Preliminary Geotechnical Evaluation
Genesee and Henderson
Combined Sewer Overflow (CSO)
Reduction Project
Seattle, Washington

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EXECUTIVE SUMMARY

Geotechnical conditions and impacts were assessed for conceptual level improvements for 12 options for the Genesee Area basins and 16 options for the Henderson Area basins. Our review included the collection and assessment of approximately 140 pre-existing soil and rock exploration borings and test pits from our files and the University of Washington Mapping Project, geologic hazard maps dealing with susceptibility to settlement, liquefaction, seismicity, and slope instability, and man-made hazard maps, such as landfills. We also reviewed local geologic maps.

The most prominent geologic feature in the area is the Seattle Fault, an east-west-trending 7- to 8-mile-wide deformed and offset zone that extends from Atlantic City Park on the south to Leschi Park on the north and results in sandstone and shale bedrock exposed from Seward Park and southward. Other significant features are the presence of soft clays and peats and loose sands along the Lake Washington shoreline and in most of the low-lying valleys, a large garbage fill in the Genesee Park area, and hard to dense glacial and interglacial deposits in the hilly areas.

Issues that may impact excavations for pump stations and treatment plants, construction of new conveyance lines, and inline and offline storage pipes and tanks may include:

- Groundwater levels are coincident with or above lake level. Perched groundwater tables may occur in granular layers above the lake level.
- Dewatering and permanent drainage may be required for structures near or below groundwater level.
- Dewatering may result in consolidation of soft and loose soils and settlement of adjacent structures unless adequately designed and monitored.
- Earthquake-induced liquefaction and lateral spreading could result in downdrag or lateral forces on pile foundations, loss of foundation support, and/or lateral movement of structures built in soft or loose post-glacial soils.
- Watertight shoring may be required for most structures excavated to near or below groundwater level.
- Driving of pile foundations into the hard or dense glacial soils or bedrock may be difficult and may require pre-drilling.
- Loose sands and silts, and soft clays and peats, underlain by dense or hard glacial soils occur along the Lake Washington shoreline and in most lowland areas, to varying depths. Structures founded in or on these deposits may require deep foundations or soil improvement to mitigate settlement.

- Heavy ripping or blasting may be required to excavate substantially into the sandstone/shale bedrock.
- Slopes adjacent to some sites are subject to deterioration and landslides.
- The Genesee Park landfill likely contains contaminated soils and groundwater, and scattered methane gas pockets. The garbage fill is up to 40 feet thick. Special precautions will be required to excavate, dewater, and found structures in these garbage fills.

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PRELIMINARY GEOTECHNICAL EVALUATION
GENESEE AND HENDERSON COMBINED SEWER OVERFLOW (CSO) REDUCTION PROJECT
SEATTLE, WASHINGTON

1.0 INTRODUCTION

This report presents the results of our preliminary geotechnical studies performed for the proposed Genesee and Henderson CSO Reduction Projects. This preliminary geotechnical evaluation is based on available exploration data derived from our files and published literature, as well as our experience in the area. We understand that the project will involve improvements in both in-line and off-line storage capacity, infiltration reduction, and pump station improvements within the basins of the Genesee and Henderson Areas in Seattle, Washington. Most of the improvements will be near the west shoreline of Lake Washington in the South Seattle area, as shown in Figure 1.

Our evaluation was based on a review of existing soil and groundwater data derived from our files, from the University of Washington Mapping Project (Troost et al., 2005), from published literature and from our experience on projects in the Genesee and Henderson Areas. The logs for approximately 140 borings and test pits were collected in the general vicinity of the proposed project options. We have also utilized the City of Seattle's geographic information system-based maps of Environmentally Critical Areas, seismic hazard maps for Seattle, U.S. Geological Survey maps of liquefaction potential in Seattle (Grant and Perkins, 1997), and City of Seattle landslide potential assessments (Shannon & Wilson, 1997).

1.1 Genesee Area

The Genesee Area extends from Seward Park and Andrews Bay, northward to the Stan Sayers Memorial Park and Genesee Park along the west shoreline of Lake Washington. We assessed potential geotechnical issues regarding the conceptual project features in Basins 37, 38, 41, 42, 43, and 165. These potential issues are summarized in Table 1 and described below.

Indicated possible modifications for the Genesee Area that would likely have geotechnical components and considerations include new inline and offline storage, construction of new pump stations, force mains, gravity sewer and lakelines, and construction of large-diameter tunnels.

1.2 Henderson Area

The Henderson Area extends southward from Seward Park, through Martha Washington Park, and down to Atlantic City Park and Rainier Beach, along the west shoreline of Lake Washington. We assessed potential geotechnical issues regarding the conceptual project features in Basins 44, 45, 46, 49, 47N, and 47S. These potential issues are summarized in Table 2 and described below.

Indicated possible modifications for the Henderson Area that would likely have geotechnical components and considerations include new inline and offline storage, expansion of existing pump stations, new pump stations, force mains, gravity sewer and lakelines, and construction of large-diameter tunnels.

2.0 GEOLOGY AND SUBSURFACE CONDITIONS

2.1 Topography and Geology

Seattle is located in the central portion of the Puget Lowland, a north-south-oriented elongated topographic and structural depression bordered by the Cascade Mountains to the east and the Olympic Mountains to the west. This lowland is characterized by a series of north-south-trending ridges separated by deeply cut ravines and broad valleys. These ridges and valleys are the result of glacial scouring and subglacial erosion. In general, the ground surface varies between 400 feet elevation and sea level.

Geologists believe that the Puget Sound area has been subjected to six or more major glaciations during the Pleistocene Epoch (2 million years ago to about 10,000 years ago), which filled the Puget Lowland to depths of up to 3,600 feet, with a complex sequence of glacial and nonglacial sediments. These glaciers originated in the coastal mountains of British Columbia. The maximum southward advance of the ice was about halfway between Olympia and Centralia (about 50 miles south of Seattle). During the most recent ice coverage of the central Puget Lowland (Vashon Stade of the Fraser Glaciation), the thickness of the ice is estimated to have been about 3,000 feet in the project area. The last ice covering the area receded about 13,500 years ago.

The distribution of the sediments in the Puget Lowland is complex because each glacial advance partially eroded older deposits and deposited new sediments. During the intervening interglacial episodes, the complete or partial erosion or the reworking of some deposits, as well as the local deposition of other sediments, further complicates the geologic setting.

Since the last glaciation, extensive landsliding has occurred along the steep flanks of the hills, eroded valleys, and upland plateaus of Puget Sound. The accumulation of debris from the numerous small- and medium-size landslides has resulted in a mantle of landslide deposits covering intact soils along most steep slopes not exposed to erosion. Scattered, very large rotational landslides and complexes of translational landslides are also evident along the steep slopes in Puget Sound. Some of the very large landslides may have been caused by oversteepening of the hillsides by glacial scouring and subsequent removal of ice support from the flanks of the ridges during retreat of the Vashon ice sheet. More recent evidence suggests that strong ground motions from past earthquakes may have also triggered some of these very large landslides.

Bedrock outcrops are present in only a few locations in the Seattle area and occur most prominently in the project area to the south of an east-west line extending from the City of Bremerton to the west and to the south end of Lake Sammamish toward the east. In the project area, bedrock outcrops as sandstone and basalt from the middle of the Bailey Peninsula or Seward Park and Alaska Avenue and southward. This outcrop boundary has been identified as the Seattle Fault, considered to be an active fault consisting of several sub-parallel east-west splays and an extensive deformation zone extending as far north as Interstate 90.

2.2 Hydrogeologic Regime

The groundwater conditions in the Puget Sound area are highly variable. Groundwater flow is controlled by glacial and post glacial stratigraphy and groundwater recharge/discharge relationships. Groundwater recharge typically occurs in the upland areas of Seattle and moves downward and laterally toward the lowland areas of Puget Sound and Lake Washington.

The complex glacial stratigraphy in the Seattle area has a strong influence on the nature of groundwater flows. The direction of groundwater movement is controlled in part by the permeability of the interlayer soil deposits. The permeabilities of glacial deposits typically differ by several orders of magnitude between sand and gravel and hard clay and till. Consequently, multiple sand, silt, clay, and till soil layers tend to form multiple perched and poorly connected water bearing soil layers. Groundwater flow in the stratigraphically higher, coarse-grained high permeability deposits, such as glacial outwash, flows horizontally and downward under unconfined piezometric conditions. Groundwater in these soil units is often perched on top of low-permeability till and lacustrine deposits. Much of the groundwater flows laterally and may discharge as springs or seeps along the hillsides. However, a portion of this groundwater will

percolate vertically downward through the lower permeability units to underlying higher permeability soils.

2.3 Tectonics and Seismicity

Tectonically the Puget Lowland is located in the fore arc of the Cascadia Subduction Zone. The tectonics and seismicity for the region are the result of the relative northeastward subduction of the Juan de Fuca Plate beneath the North American Plate. The convergence of these two plates results in complex north-south and east-west compression at the rate of about 0.3 to 0.4 inch per year in the Puget Lowland. The north-south compression in the Puget Lowland is accommodated by a series of west- and northwest-trending thrust faults extending to depths of 12 miles.

Movement along these thrust faults and associated faults have resulted in numerous historic and pre-historic earthquakes. Historic earthquakes in the area have included the magnitude (Ms) 7.1 Olympia earthquake of April 13, 1949; the magnitude (mb) 6.5 Seattle-Tacoma earthquake of April 29, 1965; and the recent February 28, 2001, magnitude 6.8 Nisqually earthquake. All of these earthquakes resulted in ground shaking with maximum Modified Mercalli Intensities (MMI) of about VII to VIII in the Seattle area. These levels of ground shaking are the maximum vibratory ground motion estimated to have occurred along the project alignment during the 170 years of historical record, and are estimated to correspond to peak ground accelerations between about 0.10 and 0.15 g. While actual recorded ground motions from the February 28, 2001, Nisqually earthquake in the project vicinity were generally in this range, peak ground accelerations as high as 0.31 g were recorded at Seward Park where bedrock is exposed at ground surface.

The east-west trending Seattle Fault Zone, extends for about 7 to 8 miles from Atlantic City Park on the south to Leschi Park on the north along the west coast of Lake Washington, and is the nearest potentially active fault to the project site. The fault extends from the Olympic Mountains on the west to the foothills of the Cascades on the east. Recent geologic evidence indicates that ground surface rupture from movement on this fault zone occurred as recently as 1,100 years ago. Preliminary estimates of recurrence rates for the Seattle Fault are on the order of 3,000 to 5,000 years with a slip rate of 0.03 to 0.04 inch per year. Earthquake magnitudes of up to 7.7 have been postulated for movement on this fault.

2.4 Subsurface Conditions

General soil types in the project area consist of normally consolidated post-glacial soils, overconsolidated glacial and inter-glacial soils, and bedrock as defined on the legend in Figure 4 and described in more detail for the soil and rock units found in the project area as listed below:

2.4.1 Post-glacial Soils

- *Lake Deposits (Ql)* – Depression fillings of fine-grained soils; generally very soft to stiff, silt and clay with lenses and layers of sand and peat deposited in a lacustrine environment, in slow moving water.
- *Beach Deposits (Qb)* – Deposits along former shorelines; loose to dense sand and gravel deposited by wave action.
- *Peat (Qp)* – Depression fillings of organic materials; very soft to soft, compressible soil consisting primarily of plant and woody debris often interbedded with lake deposits, and recessional lacustrine deposits.
- *Alluvium (Qal)* – River, creek, or stream deposits; very loose to medium dense, silty and gravelly sand.

2.4.2 Glacial and Pre-glacial Soils

- *Recessional Outwash Deposits* (Qvr) – Sediment deposited as the glaciers retreated from the area; loose to dense, layered to massive, sand and gravel. May contain channel deposits of coarse gravel, cobbles, and boulders.
- *Recessional Lacustrine Deposits (Qvrl)* – Depression fillings of fine-grained soils deposited as glacial ice retreated; soft to stiff silt and clay, may contain fine sand interbeds.
- *Vashon Ice-contact Deposits (Qvi)* – Soils deposited against or adjacent to ice during the wasting of glacial ice; irregular, heterogeneous and often reworked, loose to dense silt, sand and gravel.
- *Vashon Till (Qvt)* – Soil laid down along the base of glacial ice; very dense to hard silt, sand, clay, and gravel, with scattered cobbles and boulders. Often contains lenses and stringers of sand and gravel. Typically 5 to 40 feet thick.
- *Advance Outwash Deposits (Qva)* – Sediment deposited by streams and rivers as glacial ice advanced; dense to very dense, well-sorted and stratified sand and gravel, with lenses of cobbles. Ranges from clean to very silty, and may contain lenses and layers of silt. Locally over 200 feet thick.
- *Pre-Fraser glaciation Age Deposits* (Qpf) – Dense, interbedded sand, silt, and gravel.
- *Pre-Fraser Coarse-grained Deposits* (Qpfc) – Dense, clean to silty sand and gravel.

- *Pre-Fraser Fine-grained Deposits* (Qpff) – Hard, laminated to massive silt and clay with sandy interbeds. Often highly fractured and may contain sand lenses and sand dikes.
- *Pre-Olympia Glacial Deposits* (Qpog) – Dense to very dense, interbedded and intermixed, silt, sand, gravel, and till deposited by glacial action.
- *Pre-Olympia Coarse-grained Deposits* (Qpoc) – Dense to very dense, clean to silty sand and gravel, with some silt layers.

2.4.3 Bedrock

- *Blakely Formation (Tb)* – Tertiary-age (65 to 1.8 million years old) medium to coarse-grained sandstone, conglomerate, and minor siltstone.

2.5 Groundwater

Groundwater levels at the edge of Lake Washington are generally coincident with lake level, and rise in subdued mimicry of the topography away from the lake. Perched water levels are also likely to occur in sand layers and lenses underlain by much less permeable till, clay, and bedrock.

3.0 GEOLOGIC HAZARDS

The site conditions in the Genesee and Henderson areas include a variety of geologic hazards linked to the wide range of geologic, tectonic, and man-made conditions. Geologic hazards include soft and compressible soils that are susceptible to settlement, marginally and unstable slopes that have experienced or could readily experience landslides and mass wasting, soils susceptible to liquefaction and/or lateral spreading, and a variety of man-made hazards, including landfills with their attendant loose compressible debris and contamination, including methane and other gaseous, liquid, and solid contaminated materials.

3.1 Settlement

Soft lacustrine and alluvial deposits, and man-made fill, are typically compressible, and prone to long-term settlement under any increase in load. The landfill debris, underlying Genesee Park and elsewhere, is highly variable and potentially weak and compressible. Peat deposits would be even more settlement-prone than the soft clayey lacustrine deposits. Loose or soft saturated deposits could also be subject to liquefaction-induced settlement. The geologic maps in Figures 5 and 6 indicate the locations of identified soft clay (Ql) and peat (Qp) deposits.

3.2 Steep Slopes and Landslides

The City has identified landslide-prone areas that include steep slopes, known landslide areas, and areas with landslide potential because of geologic conditions. Steep slopes are defined by the City as slopes steeper than an average of 40 percent and with at least 10 feet of vertical change. Numerous small- to medium-sized recent or historic landslides have been mapped in steep slope areas and landslide debris is present in many areas along the west shore of Lake Washington. Landslide scarps are also present along much of the steep hillsides along the west shoreline of the lake. Mapped steep slopes, existing landslides, and areas of potential landsliding are shown in Figures 2 and 3. Scarp areas are shown as a dashed line, as indicated on the legend in Figure 4, for the Genesee Area in Figure 5, and the Henderson Area in Figure 6. Pipelines crossing steep slopes or potential landslides should be avoided if possible. If construction of a pipeline across these features is necessary, the pipeline should be designed to accommodate potential movement and deformation, or the area should be stabilized with drainage, buttressing, unloading, etc.

3.3 Liquefaction and Lateral Spreading

The entire Genesee and Henderson Areas are located within the Seattle Fault and Deformation zone, as indicated by the coarse, red rectangular grid overlying most of Figures 5 and 6. Portions of the Genesee and Henderson Areas are underlain by normally-consolidated, non-glacial (Holocene) soils that are susceptible to earthquake induced liquefaction, lateral spreading and their associated effects. Soil liquefaction is a phenomenon in which excess pore pressure in loose, saturated, granular soils increases during ground shaking to a level near the initial effective stress, thus resulting in a reduction of shear strength of the soil (a quicksand-like condition). The effects of liquefaction include the loss of bearing capacity for shallow foundations, reduction in lateral and vertical capacities of deep foundations, ground surface settlements, lateral spreading, and embankment instability. Additionally, liquefaction of soils surrounding belowground structures could pose uplift concerns.

Potentially liquefiable deposits have been mapped (Grant and Perkins, 1997) and have been incorporated by the City of Seattle as Environmentally Critical Areas. These mapped areas are shown in Figures 2 and 3.

One of the major liquefaction-induced types of ground failure is lateral spreading. Lateral spreading occurs because of pore-pressure buildup or liquefaction in the soil deposits underlying sloping ground. It results in displacement of the sloping ground towards the "free-face,"

typically adjacent to a waterway or slope. The amount of displacement from lateral spreading depends on the severity of the liquefaction, distance to the free face, and height of the free face. Lateral spreading is more likely to occur in the soft clayey lake deposits that rim Lake Washington and occur in many of the low valleys adjacent to the lake.

3.4 Environmental Considerations

Landfill debris underlying Genesee Park and the surrounding area may pose environmental concerns such as methane and/or chemical contaminants. Contaminated soils and groundwater may be encountered during subgrade preparation for structures, or during excavation. Contaminated groundwater could also be encountered during dewatering. Such soils and groundwater, if encountered, would need to be properly handled, treated and disposed of. Methane has also been identified in the Genesee landfill, and would need to be monitored and dealt with for any subsurface construction.

4.0 CONCEPTUAL GEOTECHNICAL CONSIDERATIONS

Subsurface conditions and geotechnical issues associated specifically with Genesee and Henderson Areas are presented in the following sections. Figures 5 and 6 present generalized surficial geology and select geotechnical issues for the project areas. Representative logs of the explorations that we used in our evaluation of the subsurface conditions near the project features are included in Appendix A, Existing Subsurface Explorations. The conceptual geotechnical issues for alternatives within each basin are included in Table 1: Genesee CSO Reduction – Geotechnical Issues for Conceptual Level Design, and Table 2: Henderson CSO Reduction – Geotechnical Issues for Conceptual Level Design.

In general, the subsurface conditions in the Genesee and Henderson Areas consist of loose and soft lacustrine deposits in the lower lying areas and along the Lake Washington shoreline, bounded and underlain by glacially overridden deposits, outwash sands and gravels, and bedrock outcroppings in the southern portions of the basin. Peat deposits have been encountered in several locations including areas of Genesee Park, around the intersection of 51st Avenue South and Farrar Street, and south of Atlantic City Park.

4.1 General Geotechnical Considerations

4.1.1 Excavation Support

Depending on the soil and groundwater conditions at a particular excavation site, several groundwater control and shoring options exist.

Soldier pile and lagging walls, either cantilever or with tiebacks and/or bracing, are commonly used for deep excavations or cuts in soils above the groundwater table, or where dewatering is practical and dewatering-induced consolidation of nearby soft soils is unlikely. This type of wall system would typically consist of placing a wide-flanged steel beam into a predrilled, 24- to 30-inch-diameter hole and backfilling the hole with concrete. The soldier pile spacing may vary between about 5 to 12 feet. Pressure-treated wood lagging or steel or concrete lagging is installed between the soldier piles to provide support to the retained soil. The excavation typically proceeds from the top down, and tiebacks are installed to provide additional support if necessary (typically for walls higher than 12 to 15 feet). Soldier piles produce cuttings during installation; therefore, soils would have to be screened for contaminants and handled appropriately if encountered.

In soils with a high groundwater table, where dewatering may not be practical, such as in clays or silts, or where dewatering could result in large disposal volumes or settlement impacts on adjacent structure, then "tight" shoring may be appropriate. Tight shoring support systems include: driven interlocking sheet piles, drilled and concreted secant piles, concrete slurry wall panels, soil mixing, ground freezing, and several other construction methods. These wall support systems may be applicable for both temporary ground support, and in some cases, also as final support.

Another option, soil nailing, consists of either driving or drilling and grouting a series of steel bars or "nails" behind the excavation surface and then covering the reinforced mass with shotcrete and then a facing, the type of which is dependent on the function of the wall and the desired aesthetics. The placement of steel dowels in the soil behind an excavation face in a fairly close pattern increases the shear resistance of the soil against rotational sliding. Soil nail walls are typically used to provide lateral stability for excavation cuts in competent soils, such as dense, granular, glacially overridden deposits, which can either be dewatered or where the groundwater level is beneath the bottom of the excavation. The walls are typically constructed from the top down in about 5-foot vertical sections, which require that the native soil has a standup time of at least 24 hours. Soil nail walls are less effective and not recommended for providing support in soft, cohesive soils and loose fill soils. These walls are also not recommended where extensive seepage occurs because it is difficult to install soil nails in a seepage zone, and it is difficult to provide adequate drainage behind the wall face.

4.1.2 Dewatering

Due to the relatively flat, low topography, groundwater levels are likely to be just a few feet below ground surface near lake level. A high groundwater table would require the use of relatively watertight shoring systems, in combination with localized dewatering as needed, during excavation to control groundwater inflow and maintain a stable excavation. Dewatering systems might include: vacuum-extraction well points, deep or shallow dewatering wells, or sumps in the excavations, depending on the level of the static groundwater during excavation, and the soil conditions surrounding the excavation. Typically, if the excavation is less than about 3 feet below the groundwater table, sumps may be used for construction dewatering. If the excavation is deeper than about 3 feet below the groundwater table, an active dewatering system is usually necessary to prevent soil loss and/or instability of the excavation from hydrostatic pressure. Dewatering efforts would typically begin some time prior to excavation below the water table. This period is usually at least two weeks in order to provide sufficient pre-drainage of soils. In our experience, dewatering soils with high fines contents, such as the lacustrine deposits observed in the project vicinity, requires additional time for pre-drainage, relative to soils with less silt.

Dewatering may cause consolidation and settlement of loose and soft soils adjacent to excavations. If excavations are planned near settlement-sensitive structures, groundwater recharge wells outside the excavation should be considered, or tight shoring might be used to limit the need for thorough dewatering.

4.1.3 Permanent Drainage

Permanent groundwater control may be necessary at some sites, depending on the particular project feature and groundwater levels. Structures constructed or founded beneath the groundwater table or in perched water zones may require permanent drainage. Smaller amounts of seepage could typically be controlled using passive systems such as perimeter footing drains, and/or vertical drain mats. If significant amounts of groundwater are encountered, active subdrain systems should be considered. Buoyancy-induced uplift of structures buried below the groundwater table should be evaluated for both short-term construction periods and long-term operating and maintenance periods.

4.1.4 Settlement

Construction activities, including excavation and dewatering, may induce changes in load on the soils that result in consolidation and settlement of soft clayey and organic soils, and loose

granular soils. Settlements of several inches to several feet may occur if the soft lacustrine clays and peats are impacted by construction. Settlements of soft or loose soils may occur in response to construction dewatering, excavation, and placement of fills. Significant dewatering can result in measurable settlements for a few hundred feet beyond the excavation walls, unless groundwater recharge is undertaken. Construction induced settlements of glacially overridden hard or dense soils are generally minimal to non-existent except where lateral deformation of retaining walls are allowed to occur.

4.2 Genesee Area Geotechnical Considerations

The following sections present geotechnical considerations for specific project alternatives as identified in the Genesee CSO Reduction Project CSO Control Alternatives List, provided by HDR, and included in Appendix B.

4.2.1 Basin 37 – Inline and Offline Storage Alternatives (OFF-100-37 and IN-100-37)

These alternatives include OFF-100-37 and IN-100-37 in the Genesee CSO Reduction Project CSO Control Alternatives List. This alternative would involve either inline or offline storage near the intersection of South Horton Street and Lake Washington Boulevard. Based on surficial geologic mapping, and our experience, the site is likely underlain by geologically-recent lacustrine clays and silts. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline or tank. Permanent groundwater control may be necessary at this site.

4.2.2 Basin 38 – Increased Capacity through Pump Station and Force Main Improvements (TKC-101-38 and TKC-103-38)

These alternatives include TKC-101-38 and TKC-103-38 in the Genesee CSO Reduction Project CSO Control Alternatives List. This alternative would involve upgrading Pump Station 5, as well as a new force main bypass of the Sand Catcher/Grit Chamber at Stan Sayres Memorial Park. Based on surficial geologic mapping, nearby existing explorations, and our

experience, the site is likely underlain by 5 to 30 feet of fill and/or geologically recent lacustrine clays and silts over pre-glacial soils and glacial till. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. Liquefaction is possible in the upper, loose and saturated soils. Liquefaction of soils surrounding belowground structures could pose uplift concerns.

4.2.3 Basin 38 – 50th Avenue South Storage (OFF-101-38 and OFF-102-38)

These alternatives include OFF-101-38 and OFF-102-38 in the Genesee CSO Reduction Project CSO Control Alternatives List. OFF-101-38 would involve constructing an about 3,400-foot-long, 14-foot inner diameter tunnel for offline storage beneath 50th Avenue South. OFF-102-38 would involve offline storage constructed beneath 50th Avenue South using open cutting techniques. Based on surficial geologic mapping, nearby existing explorations, and our experience, the site is likely underlain by about 10 to 15 feet of loose to medium dense sand and silt, overlying dense glacial deposits. The groundwater table likely varies from about 30 feet below the ground surface at the north end of the proposed storage, to about 5 to 10 feet below the ground surface at the south end of the proposed storage.

The relatively high groundwater table and presence of liquefiable soils at the south end of the site could affect design and construction. Temporary dewatering and/or relatively watertight shoring may be necessary during excavation at this site. The high groundwater table and liquefiable soils may also pose long-term concerns, including seismic settlement or uplift of belowground storage structures.

Tunneling is likely to be in mixed-face conditions with soft or loose saturated soils adjacent to hard or dense soils. These mixed-face conditions pose a challenge for closed-face tunneling boring machines and may warrant minor changes in alignment. Tunnel support would likely be with bolted, gasketed, precast concrete segments.

4.2.4 Basin 38 – Genesee Park Storage (OFF-103-38 and IN-101-38)

These alternatives include OFF-103-38 and IN-101-38 in the Genesee CSO Reduction Project CSO Control Alternatives List. These options would involve offline or inline storage in Genesee Park. Based on surficial geologic mapping, nearby existing borings, and our experience, the site is likely underlain by 20 to 40 feet of garbage fill over soft peat, soft clay, and organic soils. Dense silt, sand, and gravel underlie the soft soils. The groundwater table is likely about 20 to 40 feet below the ground surface.

The weak or compressible soils at the site could affect excavation options. Depending on the depth of the storage pipeline or tank, temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The liquefiable and compressible soils may also pose long-term concerns, including settlement and/or seismic-induced liquefaction and uplift of belowground storage structures. The garbage fill may also pose environmental concerns, including the presence of methane and/or chemical contaminants.

4.2.5 Basin 38 – Capacity Upgrades Using New Gravity Sewer (TKC-105-38)

This alternative includes TKC-105-38 in the Genesee CSO Reduction Project CSO Control Alternatives List. This alternative would involve constructing a new gravity sewer from Darigold's plant at South Andover Street and Courtland Avenue South to a discharge at South Charleston Street. Based on surficial geologic mapping, nearby existing explorations, and our experience, the site is likely underlain by about 5 to 30 feet of loose and soft silt, clay, and peat, over dense, silty sand and sandy silt with gravel. The groundwater table is likely within about 10 feet of the ground surface.

The relatively high groundwater table and possible presence of liquefiable soils at the site could affect design and construction. Temporary dewatering and/or relatively watertight shoring may be necessary during excavation at this site. The high groundwater table and liquefiable soils may also pose long-term concerns, including seismic settlement or uplift of belowground storage structures. The site is also near the edge of the garbage fill underlying Genesee Park, which may pose environmental concerns such as methane and/or chemical contaminants.

4.2.6 Basin 38 – Capacity Upgrades Using New Wet Weather Treatment Plant and Increased Conveyance along Lake Washington Boulevard (WWT-100-38 and CON-101-38)

This alternative includes WWT-100-38 and CON-101-38 in the Genesee CSO Reduction Project CSO Control Alternatives List. These alternatives would involve a new wet weather

treatment plant near Pump Station 5 and/or constructing a new lakeline along Lake Washington Boulevard from South Alaska Street to Pump Station 5. No exploration borings are present within 100 feet of this site. Based on surficial geologic mapping and our experience, the site is likely underlain by lacustrine deposits consisting of loose and soft silt and clay. Denser glacial soils would underlie the soft soils at some indeterminate depth. The groundwater table is likely within about 10 feet of the ground surface.

The weak or compressible soils at the site would affect excavation options. Depending on the depth of the pipeline, temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. Permanent groundwater control may be necessary for a new treatment plant at this site. The compressible soft soils may also pose long-term concerns, including settlement and earthquake-induced lateral spreading.

4.2.7 Basin 40 – Increased Existing Storage (OFF-104-40)

This alternative includes OFF-104-40 in the Genesee CSO Reduction Project CSO Control Alternatives List. This alternative would involve replacing existing storage pipes along South Dakota Street between 49th Avenue South and 50th Avenue South with larger capacity ones. Based on surficial geologic mapping, nearby existing explorations, and our experience, the site is likely underlain by about 5 to 10 feet of loose to medium dense fill over very dense, silty sand and sandy silt with gravel (glacial till). The groundwater table is at an indeterminate depth. No groundwater was encountered in nearby borings up to about 25 feet below ground surface, but no long-term piezometers were installed.

The shallow glacial till may require ripping or some other forms of hard soil excavation to attain the required excavation depth. Temporary dewatering (probably sumps rather than an active system) may be necessary during excavation at this site, depending on whether perched groundwater is encountered.

4.2.8 Basin 41 – Tunnel Storage Alternatives (IBT-100-41B to 38, IBT-101-41B to 38, and OFF-105-41B)

These alternatives include IBT-100-41B to 38, IBT-101-41B to 38, and OFF-105-41B in the Genesee CSO Reduction Project CSO Control Alternatives List. These alternatives would involve constructing an about 6- to 14-foot inner diameter tunnel for offline storage or inter-basin transfer. The tunnel would start at Lake Washington Boulevard South near South Adams Street, and extend up to 2,300 feet west in the right-of-way. Based on surficial geologic mapping, nearby existing explorations, and our experience, the site is likely generally underlain

by till-like deposits west of Lake Washington Boulevard to about the Genesee Park boundary. Softer lacustrine clays and silts appear to overlay the till in the vicinity of 49th Avenue and 50th Avenue. Subsurface soils in and near Genesee Park could consist of garbage fill, lacustrine deposits, and peat. The groundwater table likely varies in these different soil deposits, and may mimic the topography, but could be expected to be near-surface in some locations, particularly near Lake Washington, and at lower elevations.

The relatively high groundwater table could affect design and construction. Temporary dewatering and/or relatively watertight shoring may be necessary during excavation. Tunnel design would need to accommodate the variable ground conditions and presence of groundwater. Tunneling could likely be accomplished with a closed face microtunnel machine for tunnel diameters up to about 12 feet. Larger diameter tunnels would likely be accomplished with a closed face tunnel boring machine. Tunnel ground support could be provided by jacked pipe up to approximately 12-foot-diameter, or bolted, gasketed, precast concrete segments. The high groundwater table may also pose long-term concerns, including seismic settlement or uplift of belowground storage structures.

4.2.9 Basin 42 – Offline Storage (OFF-106-42 and OFF-107-42)

These alternatives include OFF-106-42 and OFF-107-42 in the Genesee CSO Reduction Project CSO Control Alternatives List. These alternatives would involve offline storage in a parking lot at South Adams Street and Lake Washington Boulevard. Based on surficial geologic mapping, nearby existing borings, and our experience, the site is likely underlain by about 20 feet of soft lacustrine clay and organic soils. Dense glacial soil underlies the lacustrine deposits. The groundwater table is likely within about 10 feet of the ground surface.

The weak or compressible soils at the site could affect excavation options. Depending on the depth of the storage pipeline or tank, temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline or tank. The compressible soils may also pose long-term concerns, including settlement.

4.2.10 Basin 42 – Increase Existing Offline Storage (OFF-108-42)

This alternative includes OFF-108-42 in the Genesee CSO Reduction Project CSO Control Alternatives List. This alternative would involve replacing existing storage pipes with larger capacity ones in the vicinity of 52nd Avenue South and South Genesee Way. Based on surficial geologic mapping, nearby existing explorations, and our experience, the site is likely

underlain by about 5 to 10 feet of loose to medium dense fill over very dense, silty sand and sandy silt with gravel (glacial till). The groundwater table is at an indeterminate depth. No groundwater was encountered in nearby borings up to about 25 feet below ground surface, but no long-term piezometers were installed.

The shallow glacial till may require ripping or some other form of hard soil excavation to attain the required excavation depth. Temporary dewatering (probably sumps rather than an active system) may be necessary during excavation at this site, depending on whether perched groundwater is encountered.

4.2.11 Basin 43 – Offline Storage (OFF-109-43 and OFF-110-43)

These alternatives include OFF-109-43 and OFF-110-43 in the Genesee CSO Reduction Project CSO Control Alternatives List. These alternatives were stated to involve offline storage in Lake Washington Park in the area of South Alaska Street and Lake Washington Boulevard South. Based on surficial geologic mapping, nearby existing borings, and our experience, the site is likely underlain by about 20 feet of soft lacustrine clay and organic soils. Dense glacial soil underlies the lacustrine deposits. The groundwater table is likely within about 10 feet of the ground surface.

The weak or compressible soils at the site could affect excavation options. Temporary shoring and dewatering may be necessary during excavation at this site. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline or tank. The compressible soils may also pose long-term concerns, including settlement.

4.2.12 Basin 165 – Inline or Offline Storage Option, or Transfer Flows to Basin 44 (CON-102-165, OFF-111-165, and IBT-102-165 to 44)

These alternatives include CON-102-165, OFF-111-165, and IBT-102-165 to 44 in the Genesee CSO Reduction Project CSO Control Alternatives List. These alternatives would involve reconfiguring or updating Pump Station 6, or constructing offline storage adjacent to it, at Lake Washington Boulevard and Alaska Street. Based on surficial geologic mapping, nearby existing borings, and our experience, the site is likely underlain by about 20 feet of soft lacustrine clay and organic soils. Dense glacial soil underlies the lacustrine deposits. The groundwater table is likely within about 10 feet of the ground surface.

The weak or compressible soils at the site could affect excavation options. Temporary shoring and dewatering may be necessary during excavation at this site. Due to the shallow

depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline or tank. The compressible soils may also pose long-term concerns, including settlement.

4.3 Henderson Area Geotechnical Considerations

The following sections present geotechnical considerations for specific project alternatives as identified in the Henderson CSO Reduction Project CSO Control Alternatives List, provided by HDR, and included in Appendix B.

4.3.1 Basin 44 – New Pump Station at Seward Park (CON-1-44, IBT-1-44 to 165, and IBT-8-44 to 165)

These alternatives include CON-1-44, IBT-1-44 to 165, and IBT-8-44 to 165 in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives all include the construction of a new pump station, along with various force mains along Seward Avenue or Lake Washington Boulevard. No borings are available within 150 feet of the site. Based on surficial geologic mapping, and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If bedrock is very shallow, then blasting or other forms of rock excavation may be required to attain the required excavation depth.

4.3.2 Basin 44 – Offline Storage Tunnel (OFF-14-44)

This alternative includes OFF-14-44 in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative involves the construction of an offline storage tunnel, starting at the west end of Seward Park and proceeding about 5000 feet west, to about the intersection of South Juneau Street and Rainier Avenue South. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain near Seward Park by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. West of Lake Washington Boulevard, the sandstone bedrock is generally near the ground surface. Some looser soils may be present in the vicinity of South Juneau Street

and 47th Avenue South. The groundwater table is likely relatively high, and within about 10 feet of the ground surface. Zones of perched groundwater may also be present.

The relatively high groundwater table and potentially weak or compressible soils at the portal site could affect excavation options. Depending on the depth of the tunnel, temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the structures. In areas where bedrock is determined to be very shallow, then blasting or other forms of rock excavation may be required.

Tunneling may require a variety of excavation methods depending on the presence of various soils and bedrock. Tunnels have been accomplished in the sandstone utilizing a boom excavator (roadheader) and tunnel boring machines. Either method would be applicable for the 5,000-foot-long tunnel. Support in the rock could include shotcrete and grouted rock dowels. Tunnel support in the soils would likely be bolted, gasketed, pre-cast concrete segments. However, the presence of mixed-face intermixed) soil and rock conditions will greatly complicate the tunneling process and may warrant changes in tunnel alignment.

4.3.3 Basin 44 – Offline Storage Near West End of Seward Park (OFF-2-44, OFF-10-44, and OFF-16-44)

These alternatives include OFF-2-44, OFF-10-44, and OFF-16-44 in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives all include the construction of offline storage, either as a pipe or tank, within the west end of Seward Park. Based on surficial geologic mapping, and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils overlying bedrock would affect excavation options. Depending on the depth of the storage pipeline or tank, temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing

the pipeline or tank. If bedrock is determined to be very shallow, then blasting or other forms of rock excavation, such as heavy ripping, may be required to attain the required excavation depth.

4.3.4 Increased Conveyance along Lakeline (CON-2-44 and CON-7-44)

These alternatives include CON-2-44, and CON-7-44 in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives both include the construction of increased conveyance along Lake Washington, between Outfalls 44B and 45A, south of Seward Park. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Depending on the depth of the pipeline, temporary dewatering and/or relatively watertight shoring may be necessary during construction. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline. If bedrock is determined to be very shallow, then blasting or other forms of rock excavation may be required to attain the required excavation depth.

4.3.5 Basin 45 – Upgrade of Pump Station No. 10, Construct a New Pump Station or Storage in Martha Washington Park (CON-3-45, IBT-3-45 to 165, CON-8-45, OFF-3-45, OFF-11-45, OFF-17-45, IN-1-45, and IBT-5-45 to 47N)

These alternatives include CON-3-45, IBT-3-45 to 165, CON-8-45, OFF-3-45, OFF-11-45, OFF-17-45, IN-1-45, and IBT-5-45 to 47N in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives all include various construction work within Martha Washington Park, including upgrading of the pump station, upgrading of the force main to Seward Park, new force main along Holly Street and down 55th Avenue, and either new inline or offline storage within Martha Washington Park. Based on surficial geologic mapping and our experience, the site is likely underlain by geologically recent lacustrine clays and silts within 100 feet of the shoreline and hard glacial till further to the west. A few scattered borings indicate that presence of soft to stiff silt and clay and medium dense sand to a maximum boring depth of 15 feet. The groundwater table is likely relatively high and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If glacial till is very shallow, then ripping or some other forms of hard soil excavation may be required to attain the required excavation depth.

4.3.6 Basin 46 – Increased Conveyance along Lakeline (CON-5-46 and CON-9-46)

These alternatives include CON-5-46, and CON-9-46 in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives both include the construction of increased conveyance along Lake Washington, between Outfalls 45B and Pump Station 9. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Depending on the depth of the pipeline, temporary dewatering and/or relatively watertight shoring may be necessary during construction. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline. If bedrock is determined to be very shallow, then blasting or other forms of rock excavation may be required to attain the required excavation depth.

4.3.7 Basin 46 – New Offline or Inline Storage at or Near Be'er Sheva Park (OFF-4-46 and IN-2-46)

These alternatives include OFF-4-46 and IN-2-46 in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives could include increasing the capacity of the pump station, along with a storage pipeline or tank within the park. Based on surficial geologic mapping and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. Depending on where the improvements might occur, there is also a narrow strip of beach deposits and Vashon till present. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If bedrock or till is very shallow, then specialty excavation equipment would be required to attain the required excavation depth.

4.3.8 Basin 46 – Upgrade Pump Station 9, or Construct New Pump Station at Be'er Sheva Park (TKC-2-46, IBT-6-46 to 47N, OFF-12-46, and IBT-7-46 to 47N)

These alternatives include TKC-2-46, IBT-6-46 to 47N, OFF-12-46, and IBT-7-46 to 47N in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives include increasing the capacity of the pump station, with additional conveyance to the west to the intersection of South Grattan Street and Seward Park Avenue South and then via gravity flow to the west to the intersection of Cloverdale Place and Rainier Avenue South. Based on surficial geologic mapping and our experience, the site is likely underlain by geologically recent lacustrine clays and silts, alluvial sand, and gravel, which is underlain in turn at an indeterminate depth by sandstone bedrock. Depending on where the improvements might occur, there is also a narrow strip of beach deposits and Vashon till present. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If till or bedrock is very shallow, then specialty excavation equipment would be required to attain the required excavation depth.

4.3.9 Basin 46 – Increased Gravity Conveyance through Atlantic City Park (TKC-3-46)

This alternative includes TKC-3-46 in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative involves the construction of increased conveyance from Basin 46 to the King County Henderson Pump Station. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by geologically recent

lacustrine clays and silts, underlain in turn at an indeterminate depth by sandstone bedrock. The groundwater table is likely relatively high, and within about 10 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Depending on the depth of the pipeline, temporary dewatering and/or relatively watertight shoring may be necessary during construction. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered in designing the pipeline. If bedrock is determined to be very shallow, then blasting or other forms of rock excavation may be required to attain the required excavation depth.

4.3.10 Basin 49 – New Offline Storage at Pump Station 80 (OFF-5-49)

This alternative includes OFF-5-49 in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative includes constructing new offline storage at Pump Station 80. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by up to about 20 feet of loose and soft lacustrine silt and clay, which is underlain by dense to very dense sand, gravel, and glacial till. The groundwater table is likely within about 5 to 15 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table, potentially liquefiable soils, and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If till is very shallow, then specialty excavation equipment would be required to attain the required excavation depth.

4.3.11 Basin 49 – New Offline Storage on Rainier Avenue South (OFF-6-49)

This alternative includes OFF-6-49 in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative includes constructing new offline storage parallel to existing offline storage on Rainier Avenue South. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by up to about 20 feet of loose and soft lacustrine silt and clay, which is underlain by dense to very dense sand, gravel, and glacial till. The groundwater table is likely within about 5 to 15 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. Where and if till is very shallow, then specialty excavation equipment would be required to attain the required excavation depth.

4.3.12 Basin 47N – New Offline Storage at Various Locations (OFF-7-47N, and OFF-13-47N)

These alternatives include OFF-7-47N and OFF-13-47N in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives include constructing new offline storage at various locations on public or private property, in and nearby the south end of Atlantic City Park. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by up to about 20 feet of loose and soft lacustrine silt and clay, which is underlain by dense to very dense sand, gravel, and glacial soils. The groundwater table is likely within about 5 to 15 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including dewatering-induced settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site. If glacial soil is very shallow, then specialty excavation equipment would be required to attain the required excavation depth.

4.3.13 Basin 47N – New Wet Weather Treatment Plant Adjacent to Henderson Pump Station (WWT-1-47N, and WWT-2-47N)

These alternatives include WWT-1-47N and WWT-2-47N in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives include constructing a new wet weather treatment plant adjacent to the Henderson Pump Station. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by up to about 15 feet of loose fill, which is underlain by dense sand, silt, and hard clay with gravel. The groundwater table is likely relatively high, and between about 5 and 15 feet below the ground surface.

The relatively high groundwater table and potentially weak or compressible fill soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. Prolonged dewatering without accompanying groundwater recharge may lead to consolidation of soft soils and settlement of nearby streets, utilities, and structures. The high groundwater table and compressible soils may also pose long-term concerns, including settlement or uplift of belowground storage structures. Permanent groundwater control may be necessary at this site.

4.3.14 Basin 47N – Offline Storage Tunnel from Genesee Park to Seward Park (OFF-15-47N)

This alternative includes OFF-15-47N in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative involves the construction of a tunnel for offline storage from Genesee Park to Seward Park, and then terminating in Atlantic City Park. Based on surficial geologic mapping, nearby borings, and our experience, the alignment of the tunnel would generally be through glacially over-consolidated deposits and sandstone bedrock, except where it would traverse areas of lower surficial elevation, and along Lake Washington. In these areas, the alignment could likely encounter loose and soft lacustrine silts and clays, with glacial soils and bedrock at indeterminate depths. The groundwater table is likely variable, but may be relatively high in some locations.

A relatively high groundwater table and a potential mix of weak or compressible soils, glacial soils, and bedrock at the site would affect excavation options. Depending on the depth of the tunnel, temporary dewatering and/or relatively watertight shoring may be necessary during construction of the portals. The high groundwater table and compressible soils may also pose long-term concerns, including settlement of adjacent facilities and uplift of belowground storage structures. Due to the shallow depth of groundwater, buoyancy uplift effects should be considered. If bedrock is determined to be very shallow, then blasting or other forms of rock excavation, such as a hoe-ram or roadheader, may be required for cuts.

4.3.15 Basin 47S – New Offline Storage Near Rainier Avenue South (OFF-8-47S and OFF-9-47S)

These alternatives include OFF-8-47S and OFF-9-47S in the Henderson CSO Reduction Project CSO Control Alternatives List. These alternatives include constructing new offline storage in the pedestrian walkway next to the Safeway on Rainier Avenue South, or as a tank in the parking lot. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by 5 to 15 feet of medium dense silt and silty sand fill, which is underlain

by very dense sand, silt, and gravel. The groundwater table is likely about 5 and 15 feet below the ground surface.

The relatively high groundwater table at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table may also pose long-term concerns, including uplift of belowground storage structures. Permanent groundwater control may be necessary at this site.

Tunneling may require a variety of excavation methods depending on the presence of various soils and bedrock. Tunnels have been accomplished in the sandstone utilizing a boom excavator (roadheader) and tunnel boring machines. Either method would be applicable for the 5,000-foot-long tunnel. Support in the rock could include shotcrete and grouted rock dowels. Tunnel support in the soils would likely be bolted, gasketed, pre-cast concrete segments. However, the presence of mixed-face intermixed) soil and rock conditions will greatly complicate the tunneling process and may warrant changes in tunnel alignment.

4.3.16 Basin 47S – New Conveyance from NPDES 47 (TKC-1-47S)

This alternative includes TKC-1-47S in the Henderson CSO Reduction Project CSO Control Alternatives List. This alternative includes constructing new conveyance for flows from NPDES 47 to the Henderson Trunk at South Henderson Street and Rainier Avenue South. Based on surficial geologic mapping, nearby borings, and our experience, the site is likely underlain by 5 to 15 feet of soft to stiff silt and fill, which is underlain by dense sand and very glacial till. The groundwater table is likely shallow, and within about 5 and 15 feet of the ground surface.

The relatively high groundwater table and potentially weak or compressible fill soils at the site could affect excavation options. Temporary dewatering and/or relatively watertight shoring may be necessary during construction at this site. The high groundwater table and compressible soils may also pose long-term concerns, including settlement of adjacent facilities and uplift of belowground storage structures. Permanent groundwater control may be necessary at this site.

5.0 CLOSING

Final design, construction methods, and costs are highly influenced by the variability and range of ground conditions. At many alternative sites, ground motions may span a wide range from very soft or loose soil, through hard or dense, glacially over-consolidated soils, to sandstone bedrock. Additional site-specific explorations, including field mapping, borings and test pits,

and possibly in situ tests such as downhole pressuremeter tests and pump tests will be required at most sites to better define the ground conditions and optimize construction approaches.

Shannon & Wilson has prepared a document titled, "Important Information About Your Geotechnical Report," which is included as Appendix C to this report. Please review this document for information describing the use and limitations of this report.

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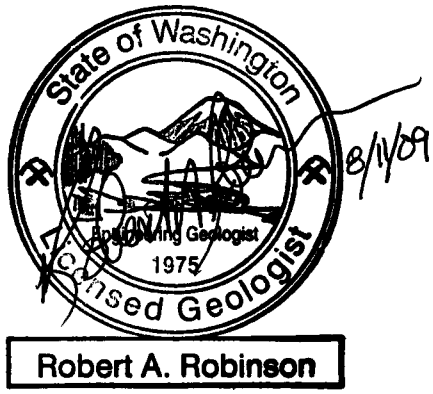

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Senior Engineer

Robert A. Robinson, C.E.G.
Senior Vice President

Items related to geotechnical engineering recommendations were prepared by or prepared under the direct supervision of Michael D. Harney, P.E.

Items related to geology, hydrogeologic setting, and engineering geology were prepared by or prepared under the direct supervision of Robert A. Robinson, C.E.G.

