August 27, 2015
Project No. KE150320A

Lodgeworks Partners
8100 East 22nd Street, Building 500
Wichita, Kansas 67226

Attention: Mr. Mike Frey

Subject: Subsurface Exploration, Geologic Hazard, and Geotechnical Engineering Report
Redmond Town Center Parcel 1-D
7210 164th Avenue NE
Redmond, Washington

Dear Mr. Frey:

We are pleased to present our geotechnical engineering report for the referenced project. This report summarizes the results of our subsurface exploration, geologic hazard, and geotechnical engineering study, and offers recommendations for the design and development of the proposed project. The design recommendations presented in our referenced report are predicated on the design information available at the time our work was completed. If the nature of the project or the project design changes significantly from the condition assumed, our recommendations should be reviewed and verified, or modified, as needed.

Our work has been performed in general accordance with our scope of work and cost proposal dated June 12, 2015 and was authorized by a signed copy of our proposal. Our services for this project have been completed in accordance with local standards of practice in the field of geotechnical engineering at the time they were completed. No other warranty, express or implied, is made. The site location is shown on the "Vicinity Map," Figure 1. The approximate locations of the exploration borings observed for our study are shown on the "Site and Exploration Plan," Figure 2. Logs of the explorations (Appendix A) and laboratory result data (Appendix B) are also attached.

PROJECT AND SITE CONDITIONS

The project site is Parcel 1-D of the Redmond Town Center and is currently occupied by a one-story Claim Jumper Restaurant and adjacent parking located at the south end of the Town Center in Redmond, Washington. The parcel is bounded by Bear Creek Parkway to the south, 164th Avenue NE to the West, parking area to the north, and a one-story restaurant building to the east.

There is surface parking adjacent to the existing office building with common landscaping vegetation in the vicinity. The site is relatively flat with vertical relief across the parcel visually estimated to be less than 5 feet.

The proposed project will include construction of a seven-story above-ground building with two of the stories dedicated to parking. We understand that column loads for the building will be on the order of 900 kips. Below-grade construction may include mechanical space or a pool.

Subsurface Exploration

Subsurface exploration completed for this project included advancing four hollow-stem auger soil borings to depths of approximately 21.5 feet. These borings are identified on Figure 2 as borings EB-1 through EB-4. Copies of exploration logs for these borings are included in Appendix A. The conclusions and recommendations presented in this report are based, in part, on the explorations completed for this study. The locations and depths of the explorations were completed within site and budget constraints.

Exploration Borings

Exploration borings EB-1 through EB-4 were completed using a track-mounted, hollow-stem auger drill rig. During the drilling process, samples were generally obtained at 2.5- to 5-foot-depth intervals. The exploration borings were continuously observed and logged by an engineering geologist from our firm. The exploration logs presented in Appendix A are based on the field logs, drilling action, and inspection of the samples secured.

Disturbed but representative samples were obtained by using the Standard Penetration Test (SPT) procedure in accordance with *American Society for Testing and Materials* (ASTM):D 1586. This test and sampling method consists of driving a standard, 2-inch outside-diameter, split-barrel sampler a distance of 18 inches into the soil with a 140-pound hammer free-falling a distance of 30 inches. The number of blows for each 6-inch interval is recorded, and the number of blows required to drive the sampler the final 12 inches is known as the Standard Penetration Resistance (“N”) or blow count. If a total of 50 is recorded within one 6-inch interval, the blow count is recorded as the number of blows for the corresponding number of inches of penetration. The resistance, or N-value, provides a measure of the relative density of

granular soils or the relative consistency of cohesive soils; these values are plotted on the attached exploration boring logs.

The samples obtained from the split-barrel sampler were classified in the field and placed in watertight containers. The samples were then transported to our laboratory for further visual classification and laboratory grain-size analyses. The laboratory testing results are included in Appendix B.

Subsurface Conditions

Because of the nature of exploratory work below ground, extrapolation of subsurface conditions between field explorations is necessary. It should be noted that subsurface conditions differing from those indicated on the exploration logs may be present due to the random nature of deposition and the alteration of topography by past grading and/or filling. The nature and extent of any variations between the field explorations may not become fully evident until the time of construction.

Stratigraphy

Fill

Fill soils (those not naturally placed) were encountered in all four borings to a depth of 2 to 4 feet below the exiting ground surface. The fill was loose to medium dense and resembled the native site soils in gradation. The existing fill is not considered suitable for direct foundation support, but could be compacted in place to support floor slabs and pavement.

Holocene Alluvium

Sediments encountered below the surficial fill, asphalt pavement, or gravel surfacing generally consisted of medium dense, sandy gravel interbedded with gravelly sand with minor quantities of silt. Although we were unable to visualize maximum gravel size from the sampling method used, it is our experience that the sediments in this geologic unit typically contain coarse gravel and cobbles.

