APPENDIX C:

Revised Geotechnical Engineering Study Report

Tumwater Brewery Planned Action EIS
Tumwater, Washington

for
SCJ Alliance/Shea Carr Jewell

September 3, 2015

GeoEngineers
Earth Science + Technology

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GeoEngineers

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Tumwater Brewery Planned Action EIS
Tumwater, Washington

File No. 19967-001-01

September 3, 2015

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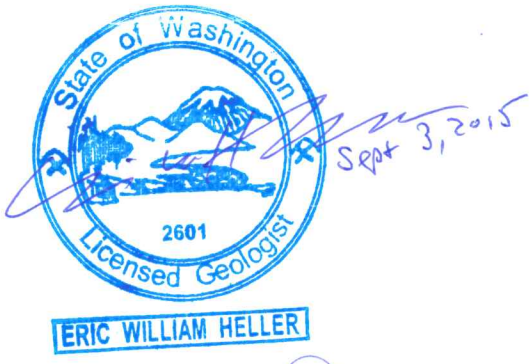

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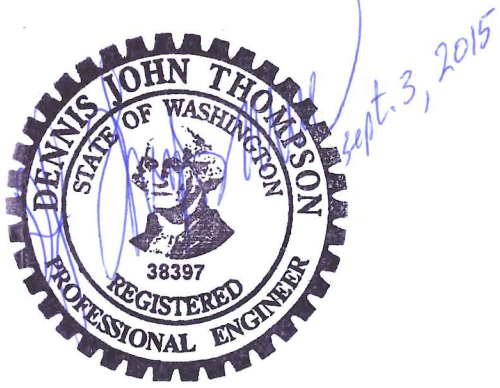

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INTRODUCTION AND PROJECT UNDERSTANDING

This report provides a summary of our geotechnical services in support of preparation of an environmental impact statement (EIS) during the initial feasibility phase of the Tumwater Brewery project. The project site is located in the north portion of the former Olympia Brewing Campus near 200 Custer Way SW in Tumwater, Washington. The approximate project location is shown on the Vicinity Map, Figure 1. Our understanding of this project is based on our discussion with you, previous studies near the project site, and review of conceptual drawings of the proposed development.

We prepared a draft preliminary study for this project dated June 19, 2014. Our June 19, 2014 study included visual observations of the site, a reconnaissance and a literature review. Since our study was prepared, we have been asked to address the Tumwater Critical Areas Ordinance (CAO) as it pertains to each of the proposed alternatives considered for the project site and to re-review available information regarding historical landslides on the slopes near the proposed improvements. There are three development alternatives under consideration:

Alternative 1: No Action.

Alternative 2: (Moderate Development Intensity) Redevelopment of existing buildings and construction of a parking structure south of the existing brewery building, which would include permanent retaining structures built within the south slope.

Alternative 3: (Maximum Development Intensity) Redevelopment of existing buildings and construction of a parking structure and a new building. The parking structure and new building would be constructed south of the existing brewery building. This option would include permanent retaining structures built within the south and east slopes.

SCOPE OF SERVICES

Details of our scope of services for this study can be reviewed in our agreements dated January 23, 2014 and December 19, 2014, which were signed on March 31, 2014 and January 28, 2015, respectively. A part of our scope of services described in the December 19, 2014 scope includes subsurface explorations in the form of borings and one monitoring well at the subject property. We received authorization to complete these explorations on May 14, 2015. An additional part of the December 19, 2014 scope includes monitoring water levels from the well continuously for 12 months using an automated pressure transducer. Quarterly visits will be made to check the equipment and download the data. At the time of this report, the groundwater monitoring scope is still on-going. A letter describing our findings will be provided once the readings are complete.

PREVIOUS EXPLORATIONS

We have completed explorations at the project site in the form of cone penetrometer test (CPT) soundings for a previous consultation related to preliminary planning and potential upgrades to the existing buildings. These explorations were completed in March of 2011. We did not prepare published documents for this study. We include the CPT data obtained from that consultation as additional information in this report.

PROJECT SITE

The irregular-shaped site is located in Tumwater, Washington north of Custer Way SW and west of Capitol Boulevard SE as approximately shown on the Vicinity Map, Figure 1. Custer Way SW and Union Pacific Railroad (UPRR) tracks form the south and east boundaries of the site, respectively. The Deschutes River forms the west and north boundaries of the site. The Schmidt House property, north of Custer Way, is not included within the project site. Although the access road from Custer Way to the brewery complex is not a part of the project site, we include the road in our discussion for completeness. The Site Plan, Figure 2, shows the site boundaries and relevant site features. Figure 3, Site Topography, shows topographic contours and slope steepness.

LITERATURE REVIEW

We reviewed readily available published information to gain an understanding of the site history and geologic conditions. A list of the documents reviewed is provided in the "References" section of this report. Below we provide a summary of our review of readily available information pertaining to site history and geology and soil conditions in the project vicinity.

Site History

Tumwater is one of the oldest American settlements on the Puget Sound, with the first settlers arriving in the 1840s. To gain an understanding of the early development in the project vicinity we reviewed historic photographs presented in "Tumwater" (Lockman and Wulfsberg, 2010).

Based on our review, the site of the existing brewery complex appears to have been first developed before 1895 when the site was purchased by Leopold Schmidt for construction of a brewery. This site was apparently chosen for the brewery because of an artesian spring at the base of a slope, which was to be used as a source of water for the brewery operation. As part of the development, a house was constructed about halfway up the slope that makes up the south portion of the brewery complex. In 1904, a new house (existing Schmidt House) was constructed at the top of the slope in the south portion of the brewery complex and the original house was removed. In 1906, a brew house was constructed near the center of the brewery complex and in 1907 a warehouse was constructed south of the brew house. The brew house and the warehouse are still on the site. The railroad on the east slope above the brewery complex was constructed prior to 1906.

The brewery was closed during prohibition, the buildings were vacated in about 1921. After prohibition, in 1933, the brewery operation moved to a new complex south of Custer Way. Based on our literature review we understand the brewery buildings have been intermittently occupied since prohibition ended. The brewery buildings are currently vacant.

We also reviewed the Natural Hazard Mitigation Plan (NHMP) for the Thurston Region (2009 Thurston NHMP) and the City of Tumwater's Annex to the NHMP for the Thurston Region (2009 Tumwater NHMP). The 2009 Tumwater NHMP briefly describes four landslides that have occurred in the vicinity of the brewery. Two landslide events are described as being triggered by the 1965 and 2001 earthquakes. The other two landslide events are described as being triggered by heavy rainfall in 1996 and 2008. The 2009 Thurston NHMP describes the 1996 event as a mudslide that occurred below Capital Way near Carlyon Avenue SE. The summary notes that leaking sewer lines could have contributed to saturation of shallow soils prior to

the intense rainfall. The 2009 Thurston NHMP describes the landslide activity associated with the 1965 and 2001 earthquakes as occurring along Deschutes Parkway on the west side of the Deschutes River/ Capital Lake. These slides occurred north of Lakeridge Drive SW, approximately 1 mile north of the brewery complex. Details on location, type of landslide mechanism, volume of displaced material are not included in available descriptions.

Published Geology and Soils

We reviewed the following readily available published information as a basis for understanding the geology and soil conditions in the project vicinity:

- *Geologic Map of the Tumwater 7.5-Minute Quadrangle, Thurston County, Washington* (Walsh, et al., 2003);
- *Soil Survey of Thurston County, Washington* (United States Department of Agriculture [USDA], 1979);
- *Liquefaction Susceptibility Map of Thurston County, Washington* (Palmer, et al., 2004);
- *Coastal Zone Atlas of Thurston County, Washington*, Washington Department of Ecology (Ecology), 1979.

The *Geologic Map of the Tumwater 7.5-Minute Quadrangle, Thurston County, Washington* (Walsh, et al., 2003) shows three geologic units within the project area:

- Crescent Formation basalt (Ev_c) is described as basalt bedrock. Outcrops of the Crescent Formation are mapped along the access road and in the brewery complex area.
- Latest Vashon recessional sand and minor silt (Qgos) is described as consisting of poorly graded fine to medium sand with minor amounts of silt. Based on our experience, recessional sand is typically observed in a medium dense condition. Within the project site, recessional sand is the predominant mapped geologic unit covering the brewery complex, south parcels and access road, and backwater areas.
- Fill (Qf) is described to include a variety of materials and is not specific to the project site. Fill may potentially contain soil materials such as clay, silt, sand and gravel, as well as debris. Fill is mapped in the brewery complex area near the shoreline of the Deschutes River.

The *Soil Survey of Thurston County, Washington* shows three soil types present within the mapped area of the site:

- Dystric Xerochrepts, 60 to 90 percent slopes. The Dystric Xerochrepts is mapped along the steep slopes and does not have a typical profile because the description is based primarily on steepness of the slope rather than composition. This soil is described as typically having rapid runoff and severe water erosion hazard.
- Indianola loamy sand, 15 to 30 percent slopes. The Indianola loamy sand is described as forming in glacial drift (outwash) deposits on terrace escarpments. This soil unit is comprised of loamy sand (sand with silt and silty sand). This soil is described as typically having medium runoff and moderate water erosion hazard.
- Puyallup silt loam. The Puyallup silt loam is described as forming in alluvium deposits on floodplains. This soil is described as consisting of silt loam (silty sand and sandy silt) and is described as typically

having slow runoff and slight water erosion hazard. The main limitation of this soil is reported to be muddiness caused by seasonal wetness.

Soil units indicative of slope instability such as mass wasting deposits (Qml) or landslide deposits (Qls) are not identified on the geologic map within the project area. A landslide deposit is identified by Walsh et al., (2003) north of the project site southeast of Interstate 5 and southwest of Capital Boulevard SE. The project site is within an area mapped as having a low to moderate liquefaction hazard according to the *Liquefaction Susceptibility Map of Thurston County, Washington*. The site is not within the mapped area the *Coastal Zone Atlas of Thurston County, Washington*.

SITE RECONNAISSANCE AND SURFACE CONDITIONS

GeoEngineers performed a site reconnaissance on April 9, 2014 to assess existing geologic conditions. The reconnaissance focused on the area near the brewery complex, which includes portions of the steep slopes, waterfront area and access road. We walked the slopes, access road and waterfront areas looking for typical geologic or geotechnical indicators such as slope instability or general settlement. On the slopes we looked for indicators such as groundwater seeps, pistol butt trees, leaning trees, soil creep, landslide scarps (old and recent), surface erosion, and steep slopes with layered geology. Along the access road we looked for similar indicators but also looked for signs of rock instability such as rock fall debris. Near the waterfront we looked for indications of settlement, bank instability and bank erosion.

Below we provide a detailed discussion of our site reconnaissance procedure and observations. We present our discussion in three geographic areas: 1) brewery complex, 2) south parcels and access road, and 3) backwater. Figures 2 and 3 show relevant site features discussed in the following sections.

Brewery Complex

Definitions

For the purposes of this report, the brewery complex is defined as the area surrounding the brewery buildings extending to the banks of the Deschutes River and backwater, and includes the east and south slopes as shown on Figures 2 and 3. South of the buildings, a steep slope rises up to the Schmidt House. East of the buildings a steep slope rises up to the UPRR tracks. The Deschutes River is to the west of the buildings and the backwater is to the north of the buildings. Below we describe surface conditions observed near the brewery buildings, on the slopes and along the shoreline.

Brewery Buildings

The brewery buildings consist of three buildings near the center of the brewery complex area: the warehouse, the brew house and a large stilt shed. The warehouse is a rectangular four-story brick structure oriented approximately east-west and located south of the brew house and shed. The brew house is a six-story brick structure. The shed is a pole structure with sheet metal sides and located east of the brew house. The area between the warehouse, brew house, and shed consists of a concrete pad raised approximately 2 to 4 feet above surrounding grades.

The area surrounding the brewery buildings generally slopes gently down to the north and west at an inclination of less than 5 percent from about Elevation 25 feet to Elevation 15 feet at the banks of the river and backwater. Surfacing of this area generally consists of gravel or asphalt concrete pavement, which has

degraded to gravel; the exceptions are the area south of the warehouse and near the shorelines where the surfaces are unimproved. At the northeast corner of the brewery complex area an abandoned railroad grade heads to the northeast, approximately paralleling the east slope.

Other features near the brewery buildings include an access road, concrete pads and vegetation. An access road enters the brewery complex area from the southwest and winds around the south and east sides of the warehouse where the road is located between the warehouse and east slope. Northeast of the warehouse on the east side of the access road there is a concrete pad measuring about 12 feet square. A closed pipe approximately 2 feet in diameter is located at the center of the pad. Vegetation around the brewery buildings is limited to grass in unpaved areas and trees and shrubs near the backwater.

While on site we observed standing and flowing surface water as well as groundwater seeps. Standing water was observed in an open excavation south of the warehouse and north of the access road. The depth of the water in the excavation was not readily apparent. Between the east side of the warehouse and access road we observed a large concrete lined ditch structure. The ditch is estimated to be 6 feet deep and 4 feet wide. At the time of our visit we observed water flowing into the ditch at a rate of about 5 to 10 gallons per minute. The water was coming from two 6- to 8-inch diameter concrete pipes in the east side-wall of the ditch. We did not observe or determine the source of the drainpipes. Groundwater seeps were also observed at and around the toe of the east and south slopes. Based on the vegetation present the seeps appear to be perennial.

Slopes

Two steep slope areas are present within the brewery complex area, the east slope and the south slope. Both the east and south slopes are generally inclined between about 50 and 70 percent. Where the east and south slopes meet, southeast of the warehouse, the slope is inclined between about 20 to 50 percent. The toe of both slopes are at about Elevation 25 feet. The top of the east slope is at about Elevation 175 feet, the top of the south slope is at about Elevation 125 feet. Where soil was observed, on the sloped areas, we classified it as fine to medium sand with silt. This is generally consistent with the description of recessional sand, Indianola loamy sand, and Puyallup silt loam described in the literature.

