Materials Testing & Consulting, Inc.

Geotechnical Engineering ● Materials Testing ● Special Inspection ● Environmental Consulting

November 15, 2016

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Subject: Geotechnical Investigation and Engineering Services
Puyallup School District – New SW Elementary school - Geotechnical Study
144th St E, Puyallup, Washington

MTC Project No.: 16S134

Dear Mr. Gerstmann:

This letter transmits our Geotechnical Investigation Report for the above-referenced project. Materials Testing & Consulting, Inc. (MTC) performed this geotechnical study in accordance with our Proposal for Geotechnical Services, dated August 4, 2016.

We would be pleased to continue our role as your geotechnical engineering consultants during the project planning and construction. We also have a keen interest in providing materials testing and special inspection during construction of this project. We will be pleased to meet with you at your convenience to discuss these services.

We appreciate the opportunity to provide geotechnical engineering services to you for this project. If you have any questions regarding this report, or if we can provide assistance with other aspects of the project, please contact me at (360) 755-1990.

Respectfully Submitted,
MATERIALS TESTING & CONSULTING, INC.

Luke McCann, G.I.T.
Project Geologist

Sangho (Peter) Lee, P.E.
Professional Engineer

Attachment: Geotechnical Investigation Report

PHASE 1 GEOTECHNICAL SITE INVESTIGATION

PUYALLUP SCHOOL DISTRICT SW ELEMENTARY

144TH STREET EAST, PUYALLUP, WASHINGTON

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Prepared by:

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November 15, 2016
MTC Project Number: **16S134**

Table of Contents

1.0 INTRODUCTION

1.1 GENERAL

This report presents the findings and recommendations of Materials Testing & Consulting, Inc.'s (MTC) geotechnical investigation conducted in support of the design and construction of the proposed elementary school complex development. The proposed project site is a currently forested 18 acre parcel located northwest of the intersection of 144th Street East and 80th Avenue Court East in Puyallup, Washington. Maps depicting the general location, aerial photo of existing conditions, and proposed layout of the project site are provided in Figures 1 and 2 of Appendices A and B, respectively.

1.2 PROJECT DESCRIPTION

It is our understanding that the proposed project consists of developing the property for a new elementary school complex, comprised potentially of a 3-story 110,000 square foot elementary school building and surrounding campus. Exact locations of features and developments have not been determined at this time. Exterior improvements are anticipated to include infrastructure for large and small vehicle accesses, parking, flatworks, and play fields. The property is designated as Parcel #041917-4-028 and comprises approximately 18 acres of land. At this time, the client requests to complete a Preliminary Geotechnical Engineering Investigation for the site. Specific requests for scope have included general pavement development considerations, foundation design recommendations, and general infiltration assessment for stormwater planning purposes.

Topography of the project vicinity is typically gentle with a dominantly low western gradient. The area of current proposed development exists within a parcel comprising mature second-growth forest in an undeveloped area on the southern margins of the City of Puyallup.

Based on preliminary project concepts provided to date, construction elevations are assumed to be close to existing grade, with no major cuts or fills proposed. Foundations are likely to consist of shallow continuous perimeter and spread footings with relatively light loads, and slab-on-grade elements where applicable. It is anticipated that loads will be typical for the type and materials of construction, and no unusually large or vibratory loads are expected.

MTC should be allowed to review the final plans and specifications for the project to ensure that the recommendations presented herein are appropriate. Recommendations and conclusions presented by this report will need to be reevaluated in the event that changes to the proposed construction are made.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of our study was to explore subsurface conditions at the site and provide geotechnical recommendations for design and construction of the proposed developments. To evaluate subsurface

soil and water conditions, MTC directed and logged excavator test pits, obtained soil samples, and performed Wildcat Dynamic Cone Penetrometer (DCP) tests for bearing capacity evaluation. Our scope of services was consistent with that presented in our Proposal for Geotechnical Engineering Services, dated August 4, 2016.

2.0 SITE EXPLORATION AND LABORATORY TESTING

2.1 SITE EXPLORATION

Our site exploration activities were completed on September 15, 2016. Field methods involved an initial reconnaissance and mapping, along with conducting ten (10) Wildcat Dynamic Cone Penetrometer (DCP) tests. Sixteen (16) machine-assisted test pits were also excavated among the proposed development areas, executed per the MTC Project Geologist's direction. Test pit locations focused on potential new construction areas within the site, with the goal of understanding general subsurface soil characteristics of the project site, as well as to sample soils for laboratory testing. DCP tests were primarily performed near test pit locations in order to confirm subsurface soil density/consistency and correlate with test pit soil observations.

Exploration locations were selected and field located by an MTC Project Geologist while on site to investigate near-subsurface conditions within areas proposed for development. All explorations were monitored and documented by MTC personnel. Test pit excavations were performed under subcontract to MTC. Test pits were excavated to depths ranging from 5.0 to 10.0 feet below present grade (BPG), and all pits were terminated within resistant soil conditions exhibiting difficult excavation with small earthwork equipment.

MTC's field crew advanced Wildcat DCP tests until reaching practical refusal on dense or hard soils. Eight Wildcat DCP tests were completed to termination depths ranging from approximately 1.5 to 3.7 feet BPG.

Explorations were located based on pace-and-compass, GPS coordinates, and other direct measurement with standard hand equipment. All test locations are identified on Appendix B, Figure 2. Additional information on the site exploration program is available within our exploration logs for the test pits and DCP results, presented in Appendix C of this report.

2.2 LABORATORY TESTING

Laboratory tests were performed on selected soil samples in accordance with ASTM standards to determine index and engineering properties of the site soils. Tests included supplementary soil visual classification of collected samples, grain-size distribution tests (sieve and hydrometer analysis), Atterberg Limits analysis (Plasticity Index) and natural moisture content determination. Laboratory test results are presented on the test reports included in Appendix D.

3.0 EXISTING SITE CONDITIONS

3.1 SURFACE DESCRIPTION

The project site is located along the present southern margins of the City of Puyallup, Washington in a residential area. Existing neighborhood and multiple single-family residential housing developments abut the eastern and western site boundaries, as well as a municipal water tank and adjacent playground on the southwestern edge. Undeveloped forest areas comprise the north property boundaries and the southern boundary is bordered by 144th Street. The site is roughly rectangular in shape with a pan-handle comprising the southern third of the site. Access to the site for MTC's exploration work was at the south boundary, with the entryway at 144th Street.

Within the site, mature second-growth forest comprised of fir, maple, cedar, alder, birch and cottonwood is prevalent. Trees generally stand straight and vertical and some are up to 2.5 feet in diameter. Native understory of ferns, blackberry, nettles, and vine maple are omnipresent. Certain locations are thick with undergrowth, while other sections contain sparse low-lying growth due to tree canopy coverage. The property is generally without foot trails, excepting some irregular game paths.

Topography is generally level, with only a slight downward gradient trend to the west. Terrain is generally hummocky and gently rolling, with no known sharp changes in elevation. There are no known, or observed major bodies of water or seasonal channels found with the subject area. The ground surface was dry to damp during the site visit in the fall season. The elevation of the project area is roughly 500 feet above sea level.

3.2 AREA GEOLOGY

The *Geologic map of the south half of the Tacoma quadrangle, Washington* (Walsh, 1987) published by the Washington Division of Geology and Earth Resources indicates the project site is located completely within Quaternary glacial till (Unit Qdvt), described as Pleistocene-age Vashon Stade Glacial Till deposits. The *Washington Interactive Geologic Map* also depicts the site within an upland expanse of Vashon Stade Glacial Till (available from DNR, accessed online) on a 1:100,000 mapped scale. The unit mantles commonly throughout much of Pierce County uplands. It is typified as unsorted, unstratified, compacted till consisting primarily of a matrix of sand, silt, and clay containing cobbles and boulders.

Shallow soils are mapped by the USDA NRCS *Web Soil Survey* as Kapowsin gravelly ashy loam (0 to 6 percent slopes) for the entirety of the site. Kapowsin gravelly ashy loam is formed on glacial moraines and is derived from volcanic ash mixed with glacial drift over dense glaciomarine deposits. This soil typically consists of gravelly ashy loam up to 15 inches, transitioning to loam from 15 to 29 inches

depth, and below is gravelly loam to a depth of 59 inches. The Kapowsin gravelly ashy loam is moderately well drained in its upper stratigraphy, assigned to Hydrologic Group B.

Soil conditions encountered in the field generally consist of thin topsoils, cover deposits and weathered glacial soils of silty sand with gravel to silty gravel with sand, transitioning to unweathered, compact and cemented silty sand with gravel at typical depths past approximately 2.0 to 4.0 feet below present grade (BPG) with a few exceptions around 7.0 to 8.0 feet (BPG). These conditions are representative of Vashon Stade glacial till deposits and undisturbed native cover deposits, and are thus consistent with area geology sources.

3.3 SOIL CONDITIONS

A general characterization of on-site soil units encountered during our exploration is presented below. The exploration logs in Appendix C present details of soils encountered at each exploration location.

The on-site soils are generally summarized as follows in stratigraphic order to depth:

- **Topsoil (OL-ML) – Organic Silt and Plant Debris:**
  Organic topsoil was observed at the surface at all testing locations throughout the project site. These cover soils were typically silt with some sand and gravel and visible organic content. Organic material included a rich mat of plant debris and roots. Topsoil was dark brown in color, soft and dry to damp. Thickness was typically about 0.25 to 0.5 feet.

- **Weathered Glacial Deposits (GM-SM) – Silty Gravel with Sand to Silty Sand with Gravel:**
  Weathered glacial deposits were encountered at all test pit locations from 0.25 feet to 0.5 feet BPG beneath thin forest topsoils. Weathering, alteration and oxidation patterns were observed in the majority of test pit locations within this unit from 1.5 feet to 5.0 feet BFG, with a typical loose to medium dense consistency, occasionally dense in some locations with varying depth. The layer typically consists of silty sand with gravel to silty gravel with sand, varying in sand and gravel contents. The unit was generally tan in color with local orange mottling and dry at the time of the investigation. Some to minor organics (roots) were observed. Gravel, when present, was approximately 3 to 6 inches in diameter.

- **Unweathered Till Deposits (SM) – Silty Sand with Gravel:**
  Resistant, cemented and compacted soils consisting of silty sand with gravel were encountered at all test pit and DCP locations beneath the weathered strata. Depths to unweathered glacial soils ranged from 1.5 feet BPG (TP-1) to 8.0 feet BPG (TP-14), but most commonly between 3.0 and 4.0 feet BPG. These soils were relatively uniform gray in color, dense becoming hard/very dense below the upper horizon and damp with occasional mottling along the contact with the upper weathered unit. Gravel was typically rounded to sub-rounded and ranged up to cobble size

in most locations reaching 6 inches in diameter. All exploration tests were terminated within this unit due to consistently very dense conditions persisting to maximum depths explored.

3.4 GROUNDWATER CONDITIONS

No significant surface water features were observed on the site or in the close vicinity. No standing water was observed in the project areas during our site work in the mid-summer season. The nearest bodies of water to the project site is Clover Creek 0.8 miles to the south, which has very low levels seasonally, and small residential ponds greater than 0.5 miles east of the property.

During field explorations, no water seepage was observed within any test pit or DCP location. No water table was encountered by typical termination depths of 8.0 feet BPG at any test location. Given the timeframe of this investigation conducted in the late summer, it is most likely that the observed dry soil conditions represent a seasonally reduced condition. Perched groundwater levels may differ in winter and wet seasons due to the consistent presence of the underlying restricting impermeable or very low permeability soils consistently found below the weathered deposits.

Soil mottling was observed among weathered glacial soils near the interface with the underlying cemented till deposits. The mottling coloration may indicate wetting and drying cycles within the upper soil column as shallow water is perched or migrates seasonally through relatively permeable upper stratigraphy, while downward migration is restricted. Therefore, we interpret common seepage and potentially a perched water table condition should be anticipated during construction if work is conducted in the winter or spring season.

MTC's scope of investigation did not include observation and determination of seasonal variations, conclusive measurement or monitoring of groundwater elevations at the time of exploration, or determination of regional groundwater levels past the depths explored. Given the topography of the site area, known geology, and relationship to major surface water features in the vicinity, regional static groundwater levels are anticipated to be below the realm of concern for this study.

4.0 KEY GEOLOGIC CONSIDERATIONS

This section discusses significant geotechnical aspects that must be addressed in project planning and design. These considerations form the basis for the geotechnical engineering design recommendations presented in Section 5.0 and construction recommendations presented in Section 6.0.

4.1 GENERAL SITE SOIL CONDITIONS

The results of MTC's investigation indicate undisturbed native soils consisting of resistant glacial till deposits are present at shallow depths residing below cover soils and weathered or altered glacially-derived soils. Table 1 summarizes soils conditions encountered at each test pit and depicts topsoil depths as well as depths to suitable bearing soils, corresponding to the unweathered till.

Table 1. Summary of Soil Stratigraphy per Test Pit Location (depths in feet BPG)

Test Pit #	Topsoil Depth	Weathered Soil	Glacial Till (Bearing Soil)
TP-1	0.5	0.5 – 1.5	1.5+
TP-2	0.25	0.25 – 5.0	5.0+
TP-3	0.25	0.25 – 3.0	3.0+
TP-4	0.25	0.25 - 3.5	3.5+
TP-5	0.25	0.25 – 3.0	3.0+
TP-6	0.25	0.25 – 3.0	3.0+
TP-7	0.25	0.25 – 4.0	4.0+
TP-8	0.25	0.25 – 3.5	3.5+
TP-9	0.25	0.25 – 4.0	4.0+
TP-10	0.5	0.5 – 2.5	2.5+
TP-11	0.5	0.5 – 4.0	4.0+
TP-12	0.5	0.5 – 3.0	3.0+
TP-13	0.5	0.5 – 3.0	3.0+
TP-14	0.25	0.25 - 8.0	8.0+
TP-15	0.25	0.25 – 3.5	3.5+
TP-16	0.25	0.25 – 7.0	7.0+

4.2 SCOPE OF SITE GRADING

A grading plan was not available to MTC at the time of this report. Based on discussions with the client and provided conceptual plans as well as observation of existing topography, this study assumes finished site grade will be approximately at current average grade. Therefore, depths referred to in this report are considered roughly equivalent to final depths, and our recommendations below assume only limited extents of cut and fill for local leveling purposes.

In the building area, we recommend the site preparation start with complete removal of the existing trees and vegetation, followed by the removal of organic topsoils, root debris (if present) and other deleterious material. All biomaterial should be properly removed or relocated. Material removed from the project site should be disposed of in accordance with all applicable federal, state, and local regulations.

4.3 TEMPORARY EXCAVATION CUT SLOPES, SHORING, AND DEWATERING

Plans for excavation including temporary cut slopes and proposed shoring methods were not available to MTC at the time of report production. Most excavations are anticipated to be shallow. However, if excavations for foundations and utility improvements exceed 4 feet depth, it is possible that one or both techniques will be used. Section 6.3 below provides general recommendations for treatment of temporary excavations. MTC can provide further consultation, design, and evaluation services for cut slopes if desired prior to and during construction.

Dewatering to some extent may be necessary for shallow excavations, especially if construction occurs in the wet season or during prolonged wet weather due to perched water phenomenon and the interpreted very low infiltrating capacity of native soils. General recommendations for site preparation and wet weather construction are addressed in section 6.1.3 below. This study did not include a hydrogeologic evaluation necessary for accurate appraisal of site flow conditions or volume estimates. These findings shall be considered only generally suitable for planning and design of dewatering methods.

4.4 HYDROGEOLOGIC CONSIDERATIONS FOR STORMWATER DESIGN

The results of MTC's investigation indicate limiting factors are prevalent at the site expected to significantly hinder infiltration potential and restrict or prohibit feasible design scenarios for on-site infiltration. Major site limitations that must be taken into account include: 1) high potential for occurrence of seasonal shallow transient, trapped, or perched water, and 2) consistent presence of very low permeability unweathered compacted glacial till deposits beginning between 1.5 to 8.0 feet BPG throughout the site. Based on these limitations and as addressed further below, the site conditions do not appear generally amenable to conventional infiltration design or large-scale use of pervious pavement systems. It is possible that some low amount of infiltration could be gained by use of relatively small, decentralized bio-retention facilities, however these features would also be limited by the likelihood of shallow perched water in the winter season, and therefore may not be feasible for design per applicable standards. The unweathered till soils present at depth are not considered suitable for use in low-permeability pond and berm construction.

5.0 DESIGN RECOMMENDATIONS

5.1 FOUNDATION FEASIBILITY

Two requirements must be fulfilled in design of foundations. First, loads must be less than the ultimate bearing capacity of foundation soils to maintain stability; and secondly, differential settlement must not exceed an amount that will produce adverse behavior of the structure. Allowable settlement is usually exceeded before bearing capacity considerations become important; thus, the allowable bearing pressure is normally controlled by settlement considerations including differential settlement. Excess settlement due to adverse soil conditions may be a result of shallow or deep soils, or a combination of both.