MDH:RAR/mdh

6.0 REFERENCES

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Genesee CSO Reduction Project

Table 1 - Geotechnical Considerations for Conceptual Level Design

Project Component Information			Subsurface Information			Potential Design Considerations						
Basin Loc. No.	Alternatives	Description	Geologic Map Units[1]	Borings within 150 ft	Generalized Subsurface Conditions	Groundwater within 10 ft of Surface	Steep[2] Slopes (within 50 ft)	Liquefaction Prone[3] (within 50 ft)	Known Landslide (within 50 ft)	Abandoned Landfill	Known Contaminated Sites (within 50ft)	Summary of Potential Geotechnical Considerations
37	OFF-100-37 IN-100-37	In-line and off-line storage at S. Horton St. and L. Washington Blvd.	Ql/Qpoc	0	Likely lacustrine clay with high groundwater table	Y	Y?	N	Y?	N	N	*High groundwater table *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces
38	TKC-101-38 TKC-103-38	Upgrade Pump Station #5 an Syres Park and new force main	Ql/Qpogd /Qvt	5	5 to 30 ft of fill and soft clay and peat over glacial soils	Y	N	Y	N	N	?	*High groundwater table *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Liquefaction
38	OFF-101-38 OFF-102-38	Offline storage in 14 ft ID tunnel beneath 50th Ave S. for 3400 ft	Qvrl/Qvt/ Tb	2	North end GW below 30 ft, dense sands to ground surface South end GW at 5 to 10 ft, 15 ft of loose to medium sand & silt over dense sand	N (North) Y (South)	N	N (North) Y (South)	N	N	?	*High groundwater table *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Liquefaction
38	OFF-103-38 IN-101-38	Offline storage in Genesee Park	F/Qp/Qvt /Qpogd	~50	GW at 20 to 30 ft, in 20 to 40 ft garbage fill locally over soft peat and clay over dense silt, sand & gravel	N	N	Y	N	Y	Y?	*Soft / Compressible soils *Dewatering / Water tight shoring *Liquefaction *Environmental Concerns
38	TKC-105-38	New gravitysewer from Darigold at S. Andover & Courtland Ave	F/Qp/Qvt /Qpogd	17	7 to 30 ft of loose to soft fill, clay and peat over dense silty, sand and sitly sand with gravel	Y	N	Y?	N	N	?	*Soft / Compressible soils *Dewatering / Water tight shoring *Liquefaction *Environmental Concerns
38	WWT-100-38 CON-101-38	New wet-weather treatment plant and new lake line along Lake Washington Blvd north to PS 5	Ql	0	Lacustrine deposits over till.	Y	Y?	?	N	N	?	*High groundwater table *Dewatering / Water tight shoring *Soft / Compressible soils
40	OFF-104-40	Replace existing storage pipes along S. Dakota St. between 49th and 50th Ave S with larger capacity ones	Qvt	3	5 to 10 feet of fill over dense to very dense glacial till	Unlikely	N	N	N	N	N	* Hard soil excavation * Maybe perched water
41	IBT-100-41B to 38 IBT-101-41B to 38 OFF-105-41B	6 to 14 ft diameter 1500 to 2300 ft long tunnel under Adams St. from Lake Washington Blvd.	F/Ql/Qvrl/ Qvt	1	GW at 5 feet. Ranges from till-like and dense sand to garbage fill over glacial at Genesee Park	Y	N	Y	N	Y at Genesee Park	Y at Genesee Park	*High groundwater table *Dewatering / Water tight shoring *Variable ground and water conditions for tunneling
42	OFF-106-42 OFF-107-42	Offline storage in parking lot at S. Adams St. and L. Washington Blvd	Ql/Qvt	0	Lacustrine deposits over till. High GW.	Y	N	N	N	N	?	*High groundwater table *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces
42	OFF-108-42	Replace existing storage pipes in the vicinity of 52nd Ave and South Genesee Way with larger capacity ones	Qvt	1	5 to 10 feet of fill over dense to very dense glacial till	Unlikely	N	N	N	N	N	* Hard soil excavation * Maybe perched water
43	OFF-109-43 OFF-110-43	Offline storage in Lake Washington Park at S. Alaska St. and 53rd Ave. S.	Qvt/Tb	0	Lacustrine deposits over till.	N	N	N	Y?	N	N	*Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces
165	CON-102-165 OFF-111-165 IBT-102-165 to 44	Increase inline or offline storage at PS 6 at Lake Washington Blvd. and Alaska St.	Ql/Qvt	0	Lacustrine deposits over till. High GW.	N	N	N	N	N	N	*Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces

Henderson CSO Reduction Project

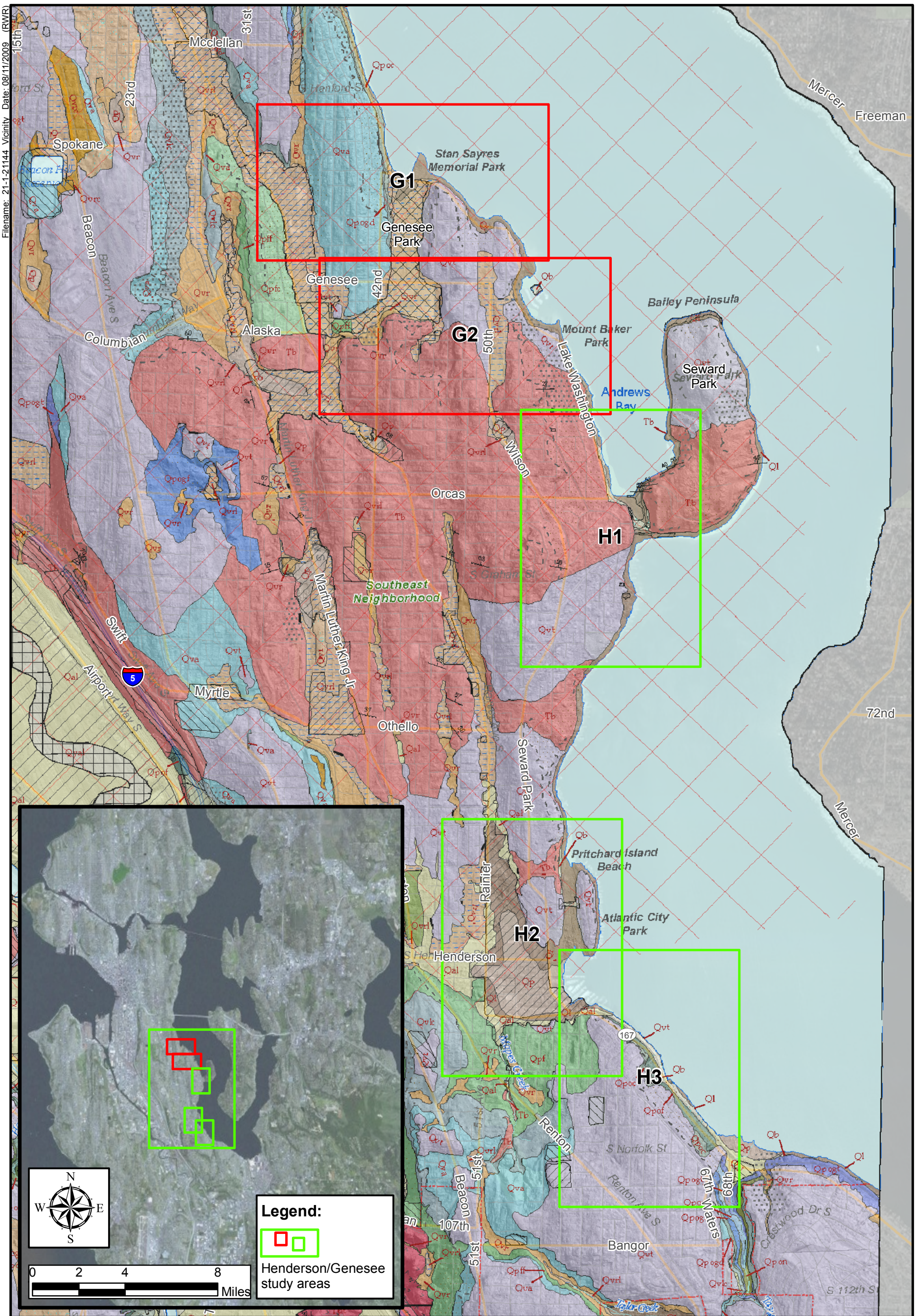
Table 2 - Geotechnical Considerations for Conceptual Level Design

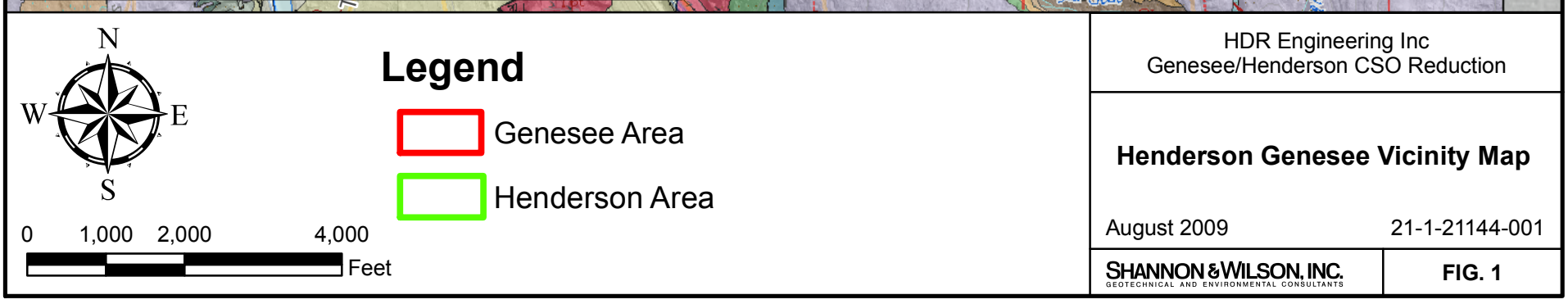
Project Component Information			Subsurface Information			Potential Design Considerations						
Basin Loc. No.	Alternatives	Description	Geologic Map Units[1]	Borings within 150 ft	Generalized Subsurface Conditions	Groundwater within 10 ft of Surface	Steep[2] Slopes (within 50 ft)	Liquefaction Prone[3] (within 50 ft)	Known Landslide (within 50 ft)	Abandoned Landfill	Known Contaminated Sites (within 50ft)	Summary of Potential Geotechnical Considerations
44	CON-1-44 IBT-1-44 to 165 IBT-8-44 to 165	New pump station at Seward Park	Ql/Tb	6	GW 2 to 5 ft deep. 0 to 20 ft of loose/soft silt and clay on sandstone/claystone	Y	Y?	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Bedrock excavation / blasting
44	OFF-14-44	Offline storage tunnel from west end of Seward Park, proceeding 5000 ft west to S Juneau and Rainier Ave S	Ql/Tb to Tb	0	Soft/loose lacustrine soils overlying bedrock near Seward Park; near-surface bedrock towards the west	Y	Y	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Bedrock excavation / blasting
44	OFF-2-44 OFF-10-44 OFF-16-44	Offline storage near west end of Seward Park	Ql/Tb	6	0 to 20 ft of loose/soft silt and clay on sandstone/claystone	Y	Y?	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Bedrock excavation / blasting
44	CON-2-44 CON-7-44	Increased conveyance along Lake Washington between Outfalls 44B and 45A	Ql/Tb	0	0 to 20 ft of loose/soft silt and clay on sandstone/claystone	Y	Y	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Bedrock excavation / blasting
45	CON-3-45 IBT-3-45 to 165 CON-8-45 OFF-3-45 OFF-11-45 OFF-17-45 IN-1-45 IBT-5-45 to 47N	Offline, Inline storage and PS upgrade	Ql/Qvt	0	GW at 3 to 10 ft in soft to stiff silty clay over dense silty sand and gravel	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
46	CON-5-46 CON-9-46	Increased conveyance along Lake Washington between Outfall 45B and Pump Station 9	Ql/Tb	0	Soft/loose lacustrine soils overlying bedrock	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation

Project Component Information			Subsurface Information			Potential Design Considerations						
Basin Loc. No.	Alternatives	Description	Geologic Map Units[1]	Borings within 150 ft	Generalized Subsurface Conditions	Groundwater within 10 ft of Surface	Steep[2] Slopes (within 50 ft)	Liquefaction Prone[3] (within 50 ft)	Known Landslide (within 50 ft)	Abandoned Landfill	Known Contaminated Sites (within 50ft)	Summary of Potential Geotechnical Considerations
46	OFF-4-46 IN-2-46	Offline or Inline storage at Be'er Sheva Park	Ql/Qb/Tb	4	10 to 12 ft of loose - med dense fill over very dense silt, sand and gravel. May encounter siltstone and sandstone	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil/rock excavation
46	TKC-2-46 IBT-6-46 to 47N OFF-12-46 IBT-7-46 to 47N	PS 9 to S Grattan St. and Seward Park Ave. S. to Cloverdale Pl. S. and Rainier Ave. S.	Ql/Qal/ Qvrl/Qvt	6	6 to 10 feet of loose fill over 0 to 5 feet of loose to soft silt and clay over 0 to 5 feet of dense sand over till	Y	N	Y	N	N	Y	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil/rock excavation
46	TKC-3-46	Increased conveyance from Basin 46 to King County Pump Station	Ql/Tb	0	Soft/loose lacustrine soils overlying bedrock	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
49	OFF-5-49	Offline storage at PS 81	Ql/Qal/ Qvrl/Qvt	2	GW within 5 to 15 ft of groundsurface. Up to 20 feet of loose/soft lacustrine over dense sand	Y	N	Y	N	N	Y	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil/rock excavation
49	OFF-6-49	Offline storage located parallel to line on Rainier Ave. S.	Ql/Qal/ Qvrl/Qvt	2	GW within 5 to 15 ft of groundsurface. Up to 20 feet of loose/soft lacustrine over dense sand	Y	Y	Y?	Y	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
47N	OFF-7-47N OFF-13-47N	In and near south end of Atlantic City Park	Ql/Qal/ Qvrl/Qvt	0	GW within 5 to 15 ft of groundsurface. Up to 20 feet of loose/soft lacustrine over dense sand	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
47N	WWT-1-47N WWT-2-47N	Adjacent to Henderson Pump Station	F/Qpf	8	GW 8 to 12 ft deep. 15 ft of fill over dense sand, silt and hard clay w/ gravel	Y	N	Y	N	N	N	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation

Project Component Information			Subsurface Information			Potential Design Considerations						
Basin Loc. No.	Alternatives	Description	Geologic Map Units[1]	Borings within 150 ft	Generalized Subsurface Conditions	Groundwater within 10 ft of Surface	Steep[2] Slopes (within 50 ft)	Liquefaction Prone[3] (within 50 ft)	Known Landslide (within 50 ft)	Abandoned Landfill	Known Contaminated Sites (within 50ft)	Summary of Potential Geotechnical Considerations
47N	OFF-15-47N	Offline storage tunnel from Genesee Park to Seward Park, and terminating at Atlantic City Park	Ql/Qal/ Qvrl/Qvt/ Tb	0	Glacially-consolidated deposits and bedrock, with lacustine and alluvial soils in low-lying areas and along Lake Washington	Y	Y	Y	Y	Y	Y	*High groundwater table *Liquefaction *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
47S	OFF-8-47S OFF-9-47S	Offline storage line in pedestrian walkway next to Safeway on Rainier Ave. S. or as tank in parking lot	F/Qpf	4	perched GW at 9 to 12 ft. 5 to 11 ft med. dense silt and silty sand fill over very dense silt, sand with gravel	N	N	Y	N	N	N	*Liquefaction *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation
47S	TKC-1-47S	Pipe from NPDES 47 to Henderson Trunk at S. Henderson St. and Rainier Ave. S	F/Qal/Qpf	7	7 to 14 ft of soft to stiff silt and clay fill over dense sand and very dense till	Y	N	N	N	N	N	*High groundwater table *Soft / Compressible soils *Dewatering / Water tight shoring *Permanent drainage / Uplift forces *Hard soil excavation

Filename: 21-1-21144 Vicinity Date: 08/11/2009 (RWR)





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Henderson Genesee Vicinity Map

August 2009 | 21-1-21144-001

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FIG. 1

Filename: 21-1-21144 Genesee.mxd Date: 08/11/2009 (RWR)

Legend

- Steep Slope
- Liquefaction Hazard
- Alternative Points
- CSO Outfalls
- CSO Storage Facilities

Landslide Type

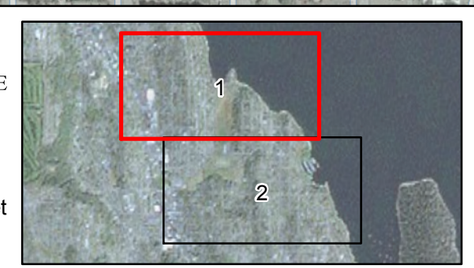
- Unidentified
- Groundwater Blowout
- High Bluff Peeloff
- Shallow Colluvial
- Deep-Seated

- Conveyance Alternatives
- Inline Storage Alternatives
- Interbasin Transfer Alternatives
- Offline Storage Alternatives
- Transfer to King County Alternatives Lines

N W E S

0 200 400 800 Feet

NOTE: Proposed project feature data provided by HDR Engineering, Inc



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Genesee CSO Reduction

Genesee Area
Liquefaction Hazard, Steep Slopes and Historical Landslides

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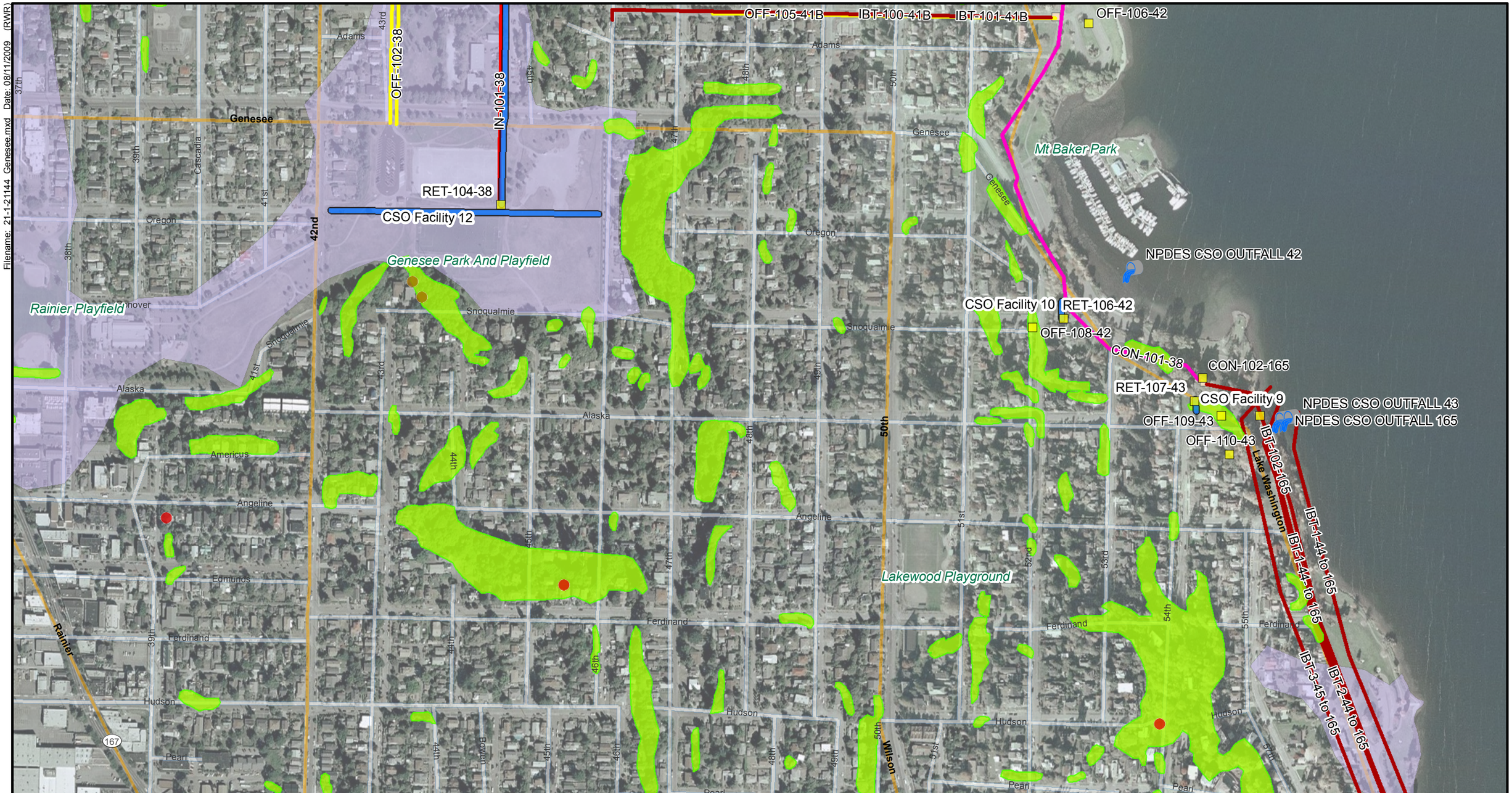
FIG. 2
Sheet 1 of 2

Filename: 21-1-21144 Genesee.mxd Date: 08/11/2009 (RWR)



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N W E S

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HDR Engineering Inc
Genesee CSO Reduction

Genesee Area
Liquefaction Hazard, Steep Slopes and Historical Landslides

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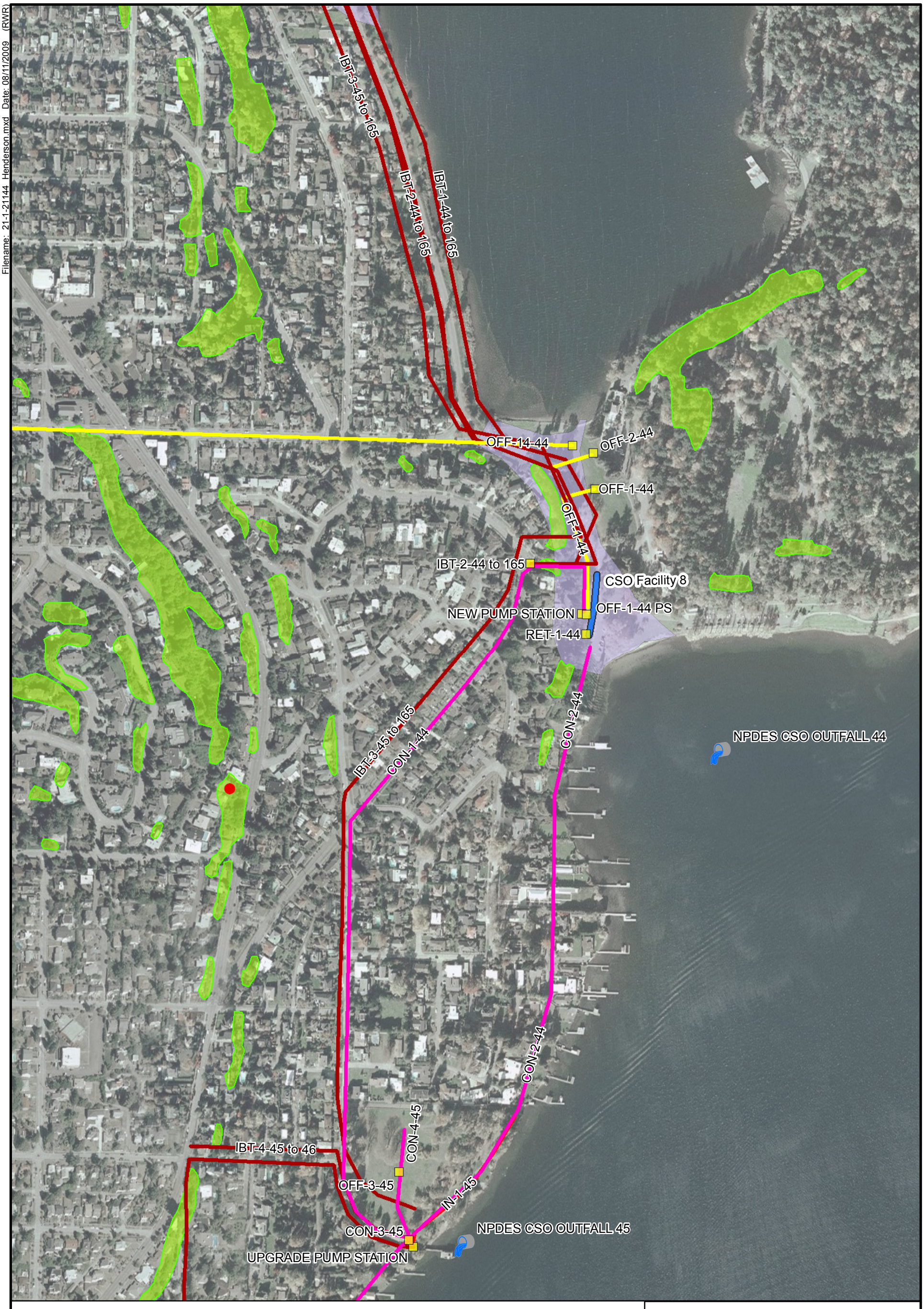
FIG. 2
Sheet 2 of 2

Filename: 21-1-21144 Henderson.mxd Date: 08/11/2009 (RWR)



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N W E S

0 200 400 800 Feet

1 2 3

NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc

HDR Engineering Inc
Henderson CSO Reduction

Henderson Area
Liquefaction Hazard, Steep Slopes and Historical Landslides

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FIG. 3
Sheet 1 of 3

Filename: 21-1-21144 Henderson.mxd Date: 08/11/2009 (RWR)

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- Steep Slope
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N W E S

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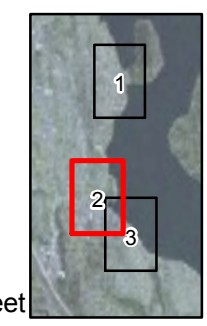

NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc

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Henderson Area Liquefaction Hazard, Steep Slopes and Historical Landslides

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FIG. 3
Sheet 2 of 3

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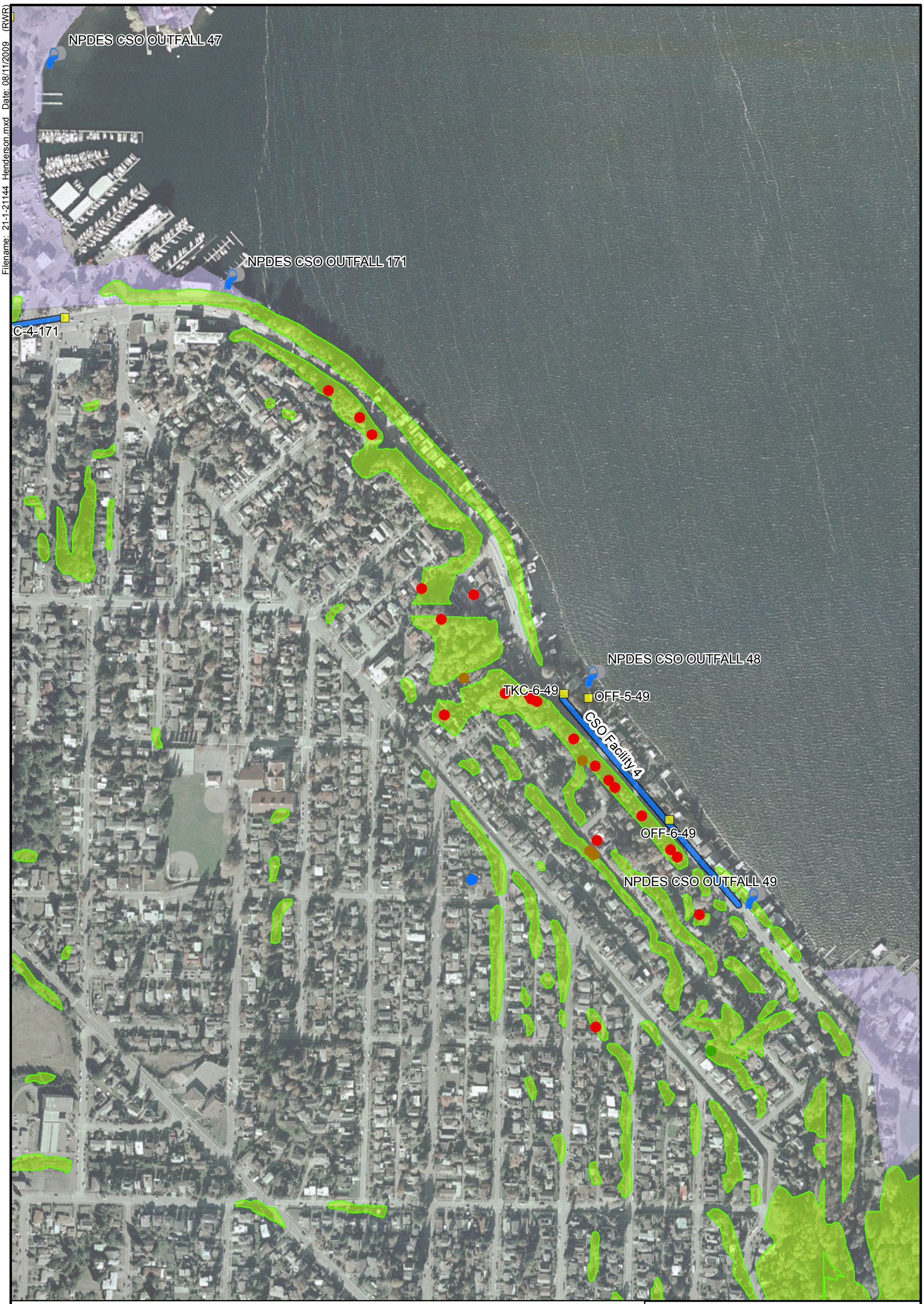

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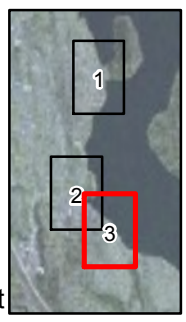

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Henderson CSO Reduction

Henderson Area
Liquefaction Hazard, Steep Slopes and Historical Landslides

August 2009 21-1-21144-001

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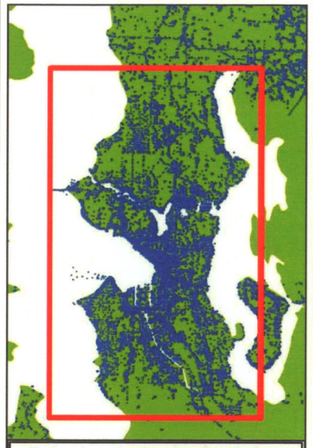
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 3
Sheet 3 of 3



Exploration points in subsurface database used to develop geologic map of Seattle.

Map Units

Nonglacial Deposits (Holocene)

- water
- Qw - Wetland deposits
- Qp - Peat
- Qb - Beach deposits
- Qbu - Uplifted beach deposits
- Qtf - Tideflat deposits
- Qal - Alluvium
- Qyal - Younger alluvium
- Ql - Lake deposits
- Qf - Fan deposits
- Qt - Terrace deposits

Younger Glacial Deposits (Fraser Glaciation, Pleistocene)

- Qvr - Vashon recessional outwash deposits
- Qvrl - Vashon recessional lacustrine deposits
- Qvrc - Vashon recessional coarse-grained deposits
- Qvi - Vashon ice-contact deposits
- Qvt - Vashon subglacial till
- Qvtm - Vashon subglacial meltout till
- Qva - Vashon advance outwash deposits
- Qvlc - Lawton Clay member of the Vashon Drift

Older Glacial and Nonglacial Deposits (Pleistocene)

- Qpf - Pre-Fraser glaciation age deposits
- Qpfc - Pre-Fraser coarse-grained deposits
- Qpff - Pre-Fraser fine-grained deposits
- Qpfn - Pre-Fraser nonglacial deposits
- Qpfnc - Pre-Fraser coarse-grained nonglacial deposits
- Qpfnf - Pre-Fraser fine-grained nonglacial deposits
- Qob - Olympia beds
- Qpo - Pre-Olympia deposits
- Qpoc - Pre-Olympia coarse-grained deposits
- Qpof - Pre-Olympia fine-grained deposits
- Qpog - Pre-Olympia glacial deposits
- Qpogc - Pre-Olympia coarse-grained glacial deposits
- Qpogf - Pre-Olympia fine-grained glacial deposits
- Qpogt - Pre-Olympia glacial till
- Qpogd - Pre-Olympia glacial diamict
- Qpon - Pre-Olympia nonglacial deposits
- Qponc - Pre-Olympia coarse-grained nonglacial deposits
- Qponf - Pre-Olympia fine-grained nonglacial deposits
- Qpdf - Possession drift fine-grained deposits
- Qhc - Hamm Creek formation
- Qpone - Pre-Olympia estuarine deposits

Bedrock (Tertiary)

- Tb - Blakeley Formation
- Tva - Andesite
- Tpt - Tukwila Formation

Overprints

- Mass wastage deposits
- Landslide deposits
- Modified land
- af - artificial fill
- afl - landfill debris
- afr - filled river channels
- graded land
- regraded land
- anticline, approx. located (McWilliams, 1971)
- fault, approx. located (Waldron and others, 1962; McWilliams, 1971)
- inclined bedding
- vertical bedding
- inclined jointing
- vertical joint

- Contact
- Scarps
- Peat bed
- Till bed

- Seattle Fault Zone
- Seattle City Limit

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The Geologic Map of Seattle - a Progress Report

by Kathy Goetz Troost, Derek B. Booth, Aaron P. Wisher, and Scott A. Shimel

NOTE:

Figure reproduced from Troost et al., 2005.

HDR Engineering, Inc.
Genesee / Henderson CSO Reduction Project

LEGEND
SOIL AND ROCK CONDITIONS

August 2009 | 21-1-21144-001

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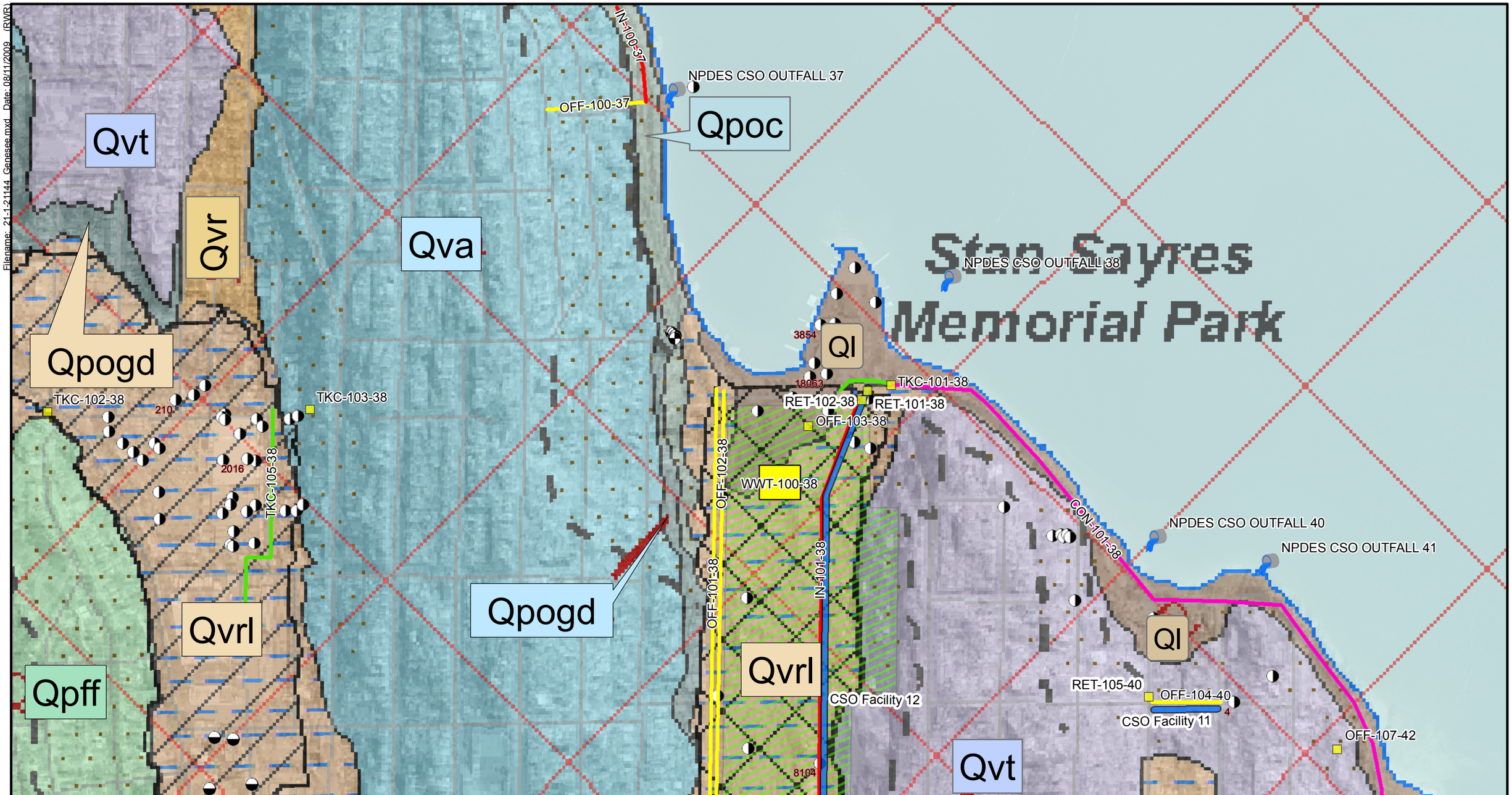
Geotechnical and Environmental Consultants

FIG. 4

Filename: 21-1-21144 Genesee.mxd Date: 08/11/2009 (RWR)



Legend

- Shannon and Wilson Historical Borings
- Shannon and Wilson Subsurface Database Borings
- Boring Name 4
- GeoMap NW Borings
- 10047 W-1819 (Document ID / S&W ID)
- Abandoned Landfill
- CSO Storage Facilities
- CSO Outfalls
- Conveyance Alternatives
- Inline Storage Alternatives
- Interbasin Transfer Alternatives
- Offline Storage Alternatives
- Transfer to King County Alternatives Lines

NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc
2. Map based on: Troost and others, 2005, Geologic map of Seattle – a progress report, USGS OF 2005-1252.

N W E S

0 200 400 800 Feet

HDR Engineering Inc
Genesee CSO Reduction

Genesee Area
Surface Geology and Borings

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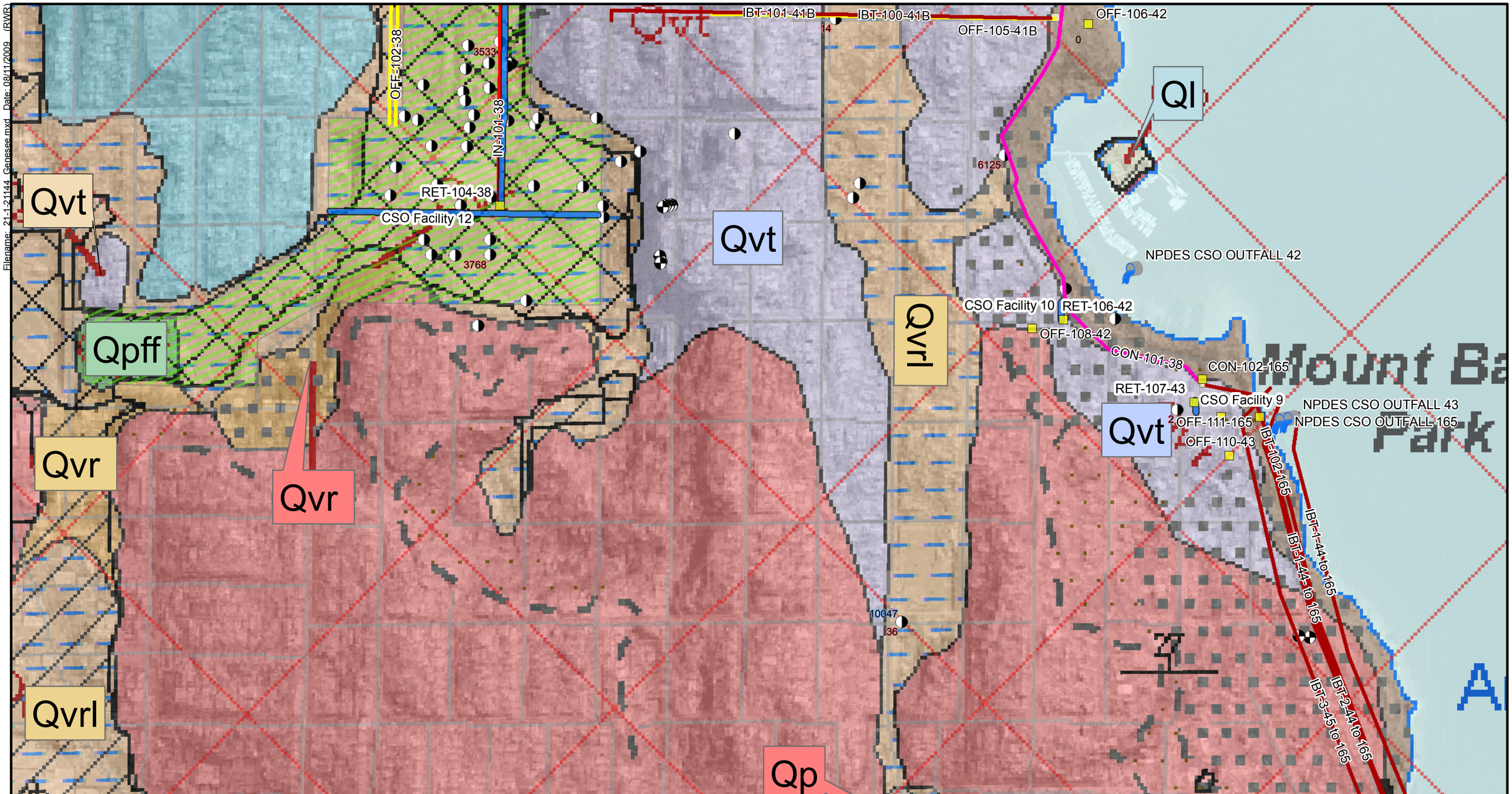
FIG. 5
Sheet 1 of 2

Filename: 21-1-21144 Genesee.mxd Date: 08/11/2009 (RWR)



Legend

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- GeoMap NW Borings
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NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc
2. Map based on: Troost and others, 2005, Geologic map of Seattle – a progress report, USGS OF 2005-1252.

N W E S

0 200 400 800 Feet

HDR Engineering Inc
Genesee CSO Reduction

Genesee Area
Surface Geology and Borings

August 2009 | 21-1-21144-001

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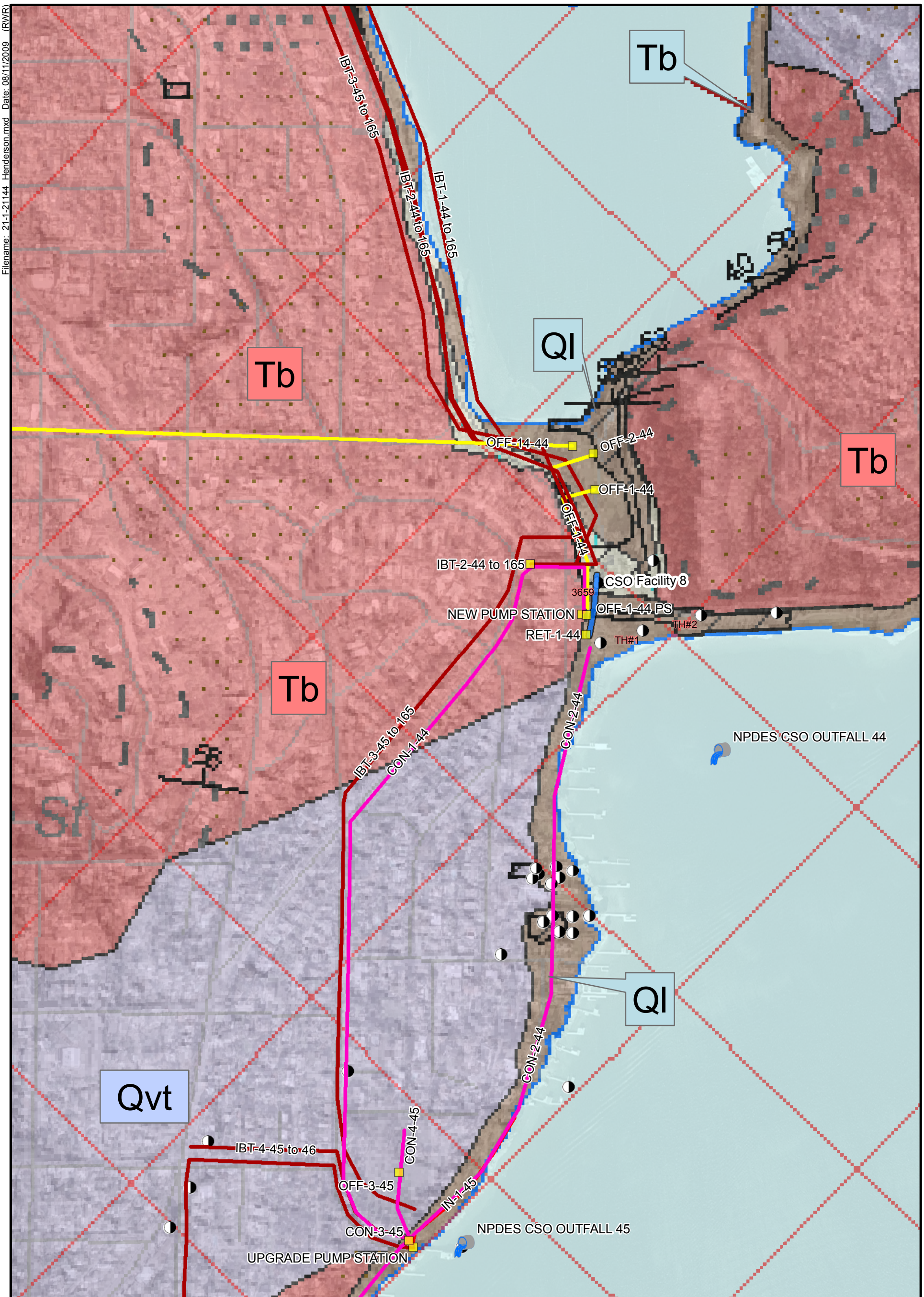
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 5
Sheet 2 of 2

Filename: 21-1-21144 Henderson.mxd Date: 08/11/2009 (RWR)



Legend

- Shannon and Wilson Historical Borings
- Shannon and Wilson Subsurface Database Borings
- Boring Name 4
- GeoMap NW Borings
- 10047 Document ID
- W-1819 S&W ID
- CSO Storage Facilities
- CSO Outfalls
- Conveyance Alternatives
- Inline Storage Alternatives
- Interbasin Transfer Alternatives
- Offline Storage Alternatives
- Transfer to King County Alternatives Lines

N W E S

0 200 400 800 Feet

1 2 3

NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc

2. Map based on: Troost and others, 2005, Geologic map of Seattle – a progress report, USGS OF 2005-1252.

HDR Engineering Inc
Henderson CSO Reduction

Henderson Area
Surface Geology and Borings

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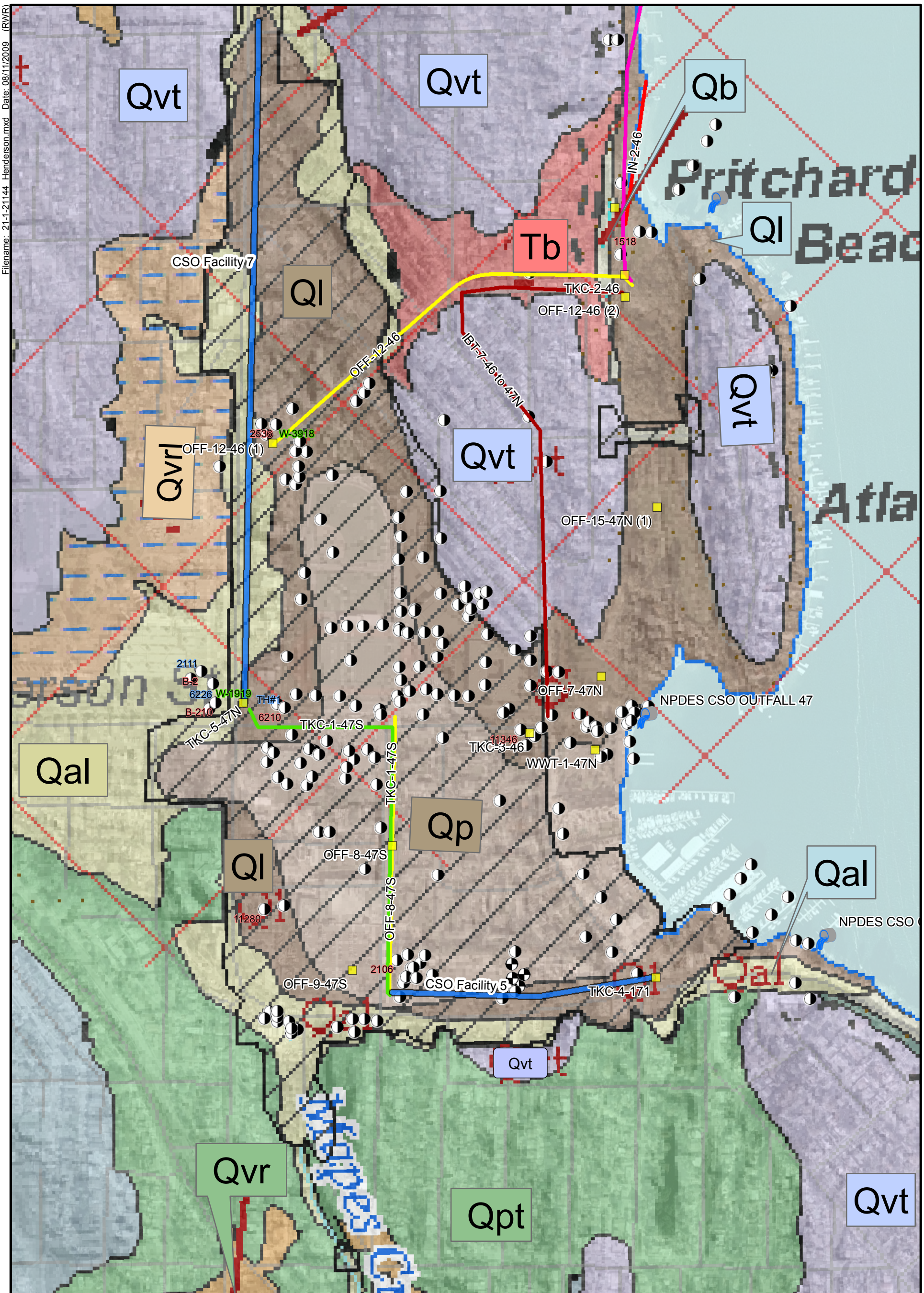
FIG. 6
Sheet 1 of 3

Filename: 21-1-21144 Henderson.mxd Date: 08/11/2009 (RWR)



Legend

- Shannon and Wilson Historical Borings
- Shannon and Wilson Subsurface Database Borings
- Boring Name 4
- GeoMap NW Borings
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- W-1819 S&W ID
- CSO Storage Facilities
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NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc

2. Map based on: Troost and others, 2005, Geologic map of Seattle – a progress report, USGS OF 2005-1252.

0 200 400 800 Feet

HDR Engineering Inc
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Henderson Area
Surface Geology and Borings

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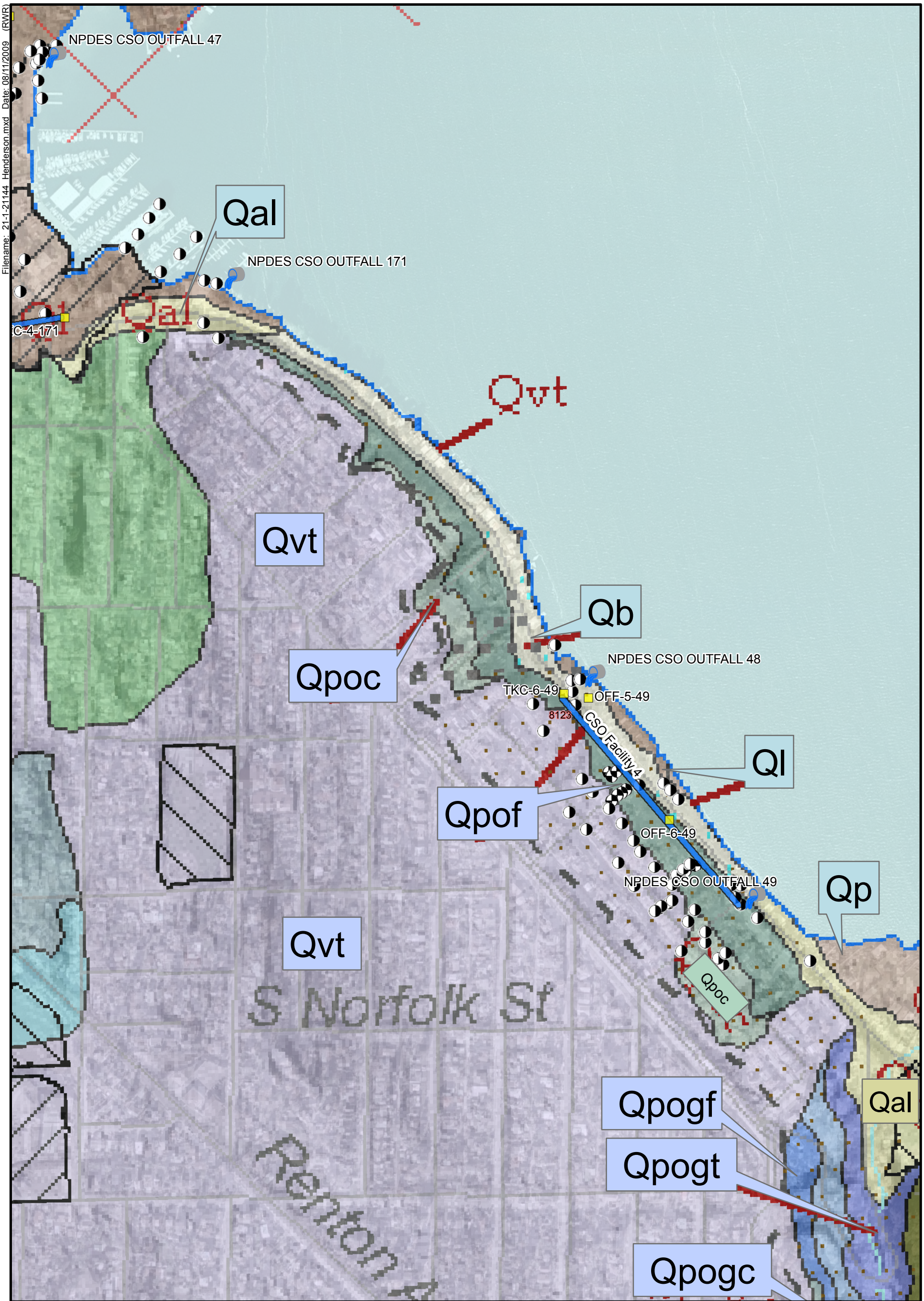
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 6
Sheet 2 of 3

Filename: 21-1-21144 Henderson.mxd Date: 08/11/2009 (RWR)



Legend

- Shannon and Wilson Historical Borings
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- Boring Name 4
- GeoMap NW Borings
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- CSO Outfalls
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N W E S

0 200 400 800 Feet

NOTES: 1. Proposed project feature data provided by HDR Engineering, Inc

2. Map based on: Troost and others, 2005, Geologic map of Seattle – a progress report, USGS OF 2005-1252.

HDR Engineering Inc
Henderson CSO Reduction

Henderson Area
Surface Geology and Borings

August 2009 21-1-21144-001

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FIG. 6
Sheet 3 of 3

APPENDIX A

EXISTING SUBSURFACE EXPLORATIONS

APPENDIX A

EXISTING SUBSURFACE EXPLORATIONS

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A-1 Genesee CSO Reduction Project Existing Subsurface Information
A-2 Henderson CSO Reduction Project Existing Subsurface Information

APPENDIX A

EXISTING SUBSURFACE EXPLORATIONS

A.1. EXISTING INFORMATION

Soil boring and test pit logs were collected from reports in or near potential alternative sites and affected areas. All logs presented in this report were found from the Shannon & Wilson archives or from GeoMapNW at the University of Washington. The information included in this appendix represents the borings that we determined to be applicable in evaluating engineering and construction-related considerations at each location. The selected reports are shown below in reference to their GeoMapNW document ID number.

