

Consulting

Robert M. Pride, LLC

Engineer

August 17, 2008

Mr. Mark Baumgarten
Sumner School District
19701 104th Street East
Bonney Lake, WA 98391

BLRB Architects, P.S.
Tacoma, WA 98402

Re: **Report on Geotechnical Investigation**
Proposed Sumner Middle School Additions
1508 Willow Street
Sumner, Washington
RMP Project No. 08-148-01

AUG 20 2008

RECEIVED

Dear Mr. Baumgarten

This report presents the results of our geological/geotechnical evaluation of the Sumner Middle School site in Sumner, Washington. It is understood that small building additions will be constructed adjacent to the existing school structure, and that improvements will be made in the storm water infiltration system. Parking lot additions and a bus loop will be constructed on the south and west sides of the school building.

The purpose of our site evaluation was to document existing shallow soil and ground water conditions on the property, to evaluate the feasibility of the proposed improvements, and to provide geotechnical recommendations for design and construction. The results of the subsurface exploration study completed and our preliminary geotechnical engineering recommendations for this project are presented herein. A preliminary site plan prepared by BLRB Architects along with available USGS geologic mapping were used as references for this study.

Existing Site Conditions

The irregularly-shaped parcel contains the existing Middle School building that is adjacent to the south side of Willows Road. Existing topography from Willow Street on the north to the south end of the site drops in elevation on the order of twelve feet. Driveway access to the parking areas is off of Willow Street, and the playfield areas are situated on the south side of the school.

Subsurface Soil and Ground Water Conditions

In order to characterize the shallow subsurface soil and ground water conditions a total of eight exploratory test pits were excavated at the locations approximately as shown on

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Drawing No. 1. Test pits were located to avoid disruption of the existing improvements and buried utilities. An upper layer of topsoil and/or fill soils ranged in depth from 1 to 3 feet over native soils that consisted of medium dense to dense alluvial sediments. These native soils were classified as silty and gravelly sands with interlayers of sandy silts.

Depths of the exploratory test pits ranged from 6 to 11 feet below the existing ground surface. Groundwater was not encountered in 7 of the 8 test pits, but there was minor seepage in TP-7 at a depth of 8.0 feet below existing grade. Groundwater is known to exist within the upper 10 to 15 feet below the ground surface, and these depths will change over the year depending on rainfall and nearby stream flow levels. Summary logs of the exploratory pits are listed in Appendix A.

Seismic Hazards

Earthquakes occur in the western Washington region with great regularity. The vast majority of these events are small and are usually not felt by people. However, moderate earthquakes do occur as evidenced by the 1949, 7.2-magnitude event, the 1965, 6.5-magnitude event, and the February 2001 magnitude 6.8 Nisqually earthquake. The 1949 earthquake appears to have been the largest in this region during recorded history and was centered in the Olympia area.

Generally, there are four types of potential geologic hazards associated with large seismic events: 1) surficial ground rupture; 2) seismically induced landslides; 3) liquefaction; and 4) ground motion. The potential for each of these to impact the site is discussed below.

Based on the grain size distribution of the sediments encountered and considering the presence of groundwater at relatively shallow depths, it is our opinion that the risk of liquefaction is low to moderate.

It is our opinion that any earthquake damage to the proposed structures, when founded on suitable foundation bearing strata in accordance with the recommendations provided in this report, would be caused by the intensity and acceleration associated with the event and not any of the above-discussed impacts. In accordance with the 2003 IBC – Table 1615.1.1 – the subject site is defined as Class D.

Conclusions and Recommendations

On the basis of our geologic research and field explorations, the existing medium dense to dense sands and silty sands will provide satisfactory support for the proposed one and two story building additions. Column loads are expected to range from 40 to 50 kips,

and the bearing wall footings will support loads ranging from 2 to 5 kips/ft. Depths to the native soils for proposed foundations are expected to range from 12 to 18 inches below existing grades. The sands and gravelly sands found in test pits at the south and west sides of the school building are considered suitable for storm water infiltration.

Foundation Recommendations

Shallow foundations may be used for support of the planned structure additions when placed on undisturbed native soils. An allowable soil bearing value of 2000 psf may be used in the design of these footings, including both dead and live loads. This value may be increased by 300 psf for each additional one foot width for continuous or isolated footings beyond two feet. An increase of one-third may also be used for short-term wind or seismic loading.

Settlement of footings founded on undisturbed native soils should be on the order of $\frac{1}{2}$ to $\frac{3}{4}$ of an inch, with a majority of this settlement occurring during construction. Some differential settlement should be expected between the newly placed footings and the adjacent existing building walls. Structural connections may be required where the new footings/walls abut the existing structure. All foundation excavations should be inspected prior to concrete placement to verify that the design bearing capacity of the soils has been attained and that construction conforms to the recommendations contained in this report.

