anticipated throughout the easterly portions of the site to establish the site frontage road and adjacent easterly sides of the building pads. It should be noted that fills directly within the building footprint areas will likely be limited to roughly 4 feet. Along the east property line, retaining walls will likely support the structural fill and new pavement and drive areas. Immediately to the west of the new building structures, structural fill placement of up to approximately 10 feet will also likely be necessary to support new pavement areas and access to the structures. With respect to cuts, excavations on the order of 10 to 12 feet are expected throughout the westerly areas of the building sites and along the west margins of the upper parking areas.

Structural Fill Material

The existing fill and native soil deposits expected to be encountered throughout the planned excavations may be feasible for use as structural fill depending on the proposed application and moisture content at the time of construction. In general, the existing fill and fine grain native soils should not be considered for use directly below the proposed building structures. The geotechnical engineer, however, should evaluate the suitability of the onsite soils for use as structural fill on a case by case basis at the time of construction.

Imported soil intended for use as structural fill should consist of a suitable 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-quarters inch fraction. The geotechnical engineer should evaluate the proposed structural fill soils and provide supplement recommendations for structural fill, as appropriate.

Based on the results of our laboratory analyses, the existing fill and native on-site soils anticipated to be encountered in the site excavations will generally have a moderate to high sensitivity to moisture. These soils are anticipated to consist largely of silty sand and sandy silt deposits. The on-site native soils may be suitable for use as structural fill, depending on the application and moisture content at the time of placement.

Compaction Requirements

For purposes of this study, structural fill placed within the building envelopes should consist of a suitable granular soil compacted to 90 percent relative compaction. Structural fill placed throughout the planned pavement areas should consist of a suitable material compacted to a relative compaction of 90 percent, with the exception of the upper 12 inches of the subgrade, which should be compacted to a relative compaction of 95 percent. The maximum dry density should be based on the maximum dry density as determined by the Modified Proctor Method (ASTM D-1557). Structural fill soils should be placed and compacted in maximum twelve (12) inch loose lifts.

Erosion Control

Temporary erosion control should consist of conventional silt fencing along the down gradient perimeter of the development portion of the site, and temporary means to control site runoff, as appropriate, or as required by the King County development standards. During periods of extended precipitation, exposed earth surfaces should be mulched or protected by other suitable means, as appropriate, to reduce the potential for surface erosion.

Rockeries and Segmental Panel Walls

We anticipate that rockeries and segmental panel (Lock and Load) walls may be utilized at the site as part of the proposed development. In our opinion, the use of rockeries and segmental panel walls at this site is feasible from a geotechnical standpoint. Rockeries and segmental panel walls over four feet in exposed height will require an engineered design. ESNW can provide engineered rockery and segmental panel wall designs, upon request.

Foundations

Due to the loose and variable near surface soil conditions encountered at the test sites, unacceptable settlement of these upper deposits could occur as the office building foundation loads are applied. As such, the use of aggregate pier foundations is recommended in this study for purposes of developing sufficient bearing capacity and for purposes of minimizing post-construction settlements.

Aggregate Piers

Due to the loose and variable near surface soil conditions, the use of aggregate piers should be considered for support of the foundations. Aggregate piers would replace the existing near surface soils with a series of crushed rock columns. The building foundations would derive support along the crushed rock columns, mitigating the potential for excessive foundation settlements. A formal design for aggregate piers should be developed during the design phase of the project when the foundation plan and loading has been determined. In general, the following preliminary recommendations and guidelines should be incorporated into the aggregate pier design:

- Pier Diameter — 24 to 30 inches (typical)
- Pier Depth — Varies. (Estimated 12 to 25 Feet).
- Installation Method — Augered Holes. Casing used in weak or caving soils.
- Aggregate Material — Typically one to one and one-half inch crushed rock.
- Pier Spacing — Varies. Depends on soil conditions and foundation loads.
- Allowable Bearing — Assume 6,000 psf.
- Friction — Assume 0.50 (Foundation / Pier Interface)*
- Passive Pressure — Assume 350 pcf (Structural Backfill)*
- Wind and Seismic — Allowable One-Third Increase
- Total Settlement — One Inch or Less
- Differential Settlement — One-half Inch or Less (over 50 feet)
- Cost — Varies, but is typically less than piling (estimated $900/pier)

*** Includes factor-of-safety of 1.5**

Based on the subsurface conditions encountered at the boring and test pit locations, the majority of the building footprint areas will likely require aggregate piers. Areas of the building site where competent native soil deposits are encountered at the building subgrade elevations may not require the use of aggregate piers. At this time, delineation of these areas is difficult to determine. Further evaluation of the foundation subgrade conditions should be performed during the site mass grading to better determine the required extent of the aggregate pier foundations. It is possible that overexcavation and replacement could be utilized in some areas where the competent native soils are present at relatively shallow depths. Where overexcavation is determined feasible, a suitable crushed rock material should be used to backfill the excavation.

Slab-On-Grade Floors

In our opinion, the proposed garage slab areas can be constructed as a slab-on-grade, and would not require aggregate pier support. The slab-on-grade floors for the proposed buildings should be supported on compacted structural fill. Structural fill in slab-on-grade areas should consist of suitable granular soil compacted to 95 percent relative compaction. 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 passing the #200 sieve, based on the minus three-quarters inch fraction. In areas where slab moisture is undesirable, installation of an approved vapor barrier or membrane below the slab should be considered.

Retaining Walls

Retaining walls should be designed to resist earth pressures and any applicable surcharge loads. For design, the following parameters should be assumed for retaining wall design:

- Active Earth Pressure (Yielding Wall) — 35 pcf (equivalent fluid)
- At-Rest Earth Pressure (Restrained Wall) — 50 pcf
- Traffic Surcharge (Passenger Vehicles) — 70 psf (rectangular distribution)
- Soil Bearing Capacity — 6,000 psf (Building Foundation Wall)
- Soil Bearing Capacity — 3,000 psf (Site Retaining Wall)
- Passive Resistance — 350 pcf (equivalent fluid)
- Coefficient of Friction — 0.50 (Building Foundation Wall)
- Coefficient of Friction — 0.40 (Site Retaining Wall)

Additional surcharge loading from foundations, sloped backfill, or other loading should be included in the retaining wall design, as appropriate. 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, as appropriate.

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 (surface seal) soil, if desired. A perforated drain pipe should be placed along the base of the wall, and connected to an appropriate discharge location. A typical retaining wall drainage and backfill detail is included as Plate 4 of this study.

Seismic Considerations

The 2012 International Building Code specifies several soil profiles that are used as a basis for seismic design of structures. The 2012 IBC recognizes ASCE for seismic site class definitions. In accordance with Table 20.3-1 of ASCE, Minimum Design Loads for Buildings and Other Structures, Site Class D, should be used for design.

Liquefaction / Landslide Hazards

In our opinion, liquefaction susceptibility at this site is low. The relative density and fine grain nature of the site soils, and the absence of a uniform shallow groundwater table are the primary bases for this designation. Additionally, building foundations supported on aggregate piers or crushed rock structural fill will mitigate the potential for liquefaction related foundation settlements.

With respect to landslide hazards, the risk of impacts from seismically induced landslides initiated offsite would be characterized as low. The proposed building structures will incorporate structural foundation walls, and the development areas are sufficiently removed from the areas of landslide potential identified to the west.

Excavations and Shoring

The Federal and state Occupation Safety and Health Administration (OSHA/WISHA) classifies soils in terms of minimum safe slope inclinations. Based on conditions observed at our test sites, the loose to medium dense silt and silty sand soils in the upper approximately ten feet would be classified as Type C soils by OSHA. Type C soils should be sloped no steeper than 1.5H:1V (Horizontal:Vertical). In addition, where groundwater seepage is encountered in excavations, the soil should be characterized as Type C, and sloped no steeper than 1.5H:1V.

The dense silt and clay soils encountered below approximately ten feet would generally be classified as Type B Soils. Temporary slopes in Type B souls should be sloped at an inclination of 1H:1V or flatter. However, the geotechnical engineer should observe temporary excavations to verify the OSHA/WISHA soil type and allowable temporary slope inclination.

Permanent slopes should be sloped no steeper than 2H:1V. Permanent slopes should be mulched or vegetated with appropriate species of plants to reduce the potential for surface erosion.

Similar to the prior development to the south (existing Astronics buildings), temporary shoring may be utilized to support the west excavation for the proposed building pads. Although temporary layback of the building excavations is likely feasible, the use of temporary shoring (if desired) would serve to maintain a relatively flat grade west to the building sites during construction. This may benefit the construction process by providing a staging area and access around the site. Temporary shoring consisting of soil nailing or soldier piles can be considered, in our opinion. Other options, however, may be feasible and can be further evaluated by ESNW, if requested. Additionally, ESNW can also provide shoring design recommendations and drawings.

Drainage

The seasonal groundwater table was observed at depths of approximately 26 to 28.5 feet below existing grades at the time of our earlier fieldwork (February and March 2007). Along the west sides of the development area, cuts ranging from 10 to 12 feet will be necessary at some locations. During construction, groundwater seepage exposed in cuts will likely be manageable through standard techniques (sump pits and interceptor trenches). However, efforts to collect surface water runoff and possible shallow groundwater seepage throughout the topographically higher west portions of the site should be evaluated prior to major grading activities. Runoff from the topographically higher areas to the west of the site could impact the development areas if provisions to collect this runoff are not further assessed and mitigated, as necessary.

