FACILITIES
UNIVERSITY *of* WASHINGTON
Campus Architecture & Planning

March 4, 2021

City of Tacoma
Planning and Development Services
747 Market St., Room 345
Tacoma, WA 98402

RE: SEPA Lead Agency
Milgard Hall
Site and Foundation Permit # PRE21-0037

Per RCW 43.21C, WAC 197-11 and WAC 478-324-020 through 210, the University of Washington is the Lead Agency responsible for compliance with the State Environmental Policy Act (SEPA) for projects which the University initiates on the campus. These rules state that when an agency initiates a proposal, it is the lead agency for the proposal and defines lead agency as the agency with the main responsibility for complying with SEPA's procedural requirements.

Per the SEPA Guidelines, as the SEPA lead agency, the University of Washington has the authority to prepare determinations of exemption, threshold determinations, scoping, preparing and issuance of environmental impact statements, etc.

The SEPA review has been completed for the Milgard Hall project as noted in the attached checklist stating how the project site has been reviewed with the Downtown Subarea Plan and 2013 South Downtown Subarea Plan Final EIS.

We look forward to working with the City of Tacoma on this project.

Sincerely,

Julie Blakeslee

Julie Blakeslee, AICP
University Environmental & Land Use Planner
SEPA Responsible Official

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Campus Architecture & Planning

Adoption of the 2013 South Downtown Subarea Plan SEPA Final EIS for and consistency of the Milgard Hall Project with the Downtown Subarea Plan

The *August 2013 Final EIS for the South Downtown Subarea Plan* reviewed the potential environmental effects for developing the campus over time. The following elements of the environment were studied per scoping and comments received on the Draft EIS:

- Earth
- Air Quality
- Water
- Plants and Animals
- Environmental Health
- Noise
- Land use and Relationship to Plans/Policies/Regulations
- Population and Housing
- Historic and Cultural Resources
- Aesthetics
- Transportation
- Public Services
- Utilities

Project Definition
The Milgard Hall project is being proposed at the south edge of campus and the UW Tacoma/Museum District between the Prairie Line Trail and South C Street. The intent of the project is to provide education use, including classrooms and laboratories, student gathering, and office space. The building is anticipated to be approximately 55,000 gross square feet (GSF) and three (3) stories.

Project Consistency with the South Downtown Subarea Plan
The project is consistent with the allowed uses and development regulations as set forth in the South Downtown Plan in the Downtown Mixed-Use Zone and Conservation District Overlay. The project will not exceed the 85’ maximum height and is within the allowed square footage of the district.

Project Consistency with the EIS
The following provides review of the proposed project by element of then environment:

<u>Earth</u> – Grading will be required for the building. A geotechnical study was conducted in support of the building permit and describes the current surface, subsurface and groundwater conditions; proposed construction practices; and structural requirements for the facility to ensure seismic

hazard areas are avoided or mitigated. No liquefaction soils exist onsite and ground rupture or land sliding is anticipated. See **Attachment C** for the geotechnical report.

Air Quality – The construction and operation of the building is within the development considered in the EIS.

Water – The construction and operation of the building is within the development considered in the EIS.

Plants and Animals – The construction and operation of the building is within the development considered in the EIS. It is anticipated that a short row (5) of maple trees would be removed on South C Street side of the site to allow for building construction, seven (7) additional site trees would be removed, five (5) site trees would be retained, and approximately 19 new trees would be planted on campus and as street trees. Minor modifications to these numbers could occur but replacement numbers per code would be met (and at least 2:1 ratio).

Environmental Health – The construction and operation of the buildings is within the development considered and existing site conditions described in the EIS. The site was known to have underlying volatile organic compound (VOC) and petroleum-related contamination in soil and groundwater due to historical use since the early 1900s for fuel distribution, including coal, and hazardous waste storage. Between 1994 and 1996 remedial work was completed at the site to remove existing underground storage tanks and remediate historical contamination. The exception to this remediation is a 230-foot-long sloped concrete retaining wall located along the west site boundary. This may have been associated with a coal bunker. There are no plans to remove this feature. Any petroleum-impacted soil encountered would be excavated and disposed of at an approved disposal site. Any contaminated groundwater would be disposed of at an approved disposal site or City of Tacoma sanitary sewer following treatment. See **Attachment C** for the geotechnical report.

Noise – The construction and operation of the building is within the development considered in the EIS.

Land Use – The building and its use is an allowed use and is consistent with development regulations as set forth in the Downtown Mixed-Use Zone and Conservation District Overlay. See **Attachment A** for a graphic representation of site zoning.

Population and Housing – Operation of the building will allow for an increase in the number of students that may attend classes on campus. This increase was considered in the EIS.

Historic and Cultural Resources – No historic resource impacts are anticipated due to consistency with the Union Depot/Warehouse Conservation District. Key design guidelines include: height – within the 85' height limit; compatible scale with surrounding buildings and no screening of mechanical equipment; predominantly masonry materials (e.g. brick, granite, terra cotta) and mass timber structure; and contributing to the district character and limited color palette.

An existing feature that is thought to be a coal bunker exists on the west side of the site. There are no plans to remove this feature. The site has been significantly disturbed and no cultural resources are anticipated. However, a cultural resources inadvertent discovery plan has been prepared and will be reviewed with all onsite contractors prior to excavation activities.

Aesthetics – No aesthetic impacts from the project are anticipated due to the building being consistent with the South Downtown Plan and the Union Depot/Warehouse District with the proposed building scale, building materials and color palette, and being within the 85' height limit. See **Attachment B** for views of the site.

Transportation – The construction and operation of the building is within the development considered in the EIS. A trip generation analysis was prepared that showed that the project is consistent with or less than anticipated by the EIS and the more recent Tacoma Brewery District Transportation Study (2016). No impacts to traffic safety, transit service, and non-motorized transportation are anticipated. See **Attachment D** for the trip generation analysis.

Public Services – The construction and operation of the building is within the development considered in the EIS. No impacts to fire, EMS, law enforcement, public schools, or parks and open space are anticipated.

Utilities – Utilities in the area are documented and are incorporated into the project; no significant impacts are anticipated. Short-term, local and temporary interruption of service may occur for any utility connections to the project site.

The University of Washington adopts the *August 2013 Final EIS for the Downtown Subarea Plan* for the Milgard Hall project for purposes of SEPA. The relevant content has been briefly described above. The EIS may be reviewed at the following website address:
https://cms.cityoftacoma.org/planning/Dome-Brewery%20Subarea/FINAL%20EIS%20-%20South%20Downtown%20Subarea%20-%20August%2028%20-%20City%20of%20Tacoma.pdf

Julie Blakeslee

Julie Blakeslee, AICP

3.4.21
Dated

Attachment A - Site Zoning
Attachment B - Site Views
Attachment C - Geotechnical Basis of Design Report, UW Tacoma Milgard Hall, GeoEngineers, February 12, 2021
Attachment D - UW Tacoma Classroom Trip Generation Analysis Memorandum, Fehr & Peers, March 4, 2021

Milgard Hall

SEPA DNS/Adoption Attachments

Attachment A

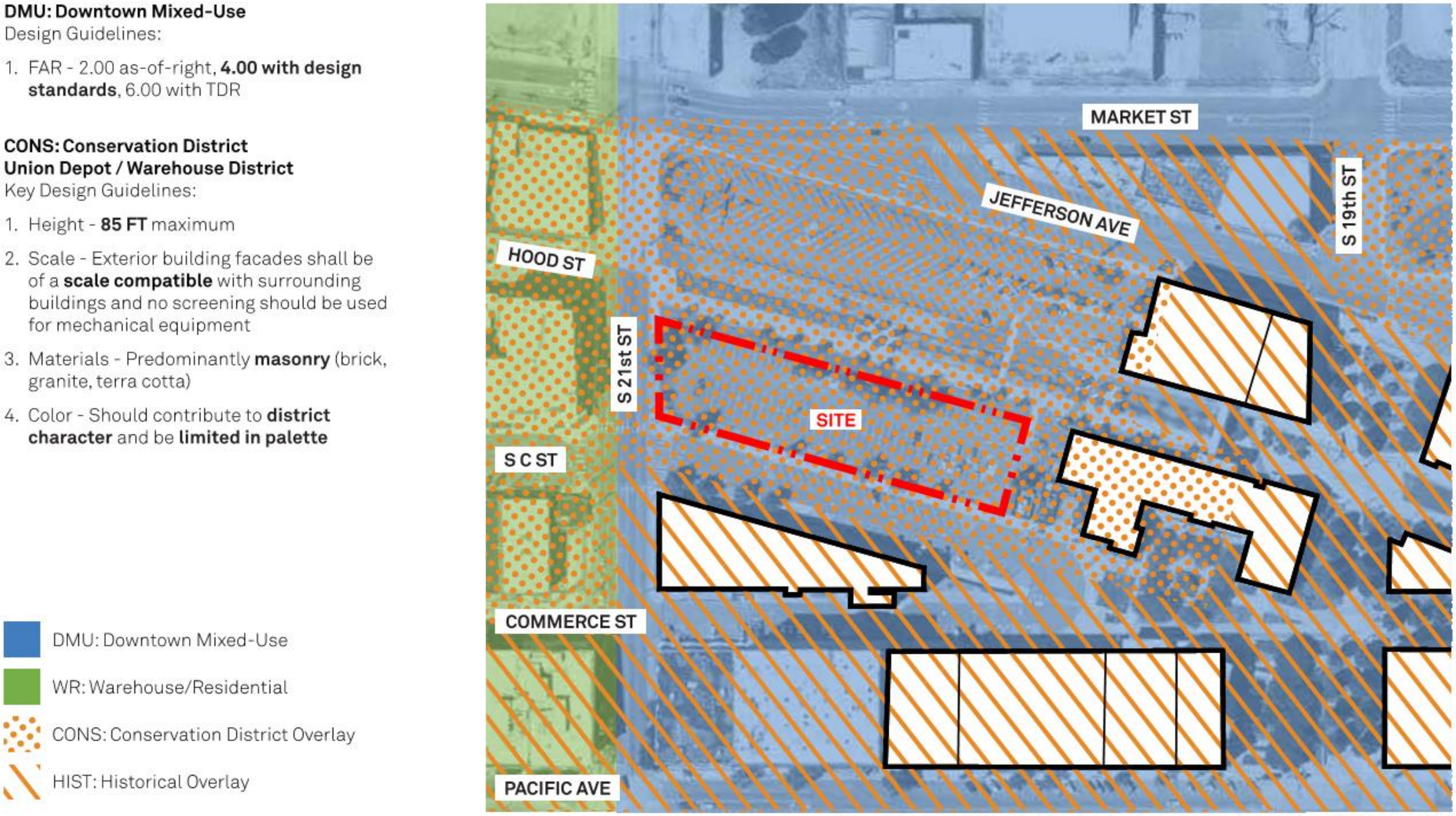
Milgard Site Zoning

DMU: Downtown Mixed-Use
Design Guidelines:

1. FAR - 2.00 as-of-right, **4.00 with design standards**, 6.00 with TDR

CONS: Conservation District
Union Depot / Warehouse District
Key Design Guidelines:

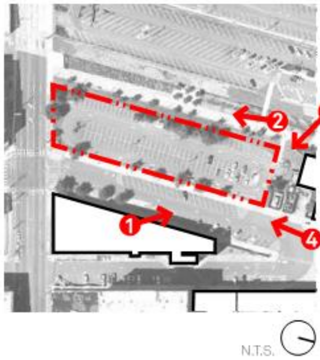
1. Height - **85 FT** maximum
2. Scale - Exterior building facades shall be of a **scale compatible** with surrounding buildings and no screening should be used for mechanical equipment
3. Materials - Predominantly **masonry** (brick, granite, terra cotta)
4. Color - Should contribute to **district character** and be **limited in palette**



Source: Tacoma Landmarks Preservation Commission - Union Depot Guidelines-2018

Attachment B

Milgard Site Views



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2

3

4

The new building will be visible from prominent campus locations including the Prairie Line Trail, Tioga Library, and Snoqualmie.

Attachment C

Geotechnical Engineering Services Report

University of Washington Tacoma Milgard Hall
Tacoma, Washington

for
University of Washington

February 12, 2021

GeoEngineers
Earth Science + Technology

Geotechnical Engineering Services Report

University of Washington Tacoma Milgard Hall
Tacoma, Washington

for
University of Washington

February 12, 2021

GeoEngineers

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Tacoma, Washington 98402
253.383.4940

Geotechnical Engineering Services Report

University of Washington Tacoma Milgard Hall
Tacoma, Washington

File No. 0183-145-00

February 12, 2021

Prepared for:

University of Washington
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Attention: Shannon Thompson

Prepared by:

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APPENDICES

1.0 INTRODUCTION AND PROJECT UNDERSTANDING

This report summarizes the results of our geotechnical engineering services for the University of Washington Tacoma (UWT) Milgard Hall project. The project site is located northwest of the East 21st Street and C Street intersection within the existing UWT Cragle Parking Lot. A Vicinity Map is provided as Figure 1. Our understanding of the project is based on information provided including the 25 percent project plans dated January 6, 2021, our conversations with the project team and our prior involvement on the project and at the UWT campus.

The proposed building will be three stories tall and will contain academic classrooms, conference/assembly room(s) and laboratory space. The building will be located on the approximate north half of the Cragle Parking Lot, the south half will remain as parking. Site development will improve access to the Prairie Line Trail located on the west side of the site as well as integrate with existing campus improvements on the north and east sides of the building. Retaining walls on the order of 5 to 10 feet tall are anticipated to accommodate the site improvements and access to the Prairie Line Trail. The preferred retaining wall type has not been selected, however, cast-in-place concrete walls or cantilever soldier pile walls are envisioned.

The proposed finished floor elevation for the building is Elevation 79.5 feet (elevations referenced to NGVD29 datum). Existing site grades at the site vary from about Elevation 82 on the south side of the building to about Elevation 73 feet on the north side of the building. Accordingly, grade will be lowered by about 2.5 feet on the south side of the site and raised about 6.5 feet on the north side of the site.

The building will be designed in accordance with the 2018 International Building Code (IBC). The structure will be supported on conventional spread footings and slab-on-grade. Bottom of footing elevations are expected to be around Elevation 76 feet. Anticipated column loads are expected to be on the order of 300 kips.

Stormwater infiltration facilities are not currently envisioned. We understand that stormwater will be detained on site in a below grade vault and discharged to the City of Tacoma stormwater system. There is an existing below grade stormwater detention vault that exists within the proposed building footprint. We understand that the existing stormwater vault will be decommissioned and left in in place below the building.

Our services have been provided in accordance with our signed agreement for this project executed on August 30, 2020, which contains an outline of our specific scope of services. We have provided a draft Geotechnical Basis of Design Report dated October 13, 2020 for this project. This report incorporates design changes, building sitting and elevation determination, proposed site improvement plans, and review comments since our draft report was prepared. GeoEngineers is also providing environmental services on this project. Our environmental services will be provided as a separate deliverable(s).

2.0 SITE CONDITIONS

2.1. Site History

Documented history of the site dates back to the early 1900s when the site was used as a fuel distribution facility. We understand that coal was distributed by the facility, which we expect was used by locomotives operating on the former rail line (current day Prairie Line Trail) located west of the site. The site was also once used to store hazardous waste. University of Washington acquired the property in the early 1990s.

Between 1994 and 1996 remedial work was completed at the site to remove existing underground storage tanks and remediate historical contamination. Detailed documentation of these remedial activities is summarized in a Soil Remediation report prepared by AGI Technologies dated March 18, 1997. Remedial activities included excavation and treatment of contaminated soil and reuse of treated soil on site. The largest remedial excavation area was located within the footprint of the proposed building. The approximate footprint of this remedial excavation area is shown on the Site Plan, Figure 2. The excavation necessitated the installation of temporary shoring, which consisted of interlocking sheet piles embedded approximately 25 feet below grade. We understand that remedial excavation depths within the temporary shoring area were typically between 13 and 15 feet below ground surface (bgs). We understand that the excavation was completed without the use of dewatering; however, perched groundwater was observed below about 12 feet bgs. The remedial excavation was backfilled with a combination of materials including imported soil, treated soils, and oversized particles that were separated from the soils prior to treatment. Based on our review of the AGI Soil Remediation Report, we understand that the backfill was placed in lifts and compacted to at least 95 percent of the theoretical maximum dry density (MDD) using vibratory compaction equipment.

Presently, remnants from historic site uses have been removed from the site with the exception of an approximately 230-foot-long sloped concrete retaining wall and stem wall which is located along the west site boundary. The location of this wall, which we understand may have been associated with a coal bunker, is shown on the Site Plan. Additional details regarding the coal bunker retaining wall is summarized in Section 2.3.2 below.

2.2. Environmental Conditions and Design Considerations

The project site is known to have underlying volatile organic compound (VOC) and petroleum-related contamination in soil and groundwater. A vapor mitigation system will be required to mitigate the risk of vapor intrusion from volatile contamination located beneath the building. Recommendations for the vapor mitigation system will be provided as part of our environmental services, as the design progresses, in a separate document.

Special soil and groundwater handling considerations will also be required at this site. For planning and budgeting purposes, the following soil and groundwater handling considerations should be followed. These recommendations may change and will be updated and revised, as necessary, once additional environmental characterization at the site is completed.

- From an environmental standpoint, soil generated from above the seasonal high groundwater level may be reused on-site. Additional details regarding reuse of on-site soils as fill and backfill fill are provided in Section "4.7 Fill Materials" of this report.
- If soil generated above the seasonal high groundwater level is to be removed (i.e., net export), at this time, we recommend assuming the soil will need to be disposed of at a UW-approved disposal facility for "petroleum-contaminated soil" based on information from existing soil data. UW-approved disposal facilities are listed in the following document https://www.ehs.washington.edu/system/files/resources/disposalfaclist.pdf. Additional environmental explorations and analytical testing are planned for the site to support characterizing soils for off-site disposal.

- Soil generated from below the seasonal high groundwater level, or soils that are found to be saturated with groundwater, should not be used as fill and structural fill at the site. Soils generated below the groundwater table will be subject to additional disposal restrictions at UW-approved Subtitle D landfill in Washington State. Additional details regarding disposal of soil generated below the groundwater table will be provided separately in an environmental report that will summarize soil handling recommendations and other mitigation measures that will be needed during construction.
- Groundwater generated during construction is anticipated to be contaminated with VOC's and will require disposal at a UW-approved disposal facility or City of Tacoma sanitary sewer following treatment. Additional details regarding disposal of water generated will be provided separately in an environmental report that will summarize water handling recommendations and other mitigation measures that will be needed during construction.

2.3. Surface Conditions

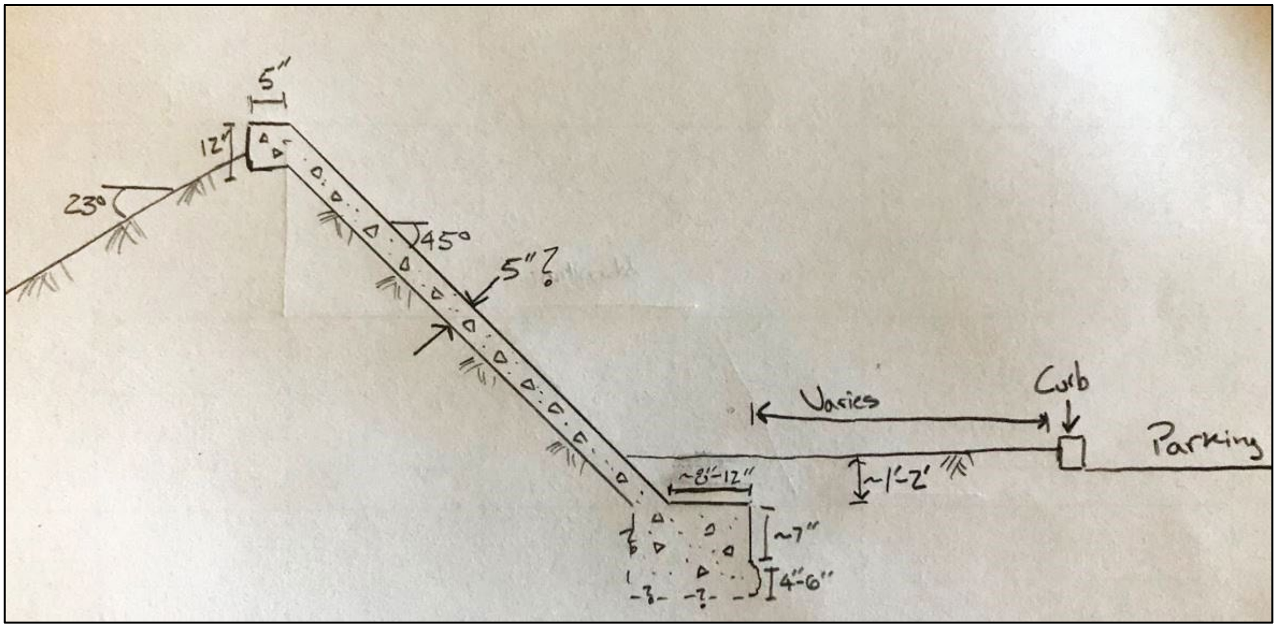
2.3.1. General

The project site is bordered by the Snoqualmie Building to the north, C Street to the east, South 21st Street to the south and the Prairie Line Trail to the west. The existing Cragle Parking Lot is paved with asphalt concrete. Two driveway access points are present from C Street into the Cragle Parking Lot.

