GEOTECHNICAL ENGINEERING STUDY
SUNSET POINTE
2301 – 23RD STREET SOUTHEAST
PUYALLUP, WASHINGTON

ES-5559

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

PREPARED FOR

MR. PETER CHEN

January 11, 2018
Updated June 24, 2019

Chase G. Halsen
Staff Geologist

Scott S. Riegel, L.G., L.E.G.
Senior Project Manager

6/25/19

Raymond A. Coglas, P.E.
Principal Engineer

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Earth Solutions NW, LLC
1805 – 136th Place Northeast, Suite 201
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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 Geotechnical 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

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Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

January 11, 2018
Updated June 24, 2019
ES-5559

Mr. Peter Chen
4709 Memory Lane West
University Place, Washington 98488

Dear Mr. Chen:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Geotechnical Engineering Study, Sunset Pointe, 23rd Street Southeast, Puyallup, Washington". Based on the results of our investigation, the proposed residential plat is feasible from a geotechnical standpoint. Our study indicates the site is underlain primarily by fill atop native Vashon drift glacial deposits. Fill was encountered at various locations within the site and will be discussed later in this report. Heavy perched groundwater seepage was encountered at one test pit location at a depth of approximately four feet below the existing ground surface elevation during our October 2017 and May 2019 subsurface explorations. As such, it is our opinion the contractor should anticipate, and be prepared to manage zones of perched groundwater seepage during construction.

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils suitable for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable and uniform bearing conditions. Additional preparation activities will likely involve overexcavating unsuitable existing fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations. In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

We understand that a stormwater detention vault will be used for stormwater management. Based on the conditions encountered during our October 2017 and May 2019 explorations, it is our opinion that infiltration be considered infeasible on this site. A detailed description and justification on the infeasibility of site infiltration will be provided within the body of this report.

Recommendations for foundation design, site preparation, drainage, and other pertinent development aspects 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

Chase G. Halsen
Senior Staff Geologist

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GEOTECHNICAL ENGINEERING STUDY
SUNSET POINTE
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PUYALLUP, WASHINGTON

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INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed residential plat to be completed at 2301 – 23rd Street Southeast in Puyallup, Washington. The purpose of this study was to provide geotechnical recommendations for currently proposed development plans. Our scope of services for completing this study included the following:

- Completion of test pits for purposes of characterizing site soils;
- Completion of laboratory testing of soil samples collected at the test pit locations;
- Conduction of engineering analyses, and;
- Preparation of this report.

The following documents and maps were reviewed as part of our study preparation:

- Preliminary Plat Utility Plan, prepared by CES NW, Inc., dated April 17, 2019;
- Puyallup Municipal Code Chapter 21.06;
- Development Review Team Letter, prepared by the City of Puyallup, dated February 5, 2019;
- Online Web Soil Survey (WSS) resource, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture;
- Liquefaction Susceptibility for Pierce County incorporating data from the Washington State Department of Natural Resources, dated September 2004, and;
- Geologic Map of the South Half of the Tacoma Quadrangle, Washington, by Timothy J. Walsh, 1987.

Project Description

Originally completed in January 2018, this report has been updated to reflect the current proposal. The current proposal includes removing the northern parcel form the proposed site and reducing the number of building sites. As such, Test Pits 14 – 18 are no longer within the subject site and are no longer included within this report evaluation.

We understand the site will be developed into a residential plat consisting of 15 residential lots and general site improvements. We presume that stormwater runoff will be managed by a detention vault (vault). At the time of report submission, building load plans were not available for review; however, based on our experience with similar developments, the proposed residential structures will likely be two to three stories in height and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads of about 1 to 2 kips per lineal foot (klf) are expected. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

We presume that cuts and/or fills up to about 10 to 15 feet will be required to establish the building pads. Stepped foundations or split-level pads may also be incorporated into the design to reduce grading requirements. Deeper excavations will likely be required to construct the stormwater facility (vault). Rockeries or mechanically stabilized earth walls (MSEWs) may be used to facilitate grade changes between adjacent lots.

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

SITE CONDITIONS

Surface

The subject site is located east of the intersection between 19th Avenue Southeast and 21st Street Southeast in Puyallup, Washington. The approximate location of the subject site is depicted on Plate 1 (Vicinity Map). The irregular-shaped property is comprised of two adjoining tax parcels (Pierce County Parcel Nos. 042035-3027) totaling approximately 9.09 acres.

The site is bordered on all sides primarily by existing residential development. A sewer and water easement is present on site, trending east to west along the entire northern edge of the development area. A relay station is present within the east-central site area as well. Multiple barn and storage structures appear to have been present within the southern site area, but had been demolished prior to our fieldwork. Based on our field observations, it appears that the land has been previously modified through the placement of fill material. It appears that the fill had been placed to establish an access pathway to the southern site area, to level out sloping areas, and fill an existing natural trough area. Based on site observations, it is our opinion the site modification was likely not associated with recent development. Current topography varies across the site, however, maintains an overall northerly/northeasterly declivity. Approximately 30 to 35 feet of total elevation change occurs within the proposed development area. Three existing ponds (A-C) are present within the central site area.

Subsurface

An ESNW representative observed, logged, and sampled 19 test pits, excavated within accessible areas of the proposed development area, on October 24, 2017 using a trackhoe and operator retained by our firm. Four additional test pits were completed on May 15, 2019 within the proposed stormwater tract area. Three shallow groundwater piezometers were installed within the stormwater tract area during our May 2019 exploration. The test pits were completed to assess and classify subsurface soil and groundwater conditions across the site. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in accordance with the Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil and Fill

Topsoil was encountered generally within the upper 2 to 18 inches of existing grades at the test pit locations. The topsoil was characterized by dark brown color, the presence of fine organic material, and small root intrusions.

Fill was observed at the majority of the test pit locations, ranging in approximate depths from 1 to 13 feet below the existing ground surface (bgs). The fill was observed to be variable in nature, typically a silty sand to sandy silt, encountered in a loose to medium dense and moist condition. In general, the majority of the fill was observed to be free of debris, with the exception of isolated areas of brick and wire debris. However, the debris is not considered to be deleterious. Due to the highly variability in texture of the fill soils, ESNW should be retained to evaluate the suitability of fill encountered during construction.

Native Soil

Underlying topsoil and fill, native soils were encountered consisting soils associated with and representative of glacial drift deposits. In general, the predominate native soil type should be considered silty sand with or without gravel (USCS: SM). However, localized areas and depositional lenses of poorly graded sand and silt (USCS: SP and ML, respectively) should be anticipated across the site. The native soils were typically encountered in a medium dense and moist condition.

Geologic Setting

The referenced geologic map resource identifies Vashon undifferentiated drift (Qdv) across the site and surrounding areas. Although not specifically characterized within the geologic map resource, Vashon drift typically consists of glacial till, glaciofluvial, and glaciolacustrine sediments. The reference WSS resource indicates soils of the Everett very gravelly sandy loam, Indianola loamy sand and Kitsap silt loam (Map Unit Symbols: 13B, 18C, 20B, and 20C, respectively). These soil groups are typically associated with moraines, eskers, kames and terrace landforms, derived from glacial outwash and glaciolacustrine material. The variability in makeup of the native soils are generally consistent with that of Vashon drift.

Groundwater

During our subsurface exploration completed on October 24, 2017, heavy, perched groundwater seepage was encountered at a depth of approximately four feet bgs at TP-4. Groundwater seepage was not encountered during our May 2019 subsurface exploration. In our opinion, the contractor should anticipate and be prepared to respond to zones of perched groundwater seepage during construction, especially within deeper excavations. Groundwater seepage is common within glacial sediments, particularly within relatively permeable lenses and/or atop dense to very dense, unweathered deposits. 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.

Geologically Hazardous Areas

In preparation of this report, we reviewed applicable city of Puyallup mapping and geologically hazardous area code section 21.06. Our evaluation is as follows.

