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**GEOTECHNICAL ENGINEERING STUDY
BULLFROG FLATS – PHASES P4 AND M
BULLFROG ROAD
CLE ELUM, WASHINGTON**

ES-10509.08



Geotechnical Engineering



Environmental Services



Earthwork Observation & Testing

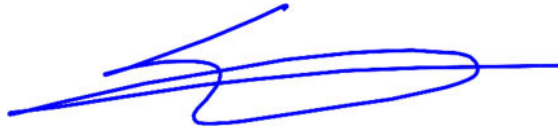


CESCL & Stormwater Services

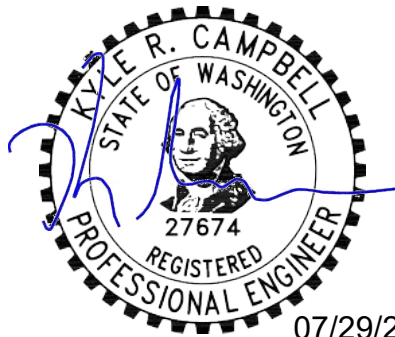
esnw.com

PREPARED FOR
BULLFROG FLATS, LLC

July 29, 2026



Stephen H. Avril
Project Manager



07/29/2026

Kyle R. Campbell, P.E.
Senior Principal Engineer

GEOTECHNICAL ENGINEERING STUDY
BULLFROG FLATS – PHASES P4 AND M
BULLFROG ROAD
CLE ELUM, WASHINGTON

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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 site-wide 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.*



**GEOPROFESSIONAL
BUSINESS
ASSOCIATION**

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By Virgil Amick at
2:40 pm, July 29, 2026

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July 29, 2026
ES-10509.08

Bullfrog Flats, LLC
18300 Redmond Way, Suite 120
Redmond, Washington 98052

Attention: Michelle Branley

Greetings:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical report to support the proposed project. Based on the results of our work, construction of the proposed new residential structures is feasible from a geotechnical standpoint. Our study indicates the site is underlain primarily by outwash deposits overlain by a thin lens of loess (windblown silts).

Based on our findings, the proposed residences may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompact native soil, or new structural fill placed directly on competent native soil. Competent native soil considered suitable for support of the proposed structures will likely be encountered beginning at a depths between two to four feet below existing grades.

The soil profile on the site includes a layer of loess on the order one to four feet in thickness. Loess is prone to settlement as loads are applied. ESNW recommends compacting the loess in place where encountered within structural areas. Additionally, where fill, loose, and/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 be necessary. ESNW can provide recommendations at the time of construction based on field observations.

Considering the granular and rocky nature of the site soil, it is our opinion that infiltration is feasible from a geotechnical standpoint. ESNW provided in-situ infiltration testing and has provided recommendations within this study.

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This report provides 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.

Sincerely,

EARTH SOLUTIONS NW, LLC



Stephen H. Avril
Project Manager

RECEIVED

By Virgil Amick at
2:40 pm, July 29, 2026

cc: Sanbell
Attention: Holli Heavrin, P.E.

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ES-10509.08

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APPENDICES

Appendix A	Subsurface Exploration Logs
Appendix B	PIT Test Location Plan

**GEOTECHNICAL ENGINEERING STUDY
BULLFROG FLATS – PHASES P4 AND M
BULLFROG ROAD
CLE ELUM, WASHINGTON**

ES-10509.08

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed new residential project to be constructed on the south side of Bullfrog Road in Cle Elum, Washington. This study was prepared to provide geotechnical recommendations for currently proposed development plans and included the following geotechnical services:

- Review of subsurface data provided by others.
- Engineering analyses and recommendations for the proposed development.
- Preparation of this report.

Project Description

It is our understanding the site will be re-developed with a series of new single-family residential structures and associated infrastructure improvements following the clearing and grading of the site. Given the topographic change across the site, grading activities will likely involve cuts on the order of ten feet or less to establish the final design grades. However, fills associated with a mechanically stabilized earth (MSE) wall systems may be planned to facilitate minor grade changes.

At the time of report submission, specific building load plans were not available for review; however, based on our experience with similar developments, the proposed residential structures will likely be one to two stories and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be about 1 to 2 kips per lineal foot. Slab-on-grade loading is anticipated to be approximately 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 afforded the opportunity to review the final design to verify the geotechnical recommendations and conclusions provided in this report have been incorporated into the plans.

RECEIVED
By Virgil Amick at
2:40 pm, July 29, 2026

SITE CONDITIONS

Surface

The subject site is located on the south side of Bullfrog Road, east of the intersection with Wood Duck Road in Cle Elum, Washington. The subject area consists of one tax parcel (parcel number 11078). The site is currently undeveloped and moderately forested.

Subsurface

ESNW reviewed the test pit data by others which consists of a series of 11 test pits between the two subject phases. The test pits were excavated at accessible locations within the proposed development area. The test pits were completed to assess and classify the site soils and to characterize the near-surface groundwater conditions within areas proposed for new residential structures. The approximate locations of the tests are depicted on Plate 2A (Subsurface Exploration Plan). Please refer to the test logs provided in Appendix A for a more detailed description of subsurface conditions.

Topsoil and Fill

Topsoil was encountered in the upper six to ten inches of existing grades at the subsurface exploration locations. Deeper or shallower pockets of topsoil may be encountered locally across the site. The topsoil was characterized by a dark brown color, the presence of fine organic material, and small root intrusions.

Fill was not observed during the site exploration. Fill may be observed during site-work surrounding existing building alignments and where utilities are present such as within road prisms. Where fill is encountered, it may not be suitable for support of new foundations and should be removed within the building footprint where encountered. However, ESNW should be consulted prior to removal or leaving in-place.

Native Soil

Underlying the topsoil, native soil was classified as silty gravel, sandy gravel with silt, silt, well graded gravel, and silty sand with gravel (USCS: GM, GM-GW, ML, GW, and SM respectively). Native soil relative density generally increased with depth. The moisture content at the time of exploration was generally characterized as moist. Native soils extended to the maximum exploration depth was 15.5 feet bgs.

Geologic Setting

Geologic mapping of the area indicates the site is underlain by alluvial deposits (Qa) as the primary geologic units underlying the subject site and surrounding area. However, the referenced document by others describes the site as being underlain by glacial outwash. Glacial outwash consists of a matrix of silts, sands, and gravels.

The online WSS resource identifies Racker ashy sandy loam (238), on slopes between 0 to 5 percent, as the primary soil unit on the site. These series soils are associated with glacial outwash deposits mantled by volcanic ash.

In our opinion, the native soils observed at the test locations are representative of glacial outwash deposits overlain by loess; and our observation of the subsurface conditions are in general agreement with the WSS and the reporting by others for the area under concern.

Groundwater

Groundwater seepage was not encountered at any of the test locations. However, seasonal groundwater seepage should be expected to develop within the soil substratum depending on the time of year and may be encountered during general earthwork activities.

It should be noted that seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas Review

We understand that the City of Cle Elum (COCE) recognizes erosion, sliding, earthquake, or other geologic events as geologically hazardous areas. Based on our review of the topographic information provided by the project civil engineer, portions of the slope complex on the northeast and south sides of the site are inclined at 40 percent or more. The COCE defines a landslide hazard area as, "Any area with a slope of forty percent or steeper and with a vertical relief of ten or more feet except areas composed of bedrock".

