GEOTECHNICAL ENGINEERING SERVICES
PROPOSED SCIENCE BUILDING
EASTSIDE PREPARATORY SCHOOL
10624 AND 10626 NORTHEAST 37TH STREET
KIRKLAND, WASHINGTON
KING COUNTY TAX PARCEL # 4315000190
AND # 4315000200

PREPARED FOR
EASTSIDE PREPARATORY SCHOOL

BY:
OTTO ROSENAU & ASSOCIATES, INC.
ORA JOB NO. 14-0232, REPORT NO. 1

OTTO ROSENAU & ASSOCIATES, INC.
Geotechnical Engineering, Construction Inspection & Materials Testing

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July 30, 2014

Attention: Mr. Jeff Sternitzky
Eastside Preparatory School
10627 Northeast 38th Place
Kirkland, WA 98033

Re: **GEOTECHNICAL ENGINEERING SERVICES**
PROPOSED SCIENCE BUILDING
EASTSIDE PREPARATORY SCHOOL
10624 AND 10626 NORTHEAST 37TH STREET
KIRKLAND, WASHINGTON
KING COUNTY PARCEL # 4315000190 AND 4315000200

ORA Project Number: 14-0232, Report 1

Dear Mr. Sternitzky,

We are pleased to provide this report for the proposed new science building to be built at the existing Eastside Preparatory School located at 10624 and 10626 Northeast 37th Street in Kirkland, Washington. We also understand that two of the existing buildings at the site are to be demolished prior to construction of the new science building. Based on our subsurface explorations, we encountered approximately 6 to 9½ feet of loose, sandy fills overlying loose to medium dense outwash sands.

It is our opinion that the proposed building can be satisfactorily supported on conventional spread footings that bear on the on the existing, medium dense sandy soils following a two-foot deep overexcavation with 2 feet of structural fill. Detailed recommendations are presented in the attached report. If you have any questions, or if we may be of additional service, please contact us.

ANTHONY GERARD COYNE
STATE OF WASHINGTON
37856
REGISTERED
PROFESSIONAL ENGINEER

Anthony G Coyne
7/30/14

Sincerely,
Otto Rosenau & Associates, Inc.

Anthony Coyne

Anthony G. Coyne, P.E.
Senior Engineer

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EASTSIDE PREPARATORY SCHOOL
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PREPARED FOR

EASTSIDE PREPARATORY SCHOOL

BY OTTO ROSENAU & ASSOCIATES, INC.

JULY 30, 2014

1. INTRODUCTION

This report presents the results of our geotechnical engineering services for the proposed Science and Gym building on the Eastside Preparatory School campus in Kirkland, Washington. The approximate location of the site is shown on the Vicinity Map on page A-1 of the appendix.

2. PROJECT DESCRIPTION

We understand that the project involves the construction of a new Science Building with a gymnasium on its upper level. Construction of the Science Building will require demolition of the existing Upper School (10624 Northeast 37th Street, King County Parcel # 4315000190), and the existing Design Lab (10626 Northeast 37th Street, King County Parcel # 4315000200), which are one-story structures with no basement level. The proposed Science Building will have one below-grade level for classrooms, two above-grade levels for classrooms, and a third above-grade level for a gymnasium above the classrooms.

3. SCOPE OF SERVICES

The scope of services included a reconnaissance of the site by the geologist, a review of geologic literature, and the witnessing of the completion of three (3) borings at the approximate location shown on the Site Plan on page A-2 of the appendix. Soil samples were taken of the underlying soils at the depths shown on the boring logs presented on pages A-7 and A-12 of the appendix.

The geotechnical engineering services were performed by Otto Rosenau and Associates, Inc. (ORA) to provide the following information:

- A summary of the observed soil and groundwater conditions,
- An evaluation of the existing site conditions,
- A review of available geologic information,
- Seismic design considerations including liquefaction potential,
- Suitable foundation systems with estimated settlements
- Allowable bearing capacity for conventional spread footings,
- Lateral earth pressures and friction coefficients,
- Influence of groundwater on the proposed construction,
- Site preparation and earthwork recommendations, and
- Recommendations for the asphalt and concrete pavement areas.

4. SITE CHARACTERIZATION

We reviewed the geological map on Washington State Department of Natural Resources (DNR), Division of Geology and Earth Resources, Washington State Geologic Information Portal's website (*fortress.wa.gov/dnr/geology*) and "Geologic Map of the Kirkland Quadrangle, Washington" (1983) by Minard, James P.. The soils at or near the project site are mapped as "Pleistocene age, advance outwash deposits" (Q_{va}), "Pleistocene age, glacial till deposits" (Q_{vt}), and "Pleistocene age, recessional outwash deposits" (Q_{vr}). The advance outwash (Q_{va}) deposits generally consist of well-bedded sands and gravels deposited by streams and rivers issuing from the advancing ice sheet. These advance outwash deposits are generally unoxidized to slightly oxidized and almost devoid of silt or clay, except near the base of the unit and as discontinuous beds. The glacial till (Q_{vt}) deposits generally consist of a glacially-transported and deposited mix of silts, sands, and gravels. These soils have been glacially overridden and typically have a dense to very dense consistency. The recessional outwash (Q_{vr}) deposits generally consist of stratified sands and gravels that are moderately sorted to well-sorted with less common silty sands and silts. The recessional outwash deposits were deposited in the outwash of the south-draining glacial meltwater during the retreat of the ice margin. The mapped soils are shown on the Geological Map on page A-3 of the appendix.

We also reviewed the Natural Resources Conservation Service's (NRCS) and University of California Davis "SoilWeb" online mapping (http://casoilresource.lawr.ucdavis.edu/gmap/), which described the soils across the site are mapped as Alderwood Gravelly Sandy Loam (AgC), 6 to 15 Percent Slopes. Deposits of Everett Gravelly Sandy Loam (EvD), 15 to 30 Percent Slopes, are mapped nearby to the east of the site. Please see the attached figure titled NCRS Soil Map on page A-4 of the appendix.

We also reviewed the "Soil Survey report of King County Area, Washington" issued November 1973 by the Soil Conservation Service for detailed descriptions of the encountered soil units. The Alderwood soil series is described as being made up of moderately well drained soils that have a weakly consolidated to strongly consolidated substratum at a depth of 24 to 40 inches. These soils are found on upland areas. The Alderwood soil series is formed under conifers, in glacial deposits. The Everett soil series is made up of somewhat excessively drained soils that are underlain by very gravelly sand at a depth of 18 to 36 inches. The Everett soil series is described as being formed in very gravelly glacial outwash deposits, under conifers. They are usually found on terraces and terrace fronts and are gently undulating and moderately steep.

5. SURFACE CONDITIONS

The Eastside Preparatory School consists of nine (9) buildings that are located on the southeast side of the Linbrook Office Development. The site is bounded by Northeast 38th Street to the northeast, and office buildings to the west, south and northwest. The location of the proposed new science building currently consists of an existing building that will be demolished during construction of the new science building (see the Site Plan on page A-2 of the appendix for the location). The topography of the location of the proposed Science Building is relatively flat with an approximate Elevation of 65 feet (NAVD 88).

6. SUBSURFACE CONDITIONS

The subsurface soil and groundwater conditions were evaluated by completing three exploratory borings. The borings were completed using rubber-tracked, hollow stem auger drilling equipment to maximum depth of 36.5 feet below the existing ground surface on April 18, 2014. The approximate locations of the borings are shown on the Site Plan on page A-2 of the appendix. The details and explanations of the borings are presented on pages A-4 to A-12 of the appendix.

In general, the site consists of approximately 6 to 9½ feet of fill material overlying Pleistocene age recessional outwash (Q_{vr}) deposits and glacial till (Q_{vt}) deposits. The fill material typically consists of brown to light brown, silty SANDS (SM) with varying amounts of organics and gravels. The fill materials are loose to medium dense in consistency with moisture contents being moist. The recessional outwash (Q_{vr}) deposits generally of light brown, fine to medium SANDS with silts (SP-SM) and varying amounts of gravels. Interbedded layers of silty SANDS (SM) were observed in the upper 10 feet of the advance outwash deposits. The advance outwash deposits are loose to dense in consistency with moisture contents being moist to wet. The glacial till (Q_{vt}) were encountered in Boring B-1 at a depth of 35 feet below ground surface. The glacial till typically consist of light gray, silty SAND (SM) with gravels. The glacial till deposits are very dense in consistency with moisture content of wet.

Groundwater was encountered in the exploratory boring designated as Boring B-1 at a depth of approximately 30 to 33.8 feet below the existing ground surface. The groundwater levels at the site will likely vary with season and precipitation.

7. LABORATORY TESTING

We performed moisture content determinations on each sample collected from the borings. We performed grain size analyses on one collected sample. The results of the moisture content determinations are presented on the boring logs on pages A-8 to A-13 of the appendix. The grain size analysis results are present on pages A-14 and A-15 of the appendix.