A bench is located on the south slope on the east side of the access road and south of the brewery buildings. The bench slopes gently down to the north at approximately 5 percent from about Elevation 65 feet to Elevation 55 feet. This area is surfaced with crushed gravel. As previously indicated, this area may the former site of the original house, which was removed around 1904.

Vegetation on the slopes consists of second growth deciduous and coniferous trees, and underbrush. Photos from Lockman and Wulfsberg show the slopes in what appear to be recent clear-cut conditions around 1906.

Modification of the slopes in the vicinity of the brewery complex appears to consist of construction of a retaining wall at the toe of the east slope and construction of the UPRR rail grade about midway up the east slope. The cast-in-place concrete retaining wall is approximately 4 feet high and is approximately vertical. Water was observed seeping through cracks in the wall and standing on the ground surface behind the wall. The UPRR rail grade traverses the east slope at approximately Elevation 100 feet and trending northeast to southwest. Where the east and south slopes meet, the rail grade extends beyond the project boundary to the southwest, with cut slopes on both sides of the tracks. The tracks enter a tunnel under

Custer Way southeast of the project site. Based on the Light Detection and Ranging (LiDAR) hillshade and topographic contours presented on Figure 3, it appears that spoils from construction of the railroad cut section may have been placed on slopes below the tracks where the east and south slopes meet.

Shoreline

The shoreline slopes down from relatively level area around the brewery buildings to the water level. From the top of bank to the water level the slopes stand approximately 5 feet high and are inclined at about 50 percent. The slopes appear to continue at this inclination below the waterline. Soil exposures were not observed along the shoreline. Vegetation was limited to grass along the river; grass and trees were present along the backwater shoreline.

Within the river and backwater, timber piling were observed near the shoreline. The age, depth and former use of the piles were not readily apparent. Based on our literature review, these may have been a part of dock structures for the brewery operation.

South Parcels and Access Road

The south parcels are located south of the brewery complex area at the top of the south slope and consist of three parcels. The parcels are located north and west of Custer Way and the UPRR tracks, respectively. The access road is located west of the parcels. The ground surface in this area slopes gently down to the north at inclinations of less than 5 percent from about Elevation 140 feet near Custer Way SW to about Elevation 125 feet along the north edge of the parcels.

Development within the south parcels and along the access road consists of existing buildings and associated parking areas surfaced with asphalt concrete pavement. Vegetation in the south parcel consists of grass lawns and shrubberies limited to landscaping areas. At the time of our visit, we did not observe standing water or signs of seepage in areas surrounding the south parcels.

The grade of the access road extending from Custer Way down to the brewery complex area slopes down to the north at an inclination between about 10 and 15 percent. The slope to the east and west of the access road is inclined at approximately 50 to 70 percent, sloping from the south parcels down to the west. Bedrock is exposed up-slope and down-slope of the road. At the time of our visit we did not observe seepage along the access road or slopes adjacent to the road. Vegetation on the slopes east and west of the access road consists of deciduous trees and shrubs.

Backwater

The backwater area of the site extends from the north edge of the brewery complex to the northern site boundary. This area of the site consists of Deschutes River backwater and continuation of the eastern slope. We did not explore surface conditions in the backwater area. Based on our observations from the shoreline and aerial photographs, the backwater area consists of slack water from the Deschutes River and low lying land. The land portions of the backwater area are vegetated with trees, shrubs and grasses.

In general, the east slope in the north portion of the site is similar to the east slope as described in the brewery complex section of this report. The notable exception is an abandoned railroad grade extending from the northeast corner of the brewery complex along the lower portions of the slope. The inclination of the slope below the abandoned railroad grade is approximately 10 to 20 percent. Based on the LiDAR and topographic contours, this variation in slope may be due to spoils from construction of the railroad grade.

SUBSURFACE EXPLORATIONS

Subsurface explorations for this project were completed between May 26 and 29, 2015. Details of our subsurface exploration program are described in Appendix A. Eight borings were completed at the project site, one of which was completed as a groundwater monitoring well. The depths of the borings and monitoring well ranged between about 12 feet and 119 feet below ground surface (bgs). We also reviewed subsurface information from the CPT data obtained during a previous consultation, as described above. We include the CPT results as Appendix B. We include the approximate locations of the borings, monitoring well, and CPTs on Figure 4.

LABORATORY TESTING

Soil samples obtained during our explorations were transported to GeoEngineers' laboratory for further examination and testing. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics and to confirm or modify field classifications. Our geotechnical testing program included grain-size analyses, percent fines determination, and moisture content determination. Details of our laboratory testing program are presented in Appendix A.

SUBSURFACE CONDITIONS

Our understanding of subsurface conditions is based on the explorations, site reconnaissance, literature review and our experience.

Soil Conditions

Explorations completed in the Brewery Complex portion of the site include borings B-1 through B-4 and CPT-1 and CPT-2. CPT-1 and CPT-2 were pre-drilled to depths of about 6 and 10 feet bgs, respectively. At the locations explored, soils generally encountered fill overlying native soils underlain by bedrock. The fill consisted of sand and gravel materials in a loose to medium dense condition extending to depths between 1-1/2 feet and 7 feet bgs. Below the fill, the native soils consist of sand, sand with silt, silty sand in a very loose to medium dense condition and very soft to stiff silt. Bedrock was encountered in boring B-4 and CPT-1 and CPT-2 at depths of about 21 feet, 16 feet, and 24 feet, respectively.

Explorations completed on the bench and along the access road include borings B-5, B-6, and B-7 which extended to depths of 26 feet, 12 feet, and 16 feet, respectively. At the locations explored fill consisting of medium dense sand with silt and silty sand extended to about 1½ to 3 feet bgs. Below the fill very loose to medium dense sand, sand with silt, and silty sand extended to depths between 12 feet and 25 feet bgs. All three borings terminated with refusal on bedrock.

In the upland area, the boring for MW-1 extended to a depth of about 119 feet bgs and terminated with refusal on bedrock. The asphalt pavement section was observed to consist of about 3 inches of asphalt concrete pavement and 12 inches of silty sand fill. Below the surfacing materials the soils consist of interbedded sand and silt materials, which we have grouped into three zones for purposes of description.

The upper interbedded zone extends to a depth of approximately 31 feet and consists of interbedded silt, silty sand, and sand with silt in a very loose to medium dense or medium stiff to stiff condition. The thickness of the interbedded layers observed in the samples varies from less than an inch to a few inches.

The middle sand extends from a depth of about 31 feet to 59 feet bgs and consists of silty fine to medium sand in a medium dense condition. The middle silt extends from a depth of about 59 feet to 82 feet bgs and consists of silt in a stiff to very stiff condition. The lower interbedded zone extends from a depth of about 82 feet to 112 feet bgs and consists of interbedded silt, silty sand, and sand with silt in a loose to very dense or stiff to very stiff condition. The boring for MW-1 terminated with refusal on bedrock.

Groundwater Conditions

Our borings were performed in May which is near the end of the typical wet season. Groundwater was observed in all the borings except B-5 through B-7 on the bench and along the access road.

Groundwater was observed in borings B-1 through B-4 near the brewery complex at depths between about 7 feet and 19 feet bgs at the time of drilling. The groundwater observed at time of drilling in borings B-1, B-2, and B-4 appears to be near Elevation 13 feet. Based on visual inspection this appears to be about the same elevation as the river. The groundwater level observed at the time of drilling in boring B-3 was at about Elevation 19 feet. This somewhat higher level may indicate influence from groundwater in the slopes to the south and east.

The boring for monitoring well MW-1 was drilled using mud rotary methods and direct measurement of groundwater was not possible at the time of drilling. On June 5, 2015 the groundwater level was measured at a depth of about 76 feet bgs. Groundwater seepage on the slope to the north of MW-1 was observed near the toe of the slope around Elevation 35 feet to 40 feet indicating the groundwater flow direction is most likely to the north.

GEOLOGY AND SOILS FOR EIS REPORT

We provide summarized discussions of topography, geology and soils, and erosion conditions based on our site reconnaissance and literature review. We anticipate that these following descriptions can be used for the EIS report.

Topography

Our understanding of the topography at the site is based on LiDAR and contour data and our reconnaissance on April 9, 2014. The highest point in the project site is approximately Elevation 140 feet near Custer Way SW; the lowest point in the project site is approximately Elevation 15 feet near the backwater area at the north end of the site. A steep slope intersects the approximately halfway point of the property. From Custer Way to the top of the steep slope the ground surface descends to the north at less than 5 percent from about Elevation 140 feet to Elevation 125 feet. The steep slopes are generally inclined on the order of 50 to 70 percent from about Elevation 125 feet to Elevation 25 feet. From the toe of the steep slope to the banks of the Deschutes River and backwater the ground surface slopes down to the north at an inclination of about 5 percent from approximately Elevation 30 feet to Elevation 15 feet. Existing slope modifications consist of the two railroad grades on the east slope and the retaining wall at the toe of the east slope near the warehouse building.

Geology and Soils

In general, our field observations agree with the mapped geology and soil descriptions. Vegetation and development within the site generally obscure the natural soils and rocks; however, we were able to observe

conditions at some locations. The majority of the soil within the project site appears to consist of fine to medium sand with varying amounts of silt. The UPRR railroad grade appears to have been established by cutting and filling the native slopes; the observed soils consisted of fine to medium sand consistent with the description of outwash sand presented in the geologic maps. Exposures of basalt bedrock were observed on the steep slopes and along the railroad grade. Because of the development in the brewery complex area, direct observation of the mapped bedrock or fill was not possible.

Erosion

The Soil Conservation Service (SCS) indicates soils with highest erosion potential (severe) are located on the steep slopes that make up the south and east portions of property located above the backwater. Soils present in developed, less steep areas are mapped as having slight to moderate erosion hazards.

GEOLOGIC HAZARD ANALYSIS BASED ON ALTERNATIVES

We evaluated geologic hazards at the project site as defined by Chapter 16.20 of the Tumwater Municipal Code (TMC), Geologically Hazardous Areas. TMC Chapter 16.20.050 defines four general categories of geologic hazards, 1) erosion and landslide, 2) seismic, 3) volcanic, and 4) tsunami. We reviewed risk assessment and mitigation considerations for each hazard category as presented in the NHMP for the Thurston Region (2009 Thurston NHMP) and the City of Tumwater's Annex to the NHMP for the Thurston Region (2009 Tumwater NHMP).

In the sections below, we provide a discussion of each general hazard category and specific hazards within each category. We address landslide, erosion, and seismic slope stability for each proposed site development alternatives, where Alternative 1 represents no action, Alternative 2 represents moderate development intensity, or Alternative 3 represents maximum development intensity.

Seismic Hazards- Surface Rupture

General

Seismic Hazard Areas are defined in Section 16.20.050 (E) of the TMC and includes mapped faults (surface rupture).

The Tumwater CAO requires that mapped surface faults within 200 feet of the site be identified and potential impacts including potential displacements and forces from fault displacements be discussed. We reviewed two maps to identify potential fault-related ground surface rupture at or near the project site; *Geologic Map of the Tumwater 7.5-minute Quadrangle, Washington* (Walsh, et al.) and Washington State Department of Natural Resources (WA DNR) Interactive Natural Hazards Map. Based on our review no surface faults are mapped within 200 feet of the project site.

Alternatives 1, 2, or 3

Based on our review and experience, it is our opinion that the risk for seismic surface rupture at the site is low for Alternatives 1, 2, or 3.

Seismic Hazards- Liquefaction and Lateral Spreading

General

Liquefaction refers to a condition where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures and subsequent loss of strength in saturated soils. In general, soils that are susceptible to liquefaction include loose to medium dense "clean" to silty sands which are below the water table. 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. Our review of the *Liquefaction Susceptibility Map of Thurston County, Washington* (Palmer, et al., 2004) indicates the site soils have a "low to moderate" liquefaction potential.

Based on our explorations, we expect that the lowland areas near the existing brewery buildings are potentially liquefiable and could experience lateral spreading. Factors influencing the potential magnitude of liquefaction-induced settlement and lateral spreading include soil conditions and earthquake motions. In general, the magnitude and risk increase as the thickness of the liquefiable portion of the soil increases and distance from the river bank decreases. Additionally, the potential for and magnitude of liquefaction and lateral spreading will vary depending on the force and duration of the earthquake.

Alternative 1

Because Alternative 1 does not include expansion of the existing building footprints and the likelihood that existing buildings are founded on bedrock, it is our opinion that the risks to the structures as a result of liquefaction or lateral spreading is low for Alternative 1. It should be verified that the existing structures are founded on bedrock.

Alternatives 2 or 3

Because development under Alternative 2 or Alternative 3 will include construction of new structures outside of the existing building footprints there is the potential that liquefaction and/or lateral spreading could impact the proposed development near the low lying areas. Based on our review, site reconnaissance, subsurface explorations, and experience, it is our opinion that the potential impact of liquefaction-induced settlement and lateral spreading to structures (existing buildings, proposed parking garage, or proposed condominium) in lower lying areas could be reduced with properly designed building foundation elements, which could include ground improvement and/or foundations bearing on the shallow bedrock. As previously discussed, it should be verified that the existing structures are founded on bedrock. Construction of improvements such as pavements, walkways, etc. between the existing brewery and the shoreline could be subject to settlement due to liquefaction and lateral spreading.