Chapter 18 of the COCE municipal code states where it is determined a geologic hazard exists on a site, "The geologic hazard area risk assessment shall include a description of the geology of the site and the proposed development; an assessment of the potential impact the project may have on the geologic hazard; an assessment of what potential impact the geologic hazard may have on the project; appropriate mitigation measures, if any; and a conclusion as to whether further analysis is necessary."

Slope stability analyses were performed to determine suitable building setbacks from the slopes which are inclined at over 40 percent, and by definition present a landslide hazard. The slope stability analyses was performed on a representative section of the proposed building area on the site, and through the subject slopes most critically sloped region (A-A'). Please see attached computer model output demonstrating factors of safety that are beyond the COCE code-mandated standard of 1.5 for pseudo static and 1.1 for seismic. In addition, we utilized the publication Geotechnical Properties of Geologic Materials by Koloski, Schwarz, and Tubbs, provided in Volume 1 of Engineering Geology in Washington in determination of design soil strength parameters based on subsurface data and available on-line geologic mapping.

ESNW evaluated the setback and conditions as shown on the referenced civil engineering plans provided by Sanbell. The section ESNW evaluated was at Lot 117 and ran through the lot and down through the entirety of the ravine located to the north of the lot. Please see attached plate (Plate 2B) for location of the slope model. Based on the stability analysis, the proposed grading will not adversely affect the subject steep slopes. No further analysis is required as the geologic hazard area risk assessment has concluded the project will not adversely affect or be affected by potential geologic hazards that are nearby given a setback of 25 feet is maintained for any home built near the top-of-steep slopes.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed residential structure(s) and associated improvements is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include site preparation and earthwork, utility installation, foundation support, slab-on-grade subgrade support, drainage, and the suitability of using on-site soils as structural fill. Where loose soil and/or loess is exposed at footing subgrade, it should be compacted in-place to the specifications for structural fill as described in this report, or removed and replaced with structural fill. The loess was observed at the surface, and extended to about four feet in places. The loess must be compacted in-place where present at footing elevations.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve site grading and related infrastructure improvements. If earthwork activities occur during wet weather, additional drainage measures, cement treatment of native soil (where allowed by the presiding jurisdiction), and/or the use of select fill material will likely be necessary during construction.

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 minimize 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 must be actively managed and may be modified during construction as site conditions require, and as approved by the site erosion control lead, to ensure proper performance.

Temporary Excavations and Slopes

Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) soil classifications are also provided:

- | | |
|--|------------------|
| • Areas exposing groundwater seepage | 1.5H:1V (Type C) |
| • Loose to medium dense soil | 1.5H:1V (Type C) |
| • Medium dense to dense native gravels and sands | 1H:1V (Type B) |

The presence of groundwater (either perched groundwater or the groundwater table) may cause localized sloughing of temporary slopes. A geotechnical professional should be afforded the opportunity 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 enhance stability and to 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:

- | | |
|----------------------------------|-------------------------------|
| • 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. Care should be taken with the silty soil present near the surface and moisture conditioning, as this material (loess) is highly moisture sensitive and will become unsuitable for use as fill if moisture content is elevated beyond about three percent of optimal.

With respect to underground utility installations and backfill, local jurisdictions may dictate the soil type(s) and compaction requirements. Unsuitable material or debris must be removed from structural areas if encountered.

In-situ and Imported Soil

The in-situ gravelly soils encountered at the subject site have a moderate sensitivity to moisture and were generally in a moist 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 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 contacted to evaluate 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

Earthwork activities that occur during the wet season will require additional measures to protect 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.

Foundations

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil (loess), or new structural fill placed directly on competent native soil. Competent native soil suitable for support of foundations will likely be encountered beginning at a depth of about two to four feet bgs. Where loose, loess, 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 be necessary.

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

- 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 may 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 applicable.

** 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 locations, the parameters and values provided below are recommended for seismic design per the 2021 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, S_s (g)	0.651
Mapped 1-second period spectral response acceleration, S_1 (g)	0.248
Short period site coefficient, F_a	1.279
Long period site coefficient, F_v	2.000
Adjusted short period spectral response acceleration, S_{MS} (g)	0.833
Adjusted 1-second period spectral response acceleration, S_{M1} (g)	0.496
Design short period spectral response acceleration, S_{DS} (g)	0.555
Design 1-second period spectral response acceleration, S_{D1} (g)	0.330

* Assumes medium dense to dense soil conditions are predominant within the upper 100 feet of the ground surface. Based on our site-specific observations as well as our experience with the project geologic setting (fine and coarse-grained deposits) across the Puget Sound region, soil conditions are likely consistent with this assumption.

Further discussion between the project structural engineer, the project owner (or their representative), and ESNW may be prudent to determine the possible impacts to the structural design due to increased earthquake load requirements under the 2021 IBC. ESNW can provide additional consulting services to aid with design efforts, including supplementary geotechnical and geophysical investigation, upon request.

Liquefaction Susceptibility

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 saturated 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, soils within the development envelope where new residential structures are proposed are characterized with low to negligible liquefaction susceptibility. The absence of a uniformly present, shallow groundwater table and the relative density of the native soil were the primary bases for this opinion.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed residential structures should be supported on well-compacted, firm, and unyielding subgrades. Where feasible, the native soil exposed at the slab-on-grade subgrade levels can likely be compacted in situ to the specifications of structural fill if groundwater seepage does not interfere with compaction activities. Unstable or yielding subgrade areas 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

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

The native soil will likely not be suitable for use as structural backfill throughout the utility trench excavations given the moisture sensitivity of the material; however, ESNW should be retained to observe in-situ conditions at the time of construction to provide appropriate recommendations. Moisture conditioning of the soil will likely be necessary before use as structural backfill. Each section of the utility lines must be adequately supported by the bedding material. Utility trench backfill should be placed and compacted to the structural fill specifications previously detailed in this report or to the applicable specifications of the presiding jurisdiction. The utility trench backfill should be placed at (or slightly above) the optimum moisture content at the time of placement and compaction. If the on-site soil cannot achieve the specifications provided in this report for structural fill, the use of imported backfill material will likely be necessary.

Drainage

The presence of groundwater seepage should be expected in excavations. Where zones of groundwater seepage are encountered, temporary measures to control groundwater seepage may be needed. Temporary measures to control groundwater seepage and surface water runoff during construction will likely involve passive elements, such as interceptor trenches and sumps.

Surface water should not be directed to the top or toe of slopes, modular block walls, or rockeries. The free-draining zones immediately behind retaining wall and rockery faces should not be used to temporarily control surface water during construction.

Surface grades must be designed to direct water away from buildings, slopes, and retaining walls. The grade adjacent to buildings, slopes, and retaining walls should be sloped away at a gradient of at least 2 percent for a horizontal distance of at least 10 feet or as setbacks allow. In our opinion, perimeter footing drains should be installed at or below the invert of the building footings where non-granular gravelly soil is not present. A typical footing drain detail is provided on Plate 4 of this report to be used where gravelly soil is not present.