We assume the primary building structure will employ shallow continuous perimeter and spread footings with an interior slab-on-grade floor. Retaining foundation walls may be incorporated for leveling construction such as in hummocky areas of the building locations, or for deeper structural features such as underground concrete vault construction if utilized. MTC assumes foundations and floors will generally be placed with final grades near current site grade. Therefore, shallow conditions of the native soils are relevant to footing and slab-on-grade construction. In our opinion, a continuous perimeter and spread footing foundation and slab-on-grade style of construction appears suitable for use given the site conditions encountered and by following the recommendations in the sections below.

Native glacial till consisting of medium dense to very dense silty sand with gravel encountered at and below likely footing grades throughout the site appear well suited for direct support of the proposed foundations. Cover soils, consisting of native topsoils and organic soils, and sensitive weathered soils of relatively low strength are not suitable to remain below the concentrated loads of foundations. We recommend unsuitable shallow soils be removed from footing areas in accordance with the recommendations below. Typical depth to prescribed bearing strata is anticipated to be between 1.5 to 4.0 feet BPG based on observed soil conditions at exploration locations. Local areas may require marginally greater depths, up to 8.0 feet BPG, to reach unweathered glacial till soils. Non-organic weathered glacial soils of verified suitably firm quality are considered generally suitable to remain below light-load slab-on-grade areas, shallow foundations, and appropriately designed pavement sections, assuming site preparations are completed as recommended herein.

Explorations of this study were limited to test pit excavations and DCP testing, documenting generally dense conditions to a maximum depth of 4.0 to 8.0 feet BPG, terminated due to resistant conditions. Given the anticipated building loads and type of construction, as well as the suitably very dense conditions present to the maximum depth explored, excessive and long term settlement does not appear to be a tangible risk to the proposed development. If concentrated or excessive structural loads are considered, MTC may be contacted to perform additional exploration (Standard Penetration Test) and engineering analysis, for further assessment of deeper soil conditions, at the request of the client. The

following recommendations presented in the remainder of this report pertain to shallow foundation construction and standard earthwork preparations. These recommendations are considered suitable for the proposed project design and are provided based on the results of site investigation to date.

5.2 FOUNDATION RECOMMENDATIONS

MTC recommends excavations for foundation elements be completed down to unweathered glacial till soils, thereby removing all organic-rich soils, unsuitably loose or soft cover soils, and potentially variable weathered deposits from the footing areas. We recommend foundations be placed on unweathered glacial till subgrade, or on approved structural fill soils if required to raise grade. Assuming site preparations are completed as described herein, we recommend the following:

- **Allowable Soil Bearing Capacity:**
  2,500 pounds per square foot (psf) for footings placed on intact unweathered native glacial till soils of suitably dense or hard consistency, or on compacted structural fill placed over these soils per the recommendations presented herein for *Structural Fill Materials and Compaction*.

  If structural fill is placed beneath footings for raising subgrade level or for backfill of overexcavated areas, a minimum 12-inch fill thickness is recommended for use.

  The allowable bearing capacity may be increased by 1/3 for transient loading due to wind and seismic events.

- **Minimum Footing Depth:**
  For a shallow perimeter and spread footing system, all exterior footings shall be embedded a minimum of 18 inches and all interior footings shall be embedded a minimum of 12 inches below the lowest adjacent finished grade, but not less than the depth required by design. However, all footings must penetrate to the prescribed bearing stratum cited above, and no footings should be founded in or above organic or loose/soft soils.

- **Minimum Footing Width:**
  Footings should be proportioned to meet stated bearing capacity and/or IBC current minimum requirements. For a shallow foundation system, continuous strip footings should be at minimum 16 inches wide and interior or isolated column footings at minimum 24 inches wide.

- **Estimated Settlements:**

  We estimate that the maximum settlements will be approximately 1 inch, or less, with a differential settlement of ½ inch, or less, over 50 linear feet. Settlement is anticipated to immediately occur when the load is applied during construction.

- **Lateral Load Resistance:**

  Lateral loads can be resisted by passive pressure against buried portions of the foundation elements and sliding resistance along its base. We recommend an allowable lateral pressure equal to that generated by a fluid with an equivalent fluid weight of 200 pcf EFW. This value assumes footings are backfilled with structural fill and includes a factor of safety of two. The upper 18 inches of soil should be ignored unless the area is paved or covered with concrete, due to soil softening associated with freeze/thaw. If footing elements are planned to be placed directly against intact native soils at a given location, we recommend the allowable lateral pressure be reduced to 150 pcf EFW.

  Sliding resistance between footings and the foundation subgrade may be factored in terms of contribution to lateral resistance. For footings placed directly on native subgrade consisting of unweathered glacial till (silty sand to sandy silt with gravel), a maximum allowable coefficient of friction of 0.35 is recommended. This value may also be used for footings placed over structural fill. This value assumes concrete placed directly on the subgrade or structural fill pad and includes a factor of safety of 1.5.

- **Footing Drains:**

  Due to low permeability very dense subgrade, MTC recommends exterior foundations employ footing drains to help maintain an unsaturated subgrade. Footing drains should employ 4-inch minimum perforated pipe and be backfilled with free-draining material (as specified below for wall drainage) wrapped in filter fabric. Footing drains should be tightlined separately from roof drains to a catch basin system or to a suitable permanent discharge point at least 10 feet from the structure. A schematic illustration of a typical footing drain is shown below.

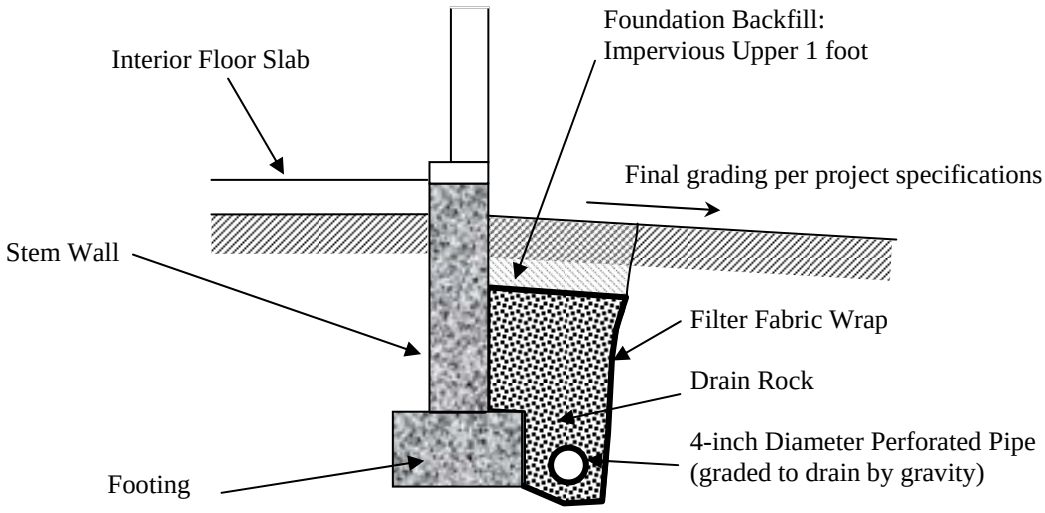


Illustration A. Footing Drain Schematic Profile

5.3 SLAB-ON-GRADE CONSTRUCTION

A slab-on-grade floor is assumed to be incorporated for building interiors. Based on our understanding of the project, interior floors are anticipated to be subject to light live loading from foot traffic and relatively light dead loads. Higher loads are assumed to be accounted for separately, such as for any slabs subject to traffic loading. MTC recommends the following activities and parameters for slab-on-grade design and construction intended to provide reinforcement against shallow soil variations and potential adverse effects of differential settlement. For the purpose of this report, we assume finished slab grade will be similar to or marginally above present grade for the below recommendations. If floor grades are planned to be substantially raised or lowered from existing grade, MTC can be contacted to confirm or provide revised or alternative recommendations based on a greater extent of site preparations.

- **Slab Subgrade Preparations:**
  All unsuitably soft, organic, or shallow yielding soils should be removed from beneath floor slabs. Existing weathered glacial soils of firm quality may be suitable to remain below slab-on-grade interiors and non-structural exterior flatworks, assuming soils are verified as firm and unyielding during construction. Local areas of excessively soft or loose subgrade will require additional overexcavation where encountered during slab preparations.

- **Base Pad:**
  An 18-inch minimum section of structural fill base is recommended to be installed beneath floor slabs to ensure a stable subgrade and adequate slab support over varying shallow conditions. Base pad material may consist of gravel borrow, as recommended herein for general structural fill application, or a similar material of equivalent function as approved by the geotechnical engineer. As noted below, capillary break material can account for the upper portion of the base section if composed of compacted angular material approved as structural fill.

  If final construction plans propose to place some slab-on-grade floors at deeper levels corresponding to unweathered glacial till subgrade, the base pad may be eliminated. In this case, a minimum 6-inch capillary break section is still recommended.

- **Subgrade Modulus:**
  A Subgrade Modulus (k) of 150 pci is recommended for use in design of interior slab-on-grade floors constructed over the prescribed base pad atop shallow weathered glacial soils of suitably firm quality.

  A Subgrade Modulus (k) of 200 pci is allowed for use in design of slabs constructed at greater depth directly over an intact unweathered glacial till subgrade and capillary break material.

- **Proof Roll:**
  Prior to placement of capillary break material and slab construction, the proposed slab subgrade or structural fill pad, if utilized, shall be proof-rolled to confirm no soft or deflecting areas are present. This is to ensure the existing base is evenly prepared and adequate for support of the slab. MTC recommends that we be contacted for observation of the proof roll and final visual confirmation of prepared base suitability. Areas of excessive rutting, pumping, or yielding shall be excavated and backfilled with new structural fill as described herein.

- **Capillary Break:**
  A capillary break is recommended to maintain a dry slab floor and reduce the potential for floor damage resulting from shallow perched water inundation. To provide a capillary moisture break, a 6-inch thick, properly compacted granular mat consisting of open-graded, free-draining angular aggregate is recommended below floor slabs. To provide additional slab structural support, and to substitute for a portion of a structural fill base pad where specified, MTC recommends the capillary break consist of crushed rock all passing the 1-inch sieve and no more than 3 percent (by weight) passing the U.S. No. #4 sieve, compacted in accordance with Section 6.2.2 below.

- **Vapor Barrier:**
  A vapor retarding membrane such as 10-mil polyethylene film should be placed beneath all floor slabs to prevent transmission of moisture through the slabs where floor coverings may be affected. Care should be taken during construction not to puncture or damage the vapor retarding membrane. To protect the membrane, a layer of sand no more than 2 inches thick may be placed over the membrane if desired.

- **Loaded Slabs and Structural Design Considerations:**
  For slabs proposed for loading due to heavier storage or vehicle parking/access, we recommend these slabs be designed for increased rigidity and self-support in order to help counteract the increased risk for differential settlement under higher loading conditions. MTC suggests at least a minimum unreinforced concrete structural section of 6.0 inches be employed, or as specified by the project engineer. It is generally recommended that these slabs be designed to incorporate reinforcing to help span variable soils and eliminate potential cracking.

  In addition, trafficked slabs may call for minimum structural fill sections to be placed to support traffic loads. The prescribed base pad section should be generally suited for lighter traffic loads beneath a structural slab. However, final slab design and specifications for structural fill reinforcement should be assessed by the project engineer based on the known structural or traffic loads available in final design. We recommend that MTC be contacted to review specifications for heavily loaded or trafficked areas if incorporated to the project.

5.4 RETAINING WALL DESIGN

The below recommendations pertain to the design of rigid, laterally loaded above-grade and buried retaining wall structures and foundations if required for the project. Values assume walls are backfilled with approved drainage fill and granular material, as applicable, and retaining a level backslope. The values are not universally applicable to exceedingly sloping backfills, backfills composed of non-granular soils, braced or tied-back walls, or for walls greater than 10 feet in height. MTC expressly recommends that we review final plans and specifications for retaining walls to ensure consistency with the recommendations presented herein, and to provide additional geotechnical consultation and recommendations as needed for final design and construction.

- **Wall Drainage:**
  To preclude build-up of hydrostatic pressure, we recommend a minimum width of 1 foot of clean, granular, free-draining material extend from the footing drain at the base of the wall to the ground surface immediately behind the wall. Native soils are not considered suitable as drainage material due to elevated fines content. Imported wall drain aggregate should conform to WSDOT Standard Specification 9-03.12(4) Gravel Backfill for Drains or 9-03.12(5) Gravel Backfill for Drywells, or equivalent as specified by the designer. A filter fabric suitable for use in soil separation and water transmission is recommended to be placed against the retained soil cut behind the wall to limit migration of fines into the drain corridor.

- **Backfill Soil – Structural Fill:**
  Where structural backfill is called for, soils used for wall backfill should be relatively granular with less than 5 percent fines (material passing the U.S. No. 200 sieve). Native site soils are not suitable for use as wall backfill. Wall backfill is considered Structural Fill, and additionally should conform to WSDOT Standard Specification 9-03.12(2) Gravel Backfill for Walls.

- **Backfill Compaction:**
  To prevent build-up of excess lateral pressures, over-compaction of structural fill behind walls if installed should be avoided. However, a lesser degree of compaction may permit excessive post-construction settlements. In order to limit wall pressures resulting from over-compaction of wall backfill, we recommend that backfill within 5 feet of a wall be compacted by small, hand-operated compaction equipment placed in 6- to 8-inch maximum loose lifts. Compaction efforts should begin along the fill edge closest to the wall and progress away from the structure.

- **Active and At-rest Pressures:**
  Yielding (cantilever) retaining walls should be designed to withstand an appropriate active lateral earth pressure, whereas non-yielding (restrained) walls should be designed to withstand an appropriate at-rest lateral earth pressure. The at-rest case is applicable where retaining wall movement is confined to less than 0.005 H, where H is the wall height. If greater movement is

possible, the active case applies. A wall movement of about 0.02 H will be required to develop full active pressures. These pressures act over the entire back of the wall and vary with the backslope inclination.

For free-draining retaining walls up to 10 feet effective height (with no backslope) and retaining noncohesive native soils or imported granular structural fills, we recommend using the parameters for active and at-rest earth pressures (given as equivalent fluid unit weights) provided in Table 2.

Table 2. Recommended Soil Parameters for Retaining Wall Design.

SOIL TYPE	CONDITION	UNIT WEIGHT (PCF)	ACTIVE PRESSURE*	AT-REST PRESSURE*
Weathered Glacial Soils	Retained	110	45	65
Intact Glacial Till	Retained	130	27	45
Structural Fill	Retained / Backfilled	125	30	50

* Noted in equivalent fluid pressure, based on depth below grade. Units of psf per foot.

5.5 SEISMIC DESIGN PARAMETERS AND LIQUEFACTION POTENTIAL

According to the *Liquefaction Susceptibility Map of Pierce County, Washington* and the accompanying *Seismic Site Class Map* (Palmer et al., 2004), the site location is identified as having a *very low* liquefaction susceptibility. Liquefaction is a phenomenon associated with a subsurface profile of relatively loose, cohesionless soils saturated by groundwater. Under seismic shaking the pore pressure can exceed the soil's shear resistance and the soil 'liquefies', which may result in excessive settlements that are damaging to structures and disruptive to exterior improvements. The Seismic Site Class Map (Palmer et al., 2004) classifies the project area as Site Class C, representing a moderate potential for increased amplitude of ground shaking during a seismic event. Based on the results of site explorations, MTC interprets the site to have a very low risk of liquefaction due to the prevalence of very dense or hard silty sand with gravel glacial till deposits directly below cover soils.

The *USGS Seismic Design Map Tool* was used to determine site-specific seismic design coefficients and spectral response accelerations for the project site assuming design Site Class C, representing a

subsurface profile (upper 100 feet) of generally very dense or hard soil conditions. Parameters in Table 3 were calculated using 2008 USGS hazard data and 2012/2015 International Building Code standards:

Table 3. Seismic Design Parameters – Site Class C

Mapped Acceleration Parameters (MCE horizontal)	S_S	1.247 g
	S_1	0.481 g
Site Coefficient Values	F_a	1.000
	F_v	1.319
Calculated Peak SRA	S_{MS}	1.247 g
	S_{M1}	0.634 g
Design Peak SRA (*2/3 of peak*)	S_{DS}	0.832 g
	S_{D1}	0.423 g
Seismic Design Category – Short Period (0.2 Second) Acceleration		D
Seismic Design Category – 1-Second Period Acceleration		D

5.6 INFILTRATION ANALYSIS & COMMENTARY

MTC was requested to assess general site conditions in terms of design considerations for potential on-site stormwater infiltration feasibility during the course of this Phase 1 geotechnical study. Projects in the feasibility or conceptual design stage are typically anticipated to incorporate on-site infiltration to the extent and use feasible for the existing subsurface conditions. We understand the project will be subject to infiltration design based on the Washington Department of Ecology *Stormwater Management Manual for Western Washington* (DoE SMMWW), 2005 edition.