GeoMapNW ID No.	S&W Job No.	Document Name	Document Date	Document Author
644		Nguyen Property	6-12-91	Altinay & Associates
1518		Pritchard Beach Bath House	1-27-94	Seattle Engineering Department
1773		Courland and Andover	5-25-79	Rittenhouse-Zeman &
2014		Proposed Taco Bell Restaurant	5-17-96	Earth Consultants, Inc.
2015		Rainier Plaza Site	4-5-93	GeoEngineers, Inc.
2016		Rainier Plaza	11-18-92	Terra Associates, Inc.
2098		Proposed Rainier Beach Home	4-25-84	Earth Sciences - James Eaton
2100		Residential Structure	4-5-95	Materials Testing Corporation
2111	W-1919	Southeast Education Center	3-2-71	Shannon & Wilson
2536	W-3918	Proposed Medical Clinic	1-8-82	Shannon & Wilson
3533		Genessee Park Crew Headquarters	10-1-95	Seattle Engineering Department
3659		Pritchard/Seward Park CSO	8-1-84	Seattle Engineering Department
3768		Genesse Park Playfields	10-11-99	Seattle Public Utilities
3854		Mount Baker Rowing Center	2-14-95	Seattle Engineering Department
3859		Seward Park, Mt Baker CSO	1-31-85	Seattle Engineering Department
4004		Seward Park	7-31-69	Seattle Engineering Department
6125		James St Et Al	4-30-72	Seattle Engineering Department
6210		Henderson St et. al.	5-21-52	Seattle Engineering Department
6226		CSO Tunnel & Pipelines	11-17-00	PacRim Geotechnical, Inc.
8104		Subsurface Evaluation - Genesee Street	7-6-76	Pacific Testing Laboratories
8123		Proposed Storm Sewer Project	9-13-82	Pacific Testing Laboratories
10047		Lake Washington Drainage	12-31-70	Seattle Engineering Department
10445		Pritchard Beach	9-8-97	Unknown
11280		Proposed Safeway Fueling Station	1-25-01	Earth Consultants, Inc.
11346		Henderson Pumping Station Upgrade	7-8-99	PacRim Geotechnical, Inc.
14220		Proposed Charlestown Apartments	8-20-01	Earth Consultants, Inc.
17814		Residence Property Development	5-15-03	Icicle Creek Engineers
18063		Mt. Baker Rowing Center	9-18-01	Associated Earth Sciences Inc.

A.2. REFERENCE

GeoMapNW, The Pacific Northwest Center for Geologic Mapping Studies, 2009, Online geodatabase: Seattle, Wash., GeoMapNW, available: http://geomapnw.ess.washington.edu/index.php?toc=maintoc&body=services/geodata/geodata.htm.

Genessee CSO Reduction Project

Table A-1 - Existing Subsurface Explorations

Project Component Information			Subsurface Information			
Basin Loc. No.	Alternatives	Description	Geologic Map Units	Borings within 150 ft	Key Borings[1] (Listed by document ID or S&W Job No.)	Other Explorations[2] (Listed by document ID)
37	OFF-100-37 IN-100-37	In-line and off-line storage at S. Horton St. and L. Washington Blvd.	Ql/Qpoc	0	none	none
38	TKC-101-38 TKC-103-38	Upgrade Pump Station #5 an Syres Park and new force main	Ql/Qpogd /Qvt	5	3854 - all borings (3 total) 18063 - all borings (2 total)	16921 (5 borings)
38	OFF-101-38 OFF-102-38	Offline storage in 14 ft ID tunnel beneath 50th Ave S. for 3400 ft	Qvrl/Qvt/ Tb	2	3859 - #4 10047 - #36	644 (2 test pits)
38	OFF-103-38 IN-101-38	Offline storage in Genesee Park	F/Qp/Qvt /Qpogd	~50	3533 - all borings (6 total) 3768 - all borings (11 total) 8104 - all borings (16 total)	10047 (10+ borings)
38	TKC-105-38	New gravitysewer from Darigold at S. Andover & Courtland Ave	F/Qp/Qvt /Qpogd	17	2016 - all borings (8 total) 10047 - #210 14220 - all borings (2 total)	1773 (3 test pits) 2014 (3 borings) 2015 (3 borings) 17814 (10 test pits)
38	WWT-100-38 CON-101-38	New wet-weather treatment plant and new lake line along Lake Washington Blvd north to PS 5	Ql	0	none	none
40	OFF-104-40	Replace existing storage pipes along S. Dakota St. between 49th and 50th Ave S with larger capacity ones	Qvt	3	3859 (1 boring)	10047 (1 boring) 2837 (1 boring)
41	IBT-100-41B to 38 IBT-101-41B to	6 to 14 ft diameter 1500 to 2300 ft long tunnel under Adams St. from Lake Washington Blvd.	F/Ql/Qvrl/ Qvt	1	10047 - #14	none
42	OFF-106-42 OFF-107-42	Offline storage in parking lot at S. Adams St. and L. Washington Blvd	Ql/Qvt	0	6125 (1 boring, ~500 feet away)	none
42	OFF-108-42	Replace existing storage pipes in the vicinity of 52nd Ave and South Genesee Way with larger capacity ones	Qvt	1	3859 (1 boring)	none
43	OFF-109-43 OFF-110-43	Offline storage in Lake Washington Park at S. Alaska St. and 53rd Ave. S.	Qvt/Tb	0	3859 - #2 (~200 feet away up the bluff)	none
165	CON-102-165 OFF-111-165 IBT-102-165 to	Increase inline or offline storage at PS 6 at Lake Washington Blvd. and Alaska St.	Ql/Qvt	0	none	none

1 - Key borings can be found in Appendix A

2 - Other Explorations are not included in this report, but can be optained from the GeoMapNW online geodatabase.

Henderson CSO Reduction Project
Table A-2 - Existing Subsurface Explorations

Project Component Information			Subsurface Information			
Basin Loc. No.	Alternatives	Description	Geologic Map Units	Borings within 150 ft	Key Borings[1] (Listed by document ID or S&W Job No.)	Other Explorations[2] (Listed by document ID)
44	CON-1-44 IBT-1-44 to 165 IBT-8-44 to 165	New pump station at Seward Park	Ql/Tb	6	3659 - all borings (2 total) 4004 - #1 and #2	4004 - boring #3 10047 - boring #4G-8E
44	OFF-14-44	Offline storage tunnel from west end of Seward Park, proceeding 5000 ft west to S Juneau and Rainier Ave S	Ql/Tb to Tb	0	none	none
44	OFF-2-44 OFF-10-44 OFF-16-44	Offline storage near west end of Seward Park	Ql/Tb	6	3659 - all borings (2 total) 4004 - #1 and #2	4004 - boring #3 10047 - boring #4G-8E
44	CON-2-44 CON-7-44	Increased conveyance along Lake Washington between Outfalls 44B and 45A	Ql/Tb	0	none	none
45	CON-3-45 IBT-3-45 to 165 CON-8-45 OFF-3-45 OFF-11-45 OFF-17-45 IN-1-45 IBT-5-45 to 47N	Offline, Inline storage and PS upgrade	Ql/Qvt	0	none	none
46	CON-5-46 CON-9-46	Increased conveyance along Lake Washington between Outfall 45B and Pump Station 9	Ql/Tb	0	none	none
46	OFF-4-46 IN-2-46	Offline or Inline storage at Be'er Sheva Park	Ql/Qb/Tb	4	1518 - all borings (3 total)	10445 - boring #R037107
46	TKC-2-46 IBT-6-46 to 47N OFF-12-46 IBT-7-46 to 47N	PS 9 to S Grattan St. and Seward Park Ave. S. to Cloverdale Pl. S. and Rainier Ave. S.	Ql/Qal/ Qvrl/Qvt	6	W-3918 - all borings (4 total) 10047 - #242 and #243	none
46	TKC-3-46	Increased conveyance from Basin 46 to King County Pump Station	Ql/Tb	0	none	none

49	OFF-5-49	Offline storage at PS 81	Ql/Qal/ Qvrl/Qvt	2	Location uncertain	Location uncertain
49	OFF-6-49	Offline storage located parallel to line on Rainier Ave. S.	Ql/Qal/ Qvrl/Qvt	2	8123 - TB-5 and TB-6	2098 (3 test pits) 2100 (3 borings)
47N	OFF-7-47N OFF-13-47N	In and near south end of Atlantic City Park	Ql/Qal/ Qvrl/Qvt	0	Location uncertain	Location uncertain
47N	WWT-1-47N WWT-2-47N	Adjacent to Henderson Pump Sta	F/Qpf	8	2173 - B-2 11346 - all borings (4 total)	6210 - boring TH#3 6226 - boring B-201 10444 - boring #R039285
47N	OFF-15-47N	Offline storage tunnel from Genesee Park to Seward Park, and terminating at Atlantic City Park	Ql/Qal/ Qvrl/Qvt/ Tb	0	none	none
47S	OFF-8-47S OFF-9-47S	Offline storage line in pedestrian walkway next to Safeway on Rainier Ave. S. or as tank in parking lot	F/Qpf	4	2106 - all borings (2 total) 11280 - all borings (2 total)	none
47S	TKC-1-47S	Pipe from NPDES 47 to Henderson Trunk at S. Henderson St. and Rainier Ave. S	F/Qal/Qp f	7	W-1919 - Borings B-2, P-4, and P-5 6210 - TH1 6226 - #205, #209, and #210	none

1 - Key borings can be found in Appendix A
2 - Other Explorations are not included in this report, but can be optained from the GeoMapNW online geodatabase.

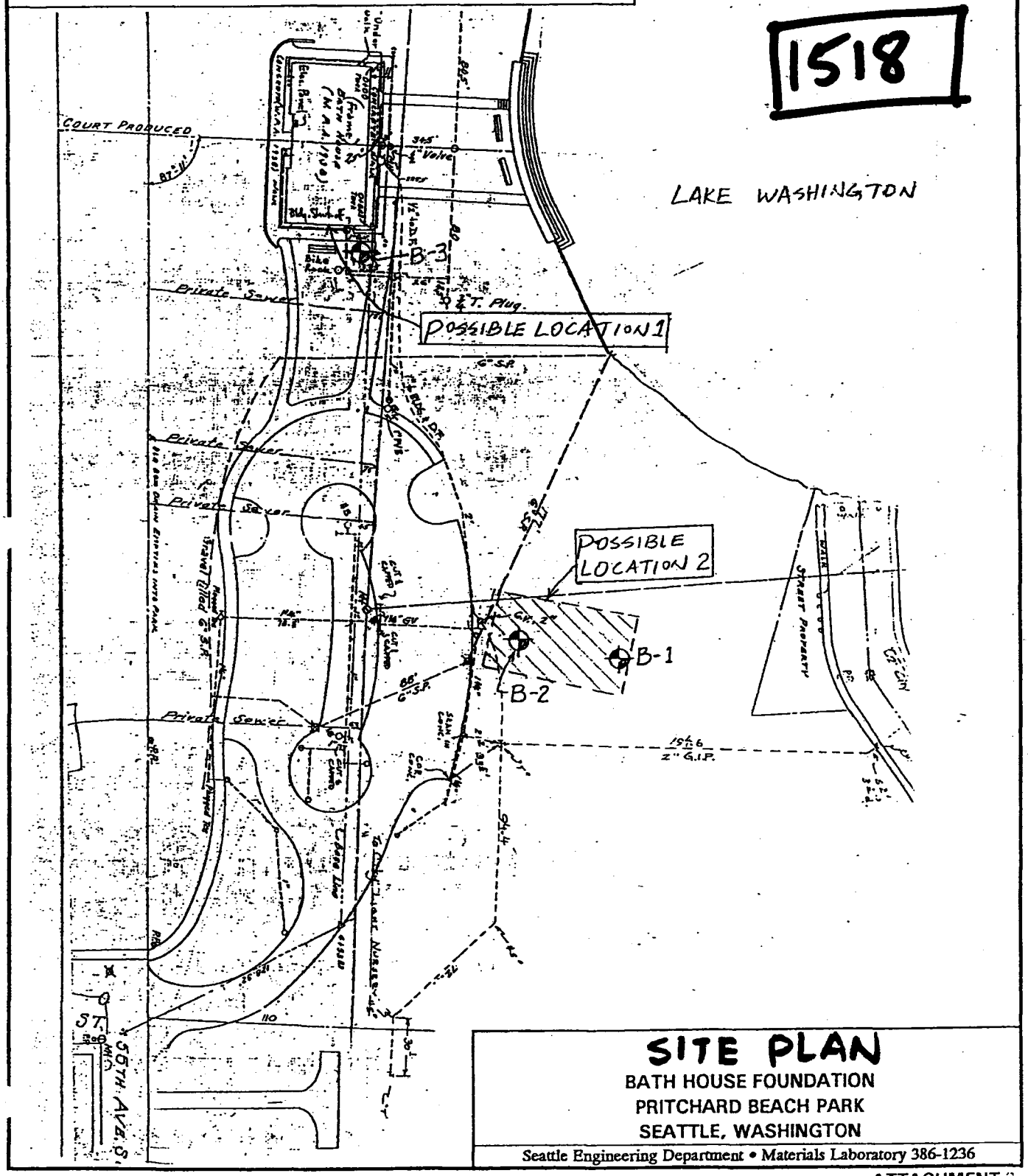
LEGEND:

B-1 APPROXIMATE HOLE LOCATION AND NUMBER

NORTH

NOT TO SCALE

1518



SITE PLAN

BATH HOUSE FOUNDATION
PRITCHARD BEACH PARK
SEATTLE, WASHINGTON

Seattle Engineering Department • Materials Laboratory 386-1236

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ATTACHMENT 2

SED Materials Laboratory

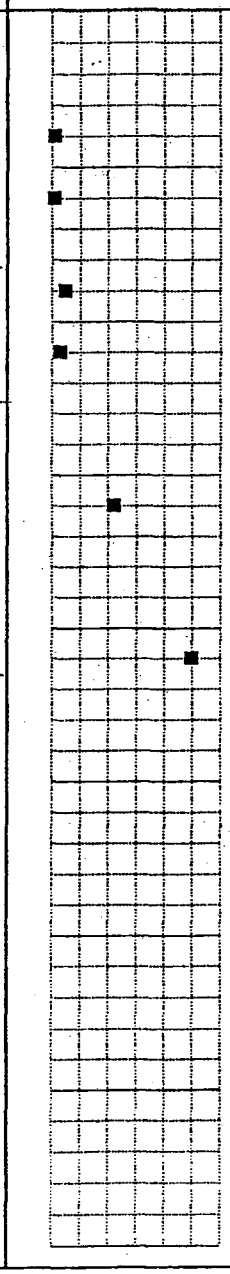
LOG OF TEST BORING

LOG DATE 12/8/94 GROUND ELEV. ? (Lawn Surface) BORING NO. B-1

PROJECT Pritchard Beach SAMPLE TYPE 2" split sampler (ASTM 1586-74) except noted.

LOCATION 75 feet E. of parking area curb between two water valves (see Location Sketch)

DEPTH, Ft	STRATA	SAMPLE No.	BLOW COUNT Per 6"	SPT-N	WATER %	USCS	COMPOSITION	CONSIS-TANCY	MOISTURE	COLOR	OTHERS
							Grass				
		1	1, 1/12"	1		SM	Mottled SILT and fine SAND (fill due to metro sewer)	V. Soft	V. wet	Mottled tan & gray	
5		2	0,0,1	1		ML	Clayey SILT with little fine sand (fill due to metro sewer) 2" Pea gravel overlying	V. soft	Wet	Same	GW estimated at drilling
		3	0,2,3	5		CL	6" silty CLAY w/ little sand	Soft	Wet	Lt. gray	
10		4	0,0,3	3		ML	Sandy SILT	V. soft	Wet	Lt. gray	
15		5	3,9,13	22		SM	Silty fine SAND	Med dense	V. moist	Dk. gray	
20		6	15, 50/6"	50		SM	Silty fine-med SAND to sandy SILT	V. dense	Moist	Dk. gray	
25							EOH @ 21.5 ft Groundwater is estimated at 5 feet during drilling.				
30											
35											
40											



REMARKS

LOGGED BY: DH

SED Materials Laboratory

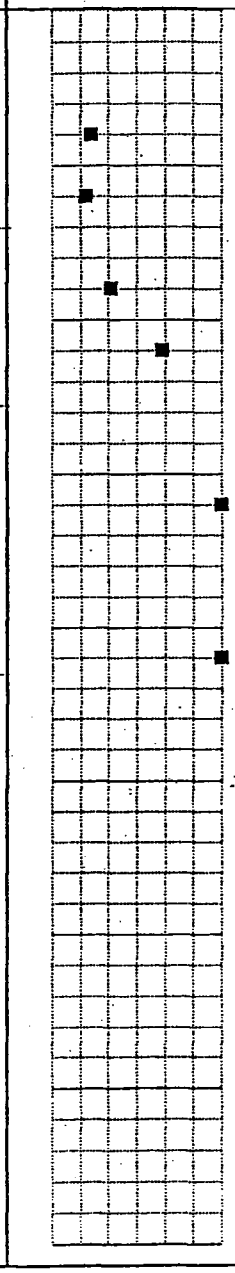
LOG OF TEST BORING

LOG DATE 12/8/94 GROUND ELEV. ? (Lawn Surface) BORING NO. B-2

ROJECT Pritchard Beach SAMPLE TYPE 2" split sampler (ASTM 1586-74) except noted.

LOCATION 33 feet E. of parking area curb, 15' S of a northerh water valve (see Location Sketch)

DEPTH, Ft	STRATA	SAMPLE No.	BLOW COUNT Per 6"	SPT-N	WATER %	USCS	SOIL DESCRIPTION: COMPOSITION	CONSIS-TANCY	MOISTURE	COLOR	OTHERS
							Grass				
5		1	4,6,8	14		CH	Silty CLAY w/ sand lenses	Med stiff	Moist	Lt. gray	
		2	3,5,7	12		CH	Layered light/dk gray silty CLAY with sand lenses.	Med stiff	Moist		
10		3	5,10,11?	21	?	SM/ ML	Silty SAND & sandy SILT	Med dense	–Wet	Mottled gray/tan	GW estimated at drilling
		4	5,12,27	39		SM	Silty fine SAND with med sand lenses	dense	moist	Gray mott'd w/ tan	
15		5	20,40,50	60		ML	Dk gray SILT w/ sand, w/ sand lenses	V. dense	Moist	Dk. gray	
20		6	20, 50/3"	60		SM	Silty fine SAND & fine sandy SILT	V. dense	Moist	Dk. gray	
25							EOH @ 21.5 ft Groundwater is estimated at 7 feet during drilling.				
30											
35											
40											



REMARKS

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LOGGED BY: DH

SED Materials Laboratory

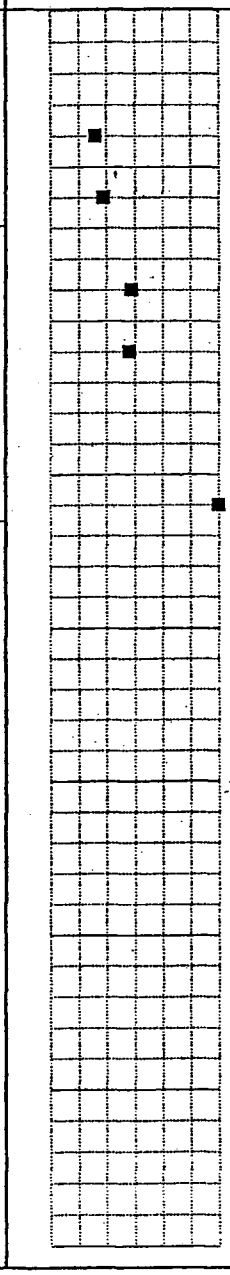
LOG OF TEST BORING

LOG DATE 12/8/94 GROUND ELEV. ? (Lawn Surface) BORING NO. B-3

PROJECT Pritchard Beach SAMPLE TYPE 2" split sampler (ASTM 1586-74) except noted.

LOCATION 15' S. of the SE corner of the existing bath house (see location sketch)

DEPTH, Ft	STRATA	SAMPLE No.	BLOW COUNT Per 6"	SPT-N	WATER %	USCS	SOIL DESCRIPTION COMPOSITION	CONSIS-TANCY	MOISTURE	COLOR	OTHERS
							Grass				
5		1	5,8,8	16		SC	Clayey fine SAND w/ little silt	Med dense	Moist	Mottled gray & tan	
		2	5,10,9	19		SC	Clayey fine SAND w/ little silt	Med dense	V. Moist	gray & tan	
10		3	10,14,15	29		SM	Silty fine SAND	Med dense	_Wet	Lt. brown	GW estimated at drilling
		4	8,10,18	28		SM	Silty med SAND	Med dense	Wet	Lt brown	
15		5	28, 50/4"	60			No recovery, estimated the same as above				
20							EOH @ 16.5 ft Groundwater is estimated at 8 feet during drilling.				
25											
30											
35											
40											



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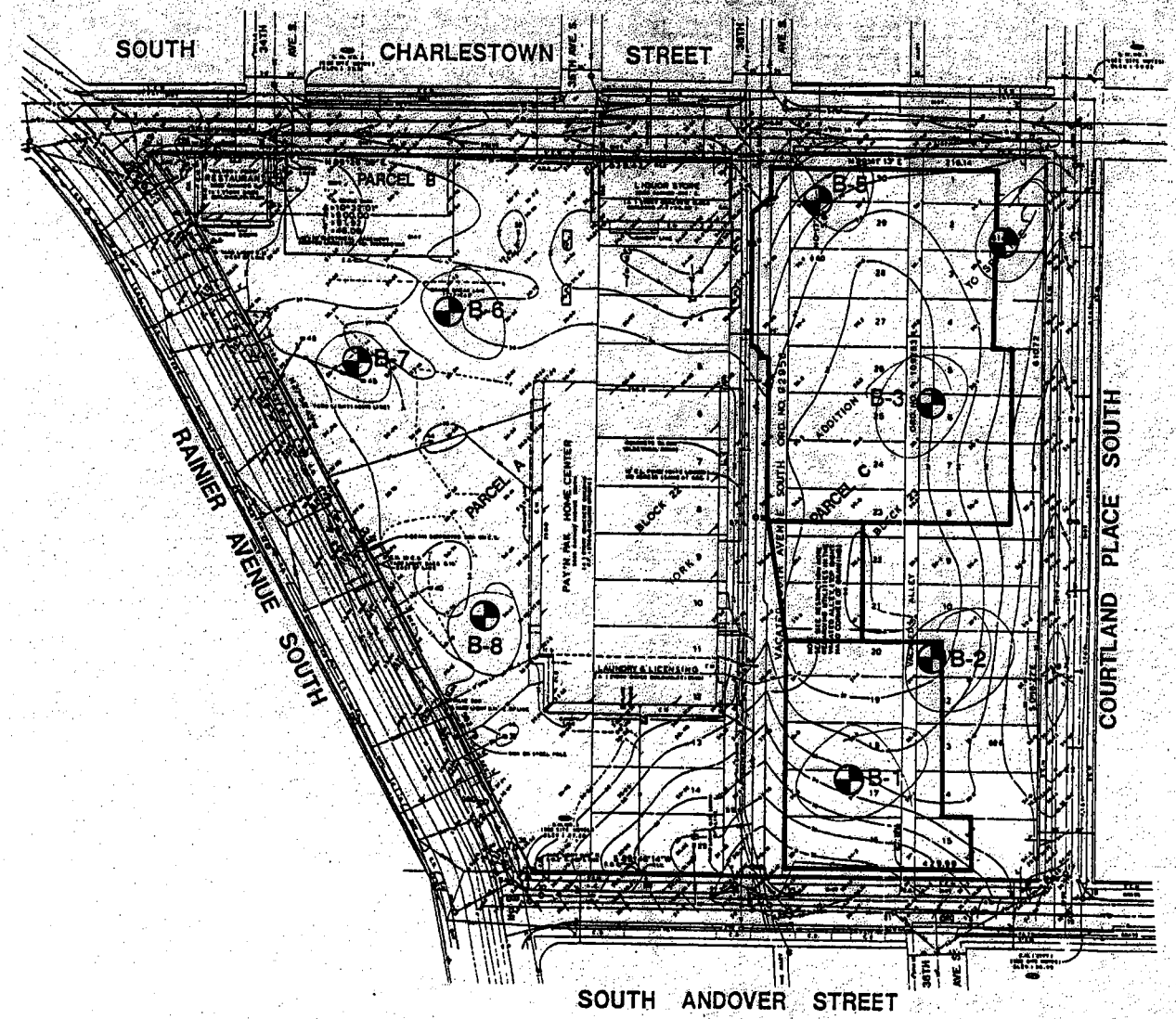


LEGEND:

B-8 NUMBER AND APPROXIMATE LOCATION OF TEST BORING

SCALE:

0' 25' 50' 100' 200'

2016

REF: Land Title Survey/Boundary & Topographic Plan by Bush, Roed & Hutchings, Inc., dated Oct.'92, and Site Plan by The Dykéman Architects, undated.

TERRA ASSOCIATES
Geotechnical Consultants

SITE PLAN
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. 2180	Date 11/92	Figure 2

Boring No. B-1

Logged by: DHG

Dated: 10-15-92

Approximate Elev. 34.5

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)	q_u (tsf)	Dry Density (pcf)
SM	Brown to gray, silty SAND with gravel, some organics, moist to wet.	Medium dense			28	9		
		Loose	5		10	14		
	(Fill)	Medium dense			11	19		
			10					
	Light tan, CLAY with root fibrils and peaty interbeds, wet.	Very stiff			18	38		
			15					
		Stiff			11	39		84
			20					
	Gray, SILT, wet.	Hard			38	26		
			25					
ML/CL	Gray, SILT grading to CLAY, trace fine SAND, wet.	Medium stiff			7	29	0.0	
			30					
		Medium stiff			41	41	3.0	
ML/SM	Gray, sandy SILT to silty SAND, wet.	Dense	35					
		Very dense			70	15		
			40					
		Very dense			50/5"	15		

Boring completed to 43 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 4

Boring No. B-2

Logged by: DHG

Dated: 10-15-92

Approximate Elev. 37.5

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)	q_u (tsf)	Dry Density (pcf)
SM	Tan, silty SAND with gravel, damp.							
		Medium dense			28	11		
			5					
		Loose			10	13		
	Dark gray below 7 feet. (Fill)	Loose			6	19		
			10					
OL	Brown, organic SILT, moist.							
CL	Gray, mottled silty CLAY with trace sand, grading to gray, fat CLAY, wet.	Stiff			13	34	2.0	
			15					
		Medium stiff			8	32	2.5	
			20					
		Very Stiff			17	40	3.0	
			25					
		Medium stiff			8	62	0.0	65
			30					
SM	Gray silty SAND, trace gravel, wet.	Very dense			86	18		
			35					
		Very dense			50/1"	20		

Boring completed to 38 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 5

Boring No. B-3

Logged by: DHG

Dated: 10-15-92

Approximate Elev. 37

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)	q_u (tsf)	Dry Density (pcf)
SM	Tan, mottled to gray, silty SAND with gravel, some wood and charcoal fragments, moist to wet.	Medium dense			18	9		
		Loose	5		7	12		
	(Fill)	Loose			6	17		
CL/CH	Gray, silty CLAY, grading to fat CLAY, wet.	Stiff	10		9	38	1.75	
		Very stiff	15		21	27	3.0	109
		Medium stiff	20		8	64	0.0	
SP	Gray, SAND with trace silt, wet.	Very dense	25		49/6"	16		
SM	Gray, silty SAND with gravel, wet.	Very dense	30		50/4"	11		
		Very dense			50/4"	12		

Boring completed to 33 feet.
Groundwater level at 18 feet on November 2, 1992.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180 | Date 11/92 | Figure 6

Boring No. B-4

Logged by: DHG

Dated: 10-16-92

Approximate Elev. 35

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)	q_u (tsf)	Dry Density (pcf)
ML	Brown and blue-gray mixed, sandy SILT, with clay and wood fragments, wet. (Fill)	Very stiff			20	13		
		Stiff	5		12	20		
ML	Orange mottled, clayey SILT with roots, wet.	Medium stiff			18	16	0.75	
ML/SC	Gray, silty CLAY to clayey SAND, with gravel, wet.	Medium dense	10					
		Very dense			50/6"	18		
			15					
		Very dense			50/3"	11		

Boring completed to 18 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180 | Date 11/92 | Figure 7

Boring No. B-5

Logged by: DHG

Dated: 10-26-92

Approximate Elev. 34.5

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)	q_u (tsf)	Dry Density (pcf)
SM	Brown, silty SAND with gravel, with sawdust, charred material, moist	Loose			10	10		
	Becomes tan, silty SAND, moist. (Fill)	Loose	5		10	14		
OL	Brown, organic SILT, wet.	Medium Stiff			8	46 111	2.5	
ML	White, SILT, wet.	Medium Stiff	10					
PT OL	Brown, PEAT, and organic soil, wet.	Medium Stiff			15	61	0.5 3.75	
	Blue-gray mottled, fat CLAY, wet.	Stiff	15		35		2.0	81
		Soft	20		4	52	0.0	
		Soft	25		3	60	0.0	
	Grades to sandy CLAY, wet.	Stiff			12	17		83
CL	Dark gray CLAY with sand, many shell fragments, wet.	Very Stiff	30 35		30	24	>4.5	
SM/ ML		Very dense	40		50/5"	*		
	Dark gray, SILT to silty SAND, many shell fragments, wet.	Very dense			51	21	>4.5	

Boring completed to 44 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 8

Boring No. B-6

Logged by: DHG

Dated: 10-16-92

Approximate Elev. 36.3

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)		
SM	(4-inches of Asphalt Pavement) Green-gray, silty SAND, w/charcoal, wet	Loose			9	12		
SM	Brown, silty SAND w/ wood & charred material, wet	Loose			8	23		

Boring terminated at 4 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 9

Boring No. B-7

Logged by: DHG

Dated: 10-16-92

Approximate Elev. 36.5

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)		
SM	(4-inches of Asphalt Pavement) Green-gray, silty SAND, wet	Loose			5	13		
SM	Black, silty SAND w/ broken glass & unknown charred material, moist	Loose			6	—		

Boring terminated at 4 feet.

TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 10

Boring No. B-8

Logged by: DHG

Dated: 10-16-92

Approximate Elev. 36.5

Graph/ USCS	Soil Description	Consistency	Depth (ft.)	Sample	(N) Blows (ft)	Water Content (%)		
SM	(4-inches of Asphalt Pavement)	Medium Dense						
	Brown, silty SAND with gravel, moist.				12	4		
		Loose			7	*		

Boring terminated at 4 feet.

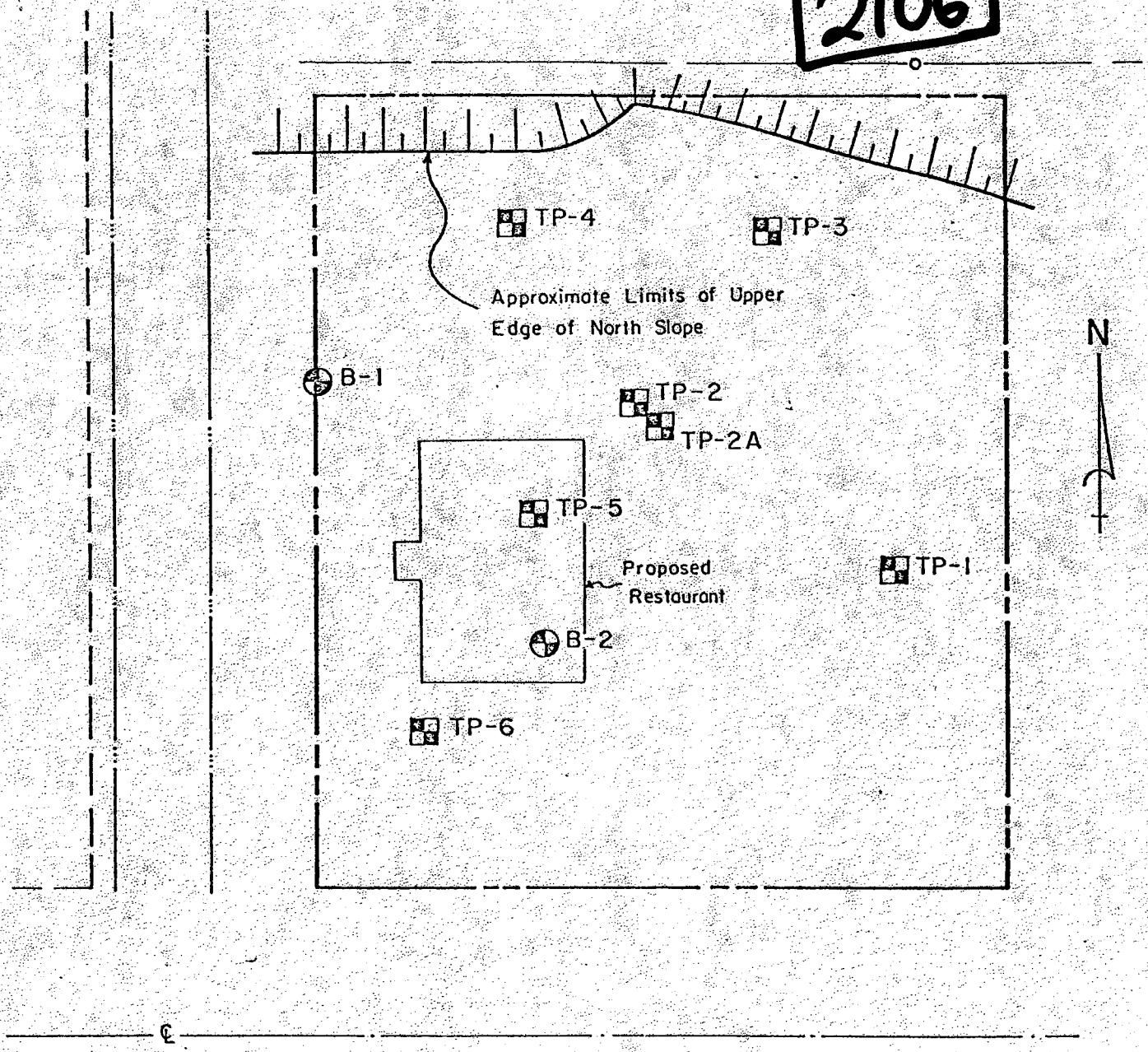
TERRA ASSOCIATES
Geotechnical Consultants

Boring Log
Rainier Avenue Food Pavilion
Seattle, Washington

Proj. No. T-2180	Date 11/92	Figure 11

SITE AND EXPLORATION PLAN

2106



LEGEND

TP-1 Test Pit Location & Number

B-1 Boring Location & Number

0 10 20 40 80

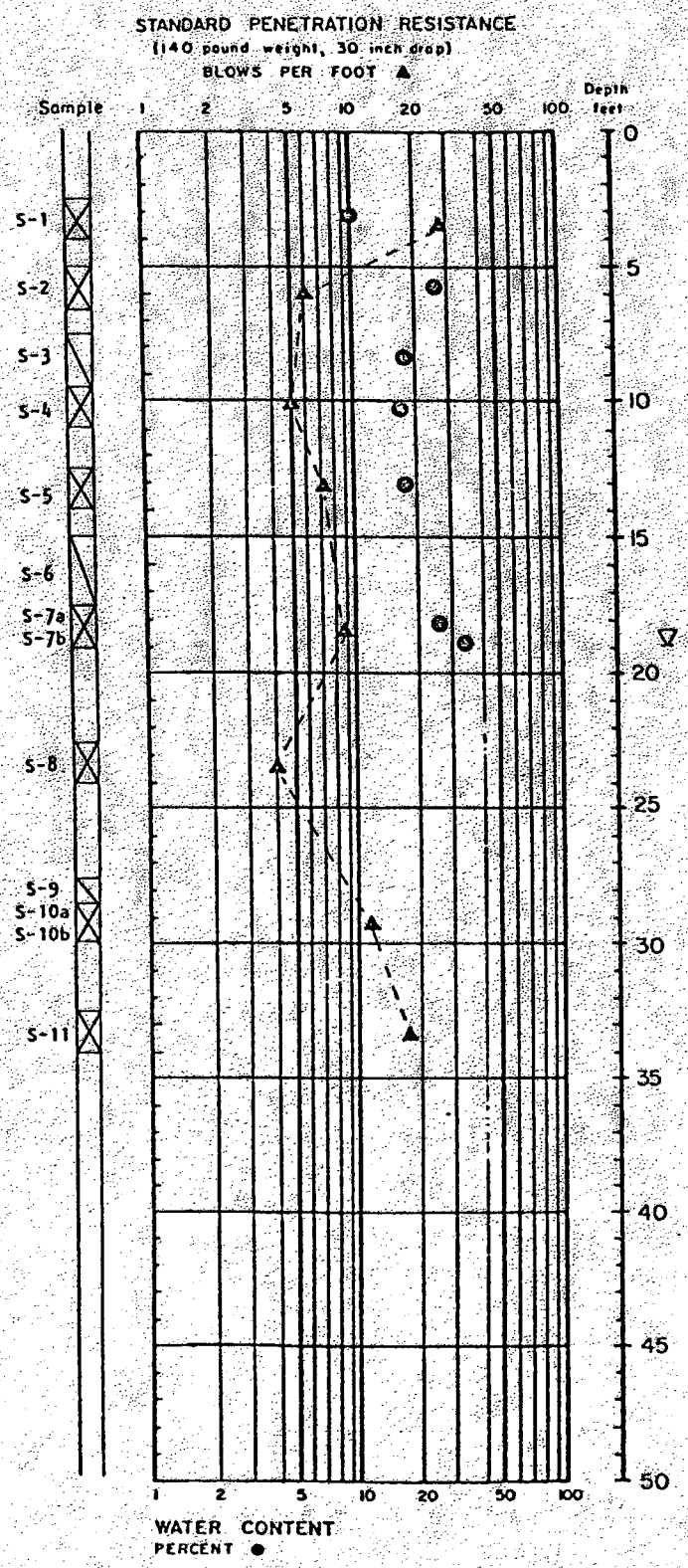
Scale in Feet
1" = 40'

J-546 1977

HART-CROWSER & associates inc.

Figure 1

BORING LOG B-



SOIL INTERPRETATION

Ground Surface at Approximate Elevation 33.0 Feet

Medium dense, damp, brown, silty fine to coarse SAND with some fine gravel (fill)

Medium stiff and loose, damp to wet, gray and brown sandy SILT and silty SAND with organic debris and some gravel (fill)

Stiff, damp, gray and black organic sandy SILT with pieces of wood debris (fill)

Damp black fibrous PEAT

Medium dense, saturated, slightly silty fine to coarse SAND

Stiff to very stiff, moist gray slightly sandy clay SILT

Bottom of Boring at 34.0 feet

McDonald's Corp.
9304 Rainier Ave. S.
578545

LEGEND

⊠ 2" O.D. Split Spoon Sample

⊘ 3" O.D. Shelby Sample

* No Sample Recovery

▽ Water Level

▯ Observation Well

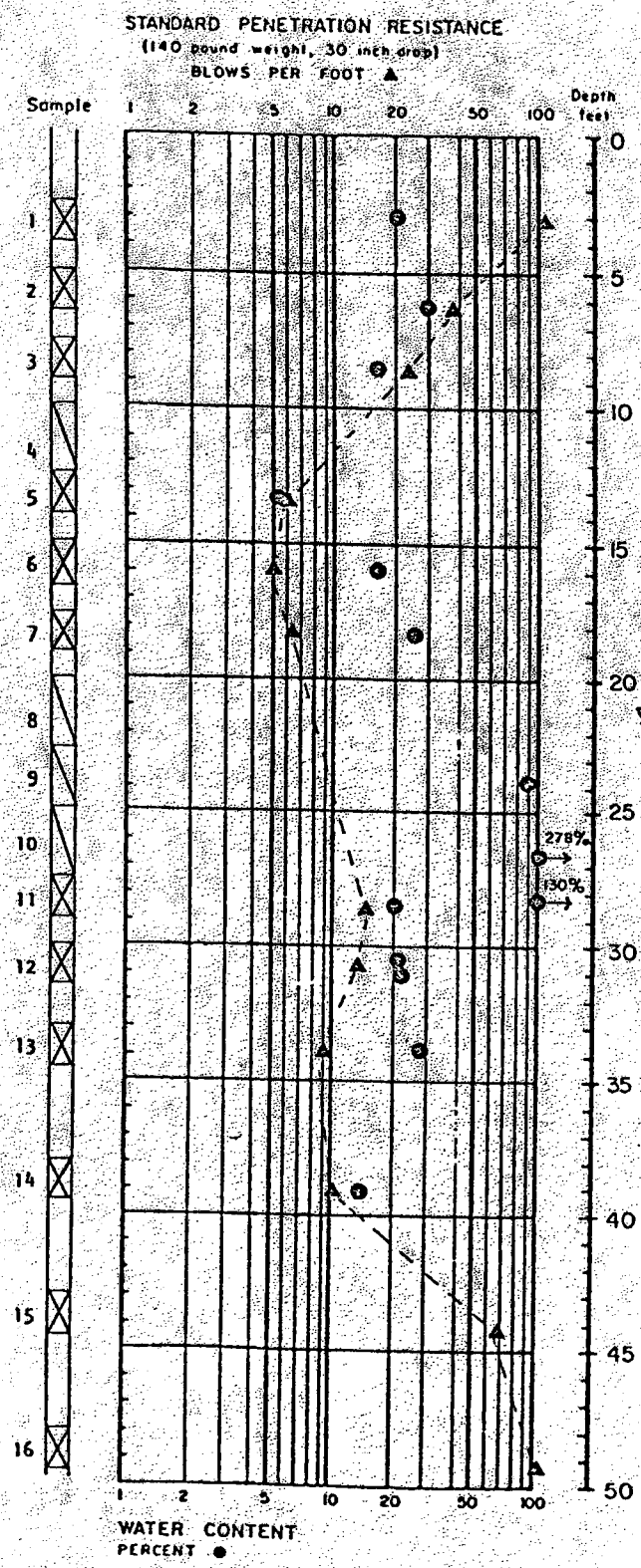
NOTE: Soil descriptions are interpretive and actual changes may be gradual.

J-534 October 197

HART-CROWSER & associates inc

Figure A-

BORING LOG B-2



SOIL INTERPRETATION

Ground Surface Elevation Approximately 33.0 feet

Dense, damp, brown, silty, fine to coarse SAND and GRAVEL with some organic and building debris (fill)

Hard, damp, mottled gray and brown, fine to medium sandy SILT (fill)
(some concrete rubble at 4.0 feet)

-becoming very stiff

-becoming medium stiff

-some organic debris

Soft, moist, fibrous PEAT

Medium dense, wet, gray, gravelly, fine to medium SAND

Stiff, saturated, gray, sandy, gravelly SILT

-becoming slightly clayey

Loose, saturated, gray, slightly silty, gravelly, fine SAND

Very dense, damp, gray, slightly gravelly, silty, fine to medium SAND (till)

Bottom of Boring 49.5 feet
Completed 10/27/77

LEGEND

⊠ 2" OD Split Spoon Sample

⊠ 3" OD Shelby Sample

* No Sample Recovery

▽ Water Level

▯ Observation Well

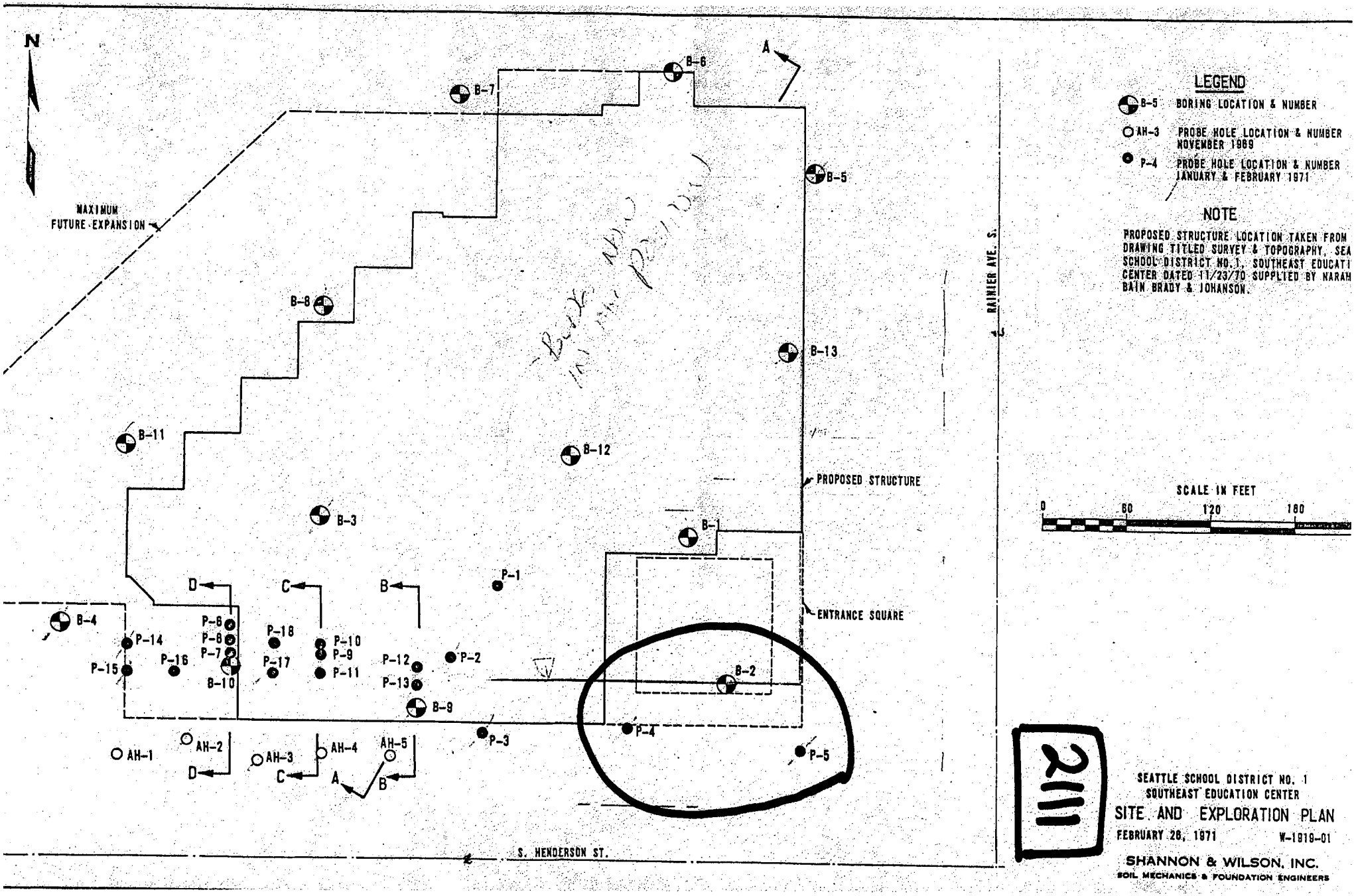
NOTE: Soil descriptions are interpretive and actual changes may be gradual

9304 Rainier Ave S
578545

J-534 October 1977

HART-CROWSER & associates inc.

