Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

GEOTECHNICAL ENGINEERING STUDY
PROPOSED FAIRGROUND IMPROVEMENTS
902 SOUTH MERIDIAN AND 705 – 15TH AVENUE SOUTHWEST
PUYALLUP, WASHINGTON

Include geotechnical study in the Storm Report. [Geotechnical Study; Pg 1 of 37]

ES-9092

Provide wet-season (Dec 1 thru Apr 1) high groundwater elevation as required by the Ecology Manual. If project timelines do not allow wet-season monitoring prior to anticipated start of construction, provide a financial security (Assignment-of-funds or Bond) in the amount of $7,500.00 that guarantees monitoring during the upcoming wet-season. [Geotechnical Study; Pg 1 of 37]

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PREPARED FOR

WASHINGTON STATE FAIR

January 11, 2024

State of Washington
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01/11/2024

Chase G. Halsen, L.G., L.E.G.
Project Manager

KEVEN D. HOFFMANN
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01/11/2024

Keven D. Hoffmann, P.E.
Associate Principal Engineer

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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 <u>not</u> 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 <u>Not</u> 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 <u>not</u> 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 <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
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Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

January 11, 2024
ES-9092

Washington State Fair
110 – 9th Avenue Southwest
Puyallup, Washington 98371

Attention: Renee McClain

Greetings:

Earth Solutions NW, LLC (ESNW) is pleased to present this geotechnical engineering report to support the proposed project. Based on the results of our investigation, the construction of the proposed fairground improvements/structures is considered feasible from a geotechnical standpoint. Based on our explorations, the subject site is underlain by extensive alluvial deposits. The local groundwater table was present at an approximate depth of five feet below grade during the May 2023 exploration.

Based on our findings, the project may consider the use of subgrade improvements to establish adequate support for the proposed foundation systems. Foundation design considerations, design parameters, and associated risks (from a geotechnical standpoint) are provided in this report.

From a geotechnical standpoint, it is our opinion that infiltration is generally infeasible for the project. The variability of the encountered alluvial soils and shallow exposure of the local groundwater table were the primary bases for this opinion. Shallow LID designs may be considered where surficial exposures of sandy soils are present and where vertical separation from the groundwater table can be successfully achieved.

Pertinent geotechnical recommendations are provided in this study. We appreciate the opportunity to be of service to you on this project. If you have any questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Chase G. Halsen, L.G., L.E.G.
Project Manager

cc: Jeff Brown Architecture, LLC
Attention: Jeff Brown
Snogyi Cho

Chris Fynboe, P.E.

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ES-9092

INTRODUCTION

General

This geotechnical engineering study was prepared for the proposed improvements to be completed within the Washington State Fairgrounds, in Puyallup, Washington. This study was prepared to provide geotechnical recommendations for the currently proposed improvements and included the following geotechnical services:

- Subsurface exploration to characterize soil and groundwater conditions, including soil borings and a seismic cone penetration test (SCPT).

- Laboratory testing of representative soil samples collected at the boring locations.

- Geotechnical engineering analyses.

Project Description

ESNW understands that the project scope will include the following:

- Construction of a 16-foot-tall canopy structure at the Gold Gate entrance.

- Demolition and construction of a new, approximately 10,000-square-foot, single-story event space in place of the existing International Building.

The canopy structure will be comprised of steel and will be supported by four 42-inch-diameter concrete columns with concrete foundation elements. Column loading for the canopy structure is estimated at 81 kips, including the weight of the columns. Loading conditions for the event space were not provided to ESNW for review at the time of this report; however, we anticipate perimeter loads of about 2 to 3 kips will be included in the design. Grade cuts and/or fills of less than five feet are expected to achieve the design elevations across the proposed improvement areas. We assume conventional detention designs or collection and discharge to an appropriate location and/or structure will be utilized for stormwater management.

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

SITE CONDITIONS

Surface

The project areas are located within the northeastern and west-central portions of the Washington State Fairgrounds, located in Puyallup, Washington. The Gold Gate and International Building areas are currently developed with various structures and are primarily surfaced with asphalt. Topography is relatively level with less than five feet of elevation change occurring in each site area.

Subsurface

An ESNW representative observed, logged, and sampled the advancement of six soil borings and one SCPT on May 22 and 23, 2023. The explorations were generally targeted to the areas of proposed improvements and ranged in depths from about 11.5 to 100 feet below the existing ground surface (bgs). All explorations were completed using machinery and operators retained by ESNW. The approximate locations of the explorations are depicted on Plate 2 (Boring Location Plan). Please refer to the exploration logs provided in Appendix A for a more detailed description of the encountered subsurface conditions.

Representative soil samples collected at the exploration locations were analyzed following the Unified Soil Classification System (USCS) and United States Department of Agriculture methods and procedures. Samples were analyzed in our laboratory for moisture content and grain size distribution in general accordance with ASTM procedures. Laboratory test results are provided in Appendix B.

Topsoil and Fill

Surficial topsoil may be expected in areas surfaced with landscaping or gravel. Based on our experience in the area, an approximate topsoil section of about 12 inches can be anticipated.

Fill was interpreted at B-2 and B-3 and observed extending to a depth of about one to three feet bgs. The fill was characterized as poorly graded gravel with silt and sand. The in-situ condition of the fill was characterized primarily as very loose to loose and moist.

Native Soil and Geologic Setting

Native soils were characterized as poorly graded sand with variable fines content (USCS: SP to SP-SM), silty sand (USCS: SM), sandy silt (USCS: ML), and silty gravel with sand (USCS: GM). In general, the native soils were encountered in a very loose to loose and moist to water-bearing condition, extending to the maximum boring depth of about 31.5 feet bgs. A similar soil profile was interpreted from the SCPT, which was advanced to a depth of about 100 feet bgs. Based on our observations, native soils appear to be representative of alluvial deposits (Qa), which have been mapped across the subject site.

The referenced Web Soil Survey resource indicates the site is underlain by Puyallup fine sandy loam. This series is generally associated with terraces and flood plains and is derived from alluvium. Based on the observed site conditions, native soils are generally considered representative of alluvium per local geologic mapping designations.

Groundwater

The local groundwater table was exposed at a depth of between 5 and 10 feet bgs at the boring locations during the May 2023 fieldwork. Data acquired from the SCPT indicates a static groundwater table depth of about 4.7 feet bgs in the approximate area of advancement. In our opinion, the SCPT data should be considered the most accurate depiction of the local groundwater table elevation at the time of the May 2023 exploration.