8. DISCUSSION

The engineering recommendations and advice presented in this report have been made in accordance with generally accepted geotechnical engineering practices in the area and are based on our understanding of the geology of the area and on our experience with similar projects. Project conditions, regarding type and location of structures and foundation loads, can change and subsurface conditions are not always similar to those encountered during the subsurface exploration. Therefore, if discrepancies are noticed, the geotechnical engineer must be contacted for review and for possible revision of the recommendations.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 GENERAL

The engineering recommendations and advice presented in this report have been made in accordance with generally accepted geotechnical engineering practices in the area. The recommendations are based on our understanding of the geology of the area and on experience with similar projects.

Based on our subsurface explorations and our analyses, the proposed new building can be satisfactorily supported on conventional footings that will bear on approximately 2 feet of properly compacted structural fill material overlying the medium dense, native, outwash soils that were encountered at depths ranging from about 6 to 9½ feet below the existing site grades as observed in our soil borings. Please refer to the following sections of the report for specific site and foundation subgrade preparation recommendations.

9.2 SEISMIC CONSIDERATIONS

The seismic design of structures in the City of Kirkland is governed by the requirements of the 2012 International Building Code (IBC). We recommend that the site soils be categorized as Site Class D for design purposes.

Risk-targeted Maximum Considered Earthquake (MCE_R) ground motion response accelerations can be obtained from maps in the IBC (Figures 1613.3.1(1) and 1613.3.1(2)) for 0.2-second and 1-second spectral response accelerations on a bedrock site. The values for S_S and S_1 are spectral accelerations (SRA) for a maximum considered earthquake event with a 2,500 year return period or a 2 percent probability of exceedance in 50 years.

The values recommended for use in this report were obtained from the USGS website at (http://geohazards.usgs.gov/designmaps/us/application.php) using the “USGS Seismic Design Maps” application (Version 3.1.0 last updated on July 11, 2013). The input parameters used with this utility were the latitude and longitude for the project site (N 47.6432°, W 122.1991°). The following table presents recommended values from the 2012 IBC and ASCE 7-10 “Minimum Design Loads for Buildings and Other Structures” for seismic design:

RECOMMENDED SEISMIC DESIGN PARAMETERS	
Site Soil Class Definition (Table 20.3-1 of ASCE 7-10)	D
Risk Category (Table 1604.5 of the IBC)	III
Mapped max. earthquake SRA at short periods, S_S, % g	128.0
Mapped max. earthquake SRA at 1-second period, S_1, % g	49.2
Site Coefficient F_a (Table 1613.3.3(1) of the IBC)	1.0

Site Coefficient F_v (Table 1613.3.3(2)) of the IBC)	1.508
Maximum considered earthquake SRA for short periods, S_{MS}	128.0
Max. considered earthquake SRA for 1-second periods, S_{M1}	74.2
Design SRA at short periods, S_{DS}	85.4
Design SRA at 1-second period, S_{D1}	49.5
Mapped Max. Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration, %, Site Class B	51.7
Site Coefficient, F_{PGA} (Table 11.8-1 of ASCE 7-10)	1.0
PGA_M , MCE_G peak ground acceleration adjusted for Site Class Effects (Equation 11.8-1 ASCE 7-10)	51.7

Liquefaction may be defined as the sudden loss of strength of soil as the soil is subjected to a rapid cyclic loading, such as during an earthquake. The mechanism that allows this to occur is that excess pore water pressures are generated between the soil particles. This excess pore water pressure reduces the frictional contact between the soil particles and reduces the shear strength of the soil. If the earthquake is of large magnitude and duration the soil can begin to behave more like a liquid than solid and "liquefy". In order for liquefaction to occur several conditions must typically be present, these include the following:

- Saturated soil.
- Fine to medium sand matrix containing less than about 10 percent fines (soil that can pass a No. 200 sieve.
- Very loose to medium dense soil conditions. This is usually defined as soils that have N-values of 15 or less.

Based on the observed subsurface soil and groundwater conditions encountered at the site and our understanding of geologic conditions present at the site, it is our opinion that the potential for the occurrence of liquefaction at the project site is low.

The site is located approximately 3.9 miles north of the northern trace of the Seattle Fault. It is our opinion that the risk of fault rupture is low based on the distance away from this fault.

9.3 FOUNDATIONS

It is our opinion that the proposed, new building can be satisfactorily supported using conventional foundation elements that bear on approximately 2 feet of properly compacted structural fill material overlying the medium dense, native, outwash soils that were encountered at depths ranging from about 6 to 9½ feet below the existing site grades.

9.3.1 Conventional Foundation: We recommend that the following allowable bearing capacities be used for the design of conventional spread footings for the proposed new building:

Foundation elements bearing on 2-foot thick zone of structural fill that in turns bears on undisturbed, medium dense sand:	3,000 psf.

The allowable bearing capacities may be increased by one-third for wind and seismic loads. If the recommendations in this report are followed, we estimate that maximum post-construction settlements will be less than three-quarters (3/4) of an inch and differential settlements will be less than one-half (1/2) of an inch between comparably loaded column footings or along a 25-foot long section of continuous wall footing.

We recommend that the minimum width of continuous footings be 18 inches and that the minimum bearing area for isolated column spread footings be 4 square feet. All foundation elements shall be placed at least 18 inches below the lowest adjacent finished grade for frost protection and to meet the minimum code requirements as presented in Section 1809 – Shallow Foundations of the 2012 IBC.

Passive resistance should be evaluated using an equivalent fluid pressure of 250 pounds per cubic foot (pcf) where foundation elements are cast on structural fill and backfilled on both sides with structural fill compacted to at least 95 percent of maximum dry density (MDD). This value of passive pressure includes a factor of safety of 1.5. An allowable coefficient of friction between the concrete footings and bearing soils of 0.33 may be used to resist lateral foundation loads.

The base of the excavations for all foundation elements at this site should be excavated using a toothless bucket to minimize disturbance of the foundation bearing soils. All foundation bearing surfaces shall be inspected by the geotechnical engineer or his representative prior to any placement of structural fill or structural concrete to verify that no unsuitable soils are present to reduce the amount of possible, post-construction, differential settlement to tolerable levels.

9.4 BELOW-GRADE WALLS AND RETAINING WALLS

The below-grade walls for this project should be designed as retaining walls. Lateral earth pressures for design of permanent below-grade walls, or retaining walls with level backfill and with no hydrostatic pressures or surcharge loads, may be calculated using the following equivalent fluid pressures in pounds per square foot per foot of wall width (psf/ft or pcf):

Active (unrestrained):	
Compacted granular soils or medium dense to dense native soils against wall	35 pcf.
Active (restrained):	
Compacted granular soils or medium dense to dense native soils against wall	58 pcf.
Passive:	
Continuous footings	250 pcf.
Column footings	250 pcf.

No factor of safety has been applied to the active pressure values listed above. A factor of safety of about 1.5 has been applied to the passive pressure value listed above.

The geotechnical engineer should be contacted to determine appropriate lateral earth pressures for situations not described above.

Seismic earth pressures were estimated using the Mononobe-Okabe pseudo-static method. We recommend that seismic earth pressures be estimated using a rectangular pressure distribution equal to 15H, where H is the height of the retained soil behind the wall.

A total soil unit weight of 130 pounds per cubic foot should be used in design of any permanent below-grade wall or retaining structures.

Passive resistance should be evaluated using an equivalent fluid pressure of 250 pounds per cubic foot (pcf) where foundation elements are cast on structural fill or very dense native soils and backfilled on both sides with structural fill compacted to at least 95 percent of maximum dry density (MDD). This value of passive pressure includes a factor of safety of 1.5. An allowable coefficient of friction between footings and bearing soils of 0.33 may be used to resist lateral foundation loads. This value includes a factor of safety of about 1.5.

9.5 SLABS-ON-GRADE

We understand that a conventional slab-on-grade is planned at the basement level of the proposed new building. We recommend that a zone of capillary break material that is at least 6 inches in thickness be provided below all future slabs-on-grade. The capillary break material should consist of 5/8-inch clean crushed gravel. Concrete floor slabs constructed on grade can be designed using a modulus of subgrade reaction 225 pounds per square inch per inch (psi/in) assuming that the slab subgrade and capillary break material is thoroughly compacted to a firm and unyielding condition equivalent to 95 percent of the MDD.

We recommend that a vapor retarder be provided beneath all future slab-on-grade areas that are to be heated to reduce the transmission of water vapor from the subgrade soil and through the slab-on-grade into the heated area. A vapor retarder will not stop the transmission of water vapor from the underlying subgrade soil, but will significantly reduce it, provided all of the seams are overlapped and sealed with moisture proof tape. At a minimum, we recommend that the vapor retarder consist of 10-mil plastic sheeting. If the floor coverings will be moisture sensitive, such as a glued-on synthetic material, carpet, or a hardwood surface, we strongly recommend that a more robust under slab vapor barrier be provided. The under slab vapor barriers should have a perm rating at least equal to the requirements of the proposed flooring system including their adhesive. The under slab vapor barriers must be installed with strict accordance with the manufacturer's recommendations to ensure satisfactory performance of the system. This typically involves taping all seams and penetrations, sealing perimeter edges, and the use of plastic reinforcing steel chairs in accordance with the manufacturer's recommendations.

9.6 PAVEMENT DESIGN

The asphalt pavements adjacent to the existing school buildings to be demolished were observed to be in good condition. These areas include pavements where daily traffic includes school buses, and weekly traffic includes garbage trucks.