Landscape medians are located adjacent to the parking areas on the south, east and west side of the parking lot. The project generally slopes downward from south to north with changes in elevations on opposite sides of the site on the order of 13 feet. The western site boundary is defined by a slope that grades upwards from the site to the grade of the Prairie Line Trail. The northern approximately half of the slope is landscaped with trees, shrubs and beauty bark. The slope in this area is on the order of 6 feet tall and is inclined at around 2H:1V (Horizontal to Vertical). Near the center of the site, the toe of the western slope is formed by a rockery wall on the order of 2 to 3 feet tall. South of the rockery the slope on the western site boundary is developed with the coal bunker retaining wall. The coal bunker retaining wall is described further in the section below.

2.3.2. Existing Coal Bunker Retaining Wall

The coal bunker retaining wall is constructed of concrete and varies in height from about 8 feet tall at the north end of the wall and around 2 feet tall on the south end of the wall. The wall is inclined at an angle of 45 degrees and the concrete (about 5 inches thick) appears to have been poured directly against the slope. The retaining wall includes a shallow foundation located at the toe of the east side of the wall. Two test pits (MIL-TP1 and MIL-TP2) were excavated at the toe of the retaining wall to investigate the retaining wall foundation. The locations of the test pits are shown on Figure 2. The retaining wall foundation is on the order of 13 inches thick and 12 inches wide. The bottom of the foundation is embedded about 2.5 feet below the grade of the adjacent parking lot. At the location of the test pits the horizontal distance between the east edge of the retaining wall footing and the curb for the existing parking lot varied between about 11 feet near the center of the retaining wall and 6.5 feet at the north end of the retaining wall. The retaining wall foundations appear to have been constructed on dense to very dense native soils. A field drawing of the retaining wall cross section is provided as Schematic 1.



Schematic 1: Coal Bunker Retaining Wall Cross Section (not to scale)

2.4. Soil and Groundwater Conditions

2.4.1. General

Our understanding of soil conditions at the site is based on our review of existing subsurface information in the vicinity, and the conditions observed in four borings (MIL-B1 through MIL-B4) and four test pits (MIL-TP1 through MIL-TP4) completed for this project. The locations of the pertinent explorations reviewed and completed for this project are shown on Figure 2. The summary exploration logs for the borings and test pits completed for this project along with details of the subsurface exploration program are provided as Appendix A. The exploration logs for the referenced (previously completed) subsurface explorations in the vicinity are provided in Appendix B.

We have not completed geotechnical laboratory testing on samples collected from our explorations at the time of this report. Once environmental characterization of the site soils is completed, we plan to review results and determine the practicality of geotechnical laboratory testing with other design team members. If and when completed, pertinent laboratory information will remain in our files and can be available upon request.

2.4.2. Soil Conditions

Subsurface conditions at the site consist of two primary soil units: fill and native soils deposits. In borings MIL-B1, MIL-B2 and MIL-B3, fill soils were observed starting below the asphalt surfacing (asphalt was about 2.5 to 3.5 inches thick at exploration locations) and extended to between 9.5 and 13.5 feet bgs. Borings MIL-B1 to MIL-B3 were advanced within the historic remedial excavation area. The observed fill depths are consistent with our understanding of the remedial activities. Boring MIL-B4 was advanced outside of the remedial excavation area and fill was observed to extend to around 5 feet bgs. This fill depth is consistent with fill thicknesses described on the referenced exploration logs previously completed in the vicinity.

In our borings, fill material consisted primarily of silty sand with variable gravel content and gravel with sand and silt and were typically medium dense to very dense.

There is some uncertainty of the geologic origin of the native soils. The majority of native soils below the fill in the project vicinity are comprised of ice-contact deposits, which are typically a mixture of sand, silt and gravel soils that were deposited below or on the margins of glacial ice. Within the project boundary a drainage channel cutting through the surrounding ice-contact deposits has been identified. The proposed building footprint appears to be within the approximate extents of the drainage channel. It is unclear if this drainage channel was created and filled in at the same time the ice-contact soils were deposited (subglacial outwash channel) or if the channel was formed after glaciers receded from the area. Soils within the drainage channel consist primarily of medium dense to very dense silty sand with variable gravel. For the purpose of this report, we will refer to the drainage channel soils and surrounding ice-contact deposits as "native soils." From a geotechnical perspective, these different geologic materials are expected to perform similarly. Figure 3 and Figure 4 provide our interpretation of the geologic cross section below the site.

Our test pits were located along the west side boundary at the toe of the coal-bunker retaining wall (MIL-TP1 and MIL-TP2) and along the slope that separates the site from the Prairie Line Trail (MIL-TP3 and MIL-TP4). Conditions observed in test pits MIL-TP1 and MIL-TP2 are described in Section 2.3.2 above. In MIL-TP3 and MIL-TP4, we observed between 7.5 and 9.5 feet of fill soils underlain by native soils. Observed fill consisted of loose to medium dense silty sand and intermittent layers of debris (concrete, wood, dimension timber). In MIL-TP3, we observed coal within the fill at around 7 feet bgs. The native soils observed in our test pits are generally described as dense silty sand with gravel and stiff sandy silt.

While not observed in the explorations completed for our study, coarse gravel, cobbles and boulders could be present and should be expected within the fill and native soils at the site.

2.4.3. Groundwater Conditions

Our understanding of groundwater conditions at the site is based on conditions observed in our explorations and our review of groundwater measurements from monitoring wells at and in the vicinity of the site. Depth to groundwater generally increases from southwest to northeast. Seasonal high groundwater levels are expected to be within about 5 feet of existing ground surface near the southwest corner of the site and grade to around 10 feet bgs in the northwest corner of the site. Seasonal groundwater fluctuations are expected to be on the order of 5 feet. Figure 5 and Figure 6 show our interpretation of the approximate seasonal high and low groundwater contours at the site, respectively. Groundwater levels are expected to be highest in the winter and spring months and lowest in summer or late fall.

3.0 SITE CLASS AND SEISMIC CONSIDERATIONS

3.1. Seismic Design Parameters

We understand that seismic design will be performed in accordance with 2018 IBC Standards. The following parameters provided in Table 1 should be used for design.

TABLE 1. SEISMIC DESIGN PARAMETERS

2018 IBC Seismic Design Parameters	
Spectral Response Acceleration at Short Periods (S_S)	1.348g
Spectral Response Acceleration at 1-Second Periods (S_1)	0.465g
Site Class	C
Site Modified Peak Ground Acceleration (PGAm)	0.6g
Design Spectral Response Acceleration at Short Periods (SD_S)	1.078g
Design Spectral Response Acceleration at 1-Second Periods (SD_1)	0.465g

3.2. Liquefaction, Lateral Spreading and Surface Fault Rupture

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures in loose, saturated soils and subsequent loss of strength in the deposit of soil so affected. In general, soils that are susceptible to liquefaction include loose to medium dense "clean" to silty sands that are below the water table. Based on the soil density and grain size distribution observed in our explorations it is our opinion that the potential for liquefaction at this site is low.

Lateral spreading related to seismic activity typically involves lateral displacement of large, surficial blocks of non-liquefied soil when a layer of underlying soil loses strength during seismic shaking. Lateral spreading usually develops in areas where sloping ground or large grade changes (including retaining walls) are present. Based on our understanding of the subsurface conditions and current site topography, it is our opinion that the risk of lateral spreading is low.

According to the Washington State Department of Natural Resources Interactive Natural Hazards Map (accessed February 8, 2021), no active faults are mapped in the project area. Accordingly, it is our opinion that the risk for seismic surface rupture is low.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1. General

Based on our understanding of the project, the explorations performed and reviewed for this study and our experience, it is our that proposed improvements can be constructed generally as envisioned with regard to geotechnical considerations. A summary of the primary geotechnical considerations for the project is provided below and is followed by our detailed recommendations.

- The proposed structure can be supported using shallow foundations bearing directly on existing medium dense to dense fill, native soils or on structural fill placed over these materials. Foundation bearing surfaces should be prepared in accordance with the recommendations in this report and observed by a member of our firm during construction.
- Seasonal high groundwater levels at the site are within 5 feet of existing grades at certain locations. Completing earthwork during the summer and early fall months, when groundwater levels are at their lowest, will reduce the potential for encountering groundwater in excavations. Perched groundwater

could be encountered in excavations regardless of the time of year; however, volumes of perched groundwater will be lowest in the summer and early fall months.

- Near-surface soils contain a significant amount of fines and will likely be difficult or impossible to work with when wet. In general, we recommend against the use of on-site material as structural fill unless earthwork is completed during dry weather months.
- Our environmental studies should be reviewed in their entirety during earthwork and site development planning. Additional considerations regarding handling and use of on-site material and worker safety may be needed.

4.2. Foundation Support

4.2.1. General

We understand that the proposed foundation type for the structure is conventional shallow foundations. The base of the shallow foundation system is expected to be around Elevation 76 feet. Column loads for the structure are expected to be on the order of 300 kips. We anticipate that conventional shallow foundations will be suitable for supporting the anticipated building loads. Exterior footings should be established at least 18 inches below the lowest adjacent grade. Interior footings can be founded a minimum of 12 inches below the top of the floor slab. Isolated column and continuous wall footings should have minimum widths of 24 and 18 inches, respectively.

4.2.2. Bearing Surface Preparation and Allowable Bearing Resistance

Shallow foundations should bear directly on existing medium dense to dense fill or native soils or on compacted structural fill placed to raise site grades. Foundation excavations should be completed using a bucket with a smooth edge. After excavating to grade, the exposed foundation bearing surface should be proof compacted to a firm and unyielding condition using a hoe-pack or other piece of vibratory compaction equipment.

Soft, loose, or wet soils that cannot be adequately compacted in place should be removed and replaced with compacted structural fill. Additionally, deleterious materials including debris and organic material must be removed from below footings, if encountered. We anticipate that overexcavation below footings, if required, can be limited to 2 feet. For planning and budgeting purposes, we recommend that a contingency be included for up to 2 foot of overexcavation and replacement below approximately 25 percent of the building foundations.

For foundation bearing surfaces prepared as recommended above, footings can be proportioned using an allowable soil bearing resistance of 5,000 pounds per square foot (psf). This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering total loads, including earthquake or wind loads. These are net bearing pressures. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

If larger footings are designed as mat system, a modulus of subgrade reaction of 300 pounds per cubic inch (pci) may be used for design provided the bearing surface is prepared as recommended above.

The base of all footing excavations should be evaluated by a representative from our firm prior to placement of structural fill or formwork and reinforcement. Our representative will provide recommendations for remediation of bearing surface, if necessary.

4.2.3. Foundation Settlement

We estimate that settlement of footings designed and constructed as recommended, and for anticipated building loads, will be less than 1 inch, with differential settlements of less than ½ inch between comparably loaded isolated column footings or along 50 feet of continuous footing. Settlement is expected to occur rapidly as loads are applied. Settlements could be greater than estimated if loose or disturbed soil is present beneath footings. Once the final building footing sizes and loads are determined, we should be consulted so we can check these settlement values.

4.2.4. Lateral Resistance

The ability of the soil to resist lateral loads is a function of frictional resistance, which can develop on the base of footings and slabs and the passive resistance, which can develop on the face of below-grade elements of the structure as these elements tend to move into the soil. The allowable frictional resistance on the base of the footing may be computed using a coefficient of friction of 0.40 applied to the vertical dead-load forces. The allowable passive resistance on the face of the footing or other embedded foundation elements may be computed using an equivalent fluid density of 275 pounds per cubic foot (pcf) for undisturbed site soils or structural fill extending out from the face of the foundation element a distance at least equal to two and one-half times the depth of the element. These values include a factor of safety of about 1.5.

The passive earth pressure and friction components may be combined provided that the passive component does not exceed two-thirds of the total. The passive earth pressure value is based on the assumptions that the adjacent grade is level and that groundwater remains below the base of the footing throughout the year. The top foot of soil should be neglected when calculating passive lateral earth pressure unless the area adjacent to the foundation is covered with pavement or a slab-on-grade.

4.2.5. Slab-on-Grade Floor

We expect that slab subgrade soils will be comprised of either existing fill material for structural fill placed to establish slab subgrade elevation. The exposed subgrade should be evaluated after site grading is complete and/or prior to placement of structural fill. Disturbed areas should be compacted, if possible, or removed and replaced with compacted structural fill. In all cases, the exposed soil should be firm and unyielding. It may be appropriate to compact the exposed subgrade with a smooth drum vibratory roller to a dense and unyielding condition.

We recommend slab-on-grade floors be underlain by a minimum 12-inch-thick capillary break section. As previously discussed, a vapor intrusion mitigation system will be installed below the slab. The gravel layer associated with the vapor intrusion system can be incorporated into the capillary break section. Capillary break materials should consist of clean sand and gravel, crushed or washed rock with less than 3 percent fines based on the fraction passing the ¾-inch sieve. Based on preliminary design sections for the vapor intrusion system, a non-woven geotextile fabric may also be required below the capillary break section. Geotextile fabric material details will be provided once the vapor intrusion system is designed.

Provided that loose soil is removed, and the subgrade is prepared as recommended, we recommend slabs-on-grade be designed using a modulus of subgrade reaction of 300 pounds per cubic inch (pci). We estimate that settlement for slabs-on-grade constructed as recommended will be less than ¾ inch for a floor load of 500 psf.

4.2.6. Foundation and Below-Slab Drains and Waterproofing

4.2.6.1. General

We understand that the proposed building finished floor elevation was selected, at least in part, to avoid long-term groundwater handling considerations below the building slab and within the planned vapor intrusion system. The design seasonal high groundwater elevation at the site varies between about Elevation 76 feet at the southwest building corner to around Elevation 65 feet at the northwest building corner.

The anticipated bottom of footing elevation across the building is around Elevation 76 feet. Based on our understanding of soil conditions and the proposed bottom of footing elevations, in our opinion foundation drains are not required to maintain bearing support.

The proposed finished floor elevation for the building is Elevation 79.5 feet. We expect that the minimum groundwater separation distance that will be maintained between the bottom of the building slab and the seasonal high groundwater level is around 3 feet (assumes a slab thickness of around 6 inches). This minimum separation distance is expected to be isolated to the southwest building corner and greater groundwater separation distances will exist across the majority of the building footprint. Based on this understanding, in our opinion a below slab drainage system is not required in order to maintain dry conditions below the building. For the anticipated groundwater separation distance, we still recommend that a waterproofing product be applied to the slab on grade and below grade portions of the stem walls to help ensure dry conditions within the building. Additionally, we recommend that the hardscaping around the structure be sloped to direct surface water runoff away from the building and to appropriate collection systems.

4.3. Earth Pressures for Conventional Retaining Walls and Below-Grade Structures

4.3.1. Typical Design Parameters

We recommend the following lateral earth pressures be used for design of conventional retaining walls and below-grade structures. If drained design parameters are used, drainage systems must be included in the design in accordance with the recommendations presented in the “4.3.3 Drainage” section below.

- Active soil pressure may be estimated using an equivalent fluid density of:
  - 35 pcf for the drained and level backfill condition
  - 79 pcf for the undrained and level backfill condition (this value includes hydrostatic pressures)
  - 53 pcf for drained condition with sloping backfill behind the wall up to 2H:1V
  - 87 pcf for undrained conditions with sloping backfill behind the wall up to 2H:1V (this value includes hydrostatic pressures)
- At-rest soil pressure may be estimated using an equivalent fluid density of:
  - 53 pcf for the drained and level backfill condition
  - 87 pcf for the undrained and level backfill condition (this value includes hydrostatic pressures
  - 96 pcf for drained condition with sloping backfill behind the wall up to 2H:1V
  - 108 pcf for undrained conditions with sloping backfill behind the wall up to 2H:1V (this value includes hydrostatic pressures)

- For seismic considerations, a uniform lateral pressure of 10H psf (where H is the height of the retaining structure or the depth of a structure below ground surface) should be added to the lateral earth pressure.
- A uniform horizontal traffic surcharge of 50 psf should be applied if light vehicular traffic is allowed to operate behind the retaining wall. The traffic surcharge should be increased to 70 psf if traffic loads will include fire trucks or other heavier vehicles.

The active soil pressure condition assumes the wall is free to move laterally 0.001 H, where H is the wall height). The at-rest condition is applicable where walls are restrained from movement. The above-recommended lateral soil pressures do not include other surcharge loads than described or the effects of sloping backfill surfaces. We should be consulted if other surcharge loads are anticipated as this may change the lateral pressure values provided.

Over-compaction of fill placed directly behind retaining walls or below-grade structures must be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet of retaining walls and below-grade structures.

Retaining wall foundations and lateral resistance values may be designed in accordance with recommendations and considerations presented in Section “4.2 Foundation Support” of this report.

4.3.2. Drainage

If retaining walls or below-grade structures are designed using drained parameters, a drainage system behind the structure must be constructed to collect water and prevent the buildup of hydrostatic pressure against the structure. We recommend the drainage system include a zone of free-draining backfill a minimum of 18 inches in width against the back of the wall. The drainage material should consist of coarse sand and gravel containing less that 5 percent fines based on the fraction of material passing the ¾-inch sieve.

A perforated, rigid, smooth-walled drainpipe with a minimum diameter of 4 inches should be placed along the base of the structure within the free-draining backfill and extend for the entire wall length. The drain pipe should be metal or rigid PVC pipe and be sloped to drain by gravity. Discharge should be routed to appropriate discharge areas and to reduce erosion potential. Cleanouts should be provided to allow routine maintenance. We recommend roof downspouts or other types of drainage systems not be connected to retaining wall drain systems.

4.4. Cantilever Solider Pile Wall

4.4.1. General

We understand that cantilever soldier pile walls are being considered in the area of the Prairie Line Trail. Soldier piles typically include vertical steel H-piles spaced at about 5 to 10 feet on center, depending on the wall height, to support a vertical excavation. The piles are installed by drilling to the required depth, setting the pile into the hole and backfilling with concrete. The embedment depth of the pile is dependent on the wall height and design loads. Spaces between piles are protected with lagging, typically either treated timbers or precast concrete panels. Cantilever soldier pile walls are typically feasible for retained heights of about 15 feet or less. Taller walls, if envisioned, may require the use of tieback anchors. Based on our understanding of site grades, wall heights are not expected to exceed about 10 feet.

Figure 7 provides our recommended earth pressure diagram for cantilever soldier pile walls. The provided earth pressure diagram assumes level ground surface conditions behind the wall and that drainage systems are included behind the wall (drained conditions).

We recommend that the embedded portion of soldier piles at the site be at least 2 feet in diameter and extend a minimum distance of 10 feet below the bottom of wall and into competent soils to resist "kick-out." We recommend a GeoEngineers representative observe soldier pile installation to verify embedment depth into competent soils and provide additional recommendations, as appropriate. The axial capacity of the soldier piles must resist any vertical loads (as appropriate) such as from guardrails, adjacent utilities, or other structures.

Current wall design considers 2-foot diameter drilled shafts. Accordingly, we developed axial resistance estimates considering a 2-foot diameter shaft founded at least 10 feet into competent soils. Allowable resistances should be used for designing the piles. We recommend that the allowable bearing resistance be considered to be 6,000 psf and allowable skin friction to be 800 psf. For ultimate conditions, factor of Safety (FS) equal to 2 for end bearing and 3 for skin friction can be applied to increase resistance, where applicable.

Pile settlements under recommended axial resistances and constructed as recommended in this report are not expected to exceed about 1 inch, while differential settlement between comparably loaded piles is not expected to exceed about ½ inch. Some additional lateral and vertical displacement of the wall should be expected during the design seismic event.

4.4.1. Lagging and Drainage

Lagging may be designed for a reduced uniform pressure equal to one-half the lateral pressure. This pressure reduction is based on a maximum center-to-center pile spacing of 8 feet and the assumption that the lagging can yield relative to the soldier piles. If a wider spacing or a rigid lagging is used, we should be consulted for revised lagging pressures.

Lagging should be installed promptly after excavation, especially in areas where perched groundwater is present or where clean sand and gravel soils are present and caving soil conditions are likely. The workmanship associated with lagging installation is important for maintaining the integrity of the excavation. The lagging shall make direct contact with the soil. Where voids are present behind the lagging, the void should be filled with free-draining materials or the lagging repositioned to create full contact with the soil. The free-draining material will typically help reduce the risk of voids developing behind the wall and provide additional drainage of potential groundwater seepage. The free-draining material should consist of "Gravel Backfill for Walls and Drains" as described in Section "4.8 Fill Materials" of this report. CDF may also be considered; however, completely sealing off and/or blocking of major drainage paths or flow of water from behind the wall should be avoided.

A suitable drainage discharge system should be installed to prevent the buildup of hydrostatic pressures behind the soldier pile and lagging wall. If timber lagging is used, drainage may be achieved by spacing the timbers with a vertical gap of approximately ⅛ to ¼ inch. There are also other methods, such as weep holes. We can provide other types of drainage and relief options, as necessary.

Surface water should not be allowed to infiltrate immediately behind the soldier pile walls. Surface water should be directed away from the soldier pile walls using constructed gutters, berms and/or swales.