The presence of groundwater and fluctuation of the local groundwater table elevation can depend on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater elevations are higher during the winter, spring, and early summer months.

Review of Geologically Hazardous Areas

ESNW understands that the City of Puyallup recognizes areas susceptible to the processes of landslides, erosion, seismic, and volcanic activity as geologically hazardous areas, as outlined in Puyallup Municipal Code (PMC) 21.06.1210. Based on our investigation, the site is considered to possess a seismic hazard (related to liquefaction) and is sited within a volcanic hazard area (Lahar flow path).

Seismic Hazard (Liquefaction Evaluation)

Based on our site investigation and subsequent review, the site is considered to possess moderate liquefaction potential. The site is underlain by a thick alluvium deposit that consists of alternating layers of sand-, silt-, and gravel-dominated soils that extend to at least 100 feet bgs, with the local groundwater table interpreted at a depth of about 4.7 feet bgs during the May 2023 exploration.

ESNW evaluated liquefaction potential by modeling the site soil and groundwater profile using the LiquefyPro computer program. Soil and groundwater data were imported into the software using the SCPT data collected on site. Some modeling parameters, such as total unit weight and approximate fines content, were assigned to the various layers based on our observations, representative sieve analyses, and experience with similar soil deposits. A site-modified peak ground acceleration of 0.6 *g* and an earthquake magnitude of 7.0 were used to model the subject seismic event. In the current site condition, total settlement of up to about 10 inches across the entire 100-foot-deep soil profile was indicated by the computer program, with liquefaction primarily occurring in the sand-dominate layers. Parametric analyses that evaluated the settlement response of the soil within the upper 50 feet, 25 feet, and 10 feet of the subsurface profile suggest reduced total settlement estimates on the order of 6.75 inches to less than 1 inch.

Based on the results of our analyses, it is our opinion that the site may experience between about 3 to 5 inches of total settlement and 1.5 to 2.5 inches of differential settlement across each respective improvement area during the modeled seismic event. Although the model suggests that the 100-foot explored (upper) soil profile may experience greater total settlement, it is our opinion that not all subsurface soil layers are susceptible to liquefaction; thus, deeper potential settlement will be attenuated and is not likely to be directly expressed at the surface (where the proposed improvements will be sited).

The estimated settlement values provided in this section are considered an adequate representation of potential settlements that could be experienced during the modeled seismic event. Smaller or larger settlement amounts could occur, depending on the magnitude and location of the seismic event.

The effects of seismically induced settlement can be reduced—but not eliminated— following the completion of subgrade improvement activities. If the reduced settlement values are considered tolerable, then the foundation support methodology provided in this report (see the *Foundation Considerations* section) is considered viable for the project. However, if the reduced settlement estimates are not tolerable, alternative means of foundation support (such as surcharging or deep pile support) will likely be necessary. ESNW can provide further evaluations and recommendations relating to alternative foundation support designs, if requested.

Volcanic Hazard

Based on a review of the City of Puyallup Critical Areas application, the subject site is within an area identified as a potential volcanic hazard/lahar flow path. As such, the project will need to adhere to the standards provided in PMC 21.06.1260.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed improvements is considered feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposed project are structural fill placement and compaction, foundation and subgrade preparation and design, geologically hazardous areas mitigation, and stormwater management.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and site clearing and demolition activities. Subsequent earthwork activities will involve site grading and installation of limited infrastructure and stormwater management improvements.

Temporary Erosion Control

The following temporary erosion and sediment control Best Management Practices (TESC BMPs) are offered:

- Temporary construction entrances and drive lanes should be constructed with at least six inches of quarry spalls to both minimize off-site soil tracking and provide a stable access entrance surface. A woven geotextile fabric can be placed beneath the quarry spalls to provide greater stability, if needed.
- Silt fencing should be placed around the site perimeter.
- When not in use, soil stockpiles should be covered or otherwise protected.
- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed before beginning earthwork activities.
- Dry soils disturbed during construction should be wetted to reduce dust.
- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional TESC BMPs, as specified by the project civil engineer on the plans, should be incorporated into construction activities. ESNW can assist the project design team in designating appropriate BMPs, if requested, and can review TESC plans for applicability and to provide input. TESC measures will require upkeep and potential modification during construction to ensure proper function; such upkeep should be coordinated with the site erosion control lead, where applicable.

Stripping

Topsoil should be expected in existing landscaping and unimproved areas. In general, a topsoil section of 12 inches may be assumed for preliminary stripping estimations. ESNW should be contacted to evaluate appropriate stripping depths and areas subject to overexcavation during initial grading activities. Where encountered, organic-rich topsoil should be stripped and segregated into a stockpile for later use on site or to be exported.

Existing fill, which was exposed at B-2 and B-3, should be removed from improvement areas. ESNW can evaluate existing fill soils at the time of construction to evaluate in-situ competency and potential use as structural fill or structural element support.

Excavations and Slopes

Based on the soil conditions observed and inferred from the exploration locations, a maximum allowable temporary slope inclination of one-and-one-half horizontal to one vertical (1.5H:1V) may be used during construction. This recommendation is consistent with applicable Federal Occupation Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) guidelines for Type C soil.

Steeper temporary slope inclinations within undisturbed, dense native soil may be feasible based on the soil and groundwater conditions exposed within the excavations. ESNW can evaluate the feasibility of utilizing steeper temporary slopes at the time of construction on a case-by-case basis. In any event, an ESNW representative should observe temporary slopes to confirm inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope stability recommendations, as necessary.

If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be graded to 2H:1V (or flatter) and planted with vegetation to enhance stability and minimize erosion potential. Permanent slopes should be observed by ESNW before vegetation and landscaping.

In-situ and Imported Soil

Successful use of the on-site soil as structural fill will largely be dictated by the moisture content at the time of placement and compaction. Based on the conditions observed during the subsurface exploration, the native alluvial soil is considered to possess a moderate to severe moisture sensitivity. Depending on the time of year construction occurs, moisture conditioning measures (such as adding water to the on-site soil) may be necessary as part of site grading and earthwork activities. If the on-site soil cannot be successfully compacted, the use of imported soil may be necessary.