Lateral loads may be resisted by friction at the base of the footings and with passive pressure on the sides of footings. We recommend that an allowable coefficient of friction of 0.35 be used and a passive pressure value of 200 pcf. These values include a factor of safety of at least 1.5.

Concrete Slabs-on-Grade

Concrete floor slabs may be poured on a 4 inch layer of compacted crushed gravel after proof-rolling the exposed subgrade soils. All concrete slabs should be reinforced to minimize shrinkage cracking. A polyethylene plastic vapor barrier (minimum 10 mil) should be provided under the floor slabs to minimize moisture vapor rise through the slab. Seams and penetrations through the vapor barrier should be properly sealed. All concrete should be poured in accordance with applicable ACI guidelines.

Onsite Storm Water Infiltration

As part of our study we were asked to provide a preliminary determination as to the potential for infiltration of storm water on the site. The subsoils on the west and south sides of the site consisted primarily of sands and gravelly sands below the upper layer of

topsoil and fill. These granular soils would be classified as medium to coarse sand and gravel in accordance with the 2005 Pierce County Soil Infiltration Rates as summarized in Chapter 6 on Table 6.3. For these soils we recommend using an infiltration rate of 2.5 min/inch. With a safety factor of 2.0 the design value should be 5 min/inch for these granular soils that were encountered to a depth of at least eight feet in TP-3, TP-4, TP-5, TP-6 and TP-8. For design the water table can be assumed to be 7 feet below grade.

It is recommended that all impervious surface drainage be collected for infiltration to the west and south side of the existing school building. Storm water discharge into the ground from parking or driveway surfaces on the north side of the site could result in shallow groundwater seepage problems adjacent to the existing school foundations. Elevation differential and infiltration distance to the building foundations should be analyzed to determine if there is a potential for groundwater buildup.

Subsoil conditions on the north side of the school are less favorable for infiltration due to the higher percentages of silt in the soils to depths up to eight feet. Consideration should be given to routing all of the storm water to infiltration trenches located on the south and west sides of the site. An existing residence located just south of TP-8 should be inspected to determine if there is a basement level below existing grade. If there is a basement it will be necessary to maintain a minimum distance of at least 50 to 75 feet from the southerly infiltration trenches to the residence. Deeper trenches could reduce the setback distance, but the depth to shallow groundwater could reduce the efficiency of the trench discharge into the underlying sandy soils.

Pavement Subgrade Recommendations

New vehicle parking and bus access pavement areas will be created as part of this improvement project. No significant grade changes are expected, but final grading plans have not been prepared at this time. Prior to placement of base course materials over the prepared subgrade, the exposed subgrade soils should be proof-rolled with a loaded dump truck or other suitable equipment to identify any soft or yielding areas. Soft subgrade soils should be processed and recompacted prior to placing base gravel or pavement.

Pavement section recommendations for heavy truck and bus usage should consist of a minimum of 12 inches of imported compacted sand and gravel (Type 17 or equivalent) capped with 6 inches of 7/8 inch crushed rock overlain by 3 inches of Class B asphaltic concrete pavement. The parking areas for passenger vehicles may have the crushed rock thickness reduced to 4 inches covered with 2 inches of class B pavement.

Existing paved areas that will receive an overlayment of new asphalt pavement should be inspected for excessive cracking and settlement depressions. Large cracks will reflect

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through the new pavement overlay and areas of obvious settlement may require repair and/or replacement.

Summary

Based on our site reconnaissance and subsurface explorations the proposed improvements can be built provided the recommendations contained herein are properly implemented. Construction monitoring and consultation services should also be provided to verify that subsurface conditions are as expected. Should conditions be revealed during construction that differs from the anticipated subsurface profile, we will evaluate those conditions and provide alternative recommendations where appropriate.

Our findings and recommendations provided in this report were prepared in accordance with generally accepted principles of engineering geology and geotechnical engineering as practiced in the Puget Sound area at the time this report was submitted. We make no other warranty, either express or implied.

Please call if there are any questions.