Figure A-2


N
MAXIMUM FUTURE EXPANSION
B-6
B-7
A
B-5
B-8
B-13
B-11
B-12
PROPOSED STRUCTURE
B-3
B-1
P-1
ENTRANCE SQUARE
B-4
P-14
P-15
P-16
P-6
P-8
P-7
B-10
P-18
P-17
P-10
P-9
P-11
P-12
P-13
P-2
B-9
B-2
P-3
P-4
P-5
AH-1
AH-2
AH-3
AH-4
AH-5
D
C
B
A
RAINIER AVE. S.
S. HENDERSON ST.
LEGEND
B-5 BORING LOCATION & NUMBER
AH-3 PROBE HOLE LOCATION & NUMBER NOVEMBER 1969
P-4 PROBE HOLE LOCATION & NUMBER JANUARY & FEBRUARY 1971
NOTE
PROPOSED STRUCTURE LOCATION TAKEN FROM DRAWING TITLED SURVEY & TOPOGRAPHY, SEA SCHOOL DISTRICT NO.1, SOUTHEAST EDUCATI CENTER DATED 11/23/70 SUPPLIED BY NARAH BAIN BRADY & JOHANSON.
SCALE IN FEET
0
60
120
180
SEATTLE SCHOOL DISTRICT NO. 1
SOUTHEAST EDUCATION CENTER
SITE AND EXPLORATION PLAN
FEBRUARY 26, 1971
W-1919-01
SHANNON & WILSON, INC.
SOIL MECHANICS & FOUNDATION ENGINEERS

2111

SOIL DESCRIPTION Approximate Surface Elevation: 30 ft.	DEPTH, feet	SAMPLES	GROUND WATER	DEPTH, feet	STANDARD PENETRATION RESISTANCE (140 lb. weight, 30" drop) ▲ Blows per foot 0 20 40
Medium stiff, gray and brown, silty CLAY and clayey SILT with fine sand partings	0	1, 2, 3, 4	3/18/70	0, 5, 10, 15	
Medium to very dense, brown to gray, silty, fine to coarse SAND with scattered gravel to 24 feet (wet)	17.0	5, 6		20	72
Bottom of Boring Completed 11/14/69	25.0			25	

LEGEND

- I 2.0" O.D. split spoon sample
- II 3.0" O.D. thin-wall sample
- * Sample not recovered
- Atterberg limits: Liquid limit; Natural water content; Plastic limit
- Impervious seal
- Water level
- Piezometer tip
- P Sampler pushed
- USC Unified Soil Classification
- ● % Water content

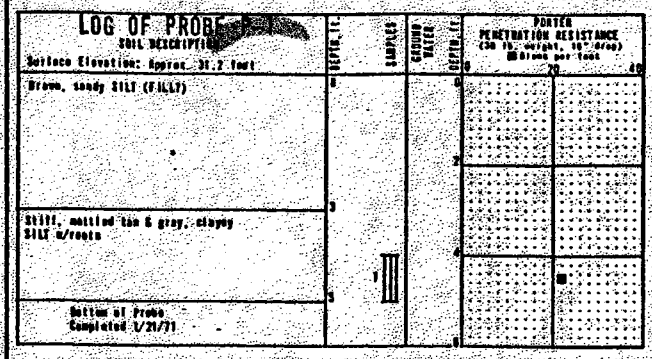
SEATTLE SCHOOL DISTRICT NO. 1
SOUTHEAST EDUCATION CENTER

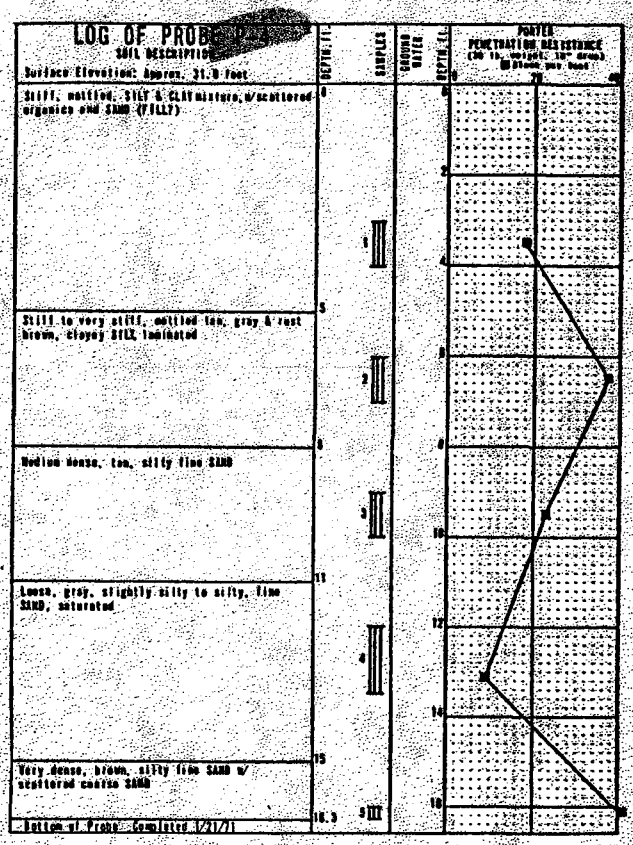
LOG OF BORING NO. B-2

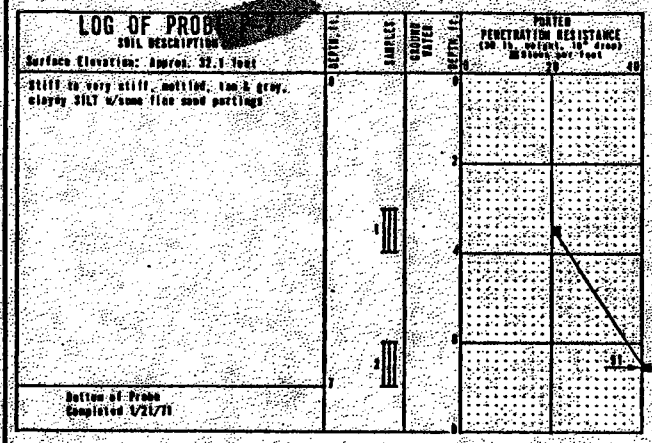
NOVEMBER 21, 1969 W-1919

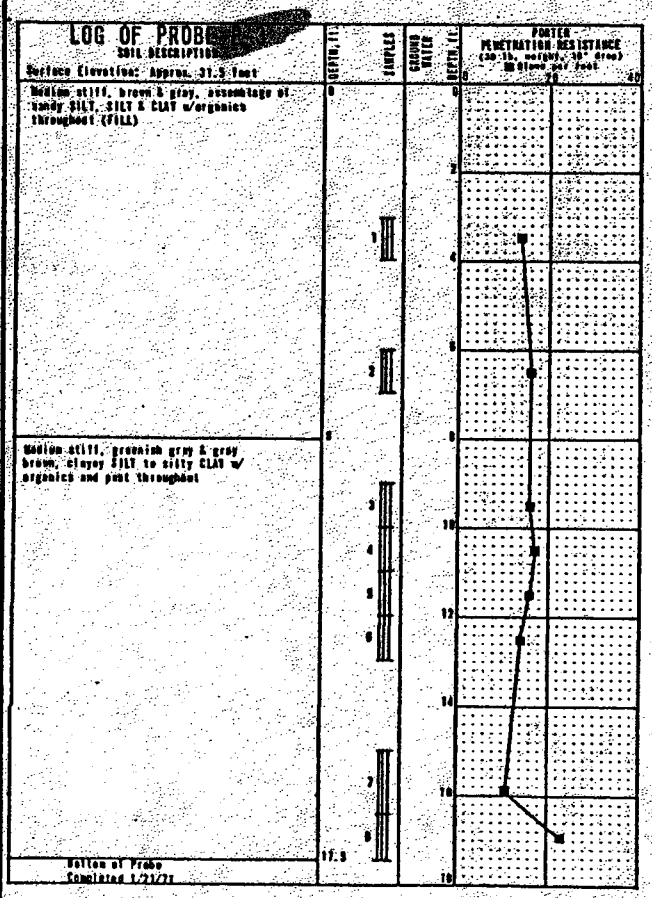
SHANNON & WILSON
SOIL MECHANICS & FOUNDATION ENGINEERS

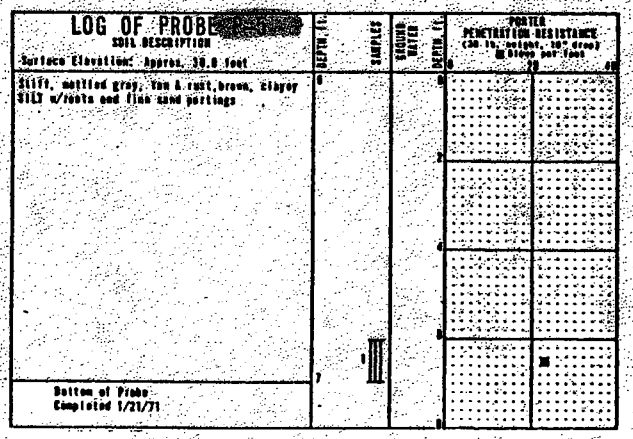
FIG. A-2











LEGEND

III 1.0" O.D. porter sampler

II 2.0" O.D. thin-wall sampler

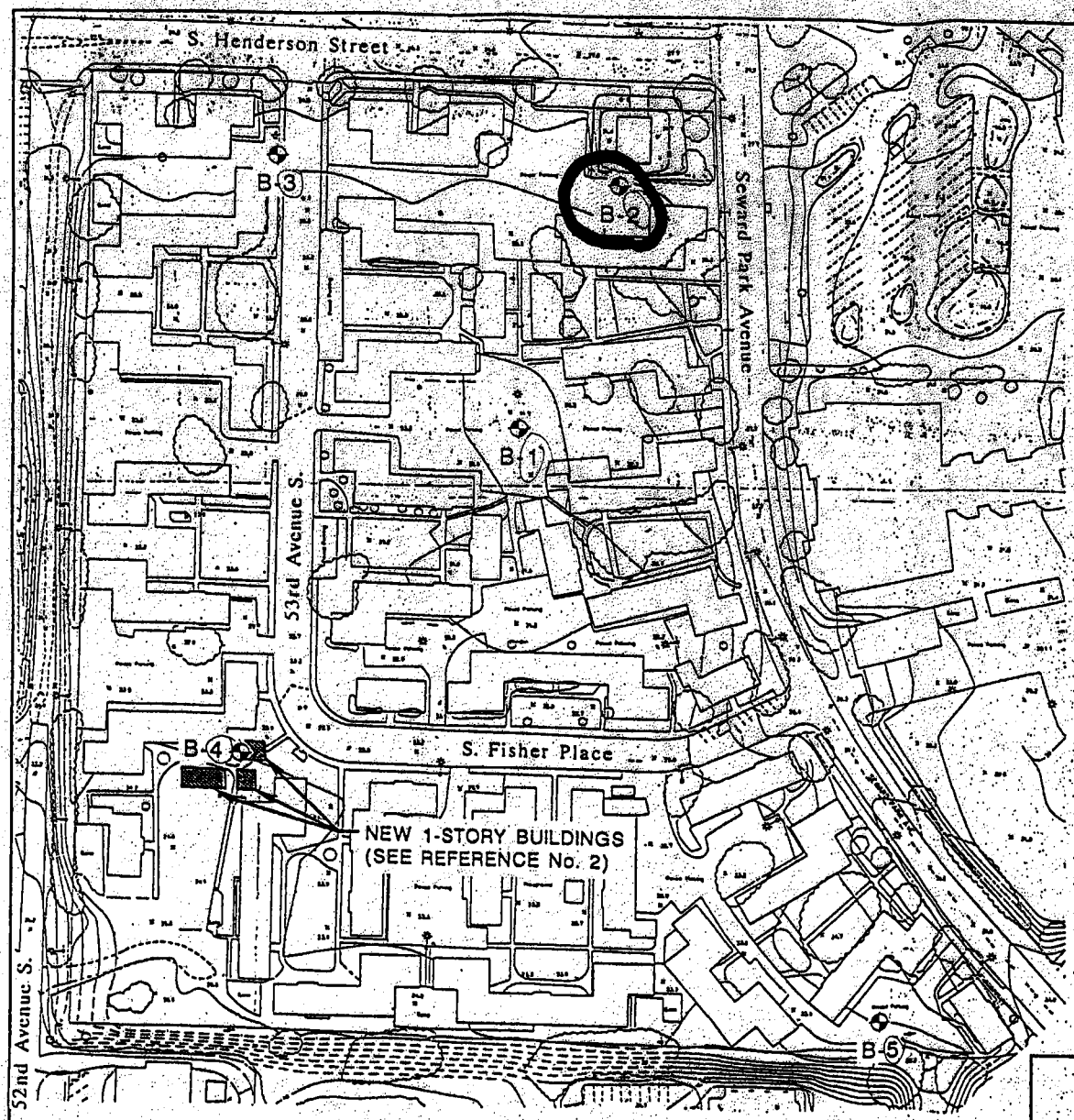
* Sample not recovered

SEATTLE SCHOOL DISTRICT NO. 1
SOUTHEAST EDUCATION CENTER

LOGS OF PROBES

FEBRUARY 26, 1971 W-1919-01

SHANNON & WILSON, INC.
SOIL MECHANICS & FOUNDATION ENGINEERS



APPROXIMATE SCALE

120 0 120 240 feet

LEGEND:

APPROXIMATE BORING LOCATION

REFERENCE:

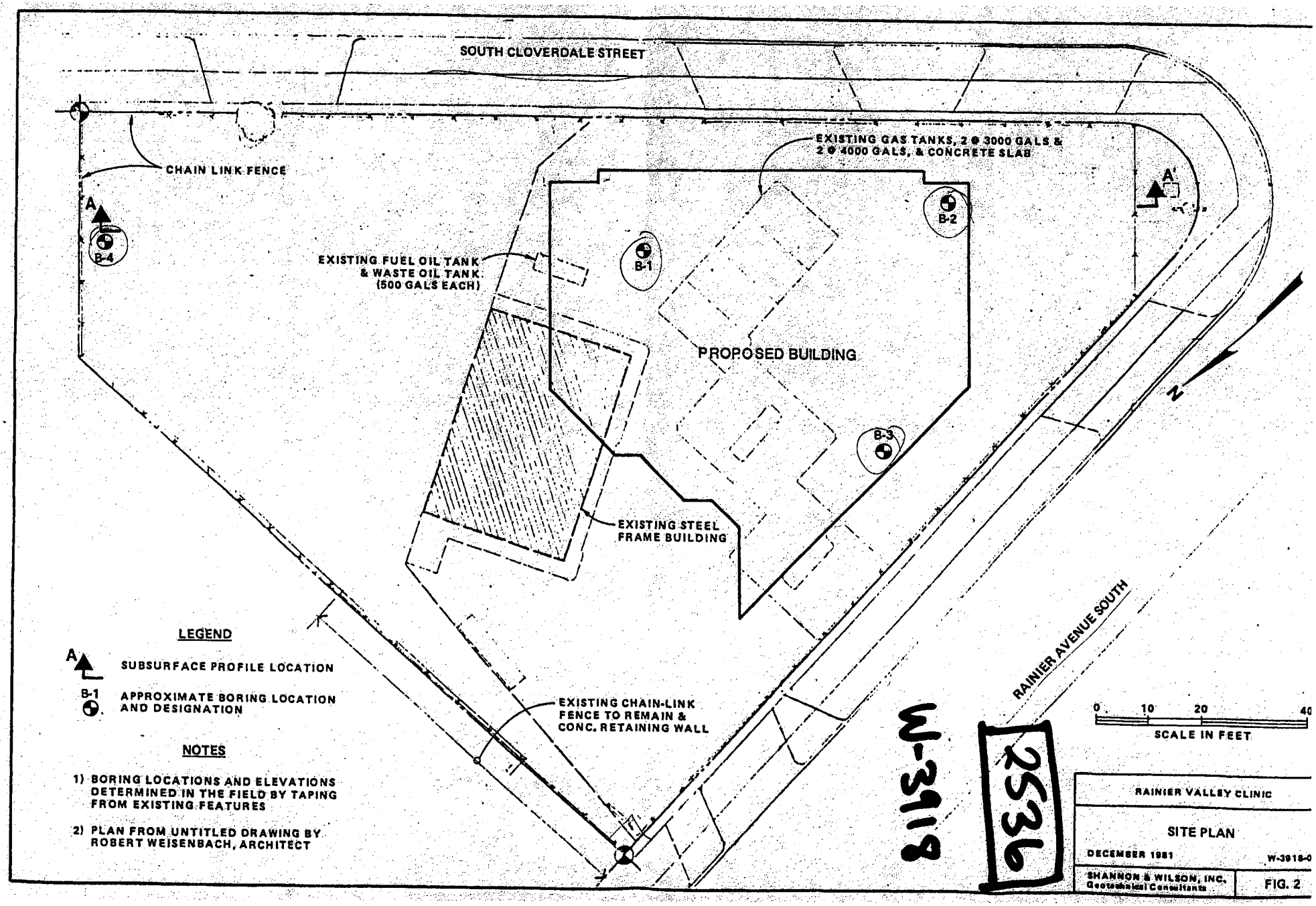
1. UNTITLED SITE PLAN PREPARED AND PROVIDED BY SvR DESIGN COMPANY, PROJECT No. 95029, SHEET 3.1, DATED MAY 24, 1996.
2. NEW 1-STORY BUILDING LOCATIONS ARE PER SITE PLAN DRAWING, SvR FILE No. 95029, DATED MAY 31, 1996.

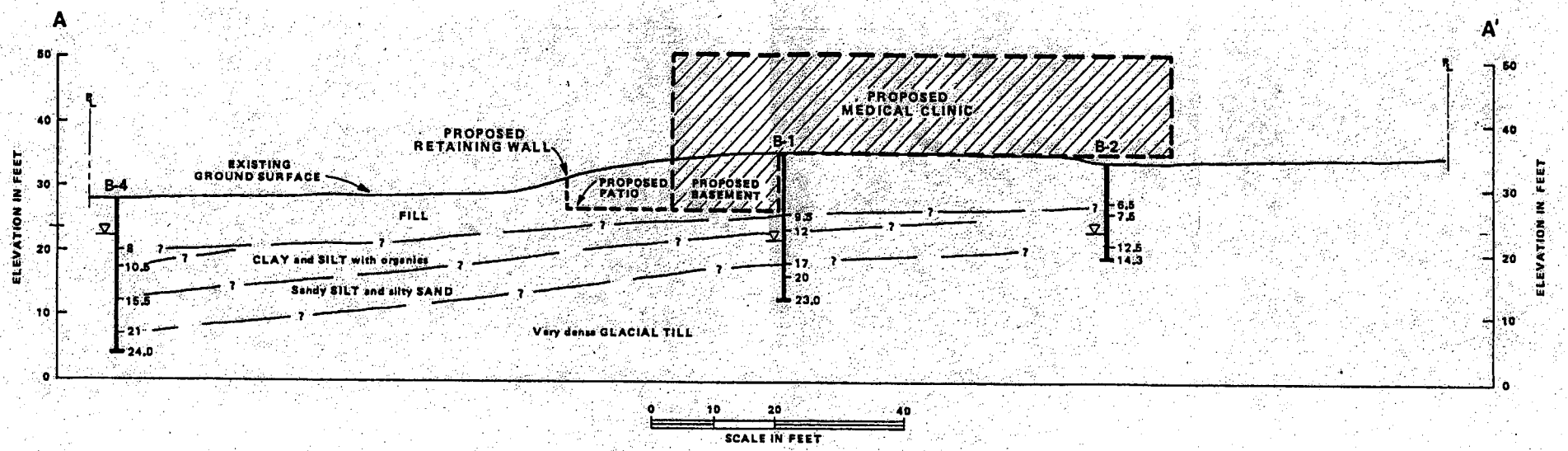
2173

TERRA ASSOCIATES
Geotechnical Consultants

EXPLORATION LOCATION PLAN
SEWARD PARK ESTATES
SEATTLE, WASHINGTON

Proj. No. 2911	Date 7/96	Figure 2


SOUTH CLOVERDALE STREET
CHAIN LINK FENCE
EXISTING GAS TANKS, 2 @ 3000 GALS & 2 @ 4000 GALS, & CONCRETE SLAB
EXISTING FUEL OIL TANK & WASTE OIL TANK (500 GALS EACH)
PROPOSED BUILDING
EXISTING STEEL FRAME BUILDING
EXISTING CHAIN-LINK FENCE TO REMAIN & CONC. RETAINING WALL
RAINIER AVENUE SOUTH
A
A'
B-1
B-2
B-3
B-4
N
LEGEND
SUBSURFACE PROFILE LOCATION
APPROXIMATE BORING LOCATION AND DESIGNATION
NOTES
1) BORING LOCATIONS AND ELEVATIONS DETERMINED IN THE FIELD BY TAPING FROM EXISTING FEATURES
2) PLAN FROM UNTITLED DRAWING BY ROBERT WEISENBACH, ARCHITECT
0 10 20 40
SCALE IN FEET
W-3918
2536
RAINIER VALLEY CLINIC
SITE PLAN
DECEMBER 1981
W-3918-0
SHANNON & WILSON, INC.
Geotechnical Consultants
FIG. 2



LEGEND

B-1 APPROXIMATE BORING LOCATION AND DESIGNATION

WATER LEVEL

17 DEPTH BELOW GROUND SURFACE IN FEET

PROPERTY LINE

NOTES

1. BORING LOCATIONS AND ELEVATIONS DETERMINED IN THE FIELD BY TAPING FROM EXISTING FEATURES AND A TOPOGRAPHIC MAP BY SHELL OIL COMPANY, DATED 3/14/69.
2. THE PROFILE WAS GENERALIZED FROM MATERIALS ENCOUNTERED IN THE BORINGS AND VARIATIONS BETWEEN THE PROFILE AND ACTUAL CONDITIONS MAY EXIST.
3. WATER LEVELS MEASURED ON 12/15/81.

RAINIER VALLEY CLINIC
SEATTLE, WASHINGTON

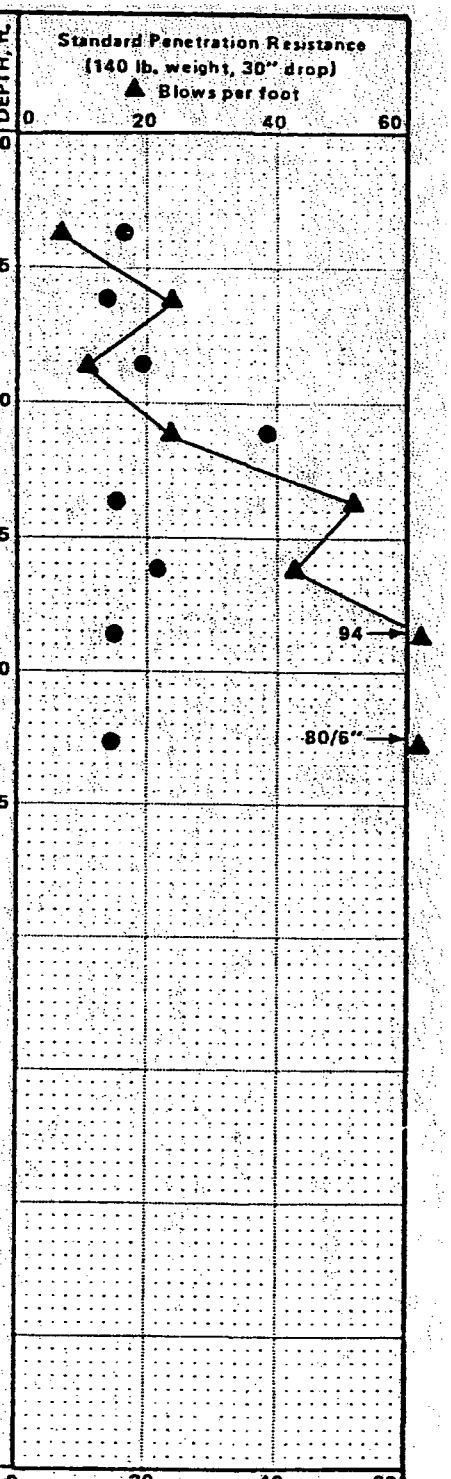
SECTION A-A'

JANUARY 1982 W-3918-01

SHANNON & WILSON, INC.
GEOTECHNICAL CONSULTANTS

FIG. 8

SOIL DESCRIPTION Surface Elevation: APPROX. 35.5 FT.	DEPTH, ft.	SAMPLES	GROUND WATER
ASPHALT	0.3		
Loose to medium dense, brown and gray, silty SAND with layers and lenses of sandy silt, scattered organics (FILL)		1, 2, 3	
Very stiff, gray, silty CLAY with scattered gravel and organics, gasoline odor (FILL)	9.5	4	
Dense to very dense, gray, slightly gravelly, sandy SILT, trace of clay, gasoline odor	12	5, 6	12-15-81
Very dense, brown, slightly gravelly, silty SAND to sandy SILT (WEATHERED TILL)	17	7	
Very dense, gray, sandy SILT; trace of gravel (TILL)	20		
BOTTOM OF BORING COMPLETED 12-14-81	23.0	8	



LEGEND

I 2" O.D. split spoon sample

II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:

Liquid limit

Natural water content

Plastic limit

Impervious seal

Water level

Piezometer tip

P Sample pushed

NOTE; The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

RAINIER VALLEY CLINIC
SEATTLE, WASHINGTON

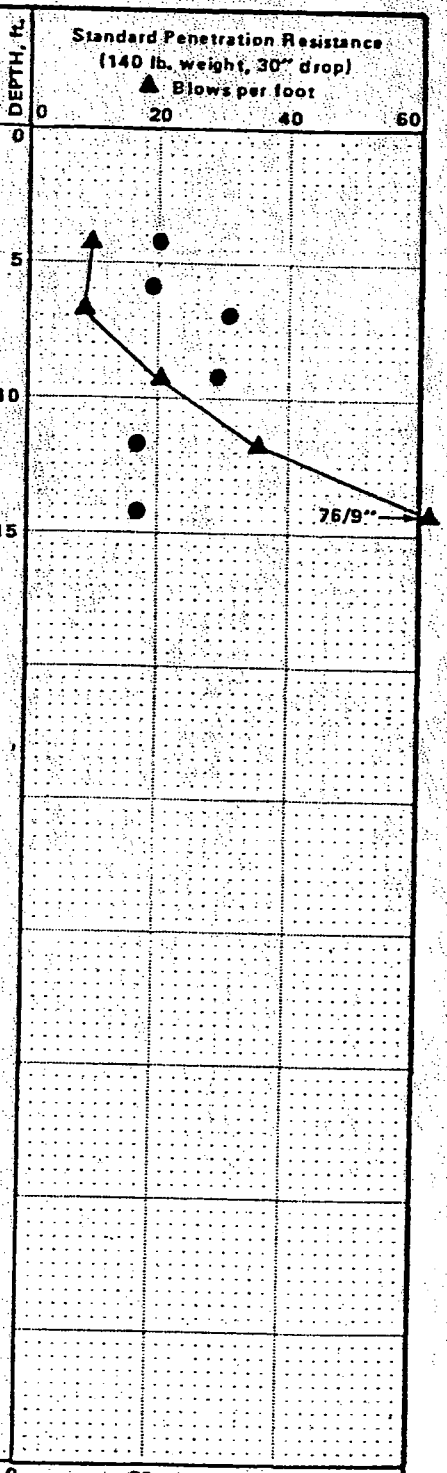
LOG OF BORING B-1

JANUARY 1982 W-3918-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 3

SOIL DESCRIPTION Surface Elevation: APPROX. 34 FT.	DEPTH, ft.	SAMPLES	GROUND WATER
ASPHALT			
Loose, gray, slightly gravelly sandy SILT, gasoline odor (FILL)	0.1	1	
Medium stiff, brown, slightly clayey SILT with sand and organics	6.5	2	
Medium dense to dense, sandy SILT with scattered gravel and organics	7.5	3	
		4	OBSERVED DURING DRILLING
Very dense, gray, sandy SILT with scattered gravel (Weathered TILL)	12.5	5	
BOTTOM OF BORING COMPLETED 12-15-81	14.3		



LEGEND

I 2" O.D. split spoon sample

II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:

Liquid limit

Natural water content

Plastic limit

Impervious seal

Water level

Piezometer tip

P Sample pushed

NOTE; The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

RAINIER VALLEY CLINIC
SEATTLE, WASHINGTON

LOG OF BORING B-2

JANUARY 1982 W-3918-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 4

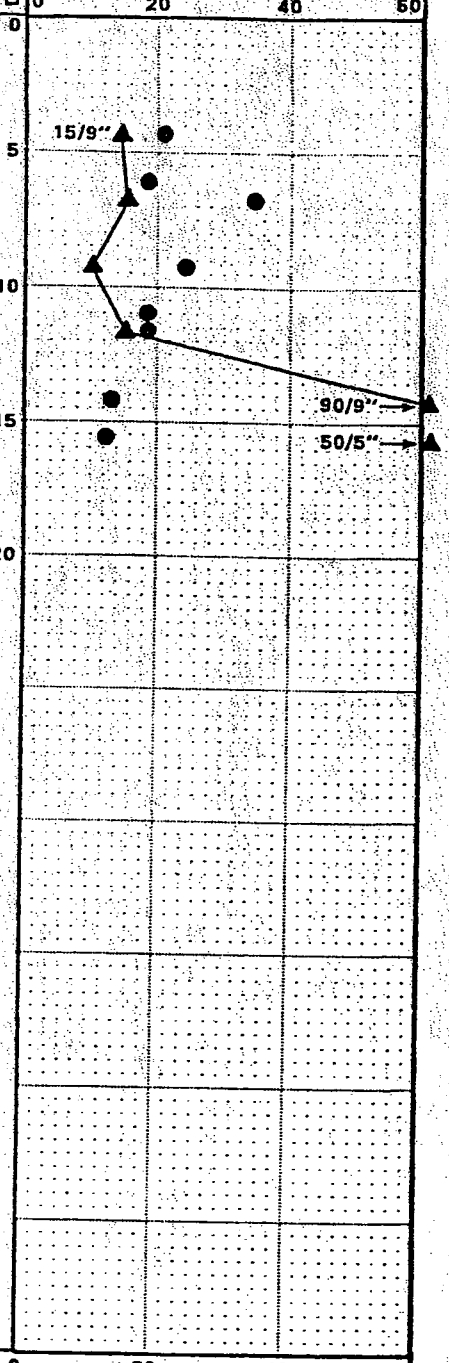
SOIL DESCRIPTION

Surface Elevation: APPROX. 37.5 FT.

Description	Depth, ft.
ASPHALT	0.2
Coarse GRAVEL (FILL)	1
Medium dense, gray, slightly gravelly, sandy SILT with organics, gasoline odor	
Stiff, brown SILT with sand, numerous organics and a trace of gravel	6.5
Medium dense, gray, slightly gravelly, sandy SILT with organics, gasoline odor	8
Medium dense, brown, silty fine SAND, scattered silt layers, trace of gravel	11
Very dense, brown, slightly gravelly, silty SAND with clean sand lenses (Weathered TILL)	12.5
BOTTOM OF BORING COMPLETED 12-15-81	15.9

SAMPLES: 1, 2, 3, 4, 5, 6

GROUND WATER: NO WATER OBSERVED DURING DRILLING



LEGEND

I 2" O.D. split spoon sample

II 3" O.D. thin-wall sample

*Sample not recovered

Impervious seal

Water level

Piezometer tip

P Sample pushed

Atterberg Limits:

Liquid limit

Natural water content

Plastic limit

NOTE; The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

RAINIER VALLEY CLINIC
SEATTLE, WASHINGTON

LOG OF BORING B-3

JANUARY 1982

W-3918-01

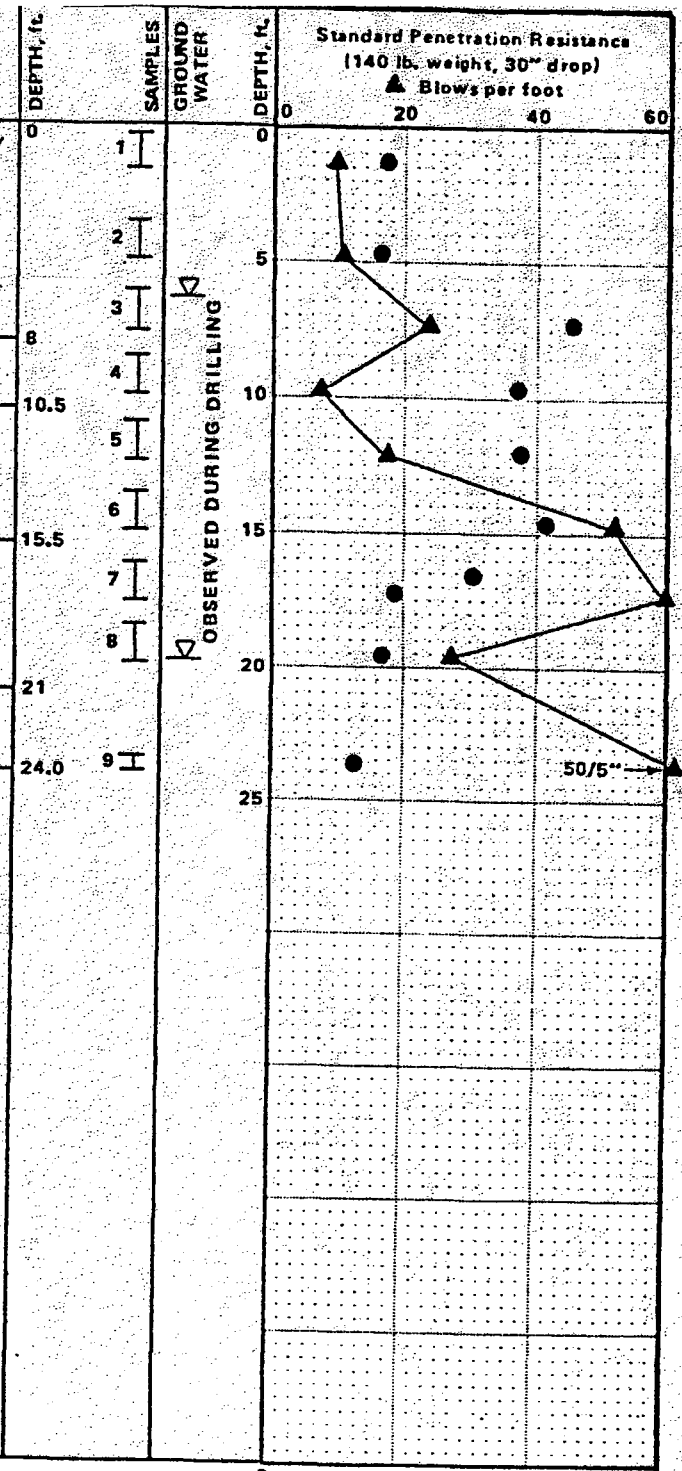
SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 5

SOIL DESCRIPTION

Surface Elevation: APPROX. 28.5 FT.

Soil description	Depth, ft.
Medium dense, brown, silty sandy GRAVEL and gravelly silty SAND with numerous organics and wood fragments	0
Medium stiff, black to brown SILT with clay, sand, organics and wood fragments	8
Very stiff, mottled brown and gray, silty CLAY with organics	10.5
Medium to very dense, layered, sandy SILT and silty SAND	15.5
Very dense, gray, gravelly, silty SAND	21
BOTTOM OF BORING COMPLETED 12-15-81	24.0



LEGEND

I 2" O.D. split spoon sample

II 3" O.D. thin-wall sample

*Sample not recovered

Atterberg Limits:

Liquid limit

Natural water content

Plastic limit

Impervious seal

Water level

Piezometer tip

P Sample pushed

NOTE: The stratification lines represent the approximate boundaries between soil types and the transition may be gradual.

RAINIER VALLEY CLINIC
SEATTLE, WASHINGTON

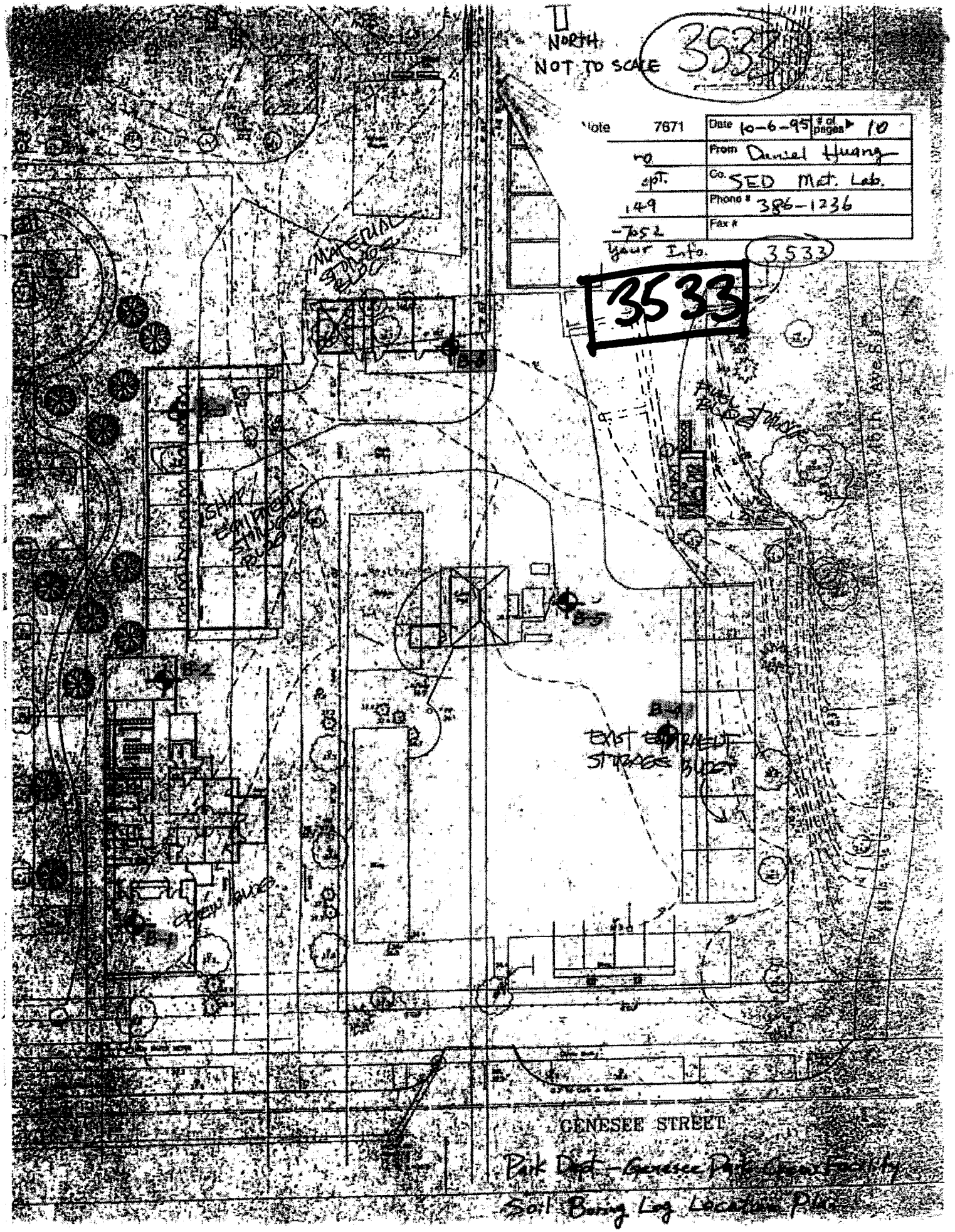
LOG OF BORING B-4

JANUARY 1982

W-3918-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 6


NORTH
NOT TO SCALE
3533
Note 7671
Date 10-6-95
# of pages ▶ 10
From Daniel Huang
Co. SED Mat. Lab.
Phone # 386-1236
Fax #
Your Info. 3533
3533
MATERIAL STORAGE BLDG
EXIST EQUIPMENT STORAGE BLDG
GENESEE STREET
Park Dept - Genesee Pool Complex Facility
Soil Boring Log Location Plan

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-1 (1/2)

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Location plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
FILL							Crushed Rock surface				
							slow Drilling				
							- - - - - - - - -				
							Easy Drilling				
	5'	①	6	8	7	15	Silty SAND & GRAVEL	Med. Dense	Slightly Moist	Bluish Gray	
FILL	10'	②	45	8	13	21	Mottled Dark Gray Sandy SILT and Black PEAT		Moist	DK Gray/ Black	
FILL	15'	③	12	10	13	23	Sandy SILT with Gravel	Med Dense	Wet	DK Gray	Methane Gas ELE = 99% ▽ G.W. (9-25-95 Estimated)
LANDFILL REFUSE BURNED RUBBISH	20'	④	21	20	12	32	LANDFILL, Coal Ash, Broken Glasses, & Organic Matter. (Black Color Water from Auger)		Wet-Saturated	Black	
ORIGINAL TOP SOIL LAYER	25'	⑤	35	21	20	41	Black organic SAND with Silt		Saturated	Black	
							Brown Organic SILT (6" at Top)		Wet	Brown	
	30'	⑥	9	10	10	20	Fibrious PEAT		Wet	Brown	

INSPECTOR DH

— continued —

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-1 (2/2)

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV.

LOCATION See Location Plan.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
SILT	35'	1	40	40	50/3		6" Bluish Gray SAND w/ Silt		Wet	Bluish Gray	No Methane Gas
							10" Light Gray SILT	HARD	Moist	Light Gray	
							(A large Gravel in Sampler)				
							END OF Hole at 36.5'				

INSPECTOR DH

CS 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-2 (1/2)

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							Crushed Rock				
							Slow Drilling				
							— · — —				
							Easy Drilling				
	5	①	25	10	8	18	No Recovery				
FILL											No Methane Gas
FILL	10	②	11	11	12	23	Dark Gray Silty fine SAND/Sandy SILT w/ Scattered Black Sand and Occasional pebbles	Med. Dense	Moist	DK Gray	
											▽ Estimated G.W. 9-25-95
LANDFILL REFUSE	15	③	4	2	3	5	LANDFILL REFUSE. Coal Ash, Burned Rubbish.	Soft	Saturated	Black	
	20	④	4	4	7	11	Refuse. Burned Rubbish. 1" Organic CLAY @ tip	Loose	Sat.	Black	No Methane Gas
ORIGINAL TOP SOIL LAYER	25'	⑤	4	6	8	14	Organic SILT w/ Gray degraded unknown Matter		Wet	Brown	
							Rock Blocked Drilling @ 29'				
	30'	7.		50/1"			Rock Fragment @ tip. No Recovery Retry				

— CONTINUED —

INSPECTOR DH

CS 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-2 (2/2)

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV.

LOCATION See Plan.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
HARD NATIVE SOIL		6	20	21	23	44	Retry, Pack Rock Anchor.				
							Greenish Gray, 1" Recovery, S.H.		Moist	Greenish Gray	
		7	21	50	5"		SILT. Gray w/ Oxidized yellow	Hard	Moist	Gray	
							spots.				
	35	8	45	50	5"		SILT w/ Little Clay & fine Sand.	Hard	Moist	DK. Gray	
							(Hard to retrieve Sampler due				
							to high adhesion)				
		9	25	40	25	.65	SILT w/ fine Sand lenses	Hard	Slightly Moist	Bluish Gray	
							(Hard to retrieve Sampler due				
							to adhesion)				

INSPECTOR DH

CB 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-3 (1/2)

PROJECT Park Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							Crushed Rock.				
FILL	5'	1/2 1/3	①	3	6	8	14	Silty CLAY w/ Med. Sand Lenses	Med Dense	Moist	DK Gray
	10'	1/2 1/2	②	5	5	6	11	Silty Fine—Med SAND	Med Dense	Moist	DK Gray	No Meth. Gas
	15'	1/2 1/3	③	14	14	10	24	Silty Sand	Med Dense	Saturated	DK Gray	▽ Est: 9-25-95
LANDFILL	20'	1/2 1/3	④	3	5	7	12	Burned RUBBISH. w/ organic Matter	Med Dense	Sat.	Black
ORIGINAL TOP LAYER	25	1/2 1/2	⑤	9	10	11	21	Organic SILT 6" PEAT @ tip	V. stiff		Brown/DK Brown	No Meth. Gas
	30'	1/2 1/2	⑥	21	30	40	70	SILT w/ Some Sand	V DENSE	Slightly Moist	Greenish Gray

(Continued)

INSPECTOR DH

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CE 7.243

LOG OF TEST BORING

DATE 9-25-95

HOLE NO. B-3 (2/2)

PROJECT Park Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Plan.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
NATIVE HARD SILT/SILTY CLAY	35"	1/6 ①	35 50/5"		SILT. Hard to Retrieve Sampler due to high Adhesion of silt.	Hard.	slightly Moist	Gray with orange and yellow spotts	
	40	1/6 ②	40 50/5"		Silty CLAY Hard to retrieve Sampler due to adhesion.	Hard.	Moist	Bluish Gray	

INSPECTOR DH

CB 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-26-95

HOLE NO. B-4

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							3" Pavement, 8" Crushed Rock				
							Gravelly Silt w/ Sand and				
Organic Silt							Organic Matter (FILL)				
Med Dense Silty SAND	5'		①	6	10	11	21	Silty SAND w/ Occ. Gravel	Med. Dense	Moist	Greenish Gray
							Color changed to Light Gray				
	10'		②	14	30	34	64	Mottled tan/Gray SILT w/ little	Hard	Slightly Moist	Tan/Gray
							fine Sand. 4" of Dark Gray				
Hard SILT							Clayey SILT at Sampler tip				
	15'		③	8	18	30	48	Dk. Gray Clayey SILT interbedded w/ Mottled	Hard	Moist	Dk. Gray
							tan/Gray SILT				
							End at 16.5'				

No Seep Flatline

INSPECTOR DH

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-26-95

HOLE NO. B-5

PROJECT Parks Dept. Genesee Park Crew Headquarter Facility

GRD. ELEV. N/A

LOCATION See Location Plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							3" AC Pavement 6" Crushed		Moist	Dark Gray	
							Rock				
							Landfill – string smell		Very Moist	Black	
							dark Gray Silt				
	5'										
		①	18	5	9	14	6" Black Organic Matter		Moist	Black	
							6" Grenish Gray Clayey Silt		Moist	Grenish Gray	
							Harder Drilling 8'–9'				
	10'										
		②	35	50/8"		50/6"	Silty fine SAND w/ occ Gravel		Moist	Yellowish Gray	
							(A rock fragment in Sampler)				
		③	50/1"				Rock fragment in Sampler.				
							Believe a large pebble at Tip. Stopped				
	15'						at 12'				

INSPECTOR DH.

CS 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 9-26-95

HOLE NO. B-6

PROJECT Genesee Park Crew Headquarter Facility

GRD. ELEV.

