



Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

**GEOTECHNICAL ENGINEERING STUDY
PROPOSED RESIDENTIAL DEVELOPMENT
LINDSAY ANNEXATION
8014, 8118, 8210, AND 8326 – 172ND STREET NORTHEAST
ARLINGTON, WASHINGTON**

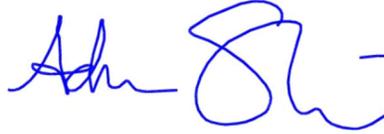
ES-9786

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esnw.com**

PREPARED FOR

MJS INVESTORS

June 28, 2024



**Adam Z. Shier, L.G.
Project Geologist**



06/28/2024

**Henry T. Wright, P.E.
Associate Principal Engineer**

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15365 NE 90th Street, Suite 100 • Redmond, WA 98052 • (425) 449-4704
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Important Information about This

Geotechnical-Engineering Report

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

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer

will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the “Findings” Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site’s subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report’s Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals’ misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals’ plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note*

conspicuously that you’ve included the material for information purposes only. To avoid misunderstanding, you may also want to note that “informational purposes” means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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 personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, *proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration.* **Confront the risk of moisture infiltration** by including building-envelope or mold specialists on the design team. **Geotechnical engineers are not building-envelope or mold specialists.**



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June 28, 2024
ES-9786

Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

MJS Investors
11201 Southeast 8th Street, Suite 116
Bellevue, Washington 98004

Attention: Rob Risinger

Dear Rob:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical report to support the proposed residential construction. Based on the results of our investigation, the proposed construction is feasible from a geotechnical standpoint. Our field observations indicate the site is underlain primarily by dense to very dense glacial till deposits.

The proposed residential structures may be supported on conventional continuous and spread footing foundations bearing on competent native soil, compacted native soil, or new structural fill placed directly on a competent subgrade. In general, we expect competent native soil suitable for support of foundations will likely be encountered about two to four feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill, or overexcavation and replacement with suitable structural fill will likely be necessary.

The existing fill is generally underlain by topsoil and is not suitable for structural support as is and should be removed and replaced with suitable structural backfill. Where encountered, fill intended for reuse as structural fill must be primarily free of organic and deleterious material and should be evaluated by ESNW at the time of construction.

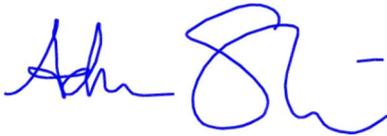
Based on our review of the referenced topographic data, a portion of the site meets or exceeds 15 percent gradient, with isolated areas in the southern portion of the site meeting or exceeding 33 percent. As such, City of Arlington regulations regarding disturbance area will likely apply. The development will likely need to be designed to accommodate the existing topography.

The native glacial till deposits exhibit very poor infiltration characteristics, including high relative density, high fines content, and weak cementation. In our opinion, full infiltration should be considered infeasible from a geotechnical standpoint.

This report provides geotechnical analyses and recommendations for the proposed residential development. The opportunity to be of service to you is appreciated. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

A handwritten signature in blue ink, appearing to read "Adam Shier", with a stylized flourish at the end.

Adam Z. Shier, L.G.
Project Geologist

Table of Contents

ES-9786

	<u>PAGE</u>
<u>INTRODUCTION</u>	1
<u>General</u>	1
<u>Project Description</u>	1
<u>SITE CONDITIONS</u>	2
<u>Surface</u>	2
<u>Subsurface</u>	2
Topsoil and Fill	2
Native Soil	3
Geologic Setting	3
Groundwater	3
<u>Geologic Hazard Areas Assessment</u>	4
Landslide Hazard Areas	4
Slopes	4
Discussion	5
<u>DISCUSSION AND RECOMMENDATIONS</u>	5
<u>General</u>	5
<u>Site Preparation and Earthwork</u>	6
Temporary Erosion Control	6
Excavations and Slopes	7
Structural Fill	7
In-situ and Imported Soil	8
Wet-Season Grading	8
Existing Fill Removal and Replacement	9
<u>Foundations</u>	9
<u>Retaining Walls</u>	10
<u>Seismic Design</u>	11
Liquefaction	11
<u>Slab-on-Grade Floors</u>	12
<u>Utility Support and Trench Backfill</u>	12
<u>Preliminary Pavement Sections</u>	12
<u>Drainage</u>	13
Infiltration Feasibility	14
Detention Pond Recommendations	14
<u>LIMITATIONS</u>	14
<u>Additional Services</u>	14
<u>REFERENCES</u>	15

Table of Contents

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ES-9786

GRAPHICS

Plate 1	Vicinity Map
Plate 2	Test Pit Location Plan
Plate 3	Retaining Wall Drainage Detail
Plate 4	Footing Drain Detail

APPENDICES

Appendix A	Subsurface Exploration Logs
Appendix B	Laboratory Test Results

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INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed residential construction to be located on the south side of 172nd Street Northeast at 8014, 8118, 8210, & 8326 – 172nd Street Northeast in Arlington, Washington. To fulfill our scope of services, the following were completed:

- Subsurface exploration to characterize the soil and groundwater conditions.
- Laboratory testing of representative soil samples collected on site.
- Infiltration feasibility evaluation based on field observations and laboratory analyses.
- Engineering analyses and recommendations for the proposed residential construction.
- Preparation of this report.

Project Description

Based on review of the referenced feasibility exhibit, the site will be redeveloped with a series of new residential lots, access roads, stormwater management facilities, and associated improvements. At the time of report submission, specific grading and building plans were not available for review. We anticipate grading for the project will include cuts and fills on the order of 10 to 15 feet or less to achieve design subgrade and finish grade elevations for the access drives and building areas. Based on our experience with similar projects, the proposed residential structures will likely be two to three stories in height and constructed using relatively lightly loaded wood framing. We anticipate perimeter footing loads will likely be 1 to 2 kips per linear foot, isolated footing loads will be less than 20 kips, and slab-on-grade loading of 150 pounds per square foot (psf).

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

SITE CONDITIONS

Surface

The subject site is located on the south side of 172nd Street Northeast at 8014, 8118, 8210, & 8326 – 172nd Street Northeast in Arlington, Washington, as illustrated on the Vicinity Map (Plate 1). The site consists of five tax parcels (Snohomish County parcel nos. 310525-002-006-00, 310526-100-100, 31052600-100-200, 31052600-102-200, and 31052600-102-300) totaling 32.28 acres. The property is currently developed with a series of single-family residences, outbuildings, and associated improvements. Undeveloped portions of the property are primarily surfaced with lawn grass, landscaping areas, access driveways, and forested conditions.

In general, terrain across the subject site descends to the west with approximately 80 feet of elevation change. Per the PDS Map Portal, an area containing a steep slope (i.e., greater than 33 percent gradient) is present in the western portion of the site. The site is bordered to the north by 172nd Street Northeast, to the east and south by undeveloped parcels, and to the west by 79th Avenue Northeast.

Subsurface

A representative of ESNW observed, logged, and sampled 25 test pits on April 2, 2024, advanced at accessible locations within the property boundaries, using a mini-trackhoe and operator retained by our firm. The test pits were completed to assess and classify the site soils, to characterize the groundwater conditions within areas proposed for new development. The maximum exploration depth was approximately 11 feet below the existing ground surface (bgs), and all test pits were terminated in undisturbed native soil deposits.