Imported structural fill soil should consist of well-graded, granular soil that can achieve a suitable working moisture content. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Subgrade Preparation

Foundation and slab subgrade surfaces should consist of competent, undisturbed native soil or structural fill placed and compacted atop competent soil. ESNW should observe subgrade areas before placing formwork. Supplementary recommendations for subgrade improvement may be provided at the time of construction; such recommendations would likely include further mechanical compaction effort or overexcavation and replacement with suitable structural fill.

Structural Fill

Structural fill is defined as compacted soil placed in the foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. The following recommendations are provided for soils intended for use as structural fill:

- Moisture content — At or slightly above optimum
- Relative compaction (minimum) — 95 percent (per ASTM D1557)
- Loose lift thickness (maximum) — 12 inches

Native site soil may only be considered suitable for use as structural fill if a suitable moisture content is achieved at the time of placement and compaction. Existing fill soil may be considered for use as structural fill only if the soil is free of organics and debris and can achieve a suitable moisture content at the time of compaction. ESNW should evaluate soils intended for use as structural fill at the time of construction. If the on-site soil cannot achieve the above specifications, the use of imported structural fill material will likely be necessary. Concerning underground utility installations and backfill, local jurisdictions will likely dictate soil type(s) and compaction requirements.

<u>Foundation Considerations</u>

Based on the observed and inferred soil conditions, it is our opinion that the native alluvium will not provide adequate support for the proposed improvements in the current condition. As such, mitigation will be necessary as part of the project to establish competent bearing conditions and reduce the potential for settlement in both the static and seismic cases.

From a geotechnical standpoint, it is feasible to complete localized subgrade improvements in the Gold Gate and International Building areas of the project. The following recommendations can be considered for the subgrade improvement and grid foundation system approach:

- Overexcavate a minimum of two feet below the design foundation subgrade elevation. Depending on the conditions exposed, additional overexcavation may be recommended by ESNW at the time of construction. Additional overexcavation may also be necessary where existing fill is present.

- Mechanically compact the exposed soil surface with heavy machinery until a firm and unyielding condition is established, as confirmed by ESNW representatives.

- Place a suitable geotextile fabric (as recommended by ESNW at the time of construction) atop the compacted subgrade to provide separation and/or strengthening. Restore grades using crushed rock or suitable granular fill in accordance with the recommendations provided in the *Structural* Fill section of this report. ESNW should be contacted to evaluate all material proposed for use as structural fill before placement and compaction.

For the Gold Gate, we understand that four, 42-inch-diameter concrete columns will be utilized. For the International Building, the foundation should be constructed as a grid system with no independent or isolated footings.

The above subgrade improvement program would be adequate in establishing competent soil bearing conditions for the proposed structures. However, this approach is not intended to fully mitigate post-construction settlement potential. Based on our evaluations, a total static settlement of two to three inches and differential static settlement of one to one-and-one-half inches may be experienced. Under seismic conditions, a total settlement of three to five inches and differential settlement of one-and-one-half to two-and-one-half inches may be experienced.

The anticipated static and seismically induced settlement estimates are independent. As such, the building designer should account for both static and seismically induced settlements in their designs. Based on our experience, targeted subgrade improvements would likely be the most cost- and time-efficient mitigation strategy. However, there is a higher risk of both static and seismically induced settlements with this approach. If the anticipated settlements associated with these targeted subgrade improvements are not tolerable, the project should consider alternative means of foundation support.

Provided the foundations will be supported as recommended, following the completion of the subgrade improvements activities outlined above, the following parameters may be used for design:

- Allowable soil bearing capacity 2,500 psf
- Passive earth pressure 300 pcf (equivalent fluid)
- Coefficient of friction 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5. ESNW should be afforded the opportunity to review the site layout and building load plans to confirm the recommendations provided in this report are applicable and appropriate for the project. Additional foundation preparation and design considerations may be provided at that time, as necessary.

Seismic Design

The 2018 International Building Code recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. ESNW recognizes that the presence of potentially liquefiable soils typically warrants a Site Class F designation; however, as presented in section 20.3.1.1, projects with structures that possess a fundamental period of vibration equal to or less than 0.5 seconds (which is assumed to apply to the proposed structures) do not require a site response analysis. As such, a site class determination in accordance with Section 20.3 and the corresponding values of F_a and F_v is permitted.

Based on the data collected at the SCPT location, in accordance with the designation criteria provided in Table 20.1-1 of ASCE 7-16, Site Class E should be used for the subject site and project. This determination is based on the calculated averaged shear wave velocity of 552 ft/sec for the upper 100 feet.

Further discussion between the project structural engineer and ESNW may be prudent to determine appropriate earthquake design parameters for the project. ESNW can provide additional consulting services to aid with design efforts, including supplementary geotechnical and geophysical investigation, upon request. ESNW can assist in determining appropriate seismic design coefficients during the appropriate phase of the project.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported by competent, firm, and unyielding subgrades. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill before slab construction. A capillary break consisting of at least four inches of free-draining crushed rock or gravel should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, the installation of a vapor barrier below the slab should be considered. Vapor barriers should be made from material specifically designed for use as a vapor barrier and should be installed in accordance with the manufacturer's recommendations.

Retaining Walls

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

- Active earth pressure (unrestrained condition) — 40 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 60 pcf
- Traffic surcharge* (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 225 pcf (equivalent fluid)
- Coefficient of friction — 0.35
- Seismic surcharge — 8H psf†

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

The above passive pressure and friction values include a factor-of-safety of 1.5 and are based on a level backfill condition and level grade at the wall toe. The design parameters provided above assume native soil will be retained behind the wall. If a sufficient thick zone of structural fill is retained by the wall (with respect to vertical and lateral extent), less stringent design parameters can be provided. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along with the height of the wall and to a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of less permeable soil, if desired. A sheet drain may be considered instead of free-draining backfill. 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. Hydrostatic pressures should be included in the wall design if drainage is not provided.

Drainage

Zones of perched groundwater seepage could develop in site excavations depending on the time of year grading operations take place, particularly within deeper excavations for utilities and/or the stormwater facility. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to both 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, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Provide a small-scale PIT test to determine infiltration feasibility. [geotech, pg 17]

Infiltration Feasibility

From a geotechnical standpoint, infiltration is generally considered infeasible for the subject project areas. The variability of the encountered alluvial soils and relatively shallow exposure of the local groundwater table were the primary bases for this opinion. Shallow LID designs may be considered where surficial exposures of sandy soils are present and where vertical offsets from the groundwater table can be successfully achieved. ESNW would be pleased to assist in further evaluating LID infiltration feasibility at the appropriate phase of site design.