For planning purposes, we recommend that the proposed asphalt thickness should match the existing asphalt pavement, but should have the following minimum cross section:

- 3-inch compacted thickness of Hot Mix Asphalt (HMA) Class ½",
- 6-inch minimum compacted thickness of Base Course Crushed Rock (WSDOT 9-03.9(3)). The upper 2 to 3 inches of Base Course Crushed Rock may be substituted with Top Course Crushed Rock (WSDOT 9-03.9(3)) to facilitate fine grading.

Alternatively, the City of Kirkland Standard Road Section as described in COK Plan no. CK-R.09 may be utilized, which has the following section:

- 2-inch compacted thickness of HMA Class ½",
- 4-inch compacted thickness of ATB, which may be substituted with HMA Class ½" or Class B asphalt,
- 4" minimum of 1-1/4" minus crushed rock.

The HMA Class ½" shall meet the requirements of "Section 5-04 Hot Mix Asphalt" of the 2012 edition of the WSDOT *Standard Specifications for Road, Bridge, and Municipal Construction* (2012 WSDOT Standard Specifications). ATB shall meet the requirements of "Section 4-06 Asphalt Treated Base" of the 2012 WSDOT Standard Specifications. HMA should be compacted to at least 91 percent of the maximum density as determined by the WSDOT FOP for AASHTO T 209 (rice density). ATB should be compacted to at least 80 percent of the maximum density as determined by the WSDOT FOP for AASHTO T 209 (rice density).

The City of Kirkland additionally has the following restrictions with regard to placement of asphalt concrete for roadway pavements per City of Kirkland Department Of Public Works Pre-Approved Plans Policy - Policy R-8: Placing Concrete or Asphalt in Adverse Weather Conditions:

A. Shall not be placed in the rain.
B. All final 2" lifts of Hot Mix Asphalt must be placed when the air temperature is 45 degrees and rising.
C. ATB shall not be placed when the air temperature is below 35 degrees.
D. Shall not be placed on frozen or ice-coated ground or subgrade.

Any substitutions must receive prior approval from the project geotechnical engineer before implementing. In the event of a conflict between the 2012 WSDOT Specifications and the City of Kirkland Standard Secifications, the stricter requirement should be followed.

9.7 ONSITE INFILTRATION

The upper loose, silty sand fill soils have limited capacity for infiltration of stormwater. The underlying clean, loose to medium dense sandy outwash soils present at depths ranging from 6 to 9.5 feet have a significant capacity for infiltration of stormwater. The native soils encountered below the upper layer of fill, or previously-disturbed soils in our explorations at depths below about 6 feet most closely appear to be associated with the Everett soil series (EvD), and are free-draining and can be modelled as an Outwash soil for purposes of hydraulic modeling with the King County Runoff Time Series (KCRTS) software program.

We recommend that any stormwater infiltration facility be located at least 15 feet away from the building to reduce the risk of stormwater routed to infiltration facilities migrating towards the basement of the proposed Science Building. Any existing silty sand soils should be fully removed from the base of excavations for future stormwater infiltration facilities to expose the underlying, clean outwash sands.

We understand that that the current stormwater infiltration design will utilize drywells setback approximately 20 feet from the proposed building in a future landscape area. We recommend that the backfill in the vicinity of the future dry wells should consist exclusively of suitable, native, clean, outwash sands as determined by project geotechnical engineer, or Gravel Backfill for Walls (WSDOT 9-03.12(2)). Please refer to the Structural Fill section of this report for detailed information of the backfill requirements in the vicinity of the future stormwater facilities. Provided that the recommendations for subgrade preparation and backfill around the future dry wells are implemented as recommended, we anticipate that a long-term design infiltration of 3 inches per hour will be feasible. We understand that the City of Kirkland will require an onsite infiltration test to verify the recommended design infiltration rate prior to allowing the infiltration facilities to go into service.

9.8 EARTHWORK

The recommendations presented in this report are predicated on fulfillment of the following earthwork recommendations.

9.8.1 Foundation Subgrade Preparation: All loose fill, organic debris, old topsoil, concrete rubble and slabs must be fully removed to expose the underlying, medium dense to dense, outwash soils at all foundation element locations. The exposed subgrade soils at the future foundation locations should be overexcavated approximately 2 feet below the bottom of the future foundation elements and replaced with Crushed Surfacing Base Course or Crushed Surfacing Top Course (WSDOT 9-03.9(3)). The overexcavation should extend laterally a distance equal to half of the depth of the overexcavation. Care should be taken while performing excavations for the new building foundations adjacent to the existing school structure to not undermine any existing school foundations. Please see the attached figure titled "Typical Foundation Detail" on page A-16 of the appendix.

9.8.2 Slab Subgrade Preparation: If any existing fill is encountered at future slabs-on-grade for the proposed new building, these fill materials should be removed to a depth of at least 2 feet below the bottom of the future slabs-on-grade and replaced with approved structural fill materials. Any organic debris, old topsoil, or rock or concrete rubble greater than 6 inches in diameter must be fully removed from the base of the overexcavation for future slabs-on-grade. The exposed, outwash soils at the base of the overexcavation should be immediately and thoroughly compacted to a firm and unyielding condition using a large, ride-on, vibratory roller to seal the surface, and should be graded to drain to a low-spot where a sump pump can be placed to remove accumulated water for discharge to a City of Kirkland approved location during periods of wet weather.

A proof roll should be performed with a loaded, single unit dump truck to evaluate the condition of the slab subgrade soils. If a dump truck cannot get into the excavation, a loaded, front end loader may be used to perform the proof roll. The proof roll must be observed by the project geotechnical engineer or his representative to evaluate whether the exposed subgrade is suitable for placement of overexcavation backfill. During periods of wet weather the future slab subgrade areas should be evaluated for the presence of unsuitable subgrade soils by probing by the geotechnical engineer, or his representative. If areas of soft subgrade soils are identified the areas must be overexcavated as directed by the geotechnical engineer, or his representative. All loose, wet soils, or otherwise unsuitable soils as determined by the geotechnical engineer, or his representative must be fully removed from future slab-on-grade areas prior to the placement of any overexcavation backfill. Any overexcavations should be backfilled with structural fill consisting of Crushed Surfacing Base Course or Crushed Surfacing Top Course (WSDOT 9-03.9(3)).

9.8.3 Pavement Subgrade Preparation: Following the removal of the existing pavements, any underlying existing organic soils, woody debris, uncontrolled fill, and any other deleterious materials shall be removed. The exposed subgrade surface should then be thoroughly compacted to a firm and unyielding condition. A thorough proof roll of the exposed subgrade soils should then be performed using a fully-loaded, single-unit dump truck to identify areas of soft subgrade soils. The proof roll shall be witnessed by an ORA geotechnical engineer or his representative. Areas of soft subgrade soil shall be removed and replaced with structural fill. The extent and depth of the overexcavations of unsuitable soils shall be determined by the ORA geotechnical engineer or his representative. All overexcavations shall be backfilled with structural fill consisting of base course crushed rock.

If the areas of unsuitable soil are extensive or deep (greater than about 18 inches), the use of one of the following measures may be considered to limit the depths of overexcavation:

- Woven geotextile fabrics,
- Geogrids, or
- using coarser backfill such as quarry spalls at the base of overexcavations with base course crushed rock at the upper portion of the overexcavation backfill.

ORA can provide suitable recommendations to address the remediation of areas with extensive or deep unsuitable subgrade soils once the extent is determined in the field.

The near-surface soils at the site are moisture-sensitive and easily disturbed during periods of wet weather. Pavement reconstruction activities should take place during the drier summer months to minimize the risk of subgrade disturbance during periods of wet weather.

9.8.4 Structural Fill – Material, Placement and Compaction: In general, the near-surface silty sands may be considered for use as structural fill during the drier times of the year, provided that it can be moisture-conditioned to within about 3 to 4 percent of optimum moisture content. The use of the near-surface silty sands should not be used as structural fill during periods of wet weather, or during wetter times of the year since this material is very moisture sensitive. The near-surface silty sands must not be used in the vicinity of the proposed onsite stormwater infiltration facilities. The clean, outwash sands that were encountered below the upper silty sands are suitable for use as structural fill. Any imported structural fill should consist of sand, gravel, or crushed rock depending upon its intended purpose. Imported structural fill to be placed during periods of wet weather should contain less than 5 percent fines (material passing a No. 200 sieve).

All fill and backfill materials should be placed in relatively horizontal loose lifts, not exceeding 10 inches in thickness, and compacted to at least 95 percent of the maximum dry density (MDD) as determined by the modified Proctor test (ASTM D1557). If manually-operated equipment such as a jumping jack compactor is used, the thickness of each loose lift should be no greater than 6 inches. Light vibratory plate compactors are not suitable for the compaction of structural fill. Soils consisting of clay, silt, peat or containing deleterious matter are generally not suitable for use as structural fill. Structural fill material should be approved by ORA prior to use. The following table summarizes our recommendations of fill material and compaction requirements for various types of aggregates.