We interpret these sediments to be representative of younger alluvium deposited subsequent to the most recent glaciation of the project region. This geologic time period, known as the Holocene epoch, began approximately 12,000 years ago. Where present below the water table, these sediments appeared to be relatively free-draining. The Holocene alluvium extended beyond the maximum depth explored of approximately 21.5 feet.

The less gravelly strata within the Holocene alluvium are moderately liquefiable and may result in settlement of buildings directly supported on this material during a strong seismic event. This is discussed further in the “Liquefaction” section of this report. The granular (sand and

gravel) portion of the Holocene alluvium may be used in structural fill applications if it can be properly moisture-conditioned and compacted and is specifically allowed by project specifications.

Geologic Mapping

Review of the regional geologic map of the area titled *Geologic Map of King County*, compiled by Booth, Troost, and Wisher (2007) indicates that the area of the project site is underlain by Quaternary alluvium with Vashon recessional outwash and older, pre-Vashon-aged sediments exposed along the edges of the Sammamish River valley east of the site. Our interpretation of the sediments encountered in our explorations is consistent with the regional geologic map.

Hydrology

Ground water seepage was encountered in our explorations below depths of approximately 12 to 15 feet. Assuming a site surface elevation of about 35 feet, ground water is estimated to be at an elevation of about 20 to 23 feet. The ground water levels encountered are interpreted to be representative of the alluvial aquifer, which is likely hydraulically connected to the Sammamish River, located to the west of the subject property.

Review of water level data recorded by the City of Redmond for well W-2 (City of Redmond Well ID #540000MW062) which is about ¼ mile west of the subject site, for the time period from August 14, 2012 through July 2, 2013, indicates that the water level in this well fluctuated 2.46 feet over the monitoring period. Specifically, a seasonal low ground water surface elevation of 25.01 feet (NAVD 88 datum) was recorded on August 14, 2012 and a seasonal high ground water elevation of 27.47 feet was recorded on February 8, 2013.

Given the gradation of the sediments underlying the site, we anticipate that significant dewatering efforts may be required to control ground water flow into any excavations extending below the water table.

INFILTRATION FEASIBILITY ASSESSMENT

Our assessment of infiltration feasibility includes general surface characterization, subsurface exploration, and grain-size testing. It is our understanding that the project is under the City of Redmond 2012 *Clearing, Grading, and Stormwater Management Technical Notebook* (SWMTN), and the 2005 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (Ecology Manual), which will provide the guidance for the site suitability criteria for infiltration.

Holocene alluvium consisting of stratified sand and gravel was encountered near the ground surface. In our opinion, the unsaturated alluvial sand and gravel is a suitable receptor soil for storm water infiltration.

Sieve analyses conducted on selected samples of the alluvial sand and gravel collected from nearby sites for other projects indicate that these sediments classify as a "SAND" on the United States Department of Agriculture (USDA) soil textural triangle. The 2005 Ecology Manual recommends a long-term design infiltration rate no greater than 2 inches per hour (iph) into soil classified as sand. We anticipate that additional testing, area/facility-specific infiltration testing, and mounding analysis would support a higher design infiltration rate. It should also be noted that any infiltration system design would be dependent on depth to the seasonal high ground water table, as well as the depth of proposed improvements. In order to obtain a greater design infiltration rate we recommend that we conduct a series of infiltration tests at the site. We are available to discuss in-depth infiltration strategies, testing methods, and costs on request.

SEISMIC HAZARDS AND MITIGATIONS

Earthquakes occur regularly in the Puget Lowland. Most events are small and are usually not felt by people. However, large earthquakes do occur, as evidenced by the 1949, 7.2-magnitude event; the 2001, 6.8-magnitude event; and the 1965, 6.5-magnitude event. The 1949 earthquake appears to have been the largest in this region during recorded history and was centered in the Olympia area. Evaluation of earthquake return rates indicates that an earthquake of the magnitude between 5.5 and 6.0 is likely within a given 20-year period.

Liquefaction

Liquefaction is a process through which unconsolidated soil loses strength as a result of vibrations, such as those which occur during a seismic event. During normal conditions, the weight of the soil is supported by both grain-to-grain contacts and by the fluid pressure within the pore spaces of the soil below the water table. Extreme vibratory shaking can disrupt the grain-to-grain contact, increase the pore pressure, and result in a temporary decrease in soil shear strength. The soil is said to be liquefied when nearly all of the weight of the soil is supported by pore pressure alone. Liquefaction can result in deformation of the sediment and settlement of overlying structures. Areas most susceptible to liquefaction include those areas underlain by non-cohesive silt and sand with low relative densities, accompanied by a shallow water table.