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 our exploration sites were analyzed in general accordance with Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil and Fill

Topsoil was generally observed within the upper 4 to 18 inches of existing grades at the test locations where historic grade modifications have not been made, characterized by its dark brown color, the presence of fine organic material, and small root intrusions. Furthermore, an approximately 24 to 36-inch-thick relic topsoil horizon was encountered at TP-6, TP-7, and TP-9 beginning at depths of about one to two feet bgs underlying reworked native material.

Fills were encountered at seven of the test locations (primarily within Snohomish County parcel number 31052600-102-200), extending up to three and one-half feet bgs. The fill generally consisted of silty sand or dark brown topsoil (USCS: SM and TPSL, respectively). Where topsoil fill was observed, the locations had been stripped of their upper weathered soil horizons during past grading activities and topsoil fill had been placed atop unweathered glacial till.

Native Soil

Underlying the topsoil and fill, native soil consisting primarily of silty sand with gravel (USCS:SM) was observed. The native silty sand soil was interpreted to be representative of glacial till deposits, which were widely encountered across the site. The native glacial till deposits were generally in a medium dense and weathered condition near surface, becoming very dense, unweathered, and weakly to moderately cemented beginning at depths between roughly one and one-half to four feet bgs. Some exploration locations appeared to have been stripped of the upper weathered soil horizons during past grading activities. Laboratory analyses of representative glacial till soil samples indicate the till deposits contain roughly 20 to 32 percent fines. All native soil samples were primarily in a moist to wet condition at the time of exploration.

Geologic Setting

Geologic mapping of the area identifies Vashon till (Qvt) as the primary geologic unit underlying the site. As reported on the geologic map, glacial till is a non-sorted mixture of silt, sand, and gravel (diamicton), resembling a low strength concrete mix. The glacial till was deposited directly beneath the glacier as it advanced over bedrock and older Quaternary deposits.

The referenced Web Soil Survey (WSS) identifies Tokul gravelly medial loam (0 to 8 percent slopes) as the primary soil unit underlying the subject site. Tokul series soils were formed over glacial till and volcanic ash. The referenced USDA soil survey characterizes this soil unit with slow to medium surface water runoff, and slight to moderate hazard of water erosion. In general, runoff and erosivity increase with slope gradient.

In our opinion, the soils observed during our subsurface exploration are generally consistent with the geologic and soils mapping resources outlined in this section.

Groundwater

Groundwater seepage was observed at 14 of the test pit locations during the fieldwork (April 2024) at depths of about two to three and one-half feet bgs. Groundwater seepage is common within glacial deposits, and the elevations and/or flow volumes of seepage can fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater elevations and flow rates are higher during the winter, spring, and early summer months.

Based on the observed groundwater condition, it is our opinion that the contractor should be prepared to manage and respond to areas of heavy groundwater seepage. Temporary dewatering and surface and groundwater controls may be necessary during construction, and in our opinion, a contingency should be provided in the budget to account for groundwater management.

Geologically Hazardous Areas Assessment

The presence of geologically hazardous areas at or near the subject site was evaluated by reviewing Part VI of AMC Chapter 20.93 (Geologically Hazardous Areas) along with the referenced county-wide hazard mapping resources. Geologically hazardous areas in the City of Arlington include areas susceptible to erosion, sliding, seismicity, or other geological events.

The following sections provide a summary of on-site landslide hazards and slopes. Specific regulations regarding development on sites with geologically hazardous areas can be found in AMC 20.93.630.

Landslide Hazard Areas

Section 20.93.600.b.2 of the AMC provides classification criteria for landslide hazard areas. Utilizing topographic data available through PDS Map Portal, ESNW determined that criterion E—*any area with a slope of 33 percent or greater and with a vertical relief of 10 or more feet (except areas composed of consolidated rock)*—is met in some sloped areas of the western portion of the site. In our opinion, all other landslide hazard designation criteria are not applicable to the site. Unless alteration of the steep slope landslide hazard area is approved, minimum buffer of 50 feet is required from all edges of a landslide hazard area, per AMC 20.93.630.b.2, and buildings are required to be set back 15 feet from the nearest buffer edge per AMC 20.93.630.b.3. It is our opinion that the relatively limited areas that appear to be sloped 33 percent or steeper can be regraded in an engineered manner to effectively eliminate the potential landslide hazard. If alteration of these areas is pursued, ESNW should be consulted during the development of grading plans to provide additional recommendations.

Slopes

Slopes are categorized in AMC section 20.93.600.b.3 into *moderate* and *steep* slope categories. *Moderate slopes shall include any slope greater than or equal to 15 percent and less than 33 percent, while steep slopes shall include any slope greater than or equal to 33 percent.* This section of the AMC does not require a minimum height of vertical relief to be classified as a moderate or steep slope. Based on review of the referenced topographic data, a portion of the site meets or exceeds 15 percent gradient, with isolated areas in the western portion of the site meeting or exceeding 33 percent.

AMC section 20.93.630.c provides regulation criteria for development on sites with moderate and steep slopes. Per table 20.93-2, allowable disturbance area is limited depending on slope gradient. Table 20.93-2 is provided below for reference.

AMC Table 20.93-2: Slope Disturbance Allowed	
Slope	Disturbance Allowed
1–14%	100%
15–24%	60%
25–32%	45%
33% or greater	0%

Discussion

Certain exceptions to the regulations described above are permitted in the AMC regarding development on landslide hazard areas and/or moderate and steep slopes. Several of these exceptions require geotechnical analysis to demonstrate that the proposed development will not adversely affect adjacent properties and/or that the proposal is designed to mitigate or essentially eliminate the risk associated with the geologically hazardous area. ESNW recommends the project team review the development proposal with respect to the requirements provided in the AMC. As project plans progress, ESNW can provide additional consulting services pertaining to geologically hazardous areas.

DISCUSSION AND RECOMMENDATIONS

General

In our opinion, the proposed construction is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed project include temporary excavations, structural fill requirements, subgrade preparation, existing fill removal and replacement, utility support and trench backfill, drainage, and stormwater management.

The proposed residential structures may be supported on conventional continuous and spread footing foundations bearing on competent native soil, compacted native soil, or new structural fill placed directly on a competent subgrade. In general, we expect competent native soil suitable for support of foundations will likely be encountered about two to four feet bgs. Where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of the soil to the specifications of structural fill, or overexcavation and replacement with suitable structural fill will likely be necessary.

The existing fill is generally underlain by topsoil and is not suitable for structural support as is and should be removed and replaced with suitable structural backfill. Where encountered, fill intended for reuse as structural fill must be primarily free of organic and deleterious material and should be evaluated by ESNW at the time of construction.

Based on our review of the referenced topographic data, a portion of the site meets or exceeds 15 percent gradient, with isolated areas in the southern portion of the site meeting or exceeding 33 percent. As such, City of Arlington regulations regarding disturbance area will likely apply. The development will likely need to be designed to accommodate the existing topography.

The native glacial till deposits exhibit very poor infiltration characteristics, including high relative density, high fines content, and weak cementation. In our opinion, full infiltration should be considered infeasible from a geotechnical standpoint.

Site Preparation and Earthwork

Site preparation activities should consist of installing temporary erosion control measures and performing site stripping within the designated clearing limits. Subsequent earthwork activities will likely involve additional mass grading and infrastructure and utility installations.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) Best Management Practices (BMPs) should be considered:

- 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 stable surfaces at site entrances. Placing geotextile fabric underneath the quarry spalls will provide greater stability, if needed.
- Silt fencing should be placed around the appropriate portions of the site perimeter.
- When not in use, soil stockpiles should be covered or otherwise protected to reduce the potential for soil erosion, especially during periods of wet weather.
- 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 reduce dust and airborne soil erosion.