Volcanic Hazards

General

Volcanic Hazard Areas are defined in Section 16.20.050 (F) of the TMC as areas subject to pyroclastic flows, lahars, or mud and debris flows derived from volcanic events. We reviewed the WA DNR Interactive Natural Hazards Map and the 2009 Thurston NHMP for mapped volcanic hazards. Based on our review, the project site is not located within mapped volcanic hazards.

Alternatives 1, 2, or 3

Based on our review and experience, it is our opinion that the risk for volcanic hazards at the site is low for Alternatives 1, 2, or 3.

Tsunami Hazards

General

Tsunami Hazard Areas are defined in Section 16.20.050 (G) of the TMC as coastal areas and large lake shoreline areas susceptible to flooding and inundation as the result of excessive wave action derived from seismic or other geologic events. Currently, no specific boundaries have been established in the City Limits for this type of hazard area.

Neither the City of Tumwater nor Thurston County provide a tsunami hazard map. The WA DNR Interactive Natural Hazards Map only provides tsunami inundation estimates in specific study areas; the project site is not located within any of the study areas. The 2009 Thurston NHMP states "although tsunamis are known to impact the coast of Washington and some parts of the Puget Sound, the Thurston Region is unlikely to be impacted by this hazard."

Alternative 1, 2, or 3

Based on our review, site location, and experience, it is our opinion that the risk for tsunami hazards at the site is low for Alternatives 1, 2, or 3.

Landslide and Erosion Hazards

General

We observed existing slope conditions and performed a slope stability analysis of the slopes east and south of the existing brewery complex. Our slope stability analysis is based on our explorations, site reconnaissance, and experience. In general, the slopes appear to be relatively stable with respect to deep-seated or global failures and instability. The results of our analysis indicate the existing slopes have a static factor of safety against deep-seated failures greater than 1.6. The seismic factor of safety against deep-seated failure indicated by our analysis is on the order of 0.7 to 1.0.

Although our analysis indicates the factor of safety for static slope stability is greater than 1.5, the steep slopes could experience and should be expected to experience shallow surficial sloughing over the long term. Sloughing is typically due to natural processes such as seepage, saturation of shallow soils during heavy rain events, decay of roots, or root removal of blown down trees. These natural processes occur whether or not the slopes are modified. The magnitude and volume of material involved in shallow surficial sloughing depends on several factors including steepness of slope, time of year, rainfall, and activity of burrowing animals.

Construction of permanent retaining structures can potentially reduce the risk associated with shallow and deep slope instability. In general, the risk of shallow surficial sloughing is managed because a portion of the slope is removed and/or retained, thereby reducing the material would have potentially sloughed.

Alternative 1

This alternative includes improvements of the existing structures; no improvements are planned to alter the existing slope conditions. Accordingly, it is our opinion that the risk of potential landslide or erosion hazards impacting the existing structures will not significantly increase or decrease. It is our opinion that the most probable hazard for Alternative 1 is continued shallow surficial sloughing on the steep slopes. Because sloughing is a natural process that occurs with or without development, mitigation measures are often limited to monitoring and maintenance.

If the existing access road to the east of the existing building is to be improved, the existing retaining wall at the toe of the east slope may need to be evaluated and potentially improved. In addition, some site re-grading and other short- and long-term erosion prevention features or techniques could be required.

Alternative 2

This alternative includes improvements to the existing buildings and cutting into the south slope to construct a parking garage south of the existing buildings. Permanent retaining structures are envisioned within the steep south slope as part of the construction of the garage. Based on our understanding of the existing soil conditions we anticipate the walls will be top down construction, such as a soil nail or soldier pile wall system. Tiebacks may be required for the soldier pile wall depending on the height of the wall, the estimated lateral earth pressures, and the elevation and direction of the groundwater gradient. These designs will have to take into consideration seismic slope stability as well. We would expect that proper building design and construction of retaining structures, including drainage, can reduce the potential for short- and long-term erosion and sloughing and improve the static and seismic factors of safety against deep-seated failures. Primary design elements will need to take into consideration drainage of the slope, depths and geometry of retaining structure(s), and embedment depths of foundations.

Alternative 3

This alternative is similar to Alternative 2 with the addition of a condominium building adjacent on the east side of the proposed parking garage (south of the existing building). Permanent retaining structures are envisioned within the steep south and east slopes as part of the construction of the condominium building. Similar construction techniques and design considerations as described for Alternative 2 are anticipated for this alternative. Because this alternative includes construction of retaining structures along a greater portion of the slopes, we would expect a proportional reduction of the potential for short- and long-term erosion and sloughing and an improvement of the static and seismic factors of safety against deep-seated failures, with proper design and construction.

ADDITIONAL DEVELOPMENT CONSIDERATIONS

Existing Buildings

Based on our review, the existing brewery buildings were constructed in the early 20th Century and have not been occupied for several decades. As-built plans were not readily available during the time of this study, but based on the location, condition of surface soil, and likely presence of shallow bedrock in the area, we anticipate that some or all of the existing buildings were constructed with shallow spread footings or short pilings founded on bedrock.

New Buildings and Structures

Structural engineering and seismic considerations will need to be assessed in conjunction with soil conditions during design of new structures and facilities. Lateral loading upon buildings due to sloping backfill conditions, surcharges, and structures as well as drainage and waterproofing will need to be addressed when designing and planning structures to be built into the slopes for Alternative 2 (south slope) and Alternative 3 (south and east slope). For excavations, retaining structures consisting of top-down construction and staged construction techniques should be considered to eliminate mass excavation of the slope face. Qualified individuals should review excavation planning, staging, and grading of this area prior to proceeding with the earthwork construction.

In general, we expect that conventional foundations are likely appropriate for support of new structures within the brewery complex area where medium dense soil or medium dense soil overlying bedrock is present. We anticipate that soft sediments and alluvial deposits are present around and south of the backwater area and within the flatter/lowland areas of the brewery complex. Deep foundations and/or ground improvement will likely be required in these areas if Alternative 2 or Alternative 3 is pursued.

Access Road

Widening of the access road could pose some construction challenges due to the presence of bedrock. Bedrock is exposed along the east side (above) and west side (below) of the access road. The two borings we performed on the roadway encountered bedrock at depths between 10 and 12 feet. The exposed bedrock does not appear to be easily excavated; removal may require the use of a hydraulic hammer and/or blasting.

As previously indicated, sloughing, weathering and erosion are natural processes that effect steep slope areas. For permanent construction and a widened access roadway, retaining structures and/or slope re-grading may need to be considered where soil exists and steep slopes are present. Although further evaluation should be completed, typically permanent slopes on the order of 2H to 1V (Horizontal to Vertical) are appropriate for soil types observed and described at the project site. In many instances, bedrock can be cut steeper or near vertical depending on the condition.

Significant Unavoidable Adverse Impacts

Qualified engineering and construction practices can help mitigate the risks inherent in construction on slopes, although those risks cannot be eliminated completely. Favorable performance of structures in the near term is useful information for anticipating future performance, but it cannot predict or imply a certainty of long-term performance, especially under conditions of adverse weather or seismic activity.

LIMITATIONS

We have prepared this report for the exclusive use of the SCJ Alliance/Shea Carr Jewell and their authorized agents in support of the Tumwater Brewery Planned Action EIS at the Tumwater Brewery site located in Tumwater, Washington. Our services were provided to assist in the potential design of foundations or a planned structure to be located on sloping property. Our recommendations are intended to improve the overall stability of the site and to reduce the potential for future property damage related to earth movements, drainage or erosion.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of 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 or other conditions, express or implied, should be understood.

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

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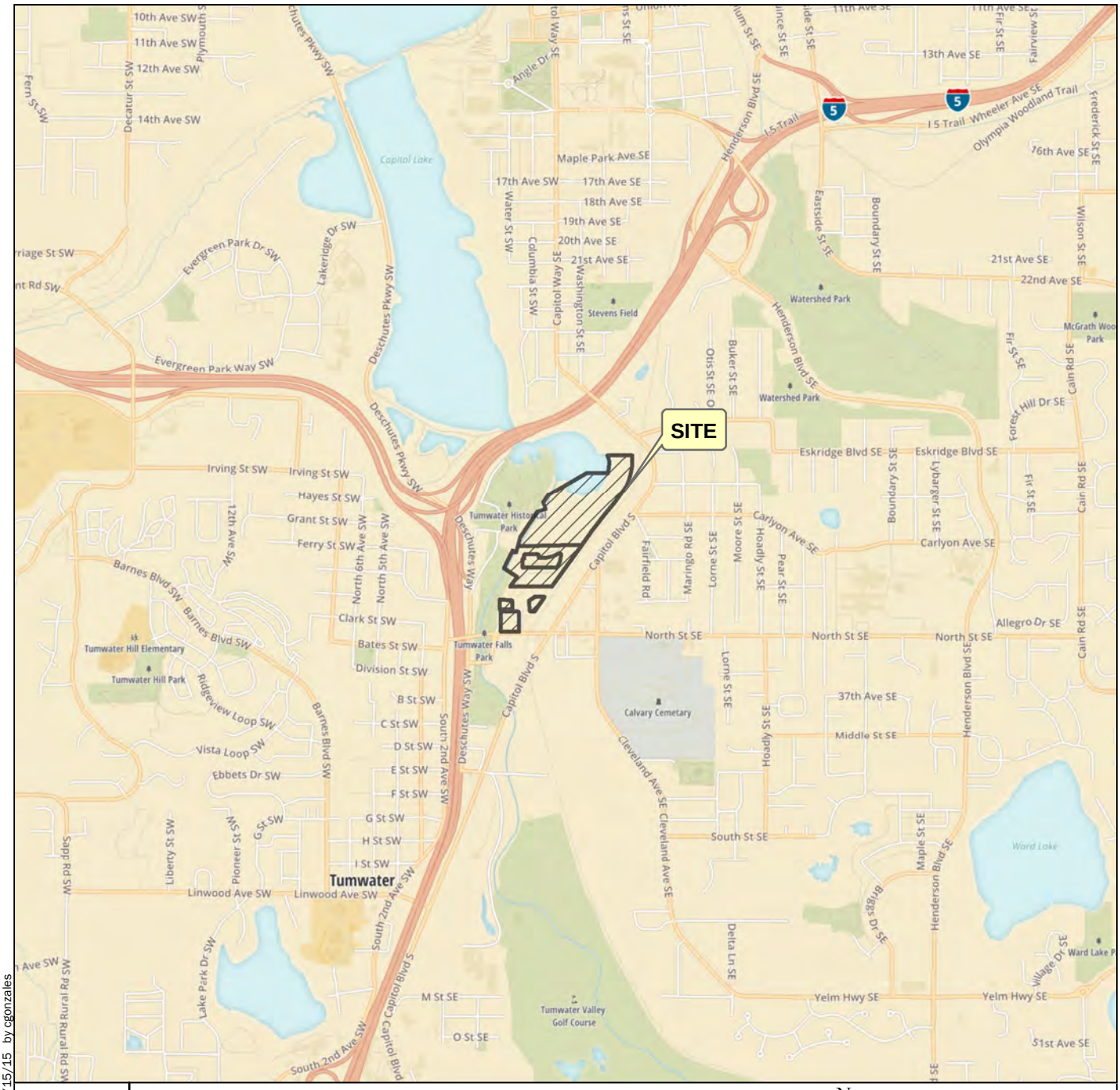

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Notes:

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, 2015

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Tumwater Brewery Site
Tumwater, Washington

GeoEngineers

Figure 1

Legend

Site Boundary

Data Source: Aerial from ESRI

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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.

N W E S

300 0 300
Feet

Site Plan

Tumwater Brewery Site
Tumwater, Washington

GeoEngineers

Figure 2

Map Revised: 28 July 2015 maugust

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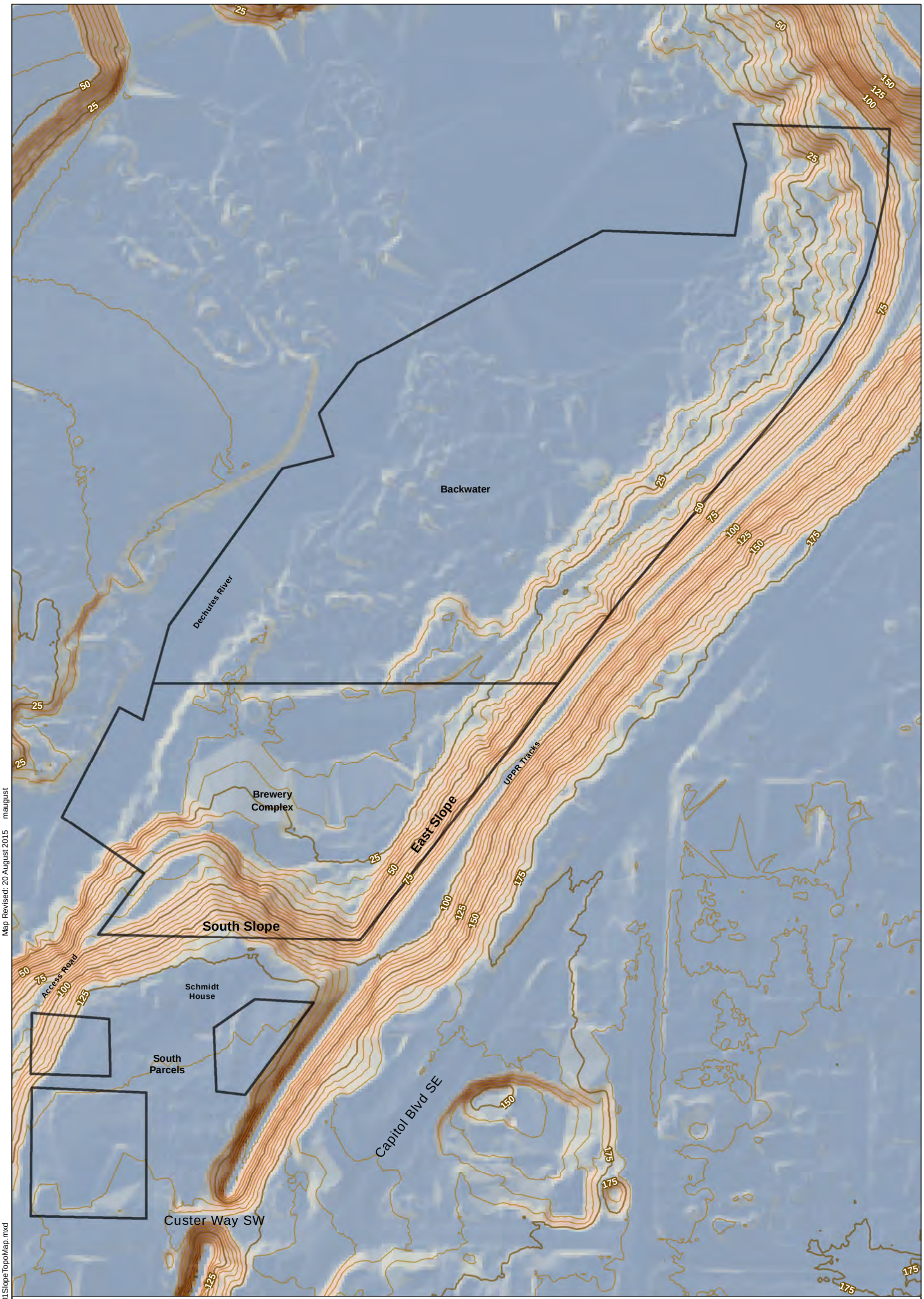

Legend

- Site Boundary
- 5-foot Contour
- Index Contour

Slope (Degree)

High : 85

Low : 0

Data Source: Lidar data obtained from the Puget Sound Lidar Consortium (PSLC), Puget Sound Lowlands 2000-2005 dataset.
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet
Vertical Datum: NAVD88
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.