If the building will incorporate crawl spaces rather than slabs-on-grade, in our opinion, a crawl space drain system can be used in lieu of perimeter footing drains. The crawl space drain must provide positive drainage to an appropriate outlet.

Infiltration Feasibility

In our opinion, infiltration potential within the native deposits is favorable based on our testing in March of 2026. In-situ infiltration testing was not part of our scope for this phase of the project, however, ESNW previously performed preliminary testing as part of the overall design process for the phases. ESNW staff observed a series of small-scale pilot infiltration tests (six in total) across phase P. The testing depth was between 6 to 15 feet below the existing surface elevations at the time of testing. Please see the measured and design rates at each location in the table below:

Test Number (depth of test)	Measured Rate (inches per hour)	Design Rate (inches per hour)
401	16	5.3
402	10	3.3
403	37	12.4
404	29	9.7
405	25	8.4
408	3	1.0

Please see attached PIT test location plan for reference in Appendix B.

LIMITATIONS

This study has been prepared for the exclusive use of Bullfrog Flats, LLC 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.

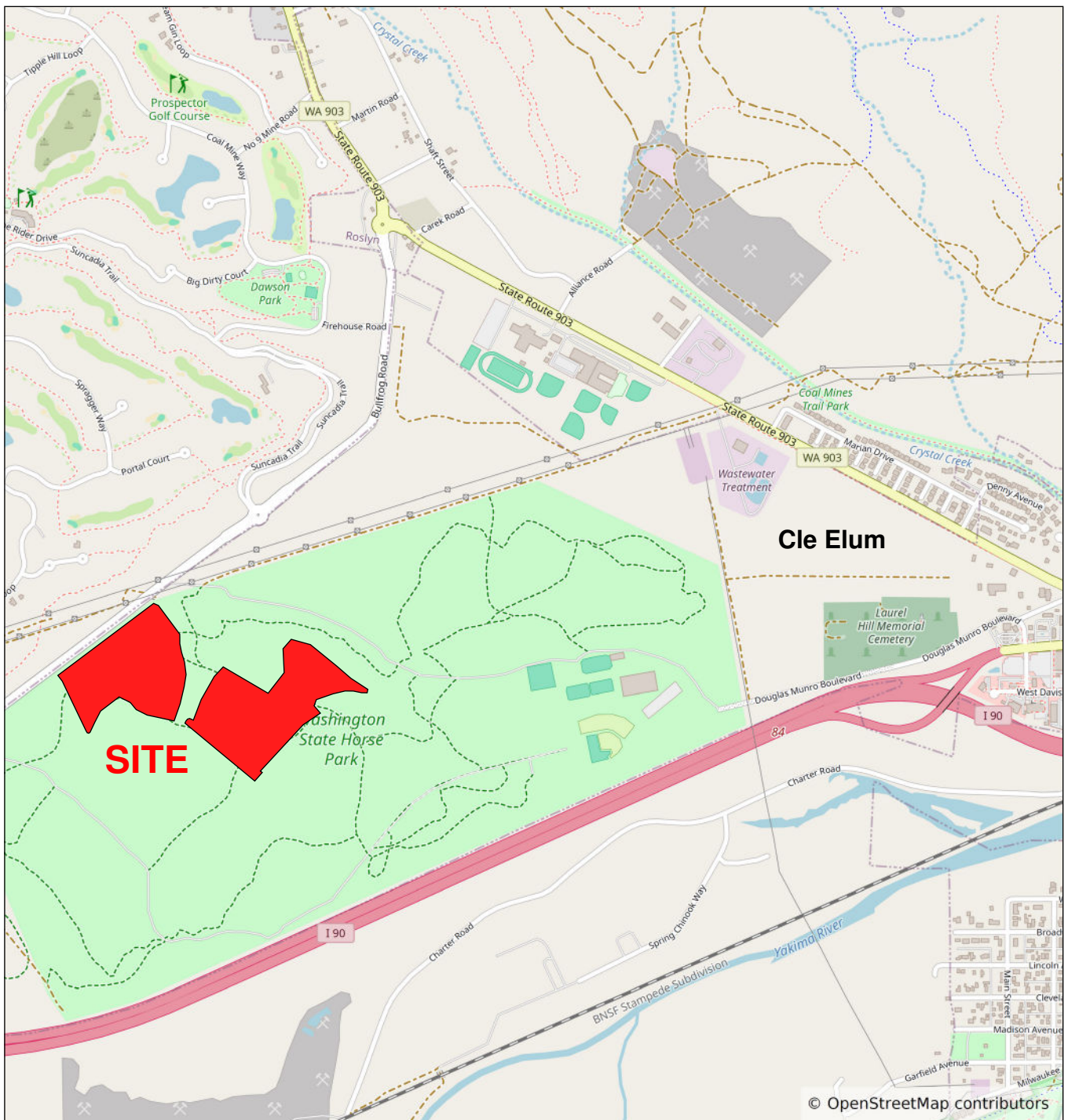
Additional Services

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 future design and construction phases of the project.

REFERENCES

The following documents and resources were reviewed as part of our report preparation:

- City of Cle Elum Municipal Code (BMC)
- COCE GIS website
- Horse Trail Grading Plan 3, Bullfrog Flats – Phase P4, prepared by Sanbell, dated May 1, 2026
- National Geologic Map Database
- Online Web Soil Survey (WSS) resource, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA)
- Technical Report, prepared by AESI, project number 20190414H001, dated September 2020



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Reference:
Kittitas County, Washington
OpenStreetMap.org