Final pile and lagging design will be required by a structural engineer. Permanent conditions such as corrosion resistant steel and access for lagging and maintenance of the wall face should also be considered. Additional soil contamination considerations such as disposal of soil and groundwater during construction should also be employed and addressed. We recommend we review the soldier pile wall design and layout to make sure our recommendations are interpreted correctly, to assist with plan and specification development and to assist with soil management considerations.

4.4.2. Construction Considerations

Soldier pile installation should be observed by GeoEngineers during construction to confirm piles have been installed in accordance with our recommendations, to confirm soil conditions are as assumed and provide additional recommendations, as appropriate.

Depending on the time of year of construction we anticipate that some groundwater could be encountered during soldier pile installation. We suggest it be planned to have to use temporary casing to prevent caving of surrounding loose soil. It is possible that drilling slurry may be used to prevent caving of loose soils, running sands and to manage seepage; however, we still recommend casing be considered as the slurry may not perform as desired.

Some debris was noted in the test pit explorations near the slope located in the northwest corner of the project area. Additionally, in our experience, cobbles and boulders are present in the glacial deposits in the area. The contractor should be prepared to encounter obstacles and potentially larger particles such as cobbles and boulders during drilling and in areas to be regraded or excavated.

Glacially consolidated soils (especially intact glacial till) can be encountered in a very dense condition and may take some effort during excavation or during drilling for pile installation. The contractor should be prepared to encounter dense soil conditions in portions of the site.

4.5. Stormwater Infiltration

Stormwater facilities at the site will be designed in accordance with the 2016 City of Tacoma Stormwater Management Manual (SWMM). The SWMM outlines criteria, that, if applicable to the site, indicate that on-site infiltration of stormwater is infeasible. Based on our understanding of conditions at the site two of the infeasibility criteria defined in the SWMM apply to this site: presence of contaminated soils and high groundwater levels.

The soil and groundwater at the site are known to be contaminated. While some areas of the site were previously remediated, the presence of contamination in the groundwater makes it impractical to prevent infiltrated water from coming in contact with contamination. Additional details regarding contamination at the site will be summarized as part of our Environmental Services, which will be provided as a separate deliverable. Due to the presence of contamination, stormwater infiltration is not recommended at the site.

In addition to the contamination at the site, high groundwater levels will likely make stormwater infiltration infeasible at this site. According to the SWMM the minimum separation distance between the base of infiltration facilities and the seasonal high groundwater level must be between 1 and 5 feet (depending on the facility type). The seasonal high groundwater level at the site is approximately 5 feet below existing ground surface. Due to the high groundwater level, in our opinion, the minimum groundwater separation distance is not able to be maintained for stormwater facilities that would be practical for use at the site, i.e., below-grade infiltration chambers/trenches, and bioswales with facility bases between 3 and 5 feet below existing grade.

4.6. Pavement Design

4.6.1. General

Asphalt concrete (AC) and Portland cement concrete (PCC) pavements are planned around the site. Existing pavements, hardscaping or other structural elements should be removed prior to placement of new pavement sections. Pavement subgrade should be prepared to a uniformly firm, dense and unyielding condition as described in “4.7.8 Subgrade Preparation” section of this report. Crushed surfacing base course and subbase should be moisture conditioned to near optimum moisture content and compacted to at least 95 percent of the MDD (ASTM D 1577).

Crushed surfacing base course (CSBC) should conform to applicable sections of 4-04 and 9-03.9(3) of the WSDOT Standard Specifications. Subbase should conform to applicable sections of 4-02 “Gravel Base” and 9-03.10 “Aggregate Gravel for Base” of the WSDOT Standard Specifications. Hot mix asphalt should conform to applicable sections of 5-04, 9-02 and 9-03 of the WSDOT Standard Specifications. PCC mix design should conform with Section 5-05.3(1) of the WSDOT Standard Specifications. Aggregates for PCC should conform to applicable sections of 9-03.1 of the WSDOT Standard Specifications.

Some areas of pavement may exhibit settlement and subsequent cracking over time. Cracks in the pavement will allow water to infiltrate to the underlying base course, which could increase the amount of pavement damage caused by traffic loads. To prolong the effective life of the pavement, cracks should be sealed as soon as possible.

4.6.2. Asphalt Concrete Pavement Design

Recommended minimum AC pavement sections are provided below.

4.6.2.1. Standard-Duty AC – Automobile Driveways and Parking Areas

- 2 inches of hot mix asphalt, class ½-inch, PG 58-22
- 4 inches of CSBC
- 4 inches of subbase consisting of select granular fil to provide a uniform grading surface, to provide pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil
- Subgrade consisting of proof-compacted firm and unyielding conditions or structural fill prepared in accordance with the “4.7.8 Subgrade Preparation” section of this report

4.6.2.2. Heavy-Duty AC – Areas Subject to Occasional Heavy Truck or Bus Traffic

- 3 inches of hot mix asphalt, class ½-inch, PG 58-22
- 6 inches of CSBC
- 4 inches of subbase consisting of select granular fill, previously described, to provide a uniform grading surface, to provide pavement support, to maintain drainage, and to provide separation from fine-grained subgrade soil

- Subgrade consisting of proof-compacted firm and unyielding conditions or structural fill prepared in accordance with the "4.7.8 Subgrade Preparation" section of this report

4.6.3. Portland Cement Concrete Pavement Design

Recommended minimum PCC pavement sections are provided below. PCC pavements are envisioned in pedestrian areas and in areas that will be subject to occasional vehicular, delivery truck and maintenance vehicle traffic. In our opinion steel reinforcement does not need to be included in the PCC for the anticipated use of these pavements. Reinforcement could be considered to reduce the potential for cracking in areas where the concrete slabs have irregular shapes or where new slabs abut existing concrete slabs, and the joint layout between the slabs cannot be matched. If reinforcement is considered, we are available to discuss typical steel reinforcement volumes with the project structural engineer, who should design the location, size and layout of reinforcement.

4.6.3.1. Sidewalk PCC Pavement – Pedestrian Areas Not Subjected to Vehicle Loading

- 4 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 2 inches of compacted crushed surfacing top course
- Native subgrade or structural fill prepared in accordance with the "4.7.8 Subgrade Preparation" section of this report

4.6.3.2. Standard PCC Pavement– Areas subjected to Occasional Vehicular and Truck Loading

- 6 inches of PCC with a minimum 14-day flexural strength of 650 psi
- 4 inches of compacted CSBC
- 4 inches of subbase consisting of select granular fill to provide a uniform grading surface and pavement support, to maintain drainage, and to provide separation from subgrade soils
- Native subgrade or structural fill prepared in accordance with the "4.7.8 Subgrade Preparation" section of this report

4.7. Site Development and Earthwork

4.7.1. General

We anticipate that site development and earthwork will include demolition of existing improvements including hardscaping and pavements, excavating for shallow foundations, utilities and other improvements, establishing subgrades for foundations and placing and compacting fill and backfill materials. We expect that site grading and earthwork can be accomplished with conventional earthmoving equipment. The following sections provide specific recommendations for site development and earthwork.

4.7.2. Clearing and Stripping

We anticipate that clearing and stripping depths in landscaped areas of the site will likely be on the order of 2 to 4 inches. However, greater stripping depths could be required within structural areas or areas of unsuitable soils, if present. The primary root systems of trees and other vegetation should be completely removed from areas be to be developed.

During demolition of existing pavements or hardscaping excessive disturbance of surficial soils may occur, especially if left exposed to wet conditions. Disturbed soils may require additional remediation during construction and grading. The foundation system of the existing buildings should be completely removed from within the structural areas of the proposed improvements.

While not observed in our explorations, cobbles and boulders can be present in the fill and native deposits in the area. Accordingly, the contractor should be prepared to remove boulders and cobbles, if encountered during grading or excavation. Boulders may be removed from the site or used in landscape areas. Voids caused by boulder removal should be backfilled with structural fill.

4.7.3. Erosion and Sedimentation Control

Erosion and sedimentation rates and quantities can be influenced by construction methods, slope length and gradient, amount of soil exposed and/or disturbed, soil type, construction sequencing and weather. Implementing an Erosion and Sedimentation Control Plan will reduce the project impact on erosion-prone areas. The plan should be designed in accordance with applicable city, county and/or state standards. The plan should incorporate basic planning principles, including:

- Scheduling grading and construction to reduce soil exposure;
- Re-vegetating or mulching denuded areas;
- Directing runoff away from exposed soils;
- Reducing the length and steepness of slopes with exposed soils;
- Decreasing runoff velocities;
- Preparing drainage ways and outlets to handle concentrated or increased runoff;
- Confining sediment to the project site; and
- Inspecting and maintaining control measures frequently.

Some sloughing and raveling of exposed or disturbed soil on slopes should be expected. We recommend that disturbed soil be restored promptly so that surface runoff does not become channeled.

Temporary erosion protection should be used and maintained in areas with exposed or disturbed soils to help reduce erosion and reduce transport of sediment to adjacent areas and receiving waters. Permanent erosion protection should be provided by paving, structure construction or landscape planting.

Until the permanent erosion protection is established and the site is stabilized, site monitoring may be required by qualified personnel to evaluate the effectiveness of the erosion control measures and to repair and/or modify them as appropriate. Provisions for modifications to the erosion control system based on monitoring observations should be included in the Erosion and Sedimentation Control Plan.

4.7.4. Temporary Excavations

Excavations deeper than 4 feet must be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." Regardless of the soil type encountered in the excavation, shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). The contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

In general, temporary cut slopes at this site should be inclined no steeper than about 1½H:1V. This guideline assumes that all surface loads are kept at a minimum distance of at least one-half the depth of the cut away from the top of the slope and that seepage is not present on the slope face. Within intact native soils, temporary cut slopes on the order of 1H:1V are feasible. If 1H:1V temporary cut slopes are considered, the slope area must be observed during excavation by a representative from our firm who will determine if the steeper cut inclination is appropriate for the given soil conditions. Flatter cut slopes will be necessary where seepage occurs or if surcharge loads are anticipated. Temporary covering with heavy plastic sheeting should be used to protect slopes during periods of wet weather.

4.7.5. Permanent Slopes

If permanent slopes are necessary we recommend they be constructed at a maximum inclination of 2H:1V. Where 2H:1V permanent slopes are not feasible, protective facings and/or retaining structures should be considered.

To achieve uniform compaction, we recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well-compacted fill. Fill placement on slopes steeper than 5H:1V should be benched into the slope face. The configuration of benches depends on the equipment being used. Bench excavations should be level and extend into the slope face.

Exposed areas should be re-vegetated as soon as practical to reduce the surface erosion and sloughing. Temporary protection should be used until permanent protection is established.

4.7.6. Groundwater Handling Considerations

Figure 5 and Figure 6 provide our estimate of seasonal high and low groundwater elevations at the site, respectively. Groundwater levels are expected to be highest between about December and April and will typically be lowest between about July and October.

As discussed previously, records from the previously completed remedial excavation at the site indicated that excavations on the order of 15 feet deep were completed without the use of dewatering; however, perched groundwater was observed starting around 12 feet bgs. We understand that the remedial excavation was primarily completed in the late summer and the excavation remained unfilled over the wet weather months. During this time period we understand that groundwater did accumulate in the open excavation.

Regardless of the time of year, in our opinion it is unlikely that significant groundwater seepage will be encountered in excavations that remain above the estimated groundwater elevations at the site. Areas of perched groundwater should be expected, however. Perched groundwater can like be handled adequately with sumps, pumps and/or diversion ditches, as necessary.

If excavations will extend below the anticipated high groundwater elevations, regardless of season, dewatering could be required. For excavations that extend only a few feet below the anticipated groundwater elevation, sumps and pumps can likely be used to manage the groundwater inflow. Dewatering well points could be necessary to complete deeper excavations. Ultimately, we recommend that the contractor performing the work be made responsible for controlling and collecting groundwater encountered.

As discussed previously, groundwater at the site is known to be contaminated and special handling and discharge considerations will be required. Additional details regarding handling of contaminated groundwater at the site will be summarized as part of our Environmental Services, which will be provided as a separate deliverable.

4.7.7. Surface Drainage

Surface water from roofs, driveways and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from buildings, erosion sensitive areas and from behind retaining structures. Roof and catchment drains should not be connected to wall or foundation drains.

4.7.8. Subgrade Preparation

Subgrades that will support structures and pavements should be thoroughly compacted to a uniformly firm and unyielding condition on completion of stripping and before placing structural fill. We recommend that subgrades for structures and pavements be evaluated, as appropriate, to identify areas of yielding or soft soil. Probing with a steel probe rod or proof-rolling with a heavy piece of wheeled construction equipment are appropriate methods of evaluation.

If soft or otherwise unsuitable subgrade areas are revealed during evaluation that cannot be compacted to a stable and uniformly firm condition, we recommend that: (1) the unsuitable soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted, if practical; or (2) the unsuitable soils be removed and replaced with compacted structural fill, as needed.

4.7.9. Subgrade Protection and Wet Weather Considerations

The majority of soils observed in our explorations contain a significant amount of fines and will be susceptible to disturbance during periods of wet weather. The wet weather season generally begins in October and continues through May in western Washington; however, periods of wet weather can occur during any month of the year. In our opinion, earthwork at the site can be considered during wet weather months provided appropriate measures are implemented to protect exposed soil. If earthwork is scheduled during the wet weather months we offer the following recommendations:

- Measures should be implemented to remove or eliminate the accumulation of surface water from work areas. The ground surface in and around the work area should be sloped so that surface water is directed away and graded so that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting.
- The contractor should take necessary measures to prevent on-site soils and other soils to be used as fill from becoming wet or unstable. These measures may include the use of plastic sheeting, sumps with pumps and grading. The site soils should not be left uncompacted and exposed to moisture.

Sealing exposed soils by rolling with a smooth-drum roller prior to periods of precipitation will help reduce the extent to which these soils become wet or unstable.

- Construction traffic should be restricted to specific areas of the site, preferably areas that are surfaced with working pad materials not susceptible to wet weather disturbance.
- Construction activities should be scheduled so that the length of time that soils are left exposed to moisture is reduced to the extent practical.
- Existing pavements and hardscaping should remain in place as long as practical during construction.

4.7.10. Abandoning Existing Stormwater Detention Vault

We understand that the existing stormwater detention vault will be decommissioned and left in place below the new building. The vault dimensions are approximately 120 feet long, 8 feet wide and 5.5 feet tall. We understand that the elevation of the top of the vault is around Elevation 70.6 feet (about 4 to 8 feet below existing site grades). Site grading plans indicate that about 9 feet of structural fill will be placed over the vault to established building subgrade elevation. We understand that building footings will not be located directly over the top of the vault.

In our opinion the vault can remain in place provided the void spaces within the vault are filled. Currently, controlled density fill (CDF) or other flowable fill material is proposed to fill the vault. During filling of the vault, measures will need to be in place to verify that the vault is completely filled. It could be necessary to cut several access points into the vault in order to place the CDF and verify that the vault was filled. It may also be necessary to use hand tools or concrete vibrators (stingers) to help distribute the CDF within the vault. We recommend that the contractor performing the work be required to provide detailed documentation and verification that the vault was completely filled. CDF or other fill materials should have a minimum 28-day compressive strength of at least 1,000 psi.

4.8. Fill Materials

4.8.1. Structural Fill

The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. We recommend that washed crushed rock or select granular fill, as described below, be used for structural fill during the rainy season. If prolonged dry weather prevails during the earthwork phase of construction, materials with a somewhat higher fines content may be acceptable. Weather and site conditions should be considered when determining the type of import fill materials purchased and brought to the site for use as structural fill.

Material used for structural fill should be free of debris, organic contaminants and rock fragments larger than 6 inches. For most applications, we recommend that structural fill material consist of material similar to “Select Borrow” or “Gravel Borrow” as described in Section 9-03.14 of the Washington State Department of Transportation (WSDOT) Standard Specifications.

4.8.2. Select Granular Fill

Select granular fill should consist of well-graded sand and gravel or crushed rock with a maximum particle size of 6 inches and less than 5 percent fines by weight based on the minus ¾-inch fraction. Organic matter, debris or other deleterious material should not be present. In our opinion, material with gradation characteristics similar to WSDOT Specification 9-03.9 (Aggregates for Ballast and Crushed Surfacing), or

9-03.14 (Borrow) is suitable for use as select granular fill, provided that the fines content is less than 5 percent (based on the minus ¾-inch fraction) and the maximum particle size is 6 inches.

4.8.3. Pipe Bedding

Trench backfill for the bedding and pipe zone should consist of well-graded granular material similar to "gravel backfill for pipe zone bedding" described in Section 9-03.12(3) of the WSDOT Standard Specifications. The material must be free of roots, debris, organic matter and other deleterious material. Other materials may be appropriate depending on manufacturer specifications and/or local jurisdiction requirements.

4.8.4. Trench Backfill

Trench backfill must be free of debris, organic material and rock fragments larger than 6 inches. We recommend that trench backfill material consist of material similar to "Select Borrow" or "Gravel Borrow" as described in Section 9-03.14 of the WSDOT Standard Specifications. Where excavations occur in the wet, alternative materials such as select granular fill should be considered.

4.8.5. Gravel Backfill For Walls

Backfill material used within 5 feet behind retaining walls should consist of free-draining material similar to "gravel backfill for walls" Described in Section 9-03.12(2) of the WSDOT Standard Specifications.

4.8.6. On-Site Soil

Reuse of onsite soils should consider the preliminary environmental design considerations provided in Section 2.2 of this report. As discussed previously, only soils generated from above the groundwater table (or those not saturated by perched groundwater) should be considered for reuse at this time. Additional environmental considerations for handling and reusing onsite soils will be provided in a separate deliverable. We understand that for planning purposes, the Project Team has assumed that soil generated during grading and excavation activities will be exported from the site and imported soils will be used as fill and backfill materials.

If on-site soils are reused on site, in our opinion the soils may be considered for use as structural fill and trench backfill, provided that they can be adequately moisture conditioned, placed and compacted as recommended and do not contain organic or other deleterious material. The majority of existing soils contain a significant percentage of fines and will be extremely moisture sensitive. These materials will be very difficult or impossible to properly compact when wet. In addition, it is possible that existing soils will be generated at moisture contents above what is optimum for compaction. As such, we do not recommend assuming that existing soils will be suitable for use as structural fill during the winter months. Special provisions for export of existing soil and import of new materials should be considered during this time.

4.8.7. Fill Placement and Compaction

4.8.7.1. General

To obtain proper compaction, fill soil should be compacted near optimum moisture content and in uniform horizontal lifts. Lift thickness and compaction procedures will depend on the moisture content and gradation characteristics of the soil and the type of equipment used. The maximum allowable moisture content varies with the soil gradation and should be evaluated during construction. Generally, 12-inch loose lifts are appropriate for steel-drum vibratory roller compaction equipment. Compaction should be achieved by mechanical means. During fill and backfill placement, sufficient testing of in-place density should be conducted to check that adequate compaction is being achieved.

4.8.7.2. Area Fills and Pavement Bases

Fill placed to raise site grades and materials under pavements and structural areas should be placed on subgrades prepared as previously recommended. Fill material placed below structures and footings should be compacted to at least 95 percent of the theoretical MDD per ASTM International (ASTM) D 1557. Fill material placed shallower than 2 feet below pavement sections should be compacted to at least 95 percent of the MDD. Fill placed deeper than 2 feet below pavement sections should be compacted to at least 90 percent of the MDD. Fill material placed in landscaping areas should be compacted to a firm condition that will support construction equipment, as necessary, typically around 85 to 90 percent of the MDD.

4.8.7.3. Backfill Behind Below-Grade Structures

Backfill behind retaining walls or below-grade structures should be compacted to between 90 and 92 percent of the MDD. Overcompaction of fill placed directly behind below-grade structures should be avoided. We recommend use of hand-operated compaction equipment and maximum 6-inch loose lift thickness when compacting fill within about 5 feet behind below-grade structures.

4.8.7.4. Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction, but generally should not be greater than about 18 inches above the pipe. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

Trench backfill material placed below structures and footings should be compacted to at least 95 percent of the MDD. In paved areas, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD in the upper 2 feet below subgrade. Fill placed below a depth of 2 feet from subgrade in paved areas must be compacted to at least 90 percent of the MDD. In non-structural areas, trench backfill should be compacted to a firm condition that will support construction equipment as necessary.

