

RECORDING REQUESTED BY AND  
WHEN RECORDED RETURN TO:



Latah Properties, LLC  
PO Box 30745  
Spokane, WA 99223

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**DOCUMENT TITLE:** Geotechnical Basement Recommendations  
**DOCUMENT SOURCE:** AllWest Geotechnical Engineers  
**REFERENCE NUMBER:** Short Plat # SP-1478-08  
**LEGAL DESCRIPTION:**

The North Half of the Southwest Quarter of the Northeast Quarter of Section 2, Township 23 North, Range 43 East, W.M. in the County of Spokane, State of Washington; TOGETHER WITH East Half of the Southeast Quarter of the Northwest Quarter of said Section 2; ALSO TOGETHER WITH that portion of East 98.00 rods of the North half of the Southwest Quarter of said section lying northerly of Elder Road.

**ASSESSOR'S TAX PARCEL NOS.** 33025.9042

**NO CONSIDERATION**

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**Geotechnical Basement Recommendations**  
**for**  
**Short Plat SP-1478-08, Spokane County, Washington**

R. E. Excise Tax Exempt

Date *Jan 5* 2009

Spokane County Treas.

By *[Signature]*



August 5, 2008  
Project No. 207-049G1.

Mr. Michel Chadduck  
Latah Properties, LLC  
P.O. Box 30745  
Spokane, WA 99223

RE: Geotechnical Evaluation  
Latah Ridge Development  
East Stoughton Road  
Spokane County, Washington

Dear Mr. Chadduck,

As requested, we have completed the geotechnical evaluation for the above-referenced project in Spokane County, Washington. The general location of the project site is shown on the attached Site Location Map (see Figure 1). The purpose of our services was to evaluate subsurface conditions at the site and to assist in the design of pavements and stormwater management facilities. The following report summarizes the results of our analysis and engineering recommendations.

### **FIELD INVESTIGATION AND RESULTS**

We observed the excavation of fourteen test pits at the site on July 18, 2008 to collect samples for testing. The test pits were excavated at the approximate locations shown on the Test Pit Location Map attached with this report (see Figure 3). The test pits were excavated to depths ranging between approximately 0.6 and 15 feet below existing site grades.

Topsoil was encountered at the ground surface in nine of the fourteen test pits. The topsoil was approximately 2 to 6 inches thick and generally consisted of silt. Test pits TP-1, TP-2 and TP-14 encountered silt and silty sand (Alluvium) beneath the topsoil to depths of 7, 8, and 2.5 feet below existing site grade, respectively. Underlying the silty sand, these test pits generally encountered poorly-graded sands (Alluvium) to the depths explored. Test pits TP-1 and TP-14 encountered lean clay layers within the poorly-graded sands at depths of 12.5 and 8 feet, respectively.

Prior to placing the subbase, we recommend that all subgrade areas be proof-rolled with a loaded dump truck. This precautionary measure would assist in detecting any localized soft areas. Any soft areas discovered during the proof-rolling operation should be excavated and replaced with a suitable structural fill material. We recommend that the proof-rolling process be observed by a qualified geotechnical engineer to make the final evaluation of the subgrade. If the clay subgrade soils are completely removed from the roadway area, it is our opinion that the geotextile separator fabric can be eliminated.

We recommend specifying crushed gravel base meeting the requirements of the Washington Department of Transportation (WSDOT) Standard Specification 9-03.9(3) for crushed gravel base course. We recommend that the asphalt concrete pavement meet the requirements of WSDOT Standard Specification for Hot Mix Asphalt (HMA) Class asphalt concrete pavements. We recommend that the crushed gravel base be compacted to a minimum of 95 percent of its modified Proctor maximum dry density. We recommend that the asphaltic concrete surface be compacted to a minimum of 92 percent of the Rice density. If a high percentage of truck traffic is expected, we should be notified so we can review our pavement recommendations and provide revisions if necessary.

#### **Stormwater, Drainage, and Site Grading**

Based on the data obtained from the test pits, it is our opinion that stormwater disposal using standard drywells is not feasible due to the presence of silty soils near the surface and low permeability clay layers encountered at depth. It is our opinion, therefore, that gravel galleries should be considered for stormwater disposal. We recommend that field permeability testing be performed in the proposed stormwater disposal areas to provide accurate permeability and infiltration rates for design. We recommend performing test pit permeability tests in these areas.

We recommend that the site be graded such that storm run-off water is directed away from the building and pavement areas to a stormwater drainage system. We recommend that landscape areas be sloped a minimum of 6 inches within 10 feet of buildings and that slabs be sloped a minimum of 2 inches. In addition, we recommend gutters and downspouts with long splash blocks or extensions.

#### **Foundations Design**

We recommend that foundations bear at least 24 inches below the exposed ground surface for frost protection or as required by local building codes. Interior footings may be placed immediately below the slab. Isolated or unheated foundations should be placed at least 36 inches below the ground surface.