As noted in Section 4.4, the results of MTC's investigation indicate site soil conditions are generally infeasible for conventional on-site infiltration design. This is due in combination to the likelihood of shallow seasonal perched water presence at the site, and the presence of relatively impermeable consolidated and cemented glacial till throughout the site. Given these overall site limitations, our further characterization for infiltration potential was focused on assessing the possibility for limited use of shallow soils for near-surface design elements such as small bio-retention, rain gardens, and pervious pavement facilities.

During test pit excavations, MTC collected representative samples of soil horizons at various depths and locations from the upper subsurface of the site. Laboratory gradation analyses were completed including sieve and hydrometer tests for rate determination to supplement field observations and classifications. Results of laboratory testing in terms of applicable rate calculations (2005 DoE SMMWW methods) are summarized in Table 4 below.

For preliminary infiltration rate determination MTC performed laboratory gradation analyses via sieve and hydrometer methods on selected representative samples. Results were interpreted to recommended

Long Term Infiltration Rates (LTIRs) per applicable methods of the *Washington Department of Ecology Stormwater Management Manual* (SMMWW, 2005), which is the criteria currently employed by the City of Puyallup for infiltration design. Standard correction factors were applied as noted in the reference documents. Data and LTIRs are summarized in Table 4:

Table 4. Summary of Grain Size Analysis Methods & LTIR

TP #	Depth (BPG)	USCS Class	Fines %	D10 (mm)	ASTM Rate	USDA Textural Classification	USDA Rate	Recommended LTIR (in/hr)
TP-2	**1.5**	SM	44.7	0.017	N/A	Loam	0.13	**0.13**
TP-3	**2.0**	SM	45.2%	0.017	N/A	Loam	0.13	
TP-6	**1.5**	GM	30.4%	0.025	N/A	Loam	0.13	
TP-10	**1.5**	SM	40.1	0.019	N/A	Loam	0.13	
TP-16	**3.0**	N/A	69.9	0.011	N/A	Loam	0.13	

Gradation Results Discussion

Tabulated LTIR values for use in facility design were chosen as corresponding to the most applicable method (ASTM or USDA). Where D10 size is in the coarse range (i.e. greater than passing #200 sieve), the ASTM method may be applied per Table 3.8 and/or Figure 3.28. Where higher fines content is present (exceeding 10%), the USDA method is recommended to be applied. Most grab samples yielded fines content greater than 10 percent and D10 sizes in the fine range. Rates presented above assume a standard level of influent control and long-term maintenance

For application to an initial shallow design scenario, if feasible, we recommend considering a corrected maximum long-term infiltration rate of ***0.13 inches/hour***. This value is generally representative of the consistently poor infiltration characteristics of shallow fine-grained soils commonly observed in test pits. However, a final design application would most likely employ a further reduced rate in order to compensate for the minimal separation to seasonal water conditions and restrictive soils. It is the responsibility of the designer to account for all reductions required. Given that infiltration potential at the site is generally very low, we recommend any infiltration facility proposed for final project design undergo additional targeted investigation to confirm suitability, most likely including PIT methods and winter season exploration for direct assessment and measurement of actual infiltration capacity at the chosen location and depth.

Pervious Pavement Feasibility

MTC considered the feasibility of pervious pavement design for the project site as a potential "Best Management Practice" (BMP). Design and feasibility criteria for pervious pavement systems is covered in the Department of Ecology SMMWW 2005, Volume III, Appendix III-C, 7.1 Permeable Pavements, as well as Department of Ecology SMMWW 2012, Volume V, BMP T5.15 Permeable Pavements. MTC reviewed these resources along with the project findings to date.

It is our present opinion, per these standards and the related assessment criteria, that the site conditions are generally considered infeasible for pervious pavement application for the following primary reasons as listed in BMP 5.15. Based on the above LTIR analysis, soils tested in areas considered for permeable pavements at 1.5 to 3.0 feet BPG display a maximum long-term infiltration rate of 0.13 inches per hour. Infiltration rates derived using the SMMWW 2005 methods do not provide Ksat values, as detailed in the SMMWW 2012 and BMP T5.15. However, our soils analysis indicates consistently low infiltration capabilities throughout most of the site; given potential natural variations, conditions likely exist that have less than the minimum necessary infiltration values required by BMP T5.15. In addition, native soils explored site-wide display indications of seasonal high water levels that may be as shallow as within 1.5 to 2.0 feet of the surface in winter months due to potential perched water development over underlying "hardpan" conditions found prevalently at shallow depths. Depending on final grades for pavement construction, this relatively impermeable shallow hardpan feature could create seasonally saturated conditions within 1 foot of the bottom of the lowest gravel base course of the pervious pavement section, assuming at-grade construction. In general, less separation can be expected where deeper grading is required.

Finally, Site Suitability Criteria (SSC) from Volume III, Section 3.3.7 of the 2012 SMMWW provides conditions that must be attained for suitability of site conditions related to in-situ treatment. SSC-6, pertaining to pervious pavement systems, states that a minimum of 18 or 12 inches of infiltrating treatment soil be present below the pavement gravel section. This may not be the case within portions of the project site which exhibit a shallow restrictive hardpan feature.

Much of the project site does not appear to meet site suitability criteria for pervious pavement considerations. We consider the above to be broadly applicable to shallow subsurface conditions throughout the project site based on the explorations to date. This commentary is not intended to and should not be interpreted to rule out use of pervious pavements for any and all design scenarios for the project, but is provided to clearly communicate the inherent site limitations to support a best selection of most suitable stormwater management elements in the early design process.

5.7 PAVEMENT DESIGN & CONSTRUCTION DISCUSSION

Washington Department of Transportation (WSDOT) Pavement Policy (2015) was used to provide the pavement section recommendations for the proposed public works building parking lot. Based on the overall size of the planned parking lot, we assumed generally low traffic for the parking lot (automobile traffic, parking lots less than 50 stalls). Based on the native soils encountered, MTC recommends that "good soil" (estimated CBR value between 10 and 40, SSV = 5.5) conditions should be assumed for the subgrade soils. Table 4 includes preliminary recommendations for the hot mix asphalt pavement and base course thickness for the new parking lot. This recommendation assumes that the subgrade will be prepared following the recommendations provided in this report and the traffic assumptions are valid.

Table 4: Preliminary Pavement Design Recommendations for Parking Lot

Pavement Layer Type	Minimum Thickness, inches	WSDOT Specifications
Hot Mix Asphalt	4	Section 5.4.4
Base Course (Dense Graded)	6	Section 5.4.4

The main entrance/exit drive will likely experience different traffic volumes than the main drives in the parking lot. As a result, consideration could be given to increasing the pavement section in the main entrance/exit drive. Pavement sections presented in the above table should not be used for areas which experience repeated truck traffic, equipment or truck parking areas, entrances and exit aprons, or contain trash dumpster loading zones. In these areas, a Portland Cement Concrete (PCC) pavement should be used. The PCC layer thickness is recommended to be 8.0 inches with a minimum of 4.0 inch-thick crushed stone base course, but may be modified depending on the final design. The reinforcement details for PCC layers should be designed by the project design engineer as the project conditions dictate.

One of the important considerations in designing a high quality and durable pavement is providing adequate drainage. Drainage design for the proposed pavement section is outside of the scope of MTC for this project. It is important that bird baths (leeching basins) and surface waves are not created during construction of the HMA layer. A proper slope should be allowed and drainage should be provided along the edges of pavements and around catch basins to prevent the accumulation of free water within the base course, which otherwise may result in subgrade softening and pavement deterioration under exposure and repeated traffic conditions.

All pavements require regular maintenance and repair in order to maintain the serviceability of the pavement. These repairs and maintenance are due to normal wear and tear of the pavement surface and are required in order to extend the serviceability life of the pavement. However, after 10 years of

service, a normal pavement structure is likely to deteriorate to a point where pavement rehabilitation may be required to maintain the serviceability. The deterioration is more likely if the pavement is constructed over poor subgrade soils or in area of higher traffic volumes.

These calculated sections should be considered preliminary until verifying the parameters, traffic loading, and assumed grading are applicable to final project design. We recommend pavement sections be reviewed by the civil designer, who may apply an alternative section for final project use based on the conditions reported herein and final design and construction preferences. MTC can be contacted to verify final design criteria, or to consult on alternative pavement sections including geotextile reinforcement or asphalt-treated base (ATB) if considered for use.

6.0 CONSTRUCTION RECOMMENDATIONS

6.1 EARTHWORK

6.1.1 Excavation

Excavations can generally be performed with conventional earthmoving equipment such as bulldozers, scrapers, and excavators. Full-size equipment may be preferable or required for deeper excavations, due to the resistant nature of the glacial till soils.

Where possible, excavations made within about one foot of finished subgrade level should be performed with smooth edged buckets to minimize subgrade disturbance and the potential for softening to the greatest extent practical.

6.1.2 Subgrade Evaluation and Preparation

After excavations have been completed to the planned subgrade elevations, but before placing fill or structural elements, the exposed subgrade soils should be evaluated under the full-time observation and guidance of an MTC representative. Where appropriate, the subgrade should be proof-rolled with a minimum of two passes with a fully loaded dump truck, water truck or scraper. In circumstances where this seems unfeasible, an MTC representative may use alternative methods for subgrade evaluation.

Any loose soil should be compacted to a firm and unyielding condition and at least to 95 percent of the modified Proctor maximum dry density per ASTM D1557. Any areas that are identified as being soft or yielding during subgrade evaluation should be over-excavated to a firm and unyielding condition or to the depth determined by the geotechnical engineer. Where over-excavation is performed below a structure, the over-excavation area should extend beyond the outside of the footing a distance equal to the depth of the over-excavation below the footing. The over-excavated areas should be backfilled with properly compacted structural fill.

6.1.3 Site Preparation, Erosion Control and Wet Weather Construction

The primarily silty native soils among proposed excavation depths are highly moisture sensitive and will become soft and difficult to compact or traverse with construction equipment when wet. During wet weather, the contractor should take measures to protect the exposed subgrades and limit construction traffic during earthwork activities.

Once the geotechnical engineer or their representative has approved a subgrade, further measures should be implemented to prevent degradation or disturbance of the subgrade. These measures could include, but are not limited to, placing a layer of crushed rock or lean concrete on the exposed subgrade, or covering the exposed subgrade with a plastic tarp and keeping construction traffic off the subgrade.

Once subgrade has been approved, any disturbance because the subgrade was not protected should be repaired by the contractor at no cost to the owner.

During wet weather, earthen berms or other methods should be used to prevent runoff from draining into excavations. All runoff should be collected and disposed of properly. Measures may also be required to reduce the moisture content of on-site soils in the event of wet weather. These measures can include, but are not limited to, air-drying and soil amendment, etc.

Since the silty on-site soils will be difficult to work with during periods of wet weather due to elevated soil moisture content, and frozen soil is not suitable for use as structural fill, we recommend that earthwork activities generally take place in late spring, summer or early fall.

Dewatering efforts may be required depending on total excavation depth, season of construction, and weather conditions during earthwork. MTC recommends major earthwork activities take place during the dry season if possible to minimize the potential for seasonal high groundwater levels near proposed excavation depth, and to reduce seepage occurrences from perched water conditions. It should be understood that some amount of water seepage from shallow sources or perched lenses may be unavoidable year-round.

6.2 STRUCTURAL FILL MATERIALS AND COMPACTION

6.2.1 Materials

All material placed below structures or pavement areas should be considered structural fill. Structural fill material shall be free of deleterious material, have a maximum particle size of 4 inches, and be compactable to the required compaction level.

Excavated native cover soils and glacial deposits consisting primarily of silt, sandy silt and silty sand are not considered suitable for re-use as structural fill beneath buildings and pavement areas based on observed high fines content and consistency. Competent, non-organic native soils may be suitable for reuse as grade fill outside of structural areas, depending on project requirements and the season of construction. Native topsoil does not appear to be present to a sufficient degree for large-scale reuse among landscaping areas.

Imported material can be used as structural fill. Imported structural fill material should conform to Section 9-03.14(1), Gravel Borrow, of the most recent edition (at the time of construction) of the State of Washington Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT Standard Specifications)*. During warm, dry weather, it will likely be necessary to add water to fill soils after residing in stockpiles if stored on site. Material properties including moisture content shall meet project specifications for the intended use.

Controlled-density fill (CDF) or lean mix concrete can be used as an alternative to structural fill materials, except in areas where free-draining materials are required or specified.

Frozen soil is not suitable for use as structural fill. Fill material may not be placed on frozen soil.

The contractor should submit samples of each of the required earthwork materials to the geotechnical engineer for evaluation and approval prior to delivery to the site. The samples should be submitted at least 5 days prior to their delivery and sufficiently in advance of the work to allow the contractor to identify alternative sources if the material proves unsatisfactory.

6.2.2 Placement and Compaction

Prior to placement and compaction, structural fill should be moisture conditioned to within 3 percent of its optimum moisture content. Loose lifts of structural fill shall not exceed 8 inches in thickness; thinner lifts will be required for walk-behind or hand operated equipment.

All structural fill shall be compacted to a dense and unyielding condition and to a minimum percent compaction based on its modified Proctor maximum dry density as determined per ASTM D1557. Structural fill placed beneath each of the following shall be compacted to the indicated percent compaction:

Foundation and Floor Slab Subgrades:	95 Percent
Pavement Subgrades (upper 2 feet):	95 Percent
Pavement Subgrades (below 2 feet):	90 Percent
Utility Trenches (upper 4 feet):	95 Percent
Utility Trenches (below 4 feet):	90 Percent

We recommend that fill placed on slopes steeper than 3:1 (H:V) be ‘benched’ in accordance with hillside terraces entry of section 2-03.3(14) of the WSDOT Standard Specifications.

We recommend structural fill placement and compaction be observed on a full-time basis by an MTC representative. A sufficient number of tests shall be performed to verify compaction of each lift. The number of tests required will vary depending on the fill material, its moisture condition and the equipment being used. Initially, more frequent testing will be required while the contractor establishes the means and methods required to achieve proper compaction.

6.3 TEMPORARY EXCAVATIONS AND SLOPES

All excavations and slopes must comply with applicable local, state, and federal safety regulations. Construction site safety is the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing soil type

information solely as a service to our client for planning purposes. Under no circumstances should the information be interpreted to mean that MTC is assuming responsibility for construction site safety or the contractor's activities. Such responsibility is not being implied or inferred.

Temporary excavations in the existing native cover and weathered soils should be inclined no steeper than 1.5H:1V, unless approved by the geotechnical engineer based on observation of actual encountered conditions at the time of construction. Deeper excavations within the intact glacial till may be inclined up to 1H:1V, or possibly greater if suitable conditions are verified within an open excavation during construction. Applying lesser grades may also be necessary depending on actual conditions encountered and the potential presence of water seepage. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed near the top of any excavation. Where stability of adjoining walls or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning may be required to provide structural stability and to protect personnel working within the excavation. Earth retention, bracing, or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Washington.

Temporary excavations and slopes should be protected from weather by covering with plastic sheeting or similar impermeable material. Sheeting sections should overlap at least 12 inches and be tightly secured with sandbags, staking, or other means to prevent wind from exposing soils under the sheeting.

6.4 PERMANENT SLOPES

MTC recommends that new areas of permanent slopes including fill embankments be inclined no greater than 3H:1V. Permanent slopes should be planted with a deep-rooted, rapid-growth vegetative cover as soon as possible after completion of slope construction. Alternatively, the slope should be covered with plastic, straw, etc. until it can be landscaped.

6.5 UTILITY TRENCHES AND EXCAVATIONS

The contractor shall be responsible for safety of personnel working in utility trenches. Given that steep excavations in native soils may be prone to caving, we recommend all utility trenches, but particularly those greater than 4 feet in depth, be supported in accordance with state and federal safety regulations.

Pipe bedding material should conform to the manufacturer's recommendations and be worked around the pipe to provide uniform support. Cobbles or boulders exposed in the bottom of utility excavations should be covered with pipe bedding or removed to avoid inducing concentrated stresses on the pipe.

Trench backfill should be placed and compacted as structural fill as recommended in Section 6.2. Particular care should be taken to insure bedding or fill material is properly compacted to provide adequate support to the pipe. Jetting or flooding is not a substitute for mechanical compaction and should not be allowed.

7.0 ADDITIONAL RECOMMENDED SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction to verify compliance with these recommendations. Testing and observations performed during construction should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork, structural fill, and pavement section placement,
- Consultation on temporary excavation cutslopes and shoring if needed,
- Testing and inspection of any concrete or masonry included in the final construction plans, and
- Geotechnical consultation as may be required prior to and during construction.

We strongly recommend that MTC be retained for the construction of this project to provide these and other services. Our knowledge of the project site and the design recommendations contained herein will be of benefit in the event that difficulties arise and either modifications or additional geotechnical engineering recommendations are required or desired. We can also, in a timely fashion observe the actual soil conditions encountered during construction, evaluate the applicability of the recommendations presented in this report to the soil conditions encountered, and recommend appropriate changes in design or construction procedures if conditions differ from those described herein.