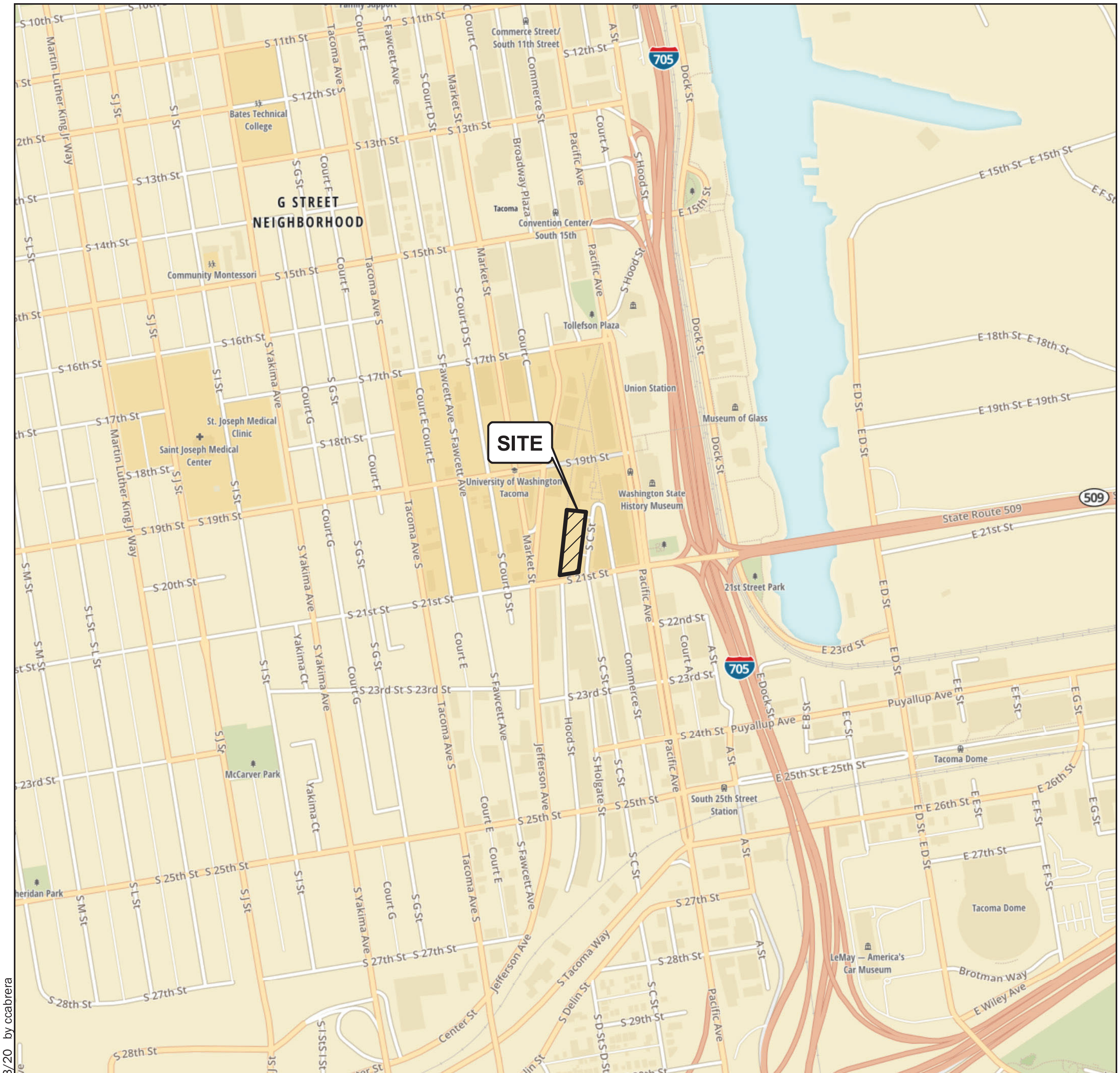
5.0 LIMITATIONS

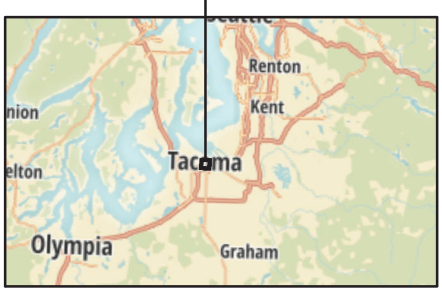
We have prepared this report for the University of Washington, for the University of Washington Tacoma Milgard Hall project located in Tacoma, Washington. University of Washington may distribute copies of this report to owner and owner's authorized agents and regulatory agencies as may be required for the project.

Our services have been executed in accordance with generally accepted practices for geotechnical engineering in this area at the time this report was prepared. The conclusions, recommendations, and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty, express or implied, applies to the services or this report.

Please refer to Appendix C titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

FIGURES





Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2016

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

UWT – Milgard Hall
Tacoma, Washington

GEOENGINEERS

Figure 1

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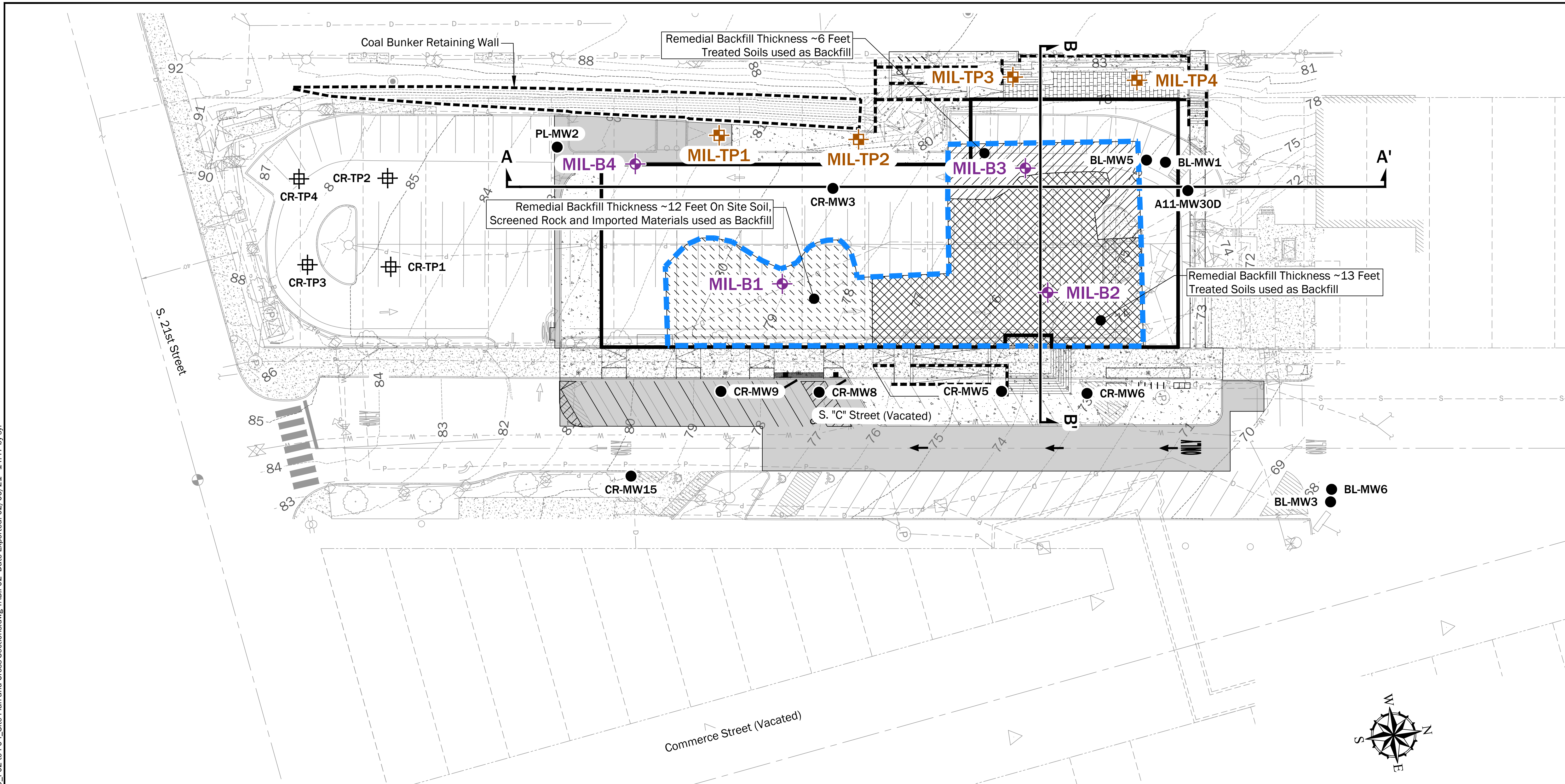

Legend

MIL-B1 Boring by GeoEngineers, Inc., 2020

MIL-TP1 Test Pit by GeoEngineers, Inc., 2020

BL-MW1 Existing Monitoring Well Location

CR-TP1 Former Test Pit Location

Historical Limits of UST/Soil Remedial Excavation

A A' Cross Section Location

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from AHBL dated 07/07/20.

Vertical Datum: City of Tacoma Datum (NGVD 29).

Projection: NAD83 Washington State Planes, South Zone, US Foot.

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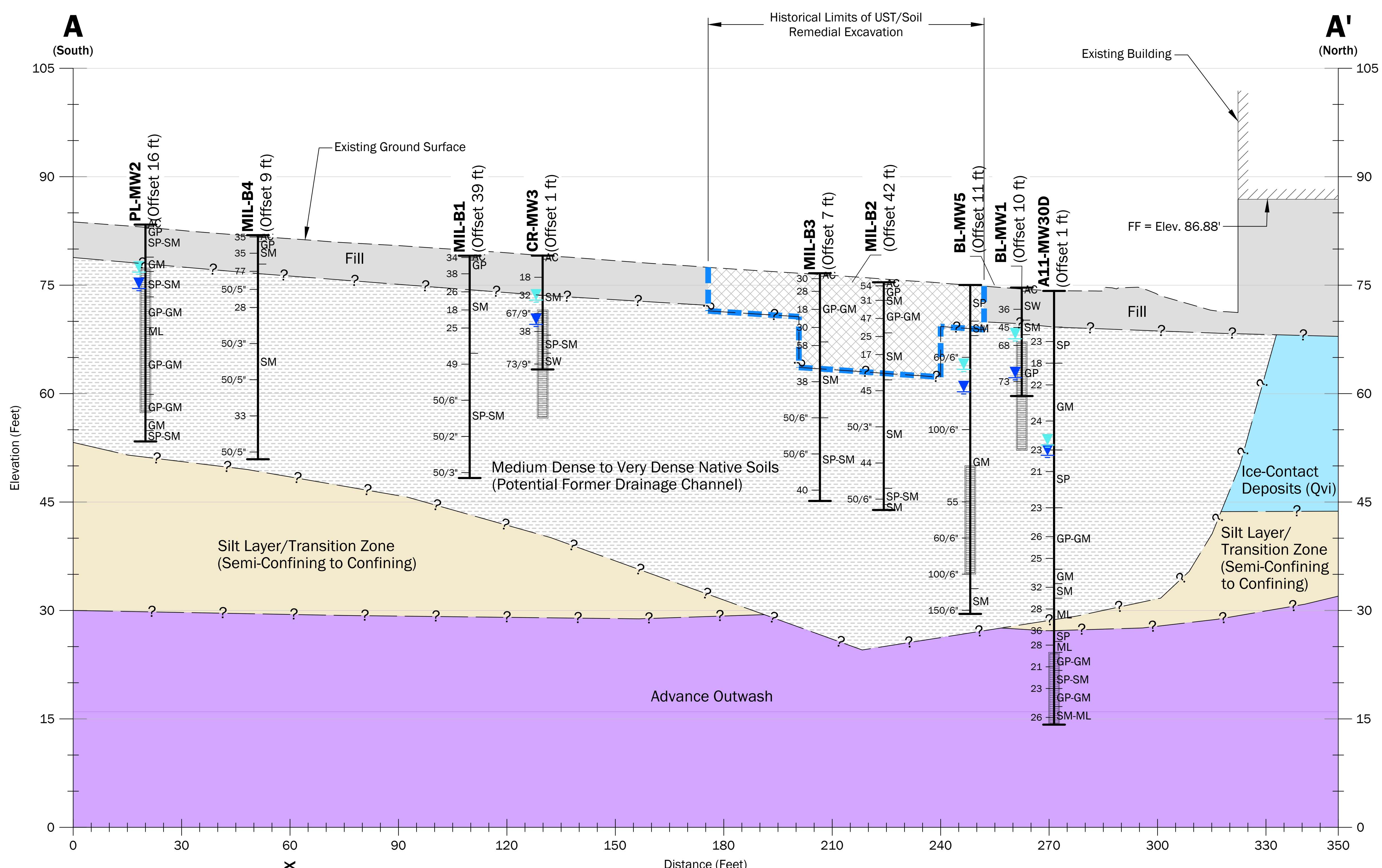
Site Plan

UWT – Milgard Hall
Tacoma, Washington

GeoEngineers

Figure 2



Legend

BL-MW-X (Offset) Monitoring Well

Inferred Soil Contact

SM Soil Classification

Groundwater Min. Depth to Water

Groundwater Max. Depth to Water

20 Blow Count

Well Screen

Fill

Ice-Contact Deposits (Qvi)

Silt Layer/Transition Zone (Semi-Confining to Confining)

Medium Dense to Very Dense Native Soils (Potential Former Drainage Channel)

Advance Outwash

Treated Soil Used as Backfill

30 0 30
Horizontal Scale in Feet

15 0 15
Vertical Scale in Feet
Vertical Exaggeration: 2X

Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: City of Tacoma Datum (NGVD 29), unless otherwise noted.

Cross Section A-A'

UWT – Milgard Hall
Tacoma, Washington

GeoEngineers

Figure 3

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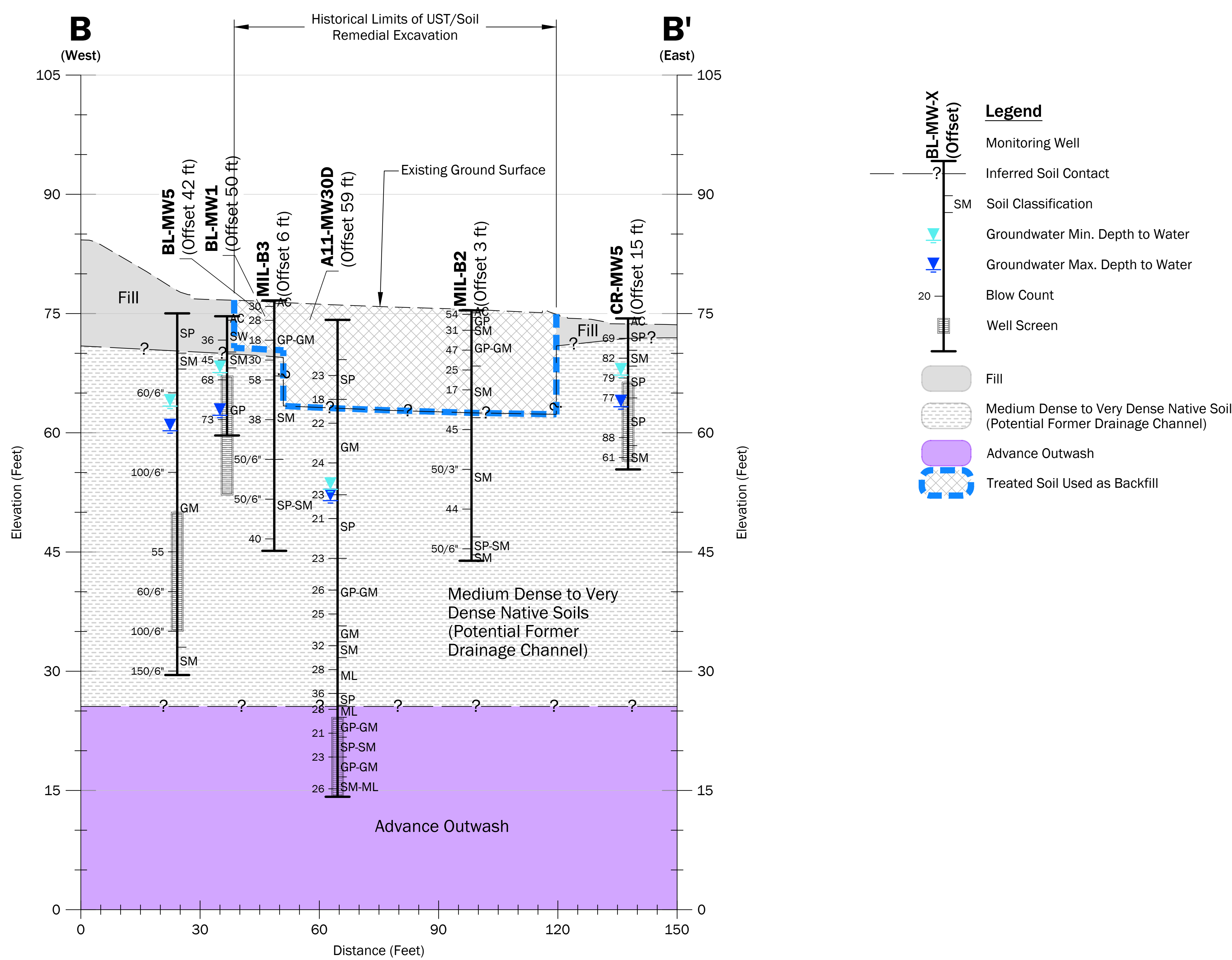

Notes:

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Datum: City of Tacoma Datum (NGVD 29), unless otherwise noted.

30 0 30
Horizontal Scale in Feet

15 0 15
Vertical Scale in Feet
Vertical Exaggeration: 2X

Cross Section B-B'

UWT – Milgard Hall
Tacoma, Washington

GeoEngineers

Figure 4

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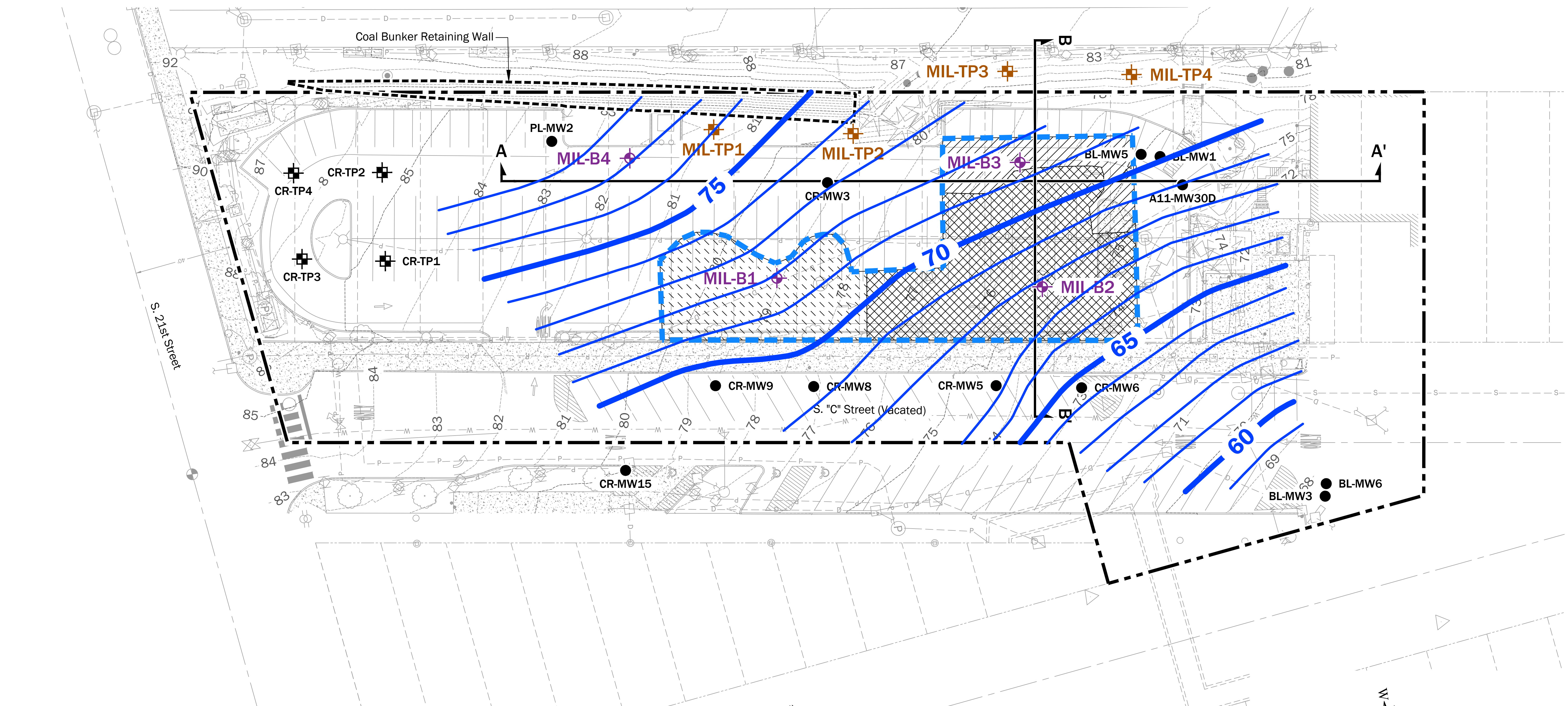


Notes:

1. Groundwater elevations for BL-MW1, BL-MW3 and BL-MW5 are the maximum and minimum elevations for the period 3/6/19 through 2/12/20 as measured and recorded by a pressure transducer/data logger; remaining monitoring wells did not have transducers installed.
2. Maximum and minimum groundwater elevations for wells not having transducers installed are extrapolated using BL-MW1 transducer data and two manual measurements from each well recorded during the transducer monitoring period. BL-MW1 maximum and minimum groundwater elevations were recorded by transducer on December 20, 2020 and September 7, 2019, respectively.
3. Only wells with screens extending within 10 feet of ground surface (shallow wells) were used for contouring. BL-MW5, CR-MW15 and A11-MW30D are screened deeper than other wells shown and were not used for contouring.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from AHBL dated 07/07/20.

Vertical Datum: City of Tacoma Datum (NGVD 29).

Projection: NAD83 Washington State Planes, South Zone, US Foot.