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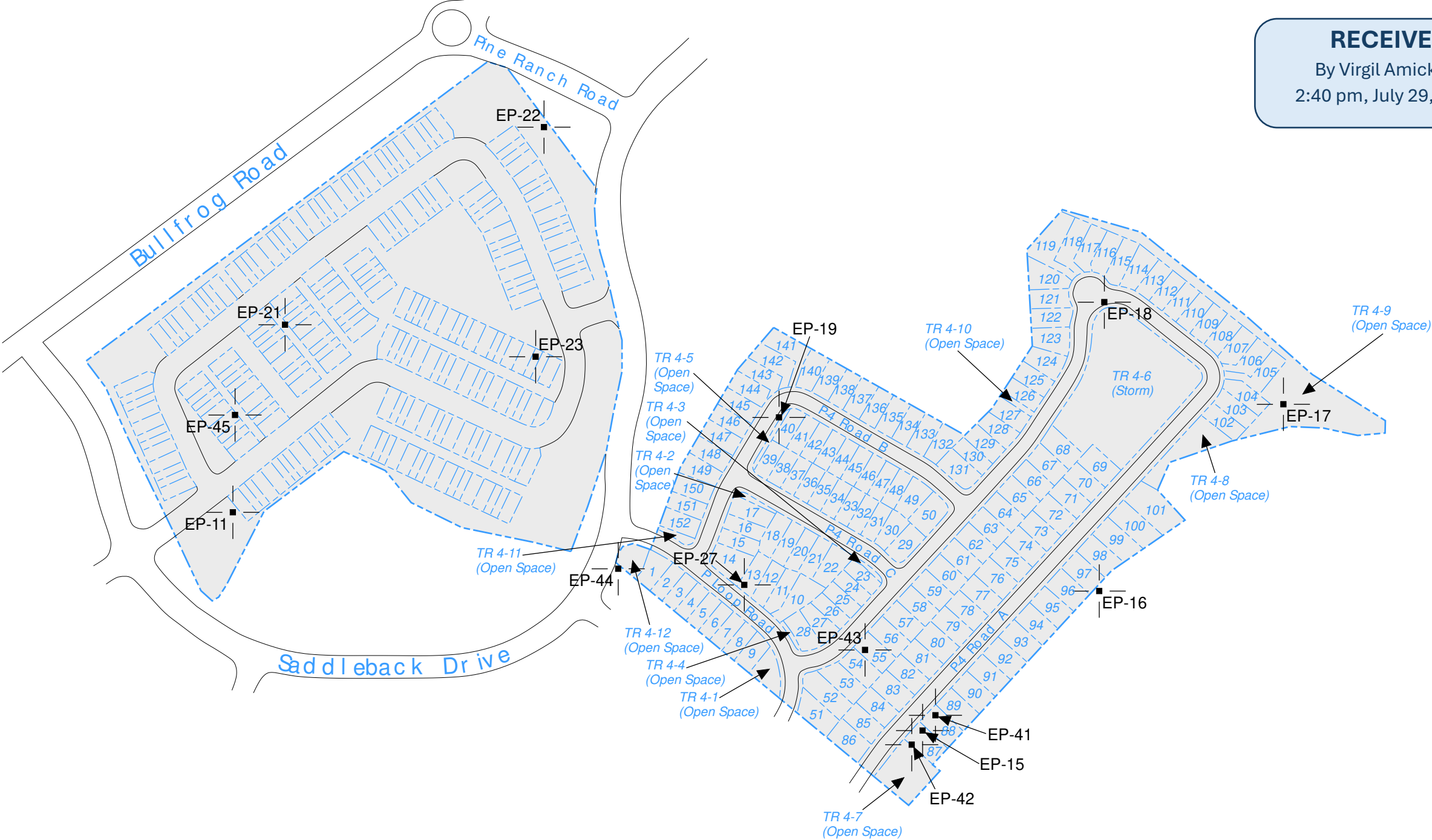
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Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services

Vicinity Map
Bullfrog Flats – Phases P4 & M
Cle Elum, Washington

Drawn ACB	Date 07/08/2026	Proj. No. 10509.08
Checked SHA	Date July 2026	Plate 1

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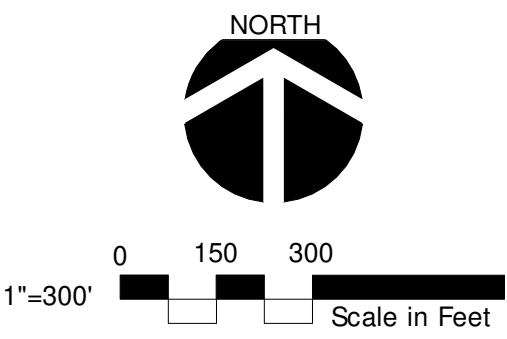


LEGEND

EP-1 | Approximate Location of AESI Exploration Pit, 2019

[Dashed Blue Outline] Subject Site

1 Proposed Lot Number



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.

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Subsurface Exploration Plan
Bullfrog Flats – Phases P4 & M
Cle Elum, Washington

Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
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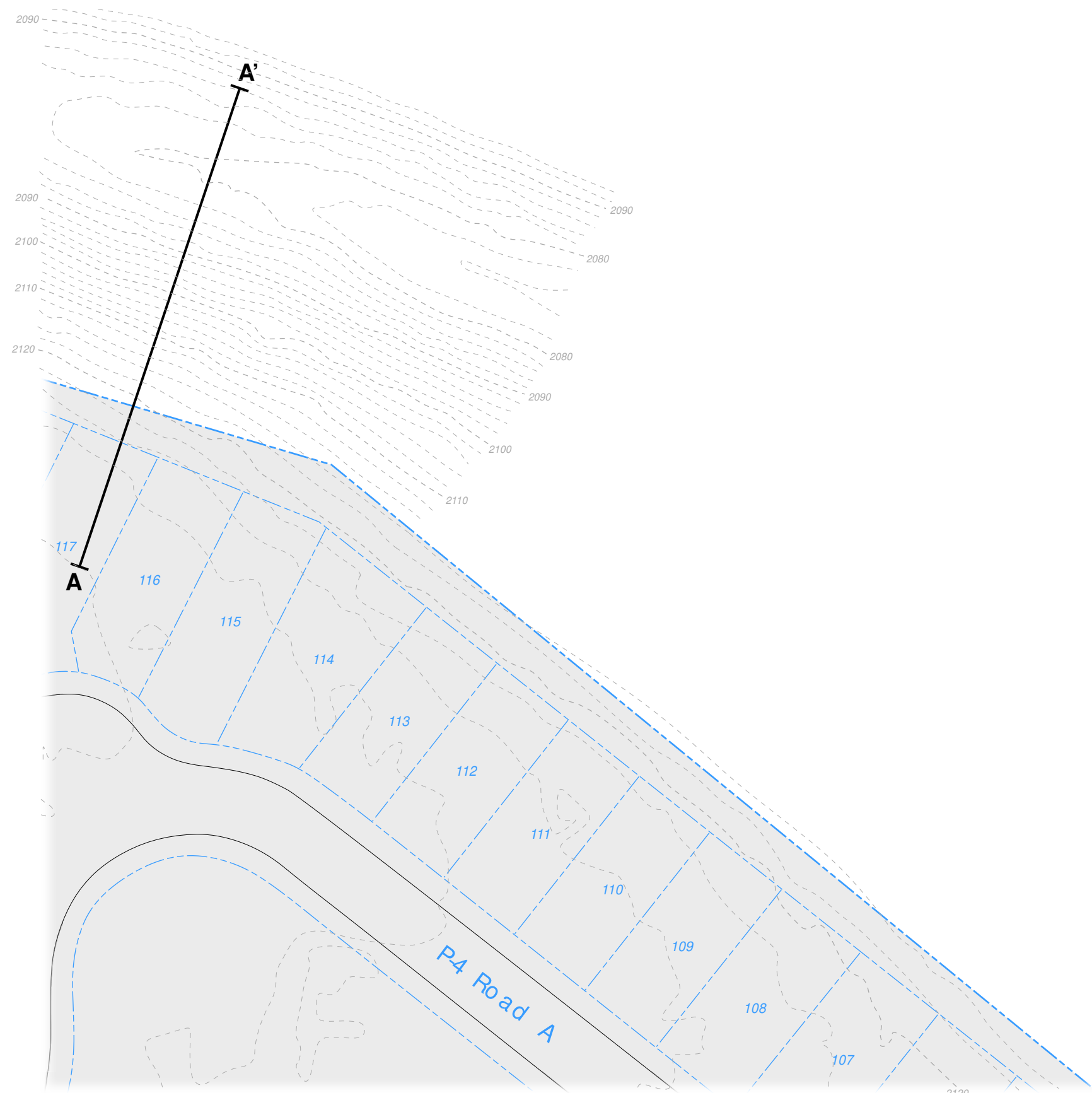
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Date
07/09/2026