Landslide and Erosion Hazards

As delineated in Puyallup Municipal Code (PMC) 21.06.1210, landslide and erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics. Landslide and erosion hazard areas include areas with the following characteristics:

- Areas that have shown mass movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch;
- Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;
- Slopes having gradients steeper than 80 percent subject to rock fall during seismic shaking;
- Areas potentially unstable because of stream incision or stream bank erosion;
- Areas located in a canyon, ravine, or on an active alluvial fan, presently or potentially subject to inundation by debris flows or flooding;
- Any area with a slope of 40 percent or steeper and a vertical relief of 10 or more feet, except areas composed of consolidated rock and properly engineered manmade slopes/retained fill. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 10 feet of vertical relief;
- Areas with a severe limitation for building development because of slope conditions, according to the Natural Resource Conservations Service, and;
- Areas meeting all three of the following criteria: (A) slopes steeper than 15 percent, except that slopes of less than 15 percent may be considered erosion hazard areas if they have certain unstable soil and drainage characteristics; (B) hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and (C) wet season springs or ground water seepage.

Based on the results of subsurface exploration and review of available topographic information, the majority of the development is not located within a landslide hazard area. However, the eastern most edge of Lots 9 and 10 and northern edge of Lot 15 meet the code criteria for a landslide hazard based on the presence of gradients in excess of 40 percent and a vertical elevation change of at least 10 feet.

On Lots 9 and 10, this sloping feature appears to be relatively minor, decreasing in overall inclination either at, or just beyond, the property lines, having a total slope height of approximately 10 to 15 feet. On Lot 15, the slope appears to be associated with the existing pond area and is considered to be isolated in extent and height. PMC 21.06.1240.1a.iii, allows for a buffer to be equal to the height of the slope (H) divided by 2 for slopes with a vertical elevation of more than 10 feet but less than 25 feet, regardless of slope percent provided that no other factors that are present that pose a slope stability risk. This buffer should be applied to the top of the slope. Provided that the recommendations relating to building pad preparation and structural fill are incorporated into the construction sequence, in our opinion, a buffer equal to H/2 can be applied to Lots 9, 10, and 15. Per Puyallup code requirements, as referenced in the attached review letter, minimizing alterations to existing slope features is preferred over mass grading. As such, stepping of foundations should be considered to maintain existing topographic slopes, where applicable. From a geotechnical standpoint, constructing foundations in such a manor is considered feasible provided they can adequately offset from any slope face as to not impose additional surcharges. For these lots, slope fills (placed in accordance with this report) as well as the use of retaining walls to achieve design grades may also be considered feasible from a geotechnical standpoint.

Landslide hazards may also be designated as areas that have a combination of slopes more than 15 percent, that have permeable soils overlying impermeable soils, and wet season springs and groundwater seepage. The majority of the proposed development areas is relatively flat. However, lots aligned along the eastern site edge (Lots 8 – 14) do contain slopes greater than 15 percent, either within the confines of the lot boundaries or directly adjacent. However, based on our exploration in the area, these lots (with the exception of Lot 9 and 10, as discussed above) do not meet all three code defining requirements to be a landslide hazard.

One area of seepage was identified during our subsurface explorations (TP-4, October 24, 2017). In this respect, the seepage zone is considered isolated, rather than a pervasive chronic site condition. It is possible for groundwater seepage zones to develop elsewhere on site but will likely be seasonal and a result of yearly rainfall totals. From a stability standpoint, the development of a seepage zone is not considered a direct indication of instability, but rather the natural lateral migration of subsurface water. We understand stormwater flows will be managed with a detention vault in conjunction with individual lot dispersions, where feasible. In this regard, we do not anticipate increased surface water runoff flows or amounts that may impact adjacent properties either during or post construction. Where encountered during construction, subsurface seepage zones can adequately be mitigated via passive drainage elements and Best Management Practice (BMPs) measures.

As delineated in Puyallup Municipal Code (PMC) 21.06.1210, erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics.

Site soils are considered to have moderate to severe erosion potential. In our opinion, provided appropriate temporary and permanent erosion and sediment control (ESC) measures are incorporated into final designs, the potential for erosion will remain low both during and after construction. Site BMPs and other means of sediment and surface flow control measures should be actively maintained during construction to upkeep proper performance.

Provided the above recommendations and considerations are include with the construction plan and sequence, it is our opinion that the proposed development will not adversely affect soil stability on adjacent properties.

Please note that our evaluation and corresponding lot recommendations are based on plans and site layouts made available to ESNW during report preparation. If site layout plans change, ESNW should be notified to provide updated recommendations.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed residential development is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include foundation support, slab-on-grade subgrade support, the suitability of using on-site soils as structural fill, and construction of the stormwater facility(s).

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils suitable for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable bearing conditions, such as overexcavating unsuitable fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations. In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

We understand that a stormwater detention vault will be used for stormwater management. Based on the conditions encountered during our October 2017 and May 2019 explorations, it is our opinion that infiltration be considered infeasible from a geotechnical standpoint. A detailed description and justification on the infeasibility of site infiltration will be provided within the body of this

This study has been prepared for the exclusive use of Mr. Peter Chen 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

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements.

Erosion Control

The following temporary erosion control measures are offered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placement of a geotextile fabric beneath the quarry spalls will provide greater stability, if needed. Existing asphalt/gravel drive lanes can be considered for use as a temporary construction entrance and should be observed by ESNW prior to construction.

- Silt fencing should be placed around the site perimeter.

- When not in use, soil stockpiles should be covered or otherwise protected.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust.

- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. Temporary erosion control measures should be continually maintained and improved to provide proper function over the course of construction.

Final erosion cultural measures should conform to the approved civil and/or landscape architecture plans. The following permanent erosion control measures are offered:

- Stabilize exposed soils with suitable vegetation immediately after final earthwork activities have taken place.

- Install permanent interceptor trenches/swales or other surface water flow controls, where necessary. ESNW can assist in identifying areas that may require such installments during mass grading activities.

Stripping

Topsoil was encountered generally within the upper 2 to 18 inches of existing grades at the test pit locations. ESNW should be retained to observe site stripping activities at the time of construction so that the degree of required stripping may be assessed. Over-stripping should be avoided, as it is unnecessary and may result in increased project development costs. Topsoil and organic-rich soil is neither suitable for foundation support nor for use as structural fill. Topsoil and organic-rich soil may be used in non-structural areas, if desired.

In-situ and Imported Soils

On-site soils are moisture sensitive, therefore, successful use as structural fill largely being dictated by the moisture content at the time of placement and compaction. Remedial measures, such as soil aeration and/or cement treatment (where allowed by the local jurisdiction or utility district), may be necessary as part of site grading and earthwork activities. Existing fill soils to be used within structural applications must be free of deleterious debris, especially with respect to construction-like debris and organic material. If the on-site soils cannot be successfully compacted, the use of an imported soil may be necessary. In our opinion, a contingency should be provided in the project budget for export of soil that cannot be successfully compacted as structural fill if grading activities take place during periods of extended rainfall activity. Soils with fines contents greater than 5 percent typically degrade rapidly when exposed to periods of rainfall.

Imported soil intended for use as structural fill should consist of a well-graded, granular soil with a moisture content that is at (or slightly above) 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 (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Subgrade Preparation

Following site stripping, cuts and fills will be completed to establish proposed subgrade elevations across the site. To establish a suitable subgrade for structural elements, re-working of existing fill soils will likely be necessary in some areas. Due to the variable thickness and extent of the existing fill, it is our opinion that structural elements within the deeper fill areas be underlain by at least four feet of (reworked) structural fill. It may be possible to rework and reuse existing fill provided that it is free of deleterious material and contain a workable moisture content and approved by ESNW at the time of construction.

Subgrades founded in competent native soils can likely be compacted in-situ with mechanical equipment until a firm and unyielding state is achieved. The uniform, mechanical compaction of the foundation and slab subgrade areas will establish a relatively consistent subgrade condition below the foundation and slab elements. ESNW should observe the subgrade(s) during initial site preparation activities to confirm soil conditions are as anticipated and to provide supplementary recommendations for subgrade preparation, as necessary.