The subject site is situated in a designated Seismic Hazard Area according to the City of Redmond seismic hazard map. To assess the liquefaction risk, we performed a preliminary liquefaction hazard analysis for this site in accordance with guidelines published in Seed & Idriss, 1982; Seed et al., 1985; and Kramer, 1996. Our liquefaction analysis was completed with

the aid of LiquefyPro computer software Version 5.8h (2009) by CivilTech Corporation. This program accepts input for SPT data, ground water levels, soil unit weight, and the depth and grain-size distribution of the sediments of concern to calculate seismically induced settlement. The preliminary liquefaction analysis was conducted based on the subsurface conditions encountered in the explorations drilled at the site; we use grain-size analysis results from other nearby projects on similar soils and SPT blow count data from the current borings. The following assumptions were used during the analysis:

- Conservative estimated unit weights were based on conventional values for the soil types encountered;

- Estimates of silt content were based on laboratory testing of selected samples from nearby projects on similar soils;

- Given the historical seasonal ground water fluctuation recorded at the site, ground water levels 2 feet above the levels observed at the time of our field study were assumed for our liquefaction analysis;

- We used two different wet settlement analysis methods embedded in the software and obtained a range of liquefaction-induced settlement values;

- The design event was considered a magnitude 7.0 earthquake with a peak horizontal ground acceleration of 0.51g, in accordance with the 2012 *International Building Code* (IBC).

Based on the liquefaction analysis utilizing the soil and ground water data from the site borings, the subsurface conditions encountered at the site pose a moderate risk of liquefaction and associated liquefaction-induced settlement. The liquefaction-induced settlement calculated for the site ranges from less than 1 inch to approximately 3 inches.

In our opinion, the magnitude of the predicted liquefaction-induced settlement for the property is within tolerable limits given that our analysis is based on a very large, very rare seismic event. Per the 2012 IBC, a design event for the subject location consists of a magnitude 7.0 earthquake with a peak vertical ground acceleration of 0.51g. Actual seismic events and forces experienced at the site will likely be much lower and result in less settlement.

Ground Motion

Structural design of the buildings should follow 2012 IBC standards using Site Class "D" as defined in Table 20.3-1 of *American Society of Civil Engineers* (ASCE) *7 – Minimum Design Loads for Buildings and Other Structures*. In accordance with the 2012 IBC, a spectral acceleration for the project area for short periods (0.2 seconds) of S_S = 1.33 and for a 1-second period of

S_1 = 0.48 should be used. Additionally, the maximum considered earthquake spectral response accelerations for short periods (0.2 seconds) of S_{MS} = 1.25 and for a 1-second period of S_{M1} = 0.73 should be used. These values were determined from the latitude and longitude of the project site using the U.S. Geological Survey (USGS) National Seismic Hazard Mapping Project website (http://earthquake.usgs.gov/designmaps/us/application).

DESIGN RECOMMENDATIONS

Our exploration indicates that, from a geotechnical standpoint, the subject site is suitable for the proposed development provided the risks discussed are accepted and the recommendations contained herein are properly followed. The site is underlain by moderately liquefiable alluvial sediments to depths greater than 21.5 feet. It is our opinion that the actual risk from liquefaction-induced settlement is low and that conventional slab-on-grade or spread footings may be used. If liquefaction hazards are to be totally mitigated, augercast piles or stone columns should be used for foundation support.

Site Preparation

Site preparation should include the demolition of the existing restaurant and the removal of all trees, brush, debris, pavement, old utilities, and any other deleterious materials. All disturbed soils resulting from demolition activities should be removed to expose underlying undisturbed native sediments and replaced with structural fill, as needed. All excavations below final grade made for demolition activities should be backfilled, as needed, with structural fill. Erosion and surface water control should be established around the clearing limits to satisfy local requirements.

Following demolition, site stripping, and potential excavation, the stripped subgrade within the building pad and any new paving areas should be proof-rolled with heavy, rubber-tired construction equipment, such as a fully loaded tandem-axle dump truck. Proof-rolling should be performed prior to structural fill placement. The proof-roll should be monitored by the geotechnical engineer so that any soft or yielding subgrade soils can be identified. Any soft/loose, yielding soils should be removed to a stable subgrade. The subgrade should then be scarified, adjusted in moisture content, and recompacted to the required density. Proof-rolling should only be attempted if soil moisture contents are at or near optimum moisture content. Proof-rolling of wet subgrades could result in further degradation. Low areas and excavations may then be raised to the planned finished grade with compacted structural fill.

In our opinion, stable construction slopes should be the responsibility of the contractor and should be determined during construction. For estimating purposes, however, we anticipate that temporary, unsupported cut slopes in the existing alluvium can be made at a maximum slope of 1.5H:1V (Horizontal:Vertical) or flatter.

Structural Fill

All references to structural fill in this report refer to subgrade preparation, fill type and placement, and compaction of materials, as discussed in this section. If a percentage of compaction is specified under another section of this report, the value given in that section should be used.

Structural fill is defined as non-organic soil, acceptable to the geotechnical engineer, placed in maximum 8-inch loose lifts, with each lift being compacted to 95 percent of the modified Proctor maximum density using ASTM:D 1557 as the standard. In the case of roadway and utility trench filling, structural fill should be placed and compacted in accordance with current City of Redmond codes and standards. The top of the compacted fill should extend horizontally outward a minimum distance of 3 feet beyond the locations of the roadway edges before sloping down at an angle of 2H:1V.