Intended Use	Specification	Compaction Requirements
Structural fill below foundation elements	Crushed Surfacing Base Course or Crushed Surfacing Top Course (WSDOT 9-03.9(3))	Each lift must be compacted to 95 percent of MDD per ASTM D1557 test procedure.
Structural fill behind below-grade walls (not drain rock <u>and in immediate vicinity</u> of onsite stormwater infiltration facilities)	Suitable, native, clean, outwash sands as determined by project geotechnical engineer, or Gravel Backfill for Walls (WSDOT 9-03.12(2))	Fill placed in future landscape areas within 5 feet of below-grade walls or retaining walls shall be compacted with manually-operated compaction equipment. Fill shall be compacted to no greater than 92 percent of MDD to minimize risk of overstressing the walls. Fill placed in future landscape areas at locations greater than 5 feet away from below-grade walls or retaining walls shall be compacted with manually-operated compaction equipment. Fill shall be compacted to between 85 and 90 percent of MDD to facilitate onsite infiltration of stormwater which are typically located no closer than 20 feet to the building.
Structural fill behind below-grade walls (not drain rock <u>and not in vicinity</u> of onsite stormwater infiltration	Suitable, native, clean, outwash sands, suitable, onsite silty sands during periods of dry weather or drier times of the year, Gravel Borrow (WSDOT 9-03.14(1) or Gravel	Fill placed within 5 feet of below-grade walls or retaining walls shall be compacted with manually-operated compaction equipment. Fill placed at depths greater than 2 feet below

Intended Use	Specification	Compaction Requirements
facilities)	Backfill for Walls (WSDOT 9-03.12(2))	finish subgrade elevation compacted to 90 percent of MDD. Fill placed at depths within 2 feet of finish subgrade elevation must be compacted to 95 percent of MDD, if the area will be supporting pavements or roadway.
Fill behind below-grade walls at zone of wall drainage material	Gravel Backfill for Drains (WSDOT 9-03.12(4))	No compaction until at least 18 inches of cover is present above perforated drain pipe. Each subsequent 12-inch lift lightly compacted using manual compaction equipment.
Capillary break material below slabs-on-grade	Clean, 3/4-inch, crushed rock such as City of Seattle Type 22 Mineral Aggregate	Each lift must be compacted to a firm and unyielding condition over the firm subgrade soils.

Structural fill to be compacted to 95 percent of MDD should be moisture-conditioned to within three (3) percent of optimum moisture. Structural fill to be compacted to 90 percent of MDD should be moisture-conditioned to within six (6) percent of optimum moisture content. Placement of frozen soils or placement of soils on frozen ground should not be attempted.

9.8.5 Erosion and Sedimentation Control: The migration of sediments from the site must be installed and controlled in accordance with City of Kirkland requirements. We recommend that the following minimum erosion control measures be employed at the site:

- Provide silt fencing around the construction area to delineate the construction limits. No construction or soil disturbance should take place outside of the construction limits.
- Stockpiled soil at the site should be kept to a minimum. Any stockpiled soils should be covered with carefully secured plastic sheeting.
- Catch basin socks should be installed in nearby catch basins located downhill of the work area that could be impacted by construction activities.
- All sediment and soil should be removed from adjacent pavements at the end of each day of construction activities.

- Periodic inspection of the adequacy and condition of the installed erosion control measures by a geotechnical engineer or an experienced representative assigned by the geotechnical engineer.

Additional erosion control measures may be required as construction progresses.

9.9 TEMPORARY EXCAVATIONS

We anticipate that temporary cut slopes will be used to complete excavations at locations where sufficient room is present between the proposed new building, existing school, and the property boundaries. We recommend that the inclination of the temporary cut slopes be no greater than 1.5H:1V (horizontal to vertical) in the upper fill materials or in the loose to medium dense outwash soils and 1H:1V in the undisturbed, dense to very dense glacial till soils. It is imperative that an ORA representative evaluate the exposed soil conditions at the time of construction to verify that the recommended slope inclinations are appropriate for the conditions being encountered. In addition, the configuration for temporary cut slope inclinations may need to be modified during the course of construction if conditions change.

All temporary cut slopes and excavations must comply with the provisions of Washington Administrative Code (WAC) Chapter 296-155, Part N, “Excavation, Trenching and Shoring.” The contractor performing the work has the primary responsibility for protection of workers and adjacent improvements. However, we recommend that the contractor submit a work plan and excavation support plan for our review prior to beginning work on the site.

9.10 DRAINAGE

9.10.1 Dewatering: Groundwater seepage will likely not be encountered during construction. However, we anticipate that dewatering could be satisfactorily completed by routing water through ditches to a low spot or sump in the excavation. Water collected in the excavation should be removed as soon as possible and should be discharged to a location approved by the City of Kirkland and in accordance with City of Kirkland requirements.

9.10.2 Below-Grade Wall and Retaining Wall Drainage: Good drainage is considered critical to the performance of earth-supported structures such as foundations and retaining walls. Adequate drainage must be provided behind the planned below-grade walls and retaining walls for this project. A typical footing drain detail is presented on the figure titled “Typical Foundation Detail” on page A-16 of the appendix.

9.10.3 Surface Drainage: Good surface drainage is an integral part of the performance of earth-supported structures such as foundations, retaining walls, and pavements. Therefore, construction grades and final site grades should be designed to prevent water from entering the foundations or gravel drains behind any retaining walls or from ponding on or next to pavements. Where pavement does not immediately abut structures, slopes, with an outfall of at least three (3) percent for a minimum distance of five (5) feet from exterior footings, should be provided. These slopes should be capped with relatively impervious soils to prevent infiltration of water into the foundation soils.

9.11 CONSTRUCTION OBSERVATION AND TESTING

The recommendations presented in this report rely on adequate observation and testing of construction materials and procedures by the geotechnical engineer or his qualified representative. At a minimum, the testing program should include:

- Observation and review of site clearing, foundation excavations, and placement of structural fill to evaluate whether actual conditions are consistent with those encountered during exploration and used for design.
- Field inspection, laboratory testing of materials, and field inspection of construction methods as required by the local building code. Typically, this includes inspection of placement of reinforcing steel and inspection and testing of Portland cement concrete to evaluate compliance with specifications regarding slump, temperature, air content, and strength.

10. REPORT LIMITATIONS

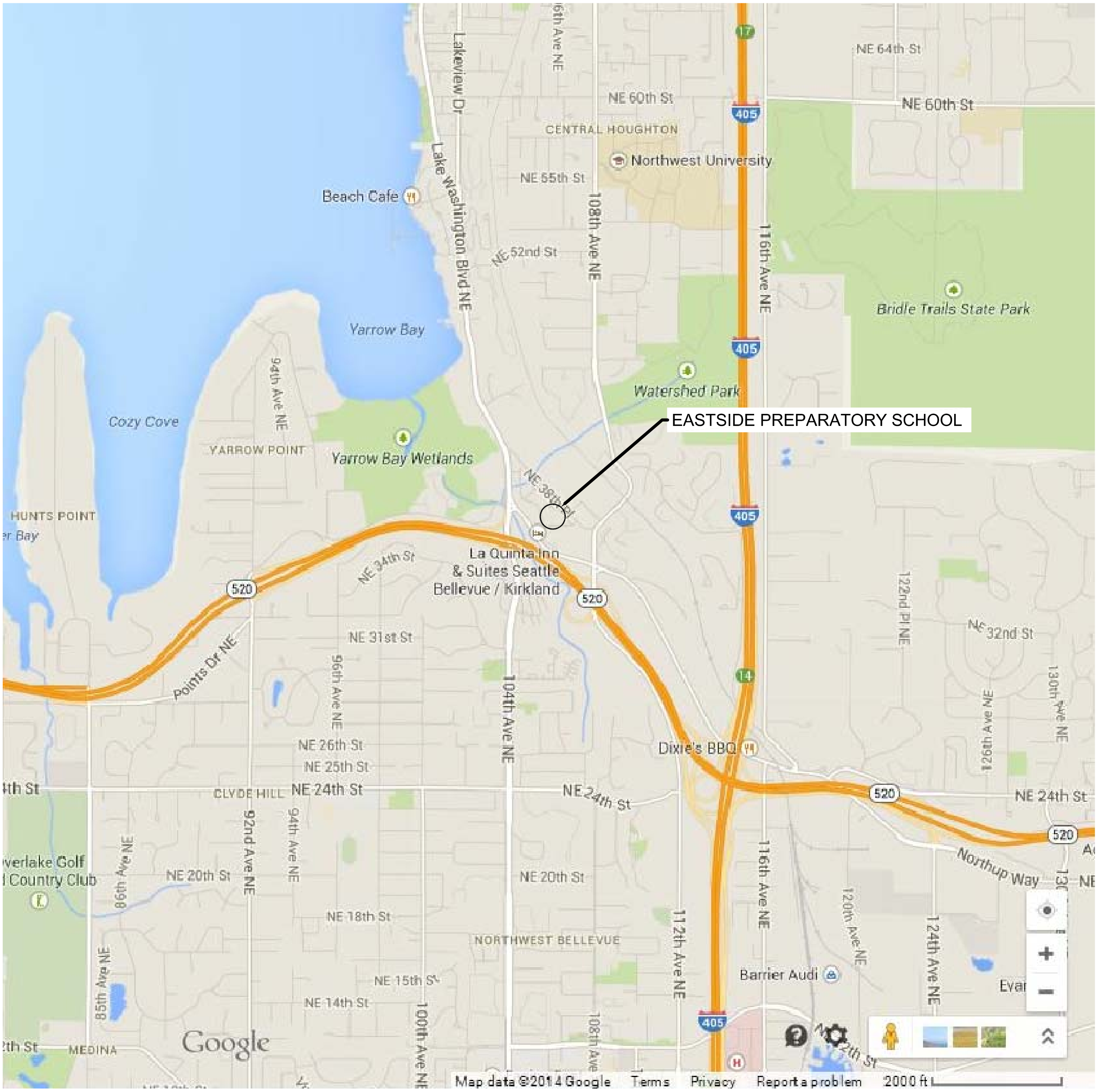
The recommendations presented in this report are for the exclusive use by Eastside Preparatory School for the proposed Science Building for the Eastside Preparatory School at 10624 and 10626 Northeast 37th Street in Kirkland, Washington. The recommendations are based on readily-available geologic literature and three borings completed on April 18, 2014. The recommendations of this report are not transferable to any other site. If there are any revisions to the plans, or if deviations from the subsurface conditions noted in this report are encountered during construction, Otto Rosenau & Associates, Inc. (ORA) should be notified immediately to determine whether changes to the design recommendations are required.