With respect to permanent drainage, perimeter drains should be installed at or below the invert of the building footings. Typical footing drain details for foundation walls and shallow footings are provided on Plates 4 and 5 of this report, respectively. The need for supplement permanent drainage elements should be evaluated by the geotechnical engineer during construction. If determined necessary, supplement drainage below the building slab and throughout exterior areas may be recommended based on observed and encountered conditions.

Utility Trench Backfill

In our opinion, the soils observed at the test sites are generally suitable for support of utilities. Organic or highly compressible soils encountered in the trench excavations should not be used for supporting utilities. In general, the on-site soils observed at the test sites should be suitable for use as structural backfill in the utility trench excavations, provided the soil is at or near the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report, or to the applicable specifications of the city jurisdictions, as appropriate. With respect to groundwater, the deeper utility trench excavations could encounter groundwater conditions.

Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure 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 to the specifications detailed in the "Site Preparation and Earthwork" section of this report. Areas of unsuitable or yielding subgrade should be re-compacted or overexcavated and replaced with suitable structural fill or crushed rock.

For relatively lightly loaded pavements subjected to automobiles and occasional heavy truck traffic, the following 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 three inches of asphalt treated base (ATB).

The HMA, ATB and CRB materials should conform to WSDOT specifications. All base material should be compacted to at least 95 percent of the maximum dry density.

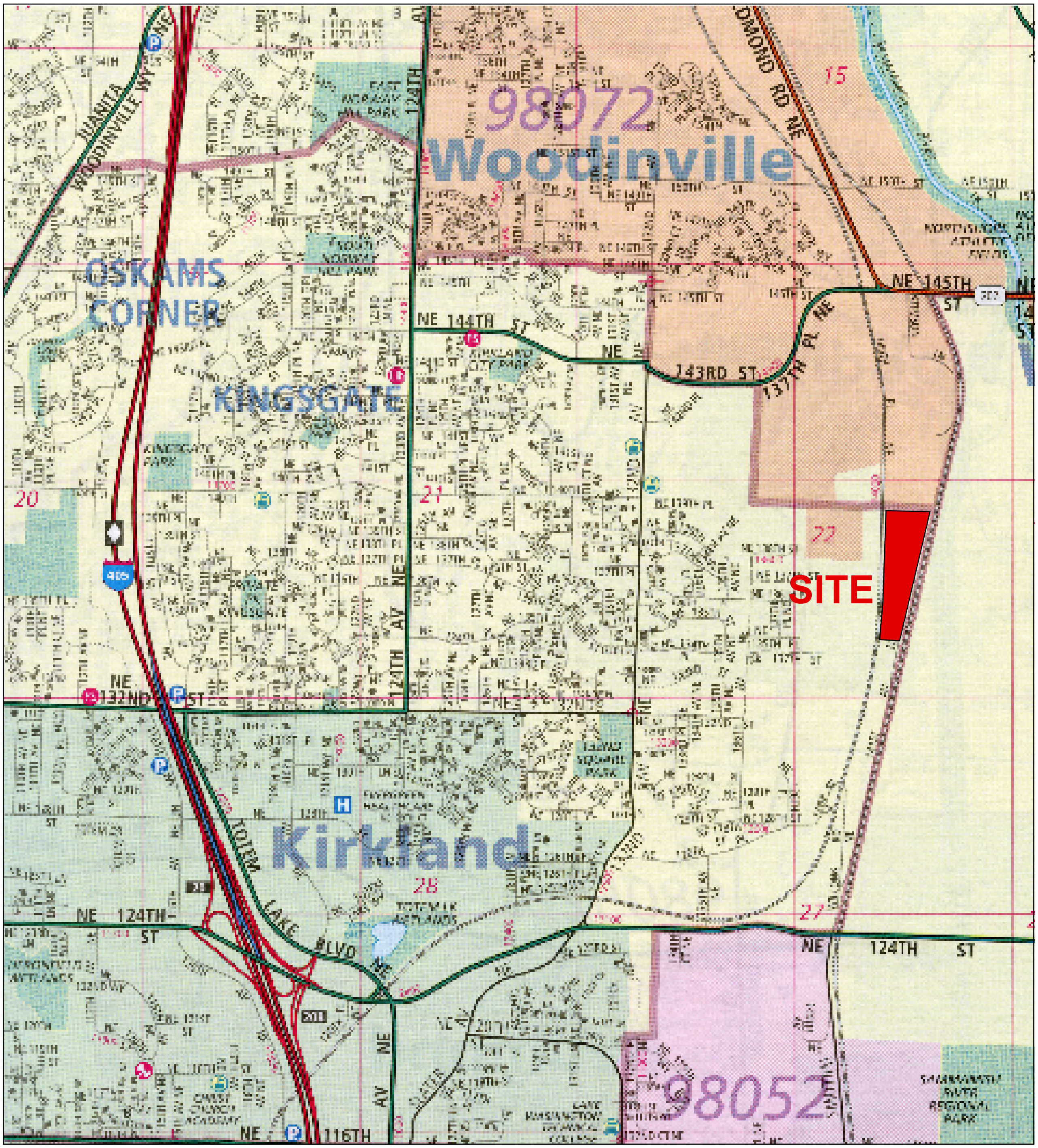
Areas with increased frequency of heavy truck-traffic generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. ESNW can provide appropriate pavement section design recommendations for truck traffic areas and right-of-way improvements, as necessary. Additionally, minimum pavement sections specified by City of Kirkland and King County Road Standards may supersede the recommendation in this study.

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 sites 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 preliminary report. ESNW should also be retained to provide testing and consultation services during construction.



Reference:
King County, Washington
Map 506
By The Thomas Guide
Rand McNally
32nd Edition

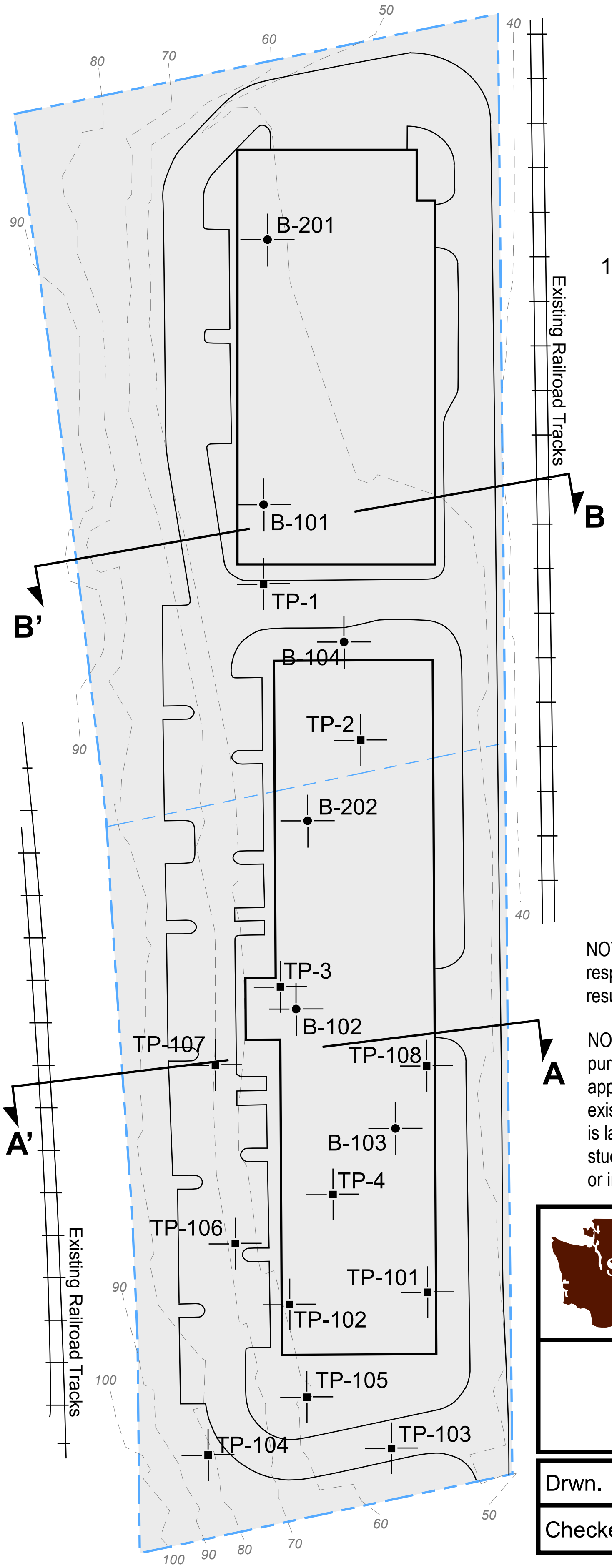
NORTH

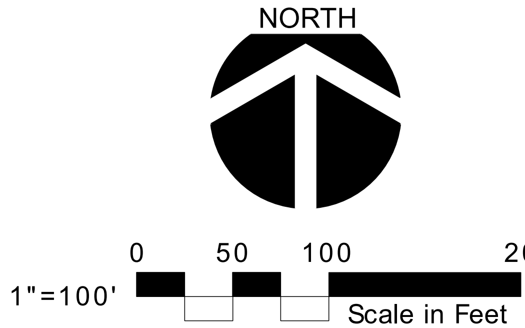
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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

Vicinity Map
Astronics North Building Addition
Kirkland, Washington

Drwn. GLS	Date 03/11/2015	Proj. No. 0736.10
Checked BTS	Date Mar. 2015	Plate 1





LEGEND

B-201 — Approximate Location of ESNW Boring, Proj. No. ES-0736.10, Feb. 2015

TP-101 — Approximate Location of ESNW Test Pit, Proj. No. ES-0736.08, April 2013

B-101 — Approximate Location of ESNW Boring, Proj. No. ES-0736, March 2007

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-0736, Feb. 2007

Subject Site

Proposed Building

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.