N W E S

200 0 200
Feet

Site Topography

Tumwater Brewery Site
Tumwater, Washington

GeoEngineers

Figure 3

Map Revised: 20 August 2015 maugust
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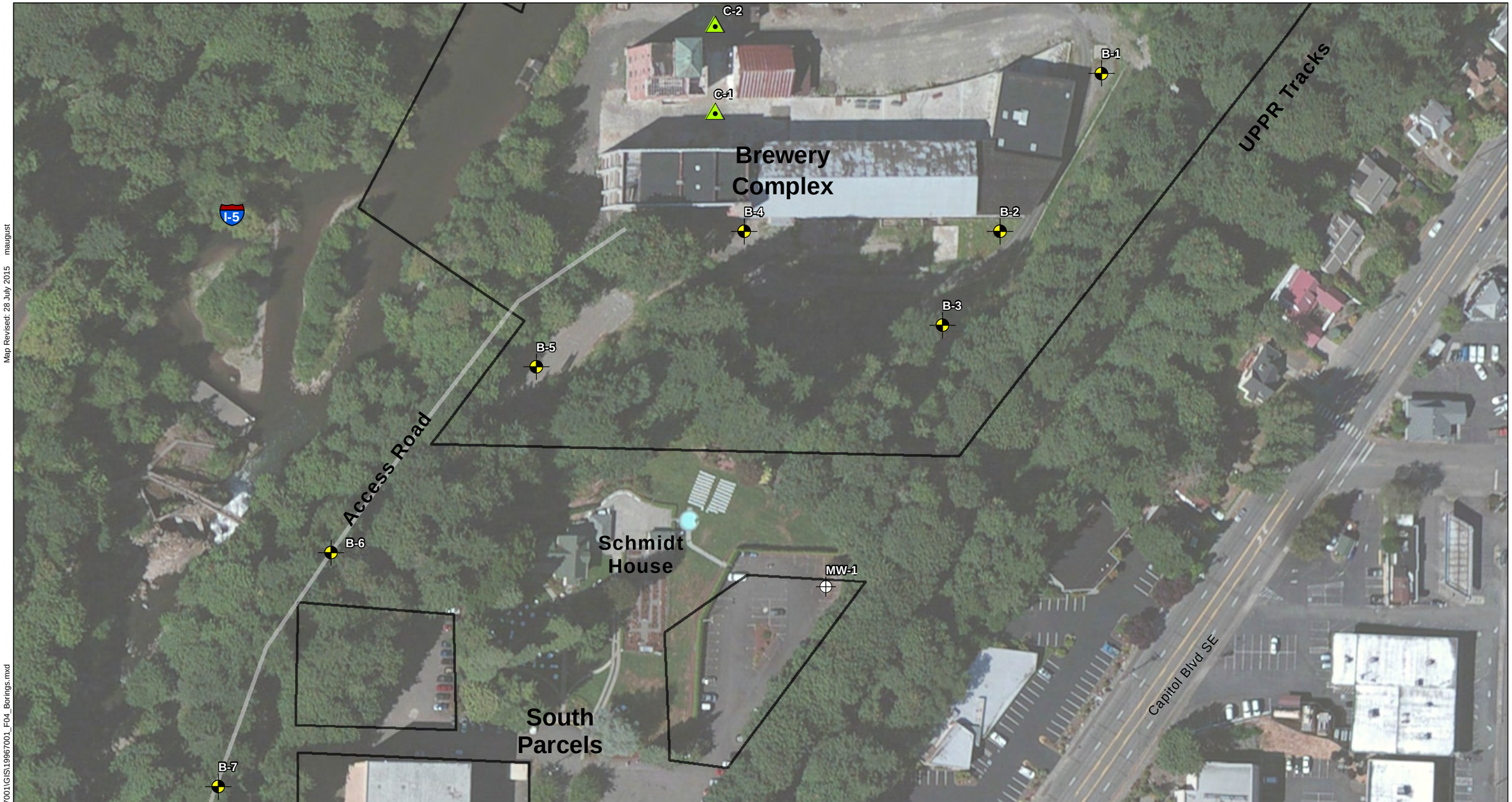
Office: TAC



Map Revised: 28 July 2015 maugust

Path: \\tac\projects\1\9199670001\GIS\199670001_F04_Borings.mxd

Office: TAC

Data Source:

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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.

Legend

- Boring Number and Approximate Location
- Cone Penetrometer Sounding and Approximate Location (Previous Consultation)
- Monitoring Well and Approximate Location
- Site Boundary

N W E S

100 0 100
Feet

Subsurface Exploration Locations

Tumwater Brewery Site
Tumwater, Washington

GeoEngineers

Figure 4

APPENDIX A
Subsurface Explorations and Laboratory Testing

APPENDIX A
SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

Subsurface Explorations

Subsurface conditions were evaluated at the site by drilling eight borings, one of which was completed as a monitoring well. The approximate locations of the explorations are shown on Figure 4. The borings were advanced to depths of 12 and 119 feet below existing grades (bgs) using track- and truck-mounted drilling equipment and operators under subcontract to GeoEngineers.

Our field representative obtained samples, classified the soils, and maintained a detailed log of each boring. Soil samples were obtained from the borings using Standard Penetration Test (SPT) methods. The SPT is a 1.4-inch inside diameter sampler driven into the soil using a 140-pound hammer free falling a distance of 30 inches. The number of blows required to drive the sampler the last 12 inches or other indicated distance is recorded on the logs as the blow count. Sample attempts were made at approximately 5-foot depth intervals. The samples were retained in sealed plastic bags. The soils were classified visually in general accordance with the system described in Figure A-1, which includes a key to the exploration logs. Summary logs of the borings are included as Figures A-2 through A-8; a summary log of monitoring well MW-1 is included as Figure A-9.

The locations of the borings and monitoring well were determined by pacing from existing site features such as curbs, buildings, edge of pavement and compared with aerial photos and topographic contours developed from LiDAR data. The elevations presented on the boring logs were estimated by interpolating between topographic contour lines. The locations and elevations of the explorations should be considered approximate.

Laboratory Test Results

Soil samples obtained from the test pits were transported to GeoEngineers laboratory. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics of the site soils and to confirm our field classification.

Sieve Analysis (SA)

Particle-size analyses were performed on selected samples in general accordance with ASTM International (ASTM) Test Method D 6913. This test method covers the quantitative determination of the distribution of soil particles larger than 75 micrometers (μm) is determined by sieving. The results of the tests were used to verify field soil classifications. Figures A-10 through A-12 present the results of the sieve analyses.

Percent Fines (%F)

Percent fines determinations were conducted on select samples in general accordance with ASTM D 1140. This test method determines the moisture content of the sample and percent of material passing the U.S. No. 200 sieve. The results of the percent fines determinations are used to assist in soil classification. The moisture content and percent fines of the samples tested are indicated on the exploration logs.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			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
MORE THAN 50% RETAINED ON NO. 200 SIEVE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE			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	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
MORE THAN 50% PASSING NO. 200 SIEVE	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.

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

ADDITIONAL MATERIAL SYMBOLS

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

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 or geologic units

Approximate location of soil strata change within a geologic soil unit

Material Description Contact

Distinct contact between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PI	Plasticity index
PP	Pocket penetrometer
PPM	Parts per million
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
NT	Not Tested

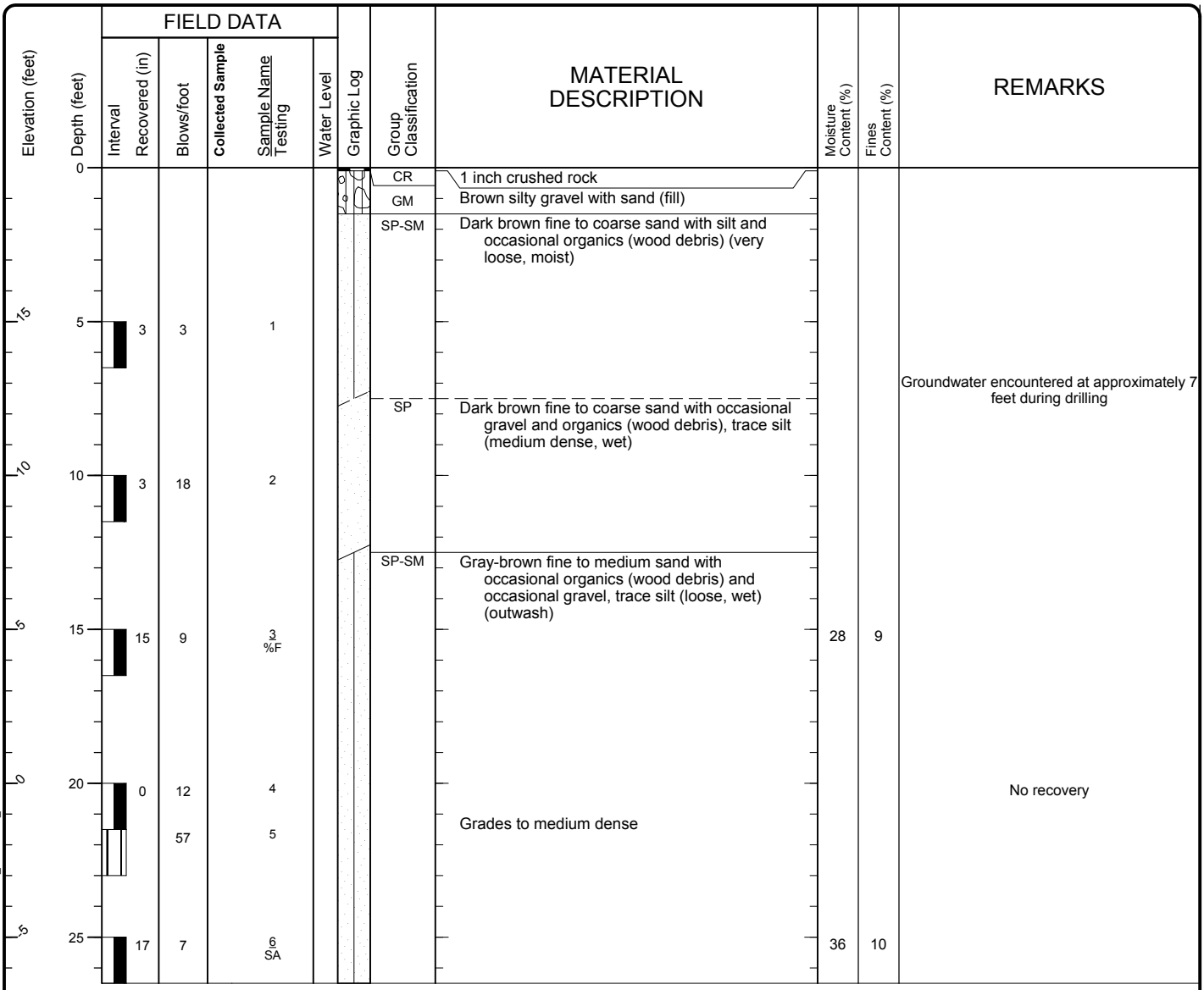
NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative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

KEY TO EXPLORATION LOGS

GeoEngineers

FIGURE A-1

Drilled Start 5/26/2015 End 5/26/2015	Total Depth (ft) 26.5	Logged By CRN / Checked By	Driller Holocene Drilling	Drilling Method Hollow-Stem Auger	
Surface Elevation (ft) 20 / Vertical Datum NAVD88	Hammer Data Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment Diedrich D-50			
Latitude / Longitude	System Datum N/A	Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft) — See remarks			
Notes:					



Note: See Figure A-1 for explanation of symbols.