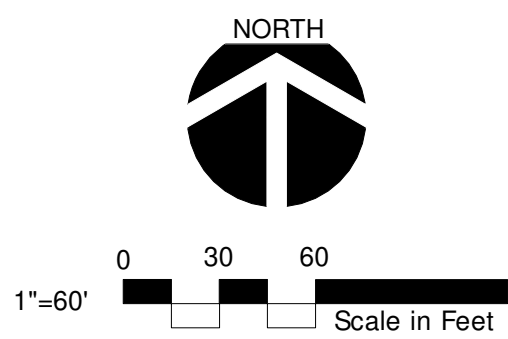
Proj. No.
10509.08

Plate
2A



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- LEGEND**
-  Subject Site
 -  Proposed Lot Number
 -  Cross-Section



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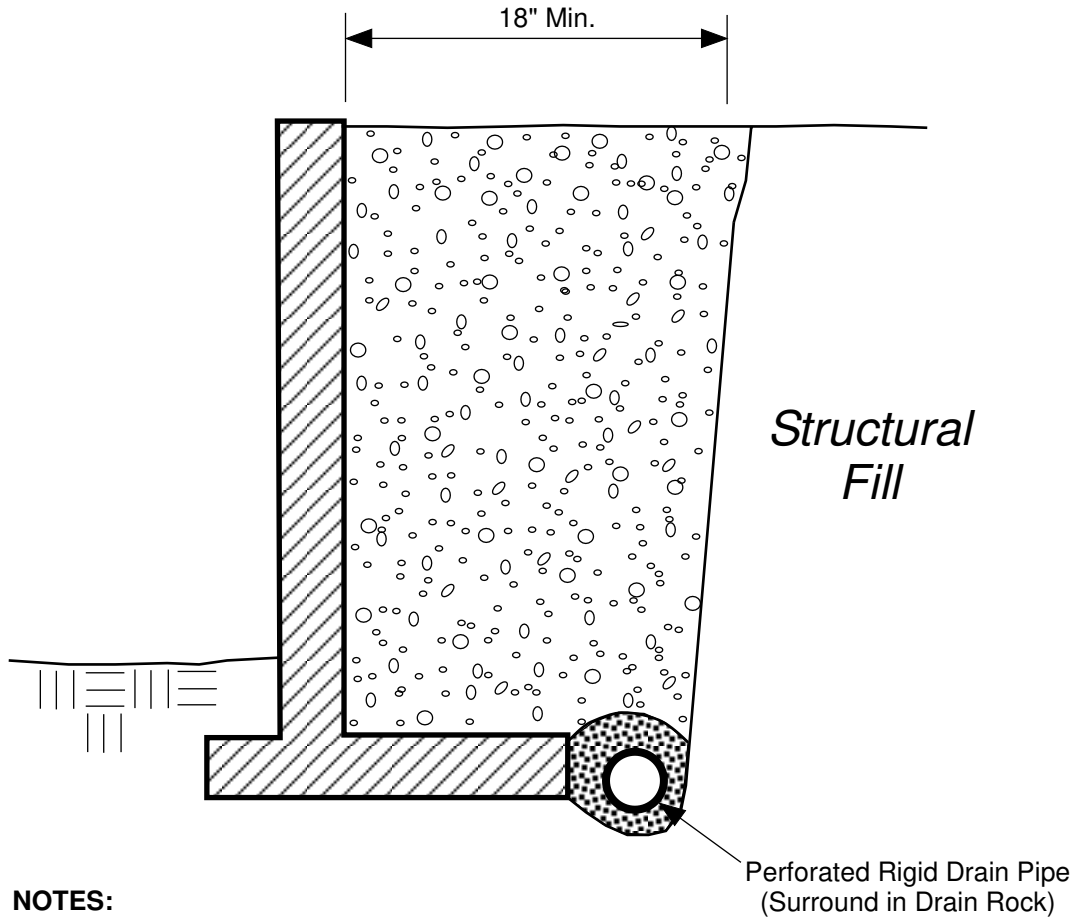
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Subsurface Exploration Plan
Bullfrog Flats – Phases P4 & M
Cle Elum, Washington

Geotechnical Engineering
Environmental Services
Earthwork Observation & Testing
CESCL & Stormwater Services



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Date 07/10/2026
Proj. No. 10509.08
Plate 2B

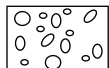


NOTES:

- 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.

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LEGEND:



Free-draining Structural Backfill



1-inch Drain Rock

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Retaining Wall Drainage Detail
Bullfrog Flats – Phases P4 & M
Cle Elum, Washington

Drawn ACB

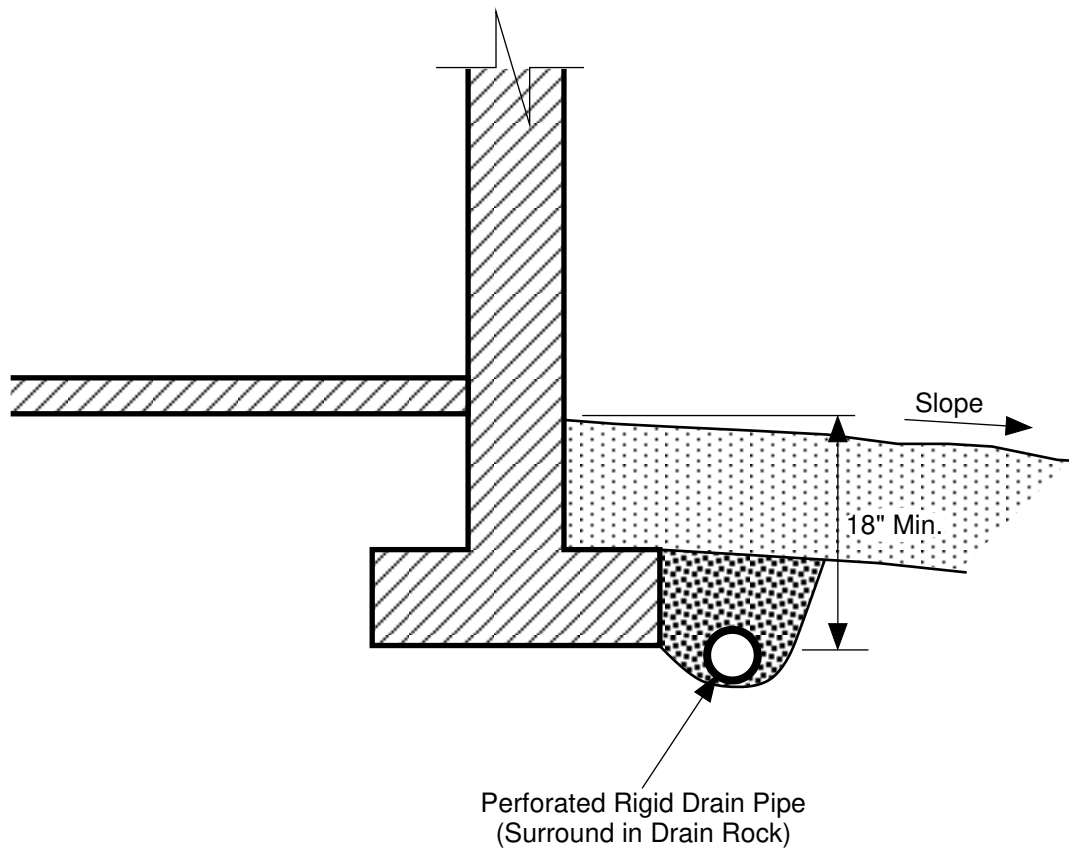
Date 07/13/2026

Proj. No. 10509.08

Checked SHA

Date July 2026

Plate 3

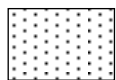


NOTES:

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

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LEGEND:



Surface Seal: native soil or other low-permeability material.