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.

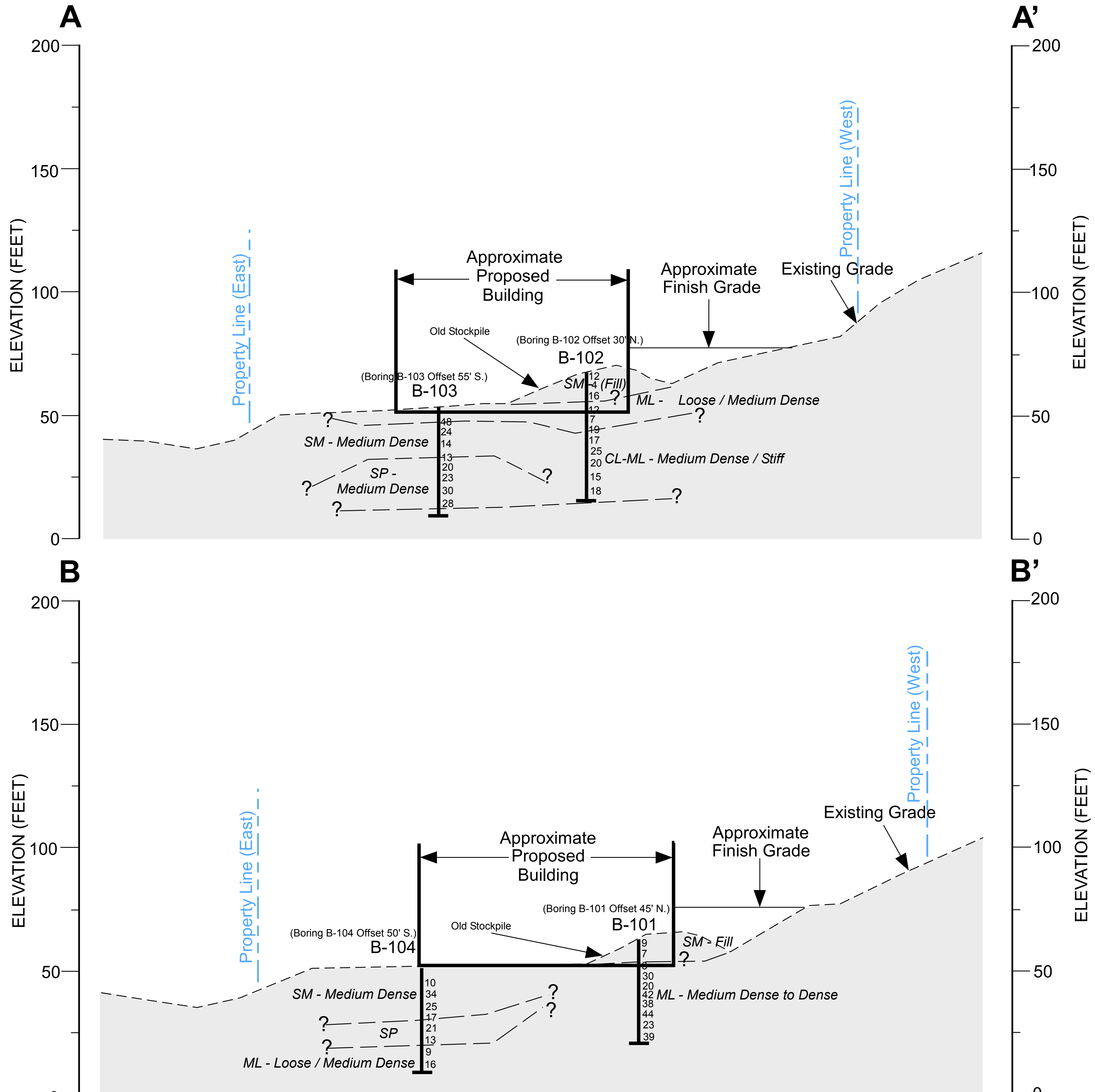
Earth Solutions NW LLC

Earth Solutions NWLLC

Geotechnical Engineering, Construction Monitoring and Environmental Sciences

Boring and Test Pit Location Plan
Astronics North Building Addition
Kirkland, Washington

Drwn. GLS	Date 03/11/2015	Proj. No. 0736.10
Checked BTS	Date Mar. 2015	Plate 2



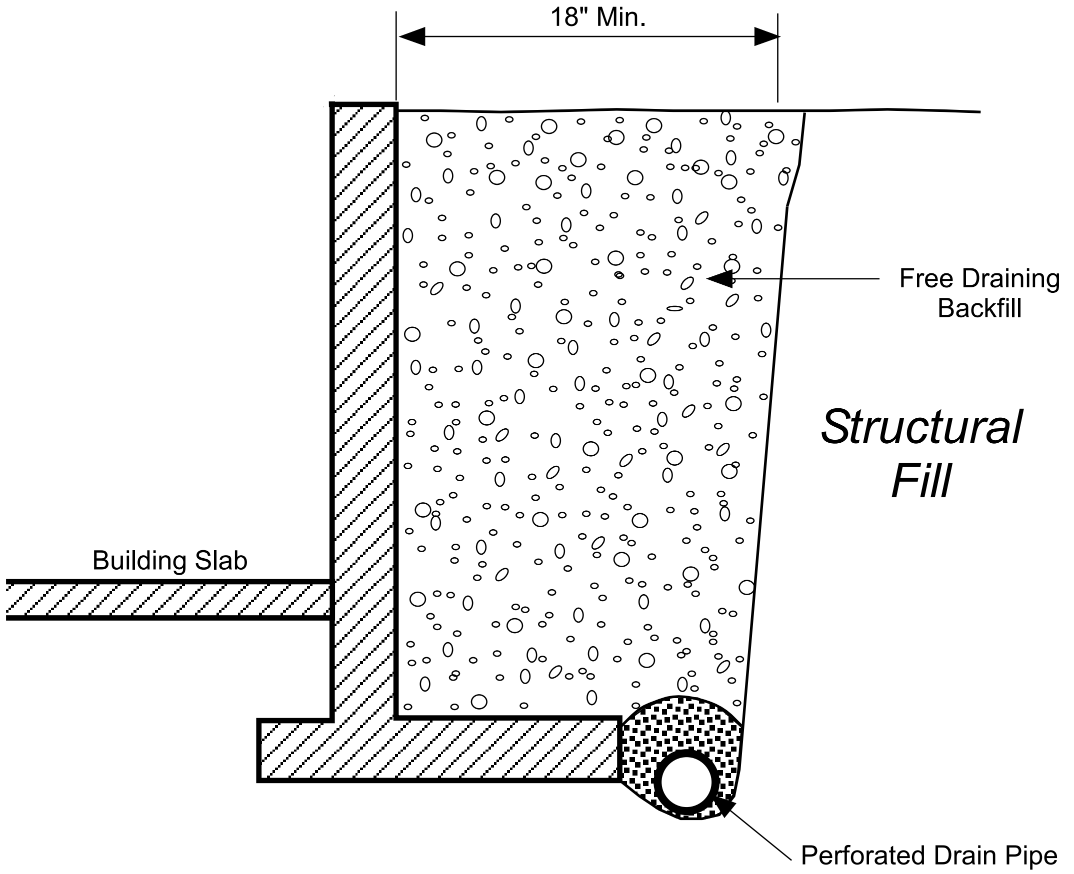
NOTE: The stratification lines shown on this cross section represent the approximate boundaries between soil types. The actual transitions may be either more gradual or more severe. They are based on our interpretation of the subsurface conditions encountered at the individual test locations and our judgement and experience. ESNW cannot be responsible for the 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.