Utility Support and Trench Backfill

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

The on-site soil is not considered suitable for use as structural backfill throughout the utility trench excavations unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction. Moisture conditioning of the soil may be necessary at some locations before use as structural fill. 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.

LIMITATIONS

This study has been prepared for the exclusive use of the Washington State Fair 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. No warranty, express or implied, is made. Variations in the soil and groundwater conditions observed at the test locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

Additional Services

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

REFERENCES

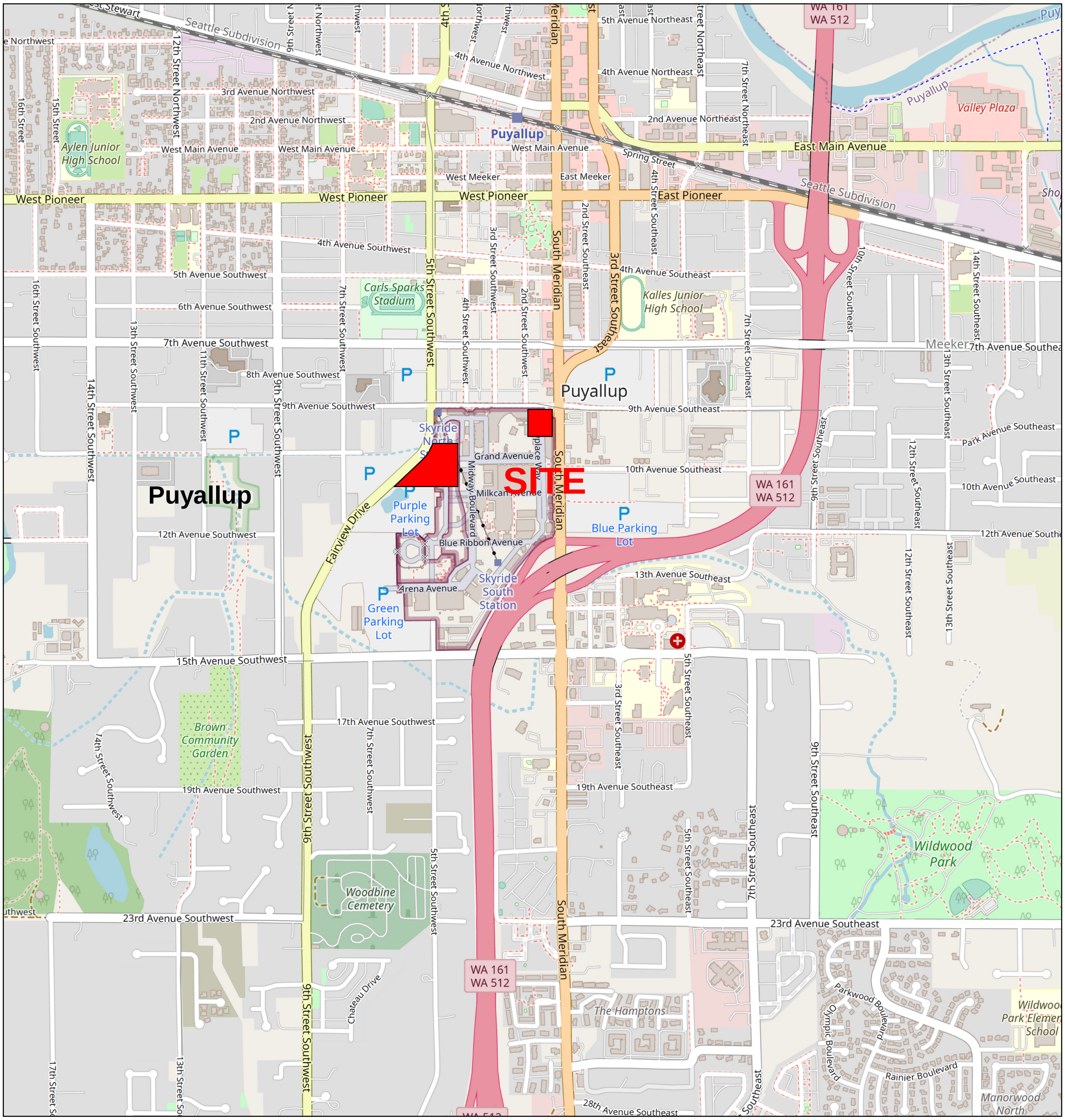
The following documents and maps were reviewed as part of the preparation of this study:

- Site Plan, prepared by JMJ Team, Figure 1, dated January 31, 2017

- Web Soil Survey, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture

- Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington, compiled by J. Eric Schuster et al., November 2015