We further recommend that project plans and specifications be reviewed by us to verify compatibility with our conclusions and recommendations.

Also, MTC retains fully accredited, WABO-certified laboratory and inspection personnel, and is available for this project's testing, observation and inspection needs. Information concerning the scope and cost for these services can be obtained from our office.

8.0 LIMITATIONS

Recommendations contained in this report are based on our understanding of the proposed development and construction activities, our field observations and exploration and our laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that vary or differ from those described herein, we should be notified immediately in order that a review may be made and supplemental recommendations provided. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this report, our recommendations should also be reviewed.

We have prepared this report in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty, express or implied, is made. The recommendations provided in this report are based on the assumption that an adequate program of tests and observations will be conducted by MTC during the construction phase in order to evaluate compliance with our recommendations. Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the author of this report, are only mentioned in the given standard; they are not incorporated into it or "included by referenced", as that latter term is used relative to contracts or other matters of law.

This report may be used only by The Puyallup School District and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the report. Note that if another firm assumes Geotechnical Engineer of Record responsibilities they need to review this report and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation under the guidance of a professional engineer registered in the State of Washington. The recommendations of this report are based on the assumption that the Geotechnical Engineer of Record has reviewed and agrees with the findings, conclusion and recommendations of this report.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Based on the intended use of the report, MTC may recommend that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Puyallup School District or anyone else will release MTC from any liability resulting from the use of this report by any unauthorized party and the Puyallup School District agrees to defend, indemnify, and hold harmless MTC from any claim or liability associated with such unauthorized use or non-compliance. We recommend that MTC be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

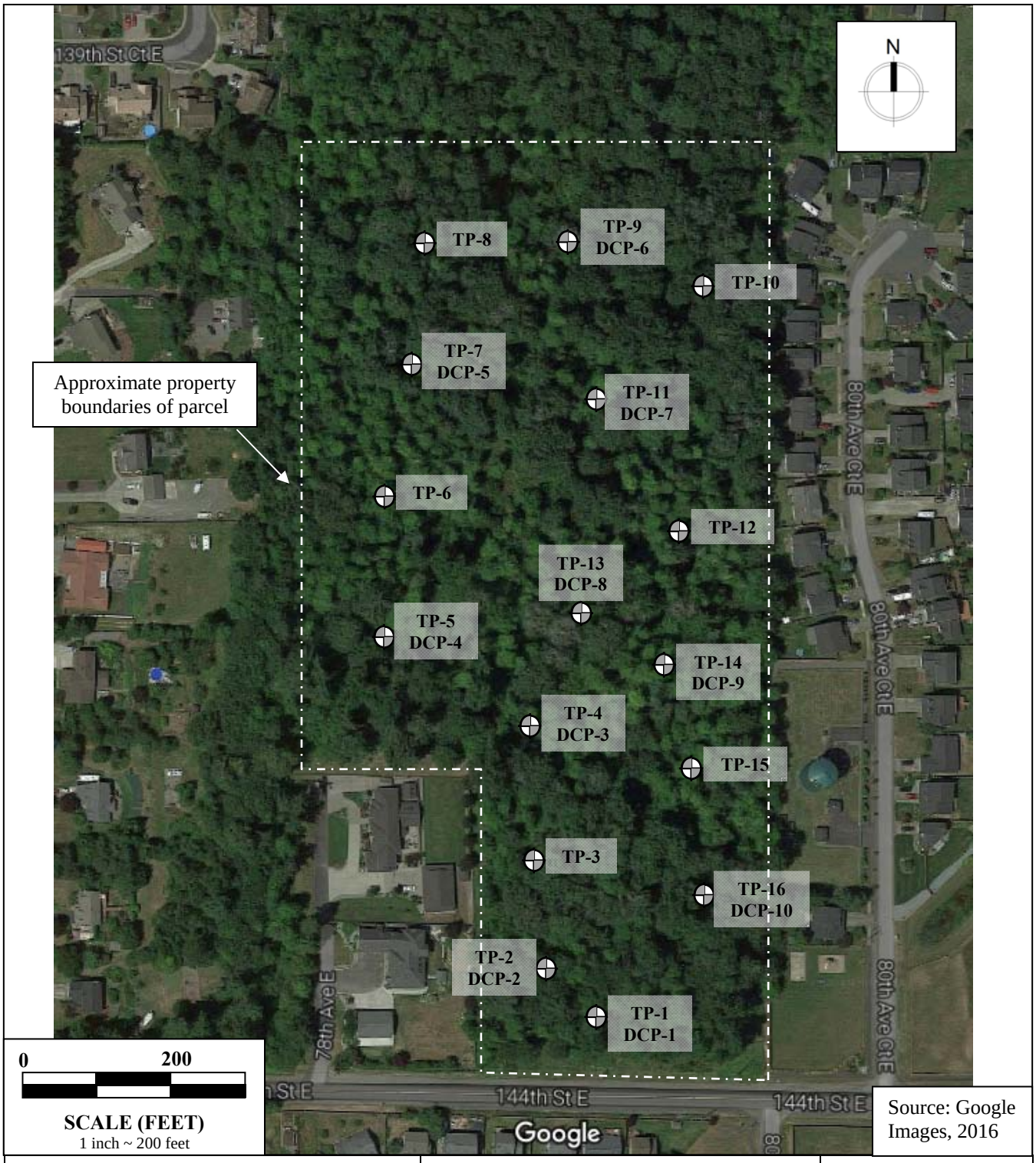
The scope of work for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

Appendix A. SITE LOCATION AND VICINITY

Source: Google Images, 2016

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Regional & Site Vicinity** New SW Elementary PSD Parcel # 0419174028 Puyallup, WA	**FIGURE** **1**

Appendix B. EXPLORATION LOCATION



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Aerial Photo of Existing Conditions** New SW Elementary PSD Parcel # 0419174028 Puyallup, WA	**FIGURE** **2**

Appendix C. EXPLORATION LOGS

Grab soil samples were collected from each exploration location by our field geologist during borehole advancement and test pit excavation. Soil samples collected during the field exploration were classified in accordance with ASTM D2487. All samples were placed in plastic bags to limit moisture loss, labeled, and returned to our laboratory for further examination and testing.

Exploration logs from test pits are shown in full in this Appendix. The explorations were monitored by our field geologist who examined and classified the materials encountered in accordance with the Unified Soil Classification System (USCS), obtained representative soil samples, and recorded pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence. Upon completion, test pits were backfilled with native soil tailings.

The stratification lines shown on the individual logs represent the approximate boundaries between soil types; actual transitions may be either more gradual or more severe. The conditions depicted are for the date and location indicated only, and it should not necessarily be expected that they are representative of conditions at other locations and times.

Penetrometer results from Wildcat DCP and Kessler DCP testing are also shown below. During wildcat penetrometer advancement, blow counts were recorded in 10 centimeter increments as a thirty-five-pound weight was dropped a distance of 15 inches. Blow counts were then converted to resistance (kg/cm^2), standard penetration blow counts (N-values), and corresponding soil consistency, as displayed on the logs.

Kessler Dynamic Cone Penetrometer (DCP) tests were conducted using KSE K-100 MD model Kessler DCP equipment to provide general soil strength data and CBR correlation for use in pavement design analysis. The KDCP is designed to generate a profile of correlative California Bearing Ratio versus depth and is operated by recording the number of blows required to advance a 0.8-inch diameter round tip probe for each successive 2-inch increment under the force of a free-falling hammer weighing 17.6 pounds and dropping 22.6 inches. The results of each KDCP test are presented in this Appendix. Accompanying blow count results is a graph of corresponding CBR values displayed by depth.

Unified Soil Classification System Chart

Major Divisions			Graph	USCS	Typical Description
Coarse Grained Soils More Than 50% Retained On No. 200 Sieve	**Gravel** More Than 50% of Coarse Fraction Retained On No. 4 Sieve	Clean Gravels		GW	Well-graded Gravels, Gravel-Sand Mixtures
				GP	Poorly-Graded Gravels, Gravel-Sand Mixtures
		Gravels With Fines		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
	Sand More Than 50% of Coarse Fraction Passing No. 4 Sieve	Clean Sands		SW	Well-graded Sands, Gravelly Sands
				SP	Poorly-Graded Sands, Gravelly Sands
		Sands With Fines		SM	Silty Sands, Sand-Silt Mixtures
				SC	Clayey Sands, Clay Mixtures
Fine Grained Soils More Than 50% Passing The No. 200 Sieve	**Silts & Clays**	Liquid Limit Less Than 50		ML	Inorganic Silts, rock Flour, Clayey Silts With Low Plasticity
				CL	Inorganic Clays of Low To Medium Plasticity
				OL	Organic Silts and Organic Silty Clays of Low Plasticity
	Silts & Clays	Liquid Limit Greater Than 50		MH	Inorganic Silts of Moderate Plasticity
				CH	Inorganic Clays of High Plasticity
				OH	Organic Clays And Silts of Medium to High Plasticity
Highly Organic Soils				PT	Peat, Humus, Soils with Predominantly Organic Content

Sampler Symbol Description

- Standard Penetration Test (SPT)
- Shelby Tube
- Grab or Bulk
- California (3.0" O.D.)
- Modified California (2.5" O.D.)

Stratigraphic Contact

- Distinct Stratigraphic Contact Between Soil Strata
- Gradual Change Between Soil Strata
- Approximate location of stratagraphic change

- Groundwater observed at time of exploration
- Measured groundwater level in exploration, well, or piezometer
- Perched water observed at time of exploration

Modifiers

Description	%
Trace	>5
Some	5-12
With	>12

Soil Consistency

Granular Soils		Fine-grained Soils	
Density	***SPT Blowcount***	***Consistency***	***SPT Blowcount***
Very Loose	0-4	Very Soft	0-2
Loose	4-10	Soft	2-4
Medium Dense	10-30	Firm	4-8
Dense	30-50	Stiff	8-15
Very Dense	> 50	Very Stiff	15-30
		Hard	> 30

Grain Size

DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		> 12"	> 12"	Larger than a basketball
Cobbles		3 - 12"	3 - 12"	Fist to basketball
Gravel	Coarse	3/4 - 3"	3/4 - 3"	Thumb to fist
	Fine	#4 - 3/4"	0.19 - 0.75"	Pea to thumb
Sand	Coarse	#10 - #4	0.079 - 0.19"	Rock salt to pea
	Medium	#40 - #10	0.017 - 0.079"	Sugar to rock salt
	Fine	#200 - #40	0.0029 - 0.017"	Flour to Sugar
Fines		Passing #200	< 0.0029"	Flour and smaller

Materials Testing & Consulting, Inc. 777 Chrysler Drive Burlington, WA 98233	**Exploration Log Key** New SW Elementary PSD Parcel # 0419174028 Puyallup, WA	**FIGURE** **3**

Materials Testing & Consulting, Inc.

Geotechnical Engineering

Log of Test Pit TP-1

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.126016, -122.323800
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 2.0 inches in diameter, roots, loose to medium dense, dry. BROWN. (Weathered Glacial Till)				
2	SM		SILTY SAND WITH GRAVEL, cobbles up to 4.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY with mottling from 1.5 to 2.0 feet. (Glacial Till)				
8			Total Depth = 8 feet Test Pit Terminated on hard digging No Groundwater Encountered				

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Log of Test Pit TP-2

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.126255, -122.324043
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND, minor gravel up to 3.0 inches in diameter, roots up to 2.0 inches in diameter, loose to medium dense, dry. BROWN. (Weathered Glacial Till)	X		44.7	13.1
2							
3							
4							
5	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY with mottling from 5.0 to 5.5 feet. (Glacial Till)				
6							
7							
8			Total Depth = 8 feet Test Pit Terminated on hard digging No Groundwater Encountered				
9							
10							
11							

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Log of Test Pit TP-3

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.126688, -122.324103
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND, tace gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN. (Weathered Glacial Till)	X		45.2	8.4
2							
3	SM		SILTY SAND WITH GRAVEL, gravel up to 4.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY. (Glacial Till)				
4							
5							
6			Total Depth = 6 feet Test Pit Terminated on hard digging No Groundwater Encountered				
7							
8							
9							
10							
11							

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Geotechnical Engineering

Log of Test Pit TP-4

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127203, -122.324111
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. BROWN with mottling from 2.5 to 3.5 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY. (Glacial Till)				
5			Total Depth = 5 feet Test Pit Terminated on hard digging No Groundwater Encountered				
6							
7							
8							
9							
10							
11							

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Log of Test Pit TP-5

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127516, -122.324937
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SP-SM		SAND WITH SILT AND GRAVEL, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 2.0 to 3.0 feet. (Weathered Glacial Till)				
2							
3						7.9	12.2
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY. (Glacial Till)				
5						24.2	9.8
6							
7							
8			Total Depth = 8 feet Test Pit Terminated on hard digging No Groundwater Encountered				
9							
10							
11							

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Log of Test Pit TP-6

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128031, -122.324943
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 2.0 to 3.0 feet. (Weathered Glacial Till)	X		30.4	5.6
2							
3	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, dry. Weakly to moderately cemented. GRAY. (Glacial Till)				
4							
5			Total Depth = 5 feet Test Pit Terminated on hard digging No Groundwater Encountered				
6							
7							
8							
9							
10							
11							

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Log of Test Pit TP-7

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128523, -122.324753
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 3.0 to 4.0 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
5							
6							
7			Total Depth = 7 feet Test Pit Terminated on hard digging No Groundwater Encountered				
8							
9							
10							
11							

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Log of Test Pit TP-8

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128986, -122.324698
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 2.5 to 3.5 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
5			Total Depth = 5 feet Test Pit Terminated on hard digging No Groundwater Encountered				
6							
7							
8							
9							
10							
11							

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Log of Test Pit TP-9

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128972, -122.323900
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 2.0 to 3.5 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
5							
6							
7							
8			Total Depth = 8 feet Test Pit Terminated on hard digging No Groundwater Encountered				
9							
10							
11							

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Log of Test Pit TP-10

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128840, -122.323178
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND, minor gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN-GRAY with mottling from 1.0 to 2.5 feet. (Weathered Glacial Till)	X		40.1	24.8
2							
3	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
4							
5			Total Depth = 5 feet Test Pit Terminated on hard digging No Groundwater Encountered				
6							
7							
8							
9							
10							
11							

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Log of Test Pit TP-11

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.128395, -122.323757
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL with SAND, gravel up to 3.0 inches in diameter, roots to 2.0 feet, loose to medium dense, dry. TAN-GRAY with mottling from 3.0 to 4.0 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
5							
6							
7			Total Depth = 7 feet Test Pit Terminated on hard digging No Groundwater Encountered				
8							
9							
10							
11							

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Log of Test Pit TP-12

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127925, -122.323328
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND WITH GRAVEL, gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN. (Weathered Glacial Till)				
2				X		24.6	7.2
3	GM		SILTY GRAVEL WITH SAND, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
4							
5							
6				X		32.1	7.9
7			Total Depth = 7 feet Test Pit Terminated on hard digging No Groundwater Encountered				
8							
9							
10							
11							

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Log of Test Pit TP-13

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127608, -122.323915
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	GM		SILTY GRAVEL WITH SAND, gravel up to 3.0 inches in diameter, roots to 2.0 feet, loose to medium dense, dry. TAN. (Weathered Glacial Till)				
2							
3	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
4							
5							
6				X		40.8	13.3
7			Total Depth = 7 feet Test Pit Terminated on hard digging No Groundwater Encountered				
8							
9							
10							
11							

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Log of Test Pit TP-14

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127367, -122.323372
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND, minor gravel up to 1.0 inches in diameter, roots to 2.0 feet, loose to dense, dry. GRAY, with mottling from 3.0 to 5.0 feet. (Weathered Glacial Till)				
2							
3							
4				X		48.4	13.9
5				X			
6							
7							
8	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
9							
10			Total Depth = 10 feet Test Pit Terminated on hard digging No Groundwater Encountered				
11							

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Log of Test Pit TP-15

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.127028, -122.323243
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SILTY SAND, trace gravel up to 3.0 inches in diameter, roots, loose to medium dense, dry. TAN, with mottling from 3.0 to 3.5 feet. (Weathered Glacial Till)				
2							
3							
4	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
5							
6			Total Depth = 6 feet Test Pit Terminated on hard digging No Groundwater Encountered				
7							
8							
9							
10							
11							

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Log of Test Pit TP-16

New Southwest Elementary
Parcel #0419174028
Puyallup, WA
Geotechnical Investigation

MTC Project #16S134

Date Started : 9/15/16
Date Completed : 9/15/16
Sampling Method : Grab Samples
Location : Approximately 47.126480, -122.323184
Logged By : LM

Depth in Feet	USCS	GRAPHIC	DESCRIPTION	Samples	Water Level	% Finer than #200	% Moisture
0	OL		TOP SOIL, organic rich mat with plant debris and roots, silt, sand, and gravel, loose, dry. DARK BROWN				
1	SM		SANDY SILT, roots to 1.0 feet, loose to dense, dry. TAN, with mottling from 3.0 to 7.0 feet. (Weathered Glacial Till)	X		69.9	22.6
2							
3							
4							
5							
6							
7	SM		SILTY SAND WITH GRAVEL, gravel up to 6.0 inches, dense to very dense, damp. Weakly to moderately cemented. GRAY. (Glacial Till)				
8			Total Depth = 8 feet Test Pit Terminated on hard digging No Groundwater Encountered				
9							
10							
11							