Please note, the above considerations are based on current site layout plans available to ESNW, as depicted on the Test Pit Location Plan attached to this report. Should site layout designs change, ESNW should be informed and allowed to reevaluate necessary preparation efforts in relation to corresponding Lot numbers.

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D1557). Soils intended for use as structural fill should be generally free of organic and deleterious material. For soil placed in utility trenches underlying structural areas, compaction requirements are dictated by the local city, county, or utility district, and are typically specified to a relative compaction of at least 95 percent.

Slope Fill

Structural fill placed within sloping areas should be include a bench configuration, as depicted on Plate 3 (Slope Fill Detail). The base bench must be "keyed" into the slope using excavating equipment, and subsequently filled and compacted with suitable structural fill before continuing to the next bench. Finish grades that are to be sloped should be "overbuilt" using a bench style fill and cut to the appropriate gradient to ensure that a compacted slope face is maintained. ESNW should be present on-site during structural fill placement to observed subgrade conditions as well as provide additional drainage recommendations, as necessary.

Excavations and Slopes

Excavation activities will likely expose loose to medium dense fill and native weathered soils as well as medium dense to dense native soils at depth. Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) soil classifications are also provided:

- Loose to medium dense native and fill soil — 1.5H:1V (Type C)
- Areas containing groundwater seepage — 1.5H:1V (Type C)
- Dense to very dense native soil — 0.75H:1V (Type A)

Steeper temporary slope inclinations within undisturbed, very dense native deposits may be feasible based on the soil and groundwater conditions exposed within the excavations. Steeper inclinations may be considered, and must be subsequently approved, by ESNW at the time of construction.

Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion, and should maintain a gradient of 2H:1V or flatter. The presence of perched groundwater may cause localized sloughing of temporary slopes due to excess seepage forces. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations.

Foundations

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils competent for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable and uniform bearing conditions, such as overexcavating unsuitable existing fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations (see Subgrade Preparation section of report). In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

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

- 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 may 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

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

The referenced liquefaction susceptibility map indicates the subject site maintains very low to moderate liquefaction susceptibility. In our opinion, site susceptibility to liquefaction may be considered negligible. The relatively consistent densities of the native soils and the absence of a uniformly established, shallow groundwater table were the primary bases for this consideration.

As part of this report preparation, we preliminarily evaluated the potential for a landslide induced from seismic activity. In our opinion, site susceptibility to a seismically induced landslide may be considered low. This consideration is primarily based on the fact that site grading, compaction, and preparation pad preparation efforts for structural areas will result in a general increase in site stability.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed residential structures should be supported on a well-compacted, firm and unyielding subgrade. Where feasible, competent native soil exposed at the slab-on-grade subgrade level can likely be compacted in situ 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 (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). 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 specifications of the manufacturer.

Retaining Walls

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

- Active earth pressure (yielding condition) — 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge (passenger vehicles) — 70 psf (rectangular distribution)*
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40
- Seismic surcharge — 6H psf**

* *Where applicable*
** *Where H equals the retained height (in feet)*

The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining 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 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe 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 4. If drainage is not provided, hydrostatic pressures should be included in the wall design.

We understand that mechanically stabilized earth (MSE) walls may be used to facilitate grade changes created as part of the proposed development. Upon request, ESNW can provide recommendations and design notes for the proposed MSE walls, as necessary.

Drainage

Based on our field observations, isolated zones of perched groundwater seepage should be anticipated within site excavations. Temporary measures to control surface water runoff and groundwater seepage during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and provide recommendations to reduce the potential for instability related to seepage effects.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 5.

Infiltration Feasibility Evaluation

Site subsurface conditions were initially explored in October 2017 and indicated variability with respect to soil types present and grain size distribution across the site. Per USDA testing methods and procedures, native soils are also classified as slightly gravelly sand, gravelly loamy coarse sand, very gravelly loamy sand, and loam. Fines contents were about 6 percent within the sands, 26 to 27 percent within the sandy loam, and 60 to 81 percent within the loam, as indicated by sieve results of representative samples. ESNW returned to the site in May 2019 to further evaluate soils within the proposed stormwater facility area (Tract A) to complete a targeted infiltration evaluation in the area. Native soils were characterized as silt in a moist to wet condition within the explored area of Tract A. Per USDA testing methods and procedure, the native silts are also classified as loam with fines contents ranging between about 92 and 96 percent.

In our opinion, the site is not a feasible candidate for successful use of infiltration. Native soils are representative of glacial drift deposits, which by their nature, depositional environment, and geomorphological history, can vary greatly with respect to soil types and grain size distribution over relatively short distances. This variation can become even more pronounced within areas of changing topography. Such conditions appear to be present across the subject site, as evident through the various soil types encountered during our explorations. Although sands were encountered at some test pit locations, they did not appear to be present in a uniform and continuous manner across the site. Conversely, other native soil types (silty sand, sandy silt, and silt) encountered during our explorations are considered as having an extremely poor infiltration potential and will not adequately support the implementation of any infiltration system, full or limited. The restraining factor of these soils potential for infiltration is the appreciable fines contents that constitutes the majority of the soil.

Preliminary Detention Vault Design

We presume a vault will be constructed on-site for means of stormwater management. We anticipate cuts of about 10 feet will be necessary to reach design subgrade elevation of the vault foundation. Based on our field observations, grade cuts for the vault are likely to expose very dense, undisturbed Vashon drift deposits.

The vault foundation should be supported directly on dense undisturbed native soil subgrade. Should overexcavation be necessary at the vault foundation subgrade, quarry spalls should be used to restore grades. Perimeter drains should be installed around the vault and conveyed to an approved discharge point. Discrete zones of perched groundwater seepage may be encountered within the vault excavation; however, buoyancy is not expected to influence the vault structure.

The following preliminary design parameters may be used for the vault:

- Allowable soil bearing capacity — 5,000 psf (dense native soil)
- Active earth pressure (unrestrained) — 35 pcf
- Active earth pressure (unrestrained, hydrostatic) — 80 pcf
- At-rest earth pressure (restrained) — 50 pcf
- At-rest earth pressure (restrained, hydrostatic) — 95 pcf
- Coefficient of friction — 0.40
- Passive earth pressure — 350 pcf
- Seismic surcharge — 6H psf*

* *Where H equals the retained height (in feet)*

Vault retaining walls should be backfilled with free-draining material or suitable sheet drainage that extends along the height of the walls. The upper one foot of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. If the elevation of the vault bottom is such that gravity flow to an outlet is not possible, the portions of the vault below the drain should be designed to include hydrostatic pressure.

The final vault design must incorporate adequate buffer space from property boundaries such that temporary excavations to construct the vault structure may be successfully completed. Temporary shoring or a grading easement will likely be required where adequate slope setbacks cannot be achieved. Once available, ESNW should review the proposed vault grading plans to preliminarily assess possible excavation restraints and provide additional recommendations.

ESNW should observe grading operations for the vault and subgrade conditions prior to concrete forming and pouring. If the soil conditions encountered during construction differ from those anticipated, supplementary recommendations may be provided. ESNW should be contacted to review the final vault design to confirm that appropriate geotechnical parameters have been incorporated.

Preliminary 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 previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as over-excavation and/or placement of thicker crushed rock or structural fill sections, prior to pavement.

We anticipate new pavement sections will be subjected primarily to passenger vehicle traffic. For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

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

For heavy loaded pavement areas such as main access roads and areas subject to large commercial vehicles, the following preliminary pavement sections may be considered:

- Three inches of HMA placed over six inches of CRB, or;
- Three inches of HMA placed over three inches of ATB.

The HMA, ATB and CRB materials should conform to WSDOT specifications. All soil base material should be compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by a modified proctor test (ASTM D1557). Final pavement design recommendations, including recommendations for heavy traffic areas, access roads, and frontage improvement areas, can be provided once final traffic loading has been determined. Road standards utilized by the governing jurisdiction may supersede the recommendations provided in this report.