Legend

Site Boundary

MIL-B1 Boring by GeoEngineers, Inc., 2020

MIL-TP1 Test Pit by GeoEngineers, Inc., 2020

BL-MW1 Existing Monitoring Well Location

CR-TP1 Former Test Pit Location

Groundwater Elevation Contour, Seasonal High

Historical Limits of UST/Soil Remedial Excavation

A A' Cross Section Location

40 0 40

Feet

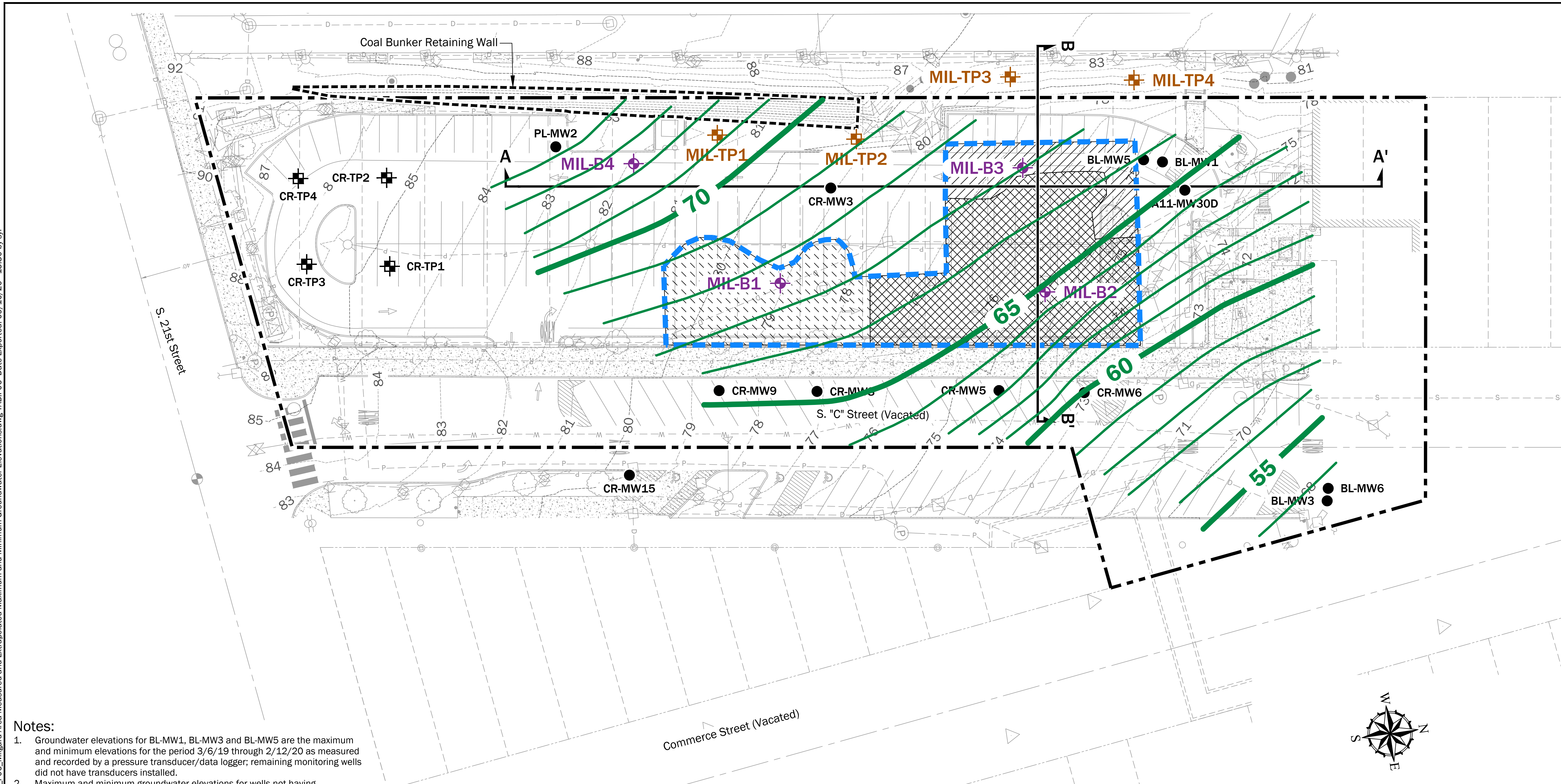
Milgard Area Measured and Extrapolated Maximum Groundwater Elevations

UWT – Milgard Hall
Tacoma, Washington

GEOENGINEERS

Figure 5

P:\0\0183145\CAD\00\Geotech Report\018314500_F05_F06_Milgard Area Measured and Extrapolated Maximum and Minimum Groundwater Elevations.dwg TAB:F05 Date Exported: 09/10/20 - 15:28 by syi



Notes:
1. Groundwater elevations for BL-MW1, BL-MW3 and BL-MW5 are the maximum and minimum elevations for the period 3/6/19 through 2/12/20 as measured and recorded by a pressure transducer/data logger; remaining monitoring wells did not have transducers installed.
2. Maximum and minimum groundwater elevations for wells not having transducers installed are extrapolated using BL-MW1 transducer data and two manual measurements from each well recorded during the transducer monitoring period. BL-MW1 maximum and minimum groundwater elevations were recorded by transducer on December 20, 2020 and September 7, 2019, respectively.
3. Only wells with screens extending within 10 feet of ground surface (shallow wells) were used for contouring. BL-MW5, CR-MW15 and A11-MW30D are screened deeper than other wells shown and were not used for contouring.
4. The locations of all features shown are approximate.
5. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Background from AHBL dated 07/07/20.

Vertical Datum: City of Tacoma Datum (NGVD 29).

Projection: NAD83 Washington State Planes, South Zone, US Foot.

Legend

- Site Boundary
- MIL-B1 — Boring by GeoEngineers, Inc., 2020
- MIL-TP1 — Test Pit by GeoEngineers, Inc., 2020
- BL-MW1 — Existing Monitoring Well Location
- CR-TP1 — Former Test Pit Location
- Groundwater Elevation Contour, Seasonal Low
- Historical Limits of UST/Soil Remedial Excavation
- A — A' Cross Section Location

Milgard Area Measured and Extrapolated Minimum Groundwater Elevations

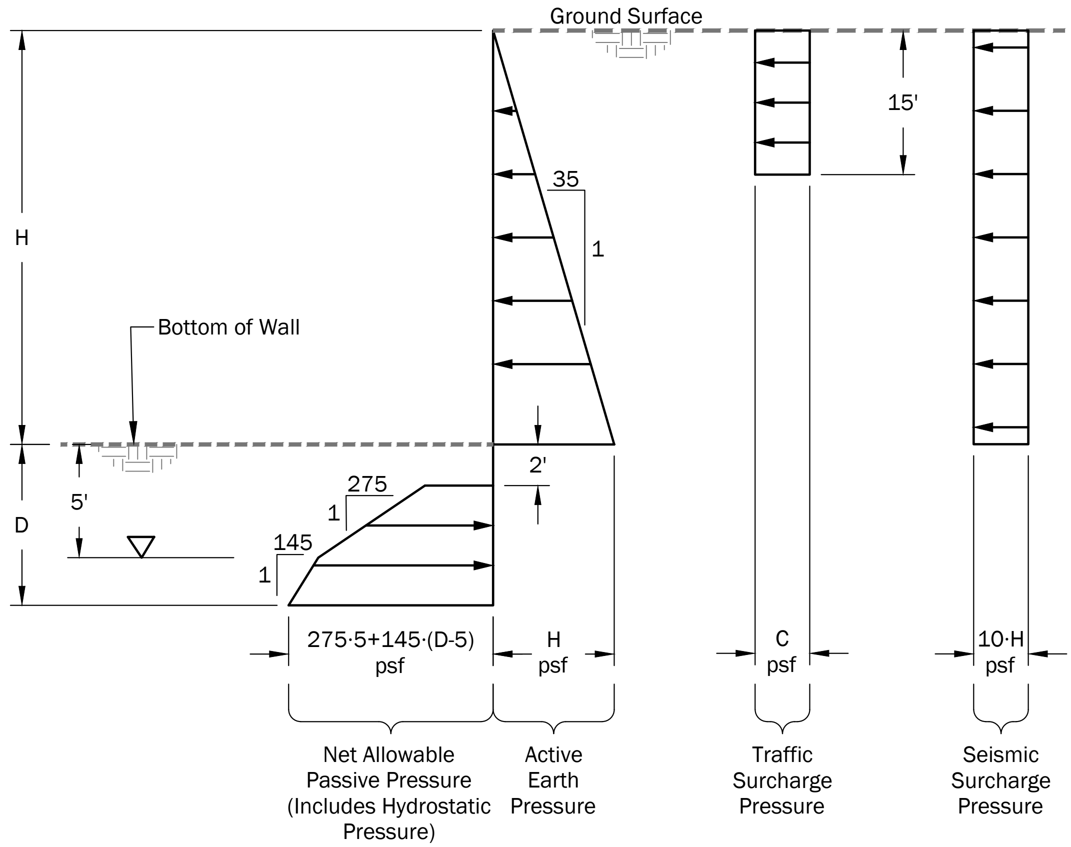
UWT – Milgard Hall
Tacoma, Washington

GeoEngineers

Figure 6

P:\0\0183145\CAD\00\Geotech Report\018314500_F05_F06_Milgard Area Measured and Extrapolated Maximum and Minimum Groundwater Elevations.dwg TAB:F06 Date Exported: 09/10/20 - 15:30 by syi

Cantilever Soldier Pile



Traffic Surcharge Factor, C	
Light Vehicular	50
Fire Truck and Similar Loading	70

Legend

H = Height of Excavation, Feet

D = Vertical Embedment Depth, Feet

▽ Design Groundwater Elevation for Drained Walls/ Passive Resistance Design

Not To Scale

Notes:

1. Active earth pressure and traffic surcharge pressure act over the pile spacing above the base of the excavation.
2. Passive earth pressure acts over 2.5 times the concreted diameter of the soldier pile, or the pile spacing, whichever is less.
3. Passive earth pressure includes a factor of safety of 1.5.
4. Additional surcharge from footings of adjacent buildings or other permanent structures are not included.
5. If additional surcharge loading (such as from soil stockpiles, excavators, dumptrucks, cranes, or concrete trucks) is anticipated, GeoEngineers should be consulted to provide revised surcharge pressures.

Earth Pressure Diagram
Cantilever Wall

UWT – Milgard Hall
Tacoma, Washington

GeoEngineers

Figure 7

APPENDICES

APPENDIX A
Subsurface Explorations

APPENDIX A
SUBSURFACE EXPLORATIONS

General

Soil conditions at the project site were explored by advancing four borings on August 11 and 12, 2020, and excavating four test pits on August 17, 2020. The approximate locations of our explorations and shown on the Site Plan, Figure 2. The explorations were located in the field using a GPS device. The locations of the explorations shown on Figure 2 should be considered approximate.

Soil Borings

Soil borings were advanced to between 30 feet and 31.5 feet below ground surface (bgs) using a truck-mounted hollow-stem auger drill rig equipment and operators under subcontract to GeoEngineers. The explorations were continuously monitored by a representative from our firm who examined and classified the soil encountered, obtained representative soil samples, and maintained a detailed log of the explorations. Soil encountered in the borings was classified in general accordance with ASTM International (ASTM) D 2488 and the classification chart listed in Key to Exploration Logs, Figure A-1. Logs of the borings are presented in Figures A-2 through A-5. The logs are based on interpretation of the field and indicate the depth at which we interpret subsurface materials or their characteristics to change, although these changes might actually be gradual.

Soil samples were obtained from the borings at approximate 2.5- to 5-foot-depth intervals using a 2-inch, outside-diameter, standard split-spoon sampler (Standard Penetration Test [SPT]) in general accordance with ASTM D 1586. The sampler was driven into the soil using a 140-pound automatic hammer, free-falling 30 inches. The number of blows required to drive the sampler each of three, 6-inch increments of penetration (total of 18 inches) were recorded in the field. The sum of the blow counts for the final 12 inches of penetration, unless otherwise noted, is reported on the boring logs.

The soil borings were backfilled by our drilling subcontractor following Washington Department of Ecology Guidelines. Soil cuttings generated during drilling were collected in drums and taken to a location designated by the UWT for temporary storage prior to disposal.

Test Pits

Test pit explorations were excavated using a mini-excavator at the approximate locations shown on the Site Plan (Figure 2). The excavations were advanced to depths between 4 and 10 feet. The explorations were continuously monitored by an engineer from our firm who examined and classified the soil encountered, obtained representative soil samples, and maintained a detailed log of the explorations. Logs of the test pits are presented in Figures A-6 through A-9. Soil generated during excavation was used to backfill the explorations.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

Sampler Symbol Descriptions

- 2.4-inch I.D. split barrel
- Standard Penetration Test (SPT)
- Shelby tube
- Piston
- Direct-Push
- Bulk or grab
- Continuous Coring

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

"P" indicates sampler pushed using the weight of the drill rig.

"WOH" indicates sampler pushed using the weight of the hammer.

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	AC	Asphalt Concrete
	CC	Cement Concrete
	CR	Crushed Rock/ Quarry Spalls
	SOD	Sod/Forest Duff
	TS	Topsoil

Groundwater Contact

Measured groundwater level in exploration, well, or piezometer

Measured free product in well or piezometer

Graphic Log Contact

Distinct contact between soil strata

Approximate contact between soil strata

Material Description Contact

Contact between geologic units

Contact between soil of the same geologic unit

Laboratory / Field Tests

%F	Percent fines
%G	Percent gravel
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DD	Dry density
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
Mohs	Mohs hardness scale
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PL	Point load test
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

Key to Exploration Logs

GeoEngineers

Figure A-1

Rev 09/2020

Drilled	Start 8/12/2020	End 8/12/2020	Total Depth (ft) 30.75	Logged By CJL / Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) 79 / Vertical Datum NGVD29	Hammer Data: Auto Hammer, 140 (lbs) / 30 (in) Drop	Drilling Equipment: Diedrich D-120
Easting (X) 1159103 / Northing (Y) 702542	System Datum: WA State Plane South, NAD83 (feet)	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	15	34	1	AC	3 inches asphalt concrete	NS	0.8	
					GP	3 inches crushed rock base course			
					SM	Brown-gray silty fine to coarse sand with gravel (dense, moist) (fill)			
		8	38	2			NS	0.3	
75									
	5	8	26	3		Grades to gray with trace organic matter (wood fragments), fine to coarse sand, medium dense	NS	1.2	
		14	18	4		Grades to brown-gray	NS	1.8	
70									
	10	13	25	5			NS	3.2	
						Grades to wet			Groundwater observed at 12 feet at time of drilling
65					SP-SM	Gray fine to coarse sand with silt and gravel (dense, wet) (native soil)			
	15	18	49	6			NS	0.6	
60									
	20	12	50/6"	7		Grades to very dense	NS	0.2	Gravel in shoe
55									
	25	8	50/2"	8		Grades to brown-gray	NS	0.2	
50									
	30	9	50/3"	9			NS	0.2	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring MIL-B1

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Drilled	Start 8/12/2020	End 8/12/2020	Total Depth (ft) 31.5	Logged By CJL / Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	75 / NGVD29	Hammer Data	Auto Hammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-120
Easting (X) / Northing (Y)	1159121 / 702646	System Datum	WA State Plane South NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	12	54	1	AC	3 inches asphalt concrete			
					GP	4 inches crushed rock base course			
					SM	Brown silty fine to medium sand with gravel (very dense, moist) (fill)	NS	8.3	Drill chatter
		6	31	2	GP-GM	Brown-gray fine to coarse gravel with silt and sand (dense, moist)	NS	3.0	
70	5	12	47	3			NS	3.4	Gravel in shoe
		13	25	4	SM	Brown silty fine to medium sand with gravel (medium dense, moist)	SS	3.0	
65	10	4	17	5			NS	1.3	
					SM	Gray silty fine to coarse sand with gravel (dense, wet) (native soil)			
60	15	12	45	6			NS	1.5	
									Groundwater measured at 18 feet at time of drilling
55	20	0	50/3"				NS	0.0	
50	25	18	44	7		Grades to with occasional gravel and dense	NS	0.0	
					SP-SM	Brown-gray fine to coarse sand with silt (very dense, wet)			
45	30	0	50/6"						
					SM	Brown-gray silty fine sand (very dense, wet)			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring MIL-B2

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Drilled	Start 8/11/2020	End 8/11/2020	Total Depth (ft)	31.5	Logged By CJL / Checked By BEL	Driller	Holocene Drilling, Inc.	Drilling Method	Hollow-stem Auger

Surface Elevation (ft) / Vertical Datum	77 / NGVD29	Hammer Data	Auto Hammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-120
Easting (X) / Northing (Y)	1159071 / 702645	System Datum	WA State Plane South NAD83 (feet)	See "Remarks" section for groundwater observed	

Notes:

Elevation (feet)	Depth (feet)	FIELD DATA: Interval	Recovered (in)	Blows/foot	Collected Sample	Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
77	0							AC	3½ inches asphalt concrete			
			7	30		1		GP-GM	Brown-gray fine to coarse gravel with silt and sand (dense, moist) (fill)	NS	0.3	
75			18	28		2			Grades to gray, medium dense	NS	0.7	
	5		3	18		3			Grades to wet	SS	0.4	Perched groundwater observed at 5 feet at time of drilling
70			8	30		4			Grades to dense, moist	NS	0.4	
	10		10	58		5		SM	Brown-gray silty fine to medium sand with gravel (very dense, moist) (native soil)	NS	0.7	
65												
	15		12	38		6			Grades to dense, wet	NS	0.3	Groundwater measured at 15 feet at time of drilling
60												
	20		8	50/6"		7		SP-SM	Brown-gray fine to coarse sand with silt and gravel (very dense, wet)	NS	0.2	
55												
	25		4	50/6"		8				NS	0.2	
50												
	30		18	40		9			Grades to with iron-oxide staining, fine to medium sand, dense	NS	1.2	

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Date:2/11/21 Path:P:\0\0183145\GINT\018314500.GPJ DBLibrary/Library:GEOENGINEERS_DF_STD_US_JUNE_2017.GLB/GEI8_ENVIRONMENTAL_STANDARD_NO_GW

Log of Boring MIL-B3

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Drilled	Start 8/12/2020	End 8/12/2020	Total Depth (ft) 31	Logged By CJL / Checked By BEL	Driller Holocene Drilling, Inc.	Drilling Method Hollow-stem Auger

Surface Elevation (ft) 82 / Vertical Datum NGVD29	Hammer Data: Auto Hammer 140 (lbs) / 30 (in) Drop	Drilling Equipment: Diedrich D-120
Easting (X) 1159047 / Northing (Y) 702491	System Datum: WA State Plane South NAD83 (feet)	See "Remarks" section for groundwater observed

Notes:

Elevation (feet)	Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	REMARKS
	0	16	35	1	AC	3 inches asphalt concrete	NS	0.7	
80					GP	6 inches crushed rock base course			
		15	35	2	SM	Brown silty fine to medium sand with gravel (dense, moist) (fill)	NS	0.8	
						Grades to with occasional iron-oxide staining			
	5	8	77	3	SM	Brown-gray with occasional iron-oxide staining silty fine to medium sand with gravel (very dense, moist) (native soil)	NS	1.7	Gravel in sampler shoe
75		0	50/5"						No recovery
	10	12	28	4		Grades to medium dense	NS	0.4	
70									
	15	0	50/3"			Grades to very dense			
65									
	20	5	50/5"	5			NS	0.1	
60									
	25	18	33	6		Grades to without iron oxide staining, trace gravel, dense, wet	NS	0.4	Groundwater measured at 25 feet at time of drilling
55									
	30	11	50/5"	7		Grades to very dense			

Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Boring MIL-B4

GEOENGINEERS

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Date Excavated	8/17/2020	Total Depth (ft)	4	Logged By	CC	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	BEL	Equipment	TB-138 FR Rubber Track-Mounted Excavator	Caving not observed

Surface Elevation (ft)	84	Easting (X)	1159031	Coordinate System	WA State Plane South
Vertical Datum	NGVD29	Northing (Y)	702526	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SM	Gray silty fine sand with gravel and occasional cobbles (dense, moist) (fill)			Depths referenced to adjacent parking lot elevation
83	1				SM	Brown to light brown with orange iron-oxide staining/mottling silty fine to medium sand with occasional gravel and debris (concrete and dimensional timber) (medium dense, moist)			Retaining wall footing observed at 18 inches below existing concrete
82	2								
81	3				SM	Brown with orange iron-oxide staining/mottling silty fine sand with gravel (dense, moist) (native soil)			Probe depth = 1 inch at 3 feet
			1						
80	4								

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Test Pit MIL-TP1

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Date Excavated	8/17/2020	Total Depth (ft)	7	Logged By	CC	Checked By	BEL	Excavator	Kelly's Excavating	Equipment	TB-138 FR Rubber Track-Mounted Excavator	Groundwater not observed	Caving not observed

Surface Elevation (ft)	83	Vertical Datum	NGVD29	Easting (X)	1159042	Northing (Y)	702605	Coordinate System	WA State Plane South	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				SM	Brown to gray silty fine to coarse sand with gravel and occasional cobbles and debris (bricks, concrete, glass) (loose, dry) (fill)			Depths referenced to adjacent parking lot elevation
82	1		1		AC	8 inches asphalt (former parking lot pavement)			
81	1.5				SM	Brown silty fine to coarse sand with gravel and occasional cobbles (medium dense, moist) (fill)			
78	5				SM	Brown silty fine to coarse sand with gravel and cobbles (medium dense, moist) (native soil)			
76	7		2						

Elevation (feet): 82, 81, 80, 79, 78, 77, 76
Depth (feet): 1, 2, 3, 4, 5, 6, 7

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Test Pit MIL-TP2

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Date Excavated	8/17/2020	Total Depth (ft)	10	Logged By	CC	Excavator Equipment	Kelly's Excavating TB-138 FR Rubber Track-Mounted Excavator	Groundwater not observed
				Checked By	BEL			See "Remarks" section for caving observed

Surface Elevation (ft)	82	Easting (X)	1159034	Coordinate System	WA State Plane South
Vertical Datum	NGVD29	Northing (Y)	702645	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0				WD	2 inches beauty bark			
81	1				SM	Gray silty fine to medium sand with gravel and occasional cobbles (loose to medium dense, dry to moist) (fill)			
80	2					Grades to with debris (concrete and wood)			
79	3								Probe = 4 inches at 3½ feet
78	4		1						
77	5								
76	6								Minor caving observed at approximately 6 feet bgs
75	7					Black coal observed at approximately 7 feet bgs			
74	8		2						
73	9		3						
72	10				SM	Brown with iron-oxide staining, silty fine sand with gravel (dense, moist) (glacially consolidated soil)			

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Test Pit MIL-TP3

GeoEngineers

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Date Excavated	8/17/2020	Total Depth (ft)	10	Logged By	CC	Excavator	Kelly's Excavating	Groundwater not observed
				Checked By	BEL	Equipment	TB-138 FR Rubber Track-Mounted Excavator	Caving not observed

Surface Elevation (ft)	80	Easting (X)	1159043	Coordinate System	WA State Plane South
Vertical Datum	NGVD29	Northing (Y)	702694	Horizontal Datum	NAD83 (feet)

Elevation (feet)	Depth (feet)	SAMPLE: Testing Sample	SAMPLE: Sample Name / Testing	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
80	0				WD	2 inches of beauty bark			
					SM	Gray silty fine to coarse sand with gravel (loose, dry to moist) (fill)			
79	1								
78	2				SM	Brown silty fine to coarse sand with gravel and occasional cobbles and debris (concrete, wood, timbers) (loose, moist)			
77	3								
76	4								
75	5								
74	6								
73	7		1						Hydrocarbon/diesel odor at 7 feet
					ML	Bluish-gray fine sandy silt (stiff, moist) (native soil)			
72	8				SM	Brown silty fine to coarse sand with gravel and occasional cobbles (dense, moist)			
71	9								
70	10		2						

Notes: See Figure A-1 for explanation of symbols.
The depths on the test pit logs are based on an average of measurements across the test pit and should be considered accurate to ½ foot.
Coordinates Data Source: Horizontal approximated based on Topographic Survey. Vertical approximated based on Topographic Survey.