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-1
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-1

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	0	0.0		0	VERY LOOSE	VERY SOFT
-	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
- 1 ft	28	124.3	••••••••••••••••••••••••••••••••••	-	DENSE	HARD
-	50	222.0	••	-	VERY DENSE	HARD
-						
- 2 ft						
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Page 1 of 1

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-2
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-2

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	3	13.3	•••	3	VERY LOOSE	SOFT
- 1 ft	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	40	177.6	•••	-	DENSE	HARD
- 2 ft	50	222.0	•••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-3
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-4

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
- 1 ft	9	40.0	••••••••••	11	MEDIUM DENSE	STIFF
-	10	44.4	••••••••••	12	MEDIUM DENSE	STIFF
-	20	88.8	••••••••••••••••••••••••	25	MEDIUM DENSE	VERY STIFF
- 2 ft	50	222.0	••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-4
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-5

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	10	44.4	••••••••••••	12	MEDIUM DENSE	STIFF
-	19	84.4	••••••••••••••••••••••••	24	MEDIUM DENSE	VERY STIFF
-	40	177.6	•••	-	DENSE	HARD
- 2 ft	50	222.0	•••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
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- 8 ft						
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-						
- 9 ft						
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-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

WILDCAT.XLS

WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-5
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-7

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	2	8.9	••	2	VERY LOOSE	SOFT
- 1 ft	3	13.3	•••	3	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	26	115.4	••••••••••••••••••••••••••••••	-	DENSE	HARD
- 2 ft	45	199.8	••	-	VERY DENSE	HARD
-	50	222.0	••	-	VERY DENSE	HARD
-						
- 3 ft						
- 1 m						
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- 4 ft						
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- 5 ft						
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- 6 ft						
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- 2 m						
- 7 ft						
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- 8 ft						
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- 9 ft						
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- 3 m 10 ft						
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- 11 ft						
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- 12 ft						
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-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-6
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-9

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 ft	13	57.7	••••••••••••••••	16	MEDIUM DENSE	VERY STIFF
-	21	93.2	••••••••••••••••••••••••••	-	MEDIUM DENSE	VERY STIFF
-	30	133.2	••••••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 2 ft	50	222.0	••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
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- 4 ft						
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- 5 ft						
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- 6 ft						
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- 2 m						
- 7 ft						
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- 8 ft						
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- 9 ft						
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- 3 m 10 ft						
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- 11 ft						
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- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Page 1 of 1

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-7
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-11

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm²	0 50 100 150	N'	SAND & SILT	CLAY
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
- 1 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	16	71.0	••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
- 2 ft	50	222.0	••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
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-						
- 5 ft						
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- 6 ft						
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- 2 m						
- 7 ft						
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- 8 ft						
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- 9 ft						
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-						
- 3 m 10 ft						
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-						
- 11 ft						
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-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-8
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-13

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
-	3	13.3	•••	3	VERY LOOSE	SOFT
-	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 ft	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
-	1	4.4	•	1	VERY LOOSE	VERY SOFT
-	7	31.1	•••••••••	8	LOOSE	MEDIUM STIFF
- 2 ft	40	177.6	••	-	DENSE	HARD
-	45	199.8	••	-	VERY DENSE	HARD
-	29	128.8	••••••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 3 ft	29	128.8	••••••••••••••••••••••••••••••••••••	-	DENSE	HARD
- 1 m	29	128.8	••••••••••••••••••••••••••••••••••••	-	DENSE	HARD
-	50	193.0	••	-	VERY DENSE	HARD
- 4 ft						
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
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-						
- 8 ft						
-						
-						
- 9 ft						
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-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-9
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-14

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	TESTED CONSISTENCY CLAY
-	2	8.9	••	2	VERY LOOSE	SOFT
-	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
- 1 ft	8	35.5	••••••••••	10	LOOSE	STIFF
-	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
-	11	48.8	••••••••••••••	13	MEDIUM DENSE	STIFF
- 2 ft	50	222.0	••	-	VERY DENSE	HARD
-						
-						
- 3 ft						
- 1 m						
-						
- 4 ft						
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- 5 ft						
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- 6 ft						
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- 2 m						
- 7 ft						
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- 8 ft						
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- 9 ft						
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- 3 m 10 ft						
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- 11 ft						
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- 12 ft						
-						
-						
- 4 m 13 ft						

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WILDCAT DYNAMIC CONE LOG

Materials Testing and Consulting
2118 Black Lake Blvd., NW
Olympia, WA 98512

PROJECT NUMBER: 16S134
DATE STARTED: 09-15-2016
DATE COMPLETED: 09-15-2016

HOLE #: DCP-10
CREW: CL
PROJECT: New Southwest Elementary School
ADDRESS: Parcel # 041917-4-028, Puyallup, Washington
LOCATION: Adjacent to TP-16

SURFACE ELEVATION: Existing Grade
WATER ON COMPLETION: None Encountered
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY SAND & SILT	CLAY
	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
1 ft	2	8.9	••	2	VERY LOOSE	SOFT
	3	13.3	•••	3	VERY LOOSE	SOFT
	8	35.5	••••••••••	10	LOOSE	STIFF
2 ft	16	71.0	••••••••••••••••••••	20	MEDIUM DENSE	VERY STIFF
	30	133.2	••••••••••••••••••••••••••••••••••••••	-	DENSE	HARD
	50	222.0	••	-	VERY DENSE	HARD
3 ft						
1 m						
4 ft						
5 ft						
6 ft						
2 m						
7 ft						
8 ft						
9 ft						
3 m 10 ft						
11 ft						
12 ft						
4 m 13 ft						

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Appendix D. LABORATORY RESULTS

Laboratory tests were conducted on several representative soil samples to better identify the soil classification of the units encountered and to evaluate the material's general physical properties and engineering characteristics. A brief description of the tests performed for this study is provided below. The results of laboratory tests performed on specific samples are provided at the appropriate sample depths on the individual boring logs. However, it is important to note that these test results may not accurately represent in situ soil conditions. All of our recommendations are based on our interpretation of these test results and their use in guiding our engineering judgment. MTC cannot be responsible for the interpretation of these data by others.

Soil samples for this project will be retained for a period of 30 days following completion of this report, unless we are otherwise directed in writing.

SOIL CLASSIFICATION

Soil samples were visually examined in the field by our geologist at the time they were obtained. They were subsequently packaged and returned to our laboratory where they were reexamined and the original description checked and verified or modified. With the help of information obtained from the other classification tests, described below, the samples were described in general accordance with ASTM Standard D2487. The resulting descriptions are provided at the appropriate locations on the individual exploration logs, located in Appendix C, and are qualitative only.

GRAIN-SIZE DISTRIBUTION & PLASTICITY INDEX

Grain-size distribution analyses were conducted in general accordance with ASTM Standard D422 on representative soil samples to determine the grain-size distribution of the on-site soil. In addition, soil liquid and plastic limits and plasticity index were determined with ASTM Standard D4318 on representative fine-grained samples. The information gained from these analyses allows us to provide a description and classification of the in-place materials. In turn, this information helps us to understand engineering properties of the soil and thus how the in-place materials will react to conditions such as heavy seepage, traffic action, loading, potential liquefaction, and so forth. The results are presented in this Appendix.

NATURAL MOISTURE CONTENT

Moisture content tests were performed in general accordance with ASTM Standard D2216 on representative soil samples to approximately ascertain the in-place moisture content of soil samples at the times they were collected. The information obtained assists us by providing qualitative information regarding soil compactability. The results are presented in this Appendix.

Hydrometer Report

Project:	New Southwest Elementary School	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client :	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP-2 @ 1.5'	**Tested By:**	FP/JE
Sample#:	S16-675		

ASTM D 2487 Soils Classification
SM, Silty Sand
Sample Color
Brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr :	2.60	
Sample Weight:	100.91	grams
Hydroscopic Moist.:	4.58%	
Adj. Sample Wgt :	96.49	grams

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	44	39.7%	0.0296 mm
5	40	36.1%	0.0193 mm
15	35	31.6%	0.0117 mm
30	22	19.8%	0.0090 mm
60	18	16.2%	0.0065 mm
250	13	11.7%	0.0033 mm
1440	7	6.3%	0.0014 mm

% Gravel:	9.5%	**Liquid Limit:**	n/a
% Sand:	45.8%	**Plastic Limit:**	n/a
% Silt:	30.6%	**Plasticity Index:**	n/a
% Clay:	14.1%		

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	100%	31.500 mm
1.0"	100%	25.000 mm
3/4"	100%	19.000 mm
5/8"	98%	16.000 mm
1/2"	96%	12.500 mm
3/8"	94%	9.500 mm
1/4"	93%	6.300 mm
#4	91%	4.750 mm
#10	86%	2.000 mm
#20	82%	0.850 mm
#40	75%	0.425 mm
#100	53%	0.150 mm
#200	44.7%	0.075 mm
Silts	44.6%	0.074 mm
	41.9%	0.050 mm
	36.3%	0.020 mm
Clays	14.1%	0.005 mm
	8.0%	0.002 mm
Colloids	4.4%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
#NAME?

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-2 @ 1.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **4**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-2 @ 1.5'
Sample#: S16-675

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
Brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

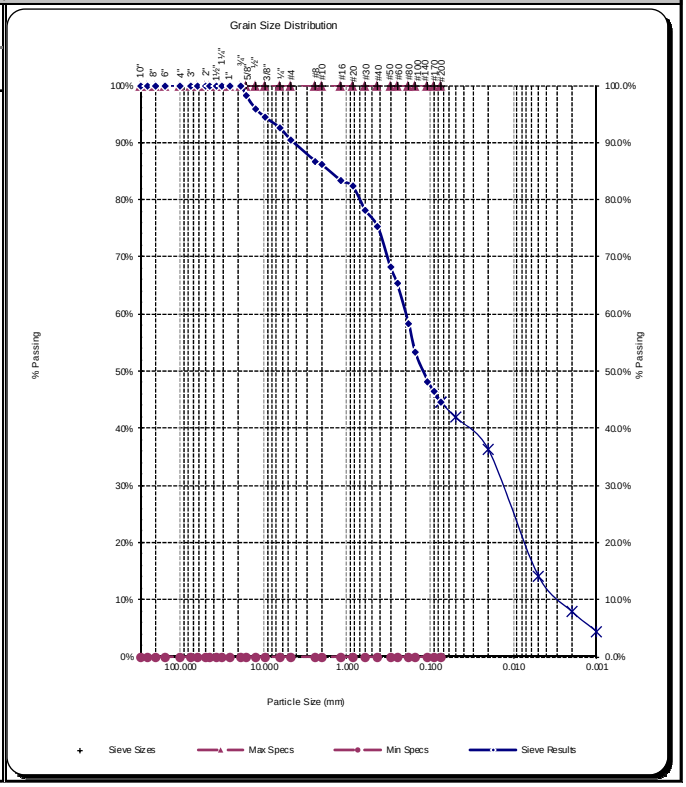
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.008 mm	% Gravel =	9.5%	Coeff. of Curvature, C_C =	0.76
$D_{(10)}$ =	0.017 mm	% Sand =	45.8%	Coeff. of Uniformity, C_U =	11.77
$D_{(15)}$ =	0.025 mm	% Silt & Clay =	44.7%	Fineness Modulus =	1.45
$D_{(30)}$ =	0.050 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.122 mm	Plasticity Index =	n/a	Moisture %, as sampled =	13.1%
$D_{(60)}$ =	0.198 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	4.424 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	19/32	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00	98%	98%	100.0%	0.0%
1/2"	12.50	96%	96%	100.0%	0.0%
3/8"	9.50	94%	94%	100.0%	0.0%
1/4"	6.30	93%	93%	100.0%	0.0%
#4	4.75	91%	91%	100.0%	0.0%
#8	2.36		87%	100.0%	0.0%
#10	2.00	86%	86%	100.0%	0.0%
#16	1.18		83%	100.0%	0.0%
#20	0.850	82%	82%	100.0%	0.0%
#30	0.600		78%	100.0%	0.0%
#40	0.425	75%	75%	100.0%	0.0%
#50	0.300		68%	100.0%	0.0%
#60	0.250	65%	65%	100.0%	0.0%
#80	0.180	58%	58%	100.0%	0.0%
#100	0.150	53%	53%	100.0%	0.0%
#140	0.106		48%	100.0%	0.0%
#170	0.090		46%	100.0%	0.0%
#200	0.075	44.7%	44.7%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-2 @ 1.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **5**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-3 @ 2.0'
Sample#: S16-627

Date Received: 5-Oct-16
Sampled By: LM
Date Tested: 6-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
Gray

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

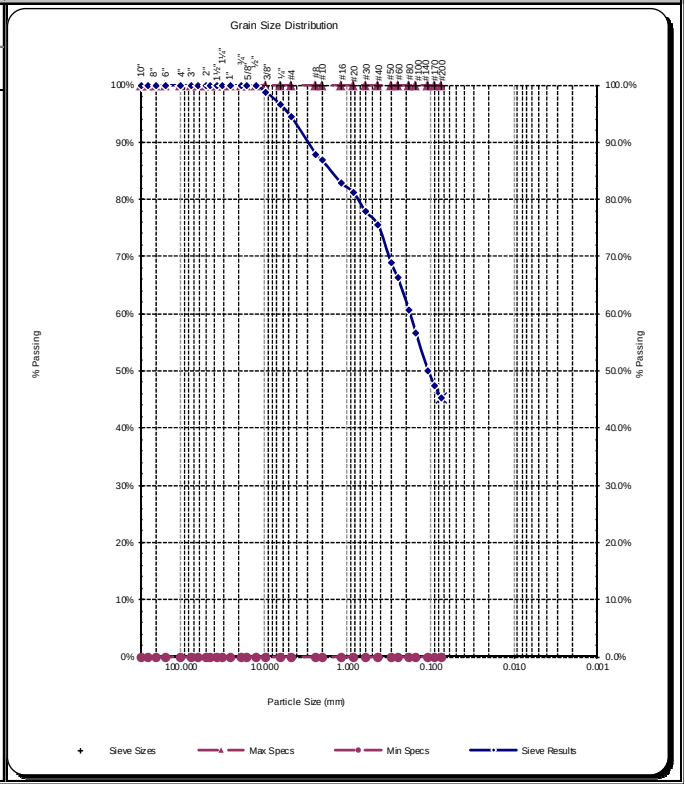
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.008	mm	% Gravel =	5.5%	Coeff. of Curvature, C_C = 0.85
$D_{(10)}$ =	0.017	mm	% Sand =	49.3%	Coeff. of Uniformity, C_U = 10.61
$D_{(15)}$ =	0.025	mm	% Silt & Clay =	45.2%	Fineness Modulus = 1.33
$D_{(30)}$ =	0.050	mm	Liquid Limit =	n/a	Plastic Limit = n/a
$D_{(50)}$ =	0.106	mm	Plasticity Index =	n/a	Moisture %, as sampled = 8.4%
$D_{(60)}$ =	0.176	mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =
$D_{(90)}$ =	3.138	mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =
Dust Ratio =	3/5		Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50	100%	100%	100.0%	0.0%
3/8"	9.50	99%	99%	100.0%	0.0%
1/4"	6.30	97%	97%	100.0%	0.0%
#4	4.75	95%	95%	100.0%	0.0%
#8	2.36		88%	100.0%	0.0%
#10	2.00	87%	87%	100.0%	0.0%
#16	1.18		83%	100.0%	0.0%
#20	0.850	81%	81%	100.0%	0.0%
#30	0.600		78%	100.0%	0.0%
#40	0.425	75%	75%	100.0%	0.0%
#50	0.300		69%	100.0%	0.0%
#60	0.250	66%	66%	100.0%	0.0%
#80	0.180	61%	61%	100.0%	0.0%
#100	0.150	57%	57%	100.0%	0.0%
#140	0.106		50%	100.0%	0.0%
#170	0.090		48%	100.0%	0.0%
#200	0.075	45.2%	45.2%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-3 @ 2.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **6**

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project:	New Southwest Elementary Sc	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client:	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP=5 @ 2.5'	**Tested By:**	FP/JE
Sample #:	S16-676		

Unified Soils Classification System, ASTM D-2487
SP-SM, Poorly graded Sand with Silt and Gravel
Sample Color
GRAY