Utility Support and Trench Backfill

In our opinion, on-site soils will generally be suitable for support of utilities. Remedial measures may be necessary in some areas to provide support for utilities, such as overexcavation and replacement with structural fill and/or placement of geotextile fabric. Groundwater seepage may be encountered within utility excavations, and caving of trench walls may occur where groundwater is encountered. Depending on the time of year and conditions encountered, dewatering, as well as temporary trench shoring, may be necessary during utility excavation and installation.

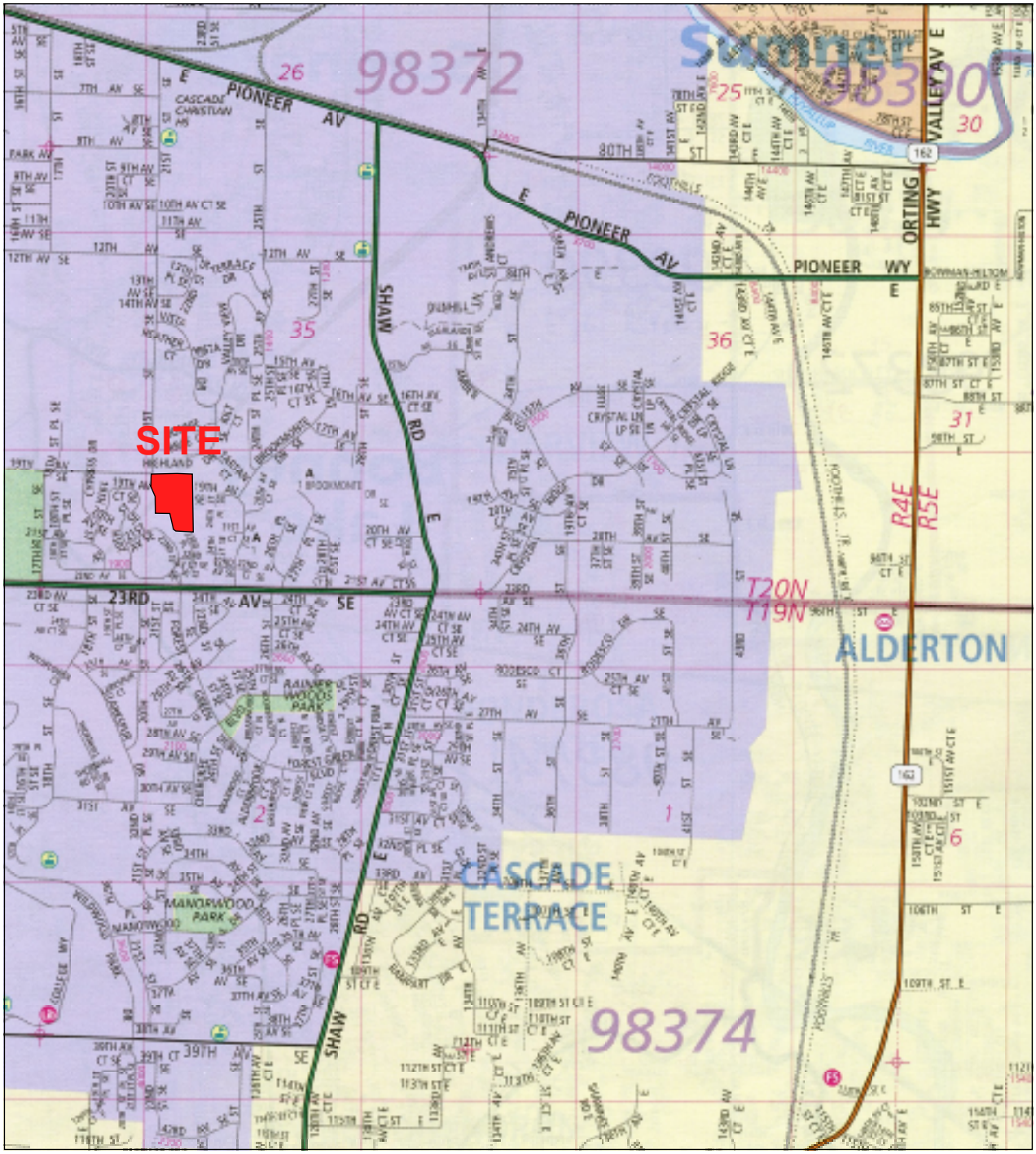
Successful use will depend on the soil's moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Each section of the utility lines must be adequately supported in the bedding material. Utility trench backfill should consist of and be placed and compacted to the specifications of structural fill as previously detailed in this report, or to the applicable specifications of the governing jurisdiction or agency.

LIMITATIONS

The recommendations and conclusions provided in this 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 neither expressed nor implied. Variations in the soil and groundwater conditions observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

Additional Services

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



Reference:
Pierce County, Washington
Map 835
By The Thomas Guide
Rand McNally
32nd Edition

NORTH

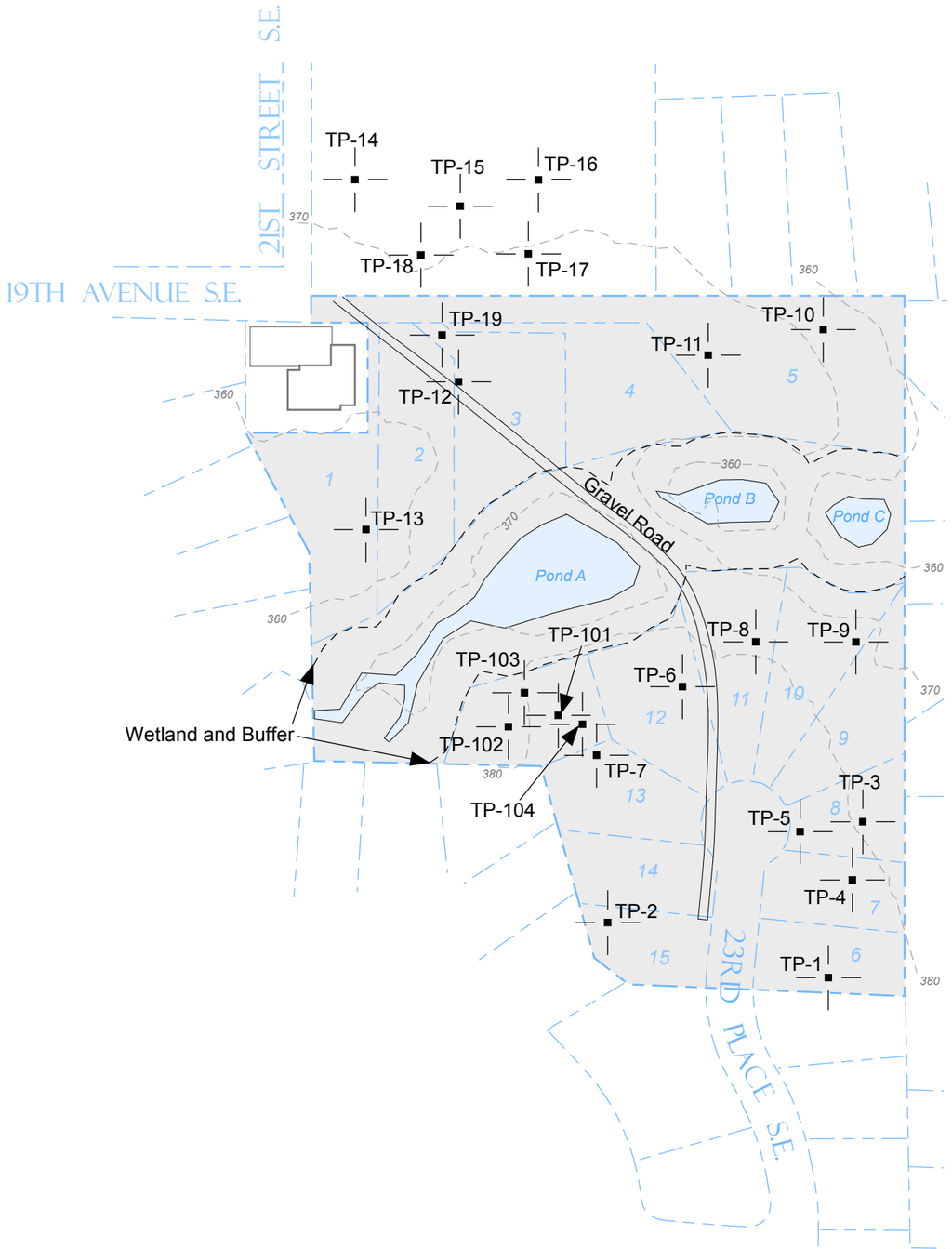
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 05/31/2019	Proj. No. 5559
Checked CGH	Date May 2019	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-5559, Oct. 2017

TP-101 — Approximate Location of ESNW Test Pit, Proj No. ES-5559, May 2019

Subject Site

Existing Building

10 — Proposed Lot Number

NORTH

1"=150'

0 75 150

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.