Respectfully,



Robert M. Pride, P. E.
Principal Geotechnical Engineer

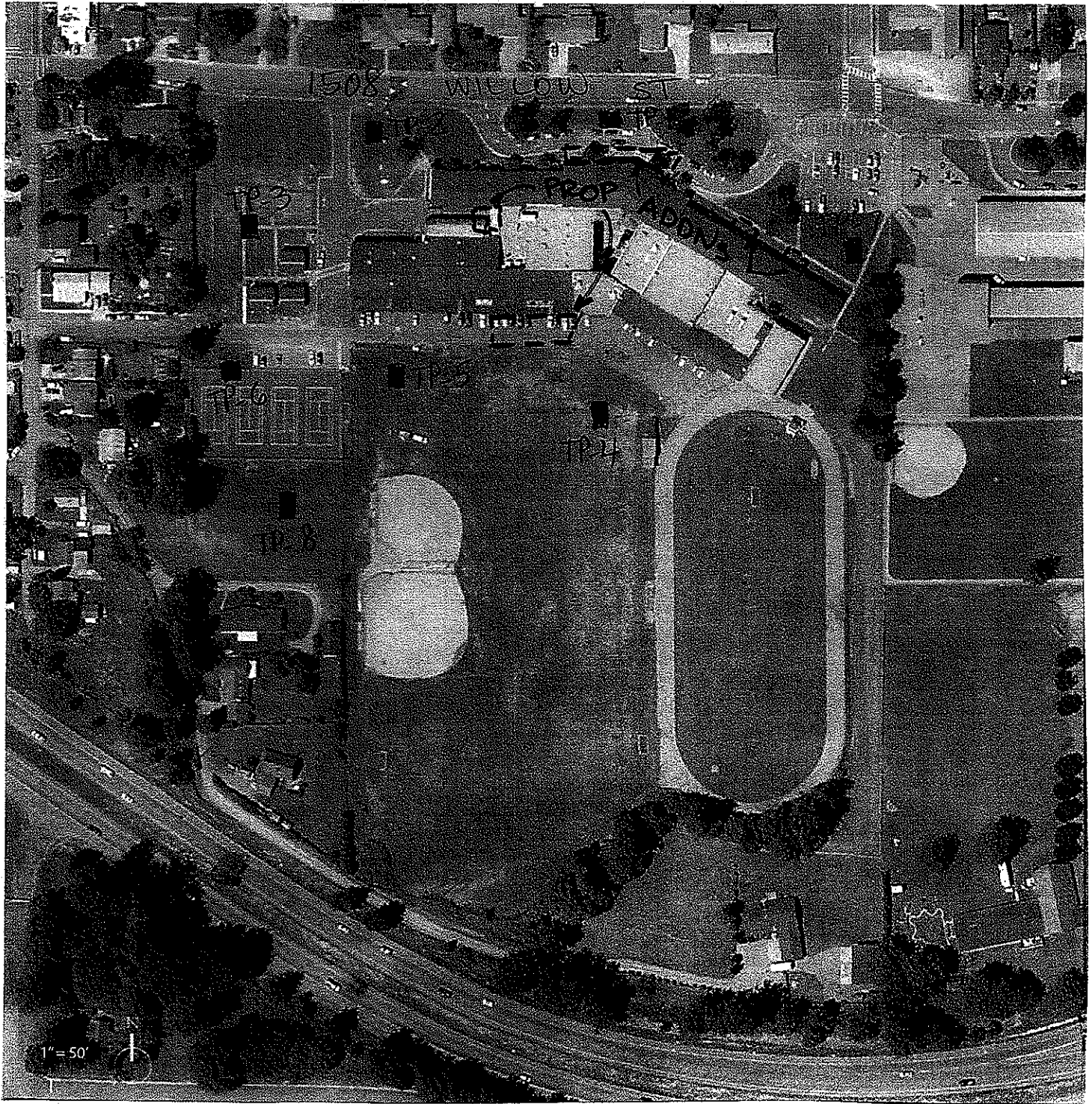


- dist: (1) Addressee
(2) BLRB architects
(1) Warner Engineering
(1) PCS Structural Engineers

EXPIRES 7-20-10

encl: Drawing No. 1
Figures A-1 to A-8

rmp: SumnerMiddle2



SITE PLAN

Proposed Middle School Additions
1508 Willow Street
Sumner, Washington
Robert M. Pride, LLC

Project No. 08-148-01

Drawing No. 1
Consulting Engineer

APPENDIX A

Summary Logs of Test Pits

LOG OF TEST PIT NO. TP-1

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|---|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p style="text-align: center;">Topsoil</p> |
| 1 | | | | | | <p>SILTY SAND; brown fine to medium, trace roots; medium dense moist</p> <p style="text-align: center;">Recent Alluvium</p> |
| 2 | | | | | | <p>SILTY SAND; brown mottled rust, fine, scattered lenses of sandy silt; dense, moist</p> |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | <p>SANDY SILT; gray-brown, fine, dense, moist</p> |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | <p>SILTY SAND; reddish brown, fine; dense, moist</p> |
| | | | | | | <p>Bottom of test pit at depth 8.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration</p> |

SUMNER MIDDLE SCHOOL

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Project No.