Log of Boring B-1

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-2
Sheet 1 of 1

Drilled	Start 5/26/2015	End 5/26/2015	Total Depth (ft) 26.5	Logged By CRN / Checked By	Driller Holocene Drilling	Drilling Method Hollow-Stem Auger
Surface Elevation (ft) 22 / Vertical Datum NAVD88			Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D-50	
Latitude / Longitude			System Datum N/A		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft)	
Notes:					See remarks	

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						SP-SM	Brown and gray fine to medium sand with silt and pockets of gray silt (loose, moist) (fill)			
20							SP	Brown and gray with orange mottling silty fine to medium sand with occasional gravel and organics (roots), trace silt (loose, wet)			
	5	8	4	1							
15							SM	Gray-brown silty fine to medium sand (loose, wet) (outwash)			Groundwater encountered at approximately 9 feet during drilling
	10	14	7	2 SA					33	21	
10											
	15	15	10	3A %F					25	16	
				3B %F				Grades to medium dense	28	16	
5											
	20	18	7	4 SA			SP-SM	Gray fine sand with silt (loose, wet)	32	9	
0											
	25	18	18	5A							
				5B			ML	Gray silt with occasional sand (stiff, wet)			

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-2

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-3
Sheet 1 of 1

Drilled	Start 5/26/2015	End 5/26/2015	Total Depth (ft)	26.5	Logged By / Checked By	CRN	Driller	Holocene Drilling	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) / Vertical Datum	27 NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50		
Latitude / Longitude			System Datum	N/A			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:									See remarks	

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						CR	Quarry spalls (fill)			
25							GP	Gray fine gravel (pea gravel) (fill)			Driller notes 1.5 feet pea gravel under coarse rock
							SP	Dark brown-gray fine to medium sand, trace silt (loose, wet)			
	5	6	6	1							
20							SP	Gray fine to medium sand with occasional gravel and organics (roots), trace silt (loose, wet) (outwash)			Groundwater encountered at approximately 8 feet during drilling
	10	17	9	2A							
				2B			ML	Gray-brown sandy silt with occasional organics (carbonized wood) (medium stiff, wet)			
15							SP-SM	Gray fine to medium sand with silt (loose, wet)			
	15	15	6	3 SA					24	5	
10							SP	Brown fine to medium sand, trace silt (loose to very loose, wet)			
	20	12	4	4A							
				4B %F			SM	Brown-gray with slight green staining silty sand with occasional gravel (loose, wet)	51	47	
5							SP	Gray fine to coarse sand with occasional gravel (medium dense, wet)			
	25	18	14	5							

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-3

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-4
Sheet 1 of 1

Drilled	Start 5/26/2015	End 5/26/2015	Total Depth (ft)	22.2	Logged By / Checked By	CRN	Driller	Holocene Drilling	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) / Vertical Datum	33 NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50		
Latitude / Longitude			System Datum	N/A			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:								See remarks		

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						GP-GM	Fine to coarse gravel with debris (asphalt) (medium dense, moist) (fill)			
							SP-SM	Dark brown fine to coarse sand with silt and gravel, trace debris (brick fragments) (very loose, moist) (fill)			
30	5	5.5	1	1							
25							SM	Gray-brown silty sand occasional gravel and organics (wood debris) (very soft, wet)			
	10	18	3	2A %F 2B %F			SM	Gray silty fine to medium sand with occasional gravel (very loose, wet)	29 47	32 36	
20							SM/ML	Gray-brown silty fine to medium sand with occasional gravel to sandy silt with occasional gravel (medium dense, wet) (outwash)			
	15	11	12	3 SA					27	28	
15											Groundwater encountered at approximately 19 feet during drilling
	20	18	50/4"	4			SM	Gray-brown silty fine to medium sand with occasional gravel (medium dense, wet)			
		2	50/2"	5			BSLT	Gray with green staining basalt (very dense, wet) (bedrock)			

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-4

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-5
Sheet 1 of 1

Drilled	Start 5/27/2015	End 5/27/2015	Total Depth (ft)	25.8	Logged By / Checked By	CRN	Driller	Holocene Drilling	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) / Vertical Datum	62 NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50		
Latitude / Longitude			System Datum	N/A			Groundwater	Date Measured	Depth to Water (ft)	Elevation (ft)
Notes:								None encountered		

Elevation (feet)	Depth (feet)	FIELD DATA: Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0						GP	Gray coarse gravel with sand, trace silt			
							SM	Brown silty fine to medium sand			
60							SM	Brown silty fine to medium sand with gravel, trace organics (loose, moist) (fill)			
	5	2	9	1							
55							SP-SM	Gray-brown fine to medium sand with occasional gravel, trace silt (medium dense, moist) (outwash)			
	10	14.5	15	2 SA					7	5	
50											Driller notes gravels at 14 feet
	15	16	21	3							Grades to less gravel
45											
	20	17	25	4A %F 4B %F					7 21	10 35	
40							SM	Gray-brown silty fine to medium sand (medium dense, moist)			
	25	5	50/4"	5			BSLT	Gray basalt, fractured, weathered (bedrock)			
		0	50/1"	6							No recovery

Note: See Figure A-1 for explanation of symbols.

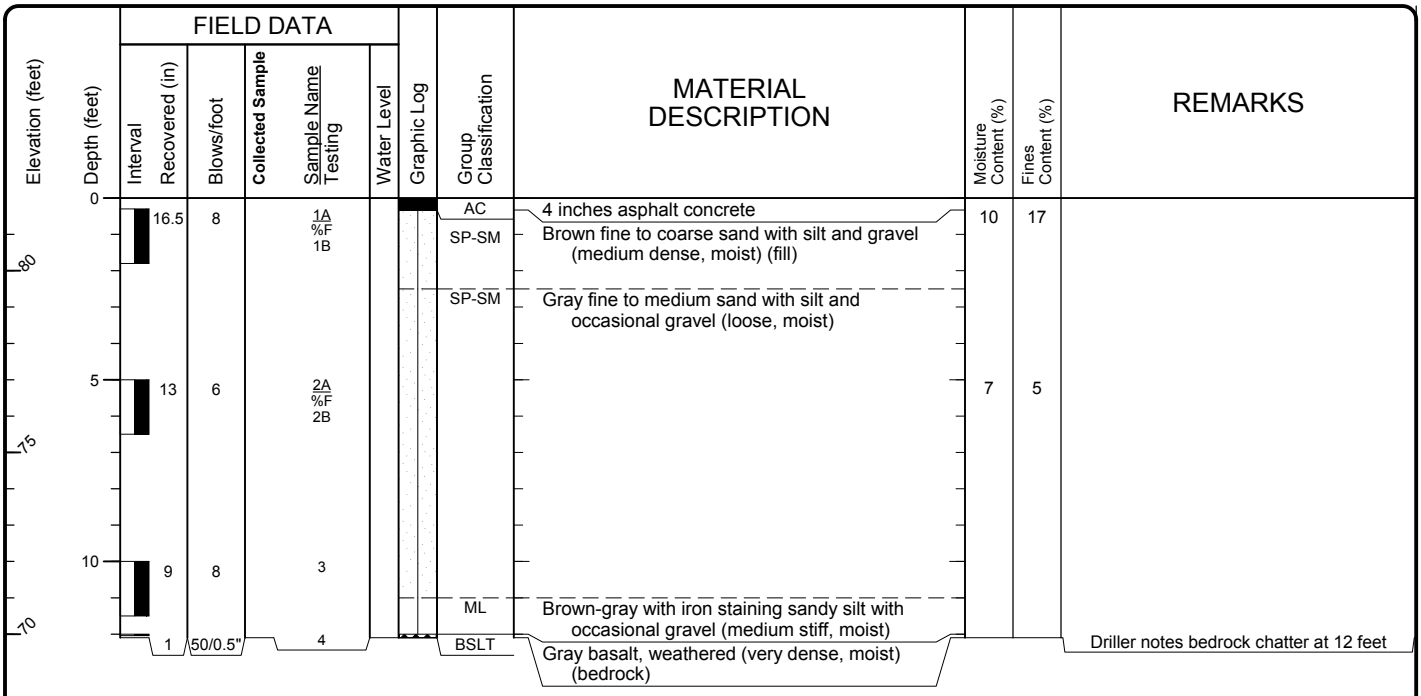
Log of Boring B-5

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-6
Sheet 1 of 1

Drilled Start 5/27/2015 End 5/27/2015	Total Depth (ft) 12.1	Logged By CRN / Checked By	Driller Holocene Drilling	Drilling Method Hollow-Stem Auger
Surface Elevation (ft) 82 / Vertical Datum NAVD88		Hammer Data Autohammer 140 (lbs) / 30 (in) Drop		Drilling Equipment Diedrich D-50
Latitude / Longitude		System Datum N/A		Groundwater: Date Measured / Depth to Water (ft) / Elevation (ft): None encountered
Notes:				



Note: See Figure A-1 for explanation of symbols.

Log of Boring B-6

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-7
Sheet 1 of 1

Drilled	Start 5/27/2015	End 5/27/2015	Total Depth (ft)	15.5	Logged By / Checked By	CRN	Driller	Holocene Drilling	Drilling Method	Hollow-Stem Auger
Surface Elevation (ft) / Vertical Datum	100 NAVD88		Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop			Drilling Equipment	Diedrich D-50		
Latitude / Longitude			System Datum	N/A			Groundwater: Date Measured	Depth to Water (ft)	Elevation (ft)	
Notes:							None encountered			

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample: Sample Name / Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)	REMARKS
	0	13	24	1A %F 1B			AC	6 inches asphalt concrete	7	19	
							SM	Brown silty fine to coarse sand with occasional gravel and occasional organics (medium dense, moist) (fill)			
							SP	Brown fine to medium sand with occasional organics (roots), trace silt (medium dense, moist)			
95	5	8	1	2				Grades to fine to coarse sand and very loose			
							SM	Gray silty fine to medium sand (loose, moist) (outwash)			
90	10	16	7	3A %F 3B					14	33	
							ML	Gray sandy silt (soft, moist)			
							BSLT	Gray and black basalt, weathered (very dense, moist) (bedrock)			Driller notes chatter 12 feet, chatter increased to 15 feet
85	15	4.5	50/3"	4							

Note: See Figure A-1 for explanation of symbols.

Log of Boring B-7

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-8
Sheet 1 of 1

Drilled	Start	End	Total Depth (ft)	Logged By	Driller	Drilling Method
	5/28/2015	5/29/2015	120.1	CRN	Holocene Drilling	Hollow-Stem Auger

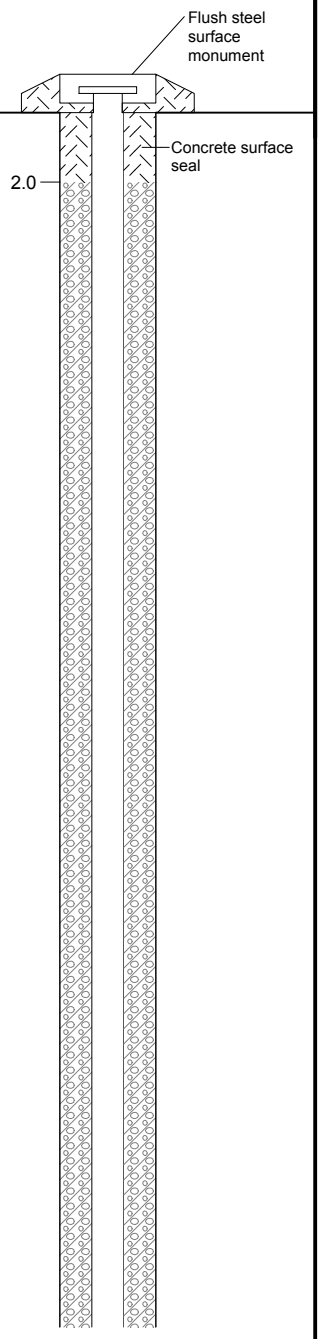
Hammer Data	Autohammer 140 (lbs) / 30 (in) Drop	Drilling Equipment	Diedrich D-50
Surface Elevation (ft) Vertical Datum	128 NAVD88	Top of Casing Elevation (ft)	
Latitude Longitude		Horizontal Datum	N/A

DOE Well I.D.: BIK931
A 2 (in) well was installed on 5/28/2015 to a depth of 108 (ft).