Additional TESC BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. TESC BMPs may be modified during construction as site conditions require and as approved by the site erosion control lead.

Excavations and Slopes

Based on the soil conditions observed at the exploration locations, excavation activities are likely to expose loose to medium dense native soils within the upper two to four feet of existing grades, becoming dense to very dense at depth. The following Federal Occupation Safety and Health Administration and Washington Industrial Safety and Health Act soil classifications and maximum allowable temporary slope inclinations may be used:

- Areas exposing groundwater seepage 1.5H:1V (Type C)
- Loose soil 1.5H:1V (Type C)
- Medium dense to dense soil 1H:1V (Type B)
- Very dense “hardpan” native soil 0.75H:1V (Type A)

Groundwater seepage should be anticipated during excavation activities, especially if excavations take place during the wet season. An ESNW representative should be requested observe temporary excavations to evaluate the presence of groundwater seepage. If seepage is not observed, steeper temporary slope inclinations may be feasible pending evaluation by the geotechnical engineer.

An ESNW representative should be requested to 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

Permanent slopes should be planted with vegetation to both enhance stability and minimize erosion and should maintain a gradient of 2H:1V or flatter.

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. Structural fill placed and compacted during site grading activities should meet the following specifications and guidelines:

- Structural fill material Granular soil
- Moisture content At or slightly above optimum
- Relative compaction (minimum) 95 percent (Modified Proctor)
- Loose lift thickness (maximum) 12 inches

The existing soil may not be suitable for use as structural fill unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Soil shall not be placed dry of the optimum moisture content and should be evaluated by ESNW during construction.

With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Areas of unsuitable material (such as peat, organic-rich soil, and other debris) should be removed from structural areas and replaced with structural fill.

In-situ and Imported Soil

The in-situ soils encountered at the subject site have a high sensitivity to moisture and were generally in a moist to wet condition at the time of exploration. Soils anticipated to be exposed on site will degrade rapidly if exposed to wet weather and construction traffic. Compaction of the soils to the levels necessary for use as structural fill may be difficult to impossible during wet weather conditions. Soils encountered during site excavations that are excessively over the optimum moisture content will likely require aeration or treatment prior to placement and compaction. Conversely, soils that are substantially below the optimum moisture content will require moisture conditioning through the addition of water prior to use as structural fill. An ESNW representative should be requested to determine the suitability of in-situ soils for use as structural fill at the time of construction.

Imported soil intended for use as structural fill should be evaluated by ESNW during construction. The imported soil must be workable to the optimum moisture content, as determined by the Modified Proctor Method (ASTM D1557), at the time of placement and compaction. 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).

Wet-Season Grading

The site soils are highly moisture sensitive; therefore, earthwork activities that occur during the wet season may require additional measures to protect both structural subgrades and soil intended for use as structural fill. Site-specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design subgrade elevations, covering working surfaces with crushed rock, protecting structural fill soil from adverse moisture conditions, and additional TESC recommendations. ESNW can assist in obtaining a wet season grading permit if required by the governing jurisdiction.

Existing Fill Removal and Replacement

At several of the test locations, loose existing fill containing variable amounts of organic debris was observed. The existing silty sand fill was encountered to depths of up to two feet bgs and the buried relic organic soils was observed to depths of up to three and one-half feet bgs. The existing fill is not suitable for structural support as is and should be removed and replaced with suitable structural backfill. The following is recommended for fill removal and replacement in structural areas.

- Remove existing fill soil, segregate organic and deleterious material from mineral soil, stockpile, and protect from moisture; ESNW can evaluate suitability of remaining mineral soil for reuse as structural fill, if requested.
- If moderate to heavy groundwater seepage is present following removal, place a layer of quarry spalls on the exposed subgrade and cover with filter fabric to establish a stable surface.
- Begin mass grading with structural fill, utilizing the stockpiled existing fill if deemed suitable by ESNW. Aeration or cement treatment of existing fill may be necessary to meet the specifications for structural fill.

Foundations

The proposed residential structures constructed on this site can be supported on conventional spread and continuous footings bearing on competent (undisturbed) native soil, compacted native soil, or new structural fill placed directly on a competent subgrade.

Due to the high moisture sensitivity of the site soils, foundation subgrade areas should be protected from wet weather or areas of remediation should be anticipated; a layer of crushed rock can be considered to protect foundation subgrade areas. If structural building pads are disturbed during wet weather, remediation measures such as overexcavation and replacement with rock may be necessary in some areas. An ESNW representative should be requested to confirm suitability of foundation subgrades at the time of construction. Provided the structure(s) will be supported as described above, the following parameters may be used for design of the new foundations:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40

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

Retaining Walls

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

- Active earth pressure (unrestrained condition) 35 pcf
- At-rest earth pressure (restrained condition) 55 pcf
- Traffic surcharge (passenger vehicles) 70 psf (rectangular distribution)
- Passive earth pressure 300 pcf
- Coefficient of friction 0.40
- Seismic surcharge 8H psf*

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

The passive earth pressure and coefficient of friction values include a safety factor of 1.5. Additional surcharge loading from adjacent foundations, sloped backfill, or other 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.

Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design. 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 3.

Seismic Design

The 2021 International Building Code (2021 IBC) recognizes ASCE 7-16 (formally known as the Minimum Design Loads and Associated Criteria for Buildings and Other Structures manual) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit and boring locations, the parameters and values provided below are recommended for seismic design per the 2021 IBC.

Parameter	Value
Site Class	C*
Mapped short period spectral response acceleration, S_s (g)	1.044
Mapped 1-second period spectral response acceleration, S_1 (g)	0.372
Short period site coefficient, F_a	1.200
Long period site coefficient, F_v	1.500
Adjusted short period spectral response acceleration, S_{MS} (g)	1.253
Adjusted 1-second period spectral response acceleration, S_{M1} (g)	0.559
Design short period spectral response acceleration, S_{DS} (g)	0.835
Design 1-second period spectral response acceleration, S_{D1} (g)	0.372

* Assumes very dense soil conditions, encountered to a maximum depth of 11 feet bgs during the April 2024 field exploration, remain very dense to at least 100 feet bgs. Based on our experience with the project geologic setting (glacial till) across the Puget Sound region, soil conditions are likely consistent with this assumption.

Liquefaction

Liquefaction is a phenomenon that can occur within a soil profile as a result of an intense ground shaking or loading condition. Most commonly, liquefaction is caused by ground shaking during an earthquake. Fine sand or silt soil profiles that are loose, cohesionless, and inundated with groundwater are most susceptible to liquefaction. During the ground shaking, the soil contracts, and porewater pressure increases. The increased porewater pressure occurs quickly and without sufficient time to dissipate, resulting in water flowing upward to the ground surface and a liquefied soil condition. Soil in a liquefied condition possesses very little shear strength in comparison to the drained condition, which can result in a loss of foundation support for structures.

In our opinion, and consistent with the depiction on the referenced liquefaction susceptibility map, the native soils are characterized with a very low or negligible susceptibility to liquefaction. The composition and relatively high density of the native soil were the primary bases for this opinion.

Slab-on-Grade Floors

Slab-on-grade floors should be supported on a firm and unyielding subgrade consisting of competent native soil or at least 12 inches of new structural fill. Unstable or yielding areas of the subgrade should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

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 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 used, the vapor barrier should consist of a material specifically designed to function as a vapor barrier and should be installed in accordance with the manufacturer's specifications.