Liquid Limit Determination

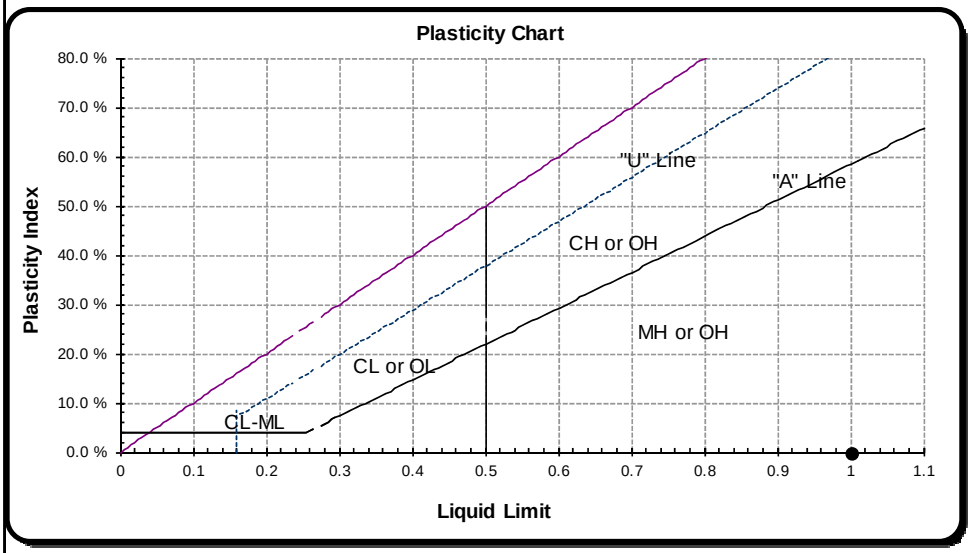
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						
Number of Blows:						

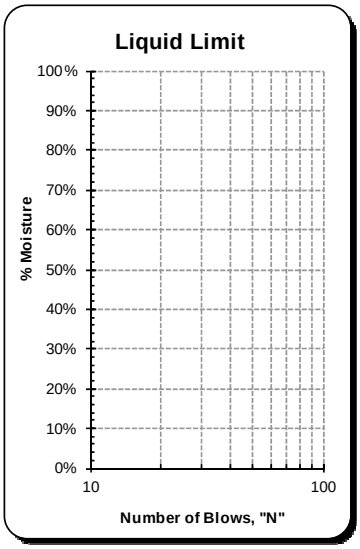
Liquid Limit @ 25 Blows: N/A
Plastic Limit: N/A
Plasticity Index, I_P: N/A

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04





Comments: Material is NON-PLASTIC

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-5 @ 2.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **7**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP=5 @ 2.5'
Sample#: S16-676

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SP-SM, Poorly graded Sand with Silt and Gravel
Sample Color:
GRAY

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

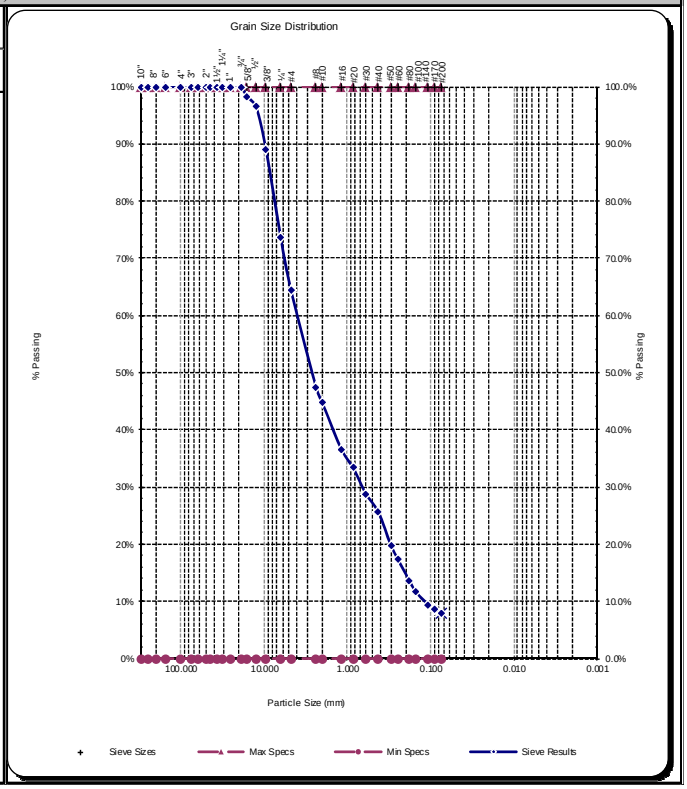
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.048 mm	% Gravel =	35.6%	Coeff. of Curvature, C_C =	0.91
$D_{(10)}$ =	0.118 mm	% Sand =	56.6%	Coeff. of Uniformity, C_U =	35.09
$D_{(15)}$ =	0.205 mm	% Silt & Clay =	7.9%	Fineness Modulus =	4.02
$D_{(30)}$ =	0.666 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	2.737 mm	Plasticity Index =	n/a	Moisture %, as sampled =	12.2%
$D_{(60)}$ =	4.134 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	9.871 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	19/62	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00	98%	98%	100.0%	0.0%
1/2"	12.50	96%	96%	100.0%	0.0%
3/8"	9.50	89%	89%	100.0%	0.0%
1/4"	6.30	74%	74%	100.0%	0.0%
#4	4.75	64%	64%	100.0%	0.0%
#8	2.36		47%	100.0%	0.0%
#10	2.00	45%	45%	100.0%	0.0%
#16	1.18		37%	100.0%	0.0%
#20	0.850	33%	33%	100.0%	0.0%
#30	0.600		29%	100.0%	0.0%
#40	0.425	26%	26%	100.0%	0.0%
#50	0.300		20%	100.0%	0.0%
#60	0.250	17%	17%	100.0%	0.0%
#80	0.180	14%	14%	100.0%	0.0%
#100	0.150	12%	12%	100.0%	0.0%
#140	0.106		9%	100.0%	0.0%
#170	0.090		9%	100.0%	0.0%
#200	0.075	7.9%	7.9%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-5 @ 2.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **8**

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project:	New Southwest Elementary Sc	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client:	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP=5 @ 5.0'	**Tested By:**	FP/JE
Sample #:	S16-677		

Unified Soils Classification System, ASTM D-2487
SM, Silty Sand
Sample Color
GRAY

Liquid Limit Determination

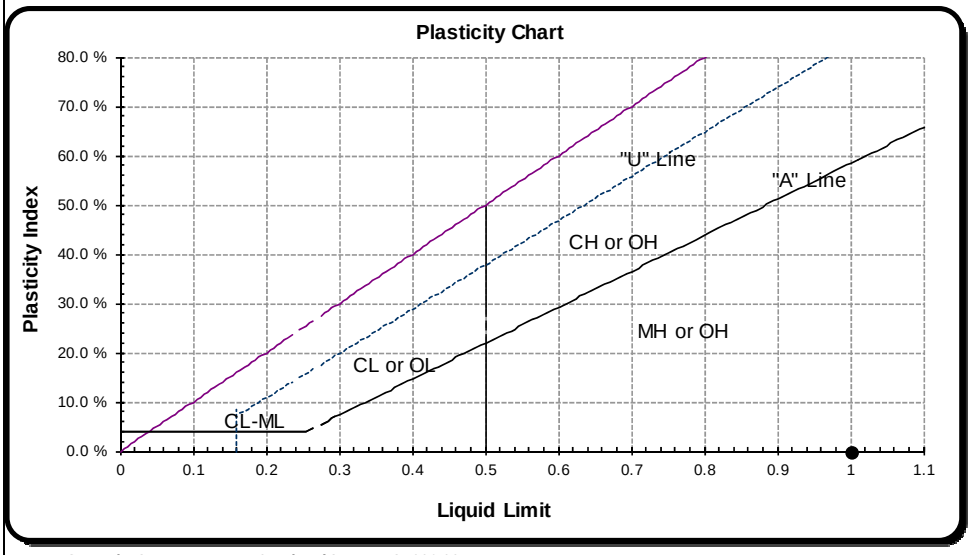
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						
Number of Blows:						

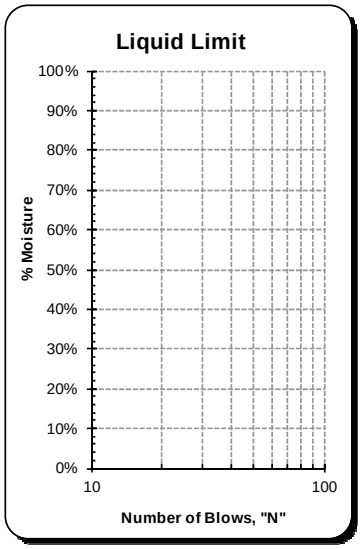
Liquid Limit @ 25 Blows: N/A
Plastic Limit: N/A
Plasticity Index, I_P: N/A

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:						
Weight of Dry Soils + Pan:						
Weight of Pan:						
Weight of Dry Soils:						
Weight of Moisture:						
% Moisture:						

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04





Comments: Material is NON-PLASTIC

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-5 @ 5.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **9**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP=5 @ 5.0'
Sample#: S16-677

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
GRAY

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

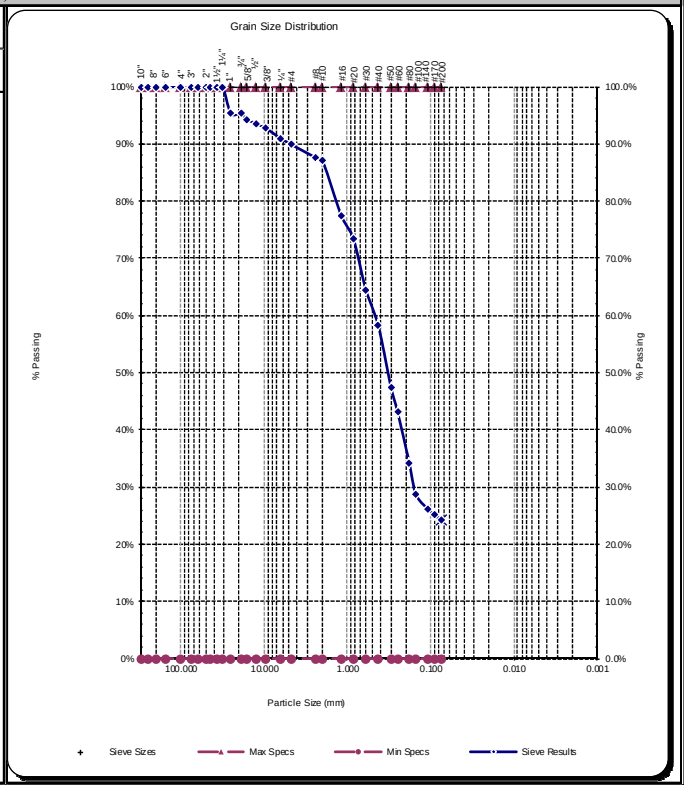
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.016 mm	% Gravel =	10.1%	Coeff. of Curvature, C_C =	1.68
$D_{(10)}$ =	0.031 mm	% Sand =	65.7%	Coeff. of Uniformity, C_U =	15.29
$D_{(15)}$ =	0.047 mm	% Silt & Clay =	24.2%	Fineness Modulus =	2.16
$D_{(30)}$ =	0.157 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.329 mm	Plasticity Index =	n/a	Moisture %, as sampled =	9.8%
$D_{(60)}$ =	0.475 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	4.887 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	22/53	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50	100%	100%	100.0%	0.0%
1.00"	25.00	95%	95%	100.0%	0.0%
3/4"	19.00	95%	95%	100.0%	0.0%
5/8"	16.00	94%	94%	100.0%	0.0%
1/2"	12.50	94%	94%	100.0%	0.0%
3/8"	9.50	93%	93%	100.0%	0.0%
1/4"	6.30	91%	91%	100.0%	0.0%
#4	4.75	90%	90%	100.0%	0.0%
#8	2.36		88%	100.0%	0.0%
#10	2.00	87%	87%	100.0%	0.0%
#16	1.18		77%	100.0%	0.0%
#20	0.850	74%	74%	100.0%	0.0%
#30	0.600		65%	100.0%	0.0%
#40	0.425	58%	58%	100.0%	0.0%
#50	0.300		48%	100.0%	0.0%
#60	0.250	43%	43%	100.0%	0.0%
#80	0.180	34%	34%	100.0%	0.0%
#100	0.150	29%	29%	100.0%	0.0%
#140	0.106		26%	100.0%	0.0%
#170	0.090		25%	100.0%	0.0%
#200	0.075	24.2%	24.2%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-5 @ 5.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **10**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-6 @ 1.5'
Sample#: S16-628

Date Received: 5-Oct-16
Sampled By: LM
Date Tested: 6-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
GM, Silty Gravel with Sand
Sample Color:
Gray

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

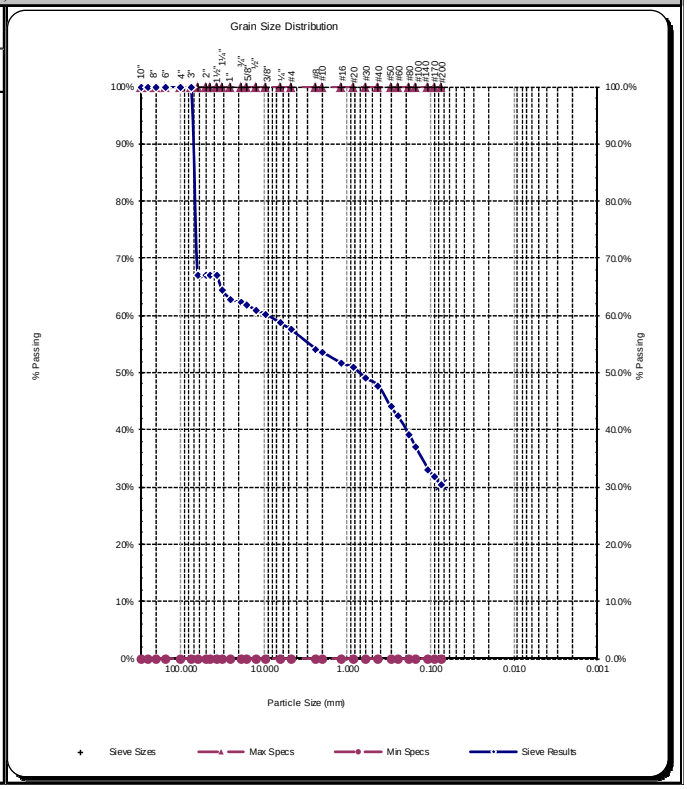
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.012 mm	% Gravel =	42.5%	Coeff. of Curvature, C_C =	0.02
$D_{(10)}$ =	0.025 mm	% Sand =	27.1%	Coeff. of Uniformity, C_U =	366.58
$D_{(15)}$ =	0.037 mm	% Silt & Clay =	30.4%	Fineness Modulus =	4.17
$D_{(30)}$ =	0.074 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.726 mm	Plasticity Index =	n/a	Moisture %, as sampled =	5.6%
$D_{(60)}$ =	9.044 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	71.359 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	7/11	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00	100%	100%	100.0%	0.0%
2.50"	63.00	67%	67%	100.0%	0.0%
2.00"	50.00	67%	67%	100.0%	0.0%
1.75"	45.00	67%	67%	100.0%	0.0%
1.50"	37.50	67%	67%	100.0%	0.0%
1.25"	31.50	64%	64%	100.0%	0.0%
1.00"	25.00	63%	63%	100.0%	0.0%
3/4"	19.00	62%	62%	100.0%	0.0%
5/8"	16.00	62%	62%	100.0%	0.0%
1/2"	12.50	61%	61%	100.0%	0.0%
3/8"	9.50	60%	60%	100.0%	0.0%
1/4"	6.30	59%	59%	100.0%	0.0%
#4	4.75	58%	58%	100.0%	0.0%
#8	2.36		54%	100.0%	0.0%
#10	2.00	54%	54%	100.0%	0.0%
#16	1.18		52%	100.0%	0.0%
#20	0.850	51%	51%	100.0%	0.0%
#30	0.600		49%	100.0%	0.0%
#40	0.425	48%	48%	100.0%	0.0%
#50	0.300		44%	100.0%	0.0%
#60	0.250	42%	42%	100.0%	0.0%
#80	0.180	39%	39%	100.0%	0.0%
#100	0.150	37%	37%	100.0%	0.0%
#140	0.106		33%	100.0%	0.0%
#170	0.090		32%	100.0%	0.0%
#200	0.075	30.4%	30.4%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-6 @ 1.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **11**

Hydrometer Report

Project:	New Southwest Elementary School	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client :	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP-10 @ 1.5"	**Tested By:**	FP/JE
Sample#:	S16-678		

ASTM D 2487 Soils Classification
SM, Silty Sand
Sample Color
Brown

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr :	2.60	
Sample Weight:	100.74	grams
Hydroscopic Moist.:	8.18%	
Adj. Sample Wgt :	93.12	grams

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	32	26.1%	0.0327 mm
5	29	23.6%	0.0210 mm
15	26	21.2%	0.0124 mm
30	19	15.5%	0.0092 mm
60	13	10.6%	0.0067 mm
250	8	6.5%	0.0034 mm
1440	3	2.4%	0.0015 mm

% Gravel:	11.3%	**Liquid Limit:**	n/a
% Sand:	48.6%	**Plastic Limit:**	n/a
% Silt:	31.6%	**Plasticity Index:**	n/a
% Clay:	8.5%		

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	100%	31.500 mm
1.0"	100%	25.000 mm
3/4"	100%	19.000 mm
5/8"	100%	16.000 mm
1/2"	98%	12.500 mm
3/8"	97%	9.500 mm
1/4"	93%	6.300 mm
#4	89%	4.750 mm
#10	75%	2.000 mm
#20	70%	0.850 mm
#40	63%	0.425 mm
#100	46%	0.150 mm
#200	40.1%	0.075 mm
Silts	39.8%	0.074 mm
	31.8%	0.050 mm
	23.3%	0.020 mm
Clays	8.5%	0.005 mm
	3.6%	0.002 mm
Colloids	1.7%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
#NAME?