LOCATION See Plan

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							Crushed Rock Surface with Silt.				
		①	3	5	4	9	Silty fine SAND/Sandy SILT		Moist	Light Brown	
	5'	②	3	2	4	6	Silty SAND			Tan/lt. Brown	
							Lower 6" DK. Gray Silty SAND/ Sandy SILT		V. Moist	DK. Gray	
		③	2	2	2	4	Refuse, Organic Matter and Burned Rubbish.		Wet	Black	
	10'										No Methane Gas
Refuse Landfill		④	8	16	13	29	A wood chip at Sampler tip		Wet	Black	
	15'						Refuse, Burned Rubbish & Organic Matter				Estimated G.W. 9-26-9
		⑤	16	9	8	17	10" Black Refuse		Saturated		
Original Top Soil Layer	20'						8" Bluish Gray clayey SILT w/ Sand		Wet		
							(Slow Drilling at 24')				
		⑥	5	19	26	45	8" Silty SAND/Sandy SILT.		Saturated		
Hard Native SILT	25						3" DK Gray SILT	V. Stiff	V. Moist		
							7" Mottled Tan/Gray SILT	Hard.	Moist		
		⑦	18	37	50/5"		Mottled Gray/Orange yellow/dark Gray SILT w/ little Sand and Occasional Gravel.	Hard	Slightly Moist		

End @ 29'

INSPECTOR DH

No Site Plan Provided

3659

CB 7.241

SEATTLE ENGINEERING DEPARTMENT

MATERIALS LABORATORY

LOG OF TEST BORING

DATE 7.2.84 HOLE NO. 1

PROJECT Pritchard/Seward CSO Contract 3 GRD. ELEV. +20

LOCATION S of Juneaus on Lake Wh. Blvd

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
Loose to medium SILT & fine sandy SILT		A	1 1	1	SANDY SILT w/trace clay	LOOSE	MOIST	GRAY	
	5								
		B	3 6 8	14	SILT disturbed	Medium	Moist to Dry	Gray	▽ 7/3/84
	10				Hard Drilling				
Very Compact weathered SILTSTONE w/sand layers		C	50/5"	50+	SILT w/siltstone	very compact	WET	GRAY	
	15								
		D	19 40 50/2"	50+	weathered SILTSTONE w/fine sand layer	VERY COMPACT	MOIST w/WET LAYERS	GRAY	PIEZO INSTALLED SAND IN TIP
BOTTOM 7.2.84	20								
	25								

10594

INSPECTOR J Ram

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CB 7.241

LOG OF TEST BORING

DATE 7-2-84 HOLE NO. 2

PROJECT PRITCHARD / SEWER PARK CSO CR3 GRD. ELEV. +20

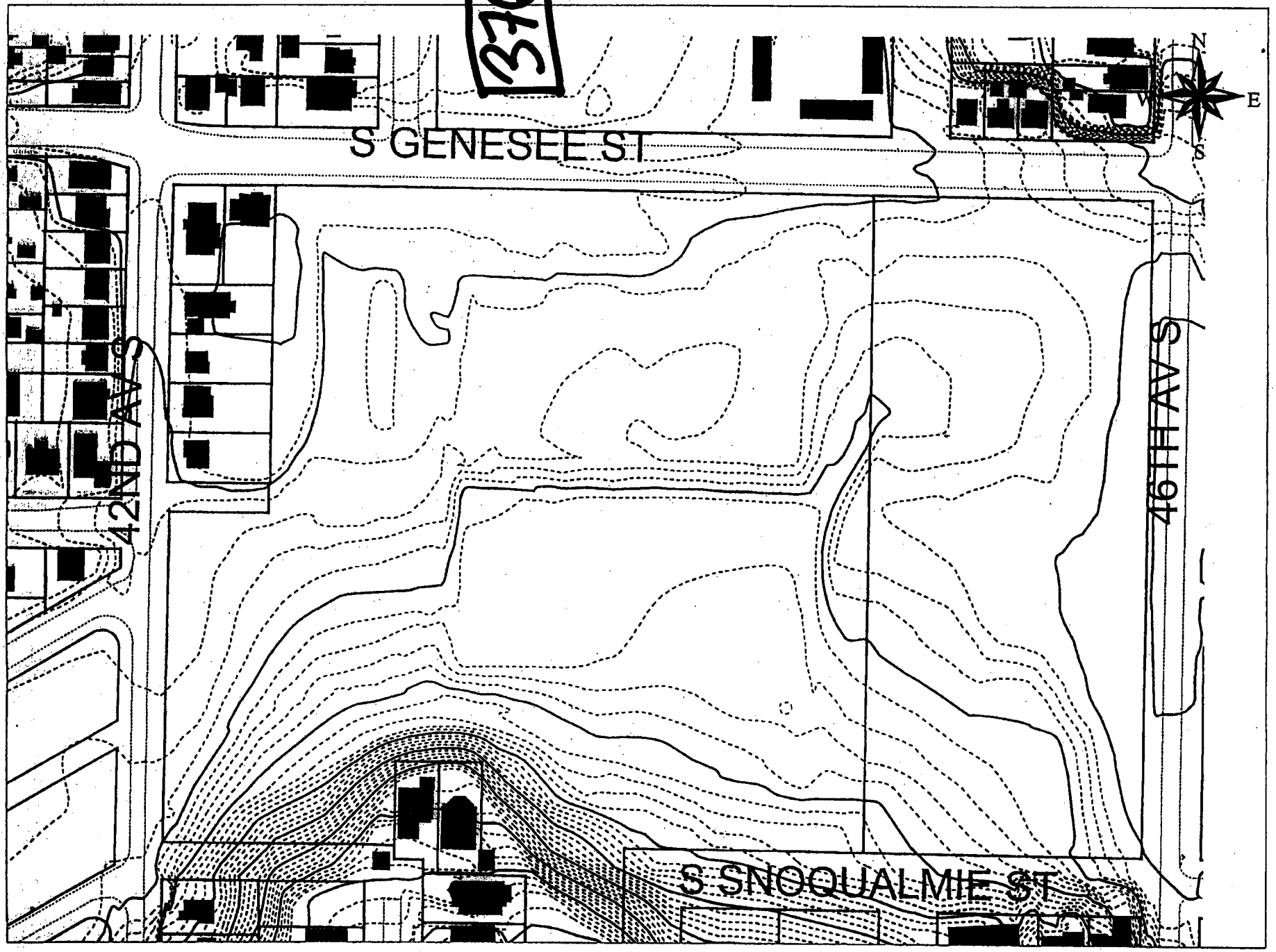
LOCATION 85' S ℄ S. Juneau St on LAKE WA BLVD

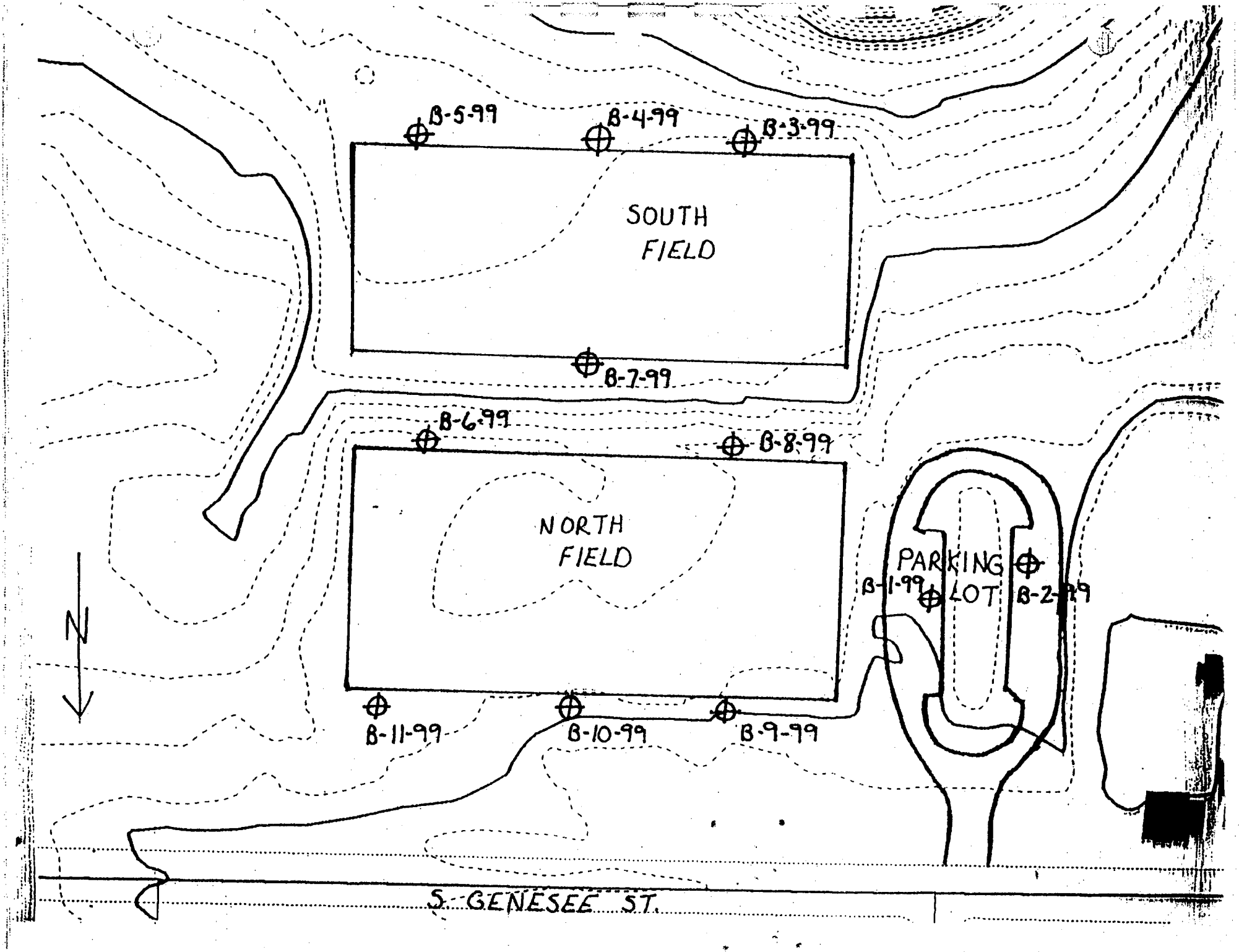
STRATA	DEPTH	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
Loose to Firm fine sandy SILT		A	1 2	2	Fine SAND-SILT w/trace clay in layer	LOOSE	WET	MODELED RUST-GRAY	
	5								▽ 7/3/84
		B	2 5 6	11	SAME	FIRM	MOIST	GRAY	
	10								
Hard Drilling		C	9 25 35	60	NO RECOVERY ON A ROCK				
	15				Hard Drilling				Open Hole
		D	50/6"	50+	NO RECOVERY ON A ROCK 2½" Gravel				
BOTTOM 7-2-84	20								

10594

INSPECTOR J Karna

3768




B-5-99
B-4-99
B-3-99
SOUTH FIELD
B-7-99
B-6-99
B-8-99
NORTH FIELD
PARKING LOT
B-1-99
B-2-99
N
B-11-99
B-10-99
B-9-99
S. GENESEE ST.

Seattle Public Utilities	SOIL BORING LOG NO. B-1-99

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	East Half of Parking Lot		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 31
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-19-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
								at surface– 2" OF ASPHALT		
		1		11,11,12	23		ML	at 2.5'– SILT W/ FINE SAND AND TRACE OF ORGANICS greenish gray, damp, med dense (FILL)		
5		2		4,5,7	12		ML	at 5'– SAME AS ABOVE greenish gray, moist, med dense (FILL)		
		3		6,12,22	34		ML	at 7.5'– 6" of SAME AS ABOVE, greenish gray, moist (FILL)		
	Ga						Garbage	SANDY SILT W/ GARBAGE, olive brown, damp, dense		
10		4		7,6,8	14		Garbage	at 10'– SILT W/ PAPER GARBAGE, dk gray, moist, med dense (GARBAGE)		
15	Ga	5		12,14,36	50		Garbage	at 15'– WOOD GARBAGE W/ SILT AND FINE SAND dk brownish-gray, wet, med dense (GARBAGE)		
20	Ga	6		5,7,16	23		Garbage	at 20'– WOOD (POOR RECOVERY) dk. brownish-gray, wet, med dense (GARBAGE)		74% LEL
25		7		5,13,28	41		ML	at 25'– SILT W/ RUST COLORED AND BROWN TREE ROOTS gray-brown, damp, dense (NATIVE)		
30		8		10,18,30	48		ML	at 30'– SAME AS ABOVE W/ NO ROOTS grayish-brown, damp, dense (NATIVE)		
								BOH at 31 feet		
35										

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. B-2-99

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	West half of Parking Lot		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 36
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-19-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION *In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)*	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES *Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.*
								at surface– 2-3" OF ASPHALT		
		1		4,6,7	13		ML	at 2.5'– SANDY SILT, olive gray, damp, med dense (FILL)		
5		2		2,6,8	14		ML	at 5'– SILT W/ TRACE OF WOOD olive gray, damp, med dense (FILL)		
	Ga									
10		3		5,12,14	26		Garbage	at 10'– PAPER AND BURNT WOOD GARBAGE W/ SILT dk gray and black, damp, med dense (GARBAGE)		
15	Ga			50/3"	50/3"		Garbage	at 15'– (NO RECOVERY), very dense (GARBAGE?)		
										0% LEL
20	Ga			8,10,12	22		Garbage	at 20'– (NO RECOVERY), med dense (GARBAGE?)		refusal at 22' due to
		4		33,6,10	16			at 20', second location, TRACE OF SILT AND GARBAGE DEBRIS AT 23-24 FEET (GARBAGE)		concrete or rock; moved 9' north and began sampling at 20 feet
										G.W. at time ▼
25		5		1,1,2	3		SP	at 25'– MEDIUM TO COARSE SAND, moist, loose (NATIVE)		of drilling
30		6		5,9,14	23		SP	at 30'– FINE TO MEDIUM SAND, moist, med. dense (NATIVE)		
35		7		33,50	100		ML	at 35'– SILT W/ SAND AND GRAVEL, gray, damp, very dense		

REMARKS: BOH at 36 feet

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	85 feet East and 10 feet South of Southwest corner of South Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 31.5
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)
		1		5,8,4	12		ML	at 2.5'– FINE SILTY SAND W/ GARBAGE (FILL)
								brown, damp, med dense
5	Ga	2		11,17,7	24		Garbage	at 5'– CLAY W/ PAPER, PLASTIC AND RUBBER GARBAGE
								dk gray, damp, med dense (GARBAGE)
10	Ga			11,20,4	24		Garbage	at 10'– (NO RECOVERY), med dense (GARBAGE?)
15	Ga			6,6,17	23		Garbage	at 15'– (NO RECOVERY), med dense (GARBAGE?)
20		3		8,17,38	55		ML	at 20'– CLAYEY SILT W/ TRACE OF ORGANICS
								bluish-gray, damp, dense (NATIVE)
25		4		7,12,15	27		ML	at 25'– SAME AS ABOVE, bluish gray, damp, med dense
								(NATIVE)
30		5		7,17,28	45		ML	at 30'– SAME AS ABOVE, bluish gray, damp, dense
								(NATIVE)
								BOH at 31.5 feet
35								

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

NOTES: Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.

G.W. on 8/18/1999

100% LEL

REMARKS

Bentonite

Sand

2" Slotted PVC

2" Solid PVC

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	189 feet East and 10 feet South of Southwest corner of South Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 31.5
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		12,11,9	20		SM-ML	at 2.5'-- SILTY SAND TO SANDY SILT brownish-gray, damp, med dense (FILL)		
5		2		3,4,15	19		SM-ML	at 5'-- SAME AS ABOVE gray, damp, med dense (FILL)		
		3		4,5,26	31		SM-ML	at 7.5'-- SILT W/ GARBAGE, gray, damp, dense		
10	Ga	4		39,48,15	63		Garbage	at 10'-- SANDY SILT W/ SOME GARBAGE brownish gray, damp, very dense (GARBAGE)		
	Ga			15,4,38	42		Garbage	at 12.5'-- (NO RECOVERY), dense (GARBAGE?)		
15	Ga	5		9,10,50/4"	85		Garbage	at 15'-- SILT AND SILTY SAND W/ GARBAGE gray, damp, very dense (GARBAGE)		
20	Ga	6		10,15,24	39		Garbage	at 20'-- SILT W/ GARBAGE AND SILTY SAND brownish gray, damp, dense (GARBAGE)		Possible G.W. seepage around interface of grabage and native
25		7		15,30,50/3"	130		ML	at 25'-- SILT W/ FIBROUS ORGANICS gray and brown, damp, very dense (NATIVE)		
30		8		11,15,50/3"	115		ML	at 30'-- SILT W/ TRACE OF SAND AND GRAVEL grayish brown, damp, very dense (NATIVE)		
35								BOH at 31.5 feet		

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. B-5-99

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	54 feet West and 9 feet South of Southeast corner of South Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 36
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
				10,15,12	27		SM-ML	at 2.5'– (NO RECOVERY), med dense (FILL)	
5		1		4,6,8	14		SM-ML	at 5'– SILTY SAND, gray, damp, med dense (FILL)	
		2		8,3,6	9		SM-ML	at 7.5'– SILT AND SILTY SAND, brownish-gray, damp, loose	
								(TOP OF GARBAGE)	
10	Ga	3		8,3,5	8		Garbage	at 10'– (NO RECOVERY), loose (GARBAGE?)	
15	Ga	4		36,21,20	41		Garbage	at 15'– SILTY SAND W/ BROWN DEBRIS, dk grayish-brown damp, dense (GARBAGE)	
20	Ga	5		50/3"	50/3"		Garbage	at 20'– SILTY SAND W/ WHITE PLASTIC GARBAGE grayish brown, damp, very dense (GARBAGE)	G.W. on 8/19/99
25	Ga	6		37,25,38	63		Garbage	at 25'– SILTY SAND W/ WOOD AND CONCRETE brownish-gray, moist, very dense (GARBAGE)	
30	Ga			27,10,15	25		Garbage	at 30'– (NO RECOVERY) EXECPT FOR TRACE OF WOOD med dense (GARBAGE?)	
35		7		8,50,50/3"	150		ML	at 35'– SILT, gray, damp, very dense (NATIVE)	

GRAPHS: SPT, blow/ft; Moisture % (0, 20, 40, 60)

REMARKS: BOH at 36 feet

Bentonite; Sand; 2" Slotted PVC; 2" Solid PVC

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	54 feet West and 10 feet South of Southeast corner North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 29
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-18-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		1,2,5	7		ML-SM	at 2.5'–SILTY SAND, gray, moist, loose (FILL)	
5		2		2,9,50/2"	159		ML	at 5'– SILT W/ POSSIBLY CHUNKS OF ASPHALT gray, damp, very dense (FILL)	
		3		50/2"	50/2"		Garbage	at 7.5'– PLASTIC GARBAGE W/ SILT dk gray, moist, very dense (GARBAGE)	
10	Ga	4		16,50/6"	100		Garbage	at 10'– SILTY SAND W/ GARBAGE AND WOOD CHUNKS dk gray, damp, very dense (GARBAGE)	100% LEL
				16,20,22	42		Garbage	at 12.5'– (NO RECOVERY), dense (GARBAGE?)	
15	Ga			50/3"	50/3"		Garbage	at 15'– (NO RECOVERY), very dense (GARBAGE?)	
20	Ga			35,50	100		Garbage	at 20'– (POOR RECOVERY), SILTY SAND W/ WOOD dk gray, damp, very dense (GARBAGE)	Auger refusal at 21' Relocated hole 14' to the east and started sampling at 20 feet 0% LEL
25	Ga			35,20,25	45		Garbage	at 25'– (NO RECOVERY) SANDY SILT CUTTINGS W/ PLASTIC, PAPER GARBAGE, dense	
								Native material not encountered	G.W. on 8/19/1999
30								BOH at 29 feet due to auger refusal	
35									

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS

Bentonite; Sand; 2" Slotted PVC; 2" Solid PVC

Seattle Public Utilities

SOIL BORING LOG NO. B-7-99-0[illegible]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	183' West of North Playfield, and 3' North of Paved Walkway		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 66
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-18-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		2,4,6	10		SM-ML	at 2.5'--SILTY SAND TO SANDY SILT W/ SOME ASPHALT, gray, moist, bose (FILL)		
5		2		4,4,4	8		SM-ML	at 5'-- SILTY SAND TO SANDY SILT, gray, moist, bose (FILL)		
	Ga	3		9,9,8	17		Garbage	at 7.5'-- PAPER GARBAGE W/ SANDY SILT dk gray, moist, med dense (GARBAGE)		
10	Ga	4		4,7,9	16		Garbage	at 10'-- PAPER AND PLASTIC GARBAGE W/ SILT dk gray, moist, med dense (GARBAGE)		
15	Ga	5		6,6,7	13		Garbage	at 15'-- PLASTIC AND GLASS GARBAGE, grayish brown moist, med dense (GARBAGE)		
20	Ga	6		2,2,3	5		Garbage	at 20'-- SAME AS ABOVE, dk gray, moist, bose dk gray, damp, very dense (GARBAGE)		Possible perched water at 20 feet
25	Ga	7		16,15,13	28		Garbage	at 25'-- GARBAGE W/ SILT gray-black, damp, med dense (GARBAGE)		22% LEL
30	Ga	8		33,22,22	44		Garbage	at 30'-- GARBAGE, gray, damp, dense		
35	Ga	9		100/6"	100/6"		Garbage	at 35'-- WOOD AND PLASTIC GARBAGE, black, damp, very dense		Possible G.W. at time of drilling

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. B-7-99 (2/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	183' West of North Playfield, and 3' North of Paved Walkway		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 66
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-18-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
	Ga						Garbage			
40		10		10,6,11	17		ML	at 40'– SILT W/ WOOD CHUNKS AND TRACE OF ORGANICS brown and gray, damp, med dense (NATIVE)		
45		11		3,7,12	19		ML	at 45'– SAME AS ABOVE, gray and brown, damp, med dense (NATIVE)		
50		12		5,10,15	25		ML	at 50'– SAME AS ABOVE, gray and brown, damp, med dense (NATIVE)		
55		13		2,3,5	8		ML	at 55'– SAME AS ABOVE, gray and brown, moist, loose (NATIVE)		
60		14		5,12,16	28		ML	at 60'– SAME AS ABOVE W/ SAND LENSES gray and brown, moist, med dense (NATIVE)		
65		15		18,31,50/6"	81		ML SM	at 65'– SANDY SILT TO SILTY SAND W/ TRACE OF ORGANICS gray, moist, dense (NATIVE)		
								BOH at 66 feet		
70										

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields		WO#: NS90154
LOCATION:	91' East and 7' South of Southwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)		GROUND ELEVATION (ft):
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 60
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-17-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		4,5,5	10		SM	at 2.5'-- SILT W/ FINE TO MED. SAND brown and gray, damp, bose (FILL)	
5		2		2,4,15	19		SM-ML	at 5'-- SILT W/ FINE TO MED. SAND brown and gray, moist, med dense (FILL)	
		3		4,2,4	6		ML	at 7.5'-- SANDY SILT, brown and gray, damp, bose (FILL)	
10		4		28,17,7	24		ML	at 10'-- SAME AS ABOVE W/ GRAVEL IN SHOE brown and gray, moist, med dense (FILL)	
	Ga	5		16,15,16	31		Garbage	at 12.5'-- (POOR RECOVERY), dense (GARBAGE)	100% LEL
15	Ga			12,13,21	33		Garbage	at 15'-- (NO RECOVERY), GARBAGE IN CUTTINGS dense (GARBAGE?)	
20	Ga	6		17,8,9	17		Garbage	at 20'-- (POOR RECOVERY), SANDY SILT W/ TRACE OF PLASTICS dk brown and gray, wet, med dense (GARBAGE)	G.W. on 8/19/1999
25	Ga	7		30,13,20	33		Garbage	at 25'-- (POOR RECOVERY), SANDY SILT dk brown, wet, dense (GARBAGE)	
30	Ga			50/5"	50/5"		Garbage	at 30'-- (NO RECOVERY), very dense (GARBAGE?)	35% LEL
35	Ga	8		50/3"	50/3"		Garbage	at 35'-- (POOR RECOVERY), SILT AND SAND W/ SOME ORGANICS	

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS

Bentonite
Sand
2" Slotted PVC
2" Solid PVC

Seattle Public Utilities

SOIL BORING LOG NO. B-8-99 (2/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	91' East and 7' South of Southwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 60
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-17-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION *In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)*	NOTES *Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.*
	Ga						Garbage		
40		8		8,12,20	19		ML?	at 40'– SANDY SILT W/ SOME FIBROUS ORGANICS AND SMALL PIECES OF WOOD, dk gray, moist, dense	Blow Counts affected by wood; sample does not seem dense
45				15,15,20	35		ML?	at 45'– (NO RECOVERY), dense (NATIVE?)	
50				30,34,40	74		ML?	at 50'– (NO RECOVERY), dense (NATIVE?)	
55		9		50/3"	50/3"		ML	at 55'– (POOR RECOVERY), SANDY SILT	
		10		50/1"	50/1"			dk gray, very dense, wet (NATIVE)	
60		11		22,50/5"	120		ML	at 60'– SILT, gray, damp, very dense (NATIVE)	
65									
70									

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS

Bentonite
Sand
2" Slotted PVC
2" Solid PVC

Seattle Public Utilities

SOIL BORING LOG NO. B-9-99 (1/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	78' East and 12' North of Northwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 56
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-17-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		3,6,22	28		SM	at 2.5'– SILTY SAND W/ FINE TO MED. SAND AND 5% COARSE SAND, brown, damp, med dense (FILL)	
5		2		6,8,12	20		SM-ML	at 5'– SILTY SAND TO SANDY SILT W/ MOSTLY FINE SAND gray, moist, med dense (FILL)	
	Ga			40,45,12	57		Garbage?	at 7.5'– (POOR RECOVERY), ROCK IN SAMPLER dense (GARBAGE)	
10	Ga	3		12,15,6	21		Garbage	at 10'– GARBAGE, black and gray, damp, med dense	
15	Ga	4		10,7,12	19		Garbage	at 15'– SAME AS ABOVE, black and gray, damp, med dense	
20	Ga	5		10,6,12	18		Garbage	at 20'– (POOR RECOVERY), FINE SILTY SAND W/ TRACE OF METAL GARBAGE, dk gray, moist, med dense	2% LEL
25	Ga	6		50/4"	50/4"		Garbage	at 25'– (POOR RECOVERY), dk gray, damp, very dense (GARBAGE)	G.W. at time of drilling
30	Ga	7		50/5"	50/5"		Garbage	at 30'– (POOR RECOVERY), GRAVEL AND GARBAGE dk gray, wet, very dense	
35		8		50,35,20	55		SM	at 35'– (POOR RECOVERY), SILTY SAND, gray, wet,very dense	

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. B-9-99 (2/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	78' East and 12' North of Northwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 56
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-17-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION *In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)*	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES *Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.*
							SM			
40		9		9,9,15	24		ML	at 40'– SILT W/ FINE SAND LENSES gray, moist, med dense (NATIVE)		1% LEL
45		10		6,6,12	18		ML	at 45'– SAME AS ABOVE, gray, moist, med dense (NATIVE)		
50		11		6,12,18	30		ML	at 50'– SAME AS ABOVE, dk gray, moist, med dense (NATIVE)		
55		12		16,50/5"	120		ML	at 55'– SANDY SILT W/ SOME GRAVEL, dk gray, damp, very dense (NATIVE)		
60										
65										
70										

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	228' East and 10' North of Northwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 55
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %; 0 20 40 60)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		4,5,8	13		SM	at 2.5'– FINE TO MED. GRADE SILTY SAND gray and dk brown, moist, med dense (FILL)		
5		2		7,15,20	35		SM-ML	at 5'– SAME AS ABOVE W/ A LITTLE MORE SILT gray, moist, dense (FILL)		
				1,2,2	4			at 7.5'– (NO RECOVERY), ROCK IN SAMPLER base (FILL?)		
10		3		2,4,16	20		SM-ML	at 10'– SILTY SAND AND SANDY SILT INTERBEDDED W/ BLACK SAND, olive gray to dk gray, SM-moist ML-damp, med dense		
	Ga	4		12,18,27	45		Garbage	at 12.5'– (POOR RECOVERY), GARBAGE W/ SAND AND GRAVEL black, damp, dense		
15	Ga			25,33,25	58		Garbage	at 15'– (NO RECOVERY), very dense (GARBAGE?)		
20	Ga			39,9,12	21		Garbage	at 20'– (NO RECOVERY), ROCK IN SAMPLER, med dense (GARBAGE?)		
25	Ga	5		50/3"	50/3"		Garbage	at 25'– (POOR RECOVERY), WOOD IN SAMPLER very dense (GARBAGE)		
30	Ga	6		50/3"	50/3"		Garbage	at 30'– (POOR RECOVERY), WOOD W/ SOME SILTY SAND dk gray, moist, very dense (GARBAGE)		Possible G.W. at time of drilling
35	Ga	7		7,8,8	16		Garbage	at 35'– WOOD GARBAGE W/ SILT, SAND, AND GRAVEL dk reddish brown, wet, med dense (GARBAGE)		

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. B-10-99 (2/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	228' East and 10' North of Northwest corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 55
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	GRAPHS (SPT, blow/ft; Moisture %)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
	Ga						Garbage			
40		8		35,14,14	28		ML	at 40'– SANDY SILT W/ WOOD, dk reddish brown, wet, med dense (NATIVE?)		
45				40,15,50	65		SM-ML	at 45'– (NO RECOVERY), very dense (NATIVE?)		
50		9		50/3"	50/3"		SM-ML	at 50'– (POOR RECOVERY), SANDY SILT TO SILTY SAND dk brownish gray, wet, very dense (NATIVE)		
55		10		50/5"	50/5"		SP	at 55'– MED SIZED SAND W/ SOME FINES AND A TRACE OF COARSE SAND, dk brownish gray, wet very dense (NATIVE)		
								BOH at 55 feet		
60										
65										
70										

REMARKS

Seattle Public Utilities

SOIL BORING LOG NO. [redacted]

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	22' West and 13' North of Northeast corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 40
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

DEPTH, ft	STRATA	Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION (In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)	NOTES (Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.)
		1		6,14,8	22		ML-SM	at 2.5'--SILT AND FINE TO MED SILTY SAND olive brown, damp, med dense (FILL)	
5		2		6,7,20	27		ML	at 5'-- SILT W/ A LITTLE SAND, gray, damp, med dense (FILL)	
		3		4,5,4	9		ML	at 7.5'-- SILTY SAND W/ BLACK GRAVEL AND	
	Ga						Garbage	SOME DEBRIS, olive gray, moist, loose (GARBAGE)	
10	Ga	4		15,25,8	33		Garbage	at 10'-- GARBAGE W/ SANDY SILT, olive and black, damp dense (GARBAGE)	
15	Ga	5		9,10,12	22		Garbage	at 15'-- SAME AS ABOVE, black and brown, moist, med dense (GARBAGE)	
20	Ga	6		7,8,8	16		Garbage	at 20'-- (POOR RECOVERY), SAME AS ABOVE olive gray, damp, med dense (GARBAGE)	
25	Ga	7		3,5,5	10		Garbage	at 25'-- SAME AS ABOVE, dk grayish brown, moist, med dense (GARBAGE)	
									Possible G.W. at time of drilling
30	Ga	8		4,8,23	31		Garbage	at 30'-- GARBAGE AND SAND W/ SILT AND GRAVEL very dk brown, wet, dense	
35	Ga						Garbage	(Garbage)	

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS

Seattle Public Utilities

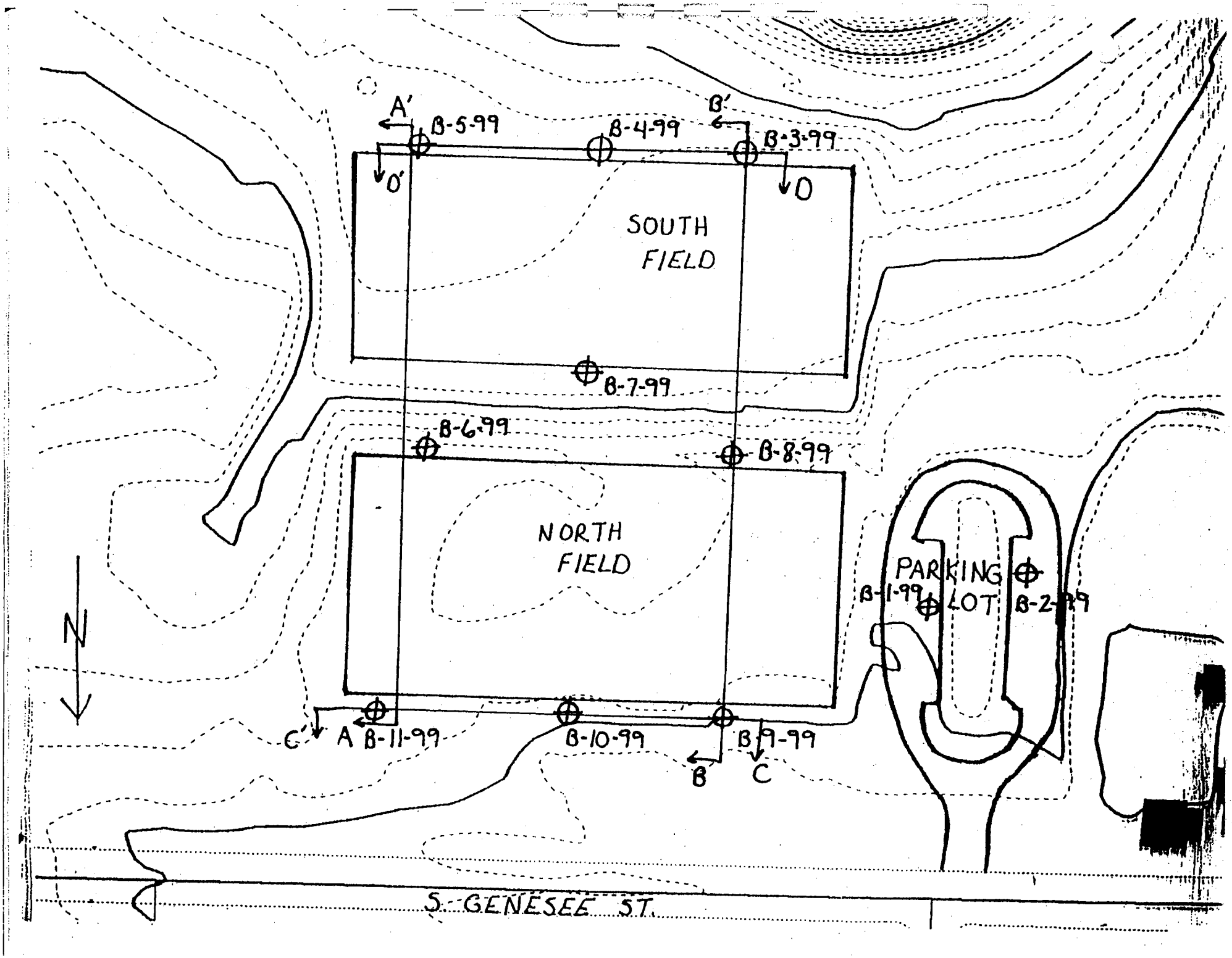
SOIL BORING LOG NO. B-11-99 (2/2)

PROJECT:	Genesse Park Playfields	WO#:	NS90154
LOCATION:	22' West and 13' North of Northeast corner of North Playfield		
METHOD:	Hollow Stem, Continuos Flight, 4 1/4" Auger (ASTM D-1586)	GROUND ELEVATION (ft):	
HAMMER:	Automatic Downhole hammer	HAMMER WEIGHT (lb): 140	HOLE DEPTH (ft): 40
SAMPLER:	2" OD Split-spoon	DROP (in): 30	G.W. DEPTH @ DRILLING (ft):
DRILLER:	Tacoma Pump	DRILL DATE: 8-16-99	LOGGED BY: KJ/JF

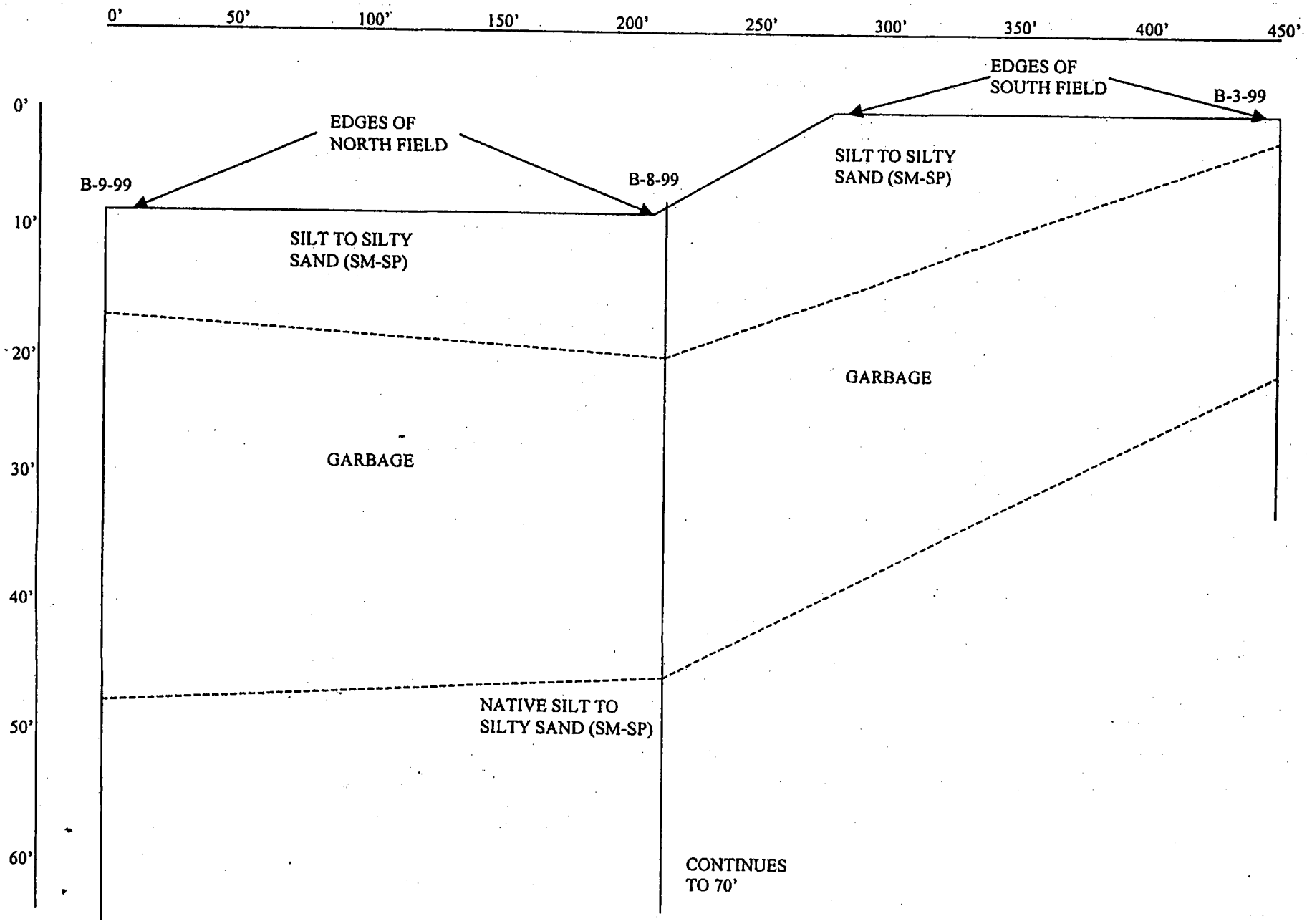
DEPTH, ft	STRATA	SAMPLE Sample #	Type	Blow Counts per 6"	SPT-N	Water %	USCS Symbol	SOIL DESCRIPTION *In the sequence of MAIN COMPOSITION (capital letters), Color, Moisture, Relative Density or Consistency, Soil Structure, and Mineralogy, etc.)*	GRAPHS (SPT, blow/ft; Moisture %)	NOTES *Wells, groundwater, casing, drilling rate, special tests & instrumentation, sample catcher, etc.*
35	Ga	9		4,5,12	17		Garbage	at 35'-- GARBAGE W/ SILT, SAND AND GRAVEL dk brownish gray, wet, med dense (GARBAGE)		
40		10		18,12,29	41		SM-SP	at 40'-- SILTY SAND TO SILT, SANDY AT TOP OF SAMPLE BECOMING MORE FINE TOWARDS THE BOTTOM, dk gray, wet, dense (NATIVE)		
								BOH at 40 feet		
45										
50										
55										
60										
65										
70										

GRAPHS: SPT, blow/ft; Moisture %; 0 20 40 60

REMARKS


A'
B-5-99
B-4-99
B'
B-3-99
D'
D
SOUTH
FIELD
B-7-99
B-6-99
B-8-99
NORTH
FIELD
PARKING
LOT
B-1-99
B-2-99
N
C'
A
B-11-99
B-10-99
B-9-99
B
C
S. GENESEE ST.

PROFILE B - B'


0'
50'
100'
150'
200'
250'
300'
350'
400'
450'
0'
10'
20'
30'
40'
50'
60'
EDGES OF NORTH FIELD
EDGES OF SOUTH FIELD
B-9-99
B-8-99
B-3-99
SILT TO SILTY SAND (SM-SP)
SILT TO SILTY SAND (SM-SP)
GARBAGE
GARBAGE
NATIVE SILT TO SILTY SAND (SM-SP)
CONTINUES TO 70'

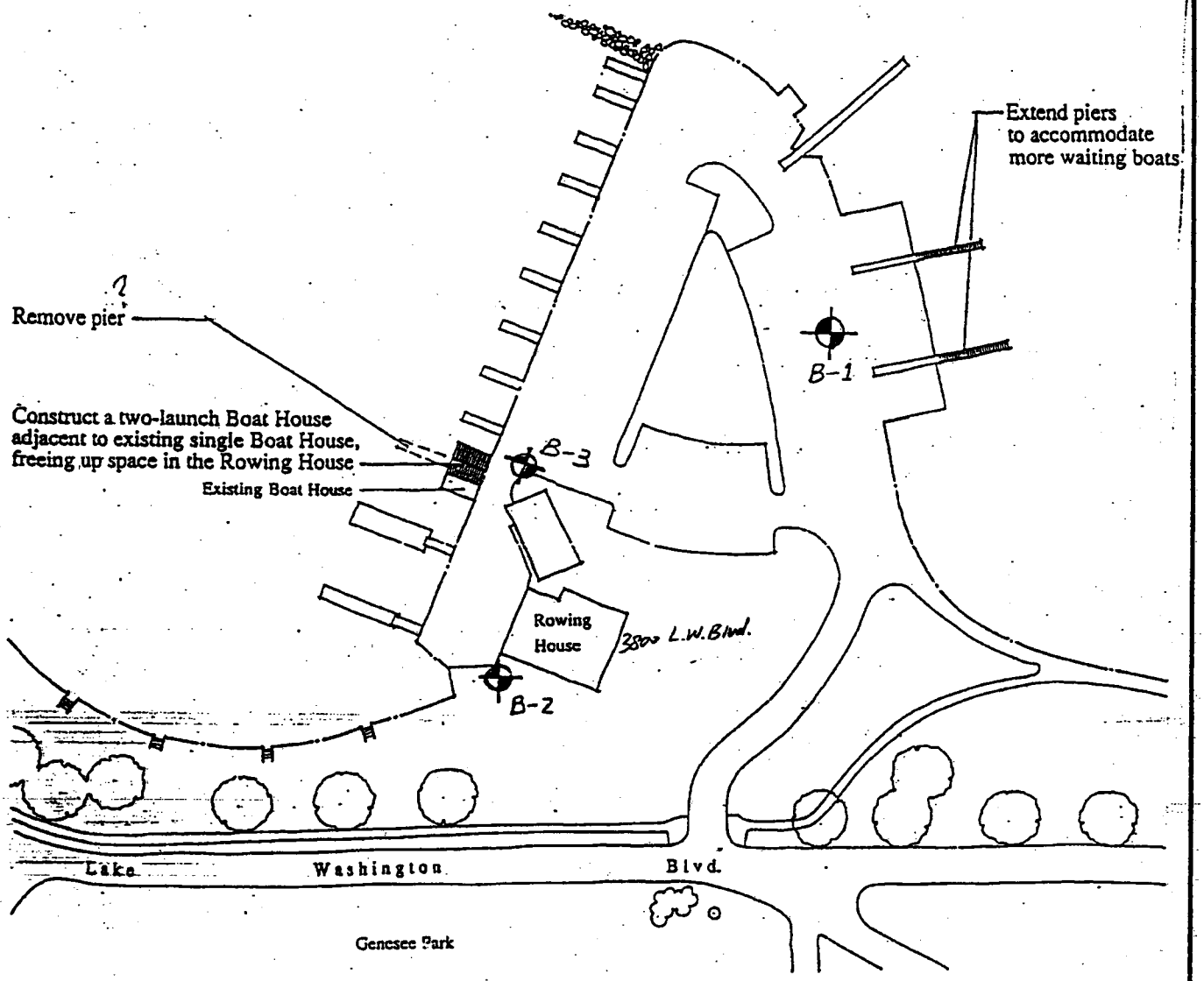
LEGEND:

B-1 APPROXIMATE HOLE LOCATION AND NUMBER

NORTH

NOT TO SCALE

3854



BORING LOCATIONS

BOAT HOUSE FOUNDATION

MOUNT BAKER ROWING CENTER

SEATTLE, WASHINGTON

Seattle Engineering Department • Materials Laboratory 386-1236

CS 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 12-15-95

HOLE NO. B-1

PROJECT Mount Baker Rowing Center – Boat house

GRD. ELEV. N/A

LOCATION Stan Sayers Park East of Parking Lot, 25' from water. see map

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
Sand with gravel (Fill?)							pavement				
							silty GRAVEL & SAND				▽ G.W.
		①	0	6	12	18	4" Gray SAND with gravel		wet		
							6" Lt Gray clayey SILT		V. moist		
	5	②	1	6	21	27	SILT with little fine sand	Stiff	Near dry	Lt. Gray	
Silt with occ. sand & gravel.		③	15	32	41	73	10" Light Gray fine sandy SILT	Hard	Moist	Lt. Gray	
							6" Light gray SILT mottled w/ med. sand.				
	10	④	34	50/4"		>50	fine sandy SILT (mottled with med. sand @ sampler tip)	Hard	slightly moist	Lt. Gray	
	15	⑤	24	36	50/1"	>50	10" Silty SAND & GRAVEL	Hard	V. moist	Gray	
							6" fine sandy SILT		Moist		
	20	⑥	50/5"			>50	SILT with fine sand & occa. gravel	Hard	slightly moist	DK Gray	
							END of Hole @ 21.5'				
							G.W. @ Lake level flowed into drilled hole through sandy layer @ 2'~5'				

INSPECTOR DH

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CB 7.241

LOG OF TEST BORING

DATE 12-15-95 HOLE NO. B-2

PROJECT Mount Baker Rowing Center — Boat House GRD. ELEV. NA

LOCATION 30' SW of Existing Rowing House (Office Bldg) @ 3800 Lake Washington Bld.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							Gray silty GRAVEL & SAND				
		1	4	4	5	9	Mottled gray med SAND & Olive gray sandy SILT	Loose	V. wet		
											▽ G.W.
Fill	5	2	3	8	9	17	Silty SAND with gravel (fill)		Sat	DK. Gray	
		3	1	0	3	3	11" Gray med SAND		sat.		
							7" Lt. Brown PEAT				
PEAT & Organics	10	4	1/18"			1	Peat & Organic SILT	Soft	Sat.	Lt Brown	
		5	0	2	2	4	8" Brown Peat	soft	Sat.		
							6" Blue gray silty CLAY				
Bluish Gray CLAY	15	6	2	4	8	12	Silty CLAY (Very plastic)		wet.	Bluish Gray	
							2" Bluish Gray CLAY				
CLAY	20	7	5	6	5	11	15" CLAY with little silt	Med. Stiff	V. Moist	Mottled Lt Brown & bluish gray	
Silty fine SAND	25	8	11	18	23	41	Silty fine SAND	V. dense	V. moist	Gray	

INSPECTOR DH

CS 7.241

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 12-15-94

HOLE NO. B-3

PROJECT Mount Baker Rowing Center

GRD. ELEV. NA

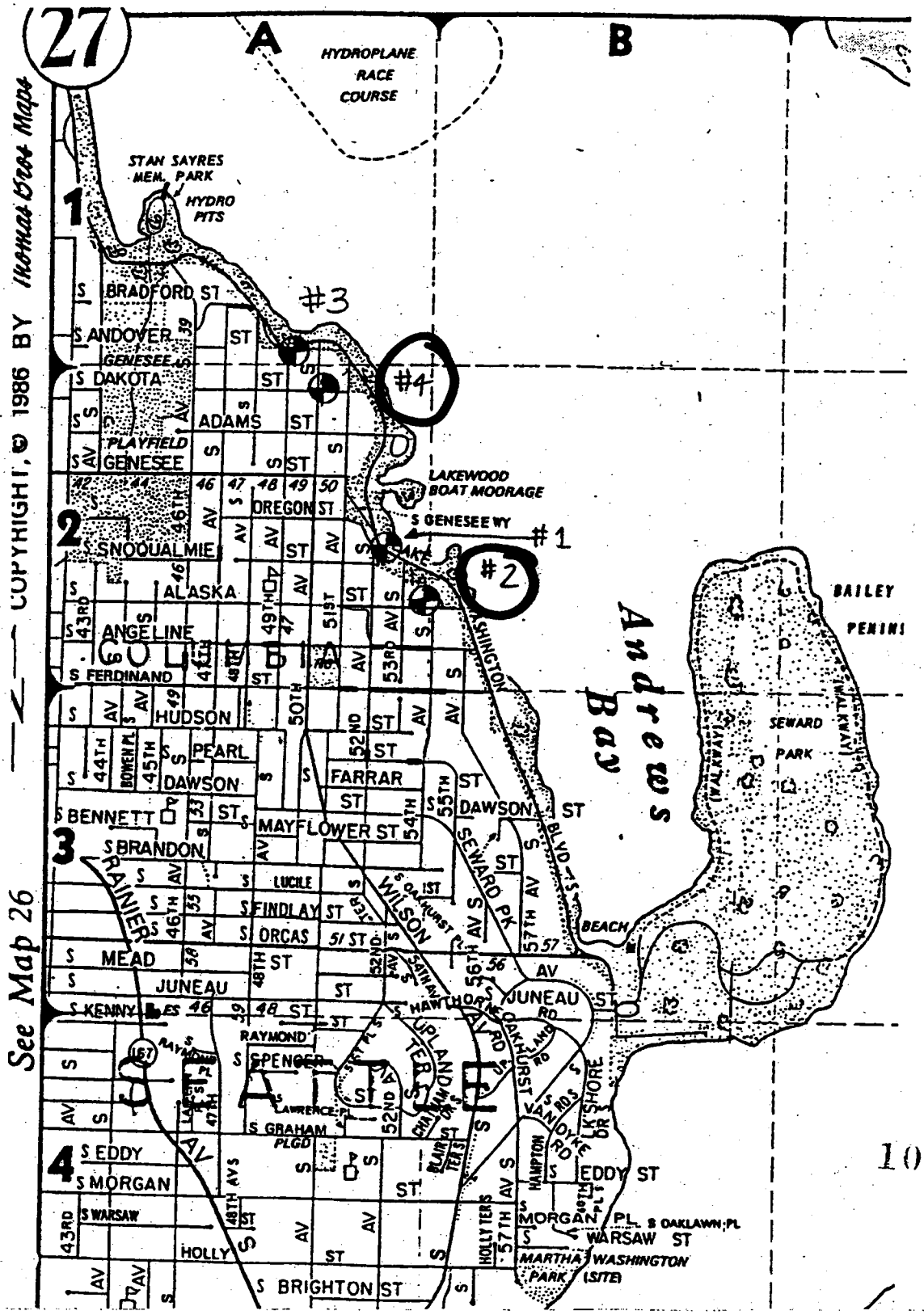
LOCATION North of Rowing House in the parking area as shown in the location map.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							pavement				
Silty CLAY – Clayey SILT							Silty CLAY – clayey SILT			Bluish Gray	
		①	3	4	8	12	No Recovery	Med stiff			
Silty fine SAND	5	②	8	14	29	41	Silty fine SAND with Gravel	Dense	Moist	Bluish Gray	
		③	8	16	19	35	Silty CLAY	V. stiff	Slightly Moist	DK Gray	
Silty CLAY	10	④	8	16	19	35	Silty CLAY with occ. gravel	V. stiff	Near Dry	DK gray	
	15	④	16	50	6"	>50	Same	Hard.	Dear Dry	DK Gray	
							(Lake water level @ about 4' below ground surface where boring was located. No G.W. was encountered in the boring hole.)				