Log of Test Pit MIL-TP4

GEOENGINEERS

Project: UWT-Milgard Hall
Project Location: Tacoma, Washington
Project Number: 0183-145-00

Figure A-9
Sheet 1 of 1

APPENDIX B
Previous Explorations

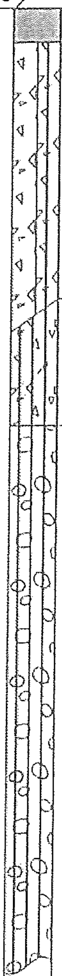
BL-MW1

00681B63.CDR

Surface Elevation
~77.5 Ft

Surface Conditions
Graded Soil

Depth in Feet	Inches Driven/Recovered	Time	Blows per Foot	PID (Sample) (ppm)	Soil Sample	Groundwater Sample	USCS Symbols	
0								Asphalt
							SW/ SM	Brown, gravelly, fine to coarse SAND with fine to coarse gravel and some silt (moist) (fill)
5							SM	Brown, silty, fine SAND (wet)
10							GM	Brown, sandy, fine to coarse SAND with silt and gravel (wet) (glacial outwash)
15								
20								



NOTE:

This well is a replacement well for BL-MW1, originally installed on July 21, 1993, by Applied Geotechnology, Inc. The original well was damaged due to construction activities and could not be located. The soil types shown are based on the log of the original well and adjacent well BL-MW5

Boring completed at 22' bgs

Groundwater encountered at 11' bgs

Boring completed as monitoring well:

2" 20-slot screen	22'-7'
2" casing	7'-0'
Concrete and monument	2'-0'
Bentonite seal	6'-2'
2/12 filter sand	22'-6'

Geologist:
Drilling method: HSA 9"
Sampling method: NA

Drill contractor: Cascade
Drill date: 10/7/98

Original in 1993 AGI

REPLACEMENT BL-MW1 GEOLOGIC BORING LOG

, No. 53-00681094.00

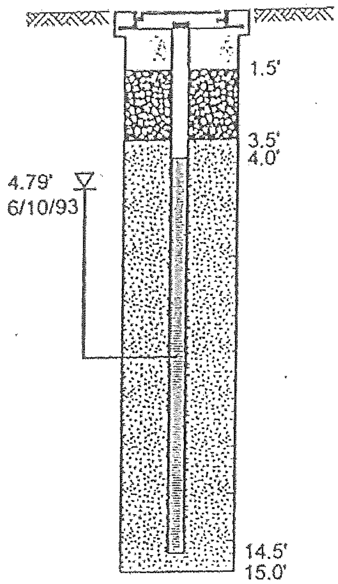
URS

University of Washington Tacoma Campus
Remedial Investigation Report

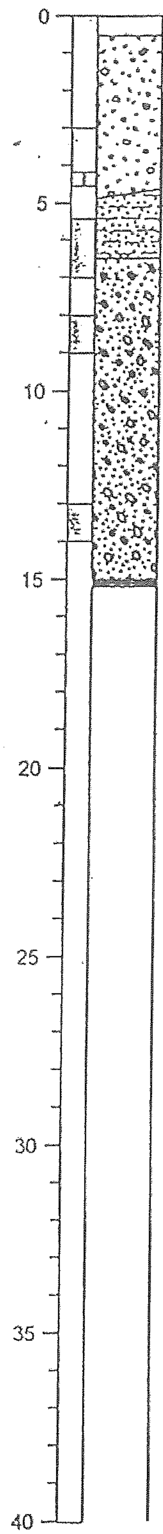
BL-MW1 (Well Log)

Equipment	Mobile B-61
Land Surface Elevation	74 feet*
Date	5/28/93

Well Construction Summary



Sheen	OVM	Blows per Foot
	0	36
	0	45
	0	68
	0	73



Asphalt.

BROWN GRAVELLY SAND (SW) dense, moist; fine to coarse grained, with fine to coarse gravel, and some silt.

BROWN SILTY SAND (SM) dense, wet; fine grained.

BROWN SANDY GRAVEL (GP) very dense, saturated; fine to coarse grained, medium to coarse sand, with some silt.

Boring terminated on 5/28/93.
Groundwater encountered at 8 feet during drilling.

Note: Analyzed soil samples are identified as BL-B1-(Depth)

* Elevations referenced to City of Tacoma datum (Mean Sea Level, NGVD29)

Applied Geotechnology Inc.

Log of Monitoring Well BL-MW1
Cragle Site/ UW Tacoma Branch Campus
Tacoma, Washington

PLATE **B7**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,743.001	SES	JLB	21 Jul. 93		

BL-MW3 (1/2)

00681B66.CDR

Surface Elevation ~67 Ft

Surface Conditions Asphalt

Depth in Feet	Inches Driven/Recovered	Time	Blows per Foot	PID (Sample) (ppm)	Soil Sample	Groundwater Sample	USCS Symbols	Description
0								Asphalt
							SM	Brown, silty SAND with gravel (medium dense) (moist) (no odor) (fill)
5	18/ 18	08:35	9/ 14/ 20	5	■			
10	6/ 6	08:45	50/ 6"	7	■		GM	Brown, silty, fine to medium SAND and GRAVEL (very dense) (moist) (no odor) (glacial outwash)
						∇		Grading wet
15	6/ 6	08:50	50/ 6"	9.8	■			As above, some gravel (wet)
								Grading to silty gravel
20								

Engineer: PMV

Drilling method: CME 55 Limited Access HSA

Sampling method: Split Spoon, 140# Hammer

Drill contractor: Cascade

Drill date: 9/11/98

J. No. 53-00681094.00

BL-MW3 (SHEET 1 of 2)
GEOLOGIC BORING LOG

URS

University of Washington Tacoma Campus
Remedial Investigation Report

BL-MW3 (2/2)

00681B66.CDR

Depth in Feet	Inches Driven/Recovered	Time	Blows per Foot	PID (Sample) (ppm)	Soil Sample	Groundwater Sample	USCS Symbols	
20	5/ 5	08.35	50/ 5"	10.7	■		GM	Brown, silty GRAVEL
							SM	Brown, silty, fine to medium SAND (wet) (no odor) (glacial till)
25	5/ 5	9:10	50/ 5"		■			Boring completed at 25' bgs
30								
35								
40								

Groundwater encountered at 14' bgs
Screen set at 10'-25' bgs

Boring completed as monitoring well:

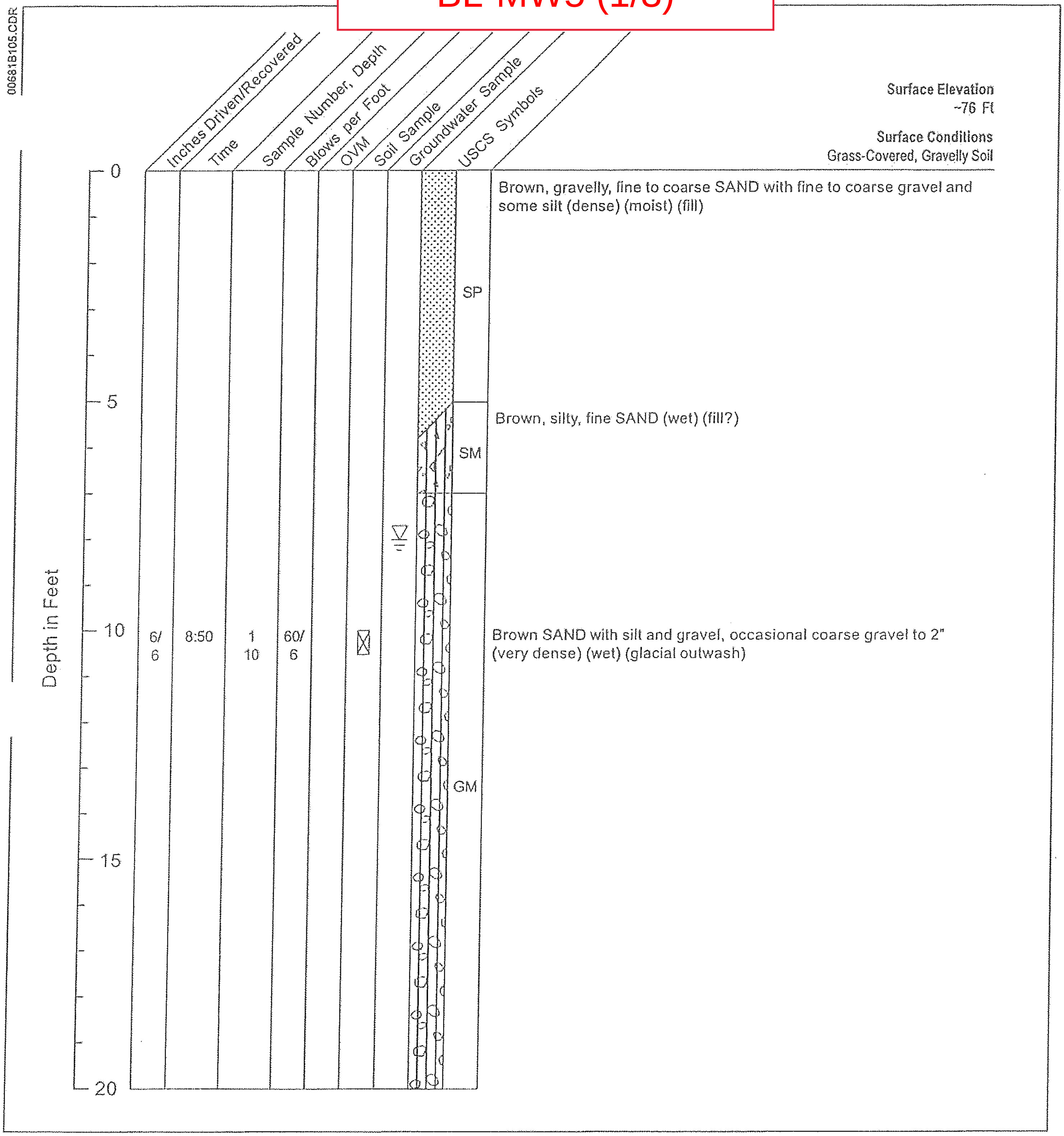
2" schedule 40 PVC 10-slot screen	25'-10'
2" schedule 40 PVC casing	10'-0'
Flush-mount locking monument	
Bentonite seal	8'-0'
2/12 filter sand	25'-8'

Engineer: PMV
Drilling method: CME 55 Limited Access HSA
Sampling method: Split Spoon, 140# Hammer

Drill contractor: Cascade
Drill date: 9/11/98

No. 53-00681094.00

BL-MW3 (SHEET 2 of 2)
GEOLOGIC BORING LOG



Geologist: TMG

Drilling method: Hollow Stem Auger

Sampling method: D&M U-Type Split Spoon, 140# Hammer

Note: Stratigraphy to a depth of 10' is from adjacent boring, BL-MW1

GW = Groundwater sample

Job No. 53-00681094.00

Drill contractor: Cascade

Drill date: 3/20/00

BL-MW5 (SHEET 1 of 3)
GEOLOGIC BORING LOG

URS

University of Washington Tacoma Campus
Remedial Investigation Report

00681B105.CDR

Depth in Feet	Inches Driven/Recovered	Time	Sample Number, Depth	Blows per Foot	OVM	Soil Sample	Groundwater Sample	USCS Symbols	Description
20	6/ 6	9:00	2 20	100/ 6"		⊠			
25	6/ 6		3 25 GW-1 25			⊠	I		Gray, medium to coarse SAND and SILT with gravel, contained well filter sand from BL-MW1 (moist)
30	6/ 6		4 30	41/ 55		⊠		GM	
35	6/ 6		5 35 GW-2 35	60/ 6"		⊠	I		
40									Increasing gravel

Geologist: TMG

Drilling method: Hollow Stem Auger

Sampling method: D&M U-Type Split Spoon, 140# Hammer

Note: Stratigraphy to a depth of 10' is from adjacent boring, BL-MW1

GW = Groundwater sample

Drill contractor: Cascade

Drill date: 3/20/00

Job No. 53-00681094.00

BL-MW5 (SHEET 2 of 3)
GEOLOGIC BORING LOG

00681B105.CDR

Depth in Feet	Inches Driven/Recovered	Time	Sample Number, Depth	Blows per Foot	OVM	Soil Sample	Groundwater Sample	USCS Symbols	Description
40	6/ 6	10:50		100/ 6"		⊠		GM	Increasing gravel
								SM	Gray, fine, sandy SILT (very dense) (moist) (glacial till)
45	6/ 6	10:20	6 45	150/ 6"		⊠	I		Boring completed at 45' bgs
		12:10	GW-3 45						Groundwater encountered at 8' bgs
50									
55									
60									

Boring completed as monitoring well:

2" schedule 40 PVC 10-slot screen	43'-38'	-5 ft screen
2" schedule 40 PVC casing	38'-+2'	
2/12 filter sand	45'-35'	
Bentonite/concrete seal	32'-3'	
Cement Seal and monument	+2' - 0'	

Geologist: TMG

Drilling method: Hollow Stem Auger

Sampling method: D&M U-Type Split Spoon, 140# Hammer

Note: Stratigraphy to a depth of 10' is from adjacent boring, BL-MW1

GW = Groundwater sample

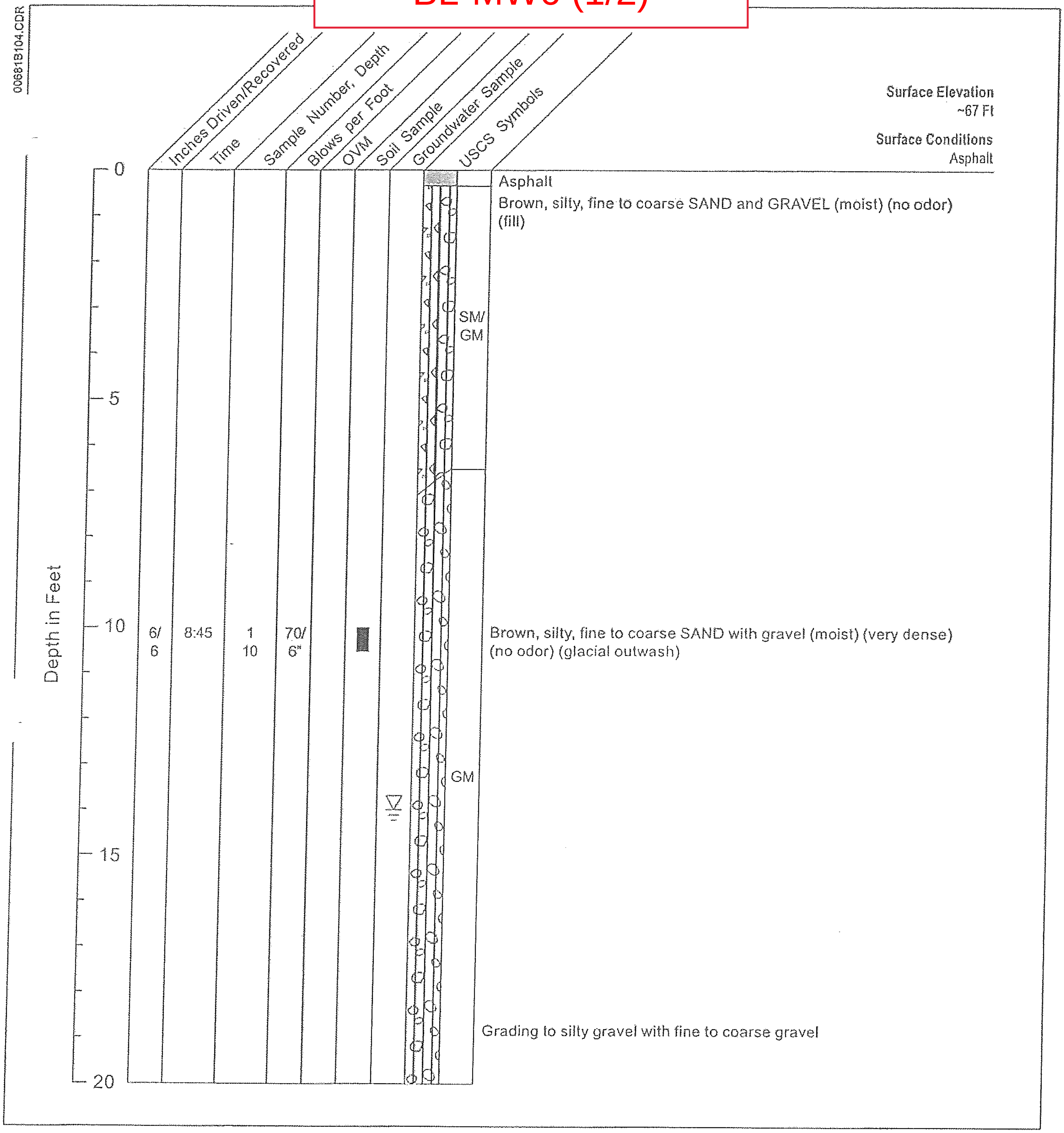
Drill contractor: Cascade

Drill date: 3/20/00

No. 53-00681094.00

BL-MW5 (SHEET 3 of 3)
GEOLOGIC BORING LOG

BL-MW6 (1/2)



Geologist: TMG

Drilling method: Hollow Stem Auger

Sampling method: D&M U-Type Split Spoon, 140# Hammer

Note: Stratigraphy to a depth of 10' from adjacent boring BL-MW3

GW = Groundwater sample

Drill contractor: Cascade

Drill date: 3/21/00

No. 53-00681094.00

BL-MW6 (SHEET 1 of 2)
GEOLOGIC BORING LOG

URS

University of Washington Tacoma Campus
Remedial Investigation Report

Depth in Feet	Inches Driven/Recovered	Time	Sample Number, Depth	Blows per Foot	OVM	Soil Sample	Groundwater Sample	USCS Symbols	Description
20	6/ 6	8:55	2 20	80/ 6"		■		GM	
								GC	Silty, fine SAND and GRAVEL (moist), and silty CLAY
25	6/ 6	9:10	3 25	55/ 6"		■	I		
		9:35	GW-1 25					SP	Gravelly SAND (very dense)
30	6/ 6	10:10	4 30	100/ 6"		■		SM	Gray and greenish gray, silty SAND and sandy SILT (very dense) (dry) (glacial till)
35	6/ 6	10:20	5 35	100/ 6"		■			
40									

Boring completed at 38' bgs

Groundwater encountered at 14' bgs

Boring completed as monitoring well:

2" schedule 40 PVC 10-slot screen	38'-33'
2" schedule 40 PVC casing	33'-0'
2/12 filter sand	38'-32'
Bentonite seal	32'-3'
Cement Seal and monument	3'-0'

Geologist: TMG

Drill contractor: Cascade

Drilling method: Hollow Stem Auger

Drill date: 3/21/00

Sampling method: D&M U-Type Split Spoon, 140# Hammer

Note: Stratigraphy to a depth of 10' from adjacent boring BL-MW3

GW = Groundwater sample

. No. 53-00681094.00

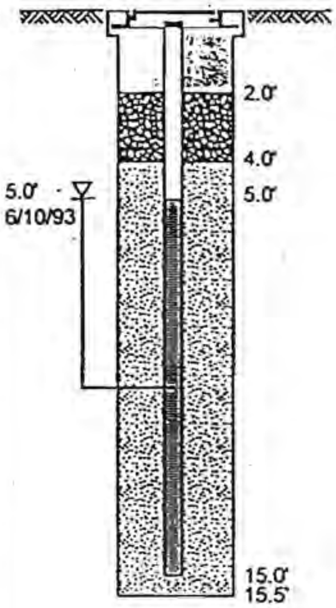
BL-MW6 (SHEET 2 of 2)
GEOLOGIC BORING LOG

CR-MW3

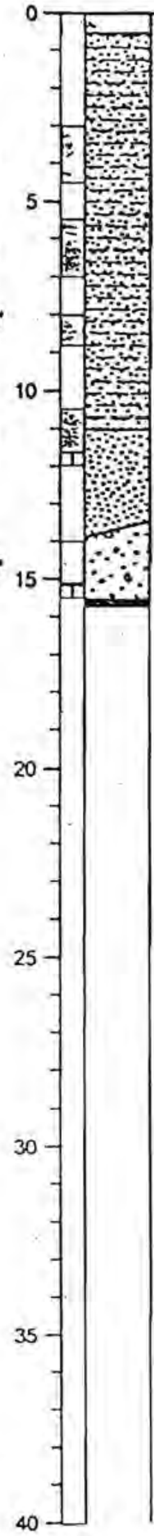
Equipment: Mobile B-61

Land Surface Elevation: 77 feet* Date: 5/27/93

Well Construction Summary



Sheen	OVM	Blows per Foot	Depth	Description
			0	Asphalt.
				BROWN SILTY SAND (SM) medium dense, moist; fine grained, with a trace of fine gravel, interlayered with sand lenses.
	0	18		
	0	32	5	Becomes fine to emdium grained, with a trace of fine gravel.
	0	67/0.9'		With some fine to coarse gravel.
	0	38	10	BROWN SAND (SP) dense, saturated; fine grained, with some silt, and a trace of gravel.
	0	73/0.9'	15	BROWN GRAVELLY SAND (SW) very dense, saturated; fine to coarse grained, fine gravel, with some silt.