Groundwater Date Measured	Depth to Water (ft)	Elevation (ft)
5/29/2015	72.6	55.4

Notes:

Elevation (feet)	Depth (feet)	Interval Recovered (in)	Blows/foot	Collected Sample	Sample Name Testing	Water Level	Graphic Log	Group Classification	MATERIAL DESCRIPTION	Moisture Content (%)	Fines Content (%)
	0							AC	3 inches asphalt concrete		
		15	6		1			SM	Dark brown silty fine to medium sand with occasional gravel and organics (loose, moist) (fill)		
125								SP-SM	Brown fine to medium sand with silt and occasional gravel (loose, moist)		
								SM	Gray silty fine to medium sand with occasional gravel (very loose, moist)		
	5	12	2		2A						
					2B %F			ML	Gray sandy silt with occasional organics (wood debris) (very soft, moist) (outwash)	31	71
120											
	10	12.5	11		3			SM	Gray silty fine to medium sand (medium dense, moist)		
115								ML	Gray silt with sand (stiff, moist)		
	15	15.5	7		4 SA					31	74
110								SM	Gray silty fine to medium sand (medium dense, moist)		
	20	14.5	15		5 %F					27	16
105											
	25	14	16		6						
100								ML	Gray silt with sand (medium stiff, moist)		
	30	12.5	18		7A %F 7B					27	61
95								SM	Gray silty fine to medium sand (medium dense, moist)		
	35										



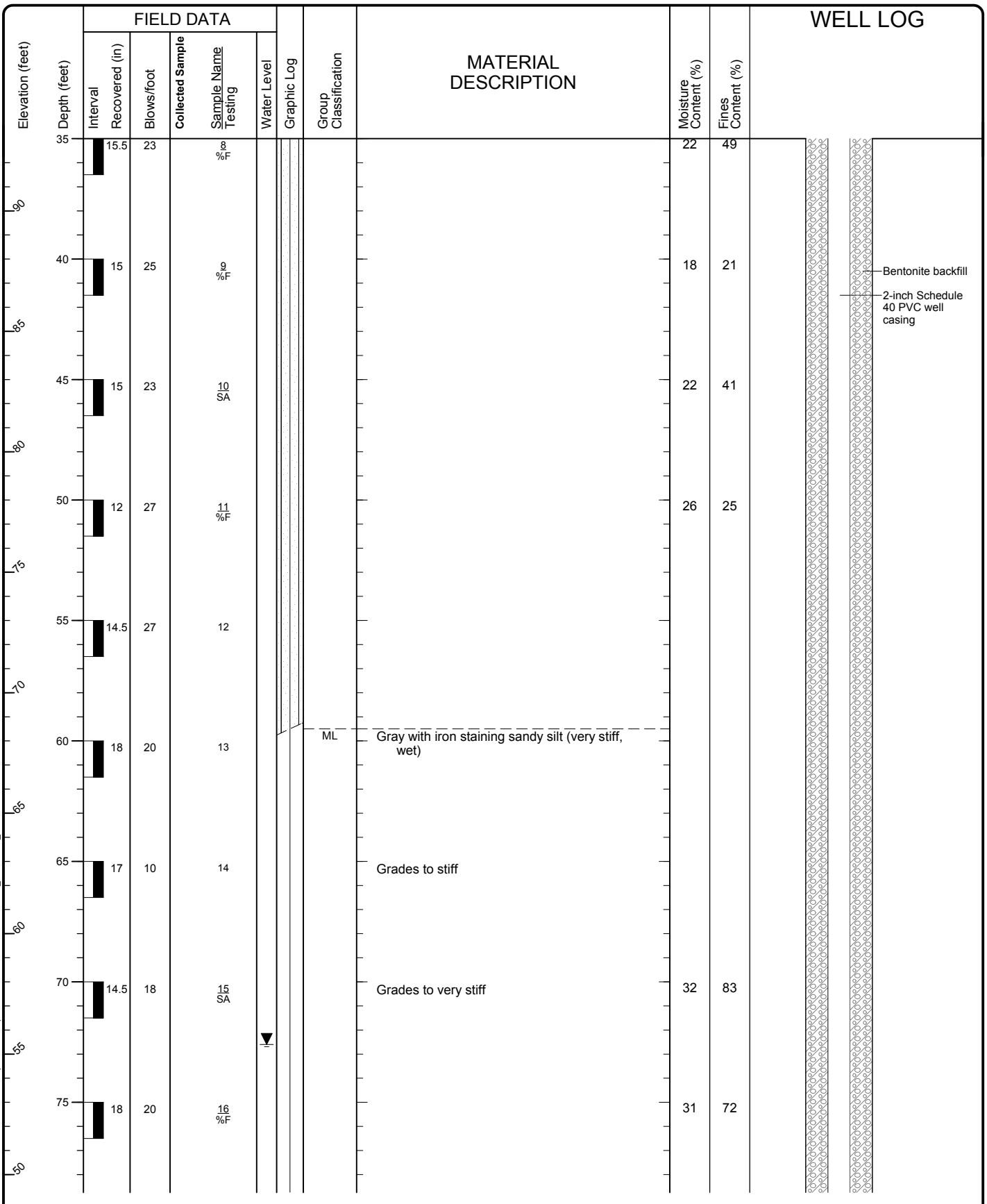
Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-1

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-9
Sheet 1 of 3



Note: See Figure A-1 for explanation of symbols.

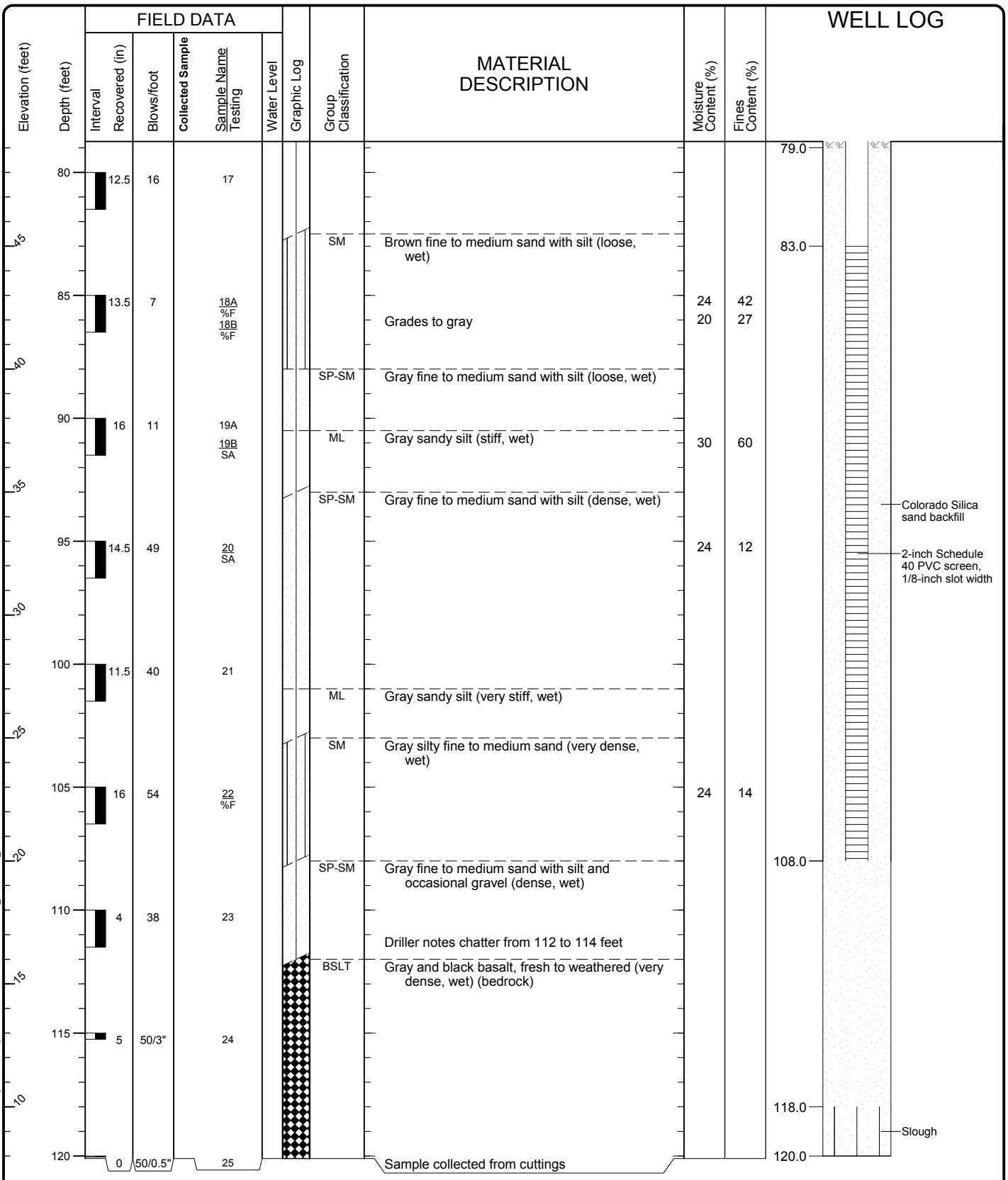
Log of Monitoring Well MW-1 (continued)

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-9
Sheet 2 of 3

Tacoma: Date:7/27/15 Path:P:\19\19967001\GINT\19967001.GPJ DBTemplate\LibTemplate:GEOENGINEERS8.GDT/GEI8_GEOTECH_WELL



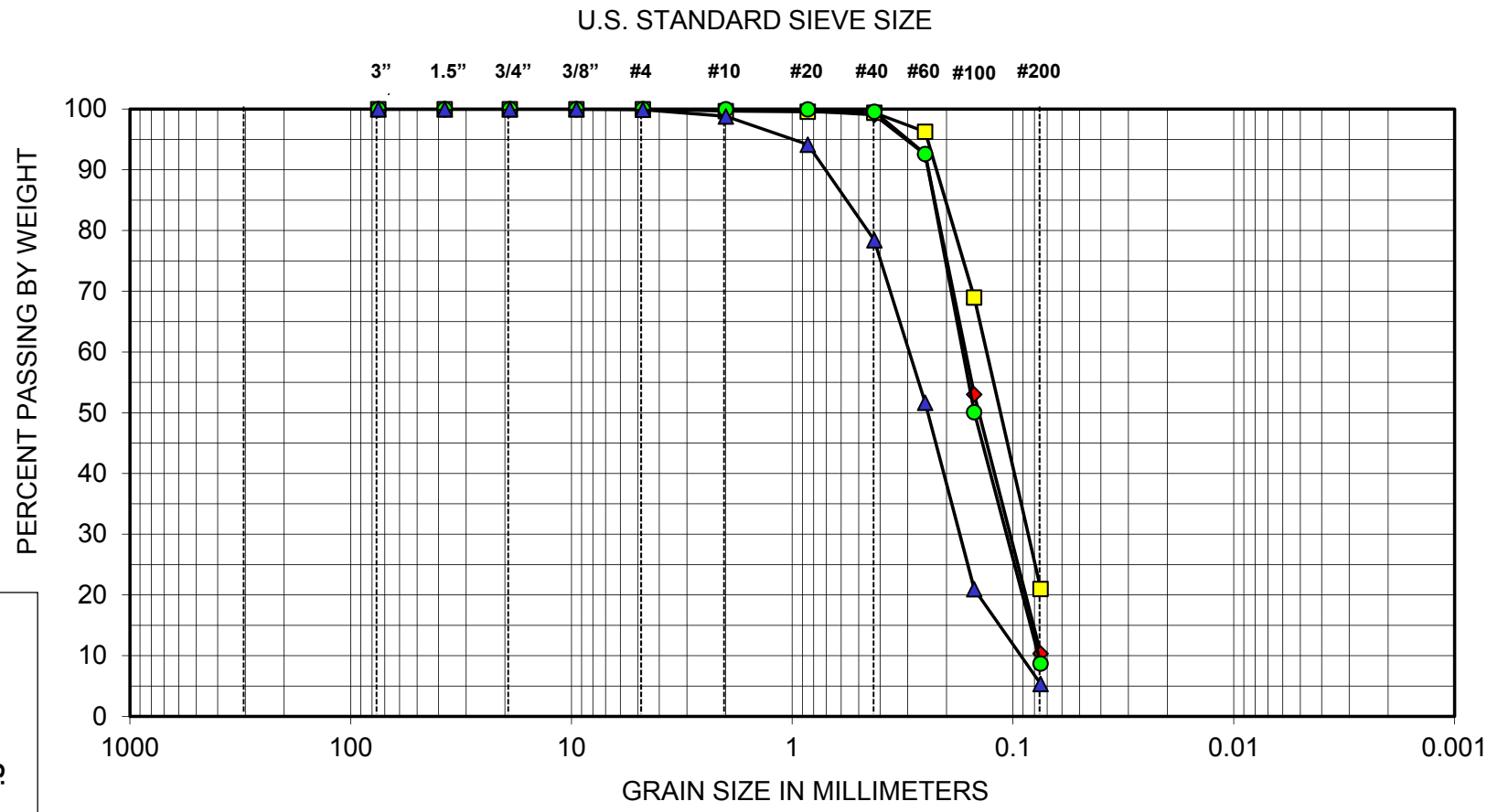
Note: See Figure A-1 for explanation of symbols.

Log of Monitoring Well MW-1 (continued)

GeoEngineers

Project: Tumwater Brewery Site
Project Location: Tumwater, Washington
Project Number: 19967-001-01

Figure A-9
Sheet 3 of 3



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	LABORATORY SOIL CLASSIFICATION
◆	B-1	25	Poorly graded sand with silt (SP-SM)
■	B-2	10	Silty sand (SM)
●	B-2	20	Poorly graded sand with silt (SP-SM)
▲	B-3	15	Poorly graded sand with silt (SP-SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913.