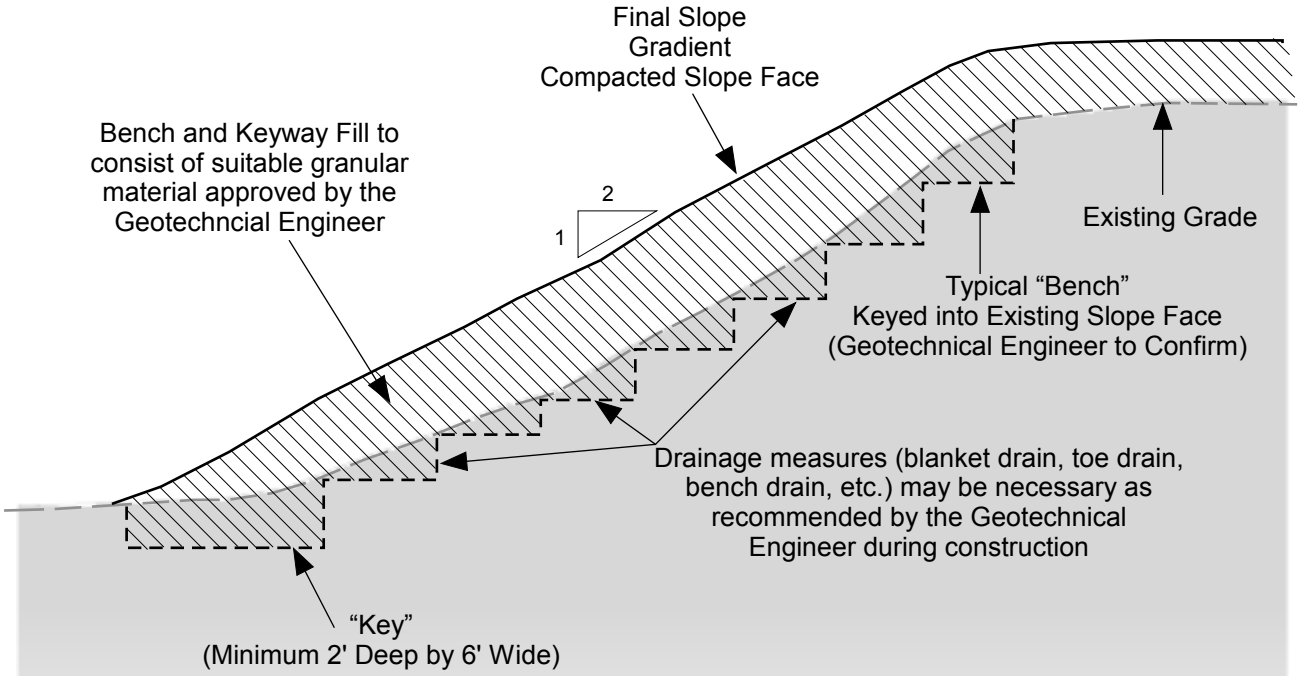
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Test Pit Location Plan
Sunset Pointe
Puyallup, Washington

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Drwn. By	MRS
Checked By	CGH
Date	05/31/2019
Proj. No.	5559
Plate	2

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING



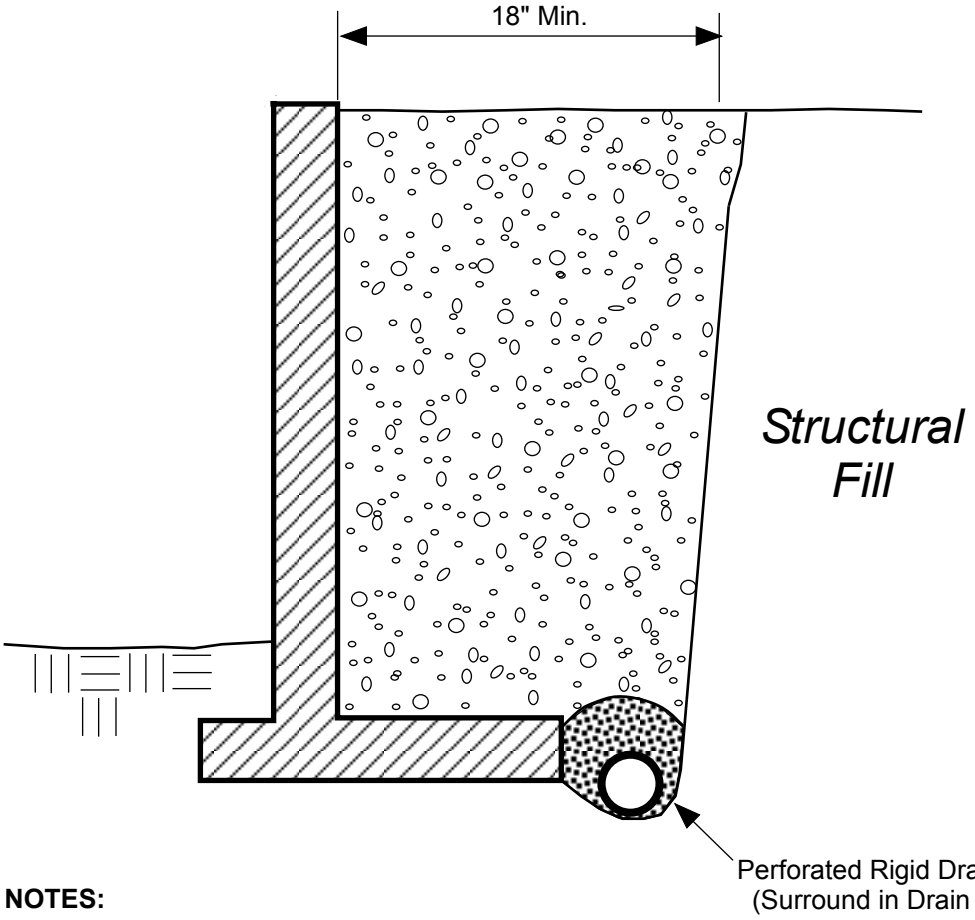
NOTES:

- Slope should be stripped of topsoil and unsuitable materials prior to excavating Keyway or benches.
- Benches will typically be equal to a bulldozer blade width of approximately 8 feet but shall be at least 4 feet.
- Final slope gradient should be 2H : 1V.
- Final slope face should be densified by over-building with compacted fill and trimming back to shape or by compaction with a bulldozer or vibratory drum roller.
- Planting or hydroseeding slope face with a rapid growth deep-rooted vegetative mat will reduce erosion potential of slope area.
- Use of pegged-in-place jute matting or geotechnical fabric will help maintain the seed and mulch in place until the root system has an opportunity to germinate.
- Structural fill should be placed in thin loose lifts not exceeding 12 inches in thickness. Each lift should be compacted to no less than the degree specified in the "Site Preparation and Earthwork" section of this report. No additional lift should be placed until compaction is achieved.