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-10 @ 1.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **12**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-10 @ 1.5"
Sample#: S16-678

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
Brown

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

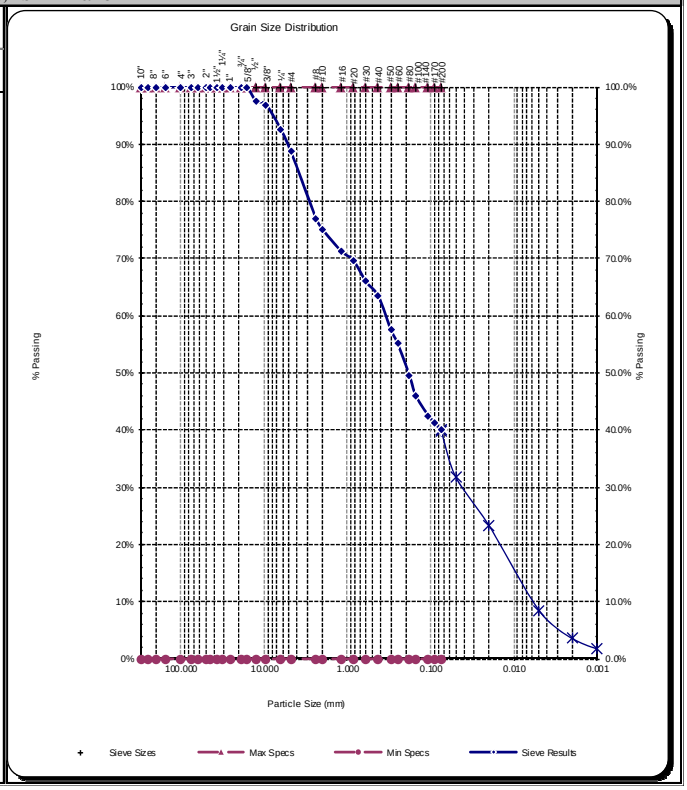
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.009	mm	% Gravel =	11.3%	Coeff. of Curvature, C_C =	0.48
$D_{(10)}$ =	0.019	mm	% Sand =	48.6%	Coeff. of Uniformity, C_U =	18.84
$D_{(15)}$ =	0.028	mm	% Silt & Clay =	40.1%	Fineness Modulus =	1.97
$D_{(30)}$ =	0.056	mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.185	mm	Plasticity Index =	n/a	Moisture %, as sampled =	24.8%
$D_{(60)}$ =	0.352	mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	5.272	mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	31/49		Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00	100%	100%	100.0%	0.0%
1/2"	12.50	98%	98%	100.0%	0.0%
3/8"	9.50	97%	97%	100.0%	0.0%
1/4"	6.30	93%	93%	100.0%	0.0%
#4	4.75	89%	89%	100.0%	0.0%
#8	2.36		77%	100.0%	0.0%
#10	2.00	75%	75%	100.0%	0.0%
#16	1.18		71%	100.0%	0.0%
#20	0.850	70%	70%	100.0%	0.0%
#30	0.600		66%	100.0%	0.0%
#40	0.425	63%	63%	100.0%	0.0%
#50	0.300		58%	100.0%	0.0%
#60	0.250	55%	55%	100.0%	0.0%
#80	0.180	50%	50%	100.0%	0.0%
#100	0.150	46%	46%	100.0%	0.0%
#140	0.106		43%	100.0%	0.0%
#170	0.090		41%	100.0%	0.0%
#200	0.075	40.1%	40.1%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-10 @ 1.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **13**

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project:	New Southwest Elementary Sc	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client:	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP12 @ 2.0'	**Tested By:**	FP/JE
Sample #:	S16-679		

Unified Soils Classification System, ASTM D-2487
SM, Silty Sand with Gravel
Sample Color
TAN

Liquid Limit Determination

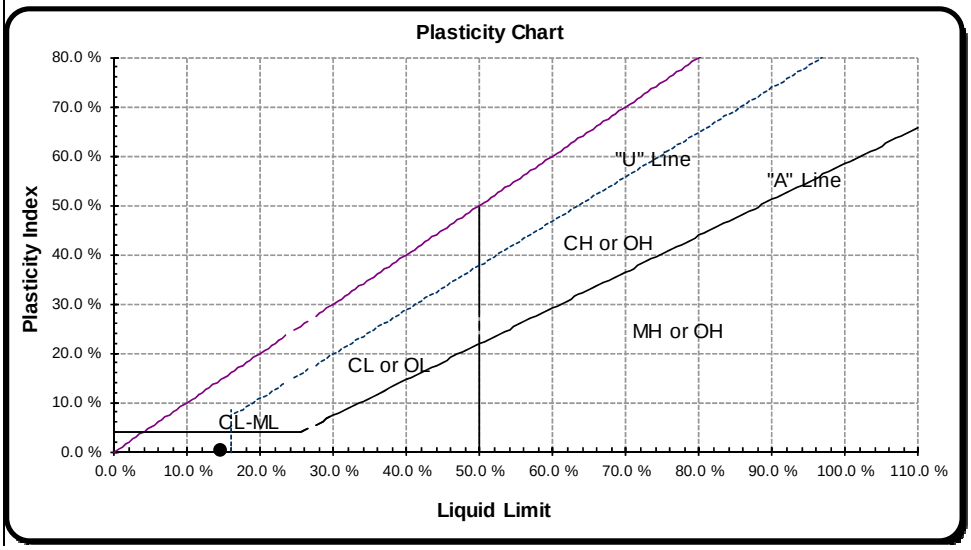
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	35.16	36.91	35.22			
Weight of Dry Soils + Pan:	33.00	34.19	32.59			
Weight of Pan:	14.87	15.02	16.66			
Weight of Dry Soils:	18.13	19.17	15.93			
Weight of Moisture:	2.16	2.72	2.63			
% Moisture:	11.9 %	14.2 %	16.5 %			
Number of Blows:	35	24	17			

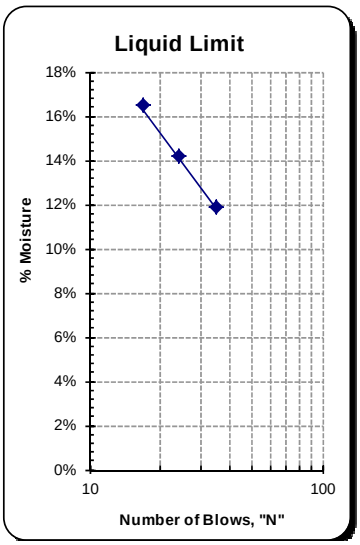
Liquid Limit @ 25 Blows: 14.3 %
Plastic Limit: 13.8 %
Plasticity Index, I_P: 0.4 %

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	34.45	35.00				
Weight of Dry Soils + Pan:	32.00	32.54				
Weight of Pan:	14.53	14.54				
Weight of Dry Soils:	17.47	18.00				
Weight of Moisture:	2.45	2.46				
% Moisture:	14.0 %	13.7 %				

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04





Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-12 @ 2.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **14**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP12 @ 2.0'
Sample#: S16-679

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
TAN

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

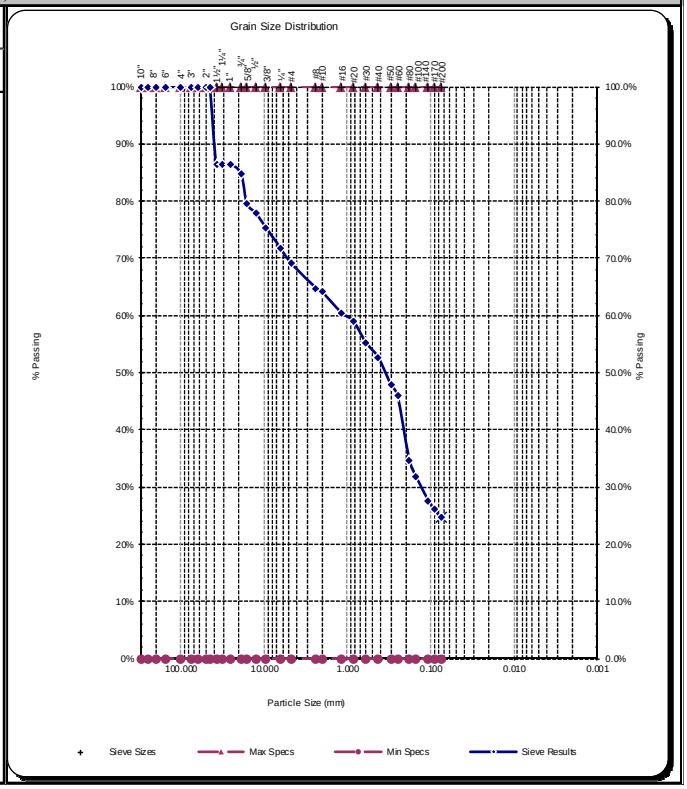
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.015 mm	% Gravel =	30.9%	Coeff. of Curvature, C_C =	0.53
$D_{(10)}$ =	0.030 mm	% Sand =	44.5%	Coeff. of Uniformity, C_U =	35.09
$D_{(15)}$ =	0.046 mm	% Silt & Clay =	24.6%	Fineness Modulus =	3.10
$D_{(30)}$ =	0.131 mm	Liquid Limit =	14.3%	Plastic Limit =	13.8%
$D_{(50)}$ =	0.355 mm	Plasticity Index =	0.4%	Moisture %, as sampled =	7.2%
$D_{(60)}$ =	1.068 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	39.498 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	22/47	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00	100%	100%	100.0%	0.0%
1.50"	37.50	86%	86%	100.0%	0.0%
1.25"	31.50	86%	86%	100.0%	0.0%
1.00"	25.00	86%	86%	100.0%	0.0%
3/4"	19.00	85%	85%	100.0%	0.0%
5/8"	16.00	80%	80%	100.0%	0.0%
1/2"	12.50	78%	78%	100.0%	0.0%
3/8"	9.50	75%	75%	100.0%	0.0%
1/4"	6.30	72%	72%	100.0%	0.0%
#4	4.75	69%	69%	100.0%	0.0%
#8	2.36		65%	100.0%	0.0%
#10	2.00	64%	64%	100.0%	0.0%
#16	1.18		60%	100.0%	0.0%
#20	0.850	59%	59%	100.0%	0.0%
#30	0.600		55%	100.0%	0.0%
#40	0.425	53%	53%	100.0%	0.0%
#50	0.300		48%	100.0%	0.0%
#60	0.250	46%	46%	100.0%	0.0%
#80	0.180	35%	35%	100.0%	0.0%
#100	0.150	32%	32%	100.0%	0.0%
#140	0.106		28%	100.0%	0.0%
#170	0.090		26%	100.0%	0.0%
#200	0.075	24.6%	24.6%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-12 @ 2.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **15**

ASTM D4318 - Liquid Limit, Plastic Limit and Plasticity Index of Soils

Project:	New Southwest Elementary Sc	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client:	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP12 @ 5.5'	**Tested By:**	FP/JE
Sample #:	S16-680		

Unified Soils Classification System, ASTM D-2487
GM, Silty Gravel with Sand
Sample Color
BROWN

Liquid Limit Determination

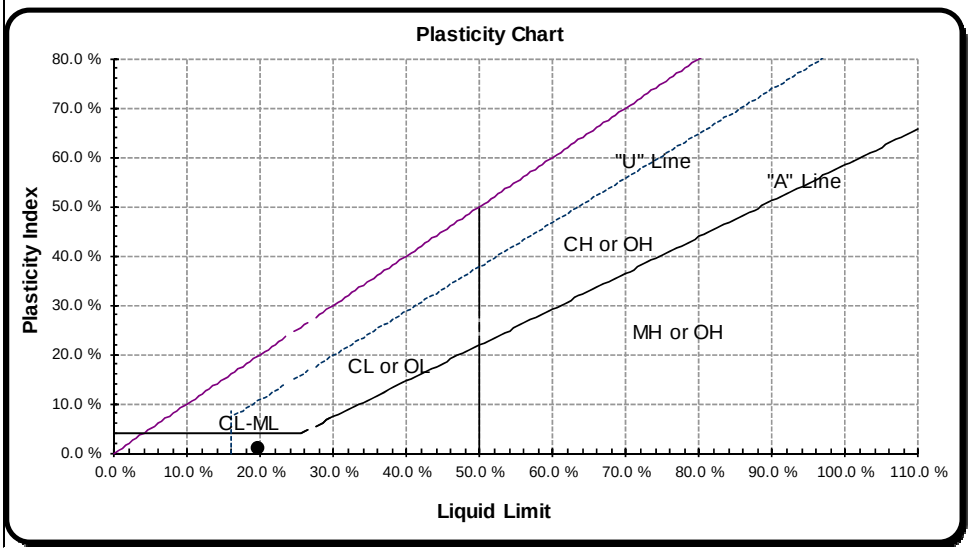
	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	36.12	35.31	35.49			
Weight of Dry Soils + Pan:	33.60	32.00	31.59			
Weight of Pan:	14.31	15.02	14.40			
Weight of Dry Soils:	19.29	16.98	17.19			
Weight of Moisture:	2.52	3.31	3.90			
% Moisture:	13.1 %	19.5 %	22.7 %			
Number of Blows:	35	26	19			

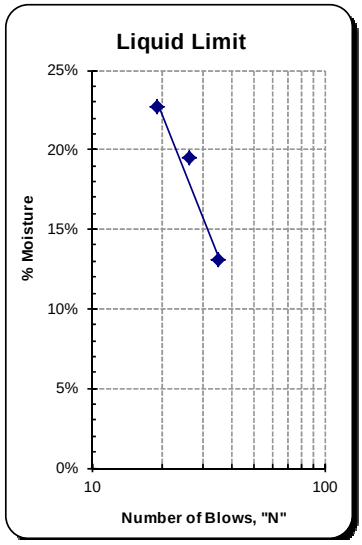
Liquid Limit @ 25 Blows: 19.4 %
Plastic Limit: 18.3 %
Plasticity Index, I_P: 1.2 %

Plastic Limit Determination

	#1	#2	#3	#4	#5	#6
Weight of Wet Soils + Pan:	36.79	37.04				
Weight of Dry Soils + Pan:	33.09	33.76				
Weight of Pan:	13.99	14.67				
Weight of Dry Soils:	19.10	19.09				
Weight of Moisture:	3.70	3.28				
% Moisture:	19.4 %	17.2 %				

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04





Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-12 @ 5.5'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **16**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP12 @ 5.5'
Sample#: S16-680

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
GM, Silty Gravel with Sand
Sample Color:
BROWN