Utility Support and Trench Backfill

The soils observed at the subsurface exploration locations are generally suitable for support of utilities. Use of the native soil as structural backfill in the utility trench excavations will depend on the in-situ moisture content at the time of placement and compaction. If native soil is placed below the optimum moisture content, settlement will likely occur once wet weather impacts the trenches. As such, backfill soils should be properly moisture conditioned, as necessary, to ensure acceptability of the soil moisture content at the time of placement and compaction. Native soil will be difficult or impossible to use as utility trench backfill during extended wet weather conditions. In this respect, aeration or treatment of the soils may be necessary prior to use as structural fill. Utility trench backfill should be placed and compacted to the specifications of structural fill provided in this report or to the applicable requirements of the presiding jurisdiction.

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 proof rolling 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 or yielding subgrade conditions will require remedial measures, such as overexcavation and/or placement of thick crushed rock or structural fill sections, prior to paving.

Where applicable, 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:

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

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections for occasional truck traffic and access roadways areas may be considered:

- Three inches of HMA placed over six inches of CRB, or;
- Three inches of HMA placed over four-and-one-half inches of ATB.

A representative of ESNW should be requested to observe subgrade conditions prior to placement of CRB or ATB. As necessary, supplemental recommendations for achieving subgrade stability and drainage can be provided.

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, upon request. Road standards utilized by the governing jurisdiction may supersede the recommendations provided in this report. 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 ASTM D1557.

If on-site roads will be constructed with an inverted crown, additional drainage measures must be included in the road design to assist in maintaining road subgrade and pavement stability. ESNW can provide further consultation and design considerations regarding roadway drainage if inverted crowns will be included in the project design, upon request.

Drainage

Groundwater seepage will likely be encountered within site excavations depending on the time of year grading operations take place. Temporary measures to control surface water runoff and groundwater during construction would likely involve passive elements such as interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

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, a foundation drain should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

If buildings will incorporate crawl spaces rather than slab-on-grade, in our opinion, a crawl space drain system will provide adequate drainage in lieu of perimeter footing drains. The crawl space drain must provide positive drainage to an appropriate outlet.

Infiltration Feasibility

The City of Arlington adopts the Washington State Department of Ecology Stormwater Management Manual for Western Washington (2019 SWMMWW) for design and implementation of new stormwater facilities. Based on our review of the 2019 SWMMWW, limiting factors for on-site infiltration can be found in Volume V, Chapter 5, Section 5.6 "Site Suitability Criteria" (SSC); specifically, SSC-1 and SSC-5.

The dense, cemented, and unweathered glacial till soils (hardpan) observed at depths beginning at about two to four feet bgs generally exhibit very poor soil infiltration characteristics, which is exhibited by the zones of perched groundwater seepage and iron oxide staining. In our opinion, the unweathered glacial soils should be considered impermeable for stormwater design purposes. The use of full infiltration systems for stormwater control is not recommended for this site.

Detention Pond Recommendations

ESNW understands a detention pond will be constructed near the western property boundary on parcel no. 31052600-100-200. ESNW should have the opportunity to review the proposed detention pond plans. Of particular concern is detention pond berm construction and preventing hydraulic communication with surrounding perched groundwater. Pond berms should include a keyway and material should be consistent with applicable governing jurisdiction specifications. Pond berm construction should be observed by ESNW representatives on a nearly full-time basis to ensure that the material placed is within specifications, geometry is consistent with the plans and to provide additional recommendations, where applicable.

LIMITATIONS

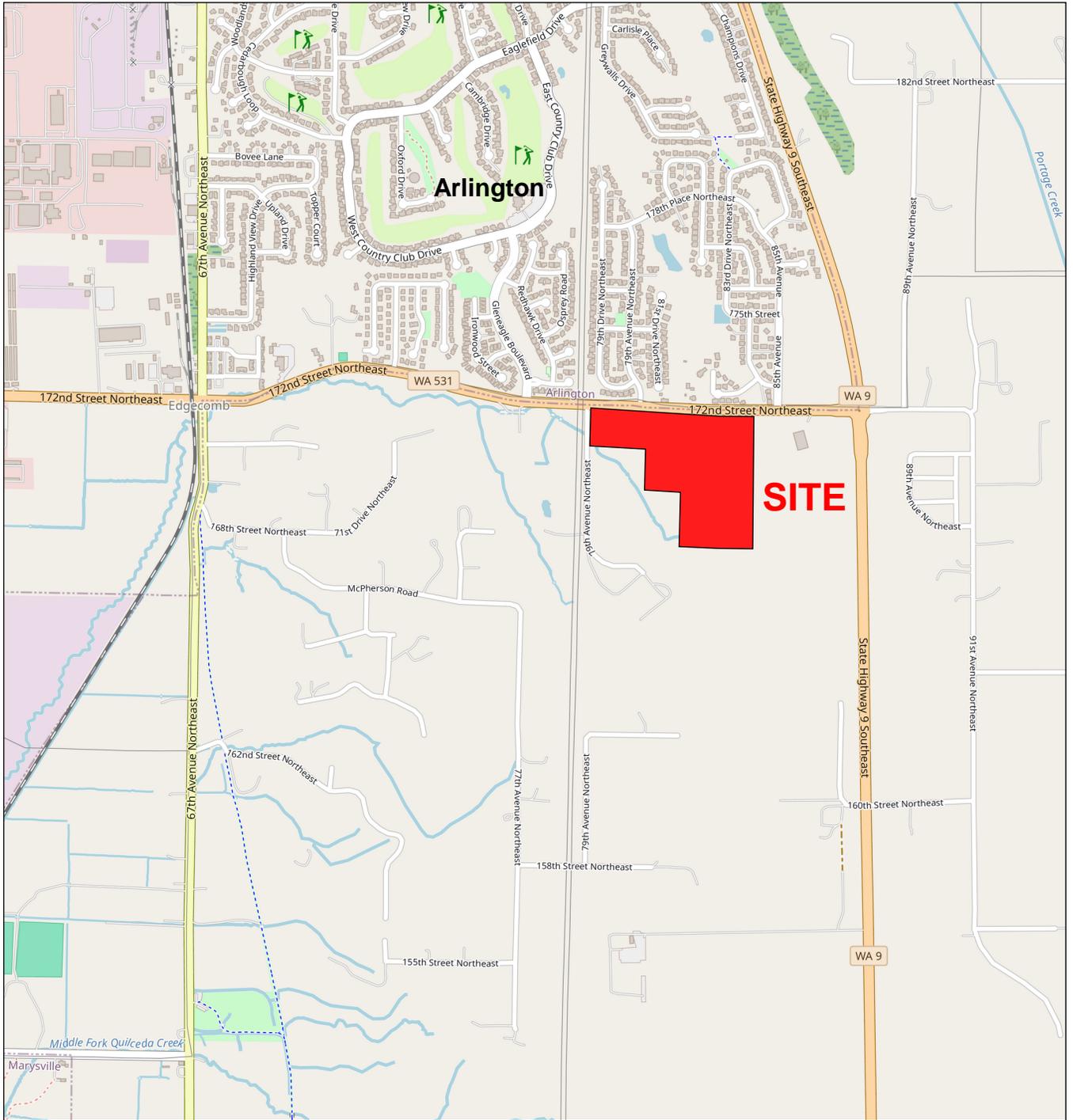
This study has been prepared for the exclusive use of MJS Investors and its representatives. The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed at the exploration 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 as needed during design and construction phases of the project.