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Slope Fill Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 3



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve 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-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Free-draining Structural Backfill

1-inch Drain Rock

Earth Solutions NW LLC
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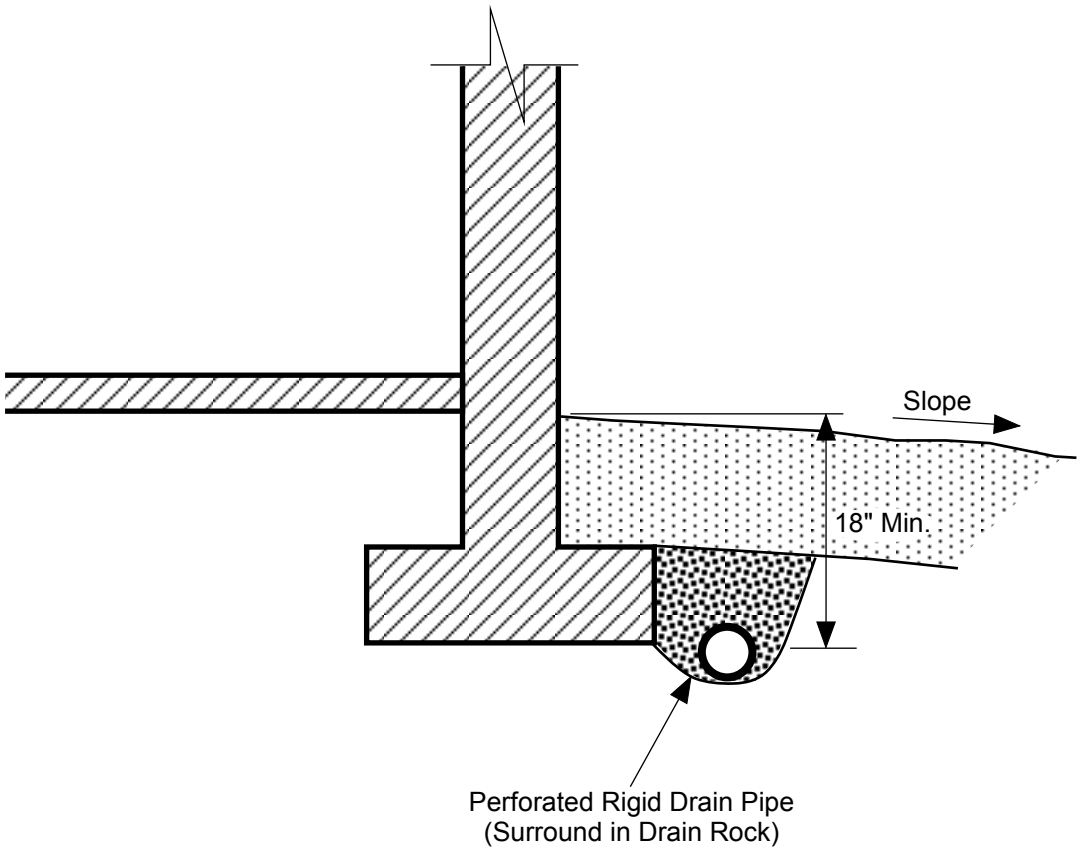
Retaining Wall Drainage Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 4



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-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Footing Drain Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 5

Appendix A

Subsurface Exploration
Test Pit Logs

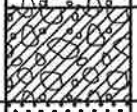
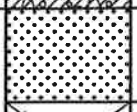
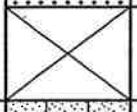
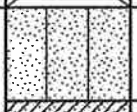
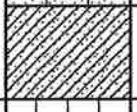
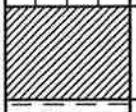
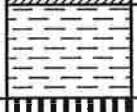
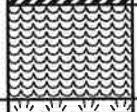
ES-5559

Subsurface conditions at the subject site were explored by an ESNW representative on October 24, 2017 and May 15, 2019. A total of 23 test pits were excavated at accessible areas of the site using an operator and trackhoe retained by our firm. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pits logs are provided in this Appendix. The test pits were excavated to a maximum depth of approximately 18 feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

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

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/19/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"	
					1.0	382.0
		MC = 13.80%	SM		Gray silty SAND with gravel, dense, moist (Fill)	
5					-sand lens ~12" thick	
		MC = 20.00%			5.5	377.5
			ML		Gray SILT, medium dense, moist (Fill)	
10		MC = 27.30% Fines = 90.00%			-becomes brown, increased fines [USDA Classification: slightly gravelly LOAM]	
					13.0	370.0
		MC = 31.90% Fines = 95.80%	ML		Tan SILT, medium dense, wet [USDA Classification: LOAM]	
15					15.0	368.0
		MC = 35.30%	SM		Tan silty SAND, medium dense, wet to saturated -minor iron oxide staining	
					-sand lens 6"- 12" thick	
		MC = 28.50%			18.0	365.0
					Test pit terminated at 18.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 18.0 feet.	

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-102

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 376 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 2.25'
1.0					375.0
			SM		Brown silty SAND, loose, moist
2.5					373.5
		MC = 25.40% Fines = 98.30%			Gray SILT, dense, moist [USDA Classification: LOAM] -heavy iron oxide staining
5					
		MC = 32.00% Fines = 92.50%	ML		-becomes brown, wet [USDA Classification: LOAM]
					-becomes wet to saturated
9.5		MC = 35.20%			366.5
					Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.5 feet.

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-103

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 384 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": heavy bush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 6.25' (Fill)
0.6					383.4
					Gray silty SAND with gravel, medium dense to dense, moist (Fill)
					-asphalt debris
		MC = 11.30%			
5			SM		
		MC = 10.40%			
					-increased sand content
					-erratic silt interbeds
		MC = 11.70%			
10					
		MC = 20.20%			
11.0					373.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 11.0 feet.

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TEST PIT NUMBER TP-104

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"	
				0.6		382.4
					Gray silty SAND with gravel, medium dense to dense, moist	
		MC = 19.90%	SM		-becomes brown -becomes gray	
5		MC = 23.50%		5.0	-heavy iron oxide staining	378.0
					Gray SILT, loose, moist to wet	
			ML		-becomes brown, wet	
10						
		MC = 29.80% Fines = 93.50%		11.0	[USDA Classification: LOAM]	372.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 11.0 feet.	

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TEST PIT NUMBER TP-1

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil &Sod 1"- 3": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			Rock		Crushed Rock (Fill)
				0.5	
			ML		Brown SILT, loose, moist
				1.0	
					Brown poorly graded SAND with silt, medium dense, moist
		MC = 7.40% Fines = 6.20%			[USDA Classification: slightly gravelly SAND]
					-increased gravel content
5			SP-SM		-becomes medium dense to dense
		MC = 4.40%			
					-increased cobbles
		MC = 7.40%		9.0	
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL	0.3	Dark brown TOPSOIL (Fill), root intrusions to 7'
			Fill	1.0	Clean washed ROCK (Fill)
					Brown/tan sandy SILT, medium dense, moist
					-light iron oxide staining 2'- 4'
		MC = 21.60%	ML		
5				5.0	
			SP	6.5	Gray poorly graded SAND, medium dense to dense, moist
		MC = 9.50%			
			ML	8.0	Tan sandy SILT, dense, moist
			SP		Gray poorly graded SAND with gravel, dense, moist
		MC = 4.80%		9.0	-caving caused by excavation activities
					Test pit terminated at 9.0 feet below existing grade. No groundwater seepage encountered during excavation. Caving observed from 6.0 to 6.5 feet and 8.0 feet to BOH. Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-3

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 18": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL (Fill), intrusions to 7'
				1.5	Gray silty SAND with gravel, medium dense, moist (Fill)
		MC = 8.90%			-clean washed rock ~4" thick -becomes brown dense
			SM		
5		MC = 8.10% Fines = 15.90%			[USDA Classification: very gravelly loamy SAND]
				7.0	
			ML		Gray SILT with sand, medium dense, moist (Fill)
		MC = 19.20%		9.0	Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, loose to medium dense, moist (Fill)
					-root intrusions to 9'
5					-heavy perched groundwater seepage
		MC = 12.30%			7.0
			ML		Gray SILT with sand, loose to medium dense, wet (Fill)
					-trace organics
					-light iron oxide staining
10		MC = 19.30%			
		MC = 22.10%			12.0
			ML		Brown sandy SILT, dense, moist
					-light iron oxide staining
15		MC = 27.40%			15.0
					Test pit terminated at 15.0 feet below existing grade. Groundwater encountered seepage encountered at 4.0 feet during excavation. Caving observed from 0.0 to 9.0 feet. Bottom of test pit at 15.0 feet.