Soils in which the amount of fine-grained material (smaller than the No. 200 sieve) is greater than approximately 5 percent (measured on the minus No. 4 sieve size) should be considered moisture-sensitive. Use of moisture-sensitive soil in structural fills should be limited to favorable dry weather conditions, and is only permitted if specifically allowed by project plans and specifications. The native soils present on-site contained variable amounts of silt. Samples of the granular alluvium and recessional outwash sediments tested for our study contained less than 10 percent fine-grained material, though isolated beds of material within the geologic unit may be more fine-grained. We therefore classify on-site soils as slightly moisture-sensitive. The silt and peat sediments encountered in the western portion of the site are not suitable for reuse in structural fill applications.

Foundations

In our opinion, the magnitude of the predicted liquefaction-induced settlement for the property is within tolerable limits given that our analysis is based on a very large, very rare seismic event. Actual seismic events experienced at the subject site will likely be much lower and result in less settlement. Although the liquefaction-induced settlement is anticipated to be minor, the effects associated with the magnitude of predicted settlement and differential settlement may result in cosmetic damage to the structure that would warrant repairs following a large earthquake. It is our opinion that conventional slab or spread footings could be used for foundation support of the proposed project provided they are founded upon suitable foundation bearing strata as described below.

Spread footings may be used for building support when founded either directly on the alluvial sand and gravel sediments, or on structural fill placed over these materials. Alluvial sand and gravel sediments suitable for foundation support were encountered in exploration borings of approximately 2 to 4 feet. For footings founded either directly upon the natural alluvial sand and gravel, or on structural fill placed over these sediments, we recommend that an allowable

bearing pressure of 3,500 pounds per square foot (psf), including dead and live loads. We recommend that the footing subgrade be recompacted to a firm and unyielding condition prior to footing placement. An increase in the allowable bearing pressure of one-third may be used for short-term wind or seismic loading. If structural fill is placed below footing areas, the structural fill should extend horizontally beyond the footing edges a distance equal to or greater than the thickness of the fill.

Drainage Considerations

Foundations should be provided with foundation drains. Drains should consist of rigid, perforated, polyvinyl chloride (PVC) pipe surrounded by washed pea gravel. The drains should be constructed with sufficient gradient to allow gravity discharge away from the proposed building. Roof and surface runoff should not discharge into the footing drain system, but should be handled by a separate, rigid, tightline drain. In planning, exterior grades adjacent to walls should be sloped downward away from the proposed structure to achieve surface drainage.

Lateral Earth Pressures and Coefficients of Friction

Lateral loads can be resisted by friction between the mat foundation or grade beams and the alluvium or supporting structural fill soils, and by passive earth pressure acting on the buried portions of the mat foundations/grade beams. We recommend the following allowable design parameters:

- Passive equivalent fluid = 250 pounds per cubic foot (pcf)
- Coefficient of friction = 0.30

If an augercast pile foundation is used, base friction on the grade beams should be ignored in the structural design.

Floor Support

A slab-on-grade floor may be used directly over the medium dense natural sediments or over structural fill placed over the natural sediments. We anticipate that the lowest level of the building will support car traffic. Slab design can assume a soil subgrade modulus of 150 pounds per cubic inch (pci) for slabs cast over the medium dense natural sediments or a limited thickness of properly compacted structural fill placed over these materials.

The floor should be cast atop a minimum of 6 inches of washed pea gravel or clean, washed crushed rock to act as a capillary break. It should also be protected from dampness by an impervious, 15-mil (minimum thickness) plastic sheeting specifically designed for use as a moisture barrier. The capillary break and moisture barrier are considered damp proofing. If a more elaborate waterproofing system is desired, we recommend a waterproofing expert be consulted for design parameters that best fit the project.

Project Design and Construction Monitoring

We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, we can confirm that our earthwork and foundation recommendations have been properly interpreted and implemented in the design.

We are also available to provide geotechnical engineering services during construction. The integrity of the foundation system depends on proper site preparation and construction procedures. In addition, engineering decisions may have to be made in the field in the event that variations in subsurface conditions become apparent. Construction monitoring services are not part of this current scope of work but have been provided in a separate scope of work and cost proposal.