11. REFERENCE

Minard, J.P., (1983). “Geologic Map of the Kirkland Quadrangle, Washington.” United States Department of the Interior, United States Geological Survey, scale 1:24,000.

Washington State Department of Natural Resources (DNR), Division of Geology and Earth Resources, Washington State Geologic Information Portal’s website (*fortress.wa.gov/dnr/geology*).

APPENDIX



Note: The location of all features shown is approximate.
Reference: Google Maps, Map data © 2014, Google

Scale: As shown

VICINITY MAP

Project Name: Eastside Preparatory School Science Building

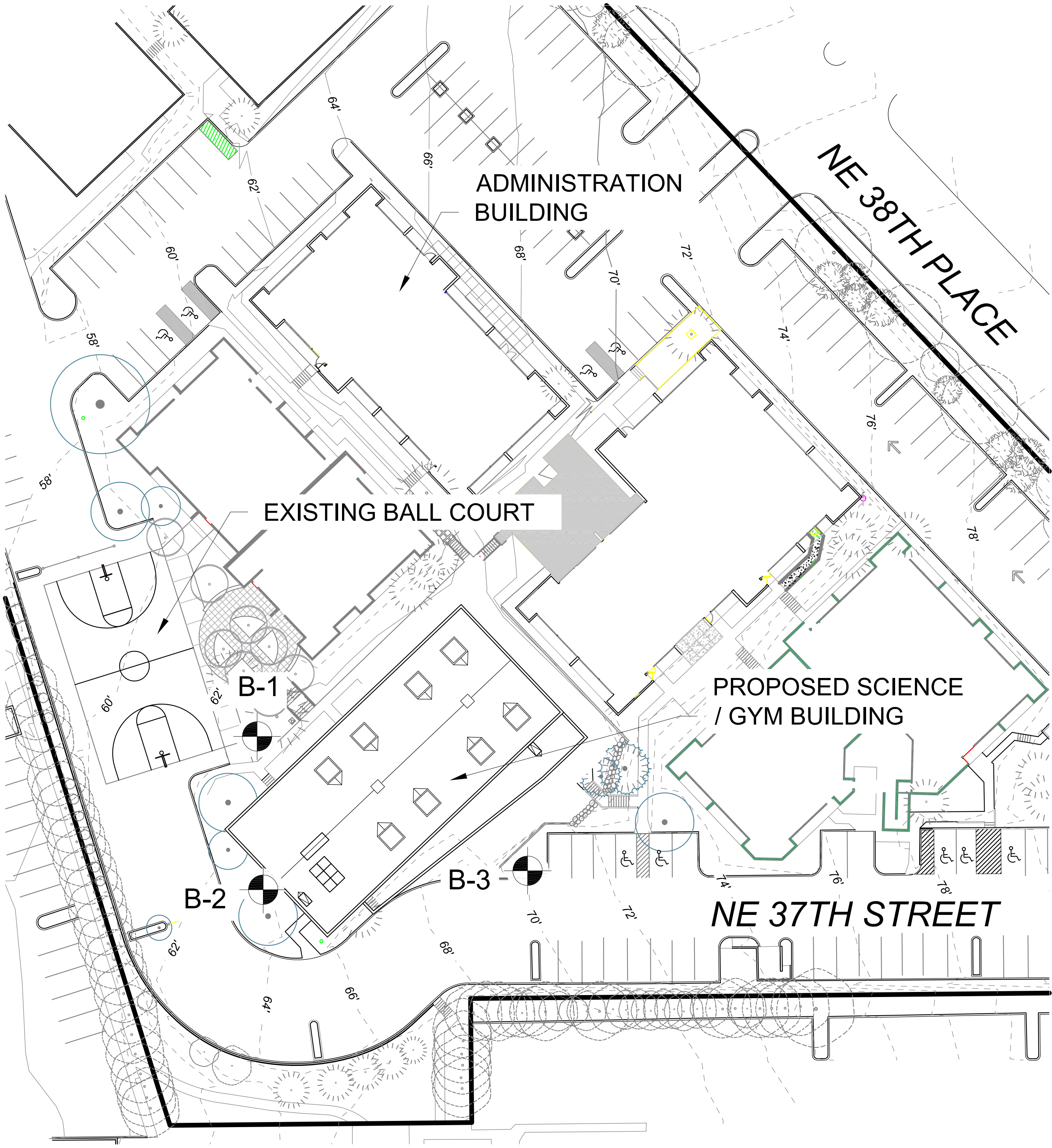
Location: 10613 NW 38th Place, Kirkland, Washington

Date: July 28, 2014

OTTO ROSENAU & ASSOCIATES, INC.

For: Eastside Preparatory School

ORA Project No.: 14-0232



LEGEND

B-1 - BORING COMPLETED BY ORA ON APRIL 18, 2014
REFERENCE: SITE PLAN PREPARED BY PUBLIC47 ARCHITECTS
xEPS SitePlan2.dwg

Scale: 1" = 60'

N

SITE PLAN

Project Name: Eastside Preparatory School Science Building

Location: 10613 NW 38th Place, Kirkland, Washington

Date: July 28, 2014

OTTO ROSENAU & ASSOCIATES, INC.