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TEST PIT NUMBER TP-5

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
					1.0 Brown silty SAND, medium dense, moist
		MC = 7.20%			-becomes tan, damp to moist
5			SM		
		MC = 20.90%			-becomes dense -light iron oxide staining
					-becomes gray, very dense -moderate cementation, light iron oxide staining
		MC = 12.40%			9.5 Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.5 feet.

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TEST PIT NUMBER TP-6

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **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, medium dense, moist (Fill)
					-root intrusions to 7'
				2.0	
				2.5	Relic TOPSOIL Horizon
					Brown sandy SILT, medium dense, moist (Fill)
					-minor brick debris
		MC = 20.50%			-becomes gray
5			ML		
				8.0	
		MC = 10.00%			Brown poorly graded SAND, dense, moist
					-light iron oxide staining
10			SP		
				12.0	-becomes wet to saturated
		MC = 31.70%			Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 12.0 feet.

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TEST PIT NUMBER TP-7

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 6"- 8": brush **AFTER EXCAVATION** --

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 7'
				0.5	Brown silty SAND, loose to medium dense, moist
		MC = 9.50%			-light to moderate iron staining
					-becomes gray, very dense
5			SM		
		MC = 18.00%		9.0	-becomes wet
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-8

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 5'
				0.5	Brown silty SAND, medium dense, moist
		MC = 16.30%	SM		
5					-becomes gray, dense
		MC = 17.80%			
				8.0	
			SP		Gray poorly graded SAND, dense, moist
		MC = 3.20%		9.0	
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-9

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
				0.5	Brown SILT with sand, medium dense to dense, moist
		MC = 21.70% Fines = 81.20%	ML		[USDA Classification: LOAM] -becomes gray -light iron oxide staining
5					
				6.0	
		MC = 3.90%	SP	6.5	Gray poorly graded SAND, dense, moist
					Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 6.5 feet.

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TEST PIT NUMBER TP-10

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Gray silty SAND, medium dense, moist (Fill)
					-root intrusions to 3.5'
					2.0
			TPSL		Relic TOPSOIL Horizon
		MC = 12.40%			2.5
					Brown silty SAND, medium dense, moist
					-becomes gray, dense
5					
		MC = 18.70%	SM		
		MC = 8.90%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-11

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 4'
0.5					Tan silty SAND, medium dense, moist
					-moderate iron oxide staining to 4'
		MC = 21.10%			
5		MC = 20.10%	SM		-intermittent light iron oxide staining
					-becomes dense
10		MC = 16.00%			
10.0					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-12

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, medium dense, moist
					-root intrusions to 3'
			ML		-becomes gray
		MC = 15.20% Fines = 60.20%			[USDA Classification: LOAM]
5					
		MC = 17.30%			
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

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TEST PIT NUMBER TP-13

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, loose to medium dense, moist
		MC = 27.30%			
5			ML		-becomes gray
		MC = 23.90%			
				9.5	
10		MC = 16.00%	SP	10.0	Gray poorly graded SAND with gravel, dense, wet
					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 10.0 feet.

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TEST PIT NUMBER TP-14

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **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			TPSL		Dark brown TOPSOIL, root intrusions to 3'
				0.5	Brown silty SAND, loose to medium dense, moist
		MC = 15.20%	SM		-becomes gray, medium dense -light iron oxide staining
5					
		MC = 7.10%		7.0	
			SP		Gray poorly graded SAND, dense, moist
10		MC = 12.50%		10.0	
			SM		Brown silty SAND, dense, moist
		MC = 9.00%		12.0	
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 12.0 feet.

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TEST PIT NUMBER TP-15

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, moist (Fill)
					-trace to moderate organics throughout
					-root intrusions to 12'
		MC = 18.90%			
5					
			SM		
10					
		MC = 91.30% Fines = 79.00%			[USDA Classification: gravelly loamy coarse SAND]
					-becomes wet
15					
				15.5	
		MC = 28.60%	ML	16.0	Gray sandy SILT, medium dense, moist
					Test pit terminated at 16.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 16.0 feet.

GENERAL BH / TP / WELL 5559.GPJ GINT US.GDT 12/21/17

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Fax: 425-449-4711

TEST PIT NUMBER TP-16

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Dark brown silty SAND, loose, wet
					-root intrusions to 3'
		MC = 30.80%	SM		
5		MC = 16.50%			-becomes brown, medium dense, moist
		MC = 7.90%			-becomes gray
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

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TEST PIT NUMBER TP-17

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, wet (Fill)
					-root intrusions to 7'
		MC = 24.10%	SM		
5					
					7.0
		MC = 6.30%	SM		Tan silty SAND, medium dense, moist
					7.5
					Test pit terminated at 7.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 7.5 feet.

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TEST PIT NUMBER TP-18

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2"- 3": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, moist (Fill)
					-root intrusions to 3'
		MC = 14.90%	SM		
					-wire debris
5				5.0	
			SM		Tan silty SAND, medium dense, moist
		MC = 6.30%		6.0	
					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

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Fax: 425-449-4711

TEST PIT NUMBER TP-19

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 10": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 2'
				1.0	
			SM		Gray silty SAND, medium dense, moist
		MC = 13.00%			
					-becomes dense
5		MC = 15.40%		5.0	
					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 5.0 feet.

Appendix B

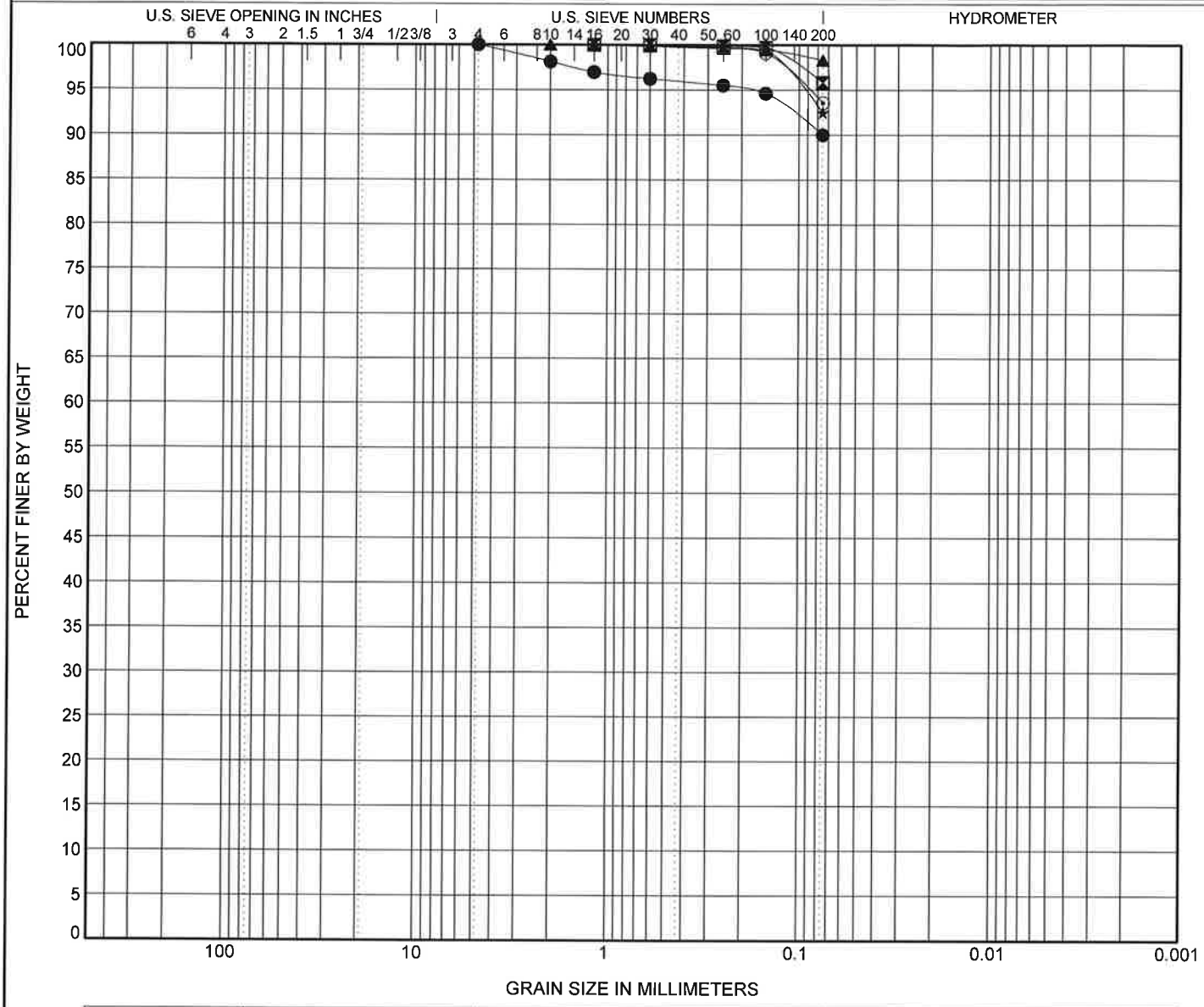
Laboratory Test Results

ES-5559

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

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-101	10.00ft.	USDA: Gray Slightly Gravelly Loam. USCS: ML.		
⊠ TP-101	14.00ft.	USDA: Tan Loam. USCS: ML.		
▲ TP-102	3.00ft.	USDA: Gray Loam. USCS: ML.		
★ TP-102	6.00ft.	USDA Brown Loam. USCS: ML.		
⊙ TP-104	11.00ft.	USDA: Brown Loam. USCS: ML.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-101	10.0ft.	4.75							90.0	
⊠ TP-101	14.0ft.	1.18							95.8	
▲ TP-102	3.0ft.	2							98.3	
★ TP-102	6.0ft.	1.18							92.5	
⊙ TP-104	11.0ft.	1.18							93.5	

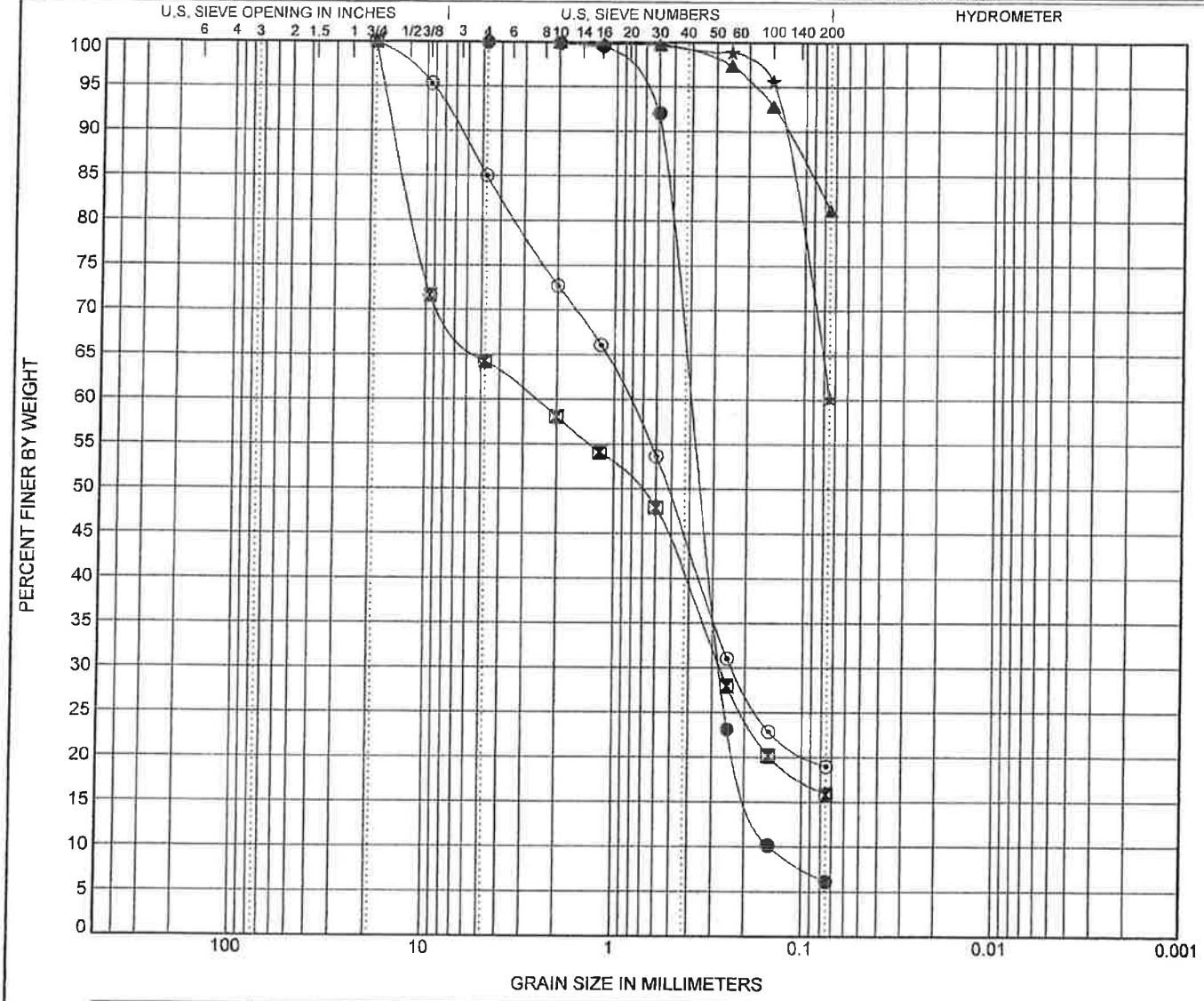
GRAIN SIZE USDA ES-5559 SUNSET POINTE.GPJ GINT US LAB.GDT 6/24/19

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

GRAIN SIZE DISTRIBUTION

CLIENT Peter Chen **PROJECT NAME** Sunset Pointe

PROJECT NUMBER ES-5559 **PROJECT LOCATION** Puyallup, Washington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
TP-01	3.00ft.	USDA: Brown Slightly Gravelly Sand. USCS: SP-SM.	1.28	2.74
TP-03	5.00ft.	USDA: Brown Very Gravelly Loamy Sand. USCS: SM with Gravel.		
TP-09	2.50ft.	USDA: Gray Loam. USCS: ML with Sand.		
TP-12	4.00ft.	USDA: Brown Loam. USCS: Sandy ML.		
TP-15	10.50ft.	USDA: Brown Gravelly Loamy Coarse Sand. USCS: SM with Gravel.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
TP-01	3.0ft.	4.75	0.399	0.273	0.146				6.2	
TP-03	5.0ft.	19	2.638	0.273					15.9	
TP-09	2.5ft.	2							81.2	
TP-12	4.0ft.	2							60.2	
TP-15	10.5ft.	19	0.847	0.234					19.0	

Report Distribution

ES-5559

EMAIL ONLY

Mr. Peter Chen
4709 Memory Lane West
University Place, Washington 98488

EMAIL ONLY

CES NW, Inc.
429 – 29th Street Northeast, Suite D
Puyallup, Washington 98372

Attention: Ms. Dawn Markakis