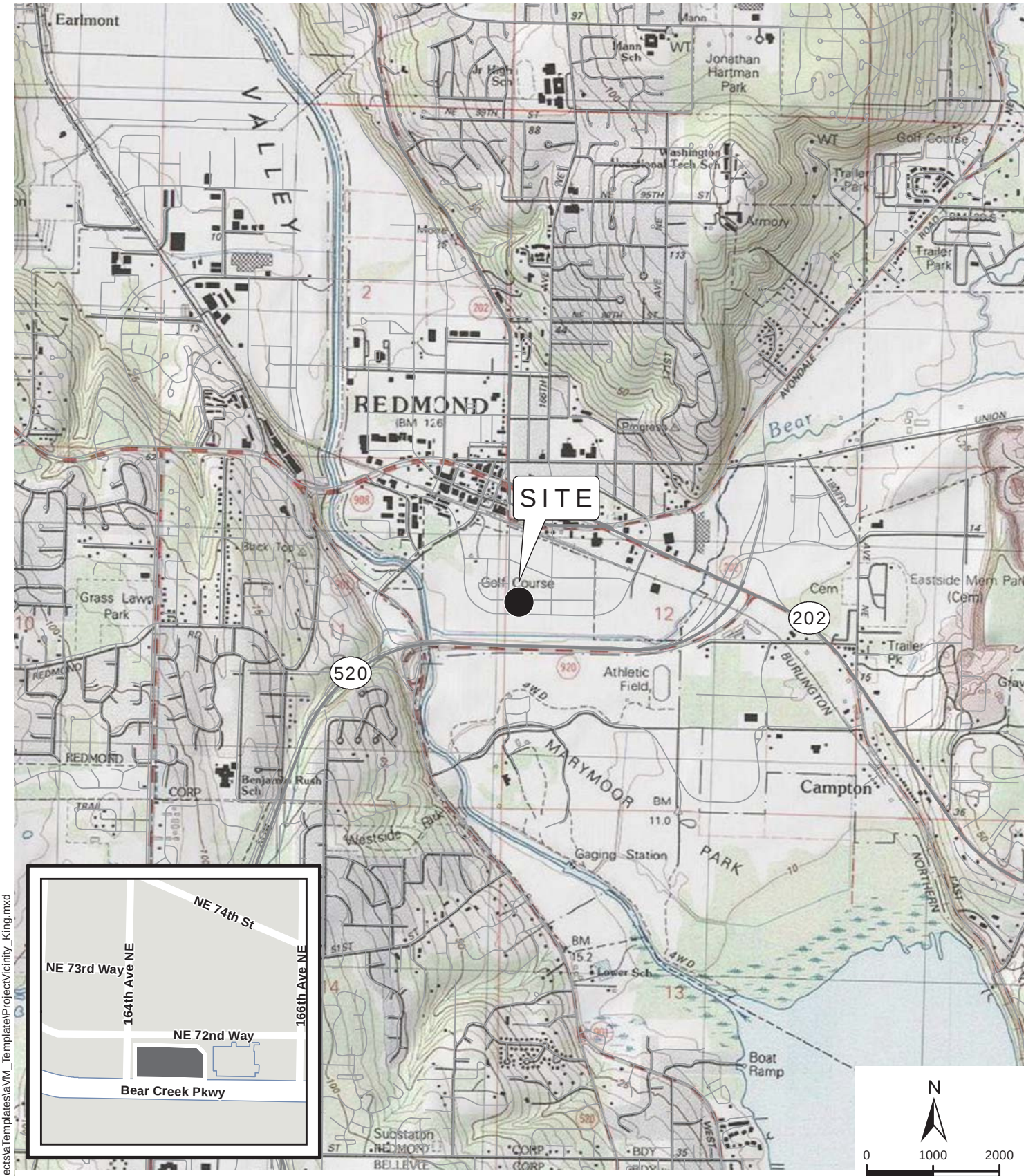
We have enjoyed working with you on this study and are confident that these recommendations will aid in the successful completion of your project. If you should have any questions or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington

Anthony W. Romanick, P.E.
Senior Staff Engineer

Kurt D. Merriman, P.E.
Senior Principal Engineer

Attachments: Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Appendix A: Exploration Logs
Appendix B: Laboratory Testing Results