For: Eastside Preparatory School

ORA Project No.: 14-0232

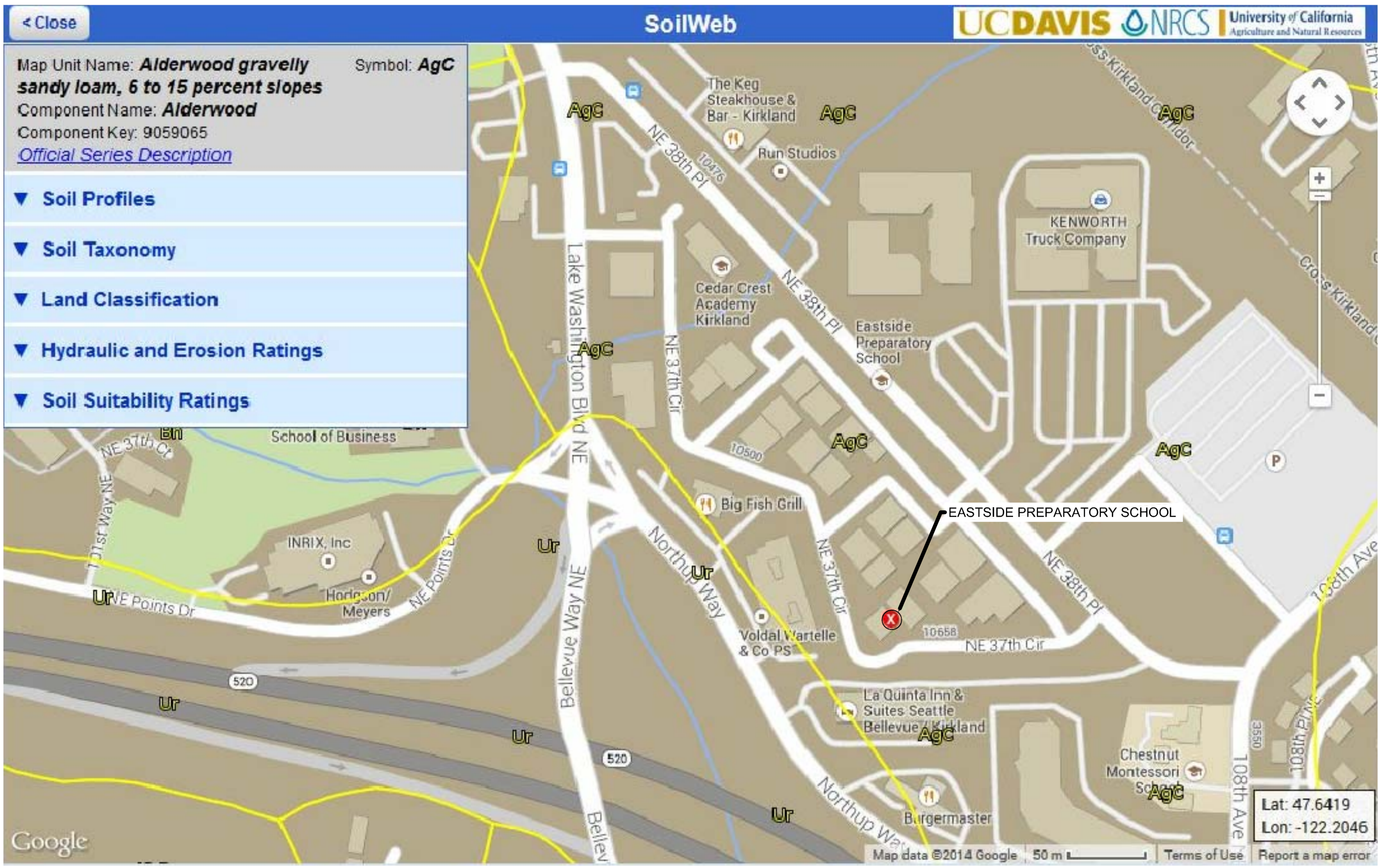
LEGEND

Qgt - Continental Glacial Till - Fraser Age
Qga - Advance Continental Glacial Outwash, Fraser Age
Qgo - Continental Glacial Outwash, Fraser Age
Qa - Alluvium

Note: The location of all features shown is approximate.
Reference: Washington Interactive Geologic Map online mapping service by Washington State Department of Natural Resources

GEOLOGIC MAP

Project Name: Eastside Preparatory School Science Building	OTTO ROSENAU & ASSOCIATES, INC.	**For:** Eastside Preparatory School
Location: 10613 NW 38th Place, Kirkland, Washington		**ORA Project No.:** 14-0232
Date: July 28, 2014		



Note: The location of all features shown is approximate.

Reference: NCRS / UC Davis / Google Maps "Soil Web" online soil deposit mapping service

NRCS SOIL MAP

Project Name: Eastside Preparatory School Science Building

Location: 10613 NW 38th Place, Kirkland, Washington

Date: July 28, 2014

OTTO ROSENAU & ASSOCIATES, INC.

For: Eastside Preparatory School

ORA Project No.: 14-0232

BORING LOG NOTES

These notes and boring logs are intended for use with this geotechnical report for the purposes and project described therein. The boring logs depict ORA's interpretation of subsurface conditions at the location of the boring on the date noted. Subsurface conditions may vary, and groundwater levels may change because of seasonal or numerous other factors. Accordingly, the boring logs should not be made a part of construction plans or be used to define construction conditions.

The approximate locations of the borings are shown on the Site Plan. The borings were located in the field by measuring from existing site features.

"Boring Size" refers the diameter and type of auger used. "HSA" denotes hollow-stem auger. "SSA" denotes solid-stem auger. "BA" denotes bucket auger.

"Sample Number and Type" refers to the sampling method and equipment used during exploration where:

- "SS" indicates split-spoon sampler with 1-3/8" inside diameter and 2" outside diameter.

"N-Values" refer to the Standard Penetration Test which records number of blows from a 140-pound hammer falling 30 inches required to advance a standard sampler eighteen inches. The blow counts required to drive the sampler through each 6-inch interval is recorded. The number of blows to drive the sampler for the last 12 inches of driving are added together and is considered to be the N-Value. The N-Value is presented in parentheses on the boring logs. The actual blow count values for each 6-inch interval is also presented. If the sample is driven less than 6 inches for a given interval, the actual distance driven is recorded.

"Moisture Content (MC)" refers to the moisture content of the soil expressed in percent by weight of dry sample as determined in the laboratory.

"Grain Size (GS)" refers to a grain size distribution analysis completed in general accordance with the ASTM D422 test procedure.

"Fines" is an estimate of the portion of a soil sample passing a No. 200 sieve as determined using the ASTM D422 test procedure.

"Atterberg Limits (AL)" refers to a determination of the liquid and plastic limits of a cohesive soil using the ASTM D 4318 test procedure.

"Dry Density (DD)" refers to an estimate of the dry density of a soil sample collected using a Shelby thin-wall sampling tube.

“Description and USCS Classification” refer to the materials encountered in the boring. The descriptions and classifications are generally based on visual examination in the field and laboratory. Where noted, laboratory tests were performed to determine the soil classification. The terms and symbols used in the boring logs are in general accordance with the Unified Soil Classification System. Laboratory tests are performed in general accordance with applicable procedures described by the American Society for Testing and Materials.

“▼” Indicates location of groundwater at the time noted.

TERMS for RELATIVE DENSITY of NON-COHESIVE SOIL

Term	Standard Penetration Resistance “N”
Very Loose	4 or less
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50 blows/foot

TERMS for RELATIVE CONSISTENCY of COHESIVE SOIL

Term	Unconfined Compressive Strength
Very Soft	0 to 0.25 tons/square-foot (tsf)
Soft	0.25 to 0.50 tsf
Medium Stiff	0.50 to 1.00 tsf
Stiff	1.00 to 2.00 tsf
Very Stiff	2.00 to 4.00 tsf
Hard	Over 4.00 tsf

DEFINITION of MATERIAL by DIAMETER of PARTICLE

Boulder	8-inches+
Cobble	3 to 8 inches
Gravel	3 inches to 5mm
Coarse Sand	5mm to 0.6mm
Medium Sand	0.6mm to 0.2mm
Fine Sand	0.2mm to 0.074mm
Silt	0.074mm to 0.005mm
Clay	less than 0.005mm

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (MORE THAN 12% FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (MORE THAN 12% FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: FINES ARE MATERIALS PASSING THE NO. 200 SIEVE.
COARSE GRAINED SOILS RECEIVE DUAL SYMBOLS IF THEY CONTAIN BETWEEN 5% AND 12% FINES.
FINE GRAINED SOILS RECEIVE DUAL SYMBOLS IF THEIR LIMITS PLOT LEFT OF THE "A" LINE WITH A PLASTICITY INDEX (PI) OF 4% TO 7%.

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BORING NUMBER B-1

CLIENT Eastside Preparatory School
PROJECT NAME Eastside Preparatory School Science Building
PROJECT NUMBER 14-0232
PROJECT LOCATION 10613 Northeast 38th Place, Kirkland, WA
DATE STARTED 4/18/14 **COMPLETED** 4/18/14
GROUND ELEVATION 63 ft NAVD 88 **HOLE SIZE** 7 inch dia.
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Track Rig)
AT TIME OF DRILLING 30.0 ft / Elev 33.0 ft
LOGGED BY Scott Hoobler, P.E. **CHECKED BY** Anthony Coyne, P.E.
AT END OF DRILLING 33.8 ft / Elev 29.2 ft
NOTES 140 # automatic hammer, SPT sampler, 30-inch drop
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elev.
0								
0.3							3-inch thick sod zone and topsoil	62.7
							Loose, brown Silty SAND with some gravel and organics (moist) (topsoil) (Fill)	
	SS 1	33	5-8-9 (17)	MC=10%	SM		Medium dense, light brown to brown Silty SAND with some gravel (moist) (Fill)	
5	SS 2	83	4-4-4 (8)	MC=13%	SM		Loose, light brown, Silty SAND (moist) (Fill)	
6.0					SP			57.0
	SS 3	72	6-5-4 (9)	MC=10%	SP		Loose, light brown, fine to medium SAND with trace silt and occasional thin interbedded silty sand layers (Outwash Deposit) Some iron oxide staining at 8.5 feet	
10	SS 4	89	7-11-9 (20)	MC=6%	SP		Medium dense, light brown, fine to medium SAND with trace silt and occasional thin interbedded silty sand layers (Outwash Deposit)	
	SS 5	78	7-9-12 (21)	MC=10%	SP		Medium dense, light brown, fine to medium SAND with trace silt with interbedded layers of silty sand (moist) (Outwash Deposit)	
15	SS 6	56	10-13-10 (23)	MC=9%	SP		Medium dense, light brown, fine to medium SAND with trace silt and some gravel, interbedded layers of silty sand (Outwash Deposit)	

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BORING NUMBER B-1

CLIENT Eastside Preparatory School
PROJECT NAME Eastside Preparatory School Science Building
PROJECT NUMBER 14-0232
PROJECT LOCATION 10613 Northeast 38th Place, Kirkland, WA

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS 7	89	6-11-12 (23)	MC=10%	SP		Medium dense, light brown, fine to medium SAND with trace silt, interbedded layers of silty sand (Outwash Deposit)
25	SS 8	53	13-22-19 (41)	MC=9%	SP		Dense, light brown, fine to medium SAND with trace silt and some gravel (moist) (Outwash Deposit)
30	SS 9	78	7-11-12 (23)	MC=20%	SP		▽ Medium dense, light brown, fine to medium SAND with trace silt (wet) (Outwash Deposit) Encountered gravel at 31-1/2 feet ▼
35						35.0	28.0
	SS 10	19	13-28-30 (58)	MC=14%	SM		Very dense, light gray Silty SAND with gravel (wet) (Till)
						36.5	26.5

Bottom of hole at 36.5 feet.