- Chapter 21.06, Article XII of the Puyallup Municipal Code



Reference:
Pierce County, Washington
OpenStreetMap.org

NORTH

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

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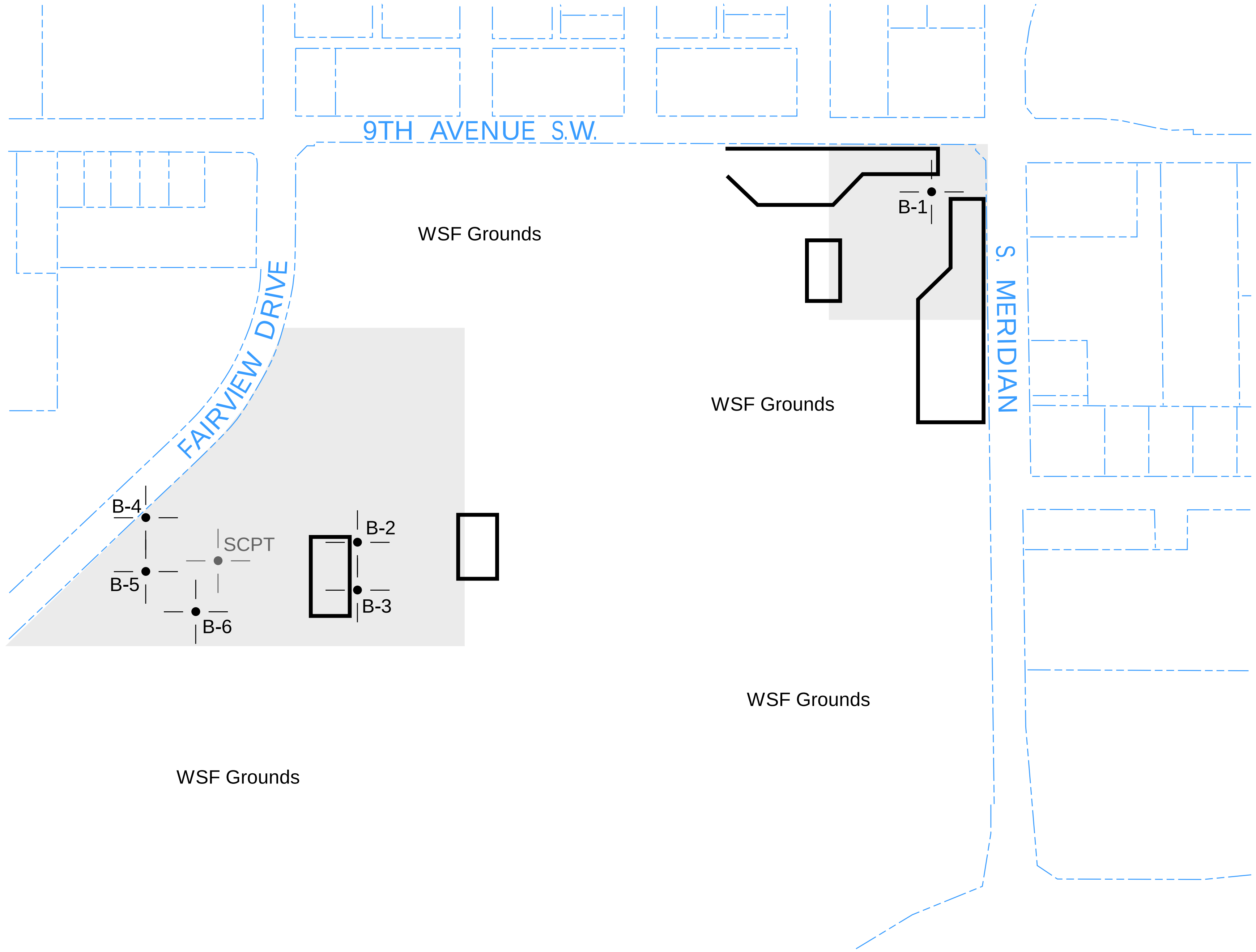
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Washington State Fair
Puyallup, Washington

Drawn MRS	Date 06/29/2023	Proj. No. 9092
Checked CGH	Date June 2023	Plate 1



LEGEND

B-1 — Approximate Location of ESNW Boring, Proj. No. ES-9092, May 2023

Subject Site

Existing Building

NORTH

NOT - TO - SCALE

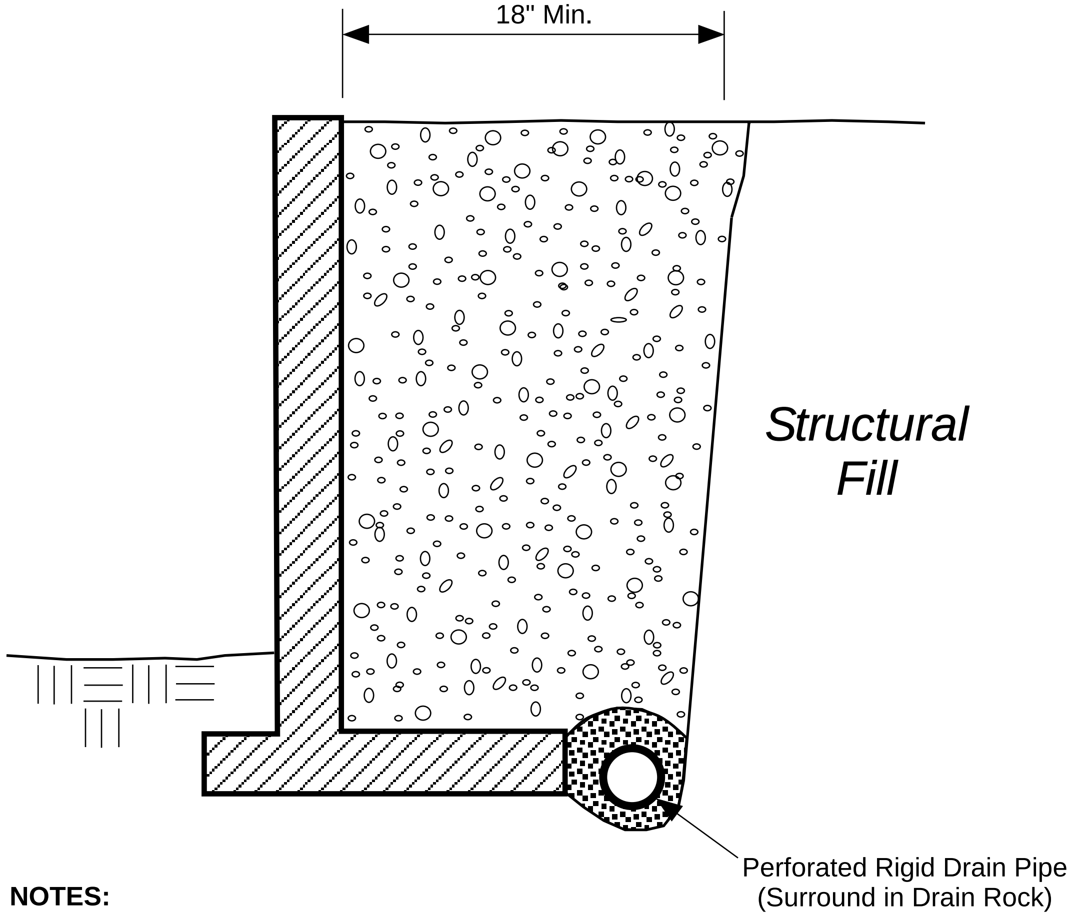
NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided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

Boring Location Plan
Washington State Fair
Puyallup, Washington

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

Drawn	MRS
Checked	CGH
Date	01/10/2024
Proj. No.	9092
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