REFERENCE: USGS, KING CO

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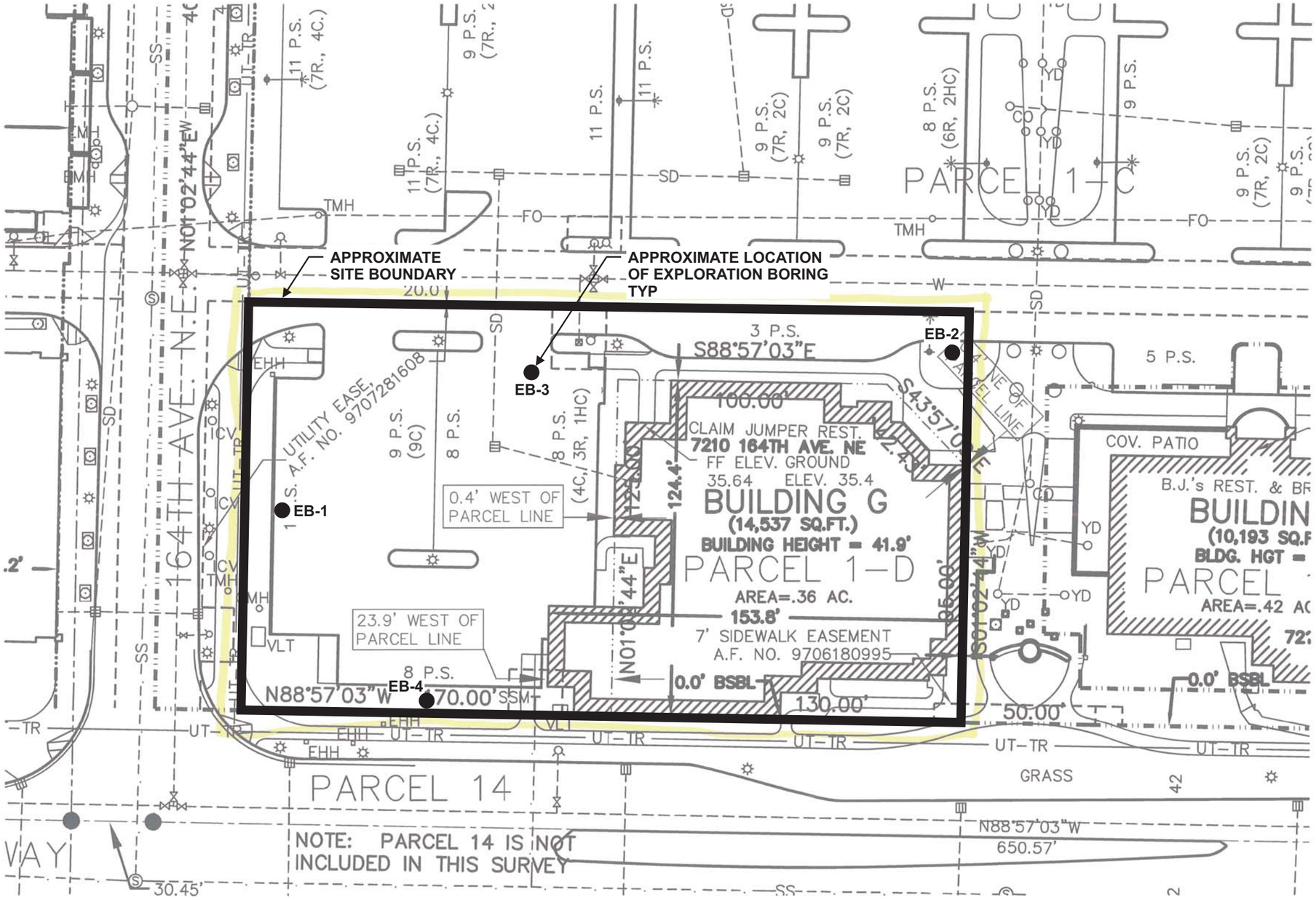
VICINITY MAP

REDMOND TOWN CENTER PARCEL 1-D
REDMOND, WASHINGTON

FIGURE 1

DATE 7/15

PROJ. NO. KE150320A



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NO SCALE

REFERENCE: MAGELLAN ARCHITECTS

150320 Redmond Town Center / F2 Site and Exploration Plan.cdr

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SITE AND EXPLORATION PLAN
REDMOND TOWN CENTER
REDMOND, WASHINGTON

FIGURE F2
DATE 7/15
PROJ. NO. KE150320A

APPENDIX A

Exploration Logs

Coarse-Grained Soils - More than 50% (1) Retained on No. 200 Sieve	Gravels - More than 50% (1) of Coarse Fraction Retained on No. 4 Sieve	≤5% Fines (5)	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≥12% Fines (5)	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% (1) or More of Coarse Fraction Passes No. 4 Sieve	≤5% Fines (5)	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≥12% Fines (5)	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% (1) or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

Coarse-Grained Soils

Density	SPT(2) blows/foot
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	>50

Fine-Grained Soils

Consistency	SPT(2) blows/foot
Very Soft	0 to 2
Soft	2 to 4
Medium Stiff	4 to 8
Stiff	8 to 15
Very Stiff	15 to 30
Hard	>30

Test Symbols

G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Chemical
DD = Dry Density
K = Permeability

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

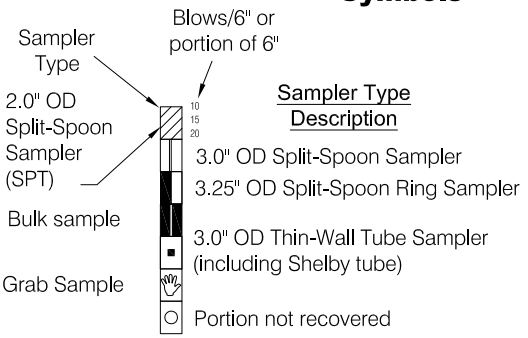
(3) Estimated Percentage

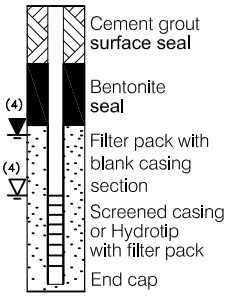
Component	Percentage by Weight
Trace	<5
Some	5 to <12
Modifier (silty, sandy, gravelly)	12 to <30
Very *modifier* (silty, sandy, gravelly)	30 to <50

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of ground water
▼ ATD = At time of drilling
▽ Static water level (date)
(5) Combined USCS symbols used for fines between 5% and 12%