REFERENCES

- Feasibly Exhibit, prepared by ESM Consulting Engineers, LLC, dated November 14, 2023
- Geologic Map of the Arlington West 7.5-minute Quadrangle, Snohomish County, Washington, by James P. Minard, dated 1985
- WSS, maintained by the Natural Resources Conservation Service under the USDA
- Soil Survey of Snohomish County Area, Washington, by Debose and Klungland, United States Department of Agriculture, Soil Conservation Service, issued July, 1983
- Snohomish County Geologic Hazards Seismic Hazard Areas Map, dated February 1, 2016
- Snohomish County Geologic Hazards Mine Hazard Areas Map, dated February 1, 2016
- Liquefaction Susceptibility Map of Snohomish County, Washington, prepared by Palmer, S.P. et al., endorsed by the Washington State Department of Natural Resources, dated September 2004
- AMC



Reference:
 Snohomish County, Washington
 OpenStreetMap.org

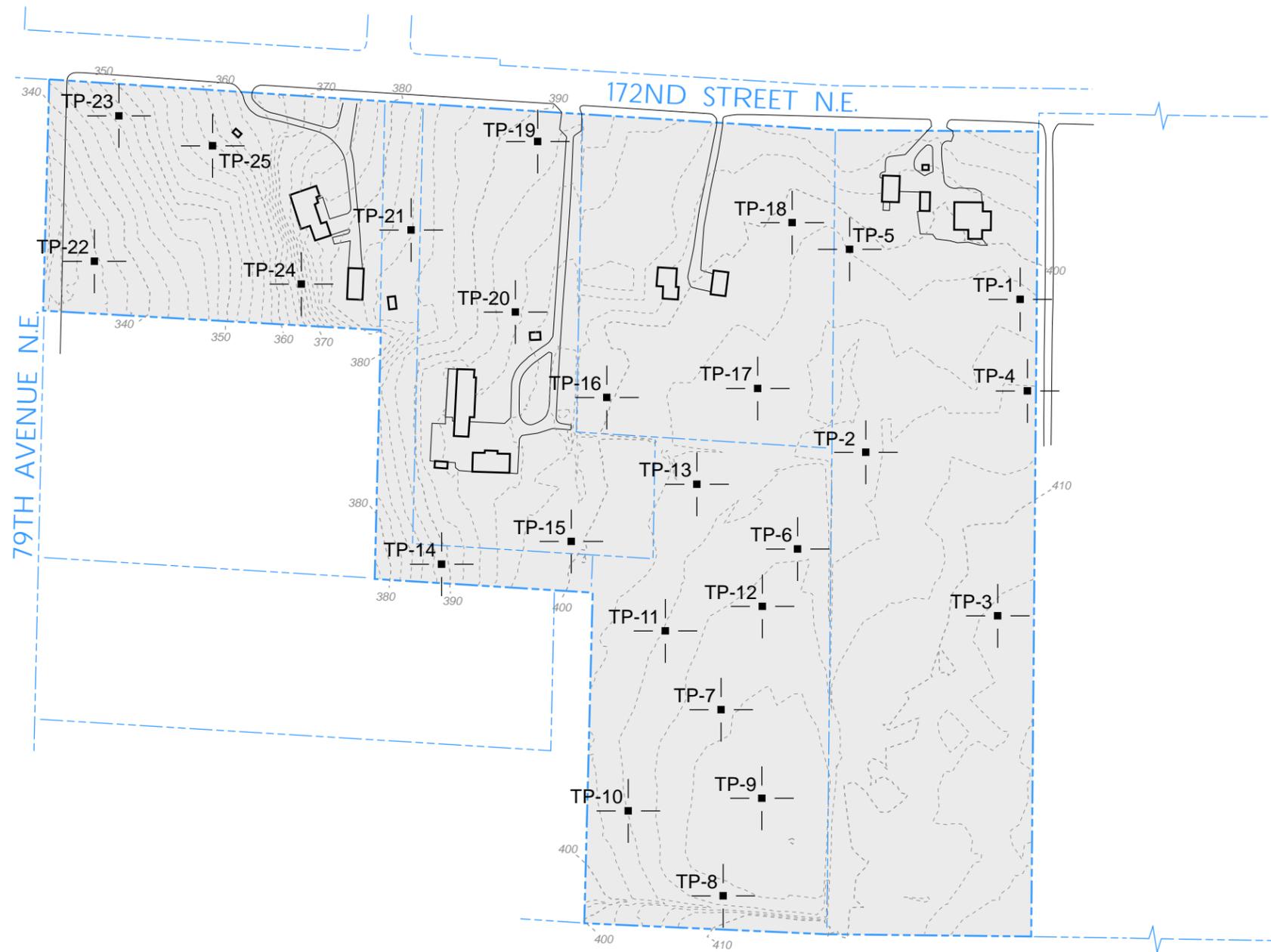


Earth Solutions NW LLC
 Geotechnical Engineering, Construction
 Observation/Testing and Environmental Services

Vicinity Map
 Lindsay Annexation
 Arlington, Washington

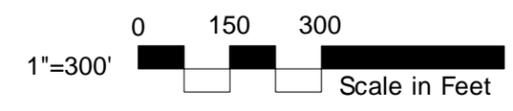
Drawn MRS	Date 06/13/2024	Proj. No. 9786
Checked AZS	Date June 2024	Plate 1

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.



LEGEND

- TP-1 | ■ | Approximate Location of ESNW Test Pit, Proj. No. ES-9786, April 2024
- ▭ | Subject Site
- ▭ | Existing Building

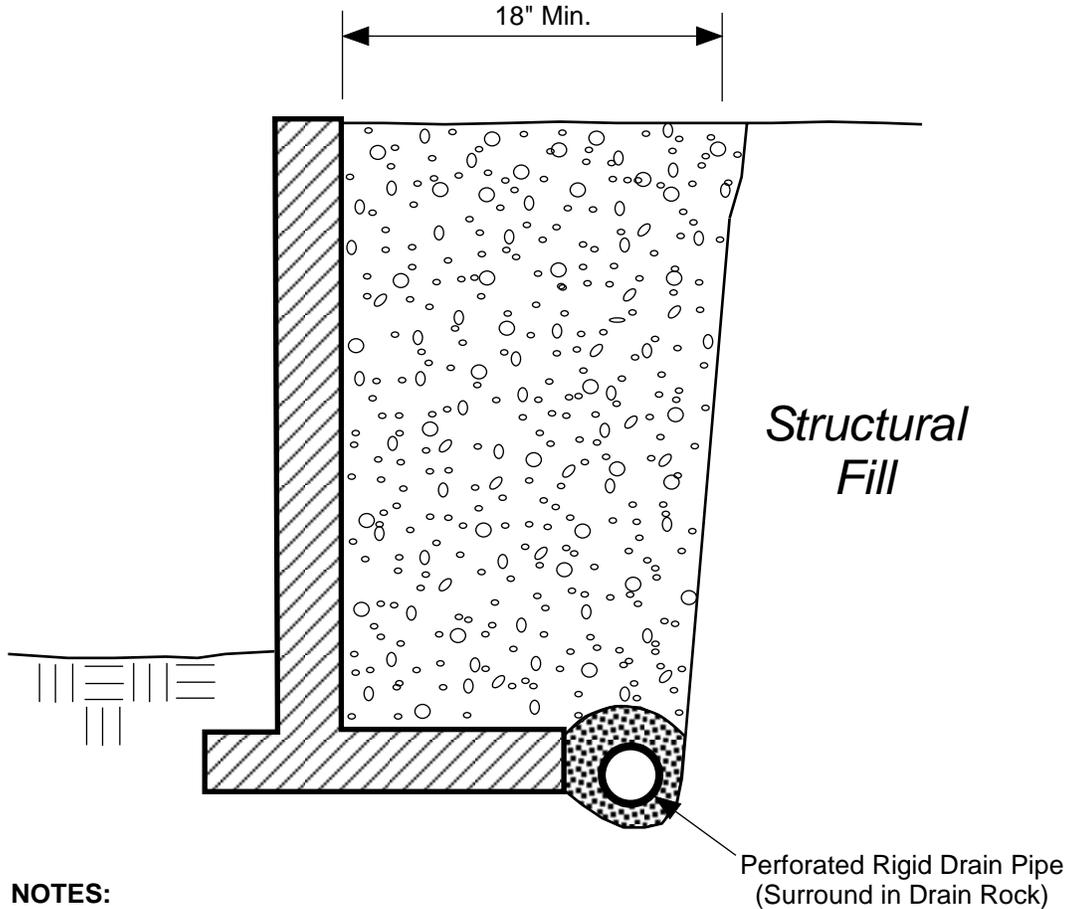


NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided 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.