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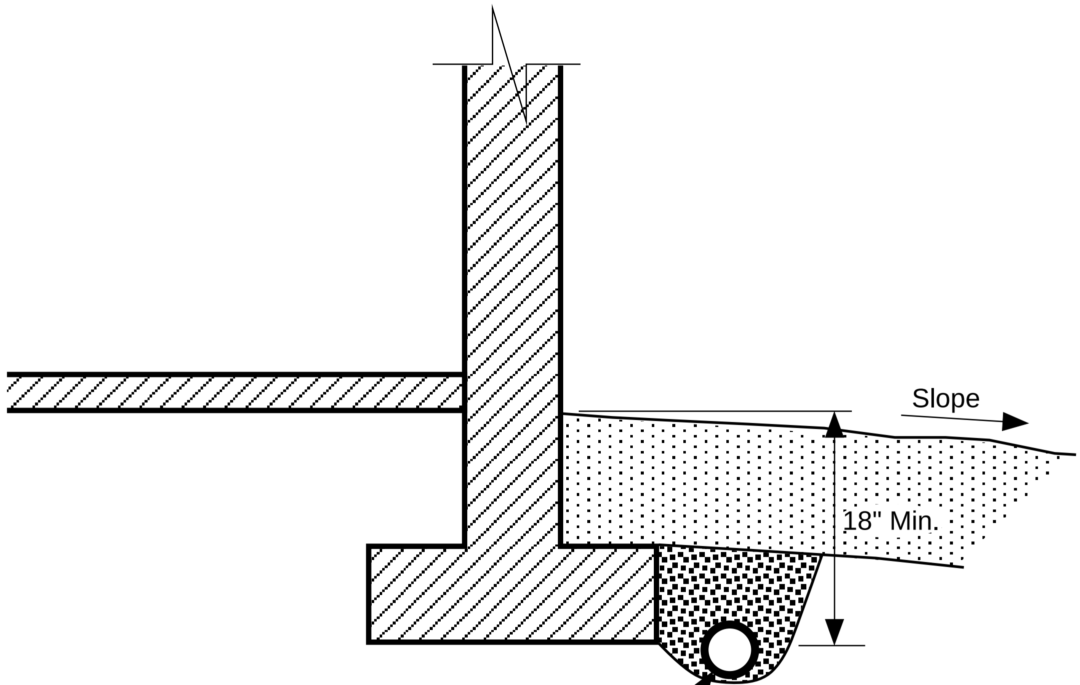
Retaining Wall Drainage Detail
Washington State Fair
Puyallup, Washington

Drawn CAM	Date 07/18/2023	Proj. No. 9092
Checked CGH	Date July 2023	Plate 3



NOTES:

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

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

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

1-inch Drain Rock

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

Footing Drain Detail
Washington State Fair
Puyallup, Washington

Drawn CAM	Date 07/18/2023	Proj. No. 9092
Checked CGH	Date July 2023	Plate 4

Appendix A

Subsurface Exploration Logs

ES-9092

Subsurface conditions at the subject site were explored on May 22 and 23, 2023. Six soil borings and one SCPT were advanced using exploratory equipment and operators retained by ESNW. The approximate locations of the explorations are illustrated on Plate 2 of this study. The boring logs and associated SCPT charts are provided in this Appendix. The explorations were advanced to depths of about 11.5 to 100 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.

Major Divisions			Symbol	Description
Coarse-Grained Soils - More Than 50% Retained on No. 200 Sieve	Gravels - More Than 50% of Coarse Fraction Retained on No. 4 Sieve	< 5% Fines	GW	Well-graded gravel with or without sand, little to no fines
			GP	Poorly graded gravel with or without sand, little to no fines
		> 12% Fines	GM	Silty gravel with or without sand
			GC	Clayey gravel with or without sand
	Sands - 50% or More of Coarse Fraction Passes No. 4 Sieve	< 5% Fines	SW	Well-graded sand with or without gravel, little to no fines
			SP	Poorly graded sand with or without gravel, little to no fines
		> 12% 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	Silts and Clays Liquid Limit Less Than 50		ML	Silt with or without sand or gravel; sandy or gravelly silt
			CL	Clay of low to medium plasticity; lean clay with or without sand or gravel; sandy or gravelly lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt with or without sand or gravel; sandy or gravelly elastic silt
			CH	Clay of high plasticity; fat clay with or without sand or gravel; sandy or gravelly fat clay
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils
Fill			FILL	Made Ground

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch

Damp - Perceptible moisture, likely below optimum MC

Moist - Damp but no visible water, likely at/near optimum MC

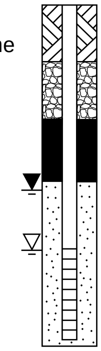
Wet - Water visible but not free draining, likely above optimum MC

Saturated/Water Bearing - Visible free water, typically below groundwater table

Symbols

ATD = At time of drilling

Static water level (date)



Terms Describing Relative Density and Consistency

Coarse-Grained Soils:

Density	SPT blows/foot
Very Loose	< 4
Loose	4 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	≥ 50

Fine-Grained Soils:

Consistency	SPT blows/foot
Very Soft	< 2
Soft	2 to 3
Medium Stiff	4 to 7
Stiff	8 to 14
Very Stiff	15 to 29
Hard	≥ 30

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 (%)

Component Definitions

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)

Modifier Definitions

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)

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.

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EXPLORATION LOG KEY

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-499-4711

BORING NUMBER B-1

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18413 **LONGITUDE** -122.29411
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
▽ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Asphalt 1"- 2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					GM		Brown silty GRAVEL with sand, loose, wet
	SS	100	3-4-4 (8)	MC = 26.5			
5							-becomes moist [USDA Classification: very gravelly LOAM]
	SS	33	9-4-3 (7)	MC = 11.5 Fines = 28.7			
7.5 ▽					ML		Brown sandy SILT, loose, water bearing -groundwater table
	SS	67	3-2-4 (6)	MC = 31.7			
10 (10.0)	SS	100	2-2-3 (5)	MC = 28.1	SP		Gray poorly graded SAND, loose, water bearing
15	SS	100	3-4-5 (9)	MC = 20.0			-becomes black -heave
20 (20.0)							

(Continued Next Page)

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BORING NUMBER B-1

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18413 **LONGITUDE** -122.29411
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Asphalt 1"- 2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	3-1-5 (6)	MC = 19.7	SP	21.5	Black poorly graded SAND, loose, water bearing -heave

Boring terminated at 21.5 feet below existing grade. Groundwater table encountered at 7.5 feet during excavation. Boring backfilled with bentonite.