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

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Exploration Log

Project Number	Exploration Number	Sheet
KE150320A	EB-1	1 of 1

Project Name	Redmond Town Center Parcel	Ground Surface Elevation (ft)	
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Boretec - Track Mounted	Date Start/Finish	7/13/15,7/13/15
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	4.25 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - 2 inches					
				Fill ?					
		S-1		Loose, moist, dark brown,silty SAND, trace organics (SM).			1 3	▲4	
				Younger Alluvial Deposits					
5		S-2		Gravel at 4 feet. Dense, moist, grayish tan, gravelly SAND, trace silt; fractured gravel in sample (SP).			16 12 17	▲29	
10		S-3		Dense, wet, gray, sandy GRAVEL, trace silt; poor recovery (GP).			25 17 25	▲42	
				Water at 12 feet.		▼			
15		S-4		Medium dense, wet, gray, gravelly SAND; grade to more gravelly toward sampler tip (SP).			10 16 8	▲24	
20		S-5		Dense, wet, gray, gravelly fine to coarse SAND (SP).			20 22 10	▲32	
				Bottom of exploration boring at 21.5 feet					
25									

Sampler Type (ST):

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

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: AWR
Approved by: JNS

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Exploration Log

Project Number	Exploration Number	Sheet
KE150320A	EB-2	1 of 1

Project Name	Redmond Town Center Parcel	Ground Surface Elevation (ft)	
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Boretec - Track Mounted	Date Start/Finish	7/13/15,7/13/15
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	4.25 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Bark / Topsoil					
				Younger Alluvial Deposits					
		S-1		Dense, moist, brown, silty SAND, some gravel; fractured gravel in sampler tip; poor recovery; blow count overstated due to gravel (SM).			50/6"	▲50/6"	
5		S-2		No recovery. Blow counts may be overstated due to gravel.			50/5"	▲50/5"	
10		S-3		Dense, moist, tan, sandy GRAVEL, trace silt; fractured gravel in sampler tip; poor recovery; blow counts my be overstated due to gravel (GP).			43 41 16	▲57	
15		S-4		Medium dense, wet, gray, sandy GRAVEL, trace silt; poor recovery (GP).		▼	16 12 12	▲24	
				Driller notes sandier drill action.					
20		S-5		Medium dense, wet, gray, fine to coarse SAND, some gravel; grade to coarser sand towards sampler tip (SP).			9 9 6	▲15	
				Bottom of exploration boring at 21.5 feet					
25									

Sampler Type (ST):

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

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: AWR
Approved by: JNS

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
KE150320A	EB-3	1 of 1

Project Name	Redmond Town Center Parcel	Ground Surface Elevation (ft)	
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Boretec - Track Mounted	Date Start/Finish	7/13/15,7/13/15
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	4.25 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - 3 inches					
				Fill ?					
				Driller notes gravelly drill action at 1 foot.					
		S-1		Dense, moist, brown, gravelly SAND, some gravel; fractured gravel in sampler tip; poor recovery; blow count may be overstated due to gravel (GP).			21 20 25	▲45	
				Younger Alluvial Deposits					
5		S-2		Dense, moist, tan, gravelly SAND; poor recovery (SP).			29 30 29	▲59	
				Driller notes sandier drill action at 8 feet.					
10		S-3		Medium dense, moist to very moist, gray, gravelly SAND, trace silt; becomes very moist in sampler tip; poor recovery (SP).			13 14 8	▲22	
				Driller notes gravelly drill action at 12 foot.					
15		S-4		Dense, wet, gray, fine to coarse SAND, trace silt (SP).		▼	21 14 16	▲30	
				Water at 16 feet.					
20		S-5		Dense, wet, gray, gravelly fine to coarse SAND; grade to coarser sand towards sampler tip (SP).			16 19 14	▲33	
				Bottom of exploration boring at 21.5 feet					
25									

Sampler Type (ST):

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

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: AWR
Approved by: JNS

associated earth sciences incorporated

Exploration Log

Project Number	Exploration Number	Sheet
KE150320A	EB-4	1 of 1

Project Name	Redmond Town Center Parcel	Ground Surface Elevation (ft)	
Location	Redmond, WA	Datum	N/A
Driller/Equipment	Boretec - Track Mounted	Date Start/Finish	7/13/15,7/13/15
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	4.25 inches

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
				Asphalt - 2 inches					
				Fill ?					
		S-1		Medium dense, moist, orange brown, silty SAND; mottled (SM).			7 4 6	▲10	
				Driller notes gravelly drill action at 4.5 feet.					
				Younger Alluvial Deposits					
5		S-2		Dense, moist, brownish gray, gravelly SAND, some silt (SP).			12 25 25		▲50
10		S-3		Medium dense, moist, tannish gray, sandy GRAVEL, some silt; poor recovery (GP).		▼	9 13 13	▲26	
15		S-4		Medium dense, wet, gray, gravelly fine to coarse SAND; contains orange silty clast in top half of sampler (SP).			12 13 10	▲23	
20		S-5		Dense, wet, gray, gravelly fine to coarse SAND; stratified (SP).			50/6"		▲50/6"
				Bottom of exploration boring at 21.5 feet					
25									