Cross Sections A-A' & B-B'
Astronics North Building Addition
Kirkland, Washington

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

Drwn. By	GLS
Checked By	BTS
Date	03/11/2015
Proj. No.	0736.10
Plate	3



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:

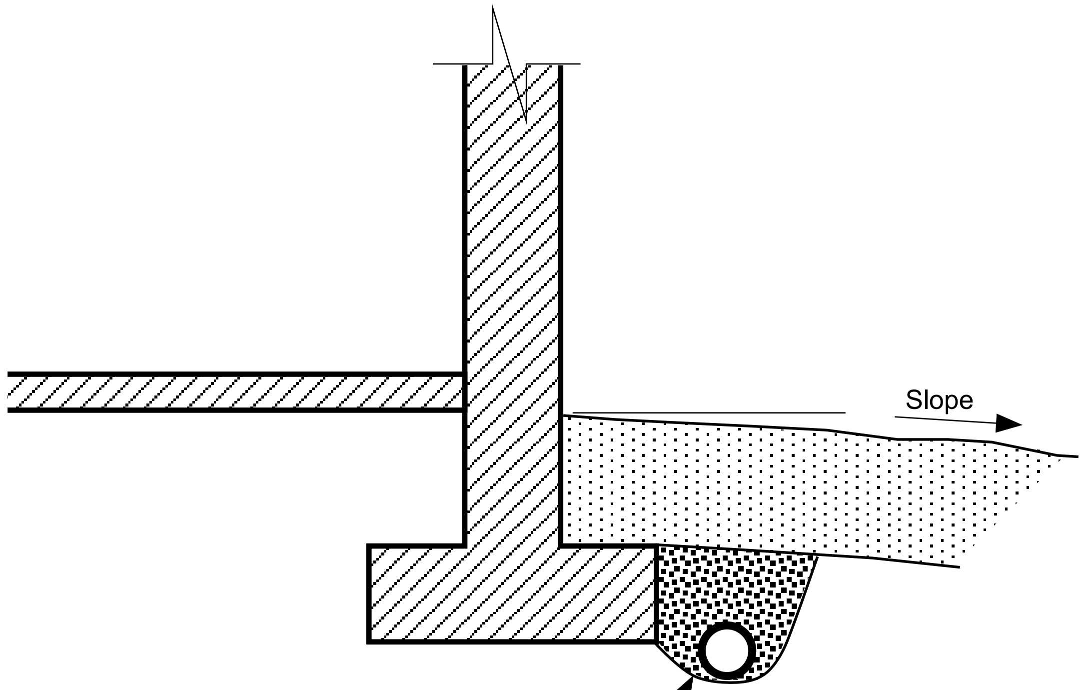
Free Draining Structural Backfill

1 inch Drain Rock

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

RETAINING WALL DRAINAGE DETAIL
Astronics North Building Addition
Kirkland, Washington

Drwn. GLS	Date 03/13/2015	Proj. No. 0736.10
Checked RAC	Date Mar. 2015	Plate 4



Perforated Rigid Drain Pipe
(Surround with 1" Rock)

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

FOOTING DRAIN DETAIL
Astronics North Building Addition
Kirkland, Washington

Drwn. GLS	Date 03/13/2015	Proj. No. 0736.10
Checked RAC	Date Mar. 2015	Plate 5

Appendix A

Subsurface Exploration

ES-0736.10

The subsurface conditions at the site were explored by excavating 12 test pits and drilling 6 borings. The approximate locations of the test sites are illustrated on Plate 2 of this report. The test log data and dates of completion are provided in this Appendix.

Earth Solutions NWLLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(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		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		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		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(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		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		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

BORING NUMBER B-201

CLIENT Astronics AES
PROJECT NAME Astronic North Building Addition
PROJECT NUMBER ES-0736.10
PROJECT LOCATION Kirkland, Washington
DATE STARTED 2/15/15 **COMPLETED** 2/15/15
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR Boretec
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY BTS **CHECKED BY** BTS
AT END OF DRILLING ---
NOTES 0" - 4" topsoil: grass
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		Brown silty SAND with gravel, loose to medium dense, moist to wet (Fill) -becomes gray
5	SS	100	21-50/3"		5.5	
				SM		Brown silty SAND, dense, moist (Native) -fibrous wood fragment within sample
	SS	100	13-14-18 (32)	ML	8.0	Gray SILT, dense, moist
10						-silty sand layer
	SS	100	13-16-20 (36)			
	SS	100	12-10-10 (20)			-becomes medium dense -increased fine sand content
15	SS	100	10-8-10 (18)			-thin layers of fine sand
20						

(Continued Next Page)

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

BORING NUMBER B-201

CLIENT Astronics AES

PROJECT NAME Astronic North Building Addition

PROJECT NUMBER ES-0736.10

PROJECT LOCATION Kirkland, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	8-12-11 (23)	ML		Gray SILT, dense, moist *(continued)*
25	SS	100	6-6-9 (15)			-becomes medium dense
30	SS	100	6-8-14 (22)			-thin sand layer
					34.0	
				CL		Becomes gray Clay, stiff, moist
35	SS	100	4-5-5 (10)			
40	SS	100	6-5-9 (14)			

(Continued Next Page)

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

BORING NUMBER B-201

CLIENT Astronics AES

PROJECT NAME Astronic North Building Addition

PROJECT NUMBER ES-0736.10

PROJECT LOCATION Kirkland, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
				CL		Becomes gray Clay, stiff, moist *(continued)*
45	SS	100	6-6-9 (15)		46.5	-becomes very stiff
						Boring terminated at 46.5 feet below existing grade. No groundwater encountered during drilling. Boring backfilled with bentonite. Bottom of hole at 46.5 feet.

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

BORING NUMBER B-202

CLIENT Astronics AES
PROJECT NAME Astronic North Building Addition
PROJECT NUMBER ES-0736.10
PROJECT LOCATION Kirkland, Washington
DATE STARTED 2/15/15 **COMPLETED** 2/15/15
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR Boretec
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY BTS **CHECKED BY** BTS
AT END OF DRILLING ---
NOTES 4" topsoil: grass
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				SM		Gray silty SAND with gravel, loose, moist to wet (Fill)
5	SS	100	3-3-3 (6)			-no recovery
7.0				ML		Brown sandy SILT with gravel and trace organic "topsoil" debris, medium dense, moist (Fill)
	SS	100	6-8-10 (18)			-brown silt at bottom of sample (Native)
10.0	SS	100	9-9-12 (21)	ML		Gray SILT with trace gravel, dense, moist (Native)
	SS	100	6-8-11 (19)			-becomes gray
15	SS	100	7-9-13 (22)			
20						

(Continued Next Page)

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

BORING NUMBER B-202

CLIENT Astronics AES

PROJECT NAME Astronic North Building Addition

PROJECT NUMBER ES-0736.10

PROJECT LOCATION Kirkland, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	5-7-12 (19)	ML		Gray SILT with trace gravel, dense, moist (Native) *(continued)* -trace gravel within silt matrix
25	SS	100	5-6-8 (14)			-decreased gravel content
30	SS	100	5-6-11 (17)			
35	SS	100	7-13-20 (33)			-becomes dense -sand layers within sample
40	SS	100	8-9-12 (21)		41.5	-becomes medium dense -sand layer within sample
						Boring terminated at 41.5 feet below existing grade. No groundwater encountered during drilling. Boring backfilled with bentonite. Bottom of hole at 41.5 feet.

TEST PIT NUMBER TP-101

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

CLIENT Astronics
PROJECT NAME Astronics - Parking Addition
PROJECT NUMBER 0736.08
PROJECT LOCATION King County, Washington
DATE STARTED 4/29/13 **COMPLETED** 4/29/13
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION —
LOGGED BY BTS **CHECKED BY** BTS
AT END OF EXCAVATION —
NOTES 2"- 4" Quarry Spalls
AFTER EXCAVATION —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0		MC = 17.90%	SM		Dark brown silty SAND with gravel, loose to medium dense, moist (Fill) -trace straw and organic material
2.0		MC = 23.50%	ML		Becomes gray SILT, dense, moist to wet (Fill) -some organic debris -light seepage at 4'
6.0		MC = 4.80%	SP		Gray poorly graded SAND with silt, medium dense to dense, moist (Fill) -increased organic debris
7.0		MC = 16.50%	SM		Brown to black TOPSOIL / silty SAND with gravel, dense, moist to wet (Native)
8.0			GP		Brown poorly graded GRAVEL and cobbles, dense, moist -occasional log debris -light seepage at 11'
11.0		MC = 40.30%	SM		Brown to black silty SAND and peat like organics, medium dense, moist to wet
15.5		MC = 16.90% MC = 17.20%	SP		Gray poorly graded SAND, medium dense, moist
17.5					Test pit terminated at 17.5 feet below existing grade. Groundwater seepage encountered at 4.0 and 11.0 feet during excavation. Bottom of test pit at 17.5 feet.

Earth Solutions NW LLC

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-102

CLIENT Astronics

PROJECT NAME Astronics - Parking Addition

PROJECT NUMBER 0736.08

PROJECT LOCATION King County, Washington

DATE STARTED 4/29/13 **COMPLETED** 4/29/13

GROUND ELEVATION ______ **TEST PIT SIZE** ______

EXCAVATION CONTRACTOR NW Excavating

GROUND WATER LEVELS:

EXCAVATION METHOD ______

AT TIME OF EXCAVATION ---

LOGGED BY BTS **CHECKED BY** BTS

AT END OF EXCAVATION ---

NOTES Depth of Topsoil & Sod 2"- 4": grass

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND with gravel, medium dense, moist (Fill)
					-slight caving upper 4'- 6'
					-becomes gray
		MC = 19.20%			-becomes dark brown silty sand with increased organics mixed into soil, medium dense, wet
5					
					-becomes loose, wet
					-decreased organics, increased silt content
10					-wood branches within soil matrix
		MC = 22.00% MC = 23.40%			
11.0			ML		Gray SILT with sand, medium dense, wet (Fill)
					-wood debris (branches)
13.0			SM		Blue gray silty SAND with gravel, medium dense, wet (Fill)
15					
16.0			ML		Brownish gray SILT, medium dense to dense, moist (Native)
		MC = 31.30%			-mottled texture
18.0		MC = 32.50%			Test pit terminated at 18.0 feet below existing grade. No groundwater encountered during excavation.