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

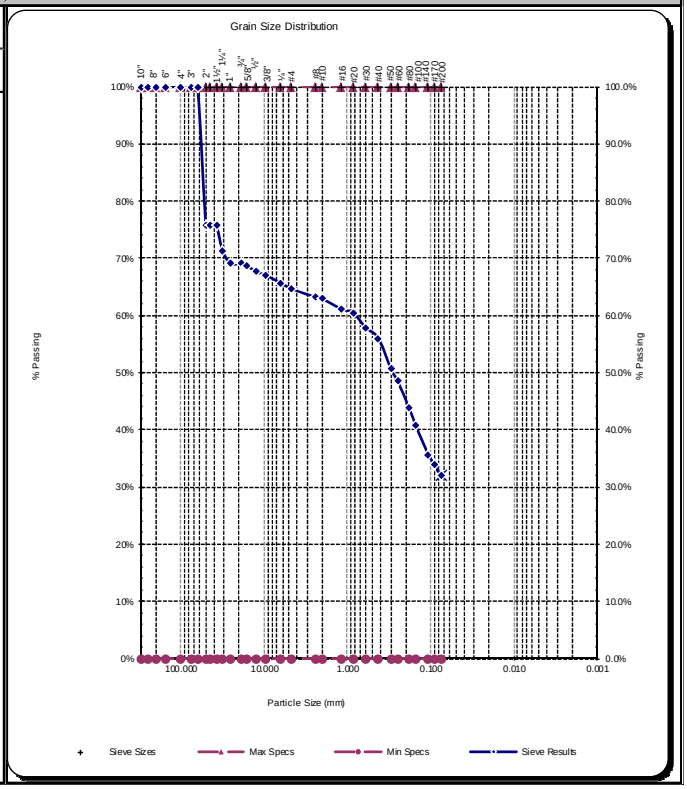
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.012 mm	% Gravel =	35.3%	Coeff. of Curvature, C_C =	0.26
$D_{(10)}$ =	0.023 mm	% Sand =	32.6%	Coeff. of Uniformity, C_U =	34.62
$D_{(15)}$ =	0.035 mm	% Silt & Clay =	32.1%	Fineness Modulus =	3.50
$D_{(30)}$ =	0.070 mm	Liquid Limit =	19.4%	Plastic Limit =	18.3%
$D_{(50)}$ =	0.285 mm	Plasticity Index =	1.2%	Moisture %, as sampled =	7.9%
$D_{(60)}$ =	0.808 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	57.652 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	43/75	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00	100%	100%	100.0%	0.0%
2.00"	50.00	76%	76%	100.0%	0.0%
1.75"	45.00	76%	76%	100.0%	0.0%
1.50"	37.50	76%	76%	100.0%	0.0%
1.25"	31.50	71%	71%	100.0%	0.0%
1.00"	25.00	69%	69%	100.0%	0.0%
3/4"	19.00	69%	69%	100.0%	0.0%
5/8"	16.00	69%	69%	100.0%	0.0%
1/2"	12.50	68%	68%	100.0%	0.0%
3/8"	9.50	67%	67%	100.0%	0.0%
1/4"	6.30	66%	66%	100.0%	0.0%
#4	4.75	65%	65%	100.0%	0.0%
#8	2.36		63%	100.0%	0.0%
#10	2.00	63%	63%	100.0%	0.0%
#16	1.18		61%	100.0%	0.0%
#20	0.850	60%	60%	100.0%	0.0%
#30	0.600		58%	100.0%	0.0%
#40	0.425	56%	56%	100.0%	0.0%
#50	0.300		51%	100.0%	0.0%
#60	0.250	49%	49%	100.0%	0.0%
#80	0.180	44%	44%	100.0%	0.0%
#100	0.150	41%	41%	100.0%	0.0%
#140	0.106		36%	100.0%	0.0%
#170	0.090		34%	100.0%	0.0%
#200	0.075	32.1%	32.1%	100.0%	0.0%



Materials Testing & Consulting, Inc.
2118 Black Lake Blvd SW
Olympia, WA 98512

Lab Sample: TP-12 @ 5.5'
New SW Elementary PSD
Parcel # 0419174028
Puyallup, WA

FIGURE
17

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-13 @ 6'
Sample#: S16-629

Date Received: 5-Oct-16
Sampled By: LM
Date Tested: 6-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand with Gravel
Sample Color:
Gray

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

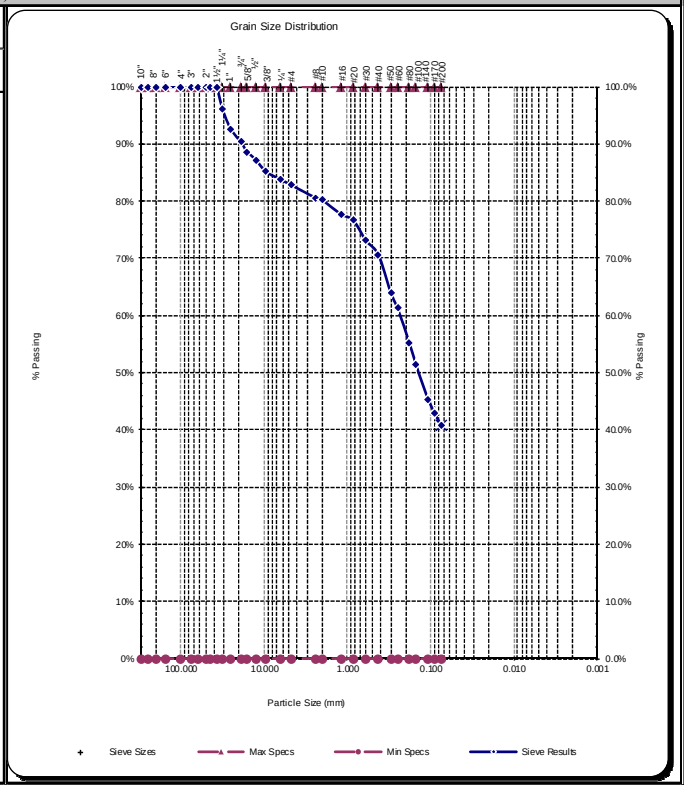
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.009 mm	% Gravel =	17.2%	Coeff. of Curvature, C_C =	0.70
$D_{(10)}$ =	0.018 mm	% Sand =	42.0%	Coeff. of Uniformity, C_U =	12.82
$D_{(15)}$ =	0.028 mm	% Silt & Clay =	40.8%	Fineness Modulus =	1.95
$D_{(30)}$ =	0.055 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.140 mm	Plasticity Index =	n/a	Moisture %, as sampled =	13.3%
$D_{(60)}$ =	0.236 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	18.420 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	26/45	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50	100%	100%	100.0%	0.0%
1.25"	31.50	96%	96%	100.0%	0.0%
1.00"	25.00	93%	93%	100.0%	0.0%
3/4"	19.00	90%	90%	100.0%	0.0%
5/8"	16.00	89%	89%	100.0%	0.0%
1/2"	12.50	87%	87%	100.0%	0.0%
3/8"	9.50	85%	85%	100.0%	0.0%
1/4"	6.30	84%	84%	100.0%	0.0%
#4	4.75	83%	83%	100.0%	0.0%
#8	2.36		81%	100.0%	0.0%
#10	2.00	80%	80%	100.0%	0.0%
#16	1.18		78%	100.0%	0.0%
#20	0.850	77%	77%	100.0%	0.0%
#30	0.600		73%	100.0%	0.0%
#40	0.425	71%	71%	100.0%	0.0%
#50	0.300		64%	100.0%	0.0%
#60	0.250	61%	61%	100.0%	0.0%
#80	0.180	55%	55%	100.0%	0.0%
#100	0.150	51%	51%	100.0%	0.0%
#140	0.106		45%	100.0%	0.0%
#170	0.090		43%	100.0%	0.0%
#200	0.075	40.8%	40.8%	100.0%	0.0%



Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-13 @ 6.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **18**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-14 @ 4'
Sample#: S16-630

Date Received: 5-Oct-16
Sampled By: LM
Date Tested: 6-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
SM, Silty Sand
Sample Color:
Gray

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

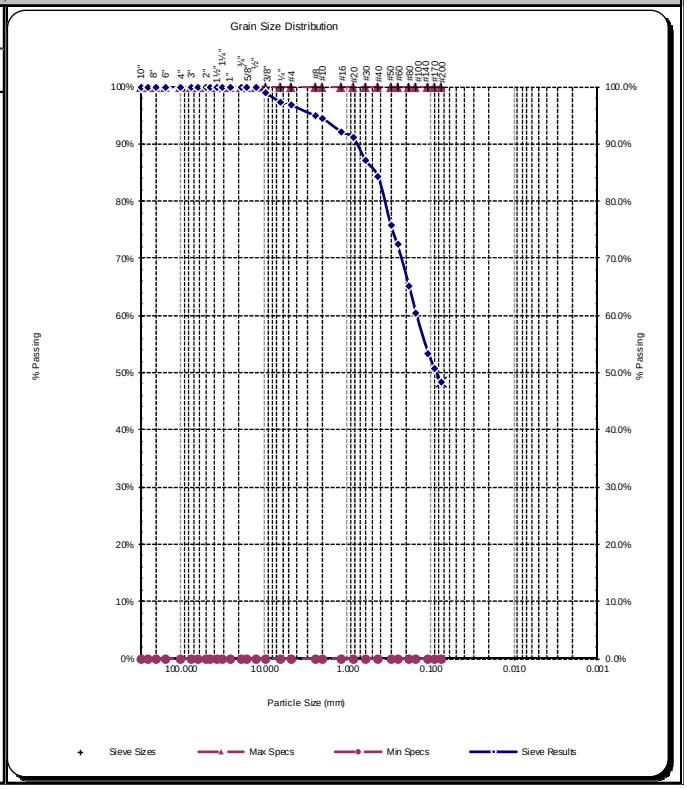
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.008 mm	% Gravel =	3.2%	Coeff. of Curvature, C_C =	0.95
$D_{(10)}$ =	0.016 mm	% Sand =	48.4%	Coeff. of Uniformity, C_U =	9.48
$D_{(15)}$ =	0.023 mm	% Silt & Clay =	48.4%	Fineness Modulus =	0.94
$D_{(30)}$ =	0.047 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.085 mm	Plasticity Index =	n/a	Moisture %, as sampled =	13.9%
$D_{(60)}$ =	0.147 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	0.782 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	31/54	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50	100%	100%	100.0%	0.0%
3/8"	9.50	99%	99%	100.0%	0.0%
1/4"	6.30	97%	97%	100.0%	0.0%
#4	4.75	97%	97%	100.0%	0.0%
#8	2.36		95%	100.0%	0.0%
#10	2.00	95%	95%	100.0%	0.0%
#16	1.18		92%	100.0%	0.0%
#20	0.850	91%	91%	100.0%	0.0%
#30	0.600		87%	100.0%	0.0%
#40	0.425	84%	84%	100.0%	0.0%
#50	0.300		76%	100.0%	0.0%
#60	0.250	72%	72%	100.0%	0.0%
#80	0.180	65%	65%	100.0%	0.0%
#100	0.150	60%	60%	100.0%	0.0%
#140	0.106		53%	100.0%	0.0%
#170	0.090		51%	100.0%	0.0%
#200	0.075	48.4%	48.4%	100.0%	0.0%



Materials Testing & Consulting, Inc.
2118 Black Lake Blvd SW
Olympia, WA 98512

Lab Sample: TP-13 @ 6.0'
New SW Elementary PSD
Parcel # 0419174028
Puyallup, WA

FIGURE
19

Hydrometer Report

Project:	New Southwest Elementary School	**Date Received:**	18-Oct-16
Project #:	16S134	**Sampled By:**	LM
Client :	Puyallup School District	**Date Tested:**	21-Oct-16
Source:	TP-16 @ 3.0"	**Tested By:**	FP/JE
Sample#:	S16-681		

ASTM D 2487 Soils Classification
#N/A

Sample Color
GRAY

ASTM D-422, HYDROMETER ANALYSIS

Assumed Sp Gr :	2.60	
Sample Weight:	100.38	grams
Hydroscopic Moist.:	8.82%	
Adj. Sample Wgt :	92.24	grams

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter
2	50	54.0%	0.0279 mm
5	46	49.7%	0.0184 mm
15	38	41.0%	0.0114 mm
30	30	32.4%	0.0085 mm
60	22	23.8%	0.0064 mm
250	14	15.1%	0.0033 mm
1440	5	5.4%	0.0014 mm

% Gravel:	0.8%	**Liquid Limit:**	n/a
% Sand:	29.2%	**Plastic Limit:**	n/a
% Silt:	50.0%	**Plasticity Index:**	n/a
% Clay:	19.9%		

ASTM C-136

Sieve Analysis
Grain Size Distribution

Sieve Size	Percent Passing	Soils Particle Diameter
3.0"	100%	75.000 mm
2.0"	100%	50.000 mm
1.5"	100%	37.500 mm
1.25"	100%	31.500 mm
1.0"	100%	25.000 mm
3/4"	100%	19.000 mm
5/8"	100%	16.000 mm
1/2"	100%	12.500 mm
3/8"	100%	9.500 mm
1/4"	99%	6.300 mm
#4	99%	4.750 mm
#10	99%	2.000 mm
#20	97%	0.850 mm
#40	92%	0.425 mm
#100	77%	0.150 mm
#200	69.9%	0.075 mm
Silts	69.6%	0.074 mm
	61.5%	0.050 mm
	50.4%	0.020 mm
Clays	19.9%	0.005 mm
	8.4%	0.002 mm
Colloids	3.8%	0.001 mm

USDA Soil Textural Classification

	Particle Size
% Sand:	2.0 - 0.05 mm
% Silt:	0.05 - 0.002 mm
% Clay:	< 0.002 mm

USDA Soil Textural Classification
#NAME?

Materials Testing & Consulting, Inc. 2118 Black Lake Blvd SW Olympia, WA 98512	**Lab Sample: TP-16 @ 3.0'** New SW Elementary PSD Parcel # 0419174028 **Puyallup, WA**	**FIGURE** **20**

Sieve Report

Project: New Southwest Elementary School
Project #: 16S134
Client: Puyallup School District
Source: TP-16 @ 3.0"
Sample#: S16-681

Date Received: 18-Oct-16
Sampled By: LM
Date Tested: 21-Oct-16
Tested By: FP/JE

ASTM D-2487 Unified Soils Classification System
#N/A
Sample Color:
GRAY

ACCREDITED
Certificate #: 1366.01, 1366.02 & 1366.04

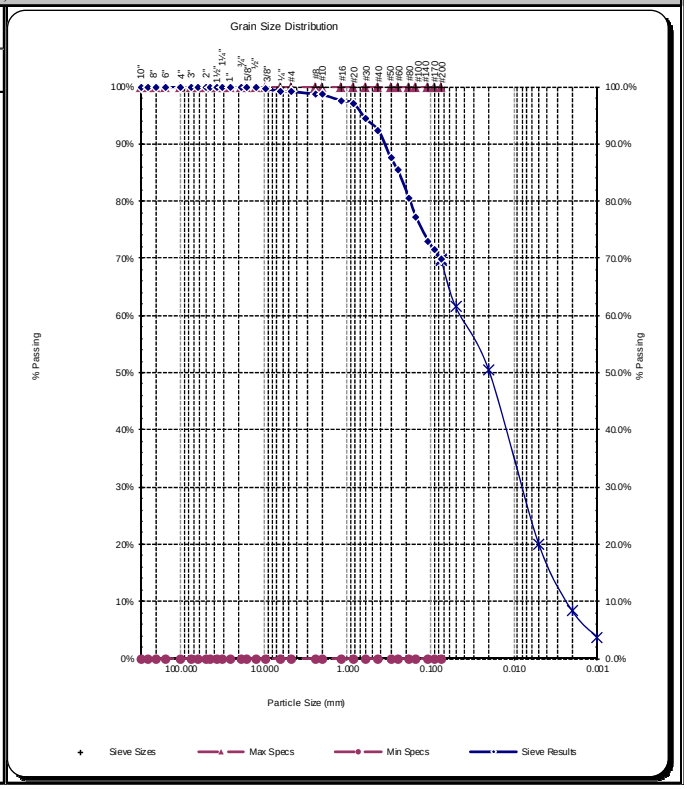
ASTM D-2216, ASTM D-2419, ASTM D-4318, ASTM D-5821

Specifications
No Specs
Sample Meets Specs ? N/A

$D_{(5)}$ =	0.005 mm	% Gravel =	0.8%	Coeff. of Curvature, C_C =	1.50
$D_{(10)}$ =	0.011 mm	% Sand =	29.2%	Coeff. of Uniformity, C_U =	6.00
$D_{(15)}$ =	0.016 mm	% Silt & Clay =	69.9%	Fineness Modulus =	0.46
$D_{(30)}$ =	0.032 mm	Liquid Limit =	n/a	Plastic Limit =	n/a
$D_{(50)}$ =	0.054 mm	Plasticity Index =	n/a	Moisture %, as sampled =	22.6%
$D_{(60)}$ =	0.064 mm	Sand Equivalent =	n/a	Req'd Sand Equivalent =	
$D_{(90)}$ =	0.364 mm	Fracture %, 1 Face =	n/a	Req'd Fracture %, 1 Face =	
Dust Ratio =	28/37	Fracture %, 2+ Faces =	n/a	Req'd Fracture %, 2+ Faces =	

ASTM C-136, ASTM D-6913

Sieve Size US	Sieve Size Metric	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00		100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00		100%	100.0%	0.0%
3/4"	19.00		100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50	100%	100%	100.0%	0.0%
3/8"	9.50	100%	100%	100.0%	0.0%
1/4"	6.30	99%	99%	100.0%	0.0%
#4	4.75	99%	99%	100.0%	0.0%
#8	2.36		99%	100.0%	0.0%
#10	2.00	99%	99%	100.0%	0.0%
#16	1.18		98%	100.0%	0.0%
#20	0.850	97%	97%	100.0%	0.0%
#30	0.600		94%	100.0%	0.0%
#40	0.425	92%	92%	100.0%	0.0%
#50	0.300		87%	100.0%	0.0%
#60	0.250	86%	86%	100.0%	0.0%
#80	0.180	80%	80%	100.0%	0.0%
#100	0.150	77%	77%	100.0%	0.0%
#140	0.106		73%	100.0%	0.0%
#170	0.090		71%	100.0%	0.0%
#200	0.075	69.9%	69.9%	100.0%	0.0%



Materials Testing & Consulting, Inc.
2118 Black Lake Blvd SW
Olympia, WA 98512

Lab Sample: TP-16 @ 3.0'
New SW Elementary PSD
Parcel # 0419174028
Puyallup, WA

FIGURE
21