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BORING NUMBER B-2

CLIENT Eastside Preparatory School
PROJECT NAME Eastside Preparatory School Science Building
PROJECT NUMBER 14-0232
PROJECT LOCATION 10613 Northeast 38th Place, Kirkland, WA
DATE STARTED 4/18/14 **COMPLETED** 4/18/14
GROUND ELEVATION 66 ft NAVD 88 **HOLE SIZE** 7 inch dia.
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Track Rig)
AT TIME OF DRILLING Not encountered
LOGGED BY Scott Hoobler, P.E. **CHECKED BY** Anthony Coyne, P.E.
AT END OF DRILLING ---
NOTES 140 # automatic hammer, SPT sampler, 30-inch drop
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						0.3	3-inch thick sod zone and topsoil 65.7
							Loose, brown Silty SAND with some gravel and organics (moist) (topsoil)
	SS 1	56	11-15-15 (30)	MC=16%	SM		Medium dense, brown to light grayish brown Silty SAND with some gravel and some wood debris and roots, some iron oxide staining (moist) (Fill)
5	SS 2	67	9-6-9 (15)	MC=8%	SM		Medium dense, light grayish brown Silty SAND with some gravel and trace wood debris (moist) (Fill)
	SS 3	11	5-4-6 (10)		SM	9.5	Loose, light grayish brown Silty SAND with some gravel and trace wood debris (moist) (Fill) 56.5
10	SS 4	78	4-6-8 (14)	MC=11% , GS	SP		Medium dense, light brown, fine to medium SAND with trace silt, interbedded layers of silty sand (moist) (Outwash Deposit)
15	SS 5	83	4-6-6 (12)	MC=16%	SP		Medium dense, light brown, fine to medium SAND with trace silt, interbedded layers of silty sand (moist) (Outwash Deposit)

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BORING NUMBER B-2

CLIENT Eastside Preparatory School **PROJECT NAME** Eastside Preparatory School Science Building

PROJECT NUMBER 14-0232 **PROJECT LOCATION** 10613 Northeast 38th Place, Kirkland, WA

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS 6	89	8-10-13 (23)	MC=8%	SP		Medium dense, light brown, fine to medium SAND with trace silt, interbedded layers of silty sand (moist) (Outwash Deposit)
25	SS 7	89	10-10-15 (25)	MC=8%	SP		Medium dense, light brown, fine to medium SAND with trace silt (moist) (Outwash Deposit)
						26.5	39.5
							Bottom of hole at 26.5 feet.

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BORING NUMBER B-3

CLIENT Eastside Preparatory School
PROJECT NAME Eastside Preparatory School Science Building
PROJECT NUMBER 14-0232
PROJECT LOCATION 10613 Northeast 38th Place, Kirkland, WA
DATE STARTED 4/18/14 **COMPLETED** 4/18/14
GROUND ELEVATION 70 ft NAVD 88 **HOLE SIZE** 7 inch dia.
DRILLING CONTRACTOR Holocene Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger (Track Rig)
AT TIME OF DRILLING Not encountered
LOGGED BY Scott Hoobler, P.E. **CHECKED BY** Anthony Coyne, P.E.
AT END OF DRILLING ---
NOTES 140 # automatic hammer, SPT sampler, 30-inch drop
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0						0.3	3-inch thick sod zone and topsoil — 69.7
					SM		Loose, brown to light brown Silty SAND (moist) (topsoil) (Fill)
							Encountered gravel at 3 feet
5	SS 1	28	7-10-6 (16)	MC=6%	SM	6.0	Medium dense, light brown Silty SAND with gravel (moist) (Fill) — 64.0
	SS 2	56	7-10-8 (18)	MC=9%	SP		Medium dense, light brown, fine to medium SAND with trace silt and gravel, interbedded layer of silty sand, some iron oxide staining (moist) (Outwash Deposit)
10	SS 3	72	8-8-6 (14)	MC=9% , GS			
	SS 4	0	6-10-9 (19)		SP		No recovery
15	SS 5	61	8-7-8 (15)	MC=10%	SP		Medium dense, light brown, fine to medium SAND with trace silt and gravel, interbedded layer of silty sand, some iron oxide staining (moist) (Outwash Deposit)

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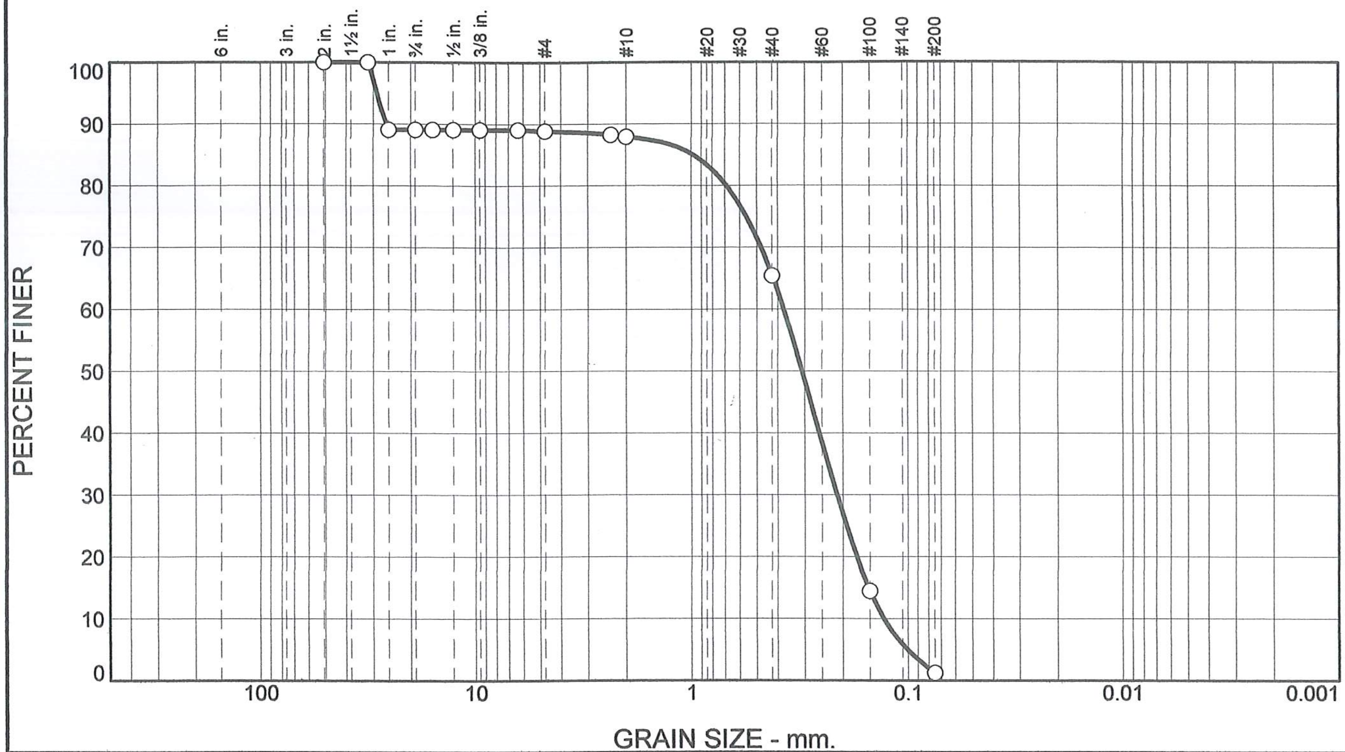
BORING NUMBER B-3

CLIENT Eastside Preparatory School
PROJECT NAME Eastside Preparatory School Science Building
PROJECT NUMBER 14-0232
PROJECT LOCATION 10613 Northeast 38th Place, Kirkland, WA

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
20	SS 6	64	11-13-11 (24)	MC=5%	SP		Medium dense, light brown, fine to medium SAND with trace silt and gravel (moist) (Outwash Deposit)
25	SS 7	92	6-7-8 (15)	MC=7%	SP		Medium dense, light brown, fine to medium SAND with trace silt (moist) (Outwash Deposit)
30	SS 8	47	13-19-18 (37)	MC=6%	SP		Dense, light brown, fine to medium SAND with trace silt and gravel (moist) (Outwash Deposit)
						31.5	38.5
							Bottom of hole at 31.5 feet.