Bottom of test pit at 18.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-103

CLIENT Astronics
PROJECT NAME Astronics - Parking Addition
PROJECT NUMBER 0736.08
PROJECT LOCATION King County, Washington
DATE STARTED 4/29/13 **COMPLETED** 4/29/13
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY BTS **CHECKED BY** BTS
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 4"- 6": grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brownish gray silty SAND with gravel, loose to medium dense, moist (Fill) -trace wood debris -light seepage at 3.5' -becomes gray, moist to wet -becomes dark brown loose to medium dense, wet
5		MC = 27.00%			
10					
12.0		MC = 25.60%	ML		Becomes blue gray SILT, dense, moist to wet (Fill)
14.0		MC = 28.60%	ML		Brown SILT, dense, moist (Native)
15					
17.0					Test pit terminated at 17.0 feet below existing grade. Groundwater seepage encountered at 3.5 feet during excavation. Bottom of test pit at 17.0 feet.

Earth Solutions NW LLC

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-104

CLIENT Astronics

PROJECT NAME Astronics - Parking Addition

PROJECT NUMBER 0736.08

PROJECT LOCATION King County, Washington

DATE STARTED 4/29/13 COMPLETED 4/29/13

GROUND ELEVATION TEST PIT SIZE

EXCAVATION CONTRACTOR NW Excavating

GROUND WATER LEVELS:

EXCAVATION METHOD

AT TIME OF EXCAVATION ---

LOGGED BY BTS CHECKED BY BTS

AT END OF EXCAVATION ---

NOTES Depth of Topsoil & Sod 2"- 4": grass

AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brownish gray silty SAND with gravel, medium dense, moist (Fill)
3.0		MC = 22.60% MC = 25.80%	ML		Becomes brownish gray SILT with sand, medium dense, moist to wet (Fill) -becomes gray -light seepage at 6'
7.0			SM		Brownish gray silty SAND, medium dense, moist to wet (Fill) -becomes loose to medium dense, wet -increased silt content
13.0		MC = 23.90%	ML		Brownish gray SILT, medium dense, moist to wet (Fill) -chain debris
18.0					Test pit terminated at 18.0 feet below existing grade. Groundwater seepage encountered at 6.0 feet during excavation. Bottom of test pit at 18.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-105

CLIENT Astronics	**PROJECT NAME** Astronics - Parking Addition
PROJECT NUMBER 0736.08	**PROJECT LOCATION** King County, Washington
DATE STARTED 4/29/13 **COMPLETED** 4/29/13	**GROUND ELEVATION** ____ **TEST PIT SIZE** ____
EXCAVATION CONTRACTOR NW Excavating	**GROUND WATER LEVELS:**
EXCAVATION METHOD	**AT TIME OF EXCAVATION** ---
LOGGED BY BTS **CHECKED BY** BTS	**AT END OF EXCAVATION** ---
NOTES Depth of Topsoil & Sod 4"- 6": grass	**AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brownish gray silty SAND with gravel, medium dense, moist to wet
4		MC = 24.60%			-light seepage at 4'
5					-becomes dense, medium dense, wet
					-becomes loose
8		MC = 30.80%			-light seepage at 8'
10		MC = 15.50%			
					-becomes medium dense, moist
12.0		MC = 33.10%	ML		Blue gray SILT with sand, medium dense, moist to wet (Fill)
13.5		MC = 30.10%	ML		Brown SILT, dense, moist to wet (Native)
15					
18.0					Test pit terminated at 18.0 feet below existing grade. Groundwater seepage encountered at 4.0 and 8.0 feet during excavation. Bottom of test pit at 18.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-106

CLIENT Astronics
PROJECT NAME Astronics - Parking Addition
PROJECT NUMBER 0736.08
PROJECT LOCATION King County, Washington
DATE STARTED 4/29/13 **COMPLETED** 4/29/13
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY BTS **CHECKED BY** BTS
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 6"- 8": grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown to black silty SAND with gravel and organic material, medium dense, moist (Fill)
		MC = 22.70%			-light seepage at 2.5'
5					
					-BBQ grate and concrete debris
6.5		MC = 19.60%	ML		Bluish gray SILT, dense to medium dense, moist to wet (Fill)
8.0			SM		Brown to black silty SAND with mixed organic content, loose, moist to wet (Fill)
10					
13.5		MC = 10.50%	SP-SM		Bluish gray poorly graded SAND with silt, medium dense, moist (Fill)
15.0			SM		Gray silty SAND with gravel, medium dense, moist (Native)
		MC = 15.10%			-mottled texture
18.0		MC = 11.50%			Test pit terminated at 18.0 feet below existing grade. Groundwater seepage encountered at 2.5 feet during excavation. Bottom of test pit at 18.0 feet.

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-107

CLIENT Astronics
PROJECT NAME Astronics - Parking Addition
PROJECT NUMBER 0736.08
PROJECT LOCATION King County, Washington
DATE STARTED 4/29/13 **COMPLETED** 4/29/13
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY BTS **CHECKED BY** BTS
AT END OF EXCAVATION ---
NOTES Depth of Topsoil & Sod 4"- 6": grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND with gravel and trace organic material mixed in dense to medium dense, moist (Fill)
					-becomes loose to medium dense, moist to wet
5					
					-becomes medium dense, increased gravel, moist
		MC = 31.50%			
10					
10.5		MC = 31.40%	ML		Brownish gray SILT, medium dense, moist (Fill)
12.0			ML		Brown SILT with sand, dense to very dense, moist (Native)
					-mottled texture
15					
16.0					Test pit terminated at 16.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 16.0 feet.

Earth Solutions NW LLC

Earth Solutions NW
1805 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-284-3300

TEST PIT NUMBER TP-108

CLIENT Astronics
PROJECT NAME Astronics - Parking Addition
PROJECT NUMBER 0736.08
PROJECT LOCATION King County, Washington
DATE STARTED 4/29/13 COMPLETED 4/29/13
GROUND ELEVATION TEST PIT SIZE
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY BTS CHECKED BY BTS
AT END OF EXCAVATION ---
NOTES Grass
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Gray silty SAND with gravel, dense, moist (Fill)
					-becomes medium dense, moist to wet
5		MC = 18.80%			
7.5		MC = 6.10%	SP-SM		Gray poorly graded SAND with silt and gravel, dense, moist (Fill)
					-asphalt debris
10.0			GP		Well graded GRAVEL and cobbles, dense, moist (Fill)
11.0		MC = 4.90%	SP-SM		Gray poorly graded SAND with silt, medium dense, moist (Fill)
12.0			TPSL		Brown to black TOPSOIL, loose, wet (12" thick)
13.0		MC = 30.30%	SM		Grades to silty SAND with gravel, dense, moist to wet (Native)
15.0		MC = 11.40%			
15.0		MC = 8.40%	SP		Brown poorly graded SAND, medium dense to dense, moist
17.0					Test pit terminated at 17.0 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 17.0 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-101

CLIENT Anastasiou
PROJECT NUMBER 0736
DATE STARTED 3/27/07 COMPLETED 3/27/07
DRILLING CONTRACTOR Boretec
DRILLING METHOD HSA
LOGGED BY WLR CHECKED BY WLR
NOTES Bare Soil

PROJECT NAME Willows Tech Center
PROJECT LOCATION King County, Washington
GROUND ELEVATION HOLE SIZE
GROUND WATER LEVELS:
AT TIME OF DRILLING ---
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					SM		Brown silty SAND, loose, moist to wet
	SS	100	6-4-5 (9)	MC = 25.20%			
5							5.0
	SS	100	2-3-4 (7)	MC = 24.70% Fines = 73.40%	ML		Brown sandy SILT, loose, moist
							7.5
	SS	100	2-1-2 (3)	MC = 35.40%	ML		Gray SILT, loose, moist to wet
10							-no sample - rock in tip of spoon
	SS	100	7-15-15 (30)				-becomes dense
15							-becomes medium dense
	SS	100	7-9-11 (20)	MC = 24.10% Fines = 93.00%			
20							20.0

GENERAL BH / TP / WELL 0736.GPJ GINT US.GDT 2/21/08

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-101

CLIENT Anastasiou

PROJECT NUMBER 0736

PROJECT NAME Willows Tech Center

PROJECT LOCATION King County, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	10-20-22 (42)	MC = 28.10%	ML		Gray SILT, dense, wet
25	SS	100	10-16-22 (38)	MC = 27.40%			
30	SS	100	16-19-25 (44)	MC = 18.60%			
35	SS	100	14-10-13 (23)	MC = 24.80%			-becomes medium dense
40	SS	100	9-16-23 (39)	MC = 19.50%			
41.5							Boring terminated at 41.5 feet below existing grade. No groundwater encountered during drilling. Boring backfilled with bentonite. Bottom of hole at 41.5 feet.