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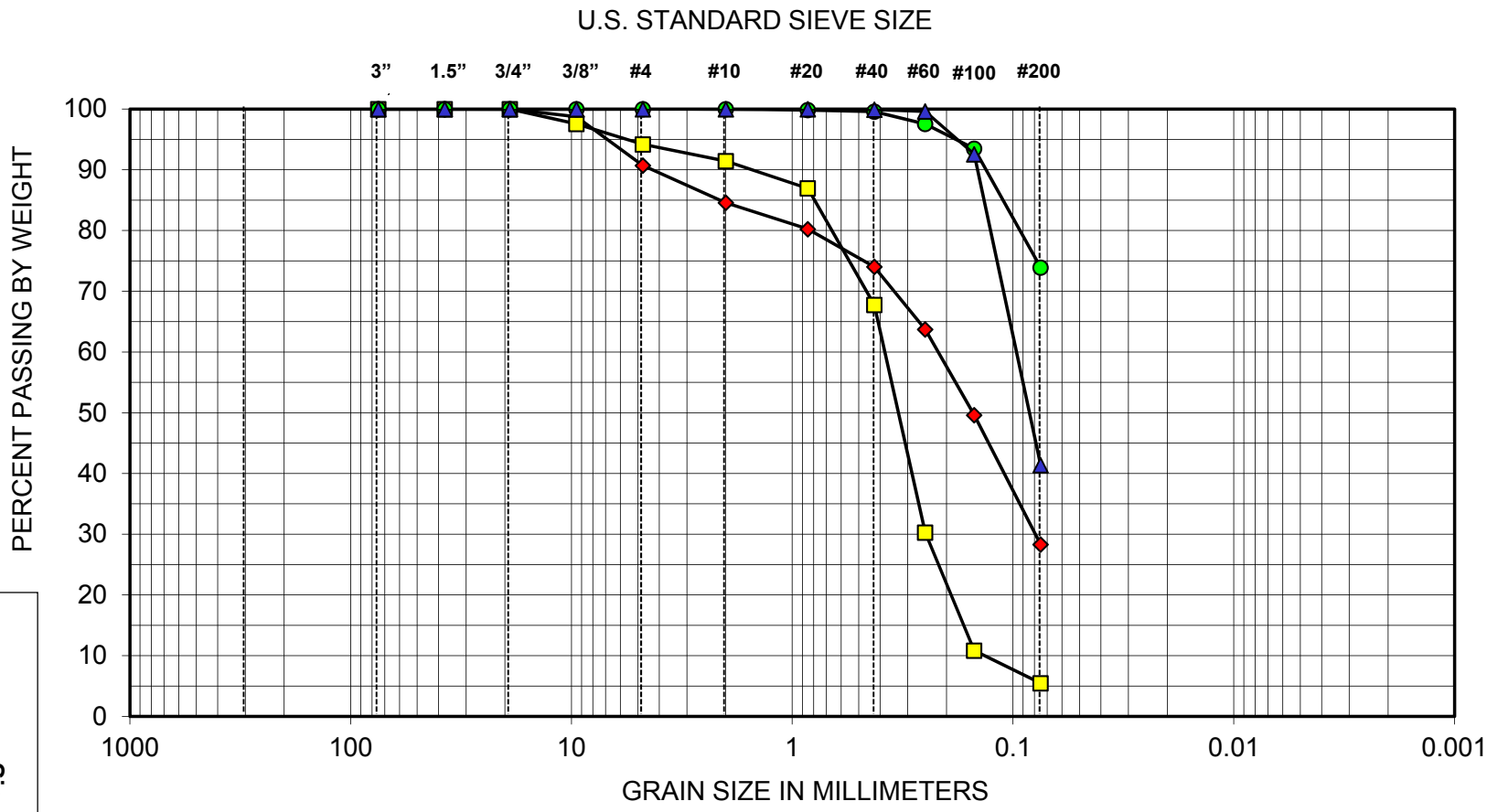
Figure A-10

Tumwater Brewery Site
Tumwater, Washington

Sieve Analysis Results



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	LABORATORY SOIL CLASSIFICATION
◆	B-4	15	Silty sand (SM)
■	B-5	10	Poorly graded sand with silt (SP-SM)
●	B-8	15	Silt with sand (ML)
▲	B-8	45	Silty sand (SM)

The grain size analysis results were obtained in general accordance with ASTM D 6913.

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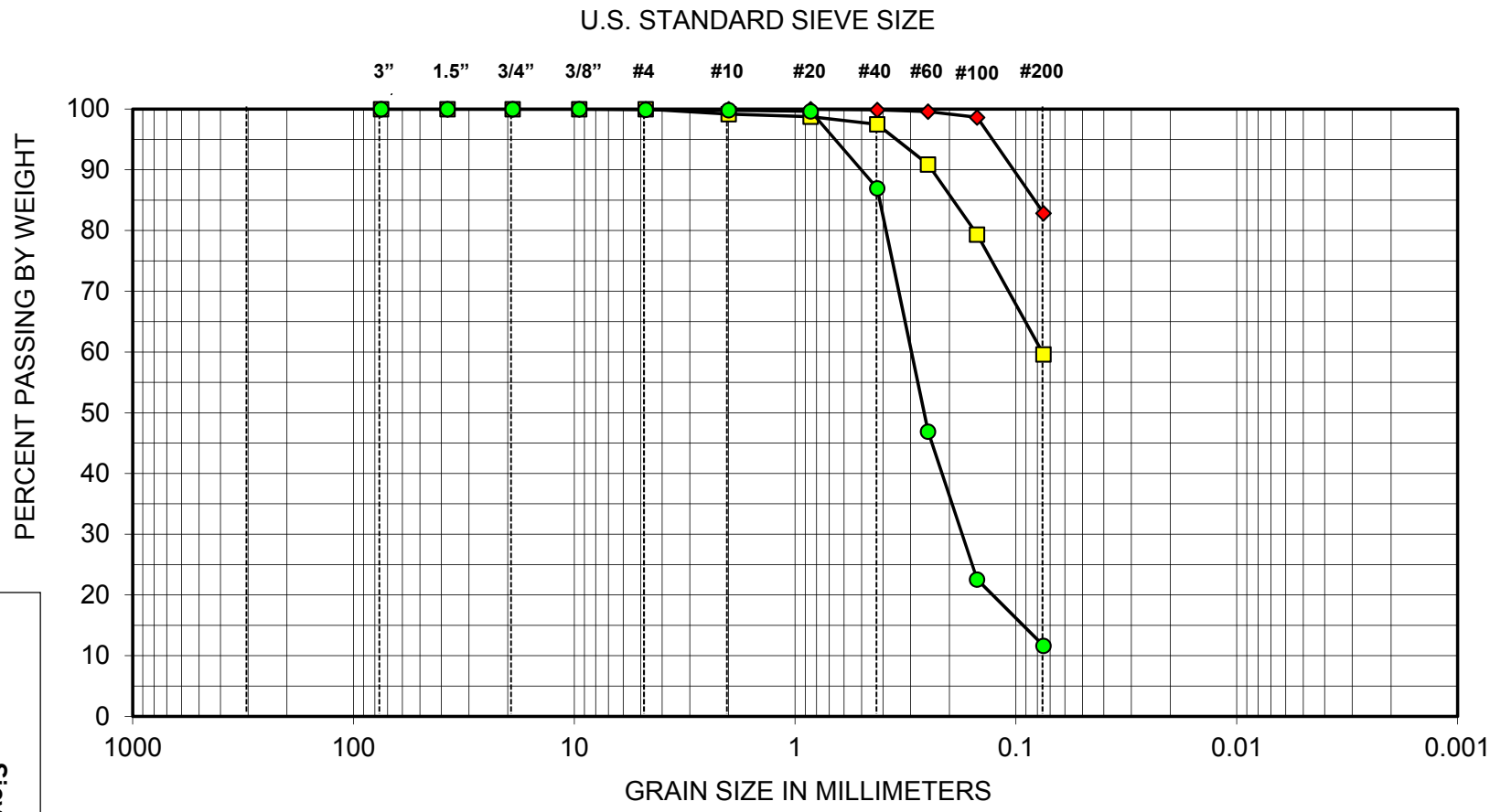
Figure A-11

Tumwater Brewery Site
Tumwater, Washington

Sieve Analysis Results



BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	LABORATORY SOIL CLASSIFICATION
◆	B-8	70	Silt with sand (ML)
■	B-8	90	Sandy silt (ML)
●	B-8	95	Poorly graded sand with silt (SP-SM)

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The grain size analysis results were obtained in general accordance with ASTM D 6913.

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Tumwater Brewery Site
Tumwater, Washington

Sieve Analysis Results

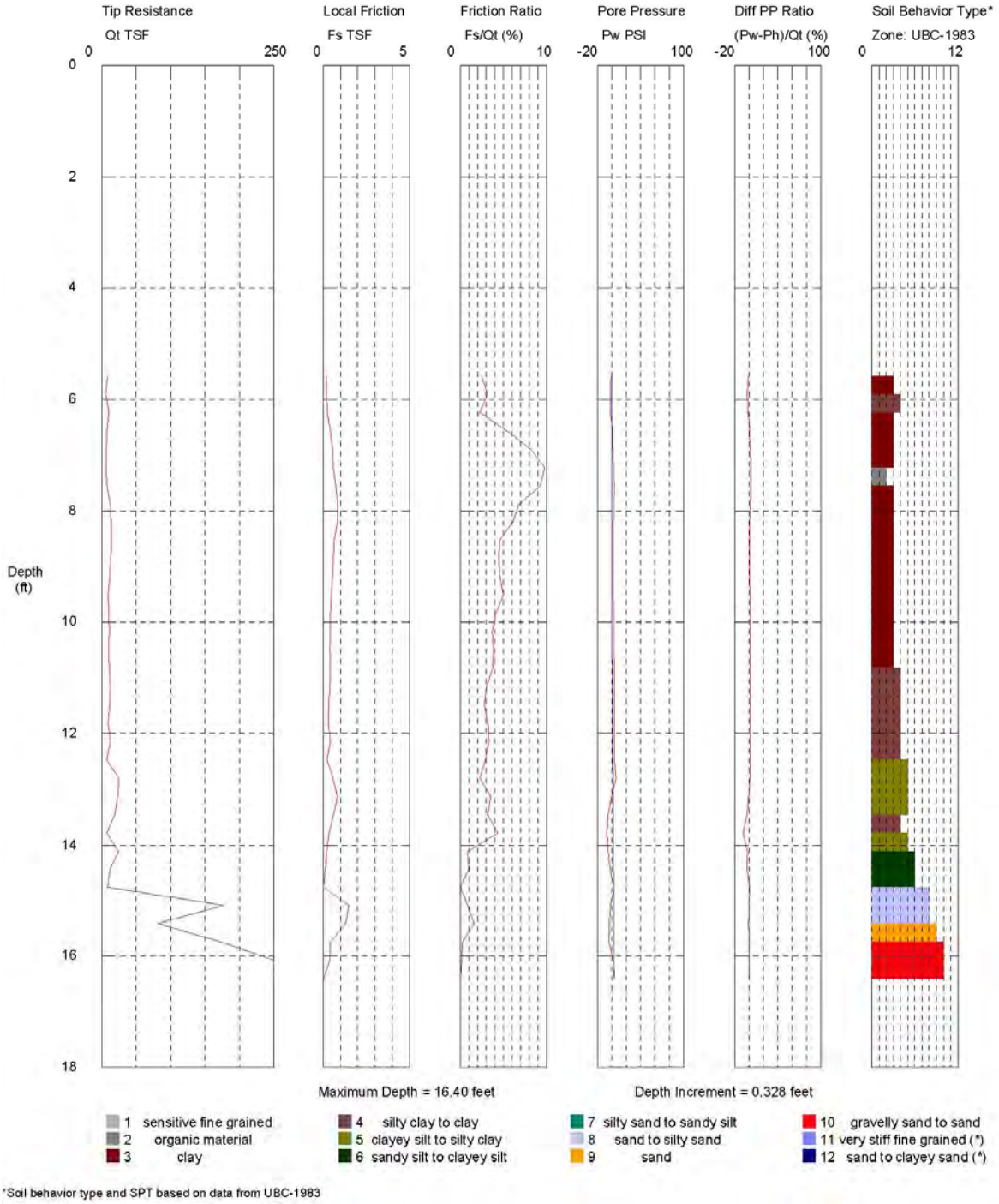
Figure A-12

APPENDIX B
Supplementary Explorations

Subsurface Technologies

Operator: SAM
Sounding: P-1
Cone Used: DSG1021

CPT Date/Time: 3/8/2011 11:35:43 AM
Location: OLYMPIA BREWHOUSE
Job Number: 19967-001-00



*Soil behavior type and SPT based on data from UBC-1983

C-1 Coneplot

Tumwater Brewery Site
Tumwater, Washington

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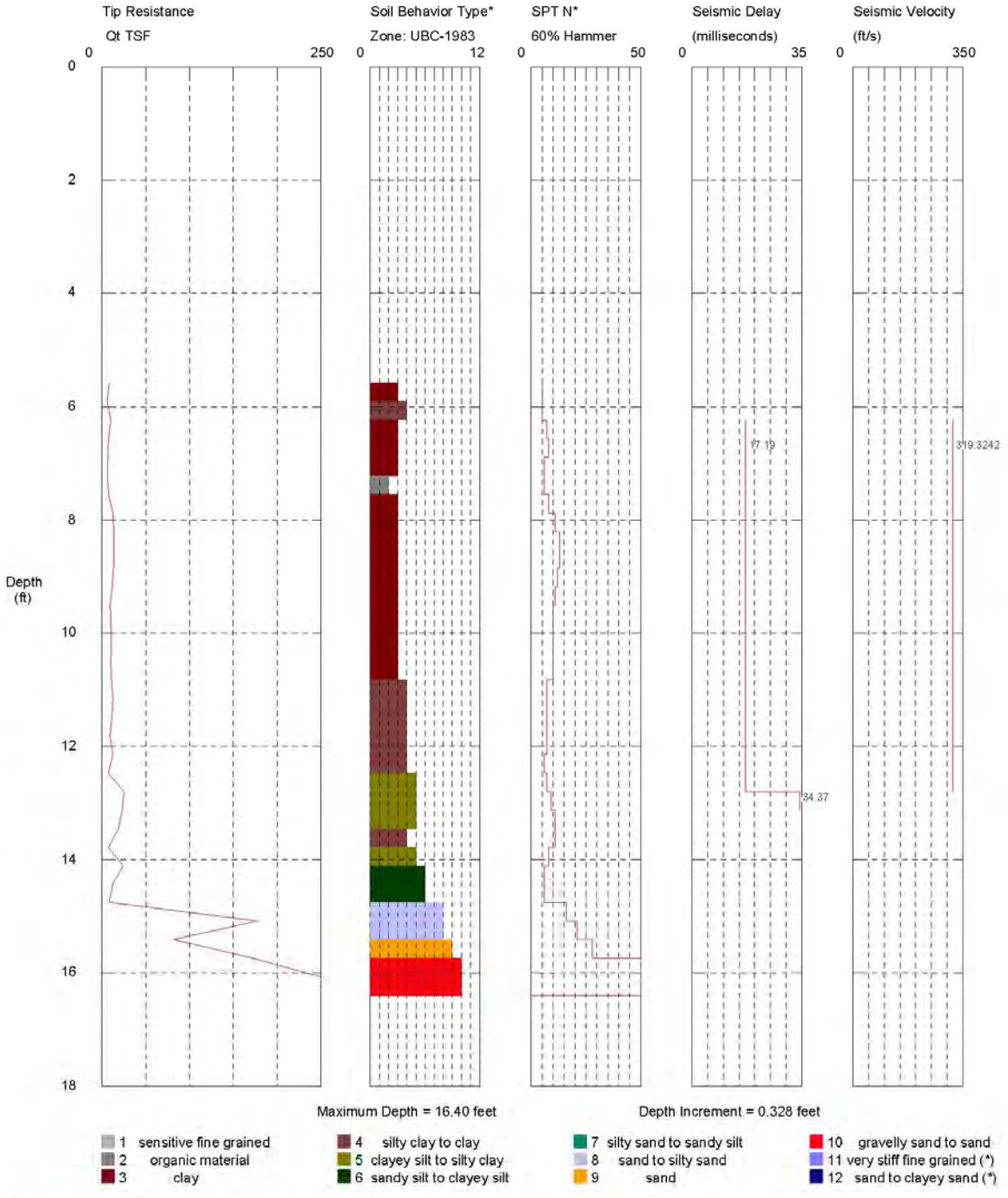
Figure B-1 (Sheet 1 of 3)