1-inch Drain Rock

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Footing Drain Detail
Bullfrog Flats – Phases P4 & M
Cle Elum, Washington

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Date 07/13/2026

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Date July 2026

Plate 4

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Appendix A

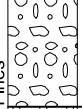
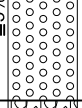
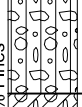
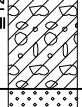
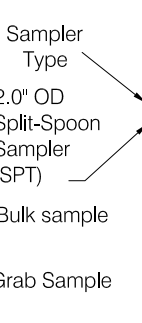
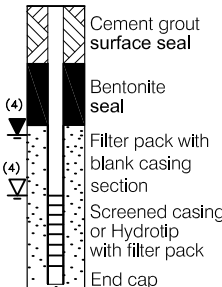
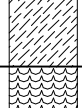
Subsurface Exploration Logs

ES-10509.08

Subsurface conditions at the subject site were explored in October of 2019 by others. A total of 15 test pits were excavated. The approximate locations of the explorations are illustrated on Plate 2A of this study. The logs are provided in this Appendix. The maximum exploration depth 15.5 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.

blocks \ dwg \ log_key.dwg LAYOUT: Layout 4 -2014 Qty Chng

Coarse-Grained Soils - More than 50% ⁽¹⁾ Retained on No. 200 Sieve				Terms Describing Relative Density and Consistency			
Gravels - More than 50% ⁽¹⁾ of Coarse Fraction Retained on No. 4 Sieve		GW	Well-graded gravel and gravel with sand, little to no fines	Coarse-Grained Soils	Density	SPT ⁽²⁾ blows/foot	Test Symbols G = Grain Size M = Moisture Content A = Atterberg Limits C = Chemical DD = Dry Density K = Permeability
		GP	Poorly-graded gravel and gravel with sand, little to no fines		Very Loose	0 to 4	
		GM	Silty gravel and silty gravel with sand		Loose	4 to 10	
		GC	Clayey gravel and clayey gravel with sand		Medium Dense	10 to 30	
Sands - 50% ⁽¹⁾ or More of Coarse Fraction Passes No. 4 Sieve		SW	Well-graded sand and sand with gravel, little to no fines	Fine-Grained Soils	Consistency	SPT ⁽²⁾ blows/foot	
		SP	Poorly-graded sand and sand with gravel, little to no fines		Dense	30 to 50	
		SM	Silty sand and silty sand with gravel		Very Dense	>50	
		SC	Clayey sand and clayey sand with gravel		Very Soft	0 to 2	
Sands - 50% ⁽¹⁾ or More of Coarse Fraction Passes No. 4 Sieve		SW	Well-graded sand and sand with gravel, little to no fines		Soft	2 to 4	
		SP	Poorly-graded sand and sand with gravel, little to no fines		Medium Stiff	4 to 8	
		SM	Silty sand and silty sand with gravel		Stiff	8 to 15	
		SC	Clayey sand and clayey sand with gravel		Very Stiff	15 to 30	
Sands - 50% ⁽¹⁾ or More of Coarse Fraction Passes No. 4 Sieve		SW	Well-graded sand and sand with gravel, little to no fines		Hard	>30	
		SP	Poorly-graded sand and sand with gravel, little to no fines				
		SM	Silty sand and silty sand with gravel				
		SC	Clayey sand and clayey sand with gravel				
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit Less than 50	ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		Component Definitions		
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Descriptive Term	Size Range and Sieve Number	
		OL	Organic clay or silt of low plasticity		Boulders	Larger than 12"	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		Cobbles	3" to 12"	
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Gravel	3" to No. 4 (4.75 mm)	
		OL	Organic clay or silt of low plasticity		Coarse Gravel	3" to 3/4"	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		Fine Gravel	3/4" to No. 4 (4.75 mm)	
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)	
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)	
		OL	Organic clay or silt of low plasticity		Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)	
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Silt and Clay	Smaller than No. 200 (0.075 mm)	
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		⁽³⁾ Estimated Percentage		Moisture Content Dry - Absence of moisture, dusty, dry to the touch Slightly Moist - Perceptible moisture Moist - Damp but no visible water Very Moist - Water visible but not free draining Wet - Visible free water, usually from below water table
		OL	Organic clay or silt of low plasticity		Component	Percentage by Weight	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		Trace	<5	
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Some	5 to <12	
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Modifier	12 to <30	
		OL	Organic clay or silt of low plasticity		Very modifier	30 to <50	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel				
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay				
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Symbols		
		OL	Organic clay or silt of low plasticity		Sampler Type	Description	
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel		2.0" OD Split-Spoon Sampler (SPT)	3.0" OD Split-Spoon Sampler	
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Bulk sample	3.25" OD Split-Spoon Ring Sampler	
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay		Grab Sample	3.0" OD Thin-Wall Tube Sampler (including Shelby tube)	
		OL	Organic clay or silt of low plasticity				
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel				
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay				
Fine-Grained Soils - 50% ⁽¹⁾ or More Passes No. 200 Sieve	Silt and Clays Liquid Limit 50 or More	CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay				
		OL	Organic clay or silt of low plasticity				
		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel				
		CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay				
Highly Organic Soils		PT	Peat, muck and other highly organic soils		⁽¹⁾ Percentage by dry weight		⁽⁴⁾ Depth of ground water ▼ ATD = At time of drilling ▽ Static water level (date)
					⁽²⁾ (SPT) Standard Penetration Test (ASTM D-1586)		
					⁽³⁾ In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)		
					⁽⁵⁾ Combined USCS symbols used for fines between 5% and 12%		

Classifications of soils in this report 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 D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.