GENERAL BH / TP / WELL 0736.GPJ GINT US.GDT 2/21/08

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-102

CLIENT Anastasiou

PROJECT NAME Willows Tech Center

PROJECT NUMBER 0736

PROJECT LOCATION King County, Washington

DATE STARTED 3/27/07 COMPLETED 3/27/07

GROUND ELEVATION ______ HOLE SIZE ______

DRILLING CONTRACTOR Boretec

GROUND WATER LEVELS:

DRILLING METHOD HSA

AT TIME OF DRILLING —

LOGGED BY WLR CHECKED BY WLR

AT END OF DRILLING —

NOTES Bare Soil

AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					SM		Brown silty SAND, loose, moist
	SS	100	3-6-6 (12)				-becomes medium dense -no sample
5	SS	100	4-2-2 (4)	MC = 24.00%			-very loose zone
10	SS	100	12-13-3 (16)	MC = 44.70% Fines = 54.30%	ML	10.0	Brown sandy SILT, medium dense, moist to wet
15	SS	100	8-6-6 (12)	MC = 34.20%			
20						20.0	

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-102

CLIENT Anastasiou
PROJECT NUMBER 0736
PROJECT NAME Willows Tech Center
PROJECT LOCATION King County, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	2-3-4 (7)	MC = 16.90%	SP		Brown poorly graded fine to medium SAND, loose, moist to wet
25	SS	100	5-7-12 (19)	MC = 23.80%	ML	25.5	Brown SILT, medium dense, moist to wet
30	SS	100	4-7-10 (17)	MC = 28.30%	CL	30.0	Brown lean CLAY, medium dense, moist to wet
35	SS	100	6-10-15 (25)	MC = 22.60% LL = 48 PL = 20	CL		
40	SS	100	6-9-11 (20)	MC = 26.40%	ML	40.0	Brown SILT, medium dense, moist

Earth Solutions NWLLC
Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-102

CLIENT Anastasiou

PROJECT NUMBER 0736

PROJECT NAME Willows Tech Center

PROJECT LOCATION King County, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
							Brown SILT, medium dense, moist *(continued)*
45	SS	100	4-6-9 (15)	MC = 23.70%	ML		
50	SS	100	6-8-10 (18)	MC = 27.20%		51.5	
							Boring terminated at 51.5 feet below existing grade. No groundwater encountered during drilling. Boring backfilled with bentonite. Bottom of hole at 51.5 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-103

CLIENT Anastasiou

PROJECT NAME Willows Tech Center

PROJECT NUMBER 0736

PROJECT LOCATION King County, Washington

DATE STARTED 3/27/07 COMPLETED 3/27/07

GROUND ELEVATION ______ HOLE SIZE ______

DRILLING CONTRACTOR Boretec

GROUND WATER LEVELS:

DRILLING METHOD HSA

AT TIME OF DRILLING 28.5 ft

LOGGED BY WLR CHECKED BY WLR

AT END OF DRILLING ---

NOTES Bare Soil

AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					ML		Gray SILT, dense, moist
5	SS	100	12-17-31 (48)	MC = 15.10%	SM	5.5	Gray silty SAND, dense, moist
10	SS	100	15-12-12 (24)	MC = 12.80% Fines = 22.10%			-becomes medium dense
15	SS	100	9-5-9 (14)				-no sample recovered
20						20.0	

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-103

CLIENT Anastasiou

PROJECT NUMBER 0736

PROJECT NAME Willows Tech Center

PROJECT LOCATION King County, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	4-6-7 (13)	MC = 8.00%			Gray poorly graded medium to coarse SAND with gravel, medium dense, moist
25	SS	100	4-15-5 (20)	MC = 16.10%			
							∇ -becomes wet, water table encountered
30	SS	100	3-6-17 (23)	MC = 11.80%	SP		
35	SS	100	15-14-16 (30)	MC = 6.80%			-becomes dense
40	SS	100	8-10-18 (28)	MC = 11.30%		41.5	
							Boring terminated at 41.5 feet below existing grade. Groundwater table encountered at 28.5 feet during drilling. Boring backfilled with bentonite. Bottom of hole at 41.5 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-104

CLIENT Anastasiou
PROJECT NAME Willows Tech Center
PROJECT NUMBER 0736
PROJECT LOCATION King County, Washington
DATE STARTED 3/27/07 **COMPLETED** 3/27/07
GROUND ELEVATION ______ **HOLE SIZE** ______
DRILLING CONTRACTOR Boretec
GROUND WATER LEVELS:
DRILLING METHOD HSA
▽ **AT TIME OF DRILLING** 26.0 ft
LOGGED BY WLR **CHECKED BY** WLR
AT END OF DRILLING ---
NOTES Bare Soil
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					SM		Brown silty SAND, loose, moist
5	SS	100	10-6-4 (10)	MC = 23.80% Fines = 68.70%	ML	5.0	Gray SILT, loose to medium dense, moist
10	SS	100	25-25-9 (34)	MC = 10.00% Fines = 41.50%	SM	10.0	Gray silty SAND with gravel, dense, moist
15	SS	100	14-16-9 (25)	MC = 11.90%	SM		-becomes medium dense
20						20.0	

GENERAL BH / TP / WELL 0736.GPJ GINT US.GDT 2/21/08

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

BORING NUMBER B-104

CLIENT Anastasiou

PROJECT NUMBER 0736

PROJECT NAME Willows Tech Center

PROJECT LOCATION King County, Washington

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	5-8-9 (17)	MC = 10.70%	SP		Gray poorly graded SAND with gravel, medium dense to dense, moist
25	SS	100	7-10-11 (21)	MC = 21.80%			▽ -water table encountered
30	SS	100	5-5-8 (13)	MC = 50.80%	ML	30.5	Gray SILT, medium dense, wet
35	SS	100	3-4-5 (9)	MC = 42.40%			-becomes loose -becomes wet
40	SS	100	5-5-11 (16)	MC = 42.70%		41.5	Boring terminated at 41.5 feet below existing grade. Groundwater table encountered at 26.0 feet during drilling. Boring backfilled with bentonite. Bottom of hole at 41.5 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

TEST PIT NUMBER TP-1

CLIENT Anastasiou
PROJECT NAME Willows Tech Center
PROJECT NUMBER 0736
PROJECT LOCATION King County, Washington
DATE STARTED 2/12/07 **COMPLETED** 2/12/07
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY WLR **CHECKED BY** WLR
AT END OF EXCAVATION ---
NOTES Bare Soil
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			ML		Blue sandy SILT, medium dense to dense, moist
		MC = 24.70%			
5					
		MC = 19.70% Fines = 50.60%			-becomes with gravel
9.0			ML		Brown SILT, dense, moist
10		MC = 28.00%			-interbedded fine sand layers
13.0		MC = 23.20%			Test pit terminated at 13.0 feet below existing grade. No groundwater encountered during excavation.
					Bottom of test pit at 13.0 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

TEST PIT NUMBER TP-2

CLIENT Anastasiou
PROJECT NUMBER 0736
DATE STARTED 2/12/07 **COMPLETED** 2/12/07
EXCAVATION CONTRACTOR NW Excavating
EXCAVATION METHOD
LOGGED BY WLR **CHECKED BY** WLR
NOTES Bare Soil

PROJECT NAME Willows Tech Center
PROJECT LOCATION King County, Washington
GROUND ELEVATION **TEST PIT SIZE**
GROUND WATER LEVELS:
AT TIME OF EXCAVATION ---
AT END OF EXCAVATION ---
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0		MC = 31.50%	SM		Black silty SAND, loose, moist (Fill)
5		MC = 5.60% MC = 4.60%	SM	5.0	Bluish gray silty SAND with gravel, medium dense to dense, moist -occasional cobbles up to 8"
10					
15		MC = 5.60%		15.0	Test pit terminated at 15.0 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 15.0 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

TEST PIT NUMBER TP-3

CLIENT Anastasiou
PROJECT NAME Willows Tech Center
PROJECT NUMBER 0736
PROJECT LOCATION King County, Washington
DATE STARTED 2/12/07 COMPLETED 2/12/07
GROUND ELEVATION TEST PIT SIZE
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY WLR CHECKED BY WLR
AT END OF EXCAVATION ---
NOTES Bare Soil
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Dark brown silty SAND, medium dense, moist (Fill) -high organic content
		MC = 22.20%			
5					
10					
15		MC = 24.60%			
		MC = 30.60%			
17.0			ML		Bluish gray SILT, medium dense, moist
18.0					Test pit terminated at 18.0 feet below existing grade. No groundwater encountered during excavation. Bottom of test pit at 18.0 feet.

Earth Solutions NW
2881 152nd Avenue N.E.
Redmond, Washington 98052
Telephone: 425-284-3300
Fax: 425-284-2855

TEST PIT NUMBER TP-4

CLIENT Anastasiou
PROJECT NAME Willows Tech Center
PROJECT NUMBER 0736
PROJECT LOCATION King County, Washington
DATE STARTED 2/12/07 **COMPLETED** 2/12/07
GROUND ELEVATION **TEST PIT SIZE**
EXCAVATION CONTRACTOR NW Excavating
GROUND WATER LEVELS:
EXCAVATION METHOD
AT TIME OF EXCAVATION ---
LOGGED BY WLR **CHECKED BY** WLR
AT END OF EXCAVATION ---
NOTES Bare Soil
AFTER EXCAVATION ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0		MC = 23.30%	ML		Bluish gray sandy SILT, medium dense to dense, moist
5		MC = 2.90%		5.5	Test pit terminated at 5.5 feet below existing grade due to possible buried utility. No groundwater encountered during excavation.
					Bottom of test pit at 9.5 feet.