19976-001-00

Subsurface Technologies

Operator: SAM
Sounding: P-1
Cone Used: DSG1021

CPT Date/Time: 3/8/2011 11:35:43 AM
Location: OLYMPIA BREWHOUSE
Job Number: 19967-001-00



*Soil behavior type and SPT based on data from UBC-1983

C-1 Seismic Coneplot

Tumwater Brewery Site
Tumwater, Washington

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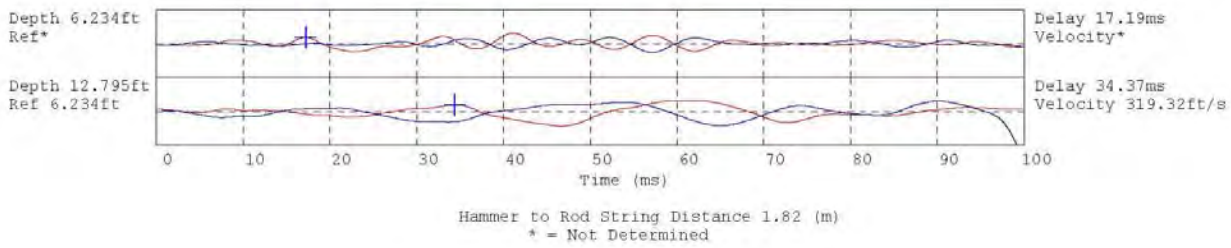
Figure B-1 (Sheet 2 of 3)

19976-001-00



C-1 Seismic Picks

Tumwater Brewery Site
Tumwater, Washington

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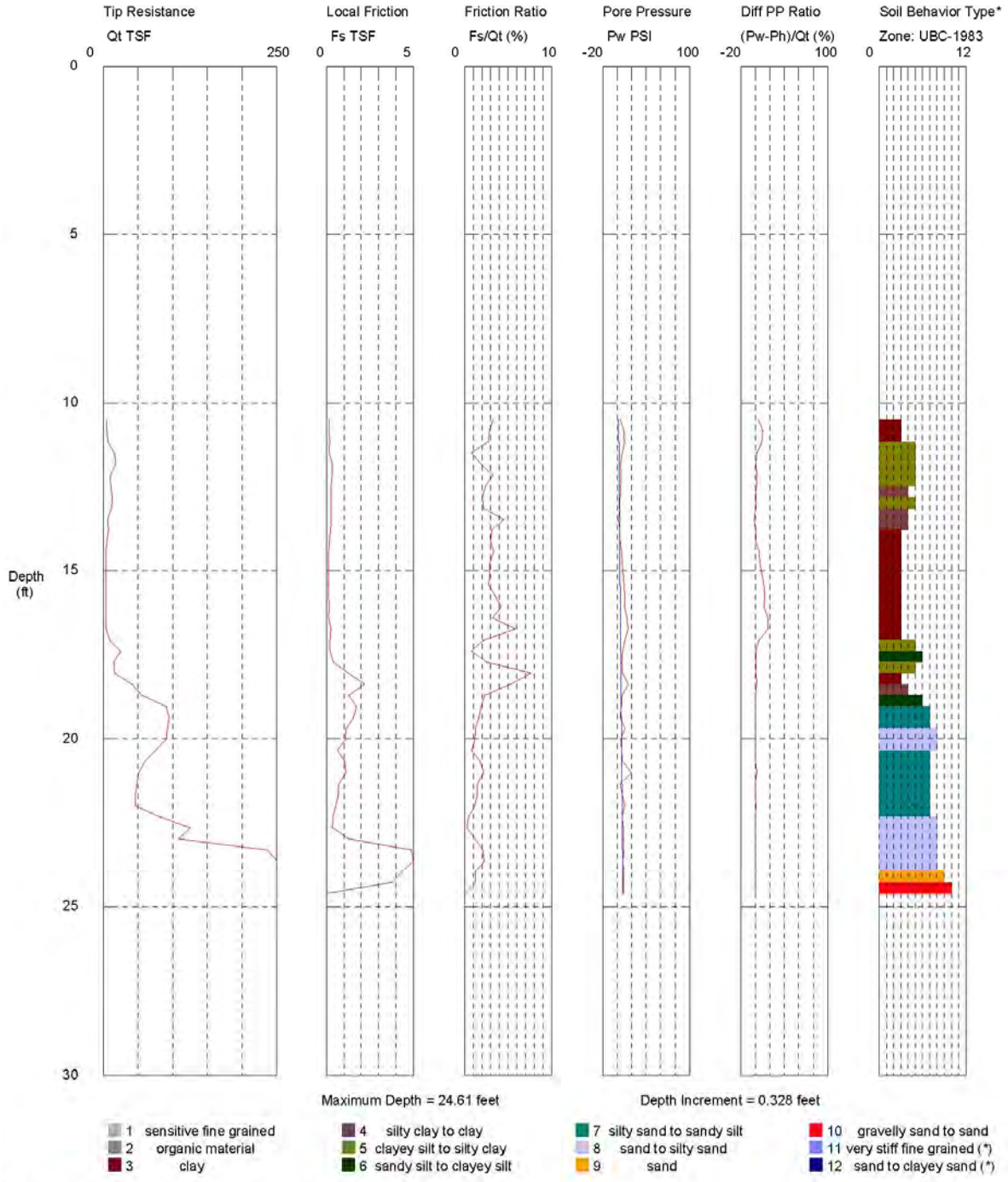
Figure B-1
(Sheet 3 of 3)

19976-001-00

Subsurface Technologies

Operator: SAM
Sounding: P-3
Cone Used: DSG1021

CPT Date/Time: 3/8/2011 2:28:01 PM
Location: OLYMPIA BREWHOUSE
Job Number: 19967-001-00



*Soil behavior type and SPT based on data from UBC-1983

C-2 Coneplot

Tumwater Brewery Site
Tumwater, Washington

GeoEngineers

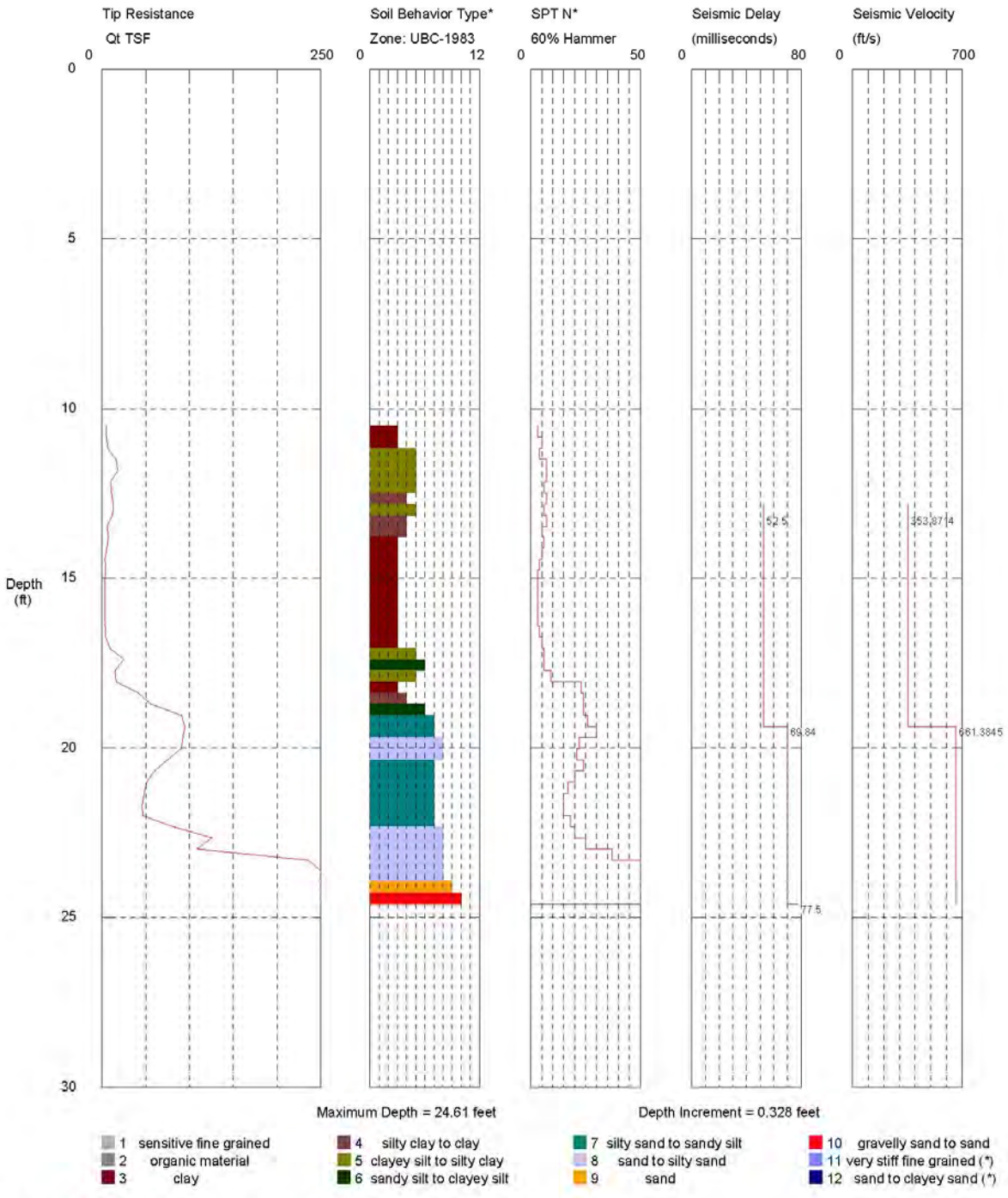
Figure B-2 (Sheet 1 of 3)

19976-001-00

Subsurface Technologies

Operator: SAM
Sounding: P-3
Cone Used: DSG1021

CPT Date/Time: 3/8/2011 2:28:01 PM
Location: OLYMPIA BREWHOUSE
Job Number: 19967-001-00



*Soil behavior type and SPT based on data from UBC-1983

C-2 Seismic Coneplot

Tumwater Brewery Site
Tumwater, Washington

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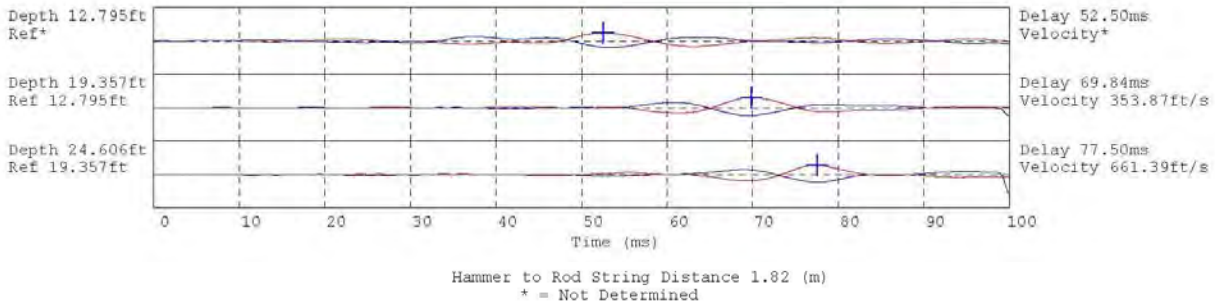
Figure B-2 (Sheet 2 of 3)

19976-001-00

Subsurface Technologies



Hammer to Rod String Distance 1.82 (m)
* = Not Determined

C-2 Seismic Picks	
Tumwater Brewery Site Tumwater, Washington	
GeoEngineers	Figure B-2 (Sheet 3 of 3)

19976-001-00

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 SCJ Alliance/Shea Carr Jewell and for the Project 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 SCJ Alliance/Shea Carr Jewell dated March 19, 2014 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 in support of the Tumwater Brewery Planned Action EIS at the Tumwater Brewery site located in Tumwater, 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;

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

- elevation, configuration, location, orientation or weight of the proposed structure;
- 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.

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

The construction 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.

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.

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.