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EXPLORATION LOG KEY

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FIGURE A1

EXPLORATION PIT NO. EP-11

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil
1	Loess
2	Medium dense, slightly moist, light brown to tan, SILT, trace fine sand; minor rootlets; non-cohesive (ML).
3	Alpine Till
4	Medium dense, slightly moist to moist, light brownish gray to brown, very silty, fine to medium SAND, some gravel; occasional cobbles; small void spaces above 3 feet; unsorted (SM). Harder digging at ~3 feet.
5	Very hard digging at 5 feet.
6	
7	Becomes moist and slightly darker brown 6.5 to 7 feet.
8	
9	
10	
11	
12	
13	Bottom of exploration pit at depth 12 feet No seepage. No caving.
14	
15	
16	
17	
18	
19	
20	

KCTP3 190414H001.GPJ April 17, 2020

**47° North
Cle Elum, WA**



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Logged by: TG
Approved by: CJK
B-07

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Project No. 190414H001
10/22/19

EXPLORATION PIT NO. EP-15

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. DESCRIPTION	
	Rocky Topsoil	
1	Glacial Erratic	
2	Highly fractured, hard, pink brown, volcanic rock; rock is in a silty matrix from 1 to 2 feet.	
3	Non-rippable with John Deere 135 G below 3 feet.	
4	Bottom of exploration pit at depth 3 feet No seepage. No caving.	
5		
6		
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KCTP3 190414H001.GPJ April 17, 2020

47° North
Cle Elum, WA

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2:40 pm, July 29, 2026

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Approved by: CJK
B-07



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Project No. 190414H001
10/22/19

EXPLORATION PIT NO. EP-16

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
1	Topsoil
2	Outwash
3	Medium dense, slightly moist, silty, GRAVEL, some sand; abundant cobbles; scattered boulders; contains lenses of clean fine gravel; stratified (GM).
4	Becomes sandy with trace silt below 4 feet (GW).
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	Bottom of exploration pit at depth 14 feet No seepage. Minor caving throughout.
16	
17	
18	
19	
20	

KCTP3 190414H001.GPJ April 17, 2020

**47° North
Cle Elum, WA**

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Approved by: CJK
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Project No. 190414H001
10/22/19

EXPLORATION PIT NO. EP-17

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. DESCRIPTION
1	Topsoil
2	Outwash
3	Medium dense to dense, slightly moist, tan, very gravelly, very silty, SAND; abundant cobbles; stratified (SM).
4	Becomes silty below 4 feet.
5	
6	
7	
8	Medium dense, slightly moist, grayish tan, sandy, GRAVEL, trace to some silt; abundant cobbles; scattered boulders (GW-GM).
9	
10	Becomes sandy to very sandy with trace silt below 10 feet.
11	
12	
13	
14	
15	Bottom of exploration pit at depth 14 feet No seepage. No caving.
16	
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-18

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil - 10 inches
1	Loess
2	Very stiff, slightly moist, tan, SILT, trace gravel; moderately abundant roots; non-plastic (ML).
3	
4	Outwash
5	Medium dense, slightly moist, tan, silty, GRAVEL, some sand; stratified (GM).
6	Medium dense, slightly moist, grayish tan, sandy, GRAVEL, trace silt; abundant cobbles and small boulders (GW).
7	
8	
9	
10	Becomes grayish brown below 10 feet.
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. Minor caving throughout.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-19

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
1	Topsoil
2	Loess
3	Very stiff, slightly moist, tan, SILT, trace gravel; non-plastic (ML).
4	Outwash
5	Medium dense, slightly moist, tan, silty, GRAVEL, some sand (GM).
6	Medium dense, slightly moist, grayish brown, sandy, GRAVEL, trace silt; abundant cobbles and scattered small boulders; stratified (GW).
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. Moderately severe caving.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-21

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered. DESCRIPTION
	Topsoil
1	Loess
2	Loose, slightly moist, light brown to tan, SILT, some fine to medium sand, trace gravel; minor rootlets; non-cohesive (ML).
3	Outwash
4	Medium dense, slightly moist, brownish gray to brown, very fine to coarse very sandy, GRAVEL, some silt; frequent cobbles; moderately stratified (GW-GM).
5	
6	
7	Becomes moist ~7 to 8 feet.
8	
9	
10	
11	
12	Occasional boulders ~12 to 15 feet.
13	
14	Slightly increased moisture and becomes silty at ~14 feet.
15	
16	Bottom of exploration pit at depth 15 feet No seepage. Minimal caving 0 to 3 feet. Moderate caving 3 to 15 feet.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-22

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil
1	
	Loess
2	Loose, slightly moist, light brown to brown, SILT, some fine sand, trace gravel; minor rootlets; noncohesive (ML).
	Outwash
3	Medium dense, slightly moist, very fine to coarse sandy, GRAVEL, trace silt; frequent cobbles (up to 18 inches in diameter); moderately stratified (GW).
4	
5	
6	
7	
8	Increased moisture at ~8 feet.
9	
10	Medium dense, moist to very moist, brownish gray, very gravelly, silty, fine to coarse SAND; occasional cobbles; silt/clay coated gravels; moderately stratified (SM).
11	
12	Becomes less silty with frequent cobbles 11 to 12 feet.
13	
14	
15	Medium dense, moist, brown to brownish gray, very sandy, GRAVEL, trace to some silt; frequent cobbles; moderately stratified (GP-GM).
16	Bottom of exploration pit at depth 15 feet No seepage. Minimal caving 0 to 3 feet. Moderate caving 3 to 15 feet.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-23

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil
1	Loess
2	Loose, slightly moist, light brown to tan, SILT, some fine to medium sand, trace gravel; minor rootlets; non-cohesive (ML).
3	
	Outwash
4	Digging becomes gravelly at 3.5 feet, contact is indistinct.
5	
6	Medium dense, slightly moist, light brown, silty, very gravelly, fine to coarse SAND (SM), to very sandy GRAVEL, some silt; frequent cobbles (GP-GM); moderately stratified.
7	
8	Medium dense, slightly moist, light brown, very sandy, GRAVEL, trace silt; moderately stratified (GW).
9	
10	Becomes moist at ~8 feet with frequent large cobbles.
11	
12	
13	
14	Occasional boulders 9 to 11 feet.
15	
16	Bottom of exploration pit at depth 15 feet Seepage?? Minimal caving 0 to 5 feet. Moderate caving 5 to 15 feet.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-27

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil
1	Loess
2	Loose, slightly moist, light brown to tan, SILT, some fine sand, trace gravel; minor rootlets; non-cohesive (ML).
3	Outwash
4	
5	Medium dense, slightly moist, brownish gray, sandy, silty, GRAVEL; frequent cobbles; moderately stratified (GM).
6	
7	Becomes moist at 7 feet.
8	Less cobbles 8 to 11 feet.
9	
10	
11	Becomes very sandy with more fine gravel at 11 feet.
12	
13	Medium dense, moist, brown, very gravelly, fine to coarse SAND, some silt (SP-SM) ranging to very sandy, GRAVEL, some silt (GP-GM); moderately stratified.
14	
15	Bottom of exploration pit at depth 14 feet No seepage. Minimal caving 0 to 3 feet. Moderate caving 3 to 14 feet.
16	
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-41

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Gravelly Topsoil
1	Alpine Till
2	Medium dense, moist, grayish brown to brown, very silty, SAND, some gravel (SM).
3	
4	Becomes dense to very dense below 3.5 feet.
5	
6	Outwash
7	Medium dense to dense, slightly moist, sandy, silty, GRAVEL; stratified (GM).
8	
9	
10	
11	
12	
13	
14	
15	
16	Bottom of exploration pit at depth 15 feet No seepage. No caving.
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-42