Appendix B

Laboratory Test Results

ES-0736.10

GRAIN SIZE DISTRIBUTION

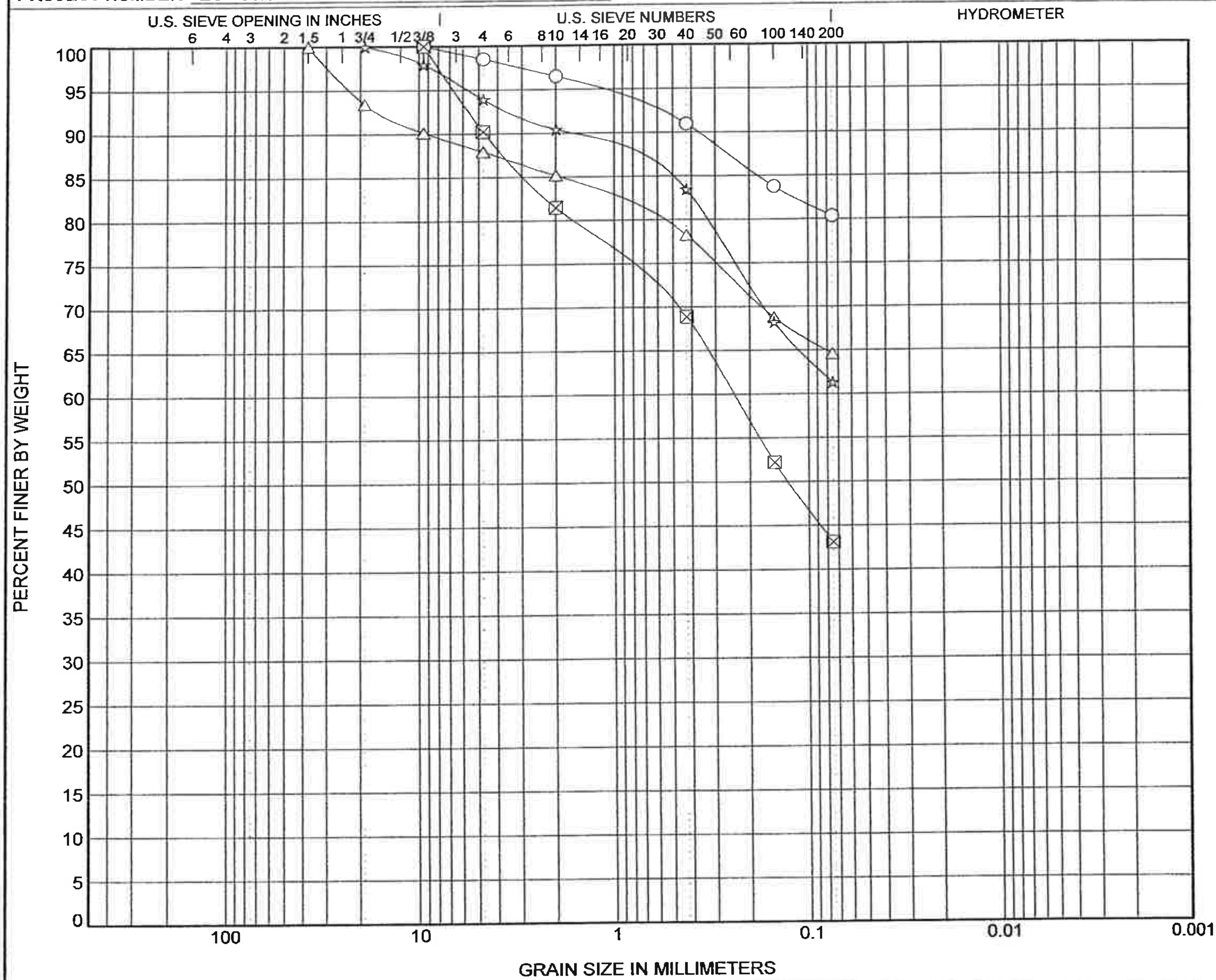
Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, WA 98005
Telephone: 425-284-3300

CLIENT Astrolnics

PROJECT NAME Astrolnics Parking Addition

PROJECT NUMBER ES-736.8

PROJECT LOCATION kirkland



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
○	TP-101	2.5ft.	Gray SILT with SAND, ML					
⊠	TP-103	5.0ft.	Dark Brown Silty SAND, SM					
△	TP-104	3.0ft.	Brownish Gray SILT with Sand, ML					
☆	TP-104.	14.5ft.	Gray Sandy SILT, ML					

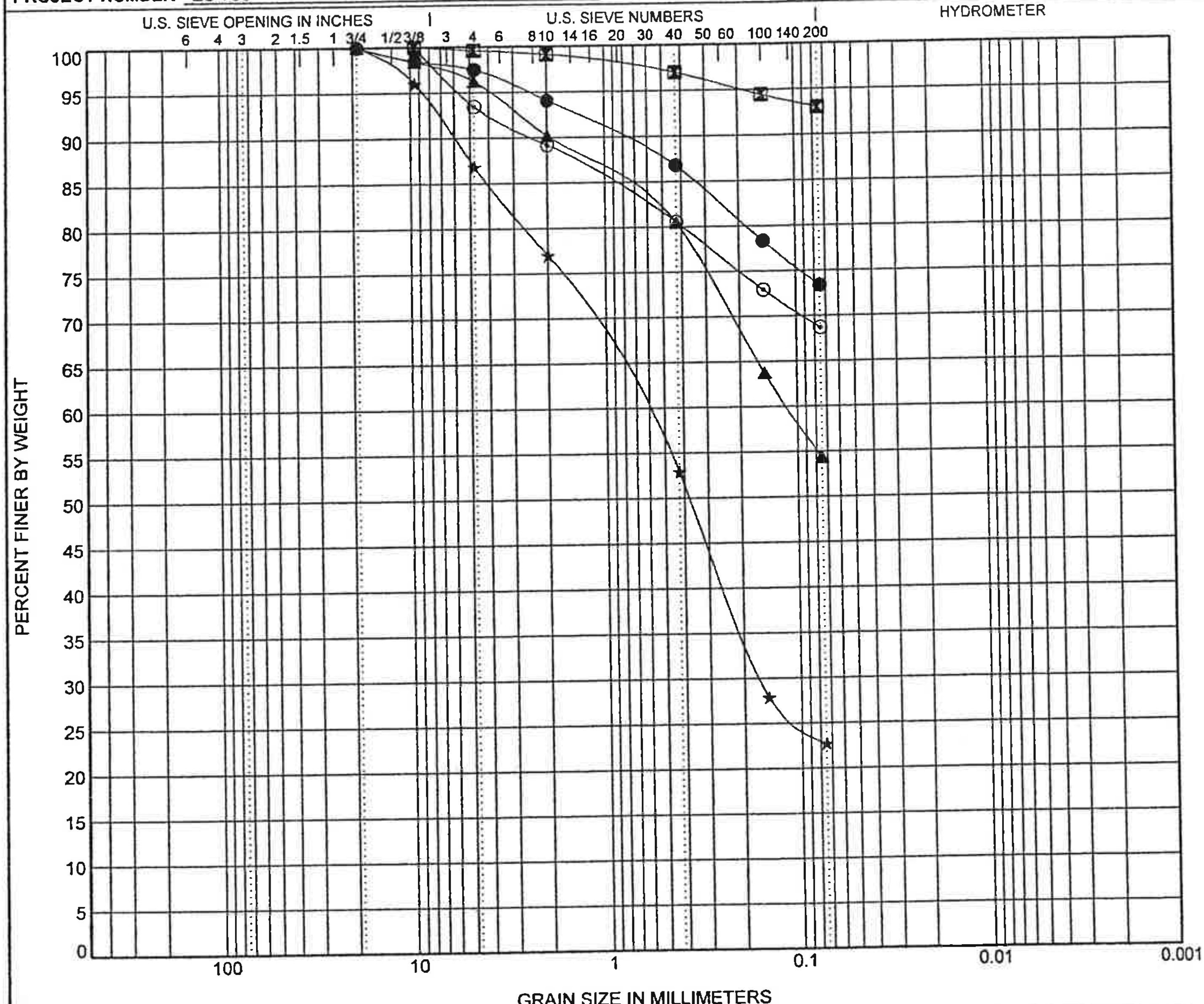
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
○	TP-101	2.5ft.	9.5				1.5	18.2	80.4	
⊠	TP-103	5.0ft.	9.5	0.244			9.7	47.1	43.1	
△	TP-104	3.0ft.	37.5				12.1	23.3	64.6	
☆	TP-104.	14.5ft.	19				6.1	32.6	61.3	

Earth Solutions NW, LLC
2881 152nd Avenue N.E.
Redmond, WA 98052
Telephone: (425) 284-3300
Fax: (425) 284-2855