Sampler Type (ST):

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

M - Moisture

- Water Level ()
- Water Level at time of drilling (ATD)

Logged by: AWR
Approved by: JNS

APPENDIX B

Laboratory Testing Results

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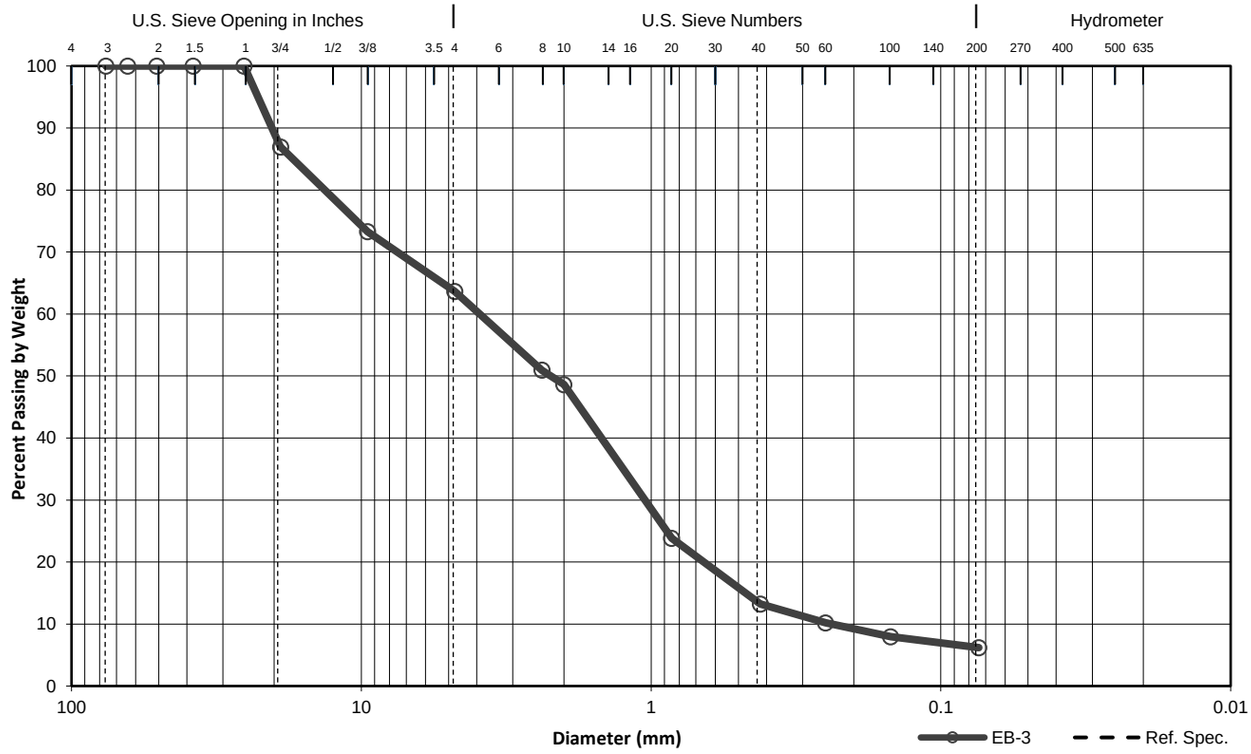
GRAIN SIZE ANALYSIS - MECHANICAL ASTM D422

Project Name	Project Number	Date Sampled	Date Tested	Tested By
Redmond Town Center	**Ke150320A**	**7/13/2015**	**7/22/2015**	**MS**

Sample Source	Sample No.	Depth (ft)	Soil Description
Onsite	**EB-3**	**1-15'**	**very gravelly SAND, some silt (SW-SM)**

Total Sample Dry Wt. (g)	Moisture Content (%)	D_{10} (mm)	Reference Specification
483.8	**13**	**0.238**	



Cobb.	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Sieve No.	Diam. (mm)	Cum. Wt. Ret. (g)	% Ret. by Wt.	% Passing by Wt.	% Specs. Pass. by Wt.	
					Min	Max
3	76.1		0.0	100.0		
2.5	64		0.0	100.0		
2	50.8		0.0	100.0		
1.5	38.1		0.0	100.0		
1	25.4		0.0	100.0		
3/4	19	63.1	13.0	87.0		
3/8	9.51	129.3	26.7	73.3		
#4	4.76	175.9	36.3	63.7		
#8	2.38	237.3	49.1	50.9		
#10	2	248.5	51.4	48.6		
#20	0.85	368.4	76.1	23.9		
#40	0.42	419.8	86.8	13.2		
#60	0.25	434.5	89.8	10.2		
#100	0.149	445.3	92.0	8.0		
#200	0.074	453.9	93.8	6.2		