Boring terminated on 5/27/93.
Groundwater encountered at 11 feet during drilling.

Note: Analyzed soil samples are identified as CR-B3-(Depth)

* Elevations referenced to City of Tacoma datum (Mean Sea Level, NGVD29)

Applied Geotechnology Inc.

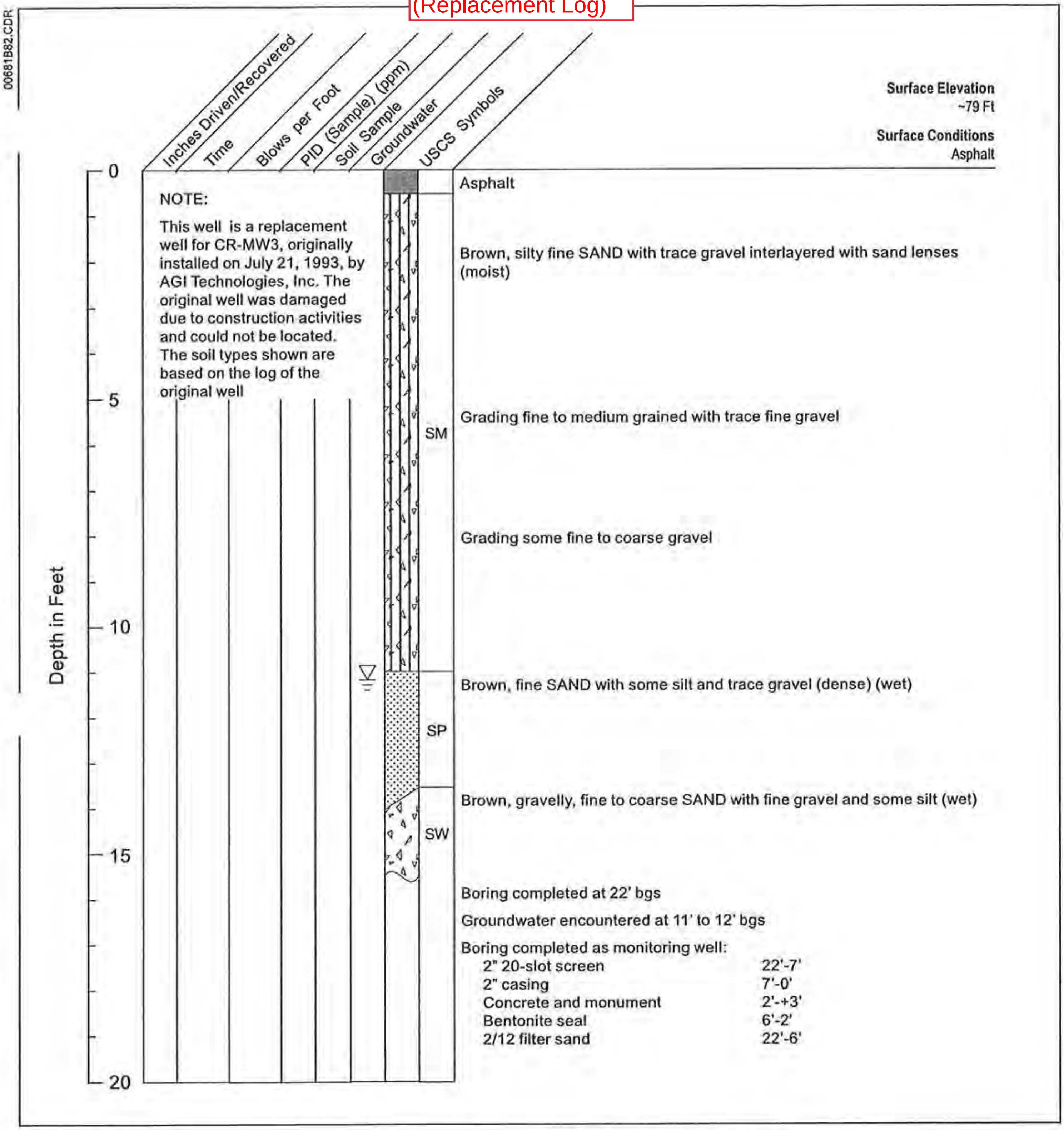
Log of Monitoring Well CR-MW3

Cragle Site/ UW Tacoma Branch Campus
Tacoma, Washington

PLATE B5

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,743.001	SES	JRB	21 Jul. 93		

CR-MW3
(Replacement Log)



Engineer: PMV

Drilling method: HSA 9"

Sampling method: NA

Drill contractor: Cascade

Drill date: 10/7/98

REPLACEMENT CR-MW3 GEOLOGIC BORING LOG

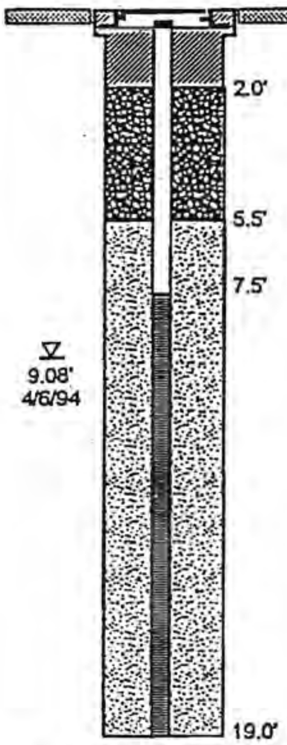
o No. 53-00681094.00

URS

University of Washington Tacoma Campus
Remedial Investigation Report

CR-MW5

Well Construction Summary

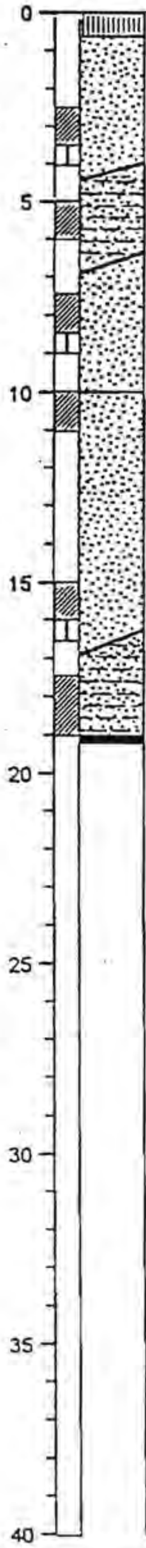


Top of Casing Elevation: 74.20 feet*

Equipment: Mobile B-61 | Date: 3/30/94

Land Surface Elevation: 75 feet* | Coordinates: N 702,621.35, E 1,159,156.70

OVM	Blows per Foot
0	69
0	82
0	79
49	77
9	88
5	61



8" Asphaltic Concrete, Cobblestone, and Concrete.

BROWN SAND (SP) very dense, moist; with a trace of silt, and fine gravel.

BROWN SILTY SAND (SM) very dense, moist; with some fine to coarse gravel.

BROWN SAND (SP) very dense, moist; with some gravel.

Hydrocarbon odor.

GRAY GRAVELLY SAND (SP) very dense, saturated; coarse grained, gravel is fine to coarse, with a trace of silt. Hydrocarbon odor.

Faint hydrocarbon odor.

BROWN SILTY SAND (SM) very dense, saturated, with a trace of fine gravel.

Groundwater encountered at 9.75 feet during drilling.

Boring converted into a groundwater monitoring well on 3/30/94.

*Elevations refer to City of Tacoma datum (Mean Sea Level, NGVD 29)

AGI TECHNOLOGIES

Log of Monitoring Well CR-MW5

University of Washington/Tacoma Branch Campus

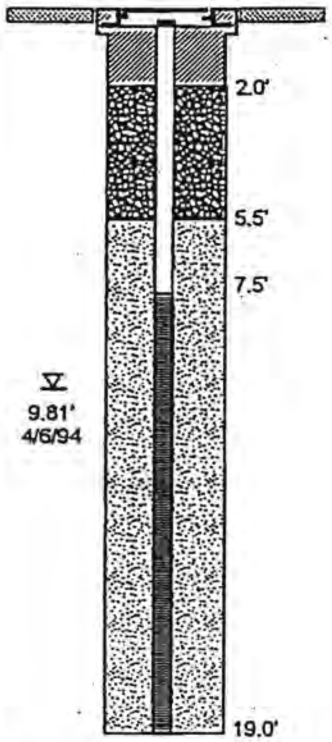
Tacoma, Washington

PLATE C3

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
743004mw.pm5	15,743.004	KM	26 May 94	LSP		

CR-MW6

Well Construction Summary

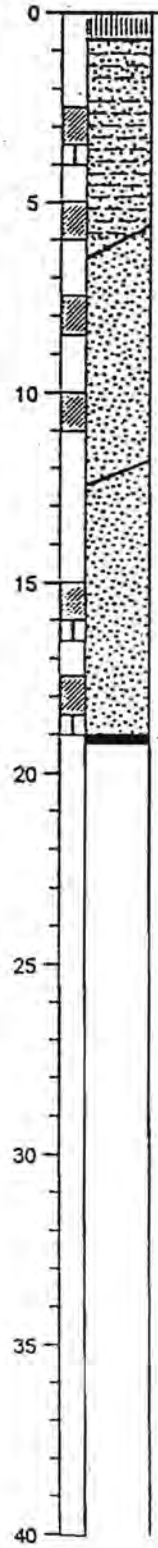


Top of Casing Elevation 72.87 feet*

Equipment	Mobile B-61	Date	3/30/94
Land Surface Elevation	73 feet*	Coordinates	N 702,654.93 E 1,159,162.35

OVM	Blows per Foot
0	49
0	80
0	69
0	72
0	71
0	47

Depth / Sample



8" Asphaltic Concrete, Cobblestones, and Concrete.
BROWN SILTY SAND (SM) very dense, moist; fine grained.

With a trace of fine to coarse gravel.

BROWN GRAVELLY SAND (SP) dense, moist; fine to medium grained, with a trace of silt.

Becomes saturated.

BROWN SAND (SP) very dense, saturated; medium to coarse grained, with a trace of silt.

Becomes medium dense, medium grained, with a trace of fine gravel and silt.

Groundwater encountered at 9.5 feet during drilling.
Boring converted into a groundwater monitoring well on 3/30/94.

*Elevations refer to City of Tacoma datum (Mean Sea Level, NGVD 29)

AGI TECHNOLOGIES

Log of Monitoring Well CR-MW6

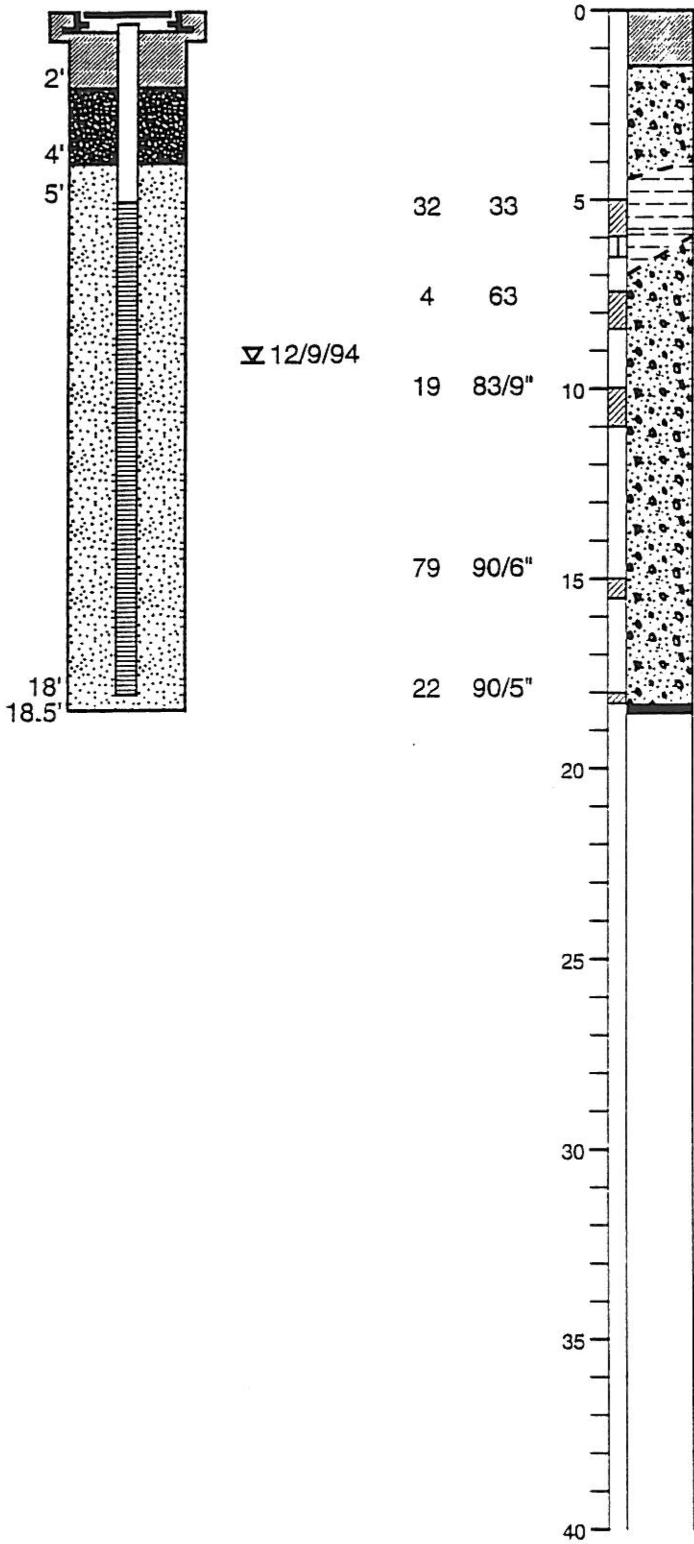
University of Washington/Tacoma Branch Campus
Tacoma, Washington

PLATE C4

	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
743004mw.pm5	15,743.004	KM	26 May 94	2SP		

CR-MW8

Equipment	CME-55
Land Surface Elevation	Approx. 80' msl
Date	12/7/94



OVM	Blows per Foot (H)	Depth (feet)	Description
		0	Asphaltic Concrete, sandstone paving blocks, concrete.
			BROWN SANDY GRAVEL (GP) very dense, moist; coarse grained, with a trace of silt.
32	33	5	DARK GRAY TO BLACK SANDY SILT (ML) very stiff, moist; with a trace of coarse grained gravel and wood, hydrocarbon like odor.
4	63		GRAY SANDY GRAVEL (GP) very dense, wet; fine to coarse grained with some silt and a trace of organics.
19	83/9"	10	Becomes saturated
79	90/6"	15	Trace of silt
22	90/5"		
			Terminated drilling at 18.4 feet bgs. Groundwater encountered at 8.3 feet bgs.

▽ 12/9/94

AGI TECHNOLOGIES

Log of Monitoring Well CR-MW8

University of Washington/Cragle Site Remediation
Tacoma, Washington

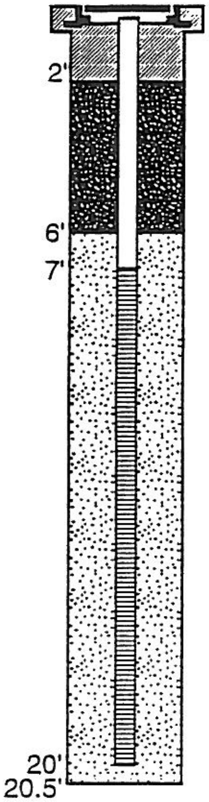
PLATE 3

File	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
crmw8.cdr	15,743.004	DFF	15 Dec 94			

CR-MW9

Equipment: CME-55

Land Surface Elevation: Approx. 80' msl   Date: 12/7/94



▽ 12/9/94

Depth (feet)	OVM	Blows per Foot (H)	Description
0			Asphaltic Concrete, sandstone paving blocks, concrete.
			BROWN SANDY GRAVEL (GP) very dense, moist; coarse grained, with a trace of silt.
			BROWN SILTY SAND (SM) very dense, moist; fine grained, with a trace of coarse gravel.
5	0	79	
			BROWN SAND (SP) very dense, moist; fine to medium grained, with a trace of fine to coarse gravel.
	2	77/9"	
10	5	60/5"	Hydrocarbon like odor, becomes saturated.
	460	60/5"	
15	508	80	Becomes gray.
			BROWN SANDY GRAVEL (GP) very dense, saturated; fine to coarse grained, with some silt.
20	88	95/6"	Boring terminated at 20.5 feet bgs. Groundwater encountered at 15 feet bgs.
25			
30			
35			
40			

AGI TECHNOLOGIES

Log of Monitoring Well CR-MW9

University of Washington/Cragle Site Remediation
Tacoma, Washington

PLATE 4

File	PROJECT NO.	DRAWN	DATE	APPROVED	REVISED	DATE
crmw9.cdr	15,743.004	DFF	15 Dec 94			

Drilled	Start	End	Total Depth (ft)	35	Logged By	JCD	Driller	Holt Drilling	Drilling Method	Rotosonic
	8/28/2013	8/28/2013			Checked By	TSD				

Hammer Data	N/A	Drilling Equipment	Geoprobe 8140 LC
Surface Elevation (ft)	79.84	Top of Casing Elevation (ft)	79.45
Vertical Datum	NGVD 1929		
Easting (X)	1159169.442	Horizontal Datum	WA State Plane,South Harn
Northing (Y)	702471.527367		

A 2 (in) well was installed on 8/28/2013 to a depth of 30 (ft).