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LOG OF TEST PIT NO. TP-2

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|--|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> |
| | | | | | Fill | |
| 1 | | | | | | GRAVELLY SILTY SAND ; light brown, fine to medium, scattered cobbles; very dense, dry to moist |
| 2 | | | | | | Recent Alluvium |
| 3 | | | | | | SILTY SAND ; brown, fine, trace little silt; dense, moist |
| 4 | | | | | | |
| 5 | | | | | | SILTY SAND ; brown, fine; dense, moist |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | Bottom of test pit at depth 8.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration |

SUMNER MIDDLE SCHOOL

Sumner, Washington

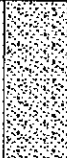

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-3

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|--|---|
| | | | | | | This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered. |
| | | | | | Fill | |
| 1 | | | | |  | GRAVELLY SAND ; brown, fine to coarse, scattered cobbles; very dense, moist |
| 2 | | | | | | |
| | | | | | Recent Alluvium | |
| 3 | | | | |  | SAND ; brown, fine, trace to little silt; dense, moist |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | Bottom of test pit at depth 8.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-4

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|---|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p style="text-align: center;">DESCRIPTION</p> <p style="text-align: center;">Topsoil</p> |
| 1 | | | | | | <p>SILTY SAND; brown fine to medium, trace roots; medium dense moist</p> <p style="text-align: center;">Recent Alluvium</p> |
| 2 | | | | | | <p>SAND; brown, fine trace silt; medium dense, moist</p> |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| | | | | | | <p>GRAVELLY SAND; brown, fine to medium, trace silt; medium dense, moist</p> |
| | | | | | | <p>Bottom of test pit at depth 8.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration</p> |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-5

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|---|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p style="text-align: center;">Topsoil</p> |
| 1 | | | | | | <p>SILTY SAND; brown fine to medium, trace roots; medium dense, moist</p> <p style="text-align: center;">Recent Alluvium</p> |
| 2 | | | | | | <p>SAND; brown, fine, trace to little silt, scattered roots; medium dense, moist</p> |
| 3 | | | | | | <p>SAND; dark brown, fine to medium, trace silt; dense, moist</p> |
| 4 | | | | | | <p>SILTY SAND; brown, fine; dense, moist</p> |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | <p>Bottom of test pit at depth 7.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration</p> |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-6

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other Tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|--|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> |
| | | | | | | Topsoil |
| 1 | | | | | | SILTY SAND ; brown fine to medium, trace roots; medium dense, moist |
| | | | | | | Fill |
| 2 | | | | | | GRAVELLY SAND ; brown, fine to medium, trace to little silt, scattered cobbles; very dense, moist |
| 3 | | | | | | Recent Alluvium |
| 4 | | | | | | SAND ; brown, fine, trace gravel, trace silt; dense, moist |
| 5 | | | | | | |
| 6 | | | | | | Bottom of test pit at depth 6.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-7

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|------------------|--|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> |
| | | | | | [Dotted Pattern] | Topsoil |
| 1 | | | | | [Dotted Pattern] | SILTY SAND ; brown fine to medium, trace roots; medium dense, moist Fill |
| 2 | | | | | [Dotted Pattern] | SANDY SILT ; brown, fine; very dense, moist |
| 3 | | | | | [Dotted Pattern] | SILTY SAND ; brown; very dense, moist |
| 4 | | | | | [Vertical Lines] | Recent Alluvium |
| 5 | | | | | [Vertical Lines] | SANDY SILT ; gray-brown mottled reddish brown, loose to medium dense, moist |
| 6 | | | | | [Vertical Lines] | |
| 7 | | | | | [Vertical Lines] | |
| 8 | | | | | [Dotted Pattern] | SANDY SILT TO SILTY FINE SAND ; gray, fine, interbedded with lenses and seams of silty sand; loose, wet |
| 9 | | | | | [Dotted Pattern] | |
| 10 | | | | | [Dotted Pattern] | |
| 11 | | | | | [Dotted Pattern] | Bottom of test pit at depth 11.0; completed and backfilled on 7/24/08. Seepage encountered during test pit exploration at depth 8 feet. |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01

LOG OF TEST PIT NO. TP-8

Surface Conditions:

Elevation (Approx.):

| Depth, ft | Elev., ft | Samples | Moisture Content, % | Other tests | Graphic Symbol | DESCRIPTION |
|-----------|-----------|---------|---------------------|-------------|----------------|---|
| | | | | | | <p>This log is part of the report prepared by Yonemitsu Geological Services (YGS) for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this trench at the time of excavation. Subsurface conditions may change at location with the passage of time. The data presented are a simplification of actual conditions encountered.</p> <p style="text-align: center;">Topsoil</p> |
| 1 | | | | | | <p>SILTY SAND; brown fine to medium, trace roots; medium dense, moist</p> <p style="text-align: center;">Recent Alluvium</p> |
| 2 | | | | | | <p>SAND; brown, fine to medium, trace silt; medium dense, moist</p> |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | <p>Bottom of test pit at depth 6.0; completed and backfilled on 7/24/08. No groundwater encountered during test pit exploration</p> |

SUMNER MIDDLE SCHOOL

Sumner, Washington

Project No.

08-1322-01