GRAIN SIZE DISTRIBUTION

CLIENT Ana Stasiou Development **PROJECT NAME** Willows Tech Center

PROJECT NUMBER ES-736 **PROJECT LOCATION** King County



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-101	5.0ft.	**Brown sandy SILT, ML**					
⊠	B-101	15.0ft.	**Gray SILT, ML**					
▲	B-102	10.0ft.	**Dark brown sandy SILT, ML**					
★	B-103	10.0ft.	**Olive brown silty SAND, SM**					
⊙	B-104	5.0ft.	**Gray sandy SILT, ML**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-101	5.0ft.	19				2.5	24.1	73.4	
⊠	B-101	15.0ft.	9.5				0.4	6.6	93.0	
▲	B-102	10.0ft.	19	0.114			3.8	41.9	54.3	
★	B-103	10.0ft.	19	0.67	0.164		13.2	64.1	22.7	
⊙	B-104	5.0ft.	9.5				6.5	24.8	68.7	

Earth Solutions NW, LLC
2881 152nd Avenue N.E.
Redmond, WA 98052
Telephone: (425) 284-3300
Fax: (425) 284-2855

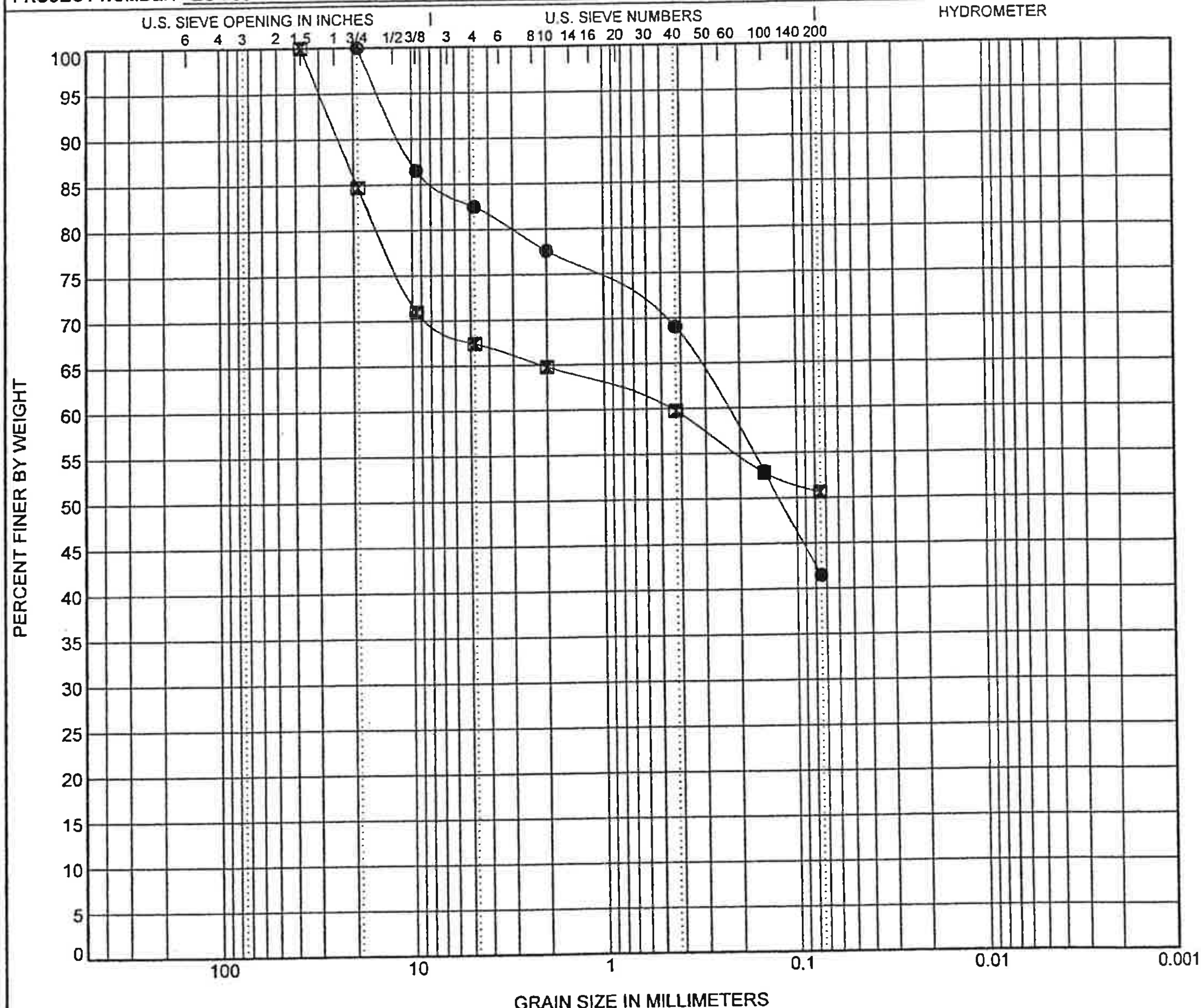
GRAIN SIZE DISTRIBUTION

CLIENT Ana Stasiou Development

PROJECT NAME Willows Tech Center

PROJECT NUMBER ES-736

PROJECT LOCATION King County



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B-104	10.0ft.	**Gray silty SAND with gravel, SM**					
⊠ TP-01	7.0ft.	**Olive brown sandy SILT with gravel, ML**					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-104	10.0ft.	19	0.236			17.5	41.0	41.5	
⊠ TP-01	7.0ft.	37.5	0.458			32.6	16.8	50.6	

Earth Solutions NW, LLC
2881 152nd Avenue N.E.
Redmond, WA 98052
Telephone: (425) 284-3300
Fax: (425) 284-2855

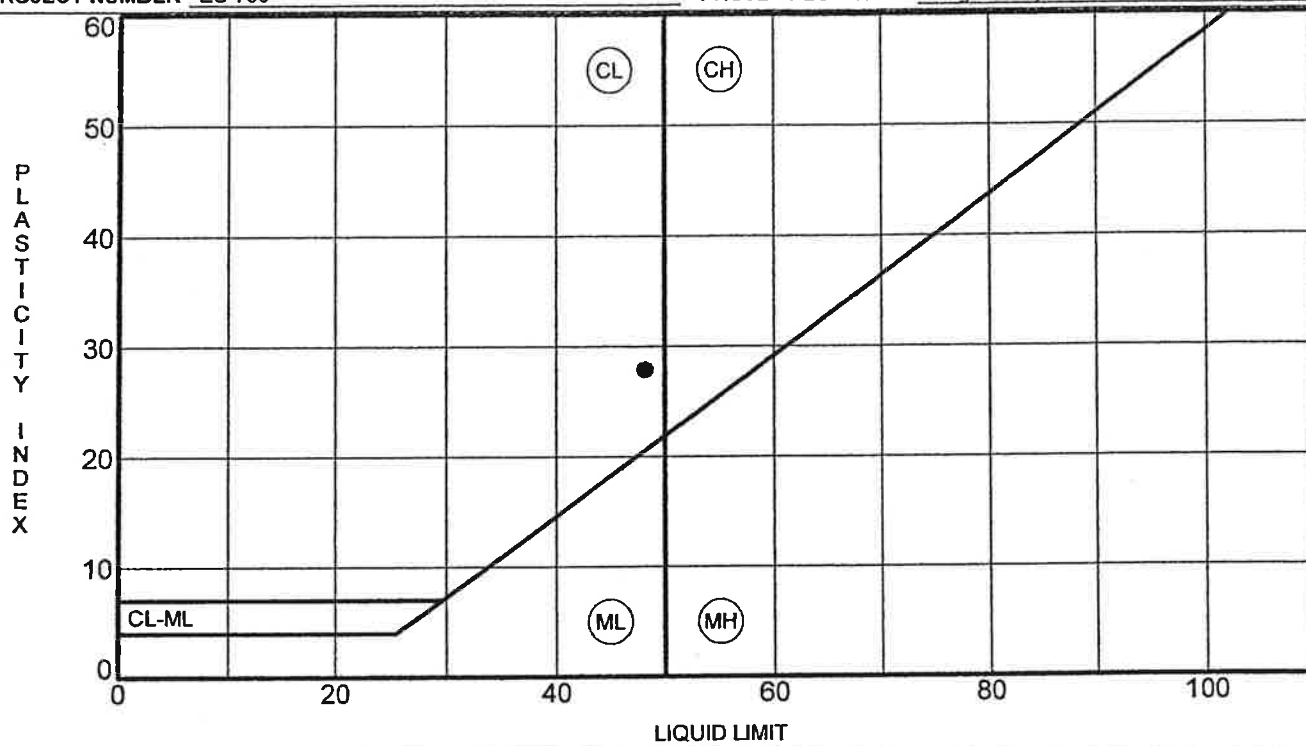
ATTERBERG LIMITS' RESULTS

CLIENT Ana Stasiou Development

PROJECT NAME Willows Tech Center

PROJECT NUMBER ES-736

PROJECT LOCATION King County



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-102**	**35.0**	**48**	**20**	**28**		**Gray lean CLAY, CL**

Report Distribution

ES-0736.10

EMAIL ONLY	**Astronics** **12950 Willows Road Northeast** **Kirkland, Washington 98034** **Attention: Mr. Timothy Borland**
EMAIL ONLY	**Craft Architects** **2505 Third Avenue, Suite 324** **Seattle, Washington 98121** **Attention: Mr. Paul Engert**