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.

Earth Solutions NW, LLC
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Telephone: 425-449-4704
Fax: 425-499-4711

BORING NUMBER B-2

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18243 **LONGITUDE** -122.29838
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
▽ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Asphalt ~2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					GP-GM		Brown poorly graded GRAVEL with silt and sand, very loose, moist (Fill)
	SS	33	7-2-2 (4)	MC = 18.3	ML	3.0	Brown sandy SILT, very loose, moist to wet
5	SS	33	6-4-6 (10)	MC = 26.9 Fines = 57.9			-becomes medium dense, wet to saturated [USDA Classification: silghtly gravelly LOAM]
	SS	100	3-2-4 (6)	MC = 30.3			▽ -groundwater table -becomes gray, loose, water bearing
10	SS	100	3-2-2 (4)	MC = 26.2			-becomes very loose
15	SS	100	4-3-2 (5)	MC = 27.4			-becomes loose
20						20.0	

Provide continuous groundwater monitoring data during the wet season (December 21st- April 1st) [geotech, pg 27]

(Continued Next Page)

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BORING NUMBER B-2

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18243 **LONGITUDE** -122.29838
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
▽ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Asphalt ~2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	67	4-5-12 (17)	MC = 28.1	SM		Brown silty SAND, medium dense, water bearing -organic/wood debris (tree stump?) -exaggerated blow counts
25	SS	33	13-23-34 (57)			26.5	-wood debris in sampler

Boring terminated at 26.5 feet below existing grade due to refusal on obstruction. Groundwater table encountered at 7.5 feet during drilling. Boring backfilled with bentonite.

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.

Earth Solutions NW, LLC
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Telephone: 425-449-4704
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BORING NUMBER B-3

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18219 **LONGITUDE** -122.29837
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF DRILLING** 10 ft
SURFACE CONDITIONS Asphalt ~2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					GP-GM	1.0	Brown poorly graded GRAVEL with silt and sand, loose, moist (Fill)
					SM	5.0	Brown silty SAND, loose, moist
5	SS	67	2-2-3 (5)	MC = 25.3	SP-SM	10.0 ∇	Brown poorly graded SAND with silt, loose, wet
10	SS	100	2-2-4 (6)	MC = 30.9 Fines = 82.7	ML	20.0	Gray SILT with sand, loose, water bearing -groundwater table [USDA Classification: LOAM]
15	SS	100	3-2-4 (6)	MC = 33.4			
20							

(Continued Next Page)

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Telephone: 425-449-4704
Fax: 425-499-4711

BORING NUMBER B-3

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18219 **LONGITUDE** -122.29837
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF DRILLING** 10 ft
SURFACE CONDITIONS Asphalt ~2"
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	3-1-3 (4)	MC = 36.1	ML		Brown sandy SILT, very loose, water bearing
25						25.0	
	SS	100	2-3-4 (7)	MC = 33.8	SP		Black poorly graded SAND, loose, water bearing -layered silty sand -trace organics/wood fragments
30	SS	67	2-9-10 (19)	MC = 26.2		31.5	-becomes medium dense (exaggerated blow counts due to heave) -6" silty sand lens

Boring terminated at 31.5 feet below existing grade. Groundwater table encountered at 10.0 feet during drilling. Boring backfilled with bentonite.

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.

Earth Solutions NW, LLC
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Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-499-4711

BORING NUMBER B-4

PROJECT NUMBER ES-9092 **PROJECT NAME** Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23 **GROUND ELEVATION**
DRILLING CONTRACTOR Geologic Drill Partners **LATITUDE** 47.18254 **LONGITUDE** -122.29994
LOGGED BY CGH **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Grass **AFTER DRILLING**

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					ML		Brown sandy SILT, very loose, moist
	SS	0	2-2-2 (4)				-no recovery
5	SS	67	2-2-2 (4)	MC = 34.1 Fines = 60.3			-moderate perched groundwater seepage -becomes wet [USDA Classification: slightly gravelly LOAM]
	SS	100	3-3-3 (6)	MC = 33.1			▽ -groundwater table -becomes loose, water bearing
10	SS	100	2-2-4 (6)	MC = 42.5			-4" to 6" silt lens
15						15.0	
	SS	100	6-6-7 (13)	MC = 29.1	SP		Black poorly graded SAND, medium dense, water bearing
20							

(Continued Next Page)

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Telephone: 425-449-4704
Fax: 425-499-4711

BORING NUMBER B-4

PROJECT NUMBER ES-9092 **PROJECT NAME** Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23 **GROUND ELEVATION**
DRILLING CONTRACTOR Geologic Drill Partners **LATITUDE** 47.18254 **LONGITUDE** -122.29994
LOGGED BY CGH **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Grass **AFTER DRILLING**

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	67	5-5-6 (11)	MC = 15.1	SP	21.5	Black poorly graded SAND, medium dense, water bearing *(continued)* -organic/wood fragments

Boring terminated at 21.5 feet below existing grade. Groundwater table encountered at 7.5 feet and groundwater seepage encountered at 5.0 feet during drilling. Boring backfilled with bentonite.

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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Fax: 425-499-4711

BORING NUMBER B-5

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/22/23 **COMPLETED** 5/22/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18224 **LONGITUDE** -122.29989
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
∇ **AT TIME OF DRILLING** 7.5 ft
SURFACE CONDITIONS Grass
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					SM		Brown sily SAND, loose, moist
	SS	17	2-2-3 (5)	MC = 32.4			
5	SS	67	3-3-3 (6)	MC = 28.0			-becomes gray, wet
	SS	100	4-4-4 (8)	MC = 30.2			∇ -groundwater table, becomes water bearing -heterogeneous color, gray to brown
10	SS	100	3-3-4 (7)	MC = 33.3		11.5	

Boring terminated at 11.5 feet below existing grade. Groundwater table encountered at 7.5 feet during drilling. Boring backfilled with soil cuttings/bentonite.