Drawn MRS
Checked AZS
Date 06/12/2024
Proj. No. 9786
Plate 2

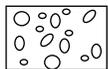


NOTES:

- 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:

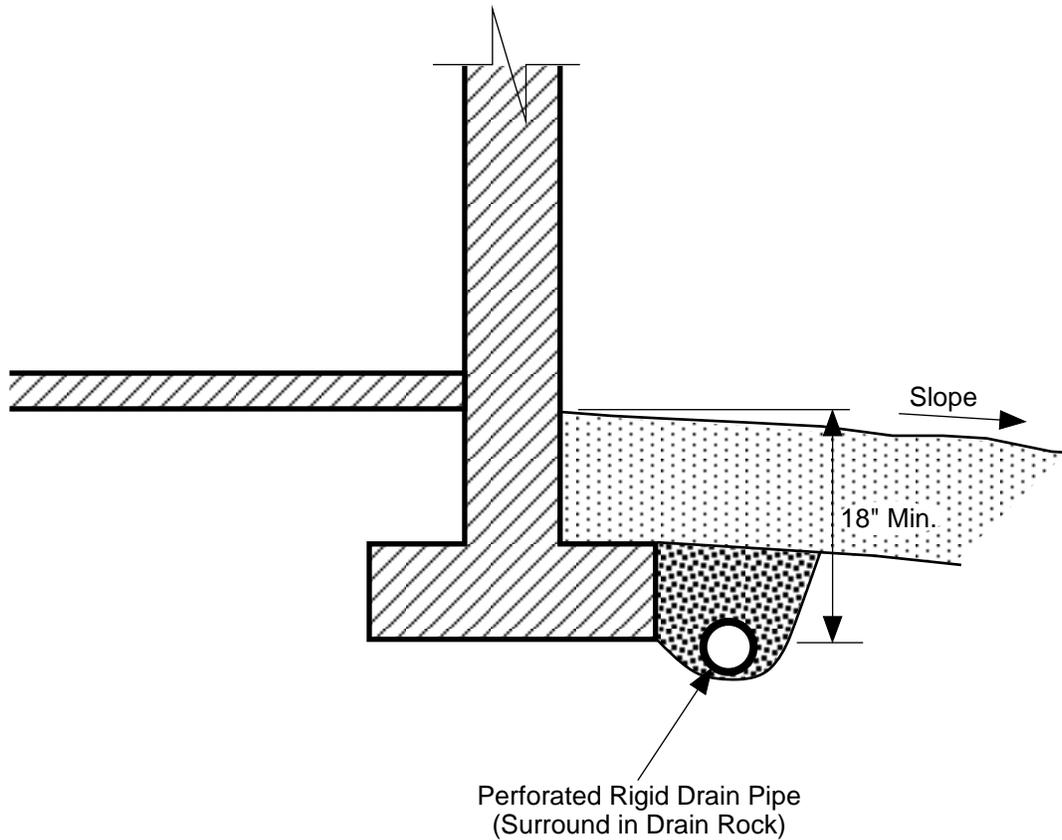


Free-draining Structural Backfill



1-inch Drain Rock

		Earth Solutions NW_{LLC} Geotechnical Engineering, Construction Observation/Testing and Environmental Services	
Retaining Wall Drainage Detail Lindsay Annexation Arlington, Washington			
Drawn	MRS	Date	06/13/2024
Proj. No.	9786		
Checked	AZS	Date	June 2024
Plate	3		

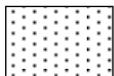


NOTES:

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

SCHMATIC 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 Lindsay Annexation Arlington, Washington			
Drawn	MRS	Date	06/13/2022
Proj. No.	9786		
Checked	AZS	Date	June 2024
Plate	4		

Appendix A

Subsurface Exploration Logs

ES-9786

Subsurface conditions on site were explored on April 2, 2024, by advancing 25 test pits using a machine and an operator retained by ESNW. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pit logs are provided in this Appendix. The test pits were advanced to a maximum depth of about 11 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.