The native soils on the property below a depth of two feet generally consist of silty to lean clays. Based on the test pit data, we anticipate that footing subgrades for residential structures will consist primarily of these soil types, structural fill, or granite and basalt bedrock. It is possible that intact granite or basalt bedrock may be encountered. Foundation subgrade transitions from bedrock to soil could potentially result in abrupt differential settlement, which could result in visible cracking of foundation walls and interior finishings.

Where subgrades transition from bedrock to soil, if necessary, we recommend that bedrock be removed from below footings to provide a uniform subgrade. We recommend placing a minimum 12-inch cushion of fill compacted to a minimum of 92 percent of the modified Proctor maximum dry density. Alternatively, foundation could be extended to bear on bedrock.

We recommend that foundation bearing surfaces be free of loose soil and debris. If the foundation bearing soils are disturbed by excavation, the exposed soil should be re-compacted to a minimum of 92 percent of the modified Proctor maximum dry density. In order to provide a uniform foundation subgrade, we recommend that all foundation subgrades be surface compacted prior to placing forms for footings.

It is our opinion that the native soils are suitable for support of spread footings designed for a net allowable bearing pressure of 2,000 pounds per square foot (psf). This recommended bearing capacity includes a safety factor of at least 3.0 against shear failure.

Structural fill or backfill placed and compacted as previously recommended will be suitable for support of spread footings designed to exert a net allowable bearing pressure of up to 2,500 psf. The maximum net allowable bearing pressure values may be increased up to 30 percent to account for transient loads such as wind and seismic.

If the previous recommendations are implemented, it is our opinion that total settlement will be less than 1 inch and that differential settlement will be less than ½ inch.

We recommend that all backfill placed on the exterior sides of the foundation walls be compacted to a minimum of 90 percent of the modified Proctor maximum dry density. Beneath slabs, steps, and pavements, the backfill should be compacted to a minimum of 95 percent of the modified Proctor maximum dry density. Backfill should be brought up uniformly on both sides of the foundation walls to reduce displacement of the foundation walls.



### **Basement Recommendations**

Based on our review of the available soil and geologic data and the data obtained from the test pits, we anticipate that bedrock will be encountered on many of the lots at the site. Bedrock, if encountered, will consist of granite or basalt. Our previous experience in this area indicates that the upper zones of the bedrock can be excavated by a large trackhoe or similar equipment. However, the majority of the bedrock will likely require mechanical splitting for removal.

Based on our review of the available data and our test pit observations, it is our opinion that basements could be constructed at the site. However, several precautions should be taken to limit the potential for groundwater to adversely affect basements.

To protect against water-related problems, we recommend basement construction include damp-proofing all below-grade walls and installation of perimeter draitile (see Figure 4). The draitile should be placed adjacent to the footings at or below bottom-of-footing elevation. The draitile should be covered with a free-draining aggregate (e.g., pea gravel, ¾-inch nominal crushed gravel, etc.) to a minimum of 6 inches above the top of the pipe. The aggregate should be wrapped in a water-permeable geotextile fabric to prevent migration of fines and to reduce the potential for clogging.

Draitile can be routed to an interior sump (with pump) or outletted down-slope from the structure, if surface grades allow, for gravity drainage. If a sump is used, the collected water could be pumped to the exterior ground surface adjacent to the house provided surface grades direct water away from the structure.

We recommend that backfill placed against the foundation walls above the fabric consist of a free-draining sand or sandy gravel having less than 5 percent by weight passing a #200 sieve to allow water to migrate to the draitile system. The on-site soils could be used if a drainage mat is placed against the foundation walls.

### **REPORT LIMITATIONS**

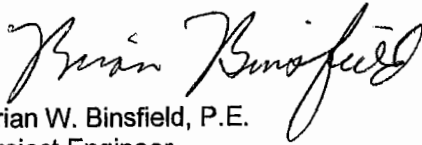
This report has been prepared to assist the planning and design of roadways and stormwater management facilities for the proposed Latah Ridge development in Spokane County, Washington. Our services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices. This acknowledgement is in lieu of all warranties either expressed or implied.



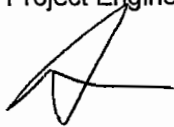
### GENERAL REMARKS

Thank you for the opportunity to provide our services. If you have questions or require additional information, please do not hesitate to contact our office.

Sincerely,  
ALLWEST Testing & Engineering, LLC



Brian W. Binsfield, P.E.  
Project Engineer



Paul T. Nelson, P.E.  
Senior Geotechnical Engineer

Attachments:        Site Location Map  
                          NRCS Soil Map  
                          Test Pit Location Map  
                          Logs of Test Pits TP-1 through TP-14  
                          Laboratory Test Results  
                          Flexible Pavement Section Design Worksheet

Cc: Whipple Consulting Engineers