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.	DESCRIPTION
		Topsoil
1		Loess
2	Very stiff, moist, tan, fine sandy, SILT (ML).	
3		Alpine Till
4	Medium dense, slightly moist, very silty, SAND, some gravel; non stratified (SM).	
5	Becomes gravelly below 4 feet.	
6		
7		
8	Becomes medium dense to dense below ~8 feet.	
9		
10	Contains scattered cobbles and boulders and becomes very dense below ~10 feet.	
11		
12		
13		
14		
15	Bottom of exploration pit at depth 14 feet No seepage. No caving.	
16		
17		
18		
19		
20		

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EXPLORATION PIT NO. EP-43

Depth (ft)	
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	DESCRIPTION
	Topsoil
1	
	Loess
2	Loose, slightly moist to moist, light brown to brown, SILT, some fine sand; minor rootlets; non-cohesive (ML).
	Outwash
3	
4	Medium dense, slightly moist, light brown, very fine to medium sandy, GRAVEL, some silt; minor rootlets; frequent cobbles; moderately stratified (GW-GM).
5	
6	
7	
8	Color turns more brownish gray, more coarse sand, and frequent large cobbles (up to ~24 inches in diameter).
9	
10	
11	
12	
13	
14	Moisture increases and more fine gravel at 13 feet.
15	Bottom of exploration pit at depth 14 feet No seepage. Minimal caving 0 to 3 feet. Moderate caving 3 to 14 feet.
16	
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-44

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
1	Topsoil
2	Alpine Till
3	Medium dense, slightly moist to moist, light brownish gray, sandy, SILT, some gravel; minor rootlets; unsorted (ML).
4	
5	Becomes moist, darker brown, and harder digging at 5 feet.
6	
7	
8	Dense, moist, brownish gray, very silty, gravelly, fine to coarse SAND; occasional cobbles; unsorted (SM).
9	
10	
11	
12	
13	Becomes very sandy.
14	
15	Bottom of exploration pit at depth 14 feet No seepage. No caving.
16	
17	
18	
19	
20	

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EXPLORATION PIT NO. EP-45

Depth (ft)	This log is part of the report prepared by Associated Earth Sciences, Inc. (AESI) for the named project and should be read together with that report for complete interpretation. This summary applies only to the location of this trench at the time of excavation. Subsurface conditions may change at this location with the passage of time. The data presented are a simplification of actual conditions encountered.
	DESCRIPTION
	Topsoil
1	Loess
2	Very stiff, slightly moist to moist, SILT; non-plastic (ML).
3	
4	Outwash
5	Moist, tan, very gravelly, silty, SAND (SM).
6	
7	
8	Medium dense, slightly moist, grayish tan, very sandy, GRAVEL, trace to some silt; stratified (GM-GW).
9	
10	Becomes slightly more moist and grayish brown with trace silt below 10 feet (GW).
11	
12	Contains abundant cobbles and scattered small boulders and becomes moist below 12 feet.
13	Becomes very moist below 13 feet.
14	
15	Trace clay below 15 feet; sticky.
16	Bottom of exploration pit at depth 15.5 feet No seepage. No caving.
17	
18	
19	
20	

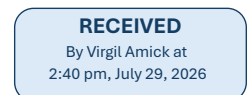
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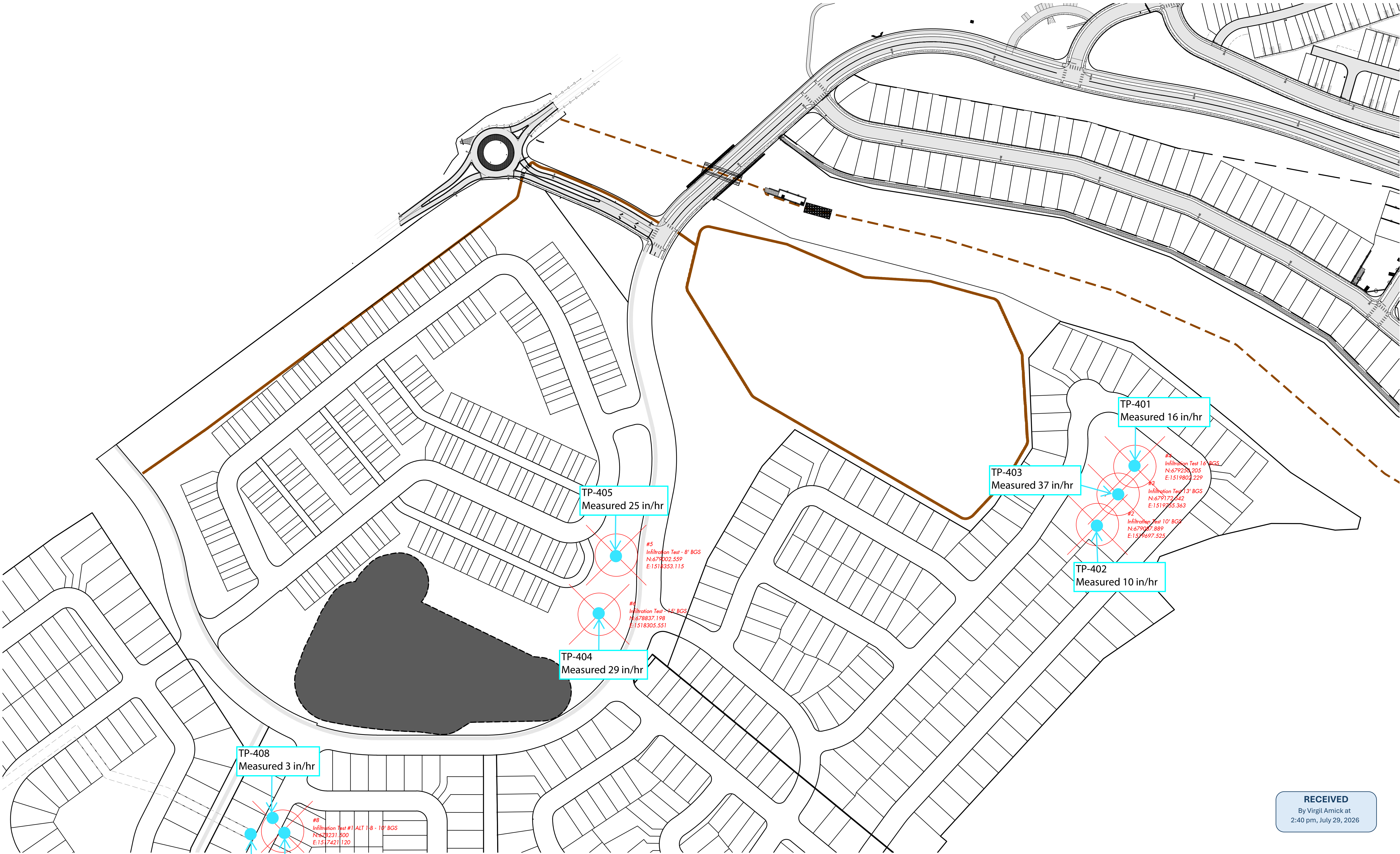
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Appendix B
PIT Test Location Plan
ES-10509.08

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3/11/2026 3:04 PM OCHAUWERS J:\2025\25308 ENGINEERING\PRELIMINARY\WORKING\LOC\INFILTRATION & BIORETENTION TESTING\LOCATIONS 2026-03-03 DWG (A)CUT1



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