Coarse-Grained Soils - More Than 50% Retained on No. 200 Sieve		Moisture Content		Symbols																							
Gravels - More Than 50% of Coarse Fraction Retained on No. 4 Sieve		GW	Well-graded gravel with or without sand, little to no fines	Dry - Absence of moisture, dusty, dry to the touch																							
		GP	Poorly graded gravel with or without sand, little to no fines	Damp - Perceptible moisture, likely below optimum MC																							
		GM	Silty gravel with or without sand	Moist - Damp but no visible water, likely at/near optimum MC																							
		GC	Clayey gravel with or without sand	Wet - Water visible but not free draining, likely above optimum MC																							
Sands - 50% or More of Coarse Fraction Passes No. 4 Sieve		SW	Well-graded sand with or without gravel, little to no fines	Saturated/Water Bearing - Visible free water, typically below groundwater table																							
		SP	Poorly graded sand with or without gravel, little to no fines																								
		SM	Silty sand with or without gravel																								
		SC	Clayey sand with or without gravel																								
Fine-Grained Soils - 50% or More Passes No. 200 Sieve		Terms Describing Relative Density and Consistency																									
Silt and Clays Liquid Limit Less Than 50		ML	Silt with or without sand or gravel; sandy or gravelly silt	Coarse-Grained Soils: <u>Density</u> <u>SPT blows/foot</u> Very Loose < 4 Loose 4 to 9 Medium Dense 10 to 29 Dense 30 to 49 Very Dense ≥ 50																							
		CL	Clay of low to medium plasticity; lean clay with or without sand or gravel; sandy or gravelly lean clay	Fine-Grained Soils: <u>Consistency</u> <u>SPT blows/foot</u> Very Soft < 2 Soft 2 to 3 Medium Stiff 4 to 7 Stiff 8 to 14 Very Stiff 15 to 29 Hard ≥ 30																							
		OL	Organic clay or silt of low plasticity	Test Symbols & Units Fines = Fines Content (%) MC = Moisture Content (%) DD = Dry Density (pcf) Str = Shear Strength (tsf) PID = Photoionization Detector (ppm) OC = Organic Content (%) CEC = Cation Exchange Capacity (meq/100 g) LL = Liquid Limit (%) PL = Plastic Limit (%) PI = Plasticity Index (%)																							
		MH	Elastic silt with or without sand or gravel; sandy or gravelly elastic silt																								
Silt and Clays Liquid Limit 50 or More		CH	Clay of high plasticity; fat clay with or without sand or gravel; sandy or gravelly fat clay	Component Definitions <table border="1"> <thead> <tr> <th>Descriptive Term</th> <th>Size Range and Sieve Number</th> </tr> </thead> <tbody> <tr> <td>Boulders</td> <td>Larger than 12"</td> </tr> <tr> <td>Cobbles</td> <td>3" to 12"</td> </tr> <tr> <td>Gravel</td> <td>3" to No. 4 (4.75 mm)</td> </tr> <tr> <td> Coarse Gravel</td> <td>3" to 3/4"</td> </tr> <tr> <td> Fine Gravel</td> <td>3/4" to No. 4 (4.75 mm)</td> </tr> <tr> <td>Sand</td> <td>No. 4 (4.75 mm) to No. 200 (0.075 mm)</td> </tr> <tr> <td> Coarse Sand</td> <td>No. 4 (4.75 mm) to No. 10 (2.00 mm)</td> </tr> <tr> <td> Medium Sand</td> <td>No. 10 (2.00 mm) to No. 40 (0.425 mm)</td> </tr> <tr> <td> Fine Sand</td> <td>No. 40 (0.425 mm) to No. 200 (0.075 mm)</td> </tr> <tr> <td>Silt and Clay</td> <td>Smaller than No. 200 (0.075 mm)</td> </tr> </tbody> </table>		Descriptive Term	Size Range and Sieve Number	Boulders	Larger than 12"	Cobbles	3" to 12"	Gravel	3" to No. 4 (4.75 mm)	Coarse Gravel	3" to 3/4"	Fine Gravel	3/4" to No. 4 (4.75 mm)	Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)	Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)	Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)	Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)	Silt and Clay	Smaller than No. 200 (0.075 mm)
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Silt and Clay	Smaller than No. 200 (0.075 mm)																										
OH	Organic clay or silt of medium to high plasticity																										
Highly Organic Soils		PT	Peat, muck, and other highly organic soils	Modifier Definitions <table border="1"> <thead> <tr> <th>Percentage by Weight (Approx.)</th> <th>Modifier</th> </tr> </thead> <tbody> <tr> <td>< 5</td> <td>Trace (sand, silt, clay, gravel)</td> </tr> <tr> <td>5 to 14</td> <td>Slightly (sandy, silty, clayey, gravelly)</td> </tr> <tr> <td>15 to 29</td> <td>Sandy, silty, clayey, gravelly</td> </tr> <tr> <td>> 30</td> <td>Very (sandy, silty, clayey, gravelly)</td> </tr> </tbody> </table>		Percentage by Weight (Approx.)	Modifier	< 5	Trace (sand, silt, clay, gravel)	5 to 14	Slightly (sandy, silty, clayey, gravelly)	15 to 29	Sandy, silty, clayey, gravelly	> 30	Very (sandy, silty, clayey, gravelly)												
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Fill		FILL	Made Ground	Classifications of soils in this geotechnical report and as shown on the exploration logs are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D2487 and D2488 were used as an identification guide for the Unified Soil Classification System.																							





15365 NE 90th Street, Suite 100
 Redmond, WA 98052
 Office (425) 449-4704 | esnw.com
 Branch Office: Pasco, WA

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 402 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15081 LONGITUDE -122.11826
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -roots, probed 9"- 12"	401.4
	GB	MC = 39.1	SM		Brown silty SAND with gravel, medium dense, moist to wet	
2.5						400.0
	GB	MC = 16.7			Gray silty SAND with gravel, medium dense to dense, moist -heavy iron oxide staining, probed 4"	
			SM		-weakly cemented, becomes dense to very dense -probed 1"- 2"	
5.0						
	GB	MC = 11.9				395.0

Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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 Redmond, WA 98052
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 Branch Office: Pasco, WA

TEST PIT NUMBER TP-2

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 405 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15008 LONGITUDE -122.11920
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -roots	404.5
			SM		Brown silty SAND with gravel, medium dense, moist	
						403.5
2.5	GB	MC = 19.5			Gray silty SAND with gravel, dense to very dense, moist -light groundwater seepage, probed 0"- 1" -moderately cemented	
5.0	GB	MC = 10.3	SM			
7.5	GB	MC = 11.0				397.0

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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 Redmond, WA 98052
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 Branch Office: Pasco, WA

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 412 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14937 LONGITUDE -122.11820
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -roots, probed 18"	411.3
	GB	MC = 47.0	SM		Brown silty SAND with gravel, loose to medium dense, moist to wet	
2.5	GB	MC = 17.3	SM		Gray silty SAND with gravel, dense, moist -moderate groundwater seepage -weakly cemented, light iron oxide staining -probed 6"	410.0
5.0			SM		-probed 0"- 1"	
	GB	MC = 11.1				405.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 206 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15034 LONGITUDE -122.11812
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 9"- 12"	205.0
	GB	MC = 34.1 Fines = 29.1	SM		Brown silty SAND with gravel, loose to medium dense, moist to wet [USDA Classification: very gravelly sandy LOAM]	
2.5						203.0
	GB	MC = 24.2	SM		Gray silty SAND with gravel, dense, moist to wet -probed 1"- 2" -moderate iron oxide staining	
5.0						
	GB	MC = 12.2	SM		-moderately cemented, becomes very dense	
7.5						198.5

Test pit terminated at 7.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-5

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 402 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15099 LONGITUDE -122.11931
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 12"- 16"	
				1.5		400.5
	∇ GB	MC = 13.6	SM		Brown silty SAND, loose to medium dense, moist	
2.5				3.5		398.5
	∇ GB	MC = 18.2	SM		Gray silty SAND with gravel, dense to very dense, moist -probed 0" -moderately cemented	
5.0				6.5		395.5
	∇ GB	MC = 13.5				

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

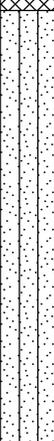
LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-6

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 406 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14958 LONGITUDE -122.11970
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			SM		Brown silty SAND, loose, moist (Fill) -probed 16"	405.0
			TPSL		Dark brown TOPSOIL (Fill)	404.0
2.5	GB	MC = 25.0			Gray silty SAND with gravel, dense to very dense, moist to wet -probed 0" -moderate iron oxide staining	
5.0			SM			
	GB	MC = 10.6				399.0

Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-7

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 407 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14899 LONGITUDE -122.12014
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			SM		Brown silty SAND, loose, moist (Fill) -probed 12"- 16"	
				1.5		405.5
			TPSL		Dark brown TOPSOIL (Fill)	
2.5				3.0		404.0
	∇ GB	MC = 19.3			Gray silty SAND with gravel, dense to very dense, moist -light groundwater seepage, probed 0" -heavy iron oxide staining	
5.0			SM		-strongly cemented	
	∇ GB	MC = 12.3		7.0		400.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 3.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-8

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 407 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14831 LONGITUDE -122.12005
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			SM		Brown silty SAND, loose, moist -probed 12"- 16"	
	∇ GB	MC = 15.5			Gray silty SAND with gravel, dense, moist -heavy iron oxide staining, weakly cemented	
2.5			SM			
5.0						
	∇ GB	MC = 11.0				
						400.5

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-9

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 409 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14870 LONGITUDE -122.11976
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
	GB	MC = 26.0 Fines = 41.5	SM		Brown silty SAND, very loose to loose, moist (Fill) -probed 24" [USDA Classification: gravelly LOAM] -cobbles	407.0
2.5			TPSL		Dark brown TOPSOIL (Fill) -roots, probed 12"	406.0
5.0	GB	MC = 19.7	SM		Gray silty SAND with gravel, dense, moist -light groundwater seepage -weakly cemented -probed 0"	
	GB	MC = 12.2				402.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 3.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-10