3859

4/4

3859



SEWARD PARK/
MT BAKER
CSO PH I

10656

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CB 7.241

LOG OF TEST BORING

DATE 1-24-85 HOLE NO. 2

PROJECT Seward Pk/Mt Baker CSO Ph I GRD. ELEV.

LOCATION S Alaska & 54th Ave SO (50' north ℄ S. Alaska 40' east ℄ 54th Ave S.)

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							6" Sod 6" top soil				
	5	1	6	9	12	21	Silty clay & Gravey silt interbedded with Gravel sand layers	Stiff	Moist	Mottled	
	10	2	8	13	50	50+	Interbedded sand and sandy silt Gravels at 11'	Dense / Stiff	moist / moist	Tan / Gray	
	15	3	50 / 6	— / —		50+	Gravel, Sand	Dense	Damp	Tan	
							cobbles at 18'				
	20	4	50 / 3	— / —		50+	Rock in end of tube drilling like cobbles; Gravels				
		5	50 / 3	— / —		50+	Silty Sands; Gravels	V Dense	Damp	Tan	
	25	6	50 / 6	— / —		50+	med grained Sand	V Dense	Damp	Tan	
	30	7	36	50 / 3		50+	mottled fine & med grained Sand	V Dense	Damp	Tan & Brown	
							~~No free water~~	Augur left all night no water next day			

INSPECTOR

10657

FPinney PTLabs

(No piezo Installed)

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CB 7.241

LOG OF TEST BORING

DATE 1-25-85 HOLE NO. 4

PROJECT Seward Park/MT Baker CSO Ph. I GRD. ELEV.

LOCATION S Dakota st & 50th Ave. South. 13' north ℄ S. Dakota 40' west ℄ 50th Ave S.

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL
							5" sod., clean sand next 12"				
	5		16	40	50 3	50+	Sandy silt or silt, Sand, some gravel	v Dense	Damp	Gray	
							Gravels at 8'				
	10	2	9	25	50 5	50+	Same	"	"	"	
							Very hard drilling at 12'				
	15	3	20	35	50 5	50+	Very silty sand or sand, silt (Partially cemented)	"	"	Blue Gray	
							Gravels at 17'				
	20	4	14	29	50	50+	Same	"	"	"	
							Gravels at 21'				
	25	5	20	50 4	— —	50+	Same	"	"	"	
	30	6	38	50 2	— —	50+	Same	"	"	"	
				BOH		29'	No free water (No piezo Installed)				

INSPECTOR F Pinney PT Labs

10658

No Site Plan Provided WO B 907 06150

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DAH 4001

DATE 6-30-63 HOLE NO.

PROJECT SEWARD PARK WEATHER

LOCATION △#1 100' AHD on ℄

WATER TABLE

GRD. EL.	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
3 JULY 63										
	A	1	1	1	2	SAND	TRACE SILT & ORGANIC	LOOSE	SATURATED	BRN.
5										
	B	1	2	1	3	12" SILT		SOFT	WET	BRN
	B.					60" SAND			WET	GRAY
10										
			(12")							
	C		1	X	1+	SILT		VERY SOFT	WET	DARK BRN.
15										
	D	2	2	3	5	CLAY	SILT & SAND LAYERS	SOFT	WET	GRAY
20										
	E	2	4	8	12	SAND	SILT, TRACE GRAVEL	FIRM	SATURATED TO WET	GRAY
25										
	F	16	27	32		SILT	SAND & GRAVEL LAYERS	VERY STIFF	MOIST	GRAY
30										

Missing log for TH #10 location of TH #20?

INSPECTOR:

00150

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 6-30-69 HOLE NO. [redacted]

PROJECT SEWARD PARK WEATHER

LOCATION Δ #2 35' AHD. ON ℄

WATER TABLE

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	A	6" 50 X X	50+	SILT	SILTSTONE SAND	VERY STIFF	DRY	GRAY
30ALL/69 ▽ 5								
ADDED WATER								
	B	½' 50 X X	50+	SILT	SILTSTONE SAND	VERY STIFF	DRY	GRAY
PULLED OUT 10								
	C							
15								
	D							
20								
	E							
25								
	F							
30								

INSPECTOR:

06151

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 6-30-69 HOLE NO. [redacted]

PROJECT SEWARD PARK WEATHER

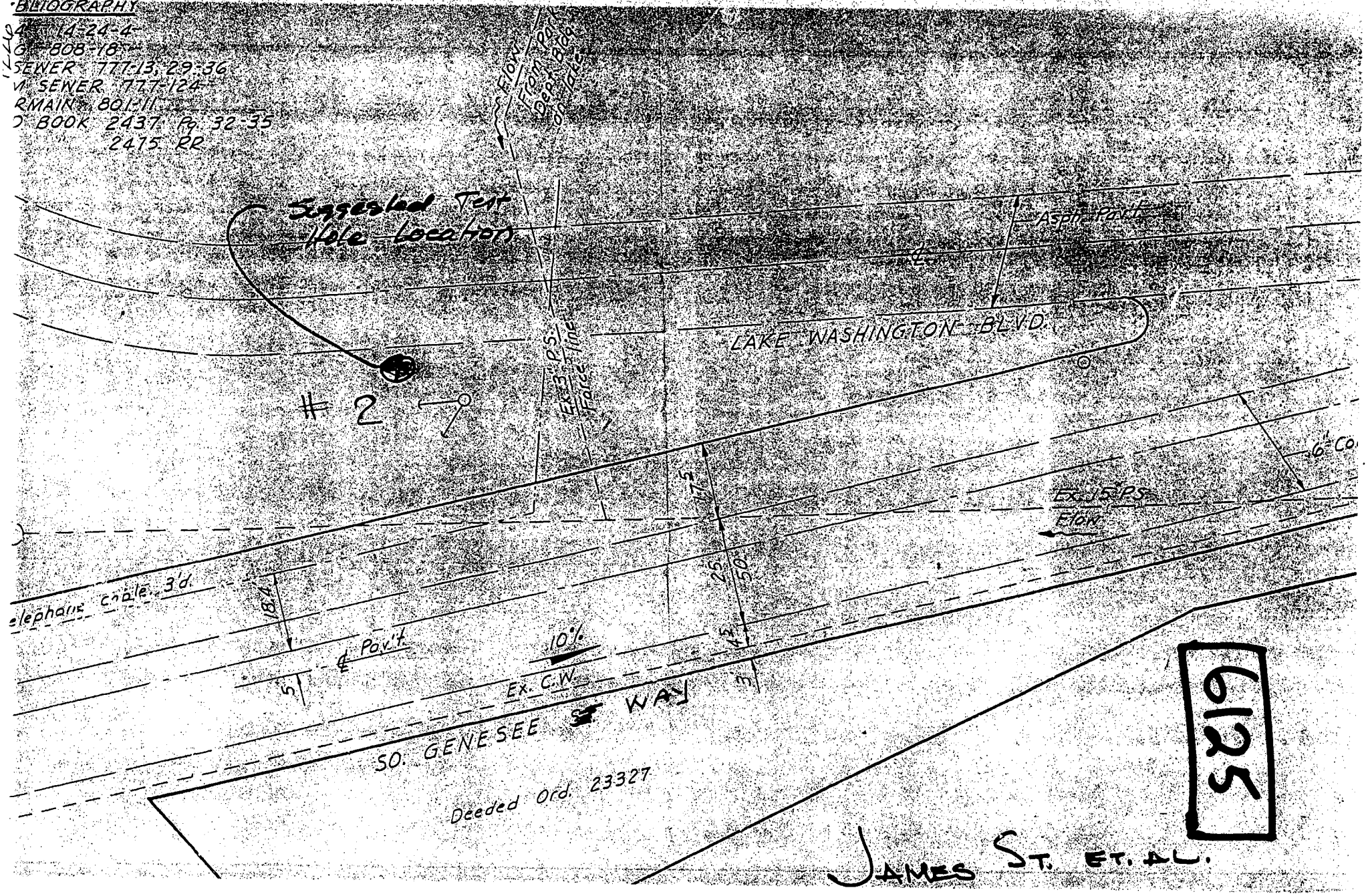
LOCATION 75' BK OF A #3

WATER TABLE

GRD. EL.	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
3 July 69			4½"							
	A	41	50	X	50+	SILT	SILTSTONE TRACE SAND	VERY STIFF	DRY	GRAY
5										
ADDED WATER										
	B	13	21	22	43	SILT	SILTSTONE	STIFF	MOIST	GRAY
10										
		5"								
	C	50	X	X	50+	SILT	SILTSTONE	VERY STIFF	—	GRAY
15										
DRILLING TIME 1 HOUR FOR 5'										
		3"								
	D	50	X	X	50+	NO	SAMPLE			
PULLED OUT										
20										
	E									
25										

INSPECTOR:

BIBLIOGRAPHY
4 14-24-4
G 808-18
SEWER 777-13, 29-36
V SEWER 777-124
R MAIN 801-11
O BOOK 2437 Pg. 32-35
2475 RR



U1221

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

CSI 7.241

LOG OF TEST BORING

DATE 4-13-72

HOLE NO. [redacted]

PROJECT James St. et al

GRD. ELEV.

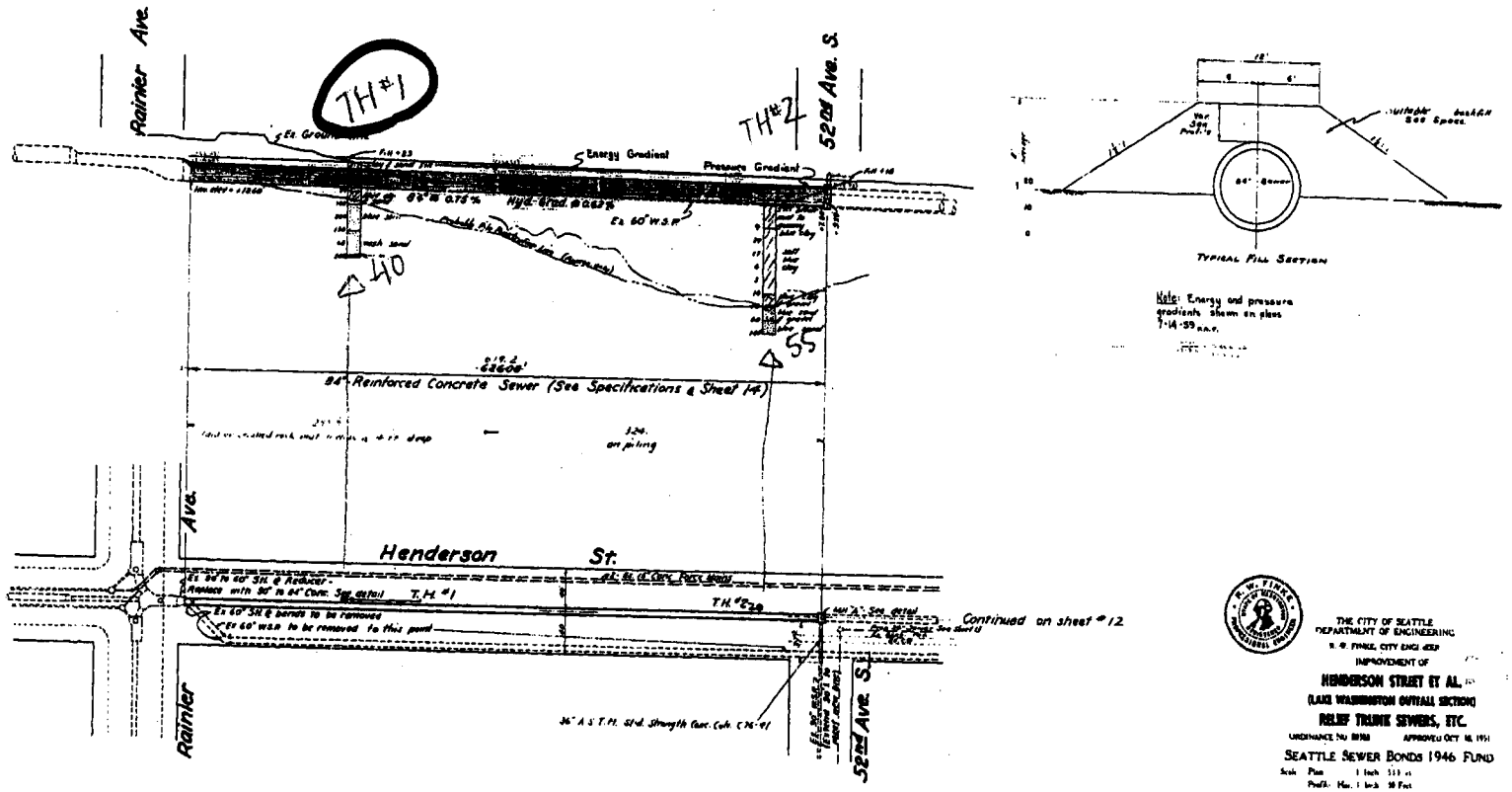
LOCATION Lk. Wash. Blvd. & Genesee Wy Ties. of PC 8° W. of ℄

STRATA	DEPTH	SAMPLE NO.	BLOW COUNT			STD. PEN.	DESCRIPTION OF MATERIAL: COMPOSITION	CONSISTENCY	MOISTURE	COLOR	WATER LEVEL 4-17-72
Loose silty SAND											
							BRN SILTY SAND				
			12"				8' SILTY SAND		MOIST	BRN	
PEAT	5	A	1	1	1		8" CLAY - SILT	LOOSE	MOIST	BL.	
							3" PEAT		WET	BRN	
Soft-medium, CLAY-SILT & PEAT											
							12" CLAY - SILT	MED	MOIST	BL	
	10	B	1	3	4	7	6" ORGANIC (PEAT)		MOIST	TAN	
Loose - V. Compact, silty SAND											
	15	C	2	4	6	10	SILTY SAND w/	LOOSE	MOIST	BRN	4-13-72
							SAND LAYERS		SAT	BRN	
											SAND
	20		6	20	35	55	SILTY SAND w/	V. COMP	WET	BRN	
							GRAVEL				

PIEZOMETER INSTALLED 4-13-72

INSPECTOR

H.W. Kokita


Rainier Ave.
52nd Ave. S.
TH #1
TH #2
Energy Gradient
Pressure Gradient
84" Reinforced Concrete Sewer (See Specifications & Sheet 14)
Henderson St.
Rainier Ave.
52nd Ave. S.
Continued on sheet # 12
Typical Fill Section
Note: Energy and pressure gradients shown on plans 7-14-59 R.A.F.
THE CITY OF SEATTLE
DEPARTMENT OF ENGINEERING
R. H. FINKLE, CITY ENGINEER
IMPROVEMENT OF
HENDERSON STREET ET AL.
(LAKE WASHINGTON OUTFALL SECTION)
RELIEF TRUNK SEWERS, ETC.
ORDINANCE No. 88780
APPROVED OCT. 18, 1951
SEATTLE SEWER BONDS 1946 FUND
Sheet 11 of 15 Sheets
APPROVED BY THE BOARD OF PUBLIC WORKS

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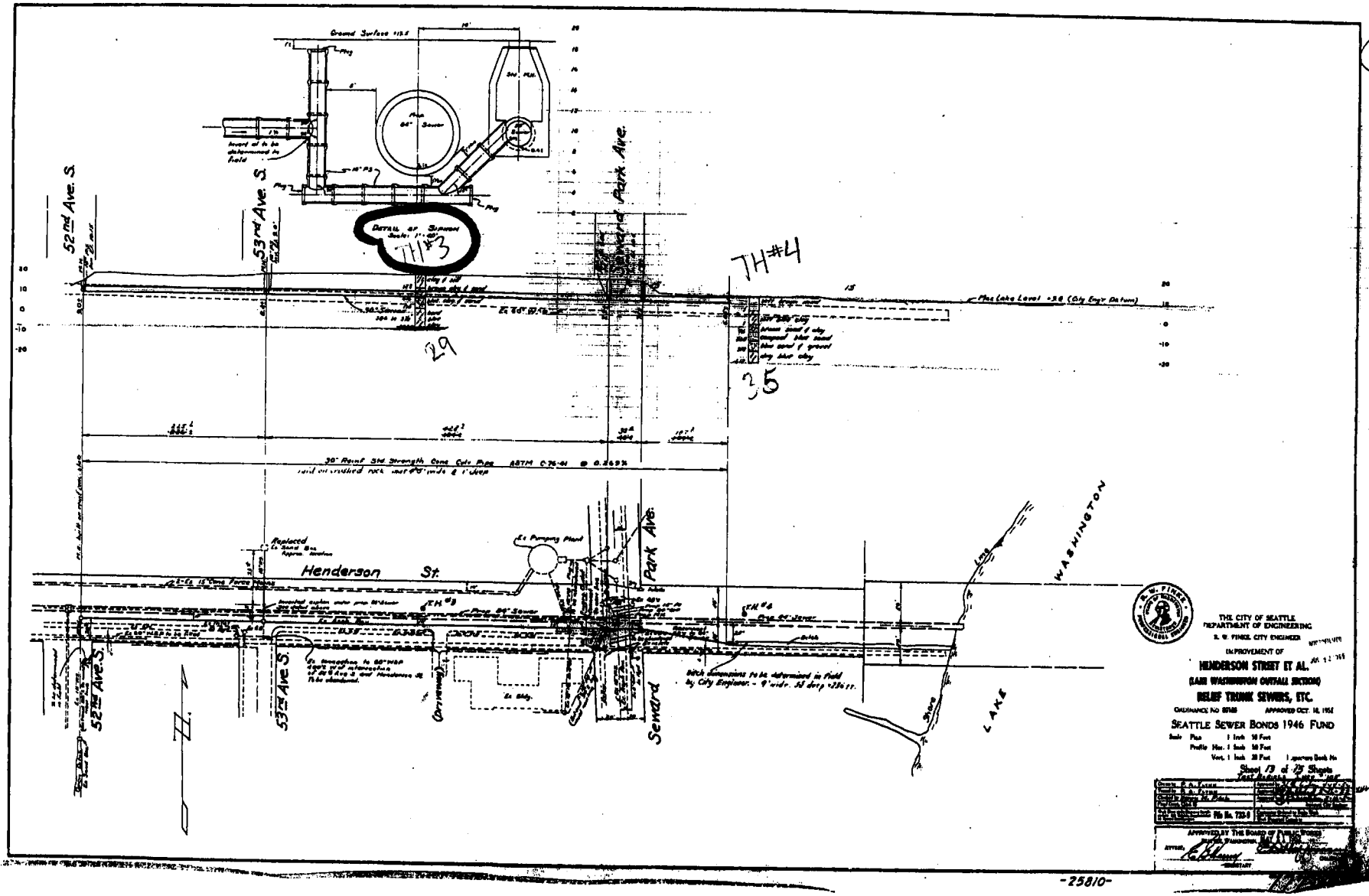

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04163

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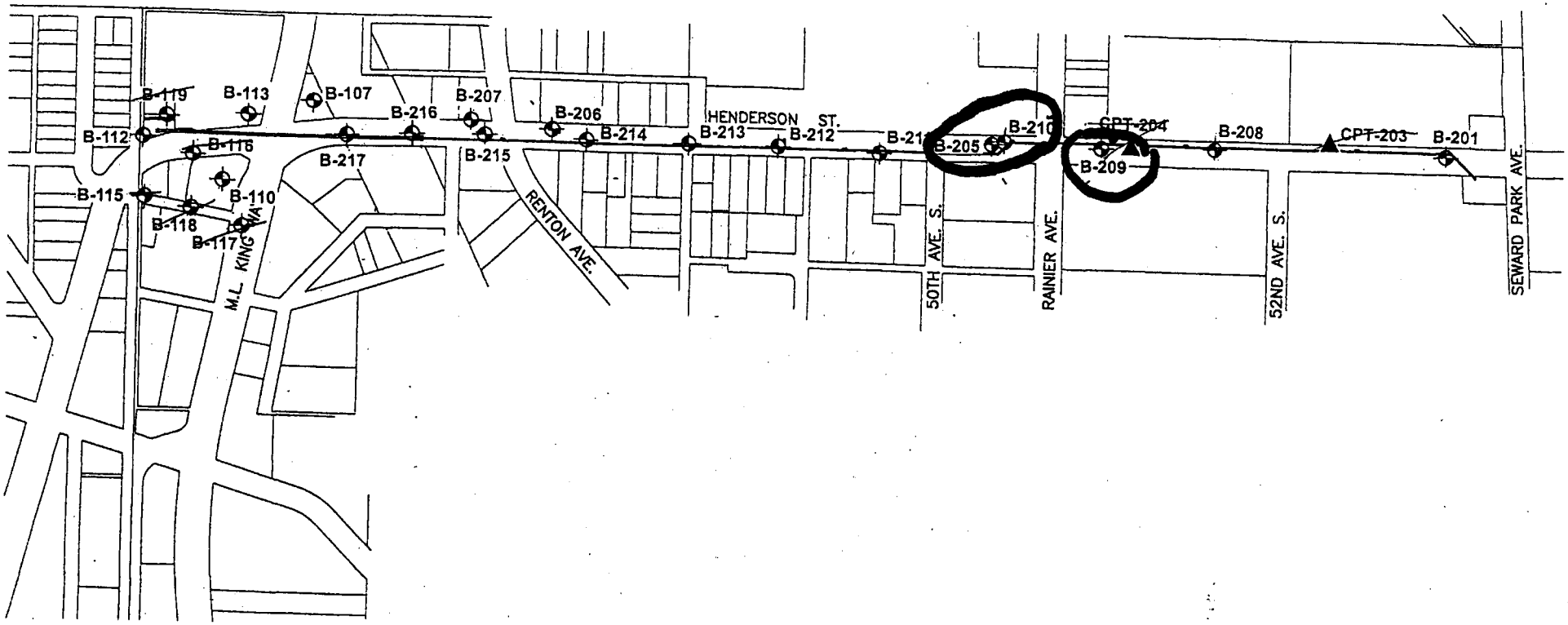


LEGEND

B-111 Exploration location and designation

SP-1 Test pit location and designation

CPT-203 Cone penetration test location and designation

PACRIM GEOTECHNICAL INC.

SCALE IN FEET

0 300 600

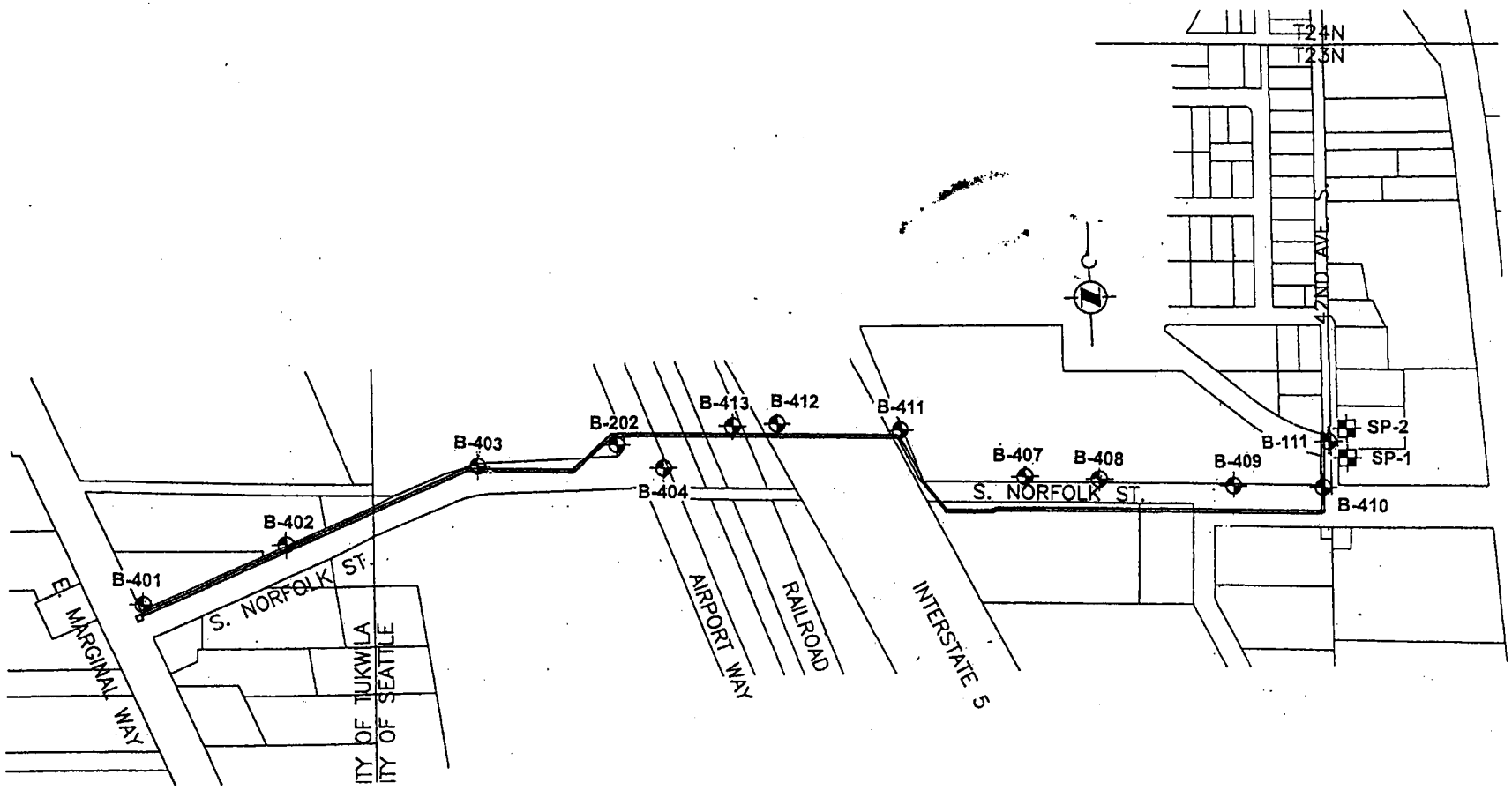
Henderson/M.L. King CSO Project – Henderson Sewers
Seattle, Washington
King County Department of Natural Resources

SITE AND EXPLORATION MAP

Project No.: 006-006

FIGURE 2B

006006temp2.CDR



LEGEND

B-111 Exploration location and designation

SP-1 Cone penetration test location and designation

PACRIM GEOTECHNICAL INC.

SCALE IN FEET

0 300 600

Henderson/M.L. King CSO Project – Treated CSO Pipeline
Seattle, Washington
King County Department of Natural Resources

SITE AND EXPLORATION MAP

Project No.: 006-006

FIGURE 2C

Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6 inches	Sample	Depth (feet)	USCS	Graphic Symbol	DESCRIPTION	Elevation (feet)	Groundwater	Well Detail
									Asphalt Pavement.			
									Concrete Pavement.	135		
							SM		Loose, brown, silty SAND with clay;moist. (ALLUVIUM)			
						5	ML		Soft, brown mottled gray and rust, clayey SILT; moist; blocky structure.	130		
	1	94	28	1 1 2	X							
						10	CL		Medium stiff, gray mottled rust and brown, silty CLAY, trace fine gravel; wet; numerous organic pockets and hard silt pockets.	125		
	2	80	41	1 3 3	X							
						15	ML		Very stiff, light brown, clayey SILT, trace fine and coarse sand; moist; numerous near vertical gray silt partings and seams, numerous gray, light brown, and rust, near horizontal fine sand seams.	120		
	3	97	29	3 6 7	X							
						20	SM		Medium dense, brown mottled rust, silty SAND with gravel, trace organics; wet. (GLACIAL TILL)	115		
	4	120	14	3 6 5	X							
						25	SM		Dense, gray, silty, fine to medium SAND, trace coarse sand and fine gravel;wet.	110		
	5	117	14	5 12 12	X							
						30	SP SM		Very dense, gray, SAND with silt and gravel; wet; numerous silty fine sand pockets.	105		
	6	130	9	0 15 37	X							
									Bottom of boring at 31.5 feet. Boring abandoned with soil cuttings, bentonite chips, and cement seal.			
						35				100		

Surface Elevation: 136 feet
Date Completed: 5/7/98
Logged By: JAM
Equipment: Truck Mounted CME 85
Drilling Method: Hollow Stem Auger
Hammer System: CME Automatic Hammer, 300 lb.

PacRim Geotechnical Inc.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

LOG OF BORING B-205

SHEET 1 OF 1

Project No. 006-006

FIGURE A-20

Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6 inches	Sample	Depth (feet)	USCS	Graphic Symbol	DESCRIPTION	Elevation (feet)	Groundwater	Well Detail
									Asphalt Pavement			
							ML		Green mottled brown, clayey, sandy SILT. (ALLUVIUM)	130		
	1	107	21	4 3 4	X	5	ML		Stiff, gray-blue mottled olive and rusty, clayey SILT, trace sand and organics; moist; scattered fine sandy silt partings.			
	2	108	22	4 7 12	X				Becomes more clayey with gravel and rusty sand pockets.	125		
GSD	3	114	15	11 12 12	X	10	SM		Dense, gray, silty, fine to medium SAND, trace coarse sand and gravel; wet; numerous silty fine sand to fine sandy silt partings and seams. (GLACIAL OUTWASH)		9/7/99	
GSD	4		7	32 34 26	X	15	GW GM		Very dense, brown, GRAVEL with silt, trace sand and clay; wet; scattered iron-oxide stained pockets and gray, silty, fine to medium sand pockets.	120 115		
GSD	5	109	20	13 22 23	X	20	SP SM		Very dense, brown, fine to medium SAND with silt; wet; scattered gray, low angle silt partings.			
	6	111	20	16 22 28	X	25			Becomes interbedded with seams of medium and medium to coarse sand.	110 105		
	7	121	13	45 31 50	X	30	SW		Very dense, brown-gray, SAND with gravel; wet.	100		
	8	129	10	23 36 40	X	35			Bottom of boring at 36.5 feet.	95		

Surface Elevation: 133.6 feet
Date Completed: 8/24/99
Logged By: JAM
Equipment: Truck-Mounted Mobile B-59
Drilling Method: Mud Rotary 5 7/8" Tricone
Hammer System: Rope & Cathead, 300 lb. Hammer

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

LOG OF BORING B-209

SHEET 1 OF 1

Project No. 006-006

FIGURE A-24

Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6 inches	Sample	Depth (feet)	USCS	Graphic Symbol	DESCRIPTION	Elevation (feet)	Groundwater	Well Detail
									Asphalt Pavement			
									Concrete Pavement			
							ML		Soft, brown mottled gray and rusty, clayey SILT, trace fine to medium sand; moist; scattered organic pockets. (ALLUVIUM)	135		
	1	85	35	1 2 1	X							
						5	OL		Soft, brown, organic SILT; wet.			
	2	88	35	1 2 4	X					130		
							ML		Medium stiff, blue-gray mottled yellow-brown, clayey SILT with organics, trace fine sand; moist; occasional iron-oxide stained partings, trace mica.			
									Stiff, brown, silty CLAY, trace fine sand; wet; numerous fine sandy silt partings and seams; scattered roots.		9/7/99	
						10	CH					
AL	3	89	34	4 4 3	X					125		
									Medium dense, gray-brown and brown, silty fine SAND to fine sandy SILT; wet. (GLACIAL OUTWASH)			
						15	SM					
	4	97	29	6 9 9	X					120		
									Very dense, gray mottled rusty and brown, silty fine SAND, trace medium to coarse sand and fine gravel; wet; numerous organic partings and pockets and silty sand seams, weathered. (GLACIAL TILL)			
						20	SM					
FC	5	114	19	15 16 17	X					115		
									Very dense, gray sandy SILT to silty SAND, trace gravel and clay; wet; trace mica.			
						25						
GSD	6	127	12	31 50/5"	X					110		
							ML					
						30						
	7	124	14	27 27 40	X					105		
									Bottom of boring at 31.5 feet.			
						35				100		

Surface Elevation: 136.0 feet
Date Completed: 8/24/99
Logged By: JAM
Equipment: Truck-Mounted Mobile B-59
Drilling Method: Mud Rotary 5 7/8" Tricone
Hammer System: Rope & Cathead, 300 lb. Hammer

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

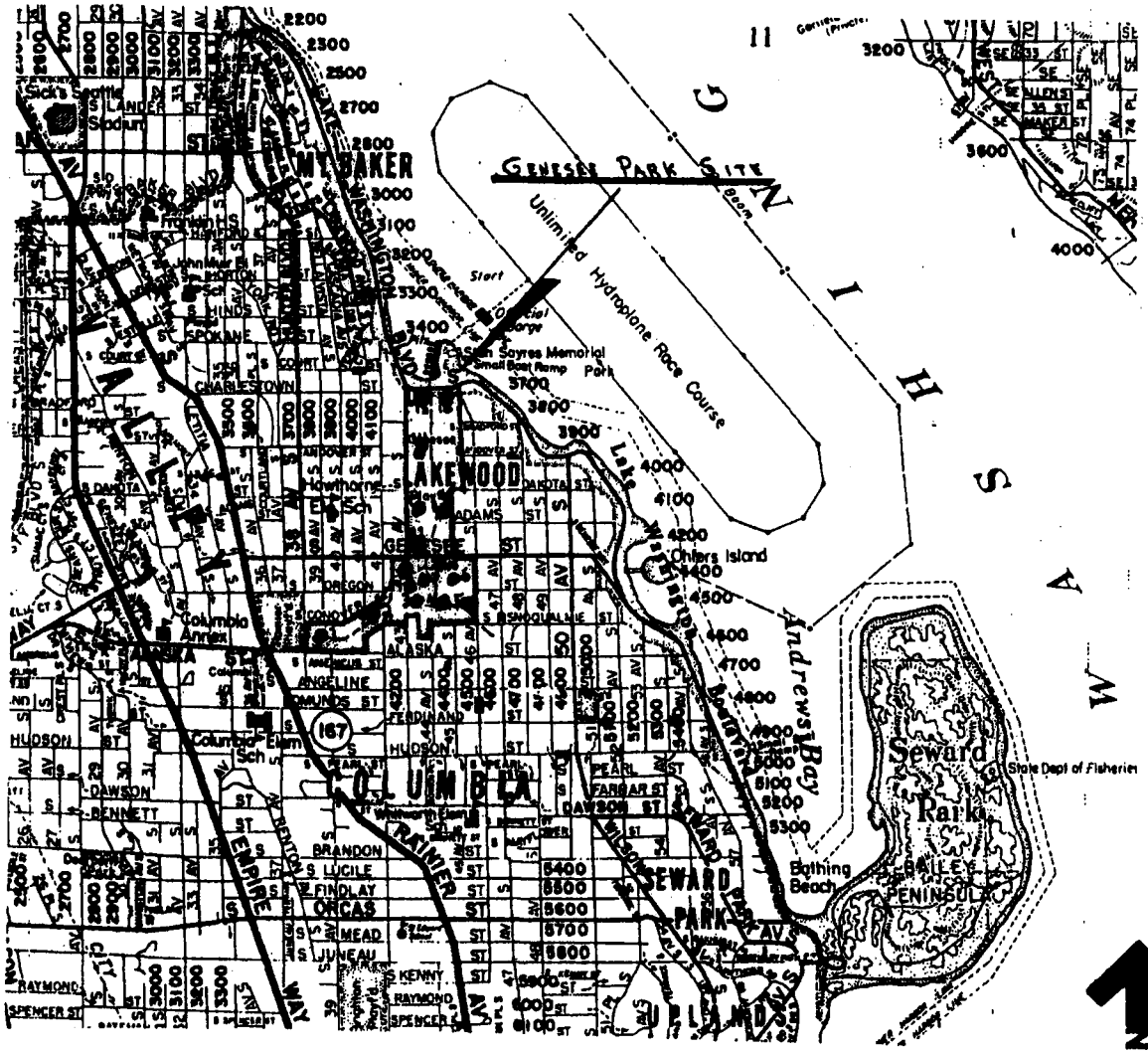
King County Department of Natural Resources

LOG OF BORING B-210

SHEET 1 OF 1

Project No. 006-006

FIGURE A-25



SITE STUDY LOCATION MAP
GENESEE PARK DEVELOPMENT

8104

7C

PROJECT:

Genesee Park

Subsurface Evaluations

Date 3-8-76

Cert. No. 763-18

Test Boring No. 1 Location 16 + 96 left 115'

STRATA Grd.El. 37.80	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)	Elevation Water Ta 31.80
0			Brown Silty Sandy Gravel	
			Brick at 2½'	
	1 12 25 / 6 6 8	3-4	Wood and pieces of a mattress	
			Base 6" sampler bouncing - no penetration	
5				
	1 3 2 / 6 6 6	8-9½	No sample return	
			Lot of string in returns	
10				
	2 4 8 / 6 6 6	13-14½	Gray chips - plastic, cloth, paper	
			**** Approximate 1910 Topo. Elev.	
15				
			Shoe included in returns	
	8 19 9 / 6 6 6	18-19½	Plastic bag or wrap, cloth, string	
			Base 6" clay	
20				
	0 1 4 / 6 6 6	23-24½	Clay	
			**** Approximate 1957 Topo. Elev.	
25				

No. 149

Test Boring No. 1 Location 16 + 96 left 115

STRATA Grd.El. 37.80	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			At 25' drilling harder
	3 27 42 / 6 6 6	28-29½	Stiff blue clay
30	T.D. 29½		

8C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. 2 Location 10 + 42 right 157'

STRATA Grd.El. 40.60	RESISTANCE Blows Pen.			At	Soil Classification & Description (Type, Color, Consistency, etc.)	Elevation Water 1 32.60 PH 6.5-7.0
0						
	5 / 6	8 / 6	13 / 6	3-4½	Upper 12" soft, silty organics	
					Base 6" plastic, cloth, paper, tin can	
5						
	3 / 6	6 / 6	20 / B	8-9	No Sample Return	
					At 9' tire or something causing bouncing	
10					with no penetration	
	7 / 6	2 / 6	5 / 6	13-14½	Rubble - organics, paper, cloth	
					Not extremely decomposed	
15						
					* Piezometer point at 17'	
****	1 / 6	3 / 6	7 / 6	18-19½	Newspaper print still readable	
					**** Approximate 1957 Topo. Elev.	
20 ****					**** Approximate 1910 Topo. Elev.	
	10 / 6	13 / 6	25 / B	23-24	Top 12" organics - leaves, wood, very little decomposi	
					Base 6" bouncing - no penetration	
25					Rubble ends at approximately 25'	

No. 149

9C

Test Boring No. 2 Location 10 + 42 right 157'

STRATA Grd.El. 40.60	RESISTANCE Blows Pen.			At	Soil Classification & Description (Type, Color, Consistency, etc.)
25					
	5 / 6	1 / 6	1 / 6	28-29½	Top 6" gravelly sand
					Middle 6" organics - marsh material
30					Base 6" silty clay
	36 / 6	41 / 6	-	33-34	Grey clay
	T.D. 34				

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. 3 Location 6 + 23 left 78'

Elevation Water Table: Not encountered

STRATA Grd.El. 59.30'	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
0			
	1/6 3/6 4/6	3-4½	Gravelly sandy silty clay
5			
			Rubble begins at approximately 6'
	25/3 - -	8'	Bouncing - no penetration
			Returns include cloth, paper, plastic - not very decomposed.
10			Strong stench
	25/0 - -	13	Bouncing - no penetration
			Returns same as above
15			
	25/0 - -	19	Bouncing - no penetration
			Returns same as above
20			
****			**** Approximate 1910 Topo. Elev.
	50/2 - -	23	Bouncing - very little penetration
			Cloth - very little decomposition - mixed with grey clay
25			

No. 149

Test Boring No. 3 Location 6 + 23 left 78'

STRATA Grd.El. 59.30	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			Rubble ends at approximately 26 ft.
****			**** Approximate 1957 Topo. Elev.
	3/6 5/6 5/6	28-29½	Top 2" organics
			Base 16" grey silty clay
30			
	1/6 1/6 3/6	33-34½	Brown interbedded silts and clays
35			
	0/6 1/6 1/6	38-39½	Brown interbedded silts and clays
40			
	4/6 16/6 22/6	43-44½	Grey clay
45	T.D. 44½'		

10C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. 4 Location 3 + 12 left 108'

Elevation Water Table 25.30

Grd.El. 55.30

Depth	Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
0			
		3-4½	Grey interbedded silts, clays and sands
5			
			Rubble begins at approximately 6'
	3 2 3 / 6 6 6	8-9½	Organics, clay and newspaper - print still readable
10			
	2 1 5 / 6 6 6	13-14½	Top 12" rubber, paper, cloth
15			Base 6" clay
			Not much decomposition
			**** Approximate 1957 Topo. Elev.
	2 2 4 / 6 6 6	18-19½	Cloth, paper, organics
20			Not much decomposition
	30 / 4	23-24'	Bouncing
25			No sample

No. 149

11C

Test Boring No. 4 Location 3 + 12 left 108'

Grd.El. 55.30

Depth	Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			Rubble ends at approximately 26'
	13 12 18 / 6 6 6	28-29½	Brownish grey clay
30 ****			**** Approximate 1910 Topo. Elev.
	4 6 8 / 6 6 6	33-34½	Brownish grey clay
35 T.D. 34½'			

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. [redacted] Location 1 + 00 left 79'

Elevation Water Ta: Not encountered

STRATA Grd.El. 53.20	RESISTANCE Blows/Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
0			
	3/6 4/6 5/6	3-4½	Sandy silty clay
			Base 2" - papers
5			Rubble begins at approximately 4½'
	2/6 2/6 5/6	8-9½	Organics & Paper
10			
	25/2	13	Bouncing - no penetration
15			No Sample
	50/2	18	Bouncing
20			No Sample
****			**** Approximate 1957 Topo. Elev.
	25/0	23	Bouncing
25			No sample

No. 149

Test Boring No. 5 Location 1 + 00 left 79'

STRATA Grd.El. 53.20	RESISTANCE Blows/Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			
	25/1	28	Bouncing
30			No Sample
	50/0	33	Bouncing
35			No Sample
			Returns are more decomposed than before, highly organic & steaming
****			**** Approximate 1910 Topo. Elev.
T.D. 38'	25/0	38	Bouncing - no penetration
40			End of auger plugged with cable

12C

PROJECT:

Genesee Park — Date 3-9-76

Subsurface Evaluation — Cert. No. 763-18

Test Boring No. 6 — Location 2 +21 right 121

STRATA Grd.El. 43.20	RESISTANCE Blows/Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)	Elevation Water Tab 3.20 3.20 after drilling PH 5.0 - 5.6
0				
			Rubble begins at 4'	
	3/6 4/6 5/6	3-4½	Sandy, silty clay with organics	
5			Base 2" undecomposed paper and cloth	
			Shelby from 8' - 10'	
10	25/0	10	Bouncing - No penetration	
	6/6 12/6 12/6	13-14½	Wood, paper, clay	
15				
	50/3	18	Bouncing - very little penetration	
20 ****			Wood, paper, wire	
			**** Approximate 1957 Topo. Elev.	
	2/6 3/6 2/6	23-24'	Ashes	
25				

No. 149

Test Boring No. 6 — Location 2 + 21 right 121

STRATA Grd.El. 43.20	RESISTANCE Blows/Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			
			**** Approximate 1910 Topo. Elev.
	1/6 1/6 1/6	28-20½	Ashes
30			
	5/6 4/6 2/6	33-34½	Top 6" ashes
			Middle 6" highly organic clay
35			Base 12" highly organic clay
	1/6 1/6 1/6	38-39½	Highly organic clay and peat
40			
	1/18	43-44½	Top 6" coarse grey silty sand
45			Base 12" bluish grey clay
	2/6 3/6 10/6	48-49½	Grey silty clay
50	T.D. 49½'		

13C

PROJECT: Genesee Park

Subsurface Evaluation

Date 3-9-76

Test Boring No. 8 Location 6 + 48 right 250

Cert. No. 763-18

STRATA	RESISTANCE Blows Pen.			Ft.	Soil Classification - Description (Type, Color, Consistency, etc.)	Elevation Water Table
Grd. El. 41.50						Not encountered
0					Explosimeter - 100%	
	3 / 6	3 / 6	6 / 6	3-4½	Brown silty sandy clay	
					Base 4" grey silty clay	
5						
	2 / 6	3 / 6	5 / 6	8-9½	Bluish grey silty clay	
10						
	12 / 6	25 / 4		13-14	Bouncing	
					Paper - coke cup, newspaper	
15					Kleenex - not decomposed	
	25 / 0			18	Hard from 14' - 18.5'	
					Bouncing	
18.5					Refusal at 18.5	
20						
****					**** Approximate 1957 Topo. Elev.	
25 ****					**** Approximate 1910 Topo. Elev.	