Groundwater

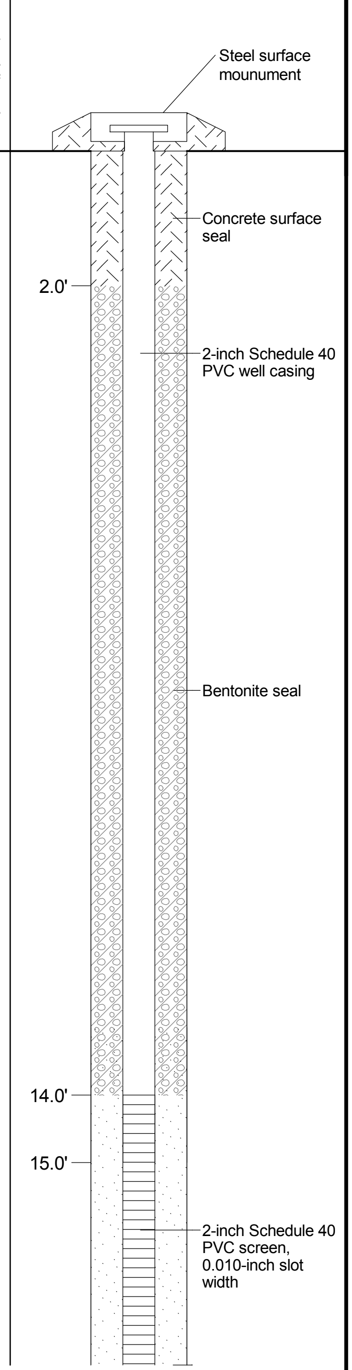
Date Measured	Depth to Water (ft)	Elevation (ft)
11/8/2013	17.13	62.32

Notes: Elevation based on survey completed by AHBL on 11/6/13

FIELD DATA

Elevation (feet)	Depth (feet)	Interval	Recovered (in)	Temperature (°C)	Collected Sample	Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
	0									No recovery		
75	5											
70	10		60			CR-MW15-10-11 CA			SM-ML	Brown to gray silty fine sand to fine sandy silt with fine to coarse sand and gravel (moist) (cemented) (Ice-Contact Deposits)		
				22							NS	<1
						CR-MW15-12-13 CA			SM	Brown to gray silty fine to coarse sand (moist) (cemented) (Ice-Contact Deposits)		
				25					SM-ML	Brown to gray silty fine sand to fine sandy silt with medium to coarse sand and gravel (moist) (cemented) (Ice-Contact Deposits)		
						CR-MW15-14-15 CA			ML	Brown to gray silt with fine sand and occasional medium to coarse sand and gravel (moist) (cemented) (Silt)		
65	15		60						SM-ML	Brown to gray silty fine sand to fine sandy silt with medium to coarse sand and gravel (moist) (Transition Zone)	NS	<1
									SP-SM	Brown fine to medium sand with silt and coarse sand to gravel (moist) (Transition Zone)		

WELL LOG



Notes: See Figure A-1 for explanation of symbols

Tacoma: Date:12/18/14 Path:C:\USERS\KJANC\DESKTOP\018308500.GPJ DBTemplate/LibTemplate:GEOENGINEERS8.GDT/GEI8_ENVIRONMENTAL_WELL

Log of Monitoring Well CR-MW15

GeoEngineers

Project: UWT 2013 Environmental Investigation
Project Location: Tacoma, Washington
Project Number: 0183-085-00

Elevation (feet)	Depth (feet)	Recovered (in)	Temperature (°C)	Sample Name / Testing	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)	WELL LOG
			28	CR-MW15-18-19 CA	SM	Brown silty sand with occasional gravel (moist) (Transition Zone)			10/20 silica sand
60	20	60		CR-MW15-19.5-20 CA	SP	Gray fine to medium sand with coarse sand to gravel, trace silt (wet) (Advance Outwash)	HS	1457 / 54.1	
			32	CR-MW15-21-22 CA	SM-ML	Brown to gray silty fine sand to fine sandy silt with medium to coarse sand and gravel (moist) (Advance Outwash)		2.3	
			28	CR-MW15-23.5-24 CA	GM	Brown to gray silty fine gravel with fine to coarse sand (moist to wet) (Advance Outwash)			
55	25	60			GM	Brown to gray silty gravel with fine to coarse sand (wet) (Advance Outwash)	NS	<1	
50	30	60		CR-MW15-29-30 CA			NS	<1	30.0'
					SM	Brown to gray silty fine to medium sand with coarse sand and gravel (wet) (Advance Outwash)			31.0'
				CR-MW15-32-33 CA	GW-GM	Brown fine to coarse gravel with silt and fine to coarse sand (wet) (Advance Outwash)	NS	<1	Bentonite backfill
45	35			CR-MW15-34-35 CA	SP-SM	Brown to gray fine to coarse sand with silt and occasional fine gravel (wet) (Advance Outwash)	NS	<1	35.0'

Notes: See Figure A-1 for explanation of symbols

Log of Monitoring Well CR-MW15 (continued)

GeoEngineers

Project: UWT 2013 Environmental Investigation
Project Location: Tacoma, Washington
Project Number: 0183-085-00

A11-MW30D (1/2)

Drilled	Start 6/21/2019	End 6/21/2019	Total Depth (ft)	60	Logged By / Checked By	Driller	Holt Services, Inc.	Drilling Method	Sonic

Hammer Data		Drilling Equipment	Terra Sonic
Surface Elevation (ft) / Vertical Datum	Undetermined	Top of Casing Elevation (ft)	
Easting (X) / Northing (Y)		Horizontal Datum	

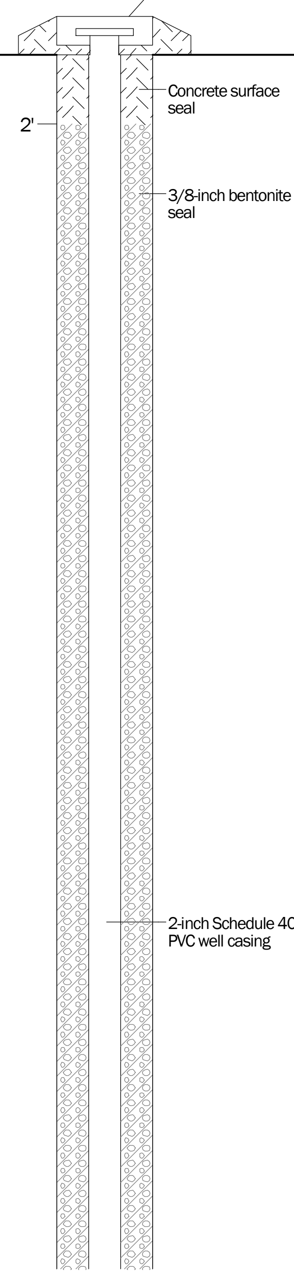
A 2-in well was installed on 6/21/2019 to a depth of 60 ft.

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)

Notes:

FIELD DATA / MATERIAL DESCRIPTION / WELL LOG

Depth (feet)	Recovered (in)	Sample Name / Testing	Graphic Log / Group Classification	Material Description	Sheen	Headspace Vapor (ppm)
0	120			Vactor truck to 5 feet to clear utilities		
5		A11-MW30D-5-6	SP	Light brown fine to coarse sand with gravel, trace silt (moist)		
7					NS	<1
9		A11-MW30D-9-10		Grades to with cobbles		
10	96		GM	Brown silty gravel with sand (wet)	NS	<1
13					NS	<1
14		A11-MW30D-14-15				
17					NS	<1
18	24					
19		A11-MW30D-19-20				
20	60					
22			SP	Brown fine to medium sand with coarse sand, trace silt (wet)	NS	<1
24		A11-MW30D-24-25				
25	60				NS	<1
29		A11-MW30D-29-30				
30	120	DUP-1-20190621	GP-GM	Brown to gray gravel with silt and sand (wet)	NS	<1
34		A11-MW30D-34-35			NS	<1
35						



Note: See Figure A-1 for explanation of symbols.
Coordinates Data Source: Horizontal approximated based on . Vertical approximated based on .

Log of Monitoring Well A11-MW30D

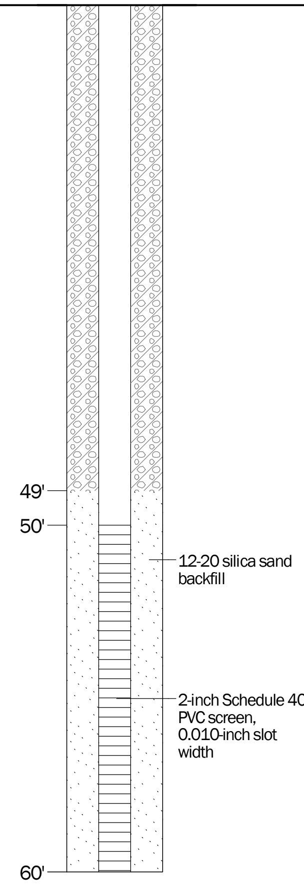
GeoEngineers

Project: UWT Remedial Investigation 2019
Project Location: Tacoma, Washington
Project Number: 0183-109-06

Figure A-
Sheet 1 of 2

Depth (feet)	Recovered (in)	Blows/foot	Sample Name / Testing	Water Level	Group Classification	MATERIAL DESCRIPTION	Sheen	Headspace Vapor (ppm)
35						Grades to with occasional cobbles	NS	<1
40	60		A11-MW30D-39-40		GM	Gray silty gravel with sand and occasional cobbles (moist to wet)		
					SM	Gray silty fine sand (moist to wet)	NS	<1
					ML	Gray silt with sand (dry)		
45	60		A11-MW30D-44-45		ML	Gray silt with occasional sand (dry) (Sticky)	NS	<1
					SP	Gray fine to medium sand, trace silt (moist to wet)	NS	<1
			A11-MW30D-49-50		ML	Gray silt with sand (moist)	NS	<1
50	120				GP-GM	Gray fine to coarse sand with silt and gravel (wet)	NS	<1
55			A11-MW30D-54-55				NS	<1
60			A11-MW30D-59-60		SM/ML	Gray silty sand to sandy silt with gravel (moist)	NS	<1

WELL LOG



Log of Monitoring Well A11-MW30D (continued)

GeoEngineers

Project: UWT Remedial Investigation 2019
Project Location: Tacoma, Washington
Project Number: 0183-109-06

APPENDIX C
Report Limitations and Guidelines for Use

APPENDIX C
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

It is important to recognize that the geoscience practices (geotechnical engineering, geology and environmental science) rely on professional judgment and opinion to a greater extent than other engineering and natural science disciplines, where more precise and/or readily observable data may exist. To help clients better understand how this difference pertains to our services, GeoEngineers includes the following explanatory "limitations" provisions in its reports. Please confer with GeoEngineers if you need to know more how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical Services are Performed for Specific Purposes, Persons and Projects

This report has been prepared for University of Washington and for the Project(s) specifically identified in the report. The information contained herein is not applicable to other sites or projects.

GeoEngineers structures its services to meet the specific needs of its clients. No party other than the party to whom this report is addressed may rely on the product of our services unless we agree to such reliance in advance and in writing. Within the limitations of the agreed scope of services for the Project, and its schedule and budget, our services have been executed in accordance with our Agreement with University of Washington dated August 3, 2020 and generally accepted geotechnical practices in this area at the time this report was prepared. We do not authorize, and will not be responsible for, the use of this report for any purposes or projects other than those identified in the report.

A Geotechnical Engineering or Geologic Report is based on a Unique Set of Project-Specific Factors

This report has been prepared for Milgard Hall located in Tacoma, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, it is important not to rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- The function of the proposed structure;
- Elevation, configuration, location, orientation or weight of the proposed structure;

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[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

- Composition of the design team; or
- Project ownership.

If changes occur after the date of this report, GeoEngineers cannot be responsible for any consequences of such changes in relation to this report unless we have been given the opportunity to review our interpretations and recommendations. Based on that review, we can provide written modifications or confirmation, as appropriate.

Environmental Concerns are Not Covered

Unless environmental services were specifically included in our scope of services, this report does not provide any environmental findings, conclusions, or recommendations, including but not limited to, the likelihood of encountering underground storage tanks or regulated contaminants.

Information Provided by Others

GeoEngineers has relied upon certain data or information provided or compiled by others in the performance of our services. Although we use sources that we reasonably believe to be trustworthy, GeoEngineers cannot warrant or guarantee the accuracy or completeness of information provided or compiled by others.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, new information or technology that becomes available subsequent to the report date, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. If more than a few months have passed since issuance of our report or work product, or if any of the described events may have occurred, please contact GeoEngineers before applying this report for its intended purpose so that we may evaluate whether changed conditions affect the continued reliability or applicability of our conclusions and recommendations.

Geotechnical and Geologic Findings are Professional Opinions

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies the specific subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied its professional judgment to render an informed opinion about subsurface conditions at other locations. Actual subsurface conditions may differ, sometimes significantly, from the opinions presented in this report. Our report, conclusions and interpretations are not a warranty of the actual subsurface conditions.

Geotechnical Engineering Report Recommendations are Not Final

We have developed the following recommendations based on data gathered from subsurface investigation(s). These investigations sample just a small percentage of a site to create a snapshot of the subsurface conditions elsewhere on the site. Such sampling on its own cannot provide a complete and accurate view of subsurface conditions for the entire site. Therefore, the recommendations included in this report are preliminary and should not be considered final. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for the recommendations in this report if we do not perform construction observation.

We recommend that you allow sufficient monitoring, testing and consultation during construction by GeoEngineers to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes if the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective means of managing the risks associated with unanticipated conditions. If another party performs field observation and confirms our expectations, the other party must take full responsibility for both the observations and recommendations. Please note, however, that another party would lack our project-specific knowledge and resources.

A Geotechnical Engineering or Geologic Report Could Be Subject to Misinterpretation

Misinterpretation of this report by members of the design team or by contractors can result in costly problems. GeoEngineers can help reduce the risks of misinterpretation by conferring with appropriate members of the design team after submitting the report, reviewing pertinent elements of the design team's plans and specifications, participating in pre-bid and preconstruction conferences, and providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. The logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Photographic or electronic reproduction is acceptable but separating logs from the report can create a risk of misinterpretation.

Give Contractors a Complete Report and Guidance

To help reduce the risk of problems associated with unanticipated subsurface conditions, GeoEngineers recommends giving contractors the complete geotechnical engineering or geologic report, including these "Report Limitations and Guidelines for Use." When providing the report, you should preface it with a clearly written letter of transmittal that:

- Advises contractors that the report was not prepared for purposes of bid development and that its accuracy is limited; and
- Encourages contractors to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer.

Contractors are Responsible for Site Safety on Their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and adjacent properties.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants, and no conclusions or inferences should be drawn regarding Biological Pollutants as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria and viruses, and/or any of their byproducts.

A Client that desires these specialized services is advised to obtain them from a consultant who offers services in this specialized field.

Attachment D

Memorandum

Date: March 4, 2021

To: Lisa Klein, AHBL

From: Michael Adamson and Daniel Dye, Fehr & Peers

Subject: University of Washington Tacoma Classroom Trip Generation Analysis

TC20-0009

University of Washington Tacoma (UWT) is planning to construct a new classroom building. Fehr & Peers was asked to determine the trip generation for the new building and compare it to the UWT trip generation assumed in the previously adopted Tacoma Brewery District Transportation Study and the UWT Campus Mobility Master Plan. The purpose of this memo is to summarize the results of this comparison and determine if the expected trip generation for the new classroom building falls within growth already anticipated in the adopted plans or whether additional transportation analysis may be needed.

Trip Generation of Classroom Building

To determine the trip generation of the new classroom building, the project team used both the Institute of Transportation Engineers (ITE) Trip Generation Manual (10^{th} Edition) and the MXD+ trip generation tool developed by Fehr & Peers. MXD+ considers various land use, transit and other local data as part of the trip generation calculation. Because of this, MXD+ can account for the urban and mixed-use nature of UWT to provide more accurate trip generation results relative to ITE rates.

The new classroom building is anticipated to be 55,000 square feet (sf) and serve up to 850 occupants at full capacity. The ITE land use code for a university is 550; this land use code has three different unit assumptions that can be used to determine trips generated:

- 1,000 sf gross floor area
- Students served
- Employees served

Trips were generated based on floor area and students served separately to determine which gave the more conservative (or higher) trip generation estimate. In the case of students served, it was assumed that 800 of the 850 occupants would be students, with approximately 50-80 additional occupants (or 10 percent of the number of students) being employees. These employees are accounted for by default as part of the trip generation calculation; although the unit of the calculation is number of students, the trips represent both the students and employees/staff serving those students. Both the ITE and MXD+ trip generation estimates were calculated. To represent traffic at the worst period of the day, the PM peak hour trip generation will be used to compare to the Tacoma Brewery District Transportation Study. These estimates are shown in **Table 1**.

Table 1: PM Peak Hour Trip Generation Estimate for Proposed Classroom Building

ITE Code	Quantity	Unit	ITE PM Peak Trips	MXD+ PM Peak Trips
University/College (550)	55,000	Square Feet	63	45
	800	Students Served	120	83

Source: Fehr & Peers.

This table shows that ITE trip generation rates yielded a higher estimate of trips overall than MXD+. This is because MXD+ also accounts for the adjacent Tacoma Link and other transit connections that will replace some vehicle trips, as well as other adjacent land uses that could capture some additional trips. Calculating the classroom building trip generation using students served also yielded a higher trip generation estimate than using floor area. Because the students served estimate represents a more conservative view of trips being generated by the classroom building, this trip generation estimate will be used in comparing with the Tacoma Brewery District Transportation Study.

Brewery District Trip Generation

Fehr & Peers prepared the Tacoma Brewery District Transportation Study for the City of Tacoma in 2016. This study evaluated existing and future traffic conditions in the Brewery District, which is located just south of UWT and is impacted by trips going to and from the university. As part of the Tacoma Brewery District Transportation Study, roadway volumes were forecasted for the year 2022. In addition to accounting for baseline growth on the roadway, trip generation was calculated and applied for major developments in the area that could impact the 2022 transportation network, including growth at UWT. To account for university growth, trip generation was calculated based on the planned construction of parking garages. Development trip generation results for 2022 are shown in **Table 2**, with trip generation for UWT bolded. It should be noted that UWT has not built additional structured parking since 2016, the assumption shown below is used as a placeholder for additional vehicle trips to and from UWT due to growth in enrollment and other facilities.

Table 2: 2022 PM Peak Hour Trip Generation for Brewery District Developments

Site	Total PM Peak Vehicle Trips
Convention Center Phase 1	91
Convention Center Phase 2	215
UW Tacoma Parking Structures	**650**
Jet Building	17
Misc. Other Developments	847

Source: Adapted from Tacoma Brewery District Transportation Study (Fehr & Peers, March 2016), Appendix E

It should be noted that the 650 PM peak hour trips generated for UWT focused on growth from 2016-2022. Because of this, it is important to account for the increase in enrollment from 2016 to 2019, which was roughly 365 additional students. [1] This would equate to a trip growth of 36 to 55 PM peak hour trips. This estimate was calculated using the same methodology as the proposed classroom building trip generation, with the lower estimate from MXD+ and the higher from ITE rates.

UWT Campus Mobility Master Plan Trip Generation

Fehr & Peers prepared the UWT Campus Mobility Master Plan for UWT in 2017. The report summarizes existing parking and transportation conditions for UWT and makes recommendations for future parking and transportation strategies, including a ten-year projection of parking systems. This ten-year projection of parking systems can also serve as an estimate of daily trips generated to the campus for each given year.

To be consistent with how trip generation was analyzed for the Brewery District, and to account for the fact that the new classroom building will comprise much of the near-term university growth, 2022 was used as the horizon year again. Using the ten-year projection of parking systems, it was found that between 2016 and 2022 parking demand would grow by 540 spaces.[2]

[1] Obtained by comparing the "Quick Stats for Student Enrollment" provided by UWT for Autumn 2016 and the "UW Tacoma 2019-20 Facts" page for Autumn 2019. 2020 enrollment was not used as a reference due to the unique traffic and enrollment circumstances experienced by UWT as a result of the COVID-19 pandemic.

[2] Obtained by calculating the difference in demand between 2016 and 2022 in Table 7 of the UWT Campus Mobility Master Plan (2017).

Based on the UWT parking model, 30% of parking spaces empty during the PM peak hour.[3] As such, the growth in demand that would be attributed to the PM peak hour would be approximately 162 trips for UWT as part of the Campus Mobility Master Plan.

Comparison of Trips Generated

Table 3 shows a comparison between the total PM peak trip generation for the proposed classroom building and what was calculated in the two adopted plans, with estimated trip growth from 2016 to 2019 subtracted out. Even accounting for enrollment growth and assuming the higher classroom trip generation estimate from ITE, it can be seen that the trip generation for the proposed classroom building is well within the trip generation assumed under the adopted Tacoma Brewery District Transportation Study. In comparing the UWT classroom trip generation to the UWT Campus Mobility Master Plan, it can be seen that the ITE trip generation is slightly higher than anticipated growth. However, the MXD+ method, which provides more precise trip generation in this case as it accounts for the mixed-use and transit-oriented nature of the area, is still within expected trip generation for the university.

Table 3: Comparison of Trip Generation Between Proposed Classroom Building and Brewery District Study

Trip Generation Source	Method	PM Peak Total
Proposed Classroom Building	MXD+	83
	ITE	120
UWT, Brewery District Study	-	*650-55* = 595
UWT Campus Mobility Master Plan	-	*162-55* = 107

Source: Fehr & Peers

Conclusions

The proposed classroom building is anticipated to generate approximately 83 PM peak hour trips under the MXD+ method and 120 PM peak hour trips under the ITE method. In comparing this to the UWT trip generation assumed as part of both the Tacoma Brewery District Transportation Study and the UWT Campus Mobility Master Plan, in addition to accounting for trip growth at UWT from 2016 to 2019, the trip generation for the proposed classroom building is within anticipated growth for the university. It is important to note that the ITE trip generation is slightly higher when compared to the UWT Campus Mobility Master Plan assumptions. However, MXD+

[3] Obtained by comparing parking distribution assumptions during the PM peak period within the UWT Parking Model, which had been used to calculate parking growth as part of the UWT Campus Mobility Master Plan (2017).

provides a more accurate accounting for the mixed-use and transit nature of the area. As such, it is not anticipated that the proposed classroom building will generate more trips than those already accounted for and analyzed as part of previously adopted plans.