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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Fax: 425-499-4711

BORING NUMBER B-6

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/23/23 **COMPLETED** 5/23/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18208 **LONGITUDE** -122.29957
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
▽ **AT TIME OF DRILLING** 5 ft
SURFACE CONDITIONS Grass
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					SM		Brown silty SAND, loose, moist
	SS	33	8-4-4 (8)	MC = 10.1			
5							▽ -becomes very loose, water bearing -groundwater table
	SS	100	2-2-1 (3)	MC = 32.9			
7.5	SS	100	2-2-3 (5)	MC = 27.5	SP-SM		Dark gray poorly graded SAND with silt, loose, water bearing
10.0	SS	100	3-1-2 (3)	MC = 32.8	SM		Gray silty SAND, very loose, water bearing
							-becomes loose
15	SS	100	3-4-3 (7)	MC = 30.4			-layered sections of poorly graded sand and silty sand
20							20.0

(Continued Next Page)

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BORING NUMBER B-6

PROJECT NUMBER ES-9092
PROJECT NAME Washington State Fair
DATE STARTED 5/23/23 **COMPLETED** 5/23/23
GROUND ELEVATION
DRILLING CONTRACTOR Geologic Drill Partners
LATITUDE 47.18208 **LONGITUDE** -122.29957
LOGGED BY CGH **CHECKED BY** KDH
GROUND WATER LEVEL:
NOTES
AT TIME OF DRILLING 5 ft
SURFACE CONDITIONS Grass
AFTER DRILLING

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS	100	2-3-2 (5)	MC = 28.7	SM	21.5	Dark gray silty SAND, loose, water bearing -6" sand lens

Boring terminated at 21.5 feet below existing grade. Groundwater table encountered at 5.0 feet during drilling. Boring backfilled with bentonite.

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-9092

Earth Solutions NW, LLC
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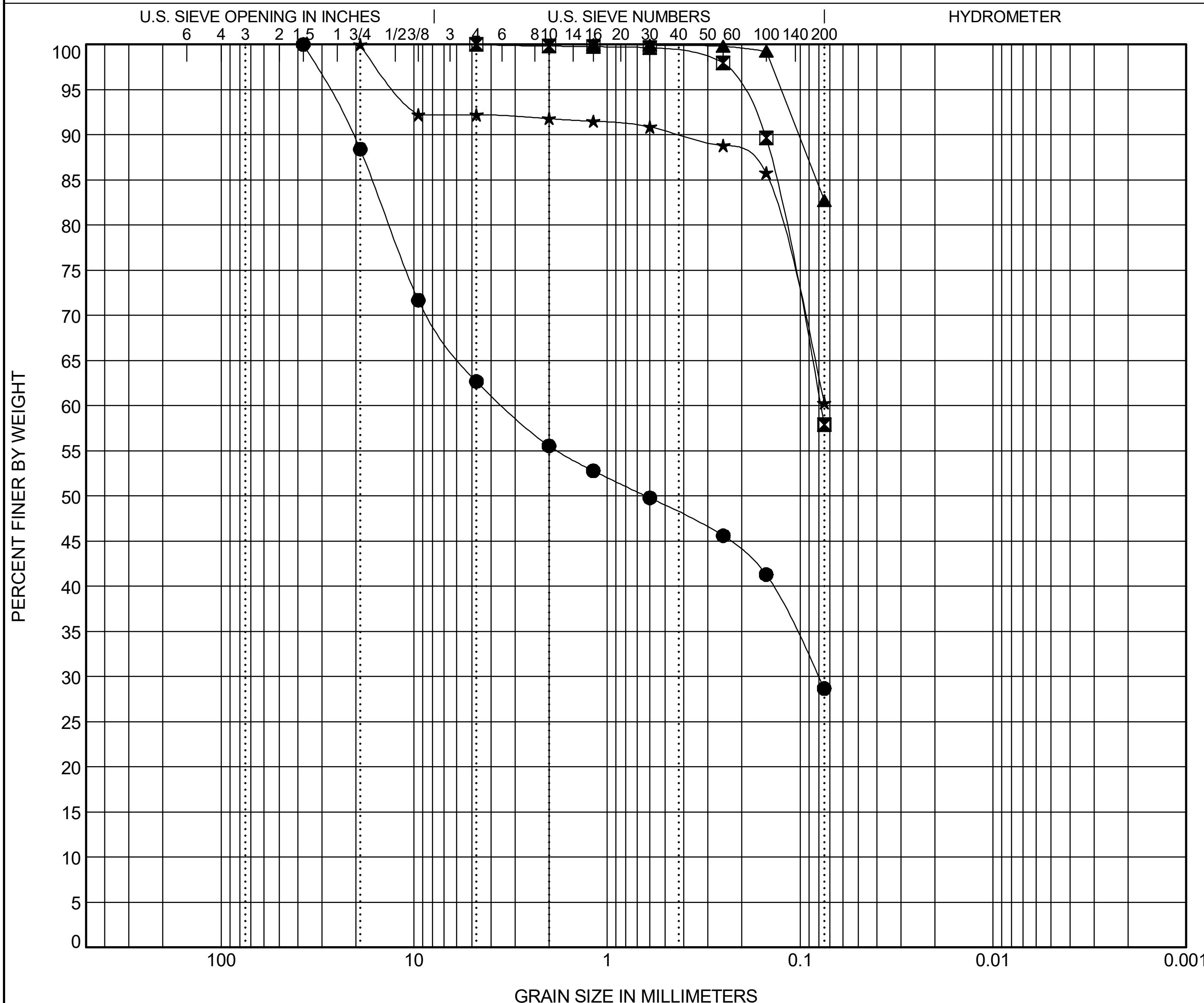
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9092 **PROJECT NAME** Washington State Fair



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	Cc	Cu
●	**B-01**	**5.00ft.**	**USDA: Brown Very Gravelly Loam. USCS: GM with Sand.**		
☒	**B-02**	**5.00ft.**	**USDA: Brown Slightly Gravelly Loam. USCS: Sandy ML.**		
▲	**B-03**	**10.00ft.**	**USDA: Gray Loam. USCS: ML with Sand.**		
★	**B-04**	**5.00ft.**	**USDA: Brown Slightly Gravelly Loam. USCS: Sandy ML.**		

	Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**B-01**	**5.0ft.**	**37.5**	**3.429**	**0.081**					**28.7**	
☒	**B-02**	**5.0ft.**	**4.75**	**0.079**						**57.9**	
▲	**B-03**	**10.0ft.**	**1.18**							**82.7**	
★	**B-04**	**5.0ft.**	**19**							**60.3**	