15C

No. 140

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. 8 Location 6 + 41 right 230'

Elevation Water T: Not encountered

STRATA Grd.El. 43.80	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
0			Explosimeter - 100+%
	2 4 6 / 6 6 6	3	Brown sandy silty clay mixed with paper
5			
	2 10 10 / 6 6 6	8	Gravelly, silty clay
10			
	37 / 3	13	Bouncing - no penetration
			No sample returned
15			
	8 9 25 / 6 6 0	18	Bouncing - no penetration
			No sample returned
20			
	25 / 1	23	Bouncing - little penetration
			Wood, plastic bag, clay
25			

No. 149

Test Boring No. 9 Location 6 + 41 right 230'

STRATA Grd.El. 43.80	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			
****			**** Approximate 1957 Topo. Elev.
****			**** Approximate 1910 Topo. Elev.
	9 6 7 / 6 6 6	28-29½	Cardboard, paper, clay, fibreboard
30			Rubble ends at approximately 30'
	6 8 10 / 6 6 6	33-34½	Brown clay
35			
	10 16 21 / 6 6 6	38-39½	Brown and bluish grey clay
40	T.D. 39½		
45			
50			

16C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-9-76

Cert. No. 763-18

Test Boring No. 10 Location 4 + 30 right 43'

STRATA — Grd.El. 39.30

Elevation Water T. 16.30

Depth	Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
0			Shelby 0-30"
			Explosimeter 100+%
	2/6 4/6 9/6	3-4½	Organics, silt and clay
5			Base 3" - wood, paper, cloth
			Not decomposed
	3/6 25/0	8-8½	Bouncing - no penetration past 6"
10			Wood, glass, paper, rug matting
			Not much decomposition
			**** Approximate 1957 and 1910 Topo. Elevs.
	1/6 2/6 4/6	13-14½	Ashes
15			
	1/6 1/6 3/6	18-19½	Ashes
20			
			Piezometer tip at 20'
	2/6 2/6 3/6	23-24½	Rubber - still elastic
25			Clay with wood chips

17C

No. 14

Test Boring No. 10 Location 4 + 30 right 43'

STRATA — Grd.El. 39.30

Depth	Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
25			Rubble ends at approximately 26'
	1/6 1/6 2/6	28-29½	Highly organic silt and clay
30			
	0/6 1/6 2/6	33-34½	Highly organic silt and clay
35			
	0/6 0/6 2/6	38-39½	Top 2" highly organic silt and clay
40			Base 16" grey silty clay
	10/6 20/6 24/6	43-44½	Coarse sand and gravel
45	T.D. 44½		Base 2" sandy clay
50			

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-11-76

Cert. No. 763-18

Test Boring No. 11 Location 0 + 60 left 168'

STRATA	RESISTANCE Blows Pen.			At	Soil Classification & Description (Type, Color, Consistency, etc.)	Elevation Water Tab 30.23 PH 7.5 - 8.0
Grd.El. 36.25						
0					Explosimeter - 60%	
					1975 Grade Elevation 35.76	
	4/6	4/6	5/6	3-4½	Top 10" brown silty clay	
5					Middle 2" paper	
1957 Grd.El.					Base 8" bluish grey gravelly sandy silt	
					**** Approximate 1957 Topo. Elev.	
	2/6	3/6	5/6	8-9½	Wood, paper, cloth	
10					Not very decomposed	
	1/6	2/6	6/6	13-14½	No sample returned	
15						
					**** Approximate 1910 Topo. Elev.	
	1/6	2/6	2/6	18-19½	Plastic, wood, clay	
20						
					Rubble ends at approximately 22'	
	10/6	23/6	30/6	23-24½	Grey medium coarse silty sand	
25						

No. 149

Test Boring No. 11 Location 0 + 60 left 168'

STRATA	RESISTANCE Blows Pen.			At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 36.25					
25					
	9/6	40/5		28-29	Grey medium coarse silty sand
T.D. 29'					
30					Base 3" brown medium coarse silty sand

18C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-11-76

Test Boring No. 12 Location: 5 + 50 left 140'

Cert. No. 763-18

STRATA	RESISTANCE Blows	Pen.		At	Soil Classification : Description (Type, Color, Consistency, etc.)	Elevation Water Table 25.50 P.H. 7.5
Grd.El. 30.50						
0					Explosimeter - 100+% : can hear and see gas bubbling up through water. Burned for approximately 30 seconds	
					1975 Grade Elevation 31.00	
	2	2	5			
	6	6	6	3-4½	Bluish grey clay	
5					Piece of brick 2" from bottom	
					Bottom 2" sandy clay	
					Rubble begins at approximately 6'	
	2	2	4			
	6	6	6	8-9½	Top 10" glass, paper, brick	
					Middle 4" clay	
					Base 4" paper, cloth	
****					**** Approximate 1957 Topo. Elev.	
****	2	4	2			
	6	6	6	13-14½	Paper and plastic mixed with sandy clay	
15					**** Approximate 1910 Topo. Elev.	
					Piezometer Point at 18'	
	5	8	16			
	6	6	6	18-19½	Wood, brick, plastic bag, newspaper - still readable	
20					Tin can	
	1	1	2			
	6	6	6	23-24½	Top 4" - ashes	
25					Base brown organic clay	

19C

No. 149

Test Boring No. 12 Location 5 + 50 left 140'

STRATA	RESISTANCE Blows	Pen.		At	Soil Classification : Description (Type, Color, Consistency, etc.)
Grd.El. 30.50					
25					
	1	2	3		
	6	6	6	28-29½	Peat - almost like sawdust
30					
	0	0	1		
	6	6	6	33-34½	Top 1" - peat
35					Base - bluish grey sandy clay with some wood chips contained within it.
	2	4	8		
	6	6	6	38-39½	Bluish grey clay.
40					Base 2" coarse sand
	17	21	22		
	6	6	6	43-44½	No sample returned
45 T.D. 44½					
50					

PROJECT:

Genesee Park

Subsurface Evaluation

Test [redacted] 43 Location 5 + 50 right 200

Date 3-11-76

Cert. No. 763-18

STRATA Grd.El. 40.50	RESISTANCE Blows Pen.			At	Soil Classification & Description (Type, Color, Consistency, etc.)	Elevation Water Table 21.50 P.H. 6.0 - 6.5
0					Shelby 0 - 1' 1975 Grd. El. 41.50	
					Explosimeter - 100+%	
					Rubble begins at approximately 6"	
****	1/6	1/6	1/6	3-4½	Bread wrapper, wood, brick, organics	
5					**** Approximate 1957 Topo. Elev.	
	5/6	4/6	4/6	8-9½	Grey gravelly sandy clay	
10						
	2/6	3/6	2/6	13-14½	Glass and ashes	
15						
****					**** Approximate 1910 Topo. Elev.	
	6/6	8/6	10/6	18-19½	Ashes, tin can,	
20					Base 2" clayey sand	
	29/6	53/6		23-24	Silty sandy gravel	
T.D. 24'						
25						

20C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-12-76

Cert. No. 763-18

Test Boring No. 14 Location 12 + 75 left 30'

STRATA	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 30.0			Elevation Water Ta 25.0 P.H. 6.5
			Explosimeter - 100+% 1975 Grd. El. 30.0
			Gas bubbling up through water - lots of pressure
			5' - 6' flame when lit - had to be extinguished
	3 5 9 / 6 6 6	3-4½	Top 6" gravelly silty clay
			Middle 8" clayey gravelly sand
			Base 4" wood and paper
	8 25 / 6 5	8-9	Tin can
			**** Approximate 1957 Topo. Elev.
			**** Approximate 1910 Topo. Elev.
	3 8 6 / 6 6 6	13-14½	Paper, plastic, wood
			Base 6" gravelly silty sand
			Tipped with peat - very fresh looking
			Piezometer tip at 16'
	21 5 6 / 6 6 6	18-19½	Ashes and glass
			Rubble ends at approximately 21'
	1 1 1 / 6 6 6	23-24½	Organic clay

Test Boring No. 14 Location 12 + 75 left 30'

STRATA	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 30.0			
	1 1 3 / 6 6 6	28-29½	Peat - very fresh looking
	5 6 7 / 6 6 6	33-34½	Top 6" peat - more decomposed than above
			Base 12" blue silty clay
	3 4 5 / 6 6 6	38-39½	Blue silty clay
	6 7 11 / 6 6 6	43	Blue and brown clay
	2 3 5 / 6 6 6	48-49½	Grey clay
	T.D. 49½'		

21C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-12-76

Cert. No. 763-18

Test Boring No. 15 Location 19 + 70 left 110'

STRATA	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 18.00			Elevation Water Table 14.00 P.H. 6.0 - 6.5
			Explosimeter - 100%
			1975 Grd. El. 19.50
			**** Approximate 1910 Topo. Elev.
	1 1 4 / 6 6 6	3-4½	Clay and organics
			**** Approximate 1957 Topo. Elev.
			Rubble begins at approximately 5' and ends at approximately 10
	3 2 1 / 6 6 6	8-9½	Glass, tin, organics
	0 0 1 / 6 6 6	13-14½	Very organic clays
	0 / 18	18-19½	Very organic clays with large pieces of wood
	1 1 1 / 6 6 6	23-24½	Very organic clays with large pieces of wood

Test Boring No. 15 Location 19 + 70 left 110'

STRATA	RESISTANCE Blows / Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 18.00			
	0 / 18	28-29½	Top 6" organic clays with pieces of wood
			Base 12" bluish grey silty sandy clay
	15 41 / 6 6	33-34	Medium coarse grey sand
T.D. 34'			

22C

PROJECT:

Genesee Park

Subsurface Evaluation

Date 3-12-76

Test Boring No. 16 Location 19 + 70 right 140'

Cert. No. 763-18

STRATA	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 21.5'			Elevation Water Table 17.5 P.H. 6.0 - 6.5
0		0-1	Brown silty sand with gravel — Explosimeter 100+%
			1975 Grd. El. 23.5
			1957 Grd. El. 24.5
	2 2 4 / 6 6 6	3-4½	Top 12" brown gravelly silty sand
5			Base 6" blue sandy silt
			**** Approximate 1910 Topo. Elev.
			Rubble begins at approx. 5' and ends at approx. 10'
	0 0 0 / 6 6 6	8-9½	Blue sandy silt mixed with paper
10			Plastic and wood
	2 2 2 / 6 6 6	13-14½	Top 6" sand
15			Base 12" peat
	2 2 2 / 6 6 6	18-19½	Peat
20			
	2 4 2 / 6 6 6	23-24½	Blue clay
25			

Test Boring No. 16 Location 19 + 70 right 140'

STRATA	RESISTANCE Blows Pen.	At	Soil Classification & Description (Type, Color, Consistency, etc.)
Grd.El. 21.5'			
25			
	2 7 8 / 6 6 6	28-29½	Sandy blue and brown clay
30			
	4 3 4 / 6 6 6	33-34½	Sandy blue and brown clay
35			
	15 21 21 / 6 6 6	38-39½	Grey silty sand
40 T.D. 39½'			
45			
50			

23C

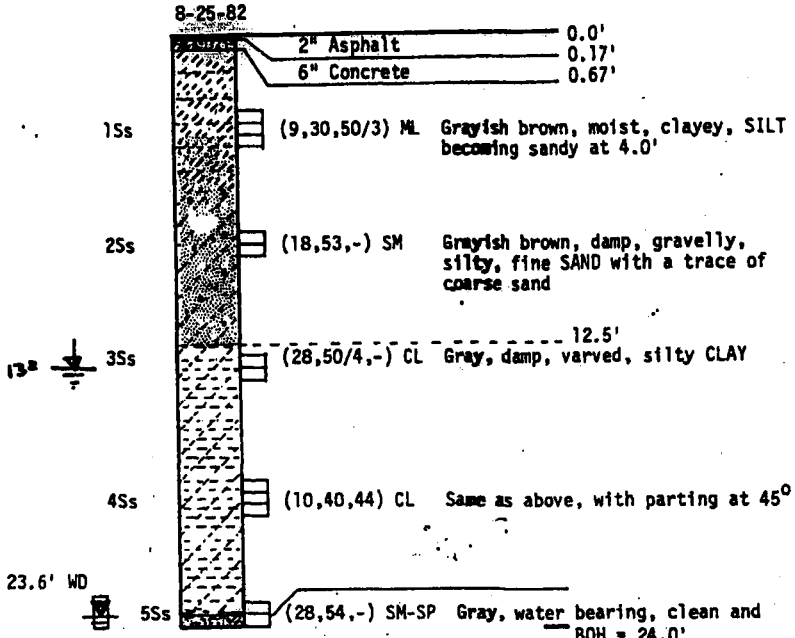
No. 149

8729

10' so. & 20 NORFOLK ST. & 6" E. & RAINIER AVE. SO.

TB-5 Location: E. side of Rainier Av. S. near S. Norfolk Street

8-25-82



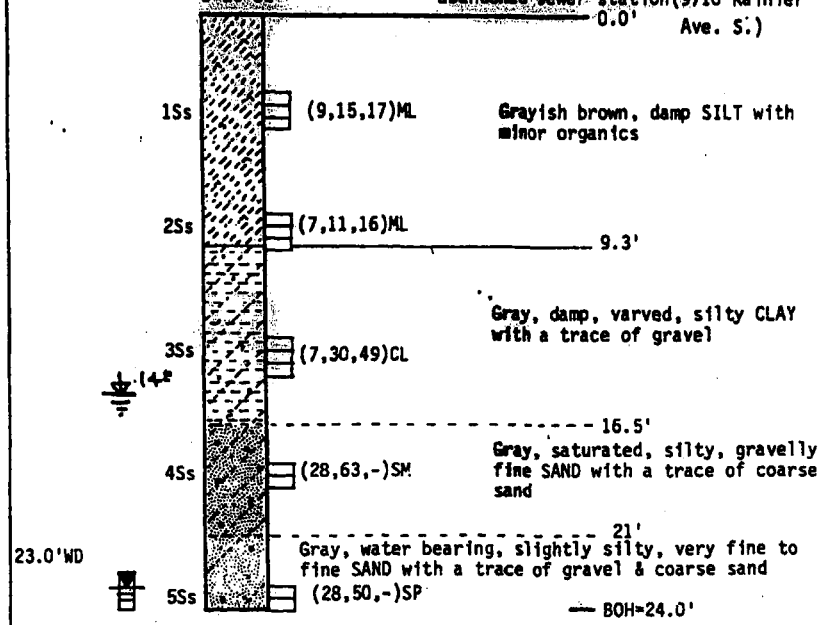
PACIFIC TESTING LABORATORIES 3220 171th AVE. W. SEATTLE, WA. 98119 206-282-0666	TEST BORING LOG for Seattle Engineering Dept. Proposed Storm Sewer Project Seattle, Washington	PROJECT NO. 8208-3015 DATE 9/13/82 DRAWN JEM ENGR./GEOL. CJJ APPROVED

8729

440' N. & SO. NORFOLK ST. & 12' E. & RAINIER AVE. SO.

TB-6 Location: E. side of Rainier Ave. S. near abandoned sewer station (9710 Rainier Ave. S.)

8-25-82

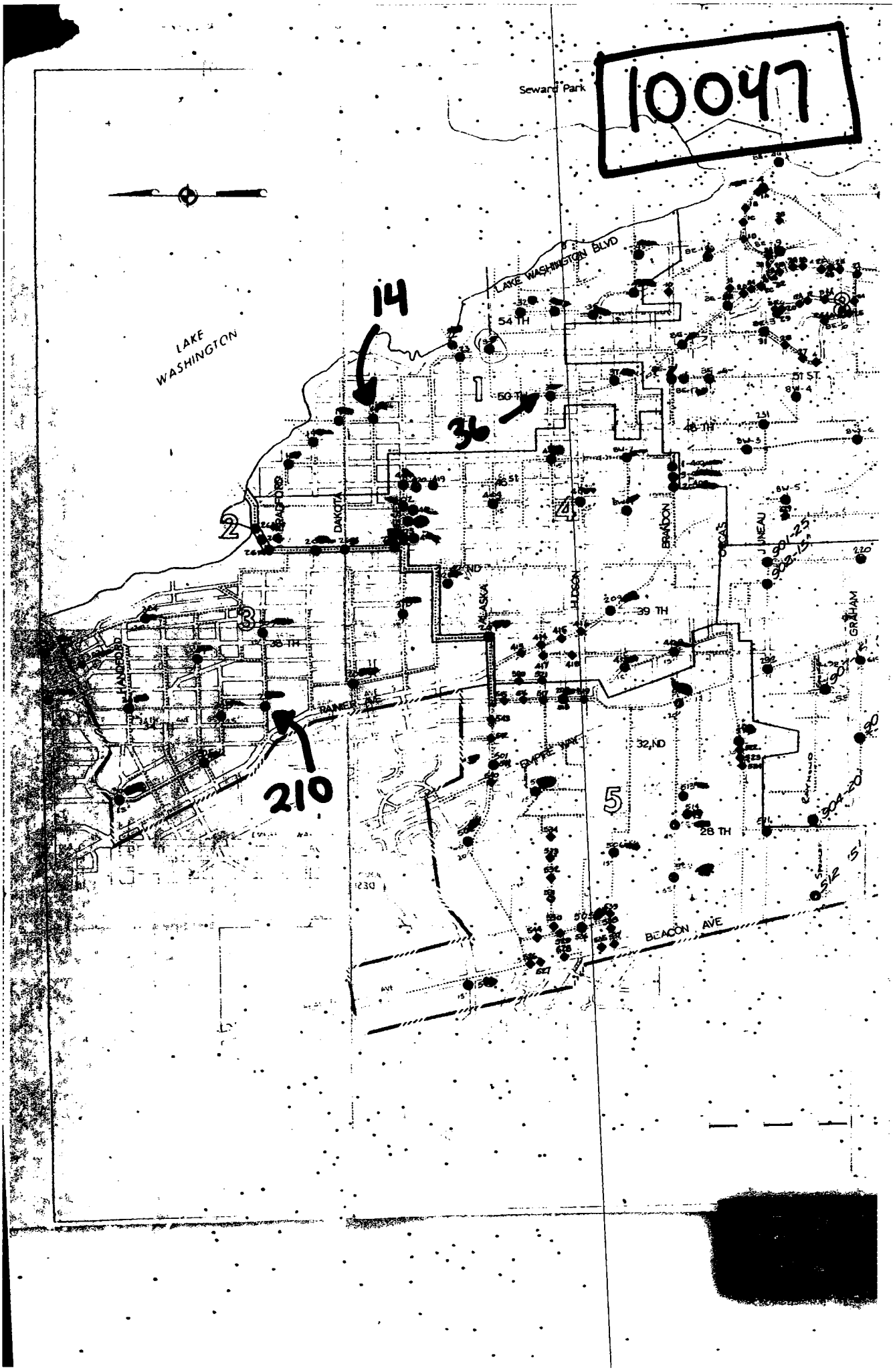


No site plan provided

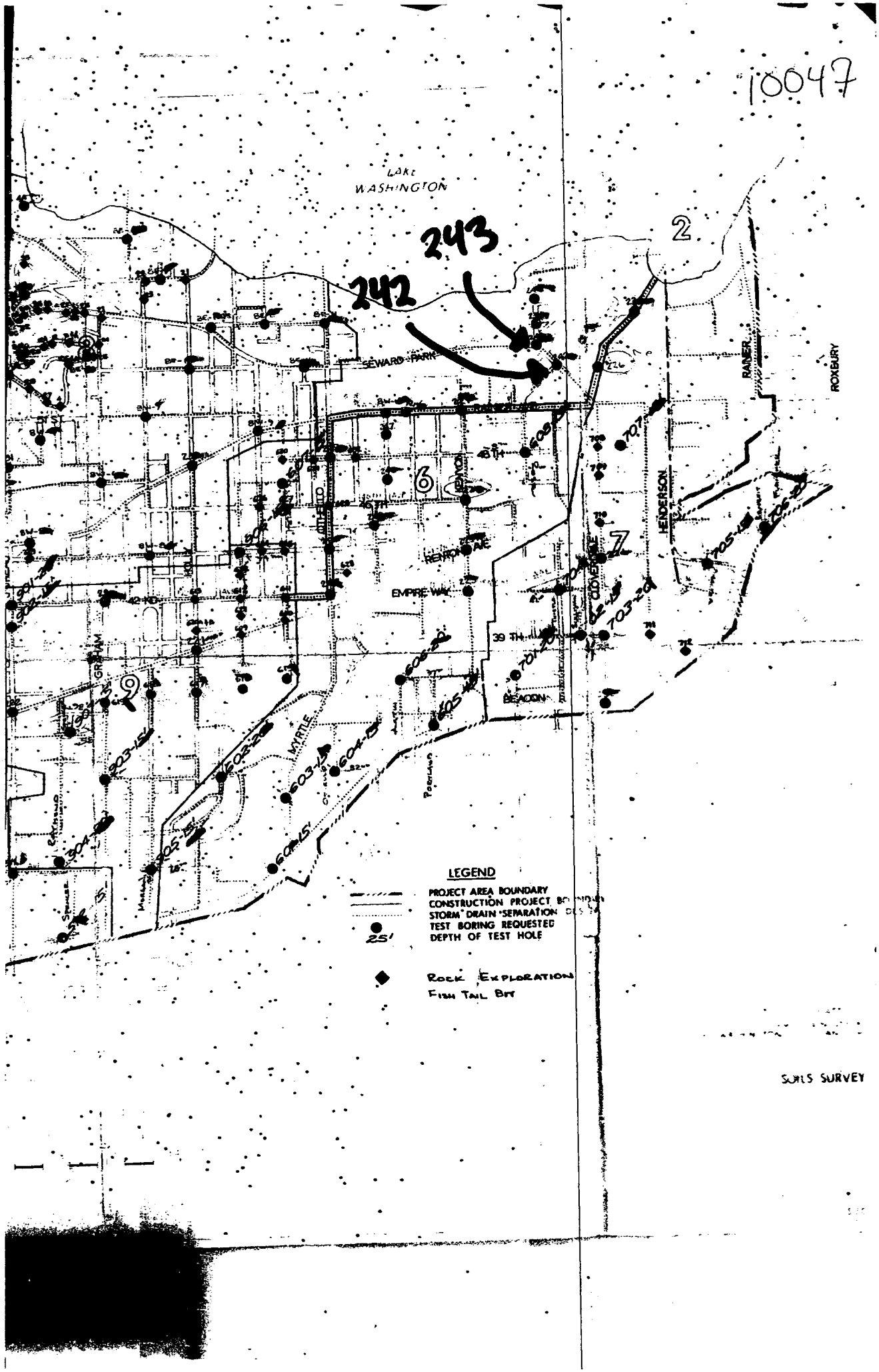
8123

PACIFIC TESTING LABORATORIES 3220 171th AVE. W. SEATTLE, WA. 98119 206-282-0666	TEST BORING LOG for Seattle Engineering Dept. Proposed Storm Sewer Project Seattle, Washington	PROJECT NO. 8209-3015 DATE 9-13-82 DRAWN JEM ENGR./GEOL. CJJ APPROVED

10047


Seward Park
LAKE WASHINGTON
LAKE WASHINGTON BLVD
54 TH
51 ST
50 TH
48 TH
46 ST
DAKOTA
BRADFORD
ALASKA
HUDSON
BRANDON
OTSEGO
JUNEAU
GRAHAM
39 TH
38 TH
RAINIER AVE
EMPIRE WAY
32 ND
28 TH
BEACON AVE
HANFORD
14
36
2
3
4
5
210
901-25
902-15
904-20
512

10047



SOILS SURVEY

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 1-24-69 HOLE NO. M S
PROJECT Lake Wash. Drainage #1 WEATHER
LOCATION 48th S & Dunsmuir 8' N. & 15' W. of ℄

WATER TABLE 2-17-69

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	A	5 15 22	37	Sand SC	Gravel Clay Minus 200 - 42%	Comp	Moist	Brn
5								
	B	8 22 53	75	Sand SC	Gravel Clay	V. Comp	Moist	Brn
10								

INSPECTOR

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

Repair

LOG OF TEST BORING

DATE 1-10-69 HOLE NO. 15
PROJECT Lake Wash. Drainage WEATHER
LOCATION SW. Corner 47th & Pleasant 25' S. & 13' W. of ℄

WATER TABLE

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	A	11 21 37	58	Sand SC	Silt. Gravel Minus 200 - 44%	V. Compt	Moist	Brn
5								
	B	23 55 100	155	Clay CL	Silt-Gravel Minus 200 - 55.4%	V. Comp LL 6.6	Moist PL 17.5	Brn LL 24.1
10								
	C	6 18 60	78	Clay 2" Zoing CL	Silt Gravel Silt Minus 200 - 69%	V. Comp LL 7.1	Moist Wet PL 18.1	Bl. Gray LL 26.2
15								
	D	17 54 100	154	Clay CL	Gravel-Silt	V. Comp	Moist	Bl.
20								

INSPECTOR H. W. Lokitz

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

Repair

LOG OF TEST BORING

DATE 1-13-69 HOLE NO. 36
PROJECT Lake Wash. Drainage #1 WEATHER
LOCATION Embankment 50' S. 152' E. & 16' S. of ℄

WATER TABLE: 1-20-69 ▽; 1-13-69 ▽

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	A	1 2 2	4	SAND SM	Silt Gravel Mica 200-47.0%	Loose	Wet	Brn
5								
				4" Silt	Green-Organic		Wet	Blk
	B	2 6 7	13	6" SAND 4" SILT SM	Gravel Sand	Loose Med	Sat. Moist	Gray Brn
10								
	C	3 7 10	17	Silt ML	Sand (Fine)	Firm	Moist	Brn
15								
	D	3 9 26	37	Sand SM	Silt Gravel Mica 200-40%	Comp.	Wet	Gray
20								
				Gravel in Tip or Sand				

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 1-14-69 HOLE NO. 37
PROJECT Lake Wash. Drainage #1 WEATHER
LOCATION S. Embankment 51½' Ave S. 25' W. & 20' S. of ℄

WATER TABLE: 1-20-69 ▽; 1-14-69 ▽

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	A	1 1 1	2	SAND SC	Silt	Loose	Moist	Brn
5					FILL			
	B	1 3 2	5	6" Sand	Gravel Silt		Moist	Green
				12" Peat		Soft	Moist	Blk
10				Pt	NOTE - PEAT			
	C	1 2	3	12" Peat		Soft	Moist	Blk
				2" Clay			Wet	Gray
15			1	4" Clay CL	Silt		Wet	Gray
	D	7 14 8	22	Sand SM	Gravel Broken fragments of gravel	Firm	Wet	Gray
20								

INSPECTOR: H. W. Kocita

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

1/2

DATE 2-69 HOLE NO. 210
PROJECT LAKE WASH. SEC. #2 WEATHER
LOCATION 35 AVE. S. & S. CHARLESTOWN ST. NW CORNER

WATER TABLE: 4-3-69

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
		18"		5" heave				
	A	2	1	SILT & GRAY	ORGANIC SAND	VERY SOFT	QUITE WET	DK. BRN. GREY
				5" SAND	GRAY		WET	DK. BRN.
5				OL	Debris, glass			
				SC				
				SC				
	B	1 2 2 4		CLAY	SAND LAYERS	SOFT	WET	DK. BRN.
				CLAY	TRACE SAND ORGANIC		MOIST	GREY
10				CL				
	C	1 1 1 2		CLAY	SAND LAYERS	SOFT	WET	GREY
15				CH				
	D	1 1 1 2		CLAY	SAND & SILT LAYERS	VERY SOFT	WET	GREY
20				CH				
HARD DRILLING								
	E	2 2 1 2		CLAY	FINE SAND LAYERS	SOFT	WET	GREY
25				CH				
	F	1 1 2 3		CLAY	FINE SAND LAYERS	SOFT	WET	GREY
30				CL				

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

2/2

DATE 4-2-69 HOLE NO. 210
PROJECT L.C. WASH. S. #2 WEATHER
LOCATION

WATER TABLE

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
	G	NO SAMPLE TAKEN — SOFT						
35								
		(10)		ROCK IN SHOW				
	H	6 50 X	150	CLAY			WET	GREY
40				CH				

INSPECTOR:

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 3-24-69 HOLE NO. 233
PROJECT LAKE WASH. SE #2 WEATHER
LOCATION 80' W. ℄ BEACON AVE S. & 11' N. ℄ S. CLOVERDALE ST

WATER TABLE: 3-31-69

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
5	A	5 6 11	17	SILT CL	SAND, TRACE GRAVEL	STIFF	MOIST	BRN.
10	B	15 24 32	57	SILT SM	SAND TRACE GRAVEL	VERY STIFF	MOIST	BRN.
15	C	8 25 (3") X	100	SILT SM-SC	SAND, TRACE GRAVEL	VERY STIFF	MOIST	GRAY
20	D	11 18 25	43	SILT ML	SAND	VERY STIFF	MOIST	BRN
25	E	8 15 22	37	SILT ML	SAND	VERY STIFF	MOIST	GREY

INSPECTOR:

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

LOG OF TEST BORING

DATE 5-22-69 HOLE NO. 242
PROJECT LAKE WASHINGTON SE WEATHER
LOCATION WABASH AVE. S. & S. CLOVERDALE 45' S. & 20' E. OF ℄

WATER TABLE: 5-26-69

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L.	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
5	A	7 18 28 46		SILT ML	FRACTURE SAND GRAVEL 54% PASSED #200	COMP	MOIST	BRN
10	B	5 50	50+	No RECOVERY		VERY COMP		
15	C	35 1½" 50	50+	SILT ML-MH		VERY COMP	MOIST	GRAY
20	D	22 4½" 50	50+	SILT ML & SM	TRACE GRAVEL CLAY LUMPS	VERY COMP	MOIST	GRAY
25	E	4" 50	50+	SAND SP-SM	SILT GRAVEL	VERY COMP	MOIST	GRAY
30	F	17 5½" 50	50+	SAND SM	SILT GRAVEL	VERY COMP	WET	GRAY

INSPECTOR:

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

1 of 2

LOG OF TEST BORING

DATE 5-20-69 HOLE NO. 243

PROJECT Lake Washington SE WEATHER

LOCATION Seward Pk Ave S. & Cloverdale 60' N & 50' S. of ℄

Piezometer Projects 2' above ground

WATER TABLE

5-22-69

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
5	A	15 29 40	69	Silt SM	Sand Gravel	Very Comp	Moist	Brn
10	B	3 23 44	67	Silt ML & SM	Sand Gravel	Very Comp	Moist	Gray
15	C	13 31 50 (5½")	50+	Silt SP SM	Sand Gravel Sand Layers	Very Comp	Moist	Brn
20	D	21 50 (4½")	50+	Silt Sand ML-CL SM-SC	Gravel Lump Clay	Very Comp	Wet	Gray
25	E	30 31 35	66	Silt SP & CL ML	Sand Gravel Sand Layer	Very Comp	Moist Wet	Gray
30	F	28 50 (4½")	50+	Silt ML SM	Sand Gravel Clay-Silt Layers	Very Comp	Moist	Gray

5-20-69 Piezometer installed

INSPECTOR:

SEATTLE ENGINEERING DEPARTMENT
MATERIALS LABORATORY

2 of 2

LOG OF TEST BORING

DATE 5-20-69 HOLE NO. 243

PROJECT Lk. Wash. SE WEATHER

LOCATION Seward Pk Ave So. & Cloverdale

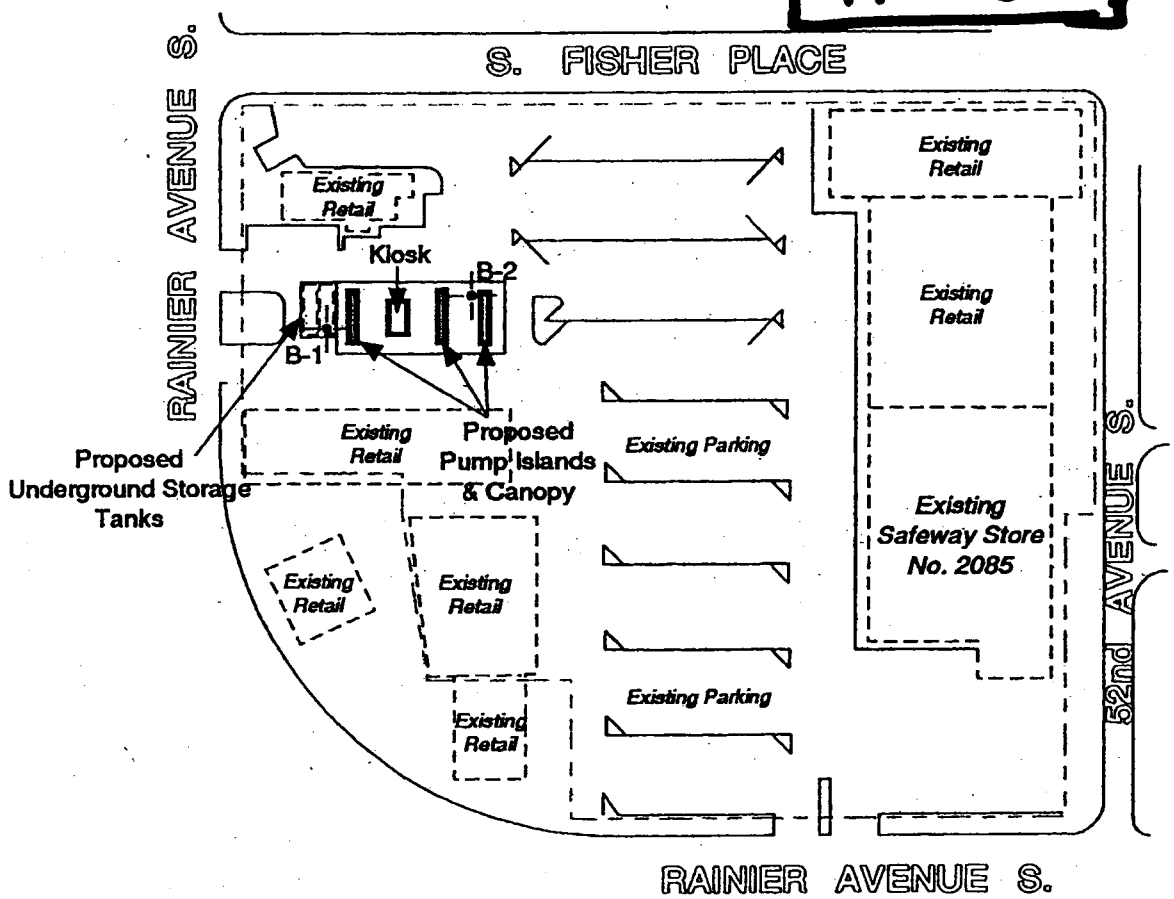
WATER TABLE

Pea Gravel

GRD. EL.	SAMPLE NO.	BLOW COUNT	STD. PEN.	DESCRIPTION OF MATERIAL: BASE MAT'L	AUXILIARY MATERIAL	CONSISTENCY	MOISTURE	COLOR
35	G	50 (3½")	50+	Silt SC	Sand Gravel	Very Comp	Moist	Gray
40	H	13 60 50 (4")	50+	Silt ML	Sand (Fine)	Very Comp	Moist	Gray
45	I	27 55 (5½")	50+	Silt ML	Sand (Fine)	Very Comp	Moist	Gray
50	J	37 50 (3½")	50+	Silt SM ML & SM	Sand Layers (Med Sand)	Very Comp	Moist	Gray

INSPECTOR:

11280



LEGEND

B-1 — Approximate Location of ECI Boring, Proj. No. E-9557, Jan. 2001

Subject Site

Proposed Building

Existing Building

N

Approximate Scale

0 50 100 200ft.

Earth Consultants, Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Location Plan
Safeway Fueling Station
Seattle, Washington

Drwn.	GLS	Date	Jan. 2001	Proj. No.	9557
Checked	MGM	Date	1/29/01	Plate	2

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

Boring Log

Project Name: Safeway Fueling Station				Sheet 2 of 2
Job No. 9557	Logged by: MGM	Start Date: 1/17/01	Completion Date: 1/17/01	Boring No.: B-2
Drilling Contactor: Associated		Drilling Method: HSA		Sampling Method: SPT
Ground Surface Elevation: 97'		Hole Completion: ☐ Monitoring Well ☐ Piezometer ☒ Abandoned, sealed with bentonite		

General Notes	W (%)	No. Blows Ft.	Graphic Symbol	Depth Ft.	Sample	USCS Symbol	
	16.2	100/4"				ML	Gray sandy SILT, very dense, moist, trace small gravel
							Boring terminated at 20.5 feet below existing grade. Perched groundwater seepage encountered at 9.0 feet during drilling. Boring backfilled with bentonite and cuttings.

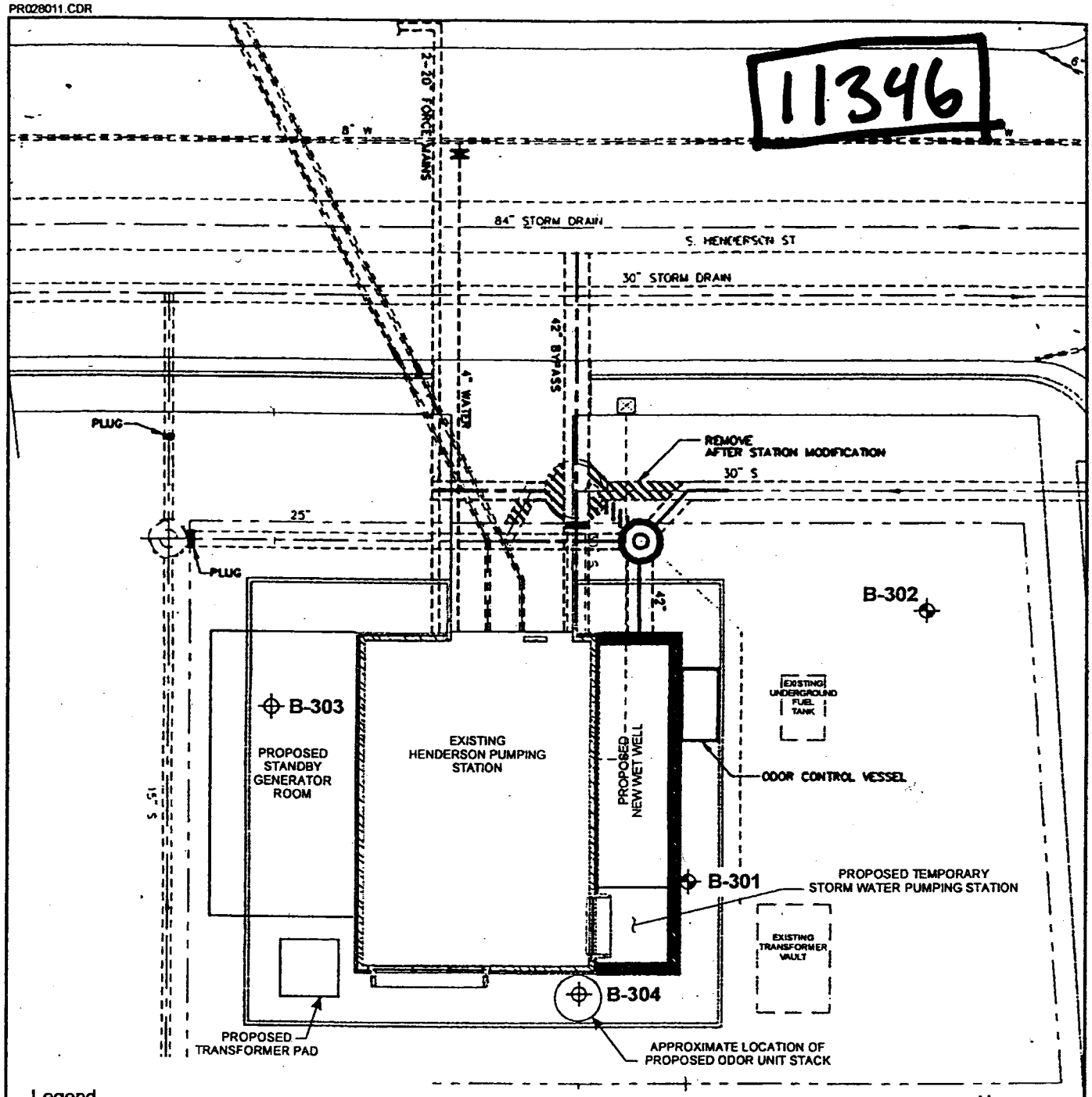
Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Log
Safeway Fueling Station
Seattle, Washington

Proj. No. 9557	Dwn. GLS	Date Jan. 2001	Checked MGM	Date 1/25/01	Plate A5

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by engineering tests, analysis and judgment. They are not necessarily representative of other times and locations. We cannot accept responsibility for the use or interpretation by others of information presented on this log.

PR028011.CDR



Legend

B-301 Approximate location of exploration completed for this study (September 1998)

B-303 Approximate location of exploration completed for this study (May 1999)

SOURCE: HDR Engineering, Inc., 1998

SCALE IN FEET

0 20 40

N

Henderson Pumping Station Upgrade
Seattle, Washington
HDR Engineering, Inc.

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

SITE AND EXPLORATION PLAN

Project No.: 006-006

FIGURE 2

BORING B-301

Surface Elevation = 127 feet

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol	Description	Elevation (feet)
									Gray-brown, fine to medium SAND with silt; medium dense; moist. (FILL)	125
	1	107	19	3 6 10	X	5	SP SM			120
GSD	2	104	11	5 7 9	X	10			Becomes wet.	6/9/99 115 ATD
GSD	3	116	15	5 9 11	X	15			Gray mottled brown and rust, sandy SILT, few pockets of clean, fine to medium sand, trace coarse sand and fine, rounded gravel; medium dense; wet. (GLACIALLY OVERRIDDEN DEPOSITS)	110
	4	100	28	8 12 17	X	20	ML		Becomes light gray-brown, few fine sand, occasional pockets of clayey silt; moist.	105
	5	99	27	10 14 15	X	25			Becomes dark gray, interbedded with fine sand; moist to wet.	100
	6	107	21	15 30 50/3"	X				Becomes hard with increasing fine sand content.	
	7	104	21	14 44 50/3"	X	30			Grades to increased clay content, trace fine gravel.	95
	8	106	21	18 50/6"	X	35			Becomes light gray, trace clay.	90

Date Drilled: 09/14/98
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: CME Automatic Hammer, 300 lb.

PacRim Geotechnical Inc.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington
King County Department of Natural Resources

LOG OF BORING B-301

SHEET 1 OF 2

Project No. 006-006

FIGURE A-2

BORING B-301

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol		Elevation (feet)	Well Detail
	9	110	20	12 22 47	X		CL		Dark gray, silty CLAY, occasional white silt partings and fissures at various angles; hard; wet.		
									Boring terminated at 41.5 ft. Groundwater encountered at 13 ft. during drilling.	85	
						45					
										80	
						50					
										75	
						55					
										70	
						60					
										65	
						65					
										60	
						70					
										55	
						75					
										50	

Date Drilled: 09/14/98
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: CME Automatic Hammer, 300 lb.

PacRim Geotechnical Inc.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington
King County Department of Natural Resources

LOG OF BORING B-301

SHEET 2 OF 2

Project No. 006-006

FIGURE A-2

BORING B-302

Surface Elevation = 125 feet

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol	Description	Elevation (feet)
									Gray-brown, mottled rust, fine to medium silty SAND, some fine gravel; medium dense; moist; gravel is rounded. (FILL)	
	1	118	14	5 6 5	X	5				120
							SM		Becomes wet.	ATD 6/9/99
	2	109	17	2 1 2	X	10			Becomes very loose, with organic matter.	115
	3	111	23	6 14 17	X	15	SM		Yellow-brown, silty fine SAND, occasional pockets of clayey silt; dense; moist. (GLACIALLY OVERRIDDEN DEPOSITS)	110
	4	109	20	15 37 50/4"	X	20			Gray, fine sandy SILT; very dense; moist.	105
	5			27 50/3"	X	25				100
							ML		Becomes interbedded with clayey silt, decreased sand content.	
	6	104	22	11 50/6"	X	30				95
	7	103	22	20 50/6"	X	35				90
							SP		Blue-gray fine to medium SAND, trace coarse sand and fine gravel, occasional pockets of gray silt; very dense; wet.	

Date Drilled: 09/14/98
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: CME Automatic Hammer, 300 lb.

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

LOG OF BORING B-302

SHEET 1 OF 2

Project No. 006-006

FIGURE A-3

BORING B-302

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol		Elevation (feet)	Well Detail
	8		17	15 50/5"	X						
									Boring terminated at 41.0 ft. Groundwater encountered at 8 ft. during drilling.		
						45				80	
						50				75	
						55				70	
						60				65	
						65				60	
						70				55	
						75				50	

Date Drilled: 09/14/98
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: CME Automatic Hammer, 300 lb.

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

LOG OF BORING B-302

SHEET 2 OF 2

Project No. 006-006

FIGURE A-3

BORING B-303

Surface Elevation = 127 feet

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol	Description	Elevation (feet)	Well Detail
							SM		Brown, silty SAND; loose; moist; trace to few organics (FILL)		
							ML		Brown, sandy SILT; soft; moist; with organics, trace roots	125	
	1		17.0	3 3 2					Light brown, fine to medium SAND with silt, trace fine gravel; loose; moist; gravel is rounded. Cobbles encountered at 4.5 ft. Becomes gray-brown.		
	2		5.9	6 10 11		5					
										120	
	3		6.2	8 10 15			SP SM		Becomes gray; moist to wet.		
						10					
									Becomes with gravel.	ATB	
	4		18.5	10 8 9			SM		Yellow-brown, fine to medium silty SAND, trace coarse sand and fine gravel; medium dense; wet.		
						15					
	5		25.0	19 29 50/4"			ML		Gray mottled yellow-brown and greenish gray, SILT with fine sand, thinly laminated with clay; very dense; wet. (GLACIALLY OVERRIDDEN DEPOSITS)	110	
						20			Boring terminated at 18.8 ft. Groundwater encountered at 12.5 ft during drilling.		
										105	
						25					
										100	
						30					
										95	
						35					
										90	

Date Drilled: 5/26/99
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: 140 lb./Rope & Cat Head

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

LOG OF BORING B-303

SHEET 1 OF 1

Project No. 006-006

FIGURE A-4

BORING B-304

Surface Elevation = 127 feet

Remarks and Other Tests	Sample No.	Dry Density (pcf)	Moisture Content (%)	Blows/6"	Sample	Depth (feet)	USCS	Graphic Symbol	Description	Elevation (feet)	Well Detail
									Dark brown, silty SAND with organics; loose; moist. (TOPSOIL)		
	1		20.1	5 5 6			ML		Light brown, fine to medium sandy SILT, few organics, trace brick fragments, trace rounded gravel; medium dense; moist to wet. (FILL)	125	
	2		8.8	5 8 11		5	SP SM		Brown-gray, fine to medium SAND, with silt, trace fine gravel, occasional pockets of silty sand; medium dense; moist.	120	
	3		7.4	7 7 8		10			Grades with occasional pockets of brown silt.		
	4		14.6	10 15 19		15	SM		Blue-gray mottled green, silty SAND with gravel, occasional seams of clean sand and thinly laminated silt; dense, moist to wet. (Glacially Overridden Deposits) Becomes wet.	115 ATD	
	5		21.3	13 18 21		20			Becomes brown, mottled gray and rust, frequent iron-stained fissures at various angles.	110	
						25			Boring terminated at 18.8 ft. Groundwater encountered at 15 ft. during drilling.	105	
						30				100	
						35				95	
										90	

Date Drilled: 5/26/99
Elevation Datum: King County (Metro)
Drilling Method: Hollow Stem Auger
Sampling Method: 140 lb./Rope & Cat Head

PACRIM GEOTECHNICAL INC.
GEOTECHNICAL ENGINEERING AND APPLIED EARTH SCIENCES

Henderson/M.L. King CSO Project
Seattle, Washington

King County Department of Natural Resources

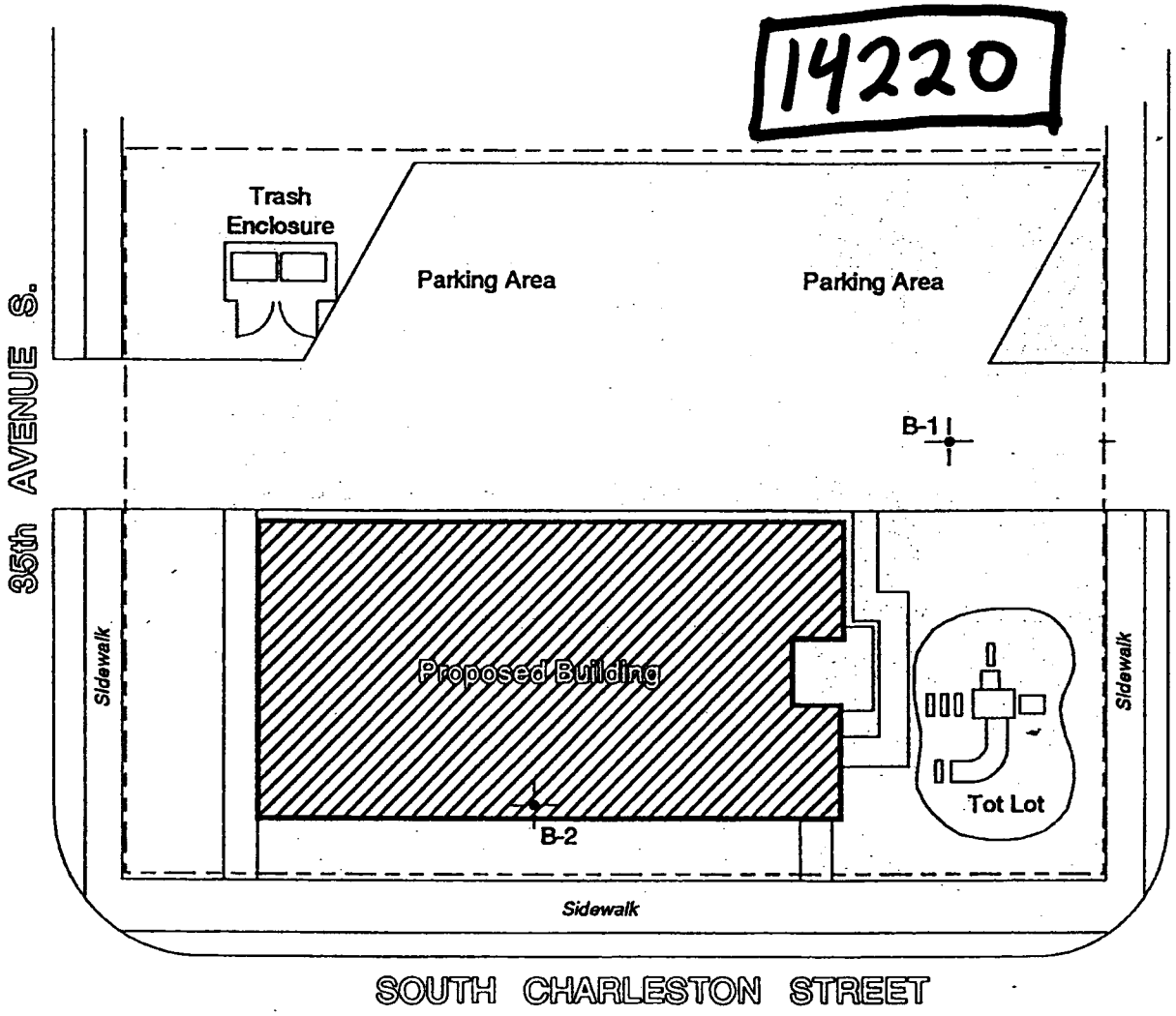
LOG OF BORING B-304

SHEET 1 OF 1

Project No. 006-006

FIGURE A-5

14220



LEGEND

B-1 — Approximate Location of ECI Boring, Proj. No. E-9823, Aug. 2001

Subject Site

Proposed Building

N

Approximate Scale

0 10 20 40ft.

Earth Consultants, Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Location Plan
3500 South Charleston Street
Seattle, Washington

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

Drwn.	GLS	Date	Aug. 2001	Proj. No.	9823
Checked	KMW	Date	8/14/01	Plate	2

Boring Log

Project Name: 3500 South Charleston Street				Sheet 1 of 2
Job No. 9823	Logged by: SR	Start Date: 8/9/01	Completion Date: 8/9/01	Boring No.: B-1
Drilling Contactor: Holocene		Drilling Method: HSA		Sampling Method: SPT
Ground Surface Elevation:		Hole Completion: ☐ Monitoring Well ☐ Piezometer ☒ Abandoned, sealed with bentonite		

General Notes	W (%)	No. Blows Ft.	Graphic Symbol	Depth Ft.	Sample	USCS Symbol	Surface Conditions:
				1		SM	Brown silty fine SAND, loose to medium dense, moist (Fill)
				2		CH	Gray fat CLAY, stiff, moist
	21.7	14		3			
				4			
	37.8	7		5			
				6			
				7			
				8			
				9			
L=64.0 PL=27.9 PI=36.1	43.0	2		10			-becomes soft
				11			
				12			
				13			-occasional sand/silt lenses
				14			
	29.7	5		15			
				16			
				17			
				18			
				19			

Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Log
3500 South Charleston Street
Seattle, Washington

Proj. No. 9823	Dwn. GLS	Date Aug. 2001	Checked SR	Date 8/15/01	Plate A2

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by engineering tests, analysis and judgment. They are not necessarily representative of other times and locations. We cannot accept responsibility for the use or interpretation by others of information presented on this log.

Boring Log

Project Name: 3500 South Charleston Street				Sheet 2 of 2
Job No. 9823	Logged by: SR	Start Date: 8/9/01	Completion Date: 8/9/01	Boring No.: B-1
Drilling Contactor: Holocene		Drilling Method: HSA		Sampling Method: SPT
Ground Surface Elevation:		Hole Completion: ☐ Monitoring Well ☐ Piezometer ☒ Abandoned, sealed with bentonite		

General Notes	W (%)	No. Blows Ft.	Graphic Symbol	Depth Ft.	Sample	USCS Symbol	
	32.5	3		21		CL	Gray fat CLAY, soft, moist to wet
				22			
				23		SP-SM	Gray poorly graded SAND with silt, dense, wet, contains gravel
				24			
	9.7	41		25			-moderate seepage at approximately 23'
				26			
							Boring terminated at 26.5 feet below existing grade. Groundwater seepage encountered at 23.0 feet during drilling. Boring backfilled with bentonite and cuttings. NOTE: Boring performed by Holocene Drilling using a truck-mounted auger.

Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Log
3500 South Charleston Street
Seattle, Washington

Proj. No. 9823	Dwn. GLS	Date Aug. 2001	Checked SR	Date 8/15/01	Plate A3

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by engineering tests, analysis and judgment. They are not necessarily representative of other times and locations. We cannot accept responsibility for the use or interpretation by others of information presented on this log.