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 404 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14864 LONGITUDE -122.12066
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 12"	403.3
			SM		Brown silty SAND, loose to medium dense, moist -light groundwater seepage	402.0
2.5	GB	MC = 16.4			Gray silty SAND with gravel, dense, moist -light groundwater seepage -iron oxide staining	
5.0			SM		-moderately cemented, probed 0"	
	GB	MC = 10.4				397.5

Test pit terminated at 6.5 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

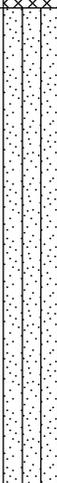
LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-11

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 404 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14923 LONGITUDE -122.12054
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			TPSL		Dark brown TOPSOIL (Fill) -light groundwater seepage
				1.5	402.5
	∇ GB	MC = 19.8			Gray silty SAND with gravel, dense, moist -moderate iron oxide staining
2.5			SM		
	∇ GB	MC = 9.9		7.0	397.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-12

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 407 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14930 LONGITUDE -122.12000
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			TPSL		Dark brown TOPSOIL (Fill) -probed 12"
2.5	GB	MC = 41.7			Gray silty SAND with gravel, dense, moist -light groundwater seepage -moderate iron oxide staining
5.0			SM		-weakly cemented
	GB	MC = 11.7			

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-13

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 403 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14996 LONGITUDE -122.12029
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Exposed soil AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL, roots -probed 12"	402.5
	∇ GB	MC = 78.5	SM		Brown silty SAND with gravel, loose, wet	
	∇ GB	MC = 24.0				401.0
2.5					Gray silty SAND with gravel, dense, moist -probed 0" -iron oxide staining	
			SM			
5.0					-becomes very dense, moderately cemented	
	∇ GB	MC = 8.5				396.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-14

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 389 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14959 LONGITUDE -122.12214
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL, roots	388.4
					Brown silty SAND, medium dense, wet	
	GB	MC = 39.6	SM		-probed 10"	
2.5						
						386.0
	GB	MC = 12.7			Gray silty SAND with gravel, very dense, moist	
			SM		-probed 0" -strongly cemented	
5.0						
	GB	MC = 7.4				382.5

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-15

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 400 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.14963 LONGITUDE -122.12124
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			TPSL		Dark brown TOPSOIL (Fill)
					398.4
2.5	GB	MC = 17.7			Gray silty SAND with gravel, dense to very dense, moist
			SM		
5.0					
	GB	MC = 7.6			394.0

Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-16

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 400 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15040 LONGITUDE -122.12091
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL	399.3
						0.7
					Brown silty SAND with gravel, medium dense, wet	
	∇ GB	MC = 53.7	SM		-probed 2"	
2.5						2.5
					Gray silty SAND with gravel, dense, moist	397.5
					-heavy groundwater seepage	
	∇ GB	MC = 14.0			-probed 0"- 1"	
5.0			SM			
						6.5
						393.5

Test pit terminated at 6.5 feet below existing grade. Groundwater seepage encountered at 2.5 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-17

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 403 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15044 LONGITUDE -122.11984
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 8"- 10"	402.2
	∇ GB	MC = 43.7	SM		Brown silty SAND, loose to medium, moist to wet	
2.5						
	∇ GB	MC = 11.5 Fines = 20.2			Gray silty SAND with gravel, dense, moist -moderate groundwater seepage -moderate iron oxide staining [USDA Classification: very gravelly sandy LOAM]	401.0
5.0			SM		-moderately cemented	
	∇ GB	MC = 8.3				396.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-19

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 391 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15143 LONGITUDE -122.12137
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 4"	390.4
					Brown silty SAND, loose to medium dense, wet	
	∇ GB	MC = 40.8	SM			388.5
2.5						
	∇ GB	MC = 17.4			Gray silty SAND with gravel, dense to very dense, moist -light groundwater seepage	
			SM		-probed 0" -weakly cemented	
5.0						
	∇ GB	MC = 9.0				384.0

Test pit terminated at 7.0 feet below existing grade. Groundwater encountered at 2.5 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-20

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 394 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15067 LONGITUDE -122.12156
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 10"	393.2
	∇ GB	MC = 41.8	SM		Brown silty SAND, medium dense, wet	
2.5						
	∇ GB	MC = 16.8				392.0
5.0			SM		Gray silty SAND with gravel, dense, moist -light groundwater seepage -moderately cemented, probed 0" -iron oxide staining	
	∇ GB	MC = 8.7				387.0

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 2.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-21

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 384 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15110 LONGITUDE -122.12206
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 12"	383.0
	∇ GB	MC = 39.0	SM		Brown silty SAND, medium dense, moist to wet	
2.5	∇ GB	MC = 19.5				382.0
			SM		Gray silty SAND, dense, moist -probed 0" -moderate iron oxide staining -weakly cemented	
5.0						
	∇ GB	MC = 8.7				377.0

Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-22

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 336 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15084 LONGITUDE -122.12432
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			SM		Brown silty SAND, loose, wet (Fill) -probed 18"
1.5					334.5
			TPSL		Dark brown TOPSOIL (Fill)
2.5					332.5
	GB	MC = 18.9			Gray silty SAND with gravel, dense, moist -heavy groundwater seepage -probed 1"
5.0					-light iron oxide staining
					-becomes medium dense to dense
	GB	MC = 13.6			
7.5			SM		
10.0					
	GB	MC = 15.5 Fines = 31.9			[USDA Classification: gravelly sandy LOAM]
11.0					325.0
<p>Test pit terminated at 11.0 feet below existing grade. Groundwater seepage encountered at 3.5 feet during excavation. No caving observed.</p> <p>LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.</p>					

GENERAL BH / TP / WELL - 9786.GPJ - GINT US.GDT - 6/28/24



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TEST PIT NUMBER TP-23

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 347 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15152 LONGITUDE -122.12423
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 10"	346.4
					Brown silty SAND, loose to medium dense, moist	
	∇ GB	MC = 22.0				
2.5			SM			
						344.0
					Gray silty SAND with gravel, very dense, moist -light groundwater seepage	
	∇ GB	MC = 12.1				
5.0			SM			
						340.0
	∇ GB	MC = 19.2				

Test pit terminated at 7.0 feet below existing grade. Groundwater seepage encountered at 3.0 feet during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-24

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 368 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15077 LONGITUDE -122.12301
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 10"	367.0
					Brown silty SAND with gravel, loose to medium dense, moist to wet	
2.5	GB	MC = 16.4	SM		-probed 6"	
						364.5
					Gray silty SAND with gravel, dense, moist	
	GB	MC = 15.8			-probed 0"	
5.0			SM		-moderately cemented	
7.5						
	GB	MC = 14.7				360.0

Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.



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TEST PIT NUMBER TP-25

PROJECT NUMBER ES-9786 PROJECT NAME Lindsay Annexation
 DATE STARTED 4/2/24 COMPLETED 4/2/24 GROUND ELEVATION 358 ft
 EXCAVATION CONTRACTOR NW Excavating LATITUDE 48.15139 LONGITUDE -122.12363
 LOGGED BY AZS CHECKED BY RAC GROUND WATER LEVEL:
 NOTES _____ ∇ AT TIME OF EXCAVATION _____
 SURFACE CONDITIONS Field grass AFTER EXCAVATION _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
			TPSL		Dark brown TOPSOIL -probed 8"	357.0
					Brown silty SAND with gravel, medium dense, moist	
2.5	GB	MC = 15.0	SM			
					Gray silty SAND with gravel, dense, moist	354.0
5.0			SM			
	GB	MC = 11.1				352.0

Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Appendix B
Laboratory Test Results
ES-9786



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GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9786

PROJECT NAME Lindsay Annexation