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	12	23	64	1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.25	100		
1	89		
.75	89		
.625	89		
.50	89		
.375	89		
.25	89		
#4	89		
#8	88		
#10	88		
#40	65		
#100	14		
#200	1.3		

* (no specification provided)

Material Description

Sample #6184a: Gray poorly graded sand

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-3

Coefficients

D_{90}= 26.0649 D_{85}= 0.9790 D_{60}= 0.3766
D_{50}= 0.3093 D_{30}= 0.2130 D_{15}= 0.1523
D_{10}= 0.1293 C_u= 2.91 C_c= 0.93

Remarks

Test Equipment ID: 5
Was sample soaked?: Not required

Date Received: 4/18/2014 **Date Tested:** 5/29/2014
Tested By: A. Duong
Checked By: A. Coyne Anthony Coyne
Title: Professional Engineer

Location: B-2, S-4, 10'
Sample Number: 6814a

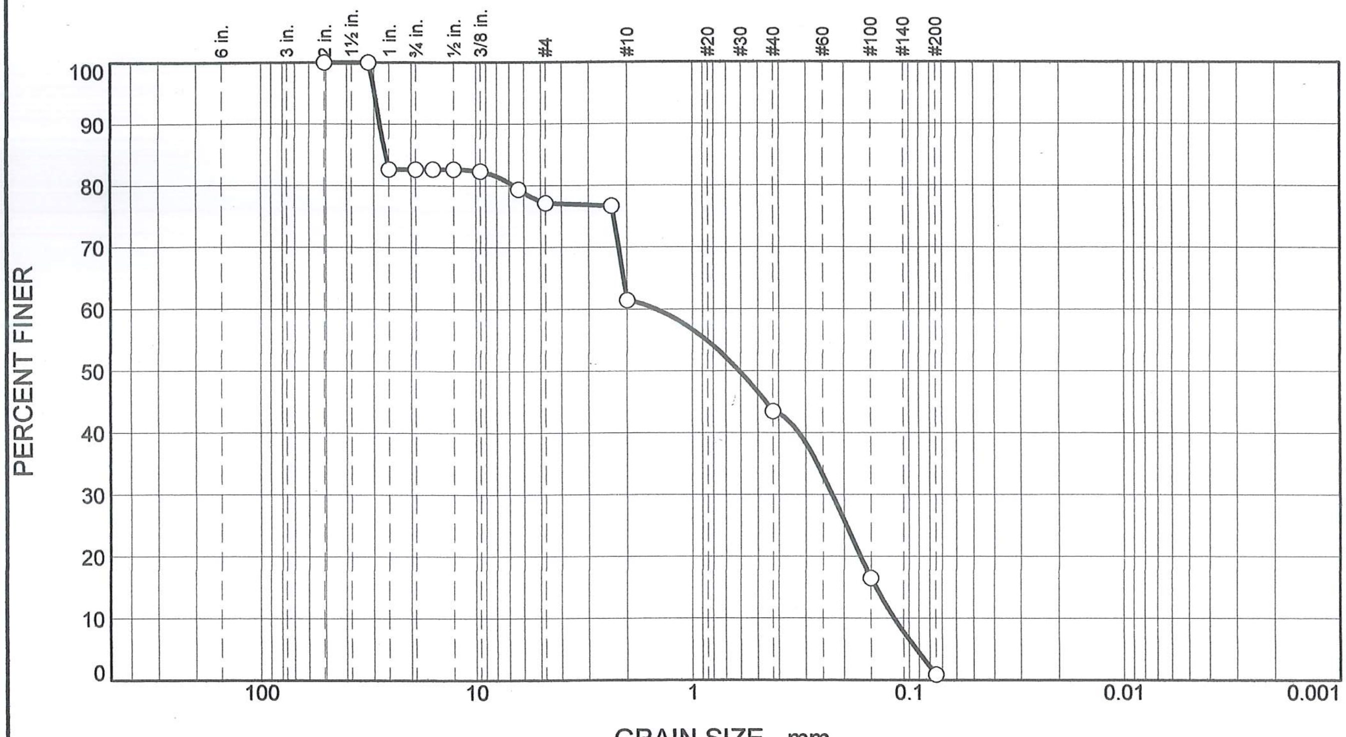
Date Sampled: 4/18/2014

OTTO ROSENAU & ASSOCIATES, INC.

Client: Eastside Preparatory School
Project: Eastside Preparatory School Science Building
10613 NW 38th Place, Kirkland
Project No: 14-0232 **Figure** 6814a

Classification: ASTM D2487 Natural Moisture: ASTM D2216

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0	39	18	42	1	

Test Results (ASTM D 422 & ASTM D 1140)			
Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100		
1.25	100		
1	83		
.75	83		
.625	83		
.50	83		
.375	82		
.25	79		
#4	77		
#8	77		
#10	61		
#40	43		
#100	16		
#200	0.9		

* (no specification provided)

Material Description

Sample #6184: Gray poorly graded sand with gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= SP AASHTO (M 145)= A-1-b

Coefficients

D_{90}= 28.1387 D_{85}= 26.4173 D_{60}= 1.4757
D_{50}= 0.6092 D_{30}= 0.2266 D_{15}= 0.1425
D_{10}= 0.1171 C_u= 12.60 C_c= 0.30

Remarks

Test Equipment ID: 5
Was sample soaked?: Not required

Date Received: 4/18/2014 **Date Tested:** 5/29/2014
Tested By: A. Duong
Checked By: A. Coyne Anthony Coyne
Title: Professional Engineer

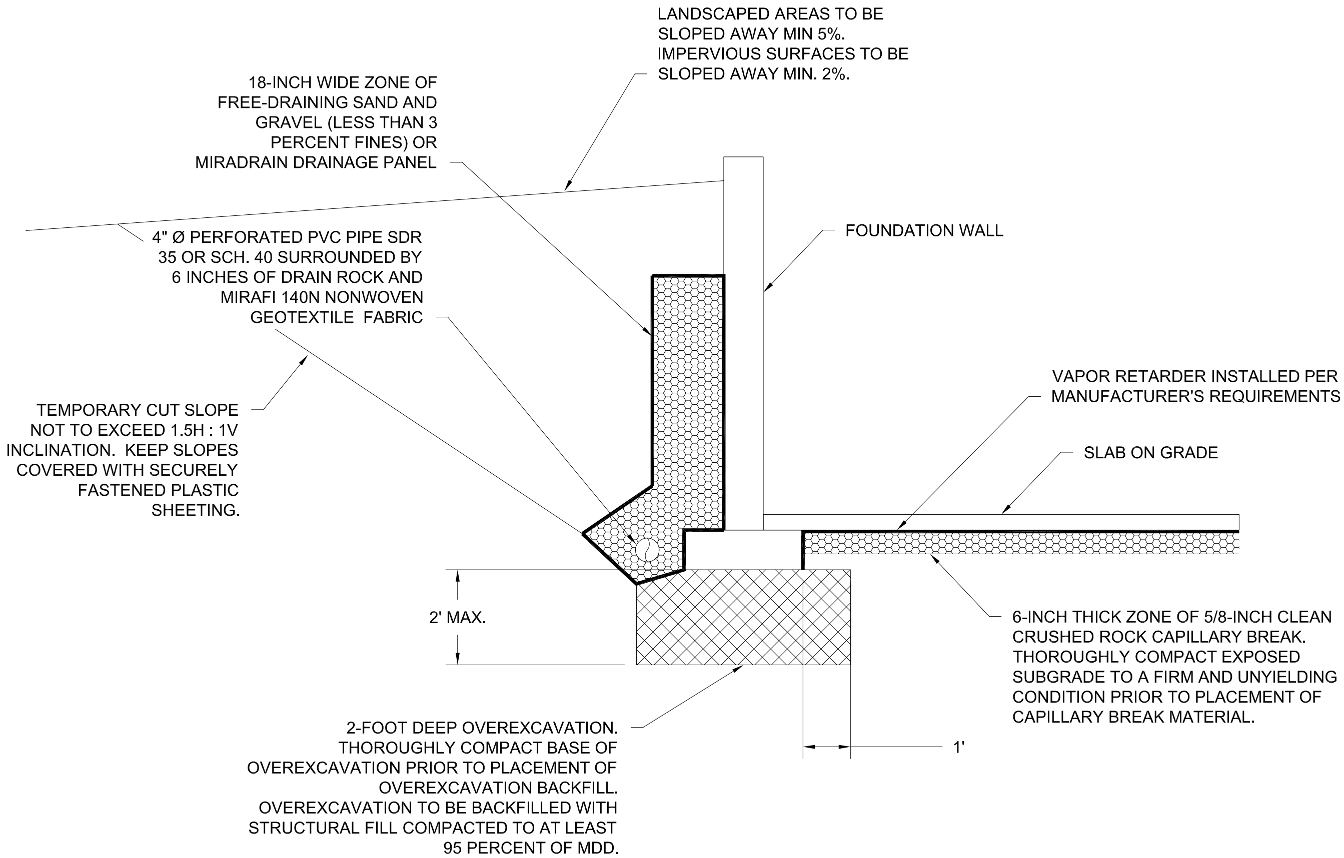
Location: B-3, S-2, 7.5' to 9'
Sample Number: 6184

Date Sampled: 4/18/2014

OTTO ROSENAU & ASSOCIATES, INC.

Client: Eastside Preparatory School
Project: Eastside Preparatory School Science Building
10613 NW 38th Place, Kirkland
Project No: 14-0232 **Figure** 6184

Classification: ASTM D2487 Natural Moisture: ASTM D2216



Note: The location of all features shown is approximate.
Scale: Not to scale

TYPICAL FOUNDATION DETAIL

Project Name: Eastside Preparatory School Science Building

Location: 10613 NW 38th Place, Kirkland, Washington

Date: July 28, 2014

OTTO ROSENAU & ASSOCIATES, INC.

For: Eastside Preparatory School

ORA Project No.: 14-0232