Boring Log

Project Name: 3500 South Charleston Street				Sheet 1 of 2
Job No. 9823	Logged by: SR	Start Date: 8/9/01	Completion Date: 8/9/01	Boring No.: B-2
Drilling Contactor: Holocene		Drilling Method: HSA		Sampling Method: SPT
Ground Surface Elevation:		Hole Completion: ☐ Monitoring Well ☐ Piezometer ☒ Abandoned, sealed with bentonite		

General Notes	W (%)	No. Blows Ft.	Graphic Symbol	Depth Ft.	Sample	USCS Symbol	Surface Conditions:
						SM	Brown silty fine SAND, loose, moist (Fill)
				1		CL	Gray CLAY, stiff, moist
				2			
	32.6	10		3			-iron oxide staining -trace organics
				4		CH	Gray fat CLAY, soft to medium stiff, moist to wet
	41.8	7		5			
				6			
				7			
				8			
				9			
	49.8	4		10			
				11			
LL=67.0 PL=29.7 PI=37.3				12			
				13			
				14			
	48.5	4		15			
				16			
				17			
				18			
				19			

Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Log
3500 South Charleston Street
Seattle, Washington

Proj. No. 9823	Dwn. GLS	Date Aug. 2001	Checked SR	Date 8/15/01	Plate A4

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by engineering tests, analysis and judgment. They are not necessarily representative of other times and locations. We cannot accept responsibility for the use or interpretation by others of information presented on this log.

Boring Log

Project Name: 3500 South Charleston Street				Sheet 2 of 2
Job No. 9823	Logged by: SR	Start Date: 8/9/01	Completion Date: 8/9/01	Boring No.: B-2
Drilling Contactor: Holocene		Drilling Method: HSA		Sampling Method: SPT
Ground Surface Elevation:		Hole Completion: ☐ Monitoring Well ☐ Piezometer ☒ Abandoned, sealed with bentonite		

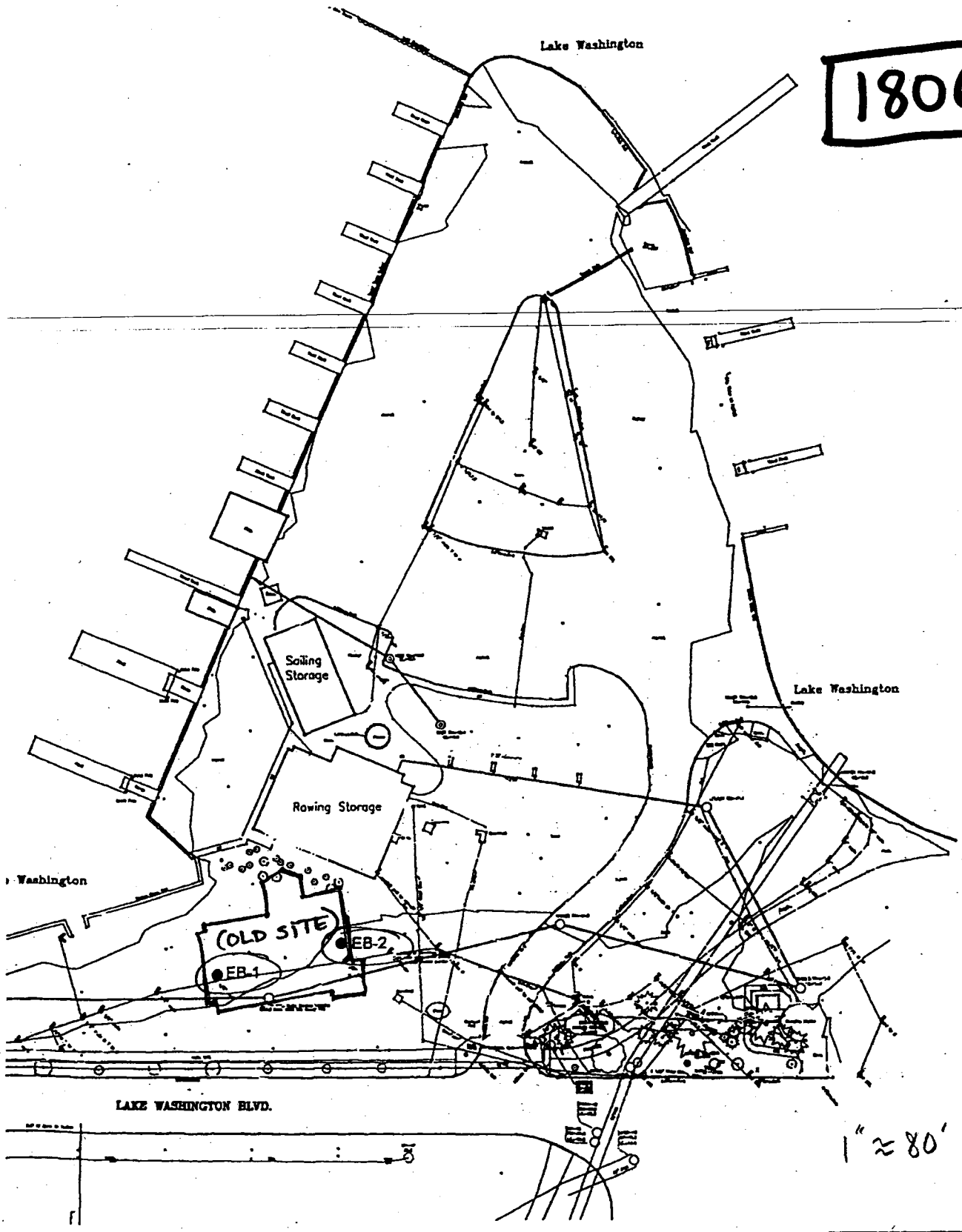
General Notes	W (%)	No. Blows Ft.	Graphic Symbol	Depth Ft.	Sample	USCS Symbol	
	31.8	1		21		CH	Gray fat CLAY, soft, wet
				22			
				23			
				24			
	53.1	2		25			
				26			
				27			
				28			
				29			
	23.6	29		30		SM	Gray silty SAND, medium dense, wet
				31			-moderate seepage at 30'
							Boring terminated at 31.5 feet below existing grade. Groundwater seepage encountered at 30.0 feet during drilling. Boring backfilled with bentonite and cuttings.

Earth Consultants Inc.
Geotechnical Engineers, Geologists & Environmental Scientists

Boring Log
3500 South Charleston Street
Seattle, Washington

Proj. No. 9823	Dwn. GLS	Date Aug. 2001	Checked SR	Date 8/15/01	Plate A5

Subsurface conditions depicted represent our observations at the time and location of this exploratory hole, modified by engineering tests, analysis and judgment. They are not necessarily representative of other times and locations. We cannot accept responsibility for the use or interpretation by others of information presented on this log.



AND EXPLORATION PLAN

. BAKER ROWING CENTER
SEATTLE, WASHINGTON

FIGURE 1

DATE 9/01

PROJECT NO. KE01558A

Exploration Log

ASSOCIATED EARTH SCIENCES, INC

Project Number	Exploration Number	Sheet
KE01558A	EB-1	1 of 1

Project Name: Mt. Baker Rowing Center
Location: Seattle, WA
Driller/Equipment: Holocene / HSA
Hammer Weight/Drop: 140# / 30"

Ground Surface Elevation (ft):
Datum: N/A
Date Start/Finish: 08/30/01,08/30/01
Hole Diameter (in):

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil					
		S-1		Medium stiff, damp, brown, SANDY SILT. Fill Soft, moist, gray SILT, little sand.			5 3 5	▲8	
5									
		S-2		Loose, wet, gray SAND.		▽	5 5 5	▲10	
10									
				Peat (Qp)					
		S-3		Very soft, wet, brown PEAT with SAND interbeds.			0 0 4	▲4	
15									
		S-4		Very soft, wet, brown PEAT. Lacustrine Sediments (Qsc) Very soft, moist, blue CLAY.			0 0 2	▲2	
20									
		S-5		Medium stiff, moist, blue/tan CLAY.			4 5 10	▲15	
25									
		S-6		Soft, moist, tan/blue CLAY with SAND interbeds.			1 2 4	▲6	
30									
		S-7		Vashon Till (Qtl) Medium dense to dense, moist, gray SAND, little gravel (blow count overstated [50/5"] due to rock).			10 11 50/5"	▲61/11"	
35				Bottom of exploration boring at 34 feet					

Sampler Type (ST):
- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
▽ Water Level ()
▼ Water Level at time of drilling (ATD)

Logged by: JPO
Approved by:

AESIBOR 01558.GPJ September 7, 2001

Exploration Log

ASSOCIATED EARTH SCIENCES, INC

Project Number	Exploration Number	Sheet
KE01558A	EB-2	1 of 1

Project Name: Mt. Baker Rowing Center
Location: Seattle, WA
Driller/Equipment: Holocene / HSA
Hammer Weight/Drop: 140# / 30"

Ground Surface Elevation (ft):
Datum: N/A
Date Start/Finish: 08/30/01,08/30/01
Hole Diameter (in):

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Topsoil					
		S-1		Medium stiff, damp, brown, SANDY SILT.			5 8 10	18	
				Asphalt					
				Fill					
5				Medium dense, damp, gray SAND.					
		S-2		Loose, wet, gray SAND.		▽	4 4 4	8	
10									
				Very soft, moist, brown, SANDY SILT.					
		S-3		Peat (Qt)			1/18	1/18"	
				Very soft, wet, brown PEAT with sand interbeds.					
15									
				Lacustrine Sediments (Qsc)					
		S-4		Soft, moist, blue-gray CLAY.			0 3 6	9	
20									
		S-5		Soft, moist, tan, CLAYEY SILT with fine SAND interbeds.			3 5 2	7	
25									
				Vashon Till (Qt)					
		S-6		No Recovery, very difficult drilling			100/2"		100/2"
				Bottom of exploration boring at 27.7 feet					
30									
35									

Sampler Type (ST):

- 2" OD Split Spoon Sampler (SPT)
- 3" OD Split Spoon Sampler (D & M)
- Grab Sample
- No Recovery
- Ring Sample
- Shelby Tube Sample

M - Moisture
▽ Water Level ()
▼ Water Level at time of drilling (ATD)

Logged by: JPO
Approved by:

APPENDIX B

COMBINED SEWER OVERFLOW (CSO) CONTROL ALTERNATIVES LISTS

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

DRAFT - For Discussion Purposes Only. Not Intended for Review.

By: HDR Team

Revised: 7/21/2009

Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
1	37	OFF	37	Offline Storage	OFF-100-37	Lakeline Capacity	Offline Storage in Basin 37 (Right-of-Way)	Offline storage (pipe or tank) located in right of way at S Horton Street and Lake Washington Blvd	37 is in compliance; Alternative could provide peak flow buffering to increase storm flow capacity downstream if King County system operation changes require additional capacity in Hanford Street Trunk B pipe		4114601830 Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
2	37	PSC	37	Permanent Source Control		System Capacity	Source Control in Basin 37	Currently no viable locations are available.	37 is in compliance; Alternative could provide peak flow buffering to increase storm flow capacity downstream if King County system operation changes require additional capacity in Lander Street Trunk Phase 2 pipe		Various		
3	37	IN	37	Inline Storage	IN-100-37	Lakeline Capacity	Inline Storage in Basin 37 (Parks Property)	Inline storage located in right of way at S Horton Street and Lake Washington Blvd	37 is in compliance; Alternative could provide peak flow buffering to increase storm flow capacity downstream if King County system operation changes require additional capacity in Hanford Street Trunk B pipe		4114601830 Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
4	37	IRPb	37	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 37	Locations TBD	Reline 50% - 100% of all sewers in Public ROW within Basin 37		Various		
5	38	PSC	38	Permanent Source Control		System Capacity	Source Control in Basin 38	Currently no viable locations are available.	Consider GSI and Separation in sections of basin 38/39 that are currently combined storm water/wastewater systems.		Various		

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

DRAFT - For Discussion Purposes Only. Not Intended for Review.

By: HDR Team
Revised: 7/21/2009
Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
6	38	RET	38	Retrofit	RET-101-38	System Capacity	Flow Recirculation to Existing Storage (Parks Property)	Add real time controls such that as the lake line backs up, flows are diverted to recirculate into basin 38. Modify outlets on existing 48-inch and 72-inch pipes by adding gates to control flow rate. Construct a new force main and control valve system at PS 5. Construct 100 lf of new force main to discharge to the 72-inch pipe upstream of a control gate to recirculate flows into the existing 48-inch and 72-inch storage pipes in Basin 38. .	May require new pumps at PS 5.		5249800001 (Stan Sayres Park) 4154301165 (Genessee Park & Playfield) Lake Washington Blvd S 45th Avenue South	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
7	38	RET	38	Retrofit	RET-103-38	System Capacity	Hydrobrake Replacement at MH 059-499	Replace hydrobrake with gate operated with real time controls to maximize storage in existing 72-inch and 48-inch storage pipes located in Genesee Park.	This alternative would be evaluated in conjunction with the removal or modification of the Darigold flows from this part of the collection system. Current hydrobrake may be sized to accommodate peak flow from Darigold, thereby minimizing upstream storage potential.		4154301165 (Genessee Park & Playfield)	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

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By: HDR Team
Revised: 7/21/2009
Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
8	38	RET	38	Retrofit	RET-104-38	System Capacity	Darigold System Operational Changes	Work with Darigold to develop strategy for releasing waste water over longer time frame (versus current "plug flow" release that has a high peak flow of ~2mgd)	Would not need to be completed as a capital project unless system modifications at Darigold require controls/retrofits to achieve release rate.		7950301240	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
9	38	RET	38	Retrofit	RET-105-38	System Capacity	Sluice Gates with Controls at MH 059-356	Install sluice gates with real time controls at MH 059-356 to maximize storage in 48-inch storage pipes	As a stand alone alternative this retrofit would control flows from basin 38. Pump Station 5 capacity would not be increased.		4154300585 (Genessee Park & Playfield)	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

DRAFT - For Discussion Purposes Only. Not Intended for Review.

By: HDR Team
Revised: 7/21/2009
Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
10	38	TKC	38	Transfer Flows to King County	TKC-101-38	Pump Station Capacity	Upgrade Pump Station 5 (Parks Property)	Upgrade Pump Station #5 (Stan Sayres Memorial Park) with increased pumping capacity.	Could be completed as stand alone project to reduce overflows at CSO Outfall 38 and lakeline capacity overflows caused in upstream basins (41a and 41b)		5249800001 (Stan Sayres Park) Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
11	38	TKC	38	Transfer Flows to King County	TKC-104-38	System Capacity	Force main Bypass or Removal of King County Sand Catcher/Grit Chamber (Parks Property)	Construct a new force main bypass around the existing County-owned sand catcher at Stan Sayres Memorial Park. Work with King County to determine functional requirement and performance of existing grit chamber near PS 5. Remove entire structure to eliminate potential choke point during storm events and reduce O&M costs to King County	The force main would bypass the sand catcher and prevent discharged flows from PS 5 backing up to CSO Outfall 38 due to lack of capacity at the sand catcher. County may balk if there are no options upstream of this location to provide grit removal. Functional determination based on King County O&M standards		5249800001 (Stan Sayres Park) Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

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By: HDR Team
Revised: 7/21/2009
Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
12	38	TKC	38	Transfer Flows to King County	TKC-105-38	System Capacity	Darigold System Dedicated Discharge Pipe	Construct a new gravity sewer pipe from Darigold's plant at S Andover Street and Courtland Ave S to an existing or new discharge at the Hanford Street Trunk B pipe at S Charlestown Street.	Would be completed if Darigold cannot modify release rate of waste water flow stream and modeling shows relief by moving peak flows out of existing collection system to relieve overflows at CSO Outfall 38.		7950301240 Courtland Place S S Andover Street S Charlestown Street	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
13	38	IRPb	38	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 38	Reline 50% - 100% of all sewers in the public ROW within Basin 38	Reline 50% - 100% of all sewers in Public ROW within Basin 38		Various		
14	38	OFF	37, 38, 40, 41A/B, 42, 43, 165	Offline Storage	OFF-101-38	System Capacity	Offline Storage Tunnel at 50th Ave S (Parks Property)	Construct a large diameter (14-foot ID) tunnel from Lake Washington Blvd south along 50th Ave South in street right-of-way. Construct retrieval shaft 3,400 feet south at existing playfield (approx 120 feet deep) for TBM removal. Mine from northern end at Lake Washington Blvd.	Alternative can provide upwards of 4MG of storage depending on diameter. Pump out would be required at north end. All flows in lake line could be diverted near Lake Washington Blvd and 50th Ave S. PS 5 could be modified to pump back to connection structure, or system retrofits with weirs/gates could allow surcharging of the lake line south of PS 5 to overtop a weir into the tunnel.	Move this to 41?	5249802800 (Park/Lake Wa Blvd) 524980PUBL 5249803975 (Lakewood Playfield) 50th Avenue South	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

DRAFT - For Discussion Purposes Only. Not Intended for Review.

By: HDR Team

Revised: 7/21/2009

Printed: 8/6/2009 8:00

Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
15	38	OFF	37, 38, 40, 41A/B, 42, 43, 165	Offline Storage	OFF-102-38	System Capacity	Open Cut Storage Pipe in 43rd Ave S (Right-of-Way)	Construct a large diameter pipeline from Lake Washington Blvd south along 43rd Ave South in street right-of-way.	Alternative can provide upwards of 4MG of storage depending on diameter. Pump out would be required at north end. All flows in lake line could be diverted near Lake Washington Blvd and 50th Ave S. PS 5 could be modified to pump back to connection structure, or system retrofits with weirs/gates could allow surcharging of the lake line south of PS 5 to overtop a weir into the tunnel.		5249800001 (Stan Sayres Park) 43rd Avenue South	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
16	38	OFF	37, 38, 40, 41A/B, 42, 43, 165	Offline Storage	OFF-103-38	System Capacity	Offline Storage at Genesee Park and Playfield (Parks Property)	Construct a large off-line storage facility at the Genesee Park to control all overflows in Genesee basin.	Flows from Henderson could be transferred to this facility if upgrades to the lake line and pump stations PS5 and PS6 are also completed. Construction into existing landfill will require additional controls during construction.		4154301165 (Genessee Park & Playfield) 4154300585 (Genessee Park & Playfield) Lake Washington Blvd S OR Private Parcels 4154300065 4154300080 4154300090 4154300100 4154300105 4154300115 4154300190 4154300205 4154300220 4154300235 4154300250 4154300260 5249800015 5249800058 5249800063 5249800065 5249800069 5249800070 5249800105 5249800107 5249800115 5249800120 5249800125 5249800130 5249800175 5249800180 5249800185 5249800195 5249800197 5249800200 5249800202 5249800204 5249801928 5249801929 5249801940 5249801961 5249801962 5249801963 5249801964	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

Genesee CSO Reduction Project

CSO Control Alternatives List

CVH

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Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
17	38	RET	37, 38, 40, 41A/B, 42, 43, 165	Retrofit	RET-102-38	System Capacity	Remove King County Grit Chamber (Parks Property)	Work with King County to determine functional requirement and performance of existing grit chamber near PS 5. Remove entire structure to eliminate potential choke point during storm events and reduce O&M costs to King County	County may balk if there are no options upstream of this location to provide grit removal. Functional determination based on King County O&M standards.		5249800001 (Stan Sayres Park) Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
18	38	TKC	37, 38, 40, 41A/B, 42, 43, 165	Transfer Flows to King County	TKC-102-38	System Capacity	Upgrade King County Rainier Ave South PS (Private Property)	Upgrade King County's Rainier Avenue Pump Station to increase the firm pumping capacity and thereby allow more flows into the County's system.	This alternative would be needed only if in-basin storage is not feasible and pumping and conveyance capacities are increased to reduce overflows to the control frequency. This is not a stand alone alternative and would require pairing with other alternatives.		3357400240 5609000235 5609000240 (3807 Letitia Avenue S 98144) Letitia Ave S Rainier Ave S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

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Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
19	38	TKC	37, 38, 40, 41A/B, 42, 43, 165	Transfer Flows to King County	TKC-103-38	System Capacity	Hanford Street Trunk B System Modifications (Right-of-Way, Private Property)	Work with King County to modify the operation of the trunk to accept more storage from the entire Genesee basin.	Alternative will require coordination with King County to ensure that King County does not create overflow condition at CSO Outfall 38. Completed only if capacity at PS5 is increased.		4154300010 4154300080 8121100700 S Charlestown Street S Charlestown Right-of-way between 40th Ave S / 41st Ave S S Charlestown Right-of-way between 41st Ave S / 42nd Ave S Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
20	38	IN	37, 38, 40, 41A/B, 42, 43, 165, Henderson	Inline Storage	IN-101-38	System Capacity	Inline Storage at Genesee Park and Playfield (Parks Property)	Construct a large diameter inline storage pipe near the existing 72-inch pipe at the Genesee Park to control all overflows in Genesee basin.	Flows from Henderson could be transferred to this facility if upgrades to the lake line and pump stations PS 5 and PS 6 are also completed. Construction into existing landfill will require additional controls during construction.		5249800001 (Stan Sayres Park) 4154301165 (Genessee Park & Playfield) 4154300585 (Genessee Park & Playfield) Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	

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Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
21	38	CON	38,40, 41, 42, 43, 165, Henderson	Increased Conveyance	CON-101-38	Lakeline Capacity	Increase Lakeline Size Along Lake Washington (Parks Property)	From basin 38/39 boundary at S Alaska Street, construct new lake line along Lake Washington Blvd north to PS 5 facility.	This alternative would be completed in conjunction with an increase in capacity at PS 5. Increasing Lakeline capacity would allow for increasing PS 6 capacity as well. Flows from Henderson area could be directed north only with overall increased capacity at PS 5, Lakeline and PS 6		5249804270 5249802800 4154303180 5249800001 5700004540 S Andover Street Lake Washington Blvd S	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
22	38	WWT	40, 41A/B, 42, 43, 165	Wet Weather Treatment Plant	WWT-100-38	System Limitations from Hydrobrakes and Pump Stations	Wet-Weather Treatment Plant (Parks Property, Private Property)	A wet-weather treatment plant could be located near PS 5. The plant could serve to treat flows from Basins 40, 41A/B, 42, 43, and 165. Modifications to existing conveyance to the treatment plant location would be required.	Flows from 38/39 along the lake line would also be treated.		5249800001 (Stan Sayres Park) 4154301165 (Genessee Park & Playfield) 4154300585 (Genessee Park & Playfield) Lake Washington Blvd S OR Private Parcels 5249801928 5249801929 5249801940 5249801961 5249801962 5249801963 5249801964	Pipe: Construction Year: 2011 Pipe Characteristics - Type: Length: Trench Properties - Backfill: Imported Cover Depth (use 4' unless otherwise noted) Manhole Spacing - Close (250 ft) Conditions – Trench Safety: (Standard, Special Shoring) Dewatering: Significant Existing Utilities: (None, Average, Complex) Traffic: Heavy Required Easement: Residential Easement Adjustment: (King County Average, Seattle) Land Acquisition: Residential-Urban Pavement Restoration: (Trench Width, Half Width/Full Width – Arterial (22/44 ft), Collector St. – Arterial (18/36 ft), Residential St. – Arterial (14/28 ft), Pump Station Construction Year: 2009 Excavation Depth: (x) ft Capacity: (x) mgd Total Dynamic Head: (x) ft	
23	40	OFF	40	Offline Storage	OFF-104-40	stem Capa	existing storage facility (Right	At existing storage facility location.	Increase storage at the existing 0.06 MG storage facility		49th Ave S S Dakota Street		
24	40	PSC	40	Permanent Source Control		System Capacity	Source Control in Basin 40	Currently no viable locations are available.	Consider GSI and Separation in sections of basin 40 that are currently combined storm water/wastewater systems.		Various		
25	40	RET	40	Retrofit	RET-106-40	stem Capa	move Hydrobrake (Right-of-W	At existing storage facility location.	Replace Hydrobrake with a Sluice gate operated on RTC. Coordinated with Lakeline real time controls		49th Ave S S Dakota Street		
26	40	IRPb	40	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 40	Reline 50% - 100% of all sewers in the public ROW within Basin 40			Various		
27	41	PSC	41	Permanent Source Control		System Capacity	Source Control in Basin 41	Locations TBD	Consider GSI and Separation in sections of basin 41 that are currently combined storm water/wastewater systems.		Various		

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28	41	IRPb	41	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 41	Reline 50% - 100% of all sewers in the public ROW within Basin 41B			Various		
29	41	IBT	40, 41A/B, 42, 43, 165	Inter-Basin Transfer	IBT-100-41B to 38	Lakeline Capacity	Inter-basin Transfer from Basins 40, 41A/B, 42, 43, and 165 to 38 (Right-of-Way)	Divert gravity flows from basins 40 and 41 at South Adams Street and 49th Avenue South/50th Avenue South eastward through a new 1,000-ft gravity sewer pipe towards new pump station. Construct a new pump station located on Lake Washington Boulevard. Divert flows from the existing lake line to the new pump station. Construct a new force main from the new pump station eastward along South Adams Street approximately 1,500 feet to discharge into Basin 38 (90' elevation difference). Increase the existing 10-inch and 14-inch gravity pipes downstream of the force main discharge. Store flows at the existing 48-inch and 72-inch pipes.	This could alleviate downstream capacity issues in the lake line and reduces overflows at CSO Outfalls 40, 41 and 42.		S Adams Street S Genessee Street 49th Ave S 50th Ave S Lake Washington Blvd S 5249804270 5249803265 5249803270		
30	41	IBT	40, 41A/B, 42, 43, 165	Inter-Basin Transfer	IBT-101-41B to 38	Lakeline Capacity	Inter-basin Transfer from Basins 40, 41A/B, 42, 43, and 165 to 38 (Right-of-Way, Parks Property)	Construct a small diameter tunnel to divert flows from basin 40 and 41 and lake line flows to basin 38. The tunnel would start at Lake Washington Blvd South near S Adams Street and the existing parking lot and extend 2,300 feet west to a connection with the existing 72-inch storage pipe at Genesee Park. The end structures would be located on Parks properties.	The diameter of the tunnel could be increased to provide additional inline storage. Pumping may be required at the western end of the tunnel to lift flows into basin 38. This option could eliminate the need to increase the Lakeline capacity north of the eastern tunnel junction structure or make improvements/increase capacity at PS 5 or King County facilities.		S Adams Street Lake Washington Blvd S 5249804270 4154300585		
31	41	OFF	40, 41A/B, 42, 43, 165, Henderson	Offline Storage	OFF-105-41B	Lakeline Capacity	Offline Storage for basins 40, 41A/B, 42, 43, and 165 (Right-of-Way, Parks Property, Private Property)	Divert flows from 40 and 41B east to Lake Washington Blvd. Construct a large diameter tunnel to divert flows from basin 40 and 41 and lake line flows from basins 42, 43 and 165. The tunnel would start at Lake Washington Blvd South near S Adams Street and the existing parking lot and extend west in the right of way. 14-foot diameter tunnel provides 2.6MG of storage. The tunnel would terminate at a portal on private property just east of Genessee Park. Some impacts to Parks property would occur during construction.	The diameter of the tunnel would be determined the control volume to maintain compliance for all basins in Genesee area. Pumping would be required at the eastern end of the tunnel to lift flows back into the Lakeline. This option could eliminate the need to increase the Lakeline capacity north of the eastern tunnel junction structure or make improvements/increase capacity at PS 5 or King County facilities. Real time controls would be used for diversion at all locations. Flows from Henderson area could be accommodated if capacity at PS 6 and Lakeline south of the tunnel entrance are increased.		S Adams Street Lake Washington Blvd S Parks Parcels Impacted: 5249804270 4154300585 East end portal location (north side btwn 51st Ave S/Lk Wa): 5249804365 5249804395 5249804370 5249804390 5249804375 5249804380 5249804385 OR East end portal location (north side btwn 50th/51st Aves S): 5249803545 5249803560 5249803550 5249803555 AND at west end portal location (north side): 5249801795 5249801790 5249801787 5249801785 5249801780 5249801775 5249801770 5249801750 OR at west end portal location (south side): 4154301780 4154301790 4154301795 4154301800 4154301815 4154301825 4154301830 4154301835 4154301865 4154301880 4154301890 4154301900 4154301906 4154301915 4154301920		
32	42	OFF	42	Offline Storage	OFF-108-42	System Capacity	Increase existing storage facility (Parks Property)	At existing storage	Add storage to the existing 0.02 MG storage facility		5249804270 S Alaska Street 54th Ave S		
33	42	PSC	42	Permanent Source Control		System Capacity	Source Control in Basin 42	Currently no viable locations are available.	Consider GSI and Separation in sections of basin 42 that are currently combined storm water/wastewater systems.		Various		
34	42	RET	42	Retrofit	RET-107-42	System Capacity	Remove Hydrobrake (Parks Property)	At existing storage	Replace Hydrobrake with a Sluice gate operated on RTC		5249804270 S Alaska Street 54th Ave S		
35	42	IRPb	42	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 42	Reline 50% - 100% of all sewers in the public ROW within Basin 42	Reline 50% - 100% of all sewers in Public ROW within Basin 42		Various		
36	42	OFF	42, 43, 165, Henderson	Offline Storage	OFF-106-42	Lakeline Capacity	Offline Storage for basins 42, 43, and 165 (Parks Property)	Construct offline storage at parking lot off of Lake Washington Blvd and S Adams Street. Divert flows from the lake line (basins 42, 43 and 165).	The available space at the parking lot could allow for additional storage of Henderson area flows. Pumping would be required to lift flows back into the Lakeline. This option could eliminate the need to increase the Lakeline capacity north of basin 42 or make improvements/increase capacity at PS 5 or King County facilities. Real time controls would be used for diversion at all locations. Flows from Henderson area could be accommodated if capacity at PS 6 and Lakeline south of the storage location entrance are increased.		5249804270 S Adams Street Lake Washington Blvd S		
37	42	OFF	42, 43, 165, Henderson	Offline Storage	OFF-107-42	Lakeline Capacity	Offline Storage for basins 42, 43, and 165 (Private Property)	Construct offline storage in private property near Lake Washington Blvd and S Adams Street. Divert flows from the lake line (basins 42, 43 and 165).	The available space at the parking lot could allow for additional storage of Henderson area flows. Pumping would be required to lift flows back into the Lakeline. This option could eliminate the need to increase the Lakeline capacity north of basin 42 or make improvements/increase capacity at PS 5 or King County facilities. Real time controls would be used for diversion at all locations. Flows from Henderson area could be accommodated if capacity at PS 6 and Lakeline south of the storage location entrance are increased.		S Adams Street Lake Washington Blvd S Parks Parcels Impacted: 5249804270 4154300585 East end portal location (north side btwn 51st Ave S/Lk Wa): 5249804365 5249804395 5249804370 5249804390 5249804375 5249804380 5249804385 OR East end portal location (north side btwn 50th/51st Aves S): 5249803545 5249803560 5249803550 5249803555		
38	43	PSC	43	Permanent Source Control		System Capacity	Source Control in Basin 43	Currently no viable locations are available.	Consider GSI and Separation in section of basin 43 that are currently combined storm water/wastewater systems.		Various		

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Line Number	Basin Location	Type	CSO Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes	Status	Possible Parcels Impacted	Cost Estimate Inputs	
39	43	IRPb	43	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 43	Reline 50% - 100% of all sewers in the public ROW within Basin 43	Reline 50% - 100% of all sewers in Public ROW within Basin 43		Various		
40	43	OFF	43, Henderson	Offline Storage	OFF-109-43	Lakeline Capacity	Offline Storage for Basin 43 (Parks Property)	Construct or modify existing offline storage at park at S Alaska Street and 54th Ave S.	As a stand alone option, the tank could gravity drain back to the Lakeline. The available space at the park could allow for additional storage of basin 165 or Henderson area flows. Pumping would be required to lift flows back into the Lakeline if this scenario is constructed. This option could eliminate the need to increase the Lakeline capacity north of basin 43 or make improvements/increase capacity at PS 5 or King County facilities. Real time controls would be used for diversion at all locations. Flows from Henderson area could be accommodated if capacity at PS 6 and Lakeline south of the storage location entrance are increased. Existing storage is not fully utilized.		5249804270 S Adams Street Lake Washington Blvd S		
41	43	OFF	43, Henderson	Offline Storage	OFF-110-43	Lakeline Capacity	Offline Storage for Basin 43 (Private Property)	Construct or modify existing offline storage in private property near S Alaska Street and 53rd Ave S/54th Ave S.	As a stand alone option, the tank could gravity drain back to the Lakeline. Private property would be secured to allow for additional storage of basin 165 or Henderson area flows. Pumping would be required to lift flows back into the Lakeline if this scenario is constructed. This option could eliminate the need to increase the Lakeline capacity north of basin 43 or make improvements/increase capacity at PS 5 or King County facilities. Real time controls would be used for diversion at all locations. Flows from Henderson area could be accommodated if capacity at PS 6 and Lakeline south of the storage location entrance are increased. Existing storage is not fully utilized.		5249804270 S Adams Street Lake Washington Blvd S 5249804810 5249804805 5249804905 5249804900 5249804825 5249804895		
42	165	OFF	165	Offline Storage	OFF-111-165	Lakeline Capacity	Offline Storage in Basin 165 (Parks Property)	Construct offline storage next to PS 6 location.	Construct storage at existing PS 6 location to basin 165 control volume. Reduces need to modify pump station or lake line.		Lake Washington Blvd S 5249804270		
43	165	PSC	165	Permanent Source Control		System Capacity	Source Control in Basin 165	Currently no viable locations are available.	Consider GSI and Separation in section of basin 165 that are currently combined storm water/wastewater systems.		Various		
44	165	CON	165	Increased Conveyance	CON-102-165	Pump Station Capacity	Pump Station 6 Capacity Upgrades and Lakeline Size Increase (Parks Property, Right-of-Way)	Increase the capacity of PS 6 and the Lakeline downstream of the force main discharge.	This alternative would increase the pumping capacity of PS 6, allowing overflow volumes to be pumped downstream. This alternative would require increasing the capacity of the Lakeline north of PS 6 and increasing the capacity of PS 5, or some combination of storage at or near PS 5.		Lake Washington Blvd S 5249804270 5249802800 524980PUBL 5249800001 4154303180		
45	165	IBT	165	Inter-Basin Transfer	IBT-102-165 to Hen	Lakeline Capacity	Transfer flows to Henderson area	Replace PS 6 to pump south to the Henderson area. Construct a new force main and valving to allow pumping to both Genesee and Henderson based on real time control operation of both areas. Force main would follow Lake Washington Blvd S to Seward Park.	Requires increasing the capacity of pump stations and lake line sections in the Henderson area.		5249804270 2324049007		
46	165	IRPb	165	Infiltration Reduction		Infiltration	Infiltration Reduction in Basin 165	Reline 50% - 100% of all sewers in the public ROW within Basin 165	Reline 50% - 100% of all sewers in Public ROW within Basin 165		Various		

Henderson CSO Reduction Project

CSO Control Alternatives List

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Line Number	Basin Location	Type	Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes
1	44	RET	44	Retrofit	RET-1-44	Hydrobrake Basin 44 to 45	Retrofit Overflow Structure 44A and B	Replace the hydrobrake in MH 067-272 with a DLC Valve placed in new vault.	This option would require a new vault in place of MH 067-274 and a new weir for 44B.
2	44	CON	44	Increased Conveyance	CON-1-44	Lakeline Capacity	CSO Basin 44 Pump Station A	New Pump Station at Seward Park. Construct a FM along Seward Park Ave S, then increase conveyance along 57th Ave S (currently 8-inch gravity sewer).	This option would route flow around PS 10 and bypass the lakeline between 44 and 45.
3	44	IBT	44	Inter-Basin Transfer	IBT-8-44 to 165	Lakeline Capacity	Inter-Basin Transfer from Basin 44 to Basin 165 using a Pump Station	New Pump Station at Seward Park. Construct a FM along Lake Washington Blvd and transfer flows **downstream** of PS 6.	This option would require additional conveyance in Genesee.
4	44	IBT	44	Inter-Basin Transfer	IBT-1-44 to 165	Lakeline Capacity	Inter-Basin Transfer from Basin 44 to Basin 165 using a Pump Station	New Pump Station at Seward Park. Construct a FM along Lake Washington Blvd and transfer flows to Basin 165 **upstream** of PS 6.	This option would require additional conveyance in Genesee.
5	44	CON	44	Increased Conveyance	CON-2-44	Lakeline Capacity	Increase Conveyance from Basin 44 to Basin 45 (Parallel)	Parallel Lakeline between O/F 44B and O/F 45A	Difficult construction due to proximity of Lake Washington and access restrictions.
6	44	CON	44	Increased Conveyance	CON-7-44	Lakeline Capacity	Increase Conveyance from Basin 44 to Basin 45 (Trenchless)	Trenchless replacement of Lakeline between O/F 44B and O/F 45A	Difficult construction due to proximity of Lake Washington and access restrictions.
7	44	OFF	44	Offline Storage	OFF-2-44	Lakeline Capacity	Offline Storage in Basin 44 (Parks Property)	Additional Offline storage (pipe or tank) located near the west end of Seward Park. Could be pumped into or gravity feed.	
8	44	OFF	44	Offline Storage	OFF-10-44	Lakeline Capacity	Offline Storage in Basin 44 (Private Property)	Additional Offline storage (pipe or tank) located adjacent to Seward Park. Could be pumped into or gravity feed.	
9	44	OFF	44	Offline Storage	OFF-16-44	Lakeline Capacity	Offline Storage in Basin 44 (ROW Property)	Additional Offline storage (pipe or tank) located adjacent to Seward Park. Could be pumped into or gravity feed.	Alternative depends on ROW available nearby
10	44	PSC	44	Permanent Source Control		System Capacity	Source Control in Basin 44	Locations TBD	
11	44	IRPb	44	Infiltration Reduction	IRPb-1-44	Infiltration	Infiltration Reduction in Basin 44	Reline 50% - 100% of all sewers in the public ROW within Basin 44	
12	44	IBT	44	Inter-Basin Transfer	IBT-2-44 to 165	Lakeline Capacity	Inter-basin Transfer from Basin 44 to Basin 165 using gravity	Place a diversion point in Juneau St. , which can divert excess flows from Basin 44 to Basin 165 **downstream** of PS 6.	This option would need to be combined with Increased conveyance in the Genesee Lakeline
13	44	IBT	44	Inter-Basin Transfer	IBT-9-44 to 165	Lakeline Capacity	Inter-basin Transfer from Basin 44 to Basin 165 using gravity	Place a diversion point in Juneau St. , which can divert excess flows from Basin 44 to Basin 165 **upstream** of PS 6.	This option would need to be combined with Increased conveyance in the Genesee Lakeline and an upgrade to PS 6.
14	44	OFF	44	Offline Storage	OFF-14-44	Lakeline Capacity	Offline Storage in Basin 44 (Tunnel)	Portal placed at Seward Park. Drive west into the hillside 5,000 feet to approximately the intersection of S Juneau St. and Rainer Ave S.	
15	45	CON	44, 45	Increased Conveyance	CON-3-45	Pump Station Capacity	Upgrade Pump Station 10 A	Upgrade Pump Station #10 (Martha Washington Park) with increased pumping capacity.	Most likely would need to be combined with increased conveyance between Basin 45 and Basin 46.
16	45	IBT	44, 45	Inter-Basin Transfer	IBT-3-45 to 165	Lakeline Capacity	Inter-Basin Transfer 45 to 165	New Pump Station (Martha Washington Park) with increased pumping capacity and FM to transfer flows back to Basin 44 at Seward Park. Then route to Basin 165.	Most likely would need to be combined with increased conveyance capacity in the Genesee Basin.
17	45	CON	44, 45	Increased Conveyance	CON-8-45	Lakeline Capacity	Increased Conveyance from 45 to 46 via New Pump Station	New Pump Station (Martha Washington Park) with increased pumping capacity and FM along Holly St. and down 55th Ave. to transfer flow to Basin 46. This option would bypass part of the Lake Line	Most likely would need to be combined with increased conveyance capacity along 55th Ave.
18	45	OFF	44, 45	Offline Storage	OFF-3-45	Lakeline Capacity	Offline Storage in Basin 45 (Parks Property)	Offline storage (pipe or tank) located in of Martha Washington Park	Could be stand alone or combined with increased conveyance from Basin 44 to Basin 45.
19	45	OFF	44, 46	Offline Storage	OFF-11-45	Lakeline Capacity	Offline Storage in Basin 45 (Private Property)	Offline storage (pipe or tank) located north of Martha Washington Park on private property	Could be stand alone or combined with increased conveyance from Basin 44 to Basin 45.

Henderson CSO Reduction Project

CSO Control Alternatives List

DRAFT - For Discussion Purposes Only. Not Intended for Review.

Revised: 7/30/2009

Line Number	Basin Location	Type	Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes
20	45	OFF	44, 46	Offline Storage	OFF-17-45	Lakeline Capacity	Offline Storage in Basin 45 (ROW Property)	Offline storage (pipe or tank) located north or west of Martha Washington Park on ROW	Alternative depends on ROW available nearby
21	45	IN	44, 45	Inline Storage	IN-1-45	Lakeline Capacity	Inline Storage in Basin 45	Inline storage located in Martha Washington Park	Could be stand alone or combined with increased conveyance from Basin 44 to Basin 45. May require lowering the invert of the pipe entering the PS 9 wet well and the depth of the wet well.
22	45	PSC	45	Permanent Source Control		System Capacity	Source Control in Basin 45	Locations TBD	
23	45	IRPb	45	Infiltration Reduction	IRPb-2-45	Infiltration	Infiltration Reduction in Basin 45	Reline 50% - 100% of all sewers in the public ROW within Basin 45	
24	45	IBT	45	Inter-Basin Transfer	IBT-5-45 to 47N	Lakeline Capacity	Inter-basin Transfer from Basin 45 to 47N	New Pump Station (Martha Washington Park) with increased pumping capacity. Convey flows west, up the hill to the intersection of Wilson Ave S and S Holly St. Flows would pass through Overflow Structure 47C.	Discharge would enter 18-inch diameter pipe that connects with storage along Rainer Ave S. Could be combined with increased conveyance from Basin 44 to Basin 45.
25	46	CON	45	Increased Conveyance	CON-5-46	Lakeline	Increase Conveyance from Basin 45 to Basin 46	Parallel Lakeline between O/F 45B and Pump Station 9	Difficult construction due to proximity of Lake Washington and access restrictions.
26	46	TKC	46	Transfer Flows to King County	TKC-2-46	Pump Station Capacity	Upgrade Pump Station 9	Upgrade Pump Station #9 (Pritchard Island Beach) with increased pumping capacity.	
27	46	OFF	45, 46	Offline Storage	OFF-4-46	Lakeline Capacity	Offline Storage in Basin 46	Offline storage located at Pritchard Island Beach	Could be stand alone or combined with increased conveyance from Basin 45 to Basin 46.
28	46	IN	45, 46	Inline Storage	IN-2-46	Lakeline Capacity	Inline Storage in Basin 46	Inline storage located at Pritchard Island Beach	Could be stand alone or combined with increased conveyance from Basin 45 to Basin 46.
29	46	PSC	46	Permanent Source Control		System Capacity	Source Control in Basin 46	Locations TBD	
30	46	IRPb	46	Infiltration Reduction	IRPb-3-46	Infiltration	Infiltration Reduction in Basin 46	Reline 50% - 100% of all sewers in public ROW within Basin 46	
31	46	IBT	46	Inter-Basin Transfer	IBT-6-46 to 47N	Lakeline Capacity	Inter-basin Transfer from Basin 46 to 47N	New Pump Station (Pritchard Island Beach) with increased pumping capacity. Convey flows west, up the hill to the intersection of S Grattan St and Seward Park Ave S. Then gravity flow to the intersection of	Intersects with storage on Rainer Ave. S. Conveyance route could be a tunnel.
32	46	TKC	46	Transfer Flows to King County	TKC-3-46	Lakeline Capacity	Increased conveyance from Basin 46 to Henderson Pump Station	Increase capacity of gravity conveyance from Basin 46 to the King County Henderson Pump Station.	
33	46	OFF	46	Offline Storage	OFF-12-46	Pump Station Capacity	Offline Storage for Basin 46 located in Basin 47N	New Pump Station (Pritchard Island Beach) with increased pumping capacity. Convey flows west, up the hill to the intersection of S Grattan St and Seward Park Ave S. Then flow to storage facility.	Storage could be used for flows from Basins 44,45 and 46 but is located in Basin 47N
34	46	IBT	46	Inter-Basin Transfer	IBT-7-46 to 47N	Lakeline Capacity	Inter-basin Transfer from Basin 46 to 47N	New Pump Station (Pritchard Island Beach) with increased pumping capacity. Convey flows west, up the hill to the intersection of S Grattan St and Seward Park Ave S. Then gravity flow into Basin 47A and to	
35	46	CON	46	Increased Conveyance	CON-9-46	Lakeline	Increase Conveyance from Basin 45 to Basin 46	Trenchless replacement of Lakeline between O/F 45B and Pump Station 9	Difficult construction due to proximity of Lake Washington and access restrictions.
36	49	TKC	49	Transfer Flows to King County	TKC-6-49	Hydrobrake to King County	Retrofit MH 306-428 in Basin 49	Remove hydrobrake located in this MH and rely on KC trunk to provide the flow restriction.	This alternative would require negotiations with King County and investigation into downstream impacts. Could include using RTC controls. Modfying transfer weir to storage could be considered.
37	49	OFF	49	Offline Storage	OFF-5-49	Hydrobrake to King County	Offline Storage in Basin 49	Offline storage located at Pump Station #80 (former treatment plant site)	Basin 49 may be in compliance.
38	49	OFF	49	Offline Storage	OFF-6-49	Hydrobrake to King County	Offline Storage in Basin 49	Offline storage located parallel to existing offline storage in Rainer Ave S	Basin 49 may be in compliance.

Henderson CSO Reduction Project

CSO Control Alternatives List

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Revised: 7/30/2009

Line Number	Basin Location	Type	Basin Controlled	Option Category	Alternative Name	Constraint (Alternative Driver)	Title	Description	Notes
39	49	PSC	49	Permanent Source Control		System Capacity	Source Control in Basin 49	Locations TBD	
40	49	IRPb	49	Infiltration Reduction	IRPb-4-49	Infiltration	Infiltration Reduction in Basin 49	Reline 50% - 100% of sewers in ROW in Basin 49	
41	171	PSC	171	Permanent Source Control		System Capacity	Source Control in Basin 171	Locations TBD	
42	171	IRPb	171	Infiltration Reduction	IRPb-5-171	Infiltration	Infiltration Reduction in Basin 171	Reline 50% - 100% of sewers in ROW in Basin 171	
43	171	TKC	171	Transfer Flows to King County	TKC-4-171	Hydrobrake to King County	Retrofit Overflow Structure 171	Remove the hydrobrake in MH 081-231 . Flow would be increased to Henderson pump station. Depending on the number of downstream connections (appears to be few according to GIS) a DLC valve may be	This alternative would require negotiations with King County.
44	47N	TKC	47N	Transfer Flows to King County	TKC-5-47N	Orifice Plate to King County	Retrofit Overflow Structure 47C	Remove orifice plate located at MH 081-330. This would increased flow to the Henderson Trunk.	This alternative would require negotiations with King County.
45	47N	OFF	46, 47S, 49, 171	Offline Storage	OFF-7-47N	System Limitations from Hydrobrakes and Pump Stations	Regional Offline Storage for Basins 46, 47S, 49 and 171 (Parks Property)	Offline storage located at various **Park** locations.	
46	47N	OFF	46, 47S, 49, 171	Offline Storage	OFF-13-47N	System Limitations from Hydrobrakes and Pump Stations	Regional Offline Storage for Basins 46, 47S, 49 and 171 (Private Property)	Offline storage located at various **Private** locations.	
47	47N	WWT	46, 47S, 49, 171	Wet Weather Treatment Plant	WWT-1-47N	System Limitations from Hydrobrakes and Pump Stations	Wet-Weather Treatment Plant	A wet-weather treatment plant could be located adjacent to Henderson Pump Station. The plant could serve to treat flows from Basins 46,47S, 49 and 171.	This alternative could be combined with increased capacity from Basin 44 to Basin 46 to increase treated Basins.
48	47N	WWT	Genesee and Henderson Areas	Wet Weather Treatment Plant	WWT-2-47N	System Limitations from Hydrobrakes and Pump Stations	Regional Wet-Weather Treatment Plant	A wet-weather treatment plant could be located adjacent to Henderson Pump Station. The plant could serve to treat flows from the Genesee Area and Henderson Area.	This alternative could be combined withmulitple increased conveyance and inter-basin transfer alternatives
49	47N	OFF	Genesee and Henderson Areas	Offline Storage	OFF-15-47N	System Limitations from Hydrobrakes and Pump Stations	Regional Tunnel and Storage	Begin Tunnel at Genesee Park, drive to Seward Park, then receive TBM at Atlantic City Park. This alternative would include structures at each of the overflow structures to convey flows to the tunnel.	Could be combined with a regional Wet-Weather Treatment Plant
50	47N	PSC	47N	Permanent Source Control		System Capacity	Source Control in Basin 47N	Locations TBD	
51	47N	IRPb	47N	Infiltration Reduction	IRPb-6-47N	Infiltration	Infiltration Reduction in Basin 47N	Reline 50% - 100% of all sewers in Public ROW in Basin 47N	
52	47S	OFF	47S, 171	Offline Storage	OFF-8-47S	Hydrobrake to King County	Offline Storage in Basin 47S	Offline storage (pipe) located in the pedestrian walkway adjacent to Safeway on Rainer Ave S	Storage for Basins 47S and 171
53	47S	OFF	47S, 171	Offline Storage	OFF-9-47S	Hydrobrake to King County	Offline Storage in Basin 47S	Offline storage (tank) located in the Safeway parking lot on Rainer Ave S	Other Properties exist; storage for Basins 47S and 171
54	47S	IRPb	47S	Infiltration Reduction	IRPb-7-47S	Infiltration	Infiltration Reduction in Basin 47S	Reline 50% - 100% of all sewers in Public ROW within Basin 49	
55	47S	TKC	47S	Transfer Flows to King County	TKC-1-47S	Hydrobrake to King County	Inter-basin Transfer from Basin 47S to KC Trunk	Convey flows (by gravity) that would have overflowed to NPDES 47 from Basin 47B back into the Henderson Trunk near the intersection of S Henderson St. and Rainer Ave S.	This alternative would require negotiations with King County.

APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL REPORT

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland