GeoEngineers
600 Dupont Street
Bellingham, Washington 98225
360.647.1510

April 29, 2013

Ronald T. Jepson & Associates, Inc.
222 Grand Avenue, Suite C
Bellingham, Washington 98225

Attention: Ron Jepson, PE, LS

Subject: Letter Report
Geologically Hazardous Area Site Assessment
Proposed University Ridge Student Apartment Development
Bellingham, Washington
File No. 20245-001-00

INTRODUCTION AND SCOPE

This letter report presents the results of GeoEngineers' geologically hazardous areas site assessment for the proposed University Ridge Student Apartment development located at the northeast quadrant of the Nevada Street and Consolidation Avenue intersection in Bellingham, Washington. The site is shown in the attached Figure 1. We previously completed a Soil Conditions and Preliminary Findings Memorandum dated April 9, 2013. A geotechnical engineering report for the project will be completed at a future date as the project goes to design. Our geotechnical services were completed in general accordance with our proposal dated October 22, 2012. Site plans provided by Ronald T. Jepson & Associates, Inc. (Jepson) show the site and proposed development and the location of pertinent geologic hazard area, which is a steep slope area along and above the east property line.

As part of the overall project permitting process, the City of Bellingham (City) requires a geologically hazardous area site assessment report for the project. The purpose of our services is to evaluate the presence of geologic hazards and impacts of the project including any necessary mitigation strategies in accordance with the City of Bellingham Critical Area Ordinance (CAO), Bellingham Municipal Code 16.55.410 – 16.55.460. The site surface and subsurface conditions are described in in our previously referenced memorandum, and are duplicated here for clarity. Our preliminary memorandum for the project also describes the proposed project and provides preliminary conclusions and recommendations for the proposed grading, and project infrastructure.

GEOLOGICALLY HAZARDOUS AREAS

Geologically hazardous areas are designated by the City CAO as referenced above. In addition to providing the definition of, and criteria for, geologically hazardous areas in the CAO, the City has

developed a Geologic Hazard Areas Map Folio identifying these areas in their database. The CAO requires that a qualified professional assess the geologic hazards based on review of available information and field studies, evaluate the specific project proposal with respect to relationship and impact on the hazard area and adjacent sites if appropriate, provide minimum buffers and setbacks, and provide mitigation strategies where appropriate for specific geologic hazards.

The relevant geologically hazardous areas include erosion, landslide, and seismic hazards. Coal mine hazards have not been identified in the area of the site, and therefore will not be addressed further in this letter.

- **Erosion Hazard Areas -** Erosion hazard areas are defined by the CAO as areas prone to soil erosion and the conditions are listed in the ordinance. The soils mapping by the SCS indicates that the site is urban land. The slope on the eastern margin of the site is identified as an erosion hazard in the City Geologic Hazard Areas Map Folio. Additionally, an erosion hazard would exist if soils are disturbed during the earthwork phase of construction.
- **Landslide Hazard Areas -** Landslide hazard areas are defined by the CAO as those susceptible to landslides and/or subsidence that could include movement of soil, fill materials, rock or other geologic strata, and areas meeting specific criteria as defined in the ordinance. The soils mapping by the SCS does not indicate any landslide hazards for the area within the urban land. The eastern slope is identified as a landslide hazard in the City Geologic Hazard Areas Map Folio.
- **Seismic Hazard Areas -** Seismic hazard areas are defined by the CAO as those areas subject to severe risk of damage as a result of earthquake induced ground shaking, slope failure, settlement, soil liquefaction, lateral spreading, or surface rupture. The site is identified as a high response to shaking in the seismic hazard in the City Geologic Hazard Areas Map Folio.

Potential impacts and mitigation strategies for these hazards are discussed in the subsequent mitigation section of this report.

SITE CONDITIONS

We previously performed research regarding site conditions and a reconnaissance of the site and vicinity during completion of the test pits for the subsurface exploration program at the site.

Geology

The site is in an area mapped with glacial drift soils, which may have had some ice contact loading. Bedrock is also mapped in the nearby area and it is our experience that the glacial drift mantles the bedrock in the project vicinity.

Surface Conditions

The 11 acre site has a typical slope of 20 to 22½ percent downward to the west. This is flatter than the steep slope criterion per the CAO. However, a thin band of the steep slope greater than 40 percent is located along the east margin of the site and into the Puget Street right-of-way (ROW) as shown in attached Jepson drawing CG-1. Based on our observations, this steep slope is a result of former grading to construct Puget Street and likely consists of fill soils.

The site is heavily forested with mature and young conifer and deciduous trees with thick understory vegetation. An east to west trending stormwater drainage is located in the northern portion of the property. The stormwater in this area enters the site from a culvert that crosses the Puget Street ROW. The property to the north is a designated wetland and was donated to the City. A buffer from the wetland is associated with proposed site development.

Groundwater seeps were also observed at the ground surface in the eastern end of the Consolidation Avenue ROW to the south of the site, and also in the southwest portion of the site.

Field Observations of Geologically Hazardous Area

No significant evidence of slope instability was observed on the slopes at this site. The critical slope is covered with thick growths of understory vegetation including blackberry brambles. Natural groundwater springs are mapped at the site in the City Geologic Hazard Areas Map Folio, but not along the steep slope area.

Subsurface Explorations

We completed seven test pits ranging from 8 to 12½ feet below the ground surface (bgs) on December 13 and 14, 2012. A summary of the soil units encountered is provided below.

- The forest duff/topsoil thickness was observed to vary between about 1 and 2 feet across the site. The forest duff/topsoil horizon will be variable across the site because of the relative mature forested condition.
- Below the forest duff/topsoil, we observed an upper zone of soft to medium stiff silt with varying sand and gravel content/loose silty sand interpreted to be a weathered zone of the glacial drift. The weathered zone generally extended to approximate depths of 3½ to 4 feet bgs across the site, with the exception of test pit TP-4 where it extended to an approximate depth of 6½ feet, and TP-3 where fill was encountered.
- In test pit TP-3, fill soils consisting of soft grading to medium stiff sandy silt with varying gravel and cobble content extended to approximately 7½ feet bgs. The fill soils may be associated with previous grading for Puget Street. Loose wet silty sand was encountered in test pit TP-3 from approximate depths of 7½ to 11½ feet bgs, which is also likely representative of the weathered zone of the glacial drift.
- Non-weathered glacial drift was encountered in the site explorations below the weathered zone. The unit was generally comprised of stiff sandy silt but includes some sand layers. The glacial drift graded to very stiff to hard at approximate depths ranging from 4 to 5 feet bgs in test pits TP-1, TP-2, TP-6, and TP-7, and approximately 7 feet in TP-5 and 9 feet in TP-4. We did not observe this transition in TP-3 because of the depth of fill.
- Weathered sandstone bedrock was encountered at approximately 9 feet bgs in test pit TP-2. Native hard silt with rock-like concretions was encountered approximately 5 feet bgs in test pit TP-6, and may be transitioning to siltstone.
- No explorations were completed within the steep slope area identified because of the thick vegetation and limited access. Test pit TP-3 encountered fill, which could be material associated

with the Puget Street construction. The fill consisted of soft to medium stiff silt with sand and occasional gravel.

Groundwater

Perched groundwater seepage was encountered at variable depths in several test pits. It typically occurs within sandier zones of the glacial drift. Seepage observed in TP-1 through TP-3 may be resulting from the stormwater drainage that discharges onto the site. Seepage was also encountered in TP-7. Groundwater is expected to vary with precipitation, season, and other factors.

Rapid groundwater seepage and caving soils were observed in the silty sand unit in test pit TP-3 from approximately 7 to 11 feet bgs. This unit consists of sand to silty sand with variable gravel content and is typically loose to medium dense, but also includes some dense soil.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site evaluation, review of the City CAO, and our preliminary engineering analysis, it is our opinion that geologic hazards at or near the site can be mitigated with appropriate design and construction practices which are discussed in our Preliminary Findings Memorandum and will be further discussed in our final geotechnical report to be completed at a future date. The report sections below present a discussion of each potential hazard and recommendations for mitigation.

The proposed site layout and grading is shown in the attached Jepson drawing SL-1. A section showing the grading, buildings and retaining walls up the slope and into the Puget Street ROW is shown in the attached Jepson drawing Sheet SC-1. A retaining wall is planned along the eastern edge of the proposed parking area as shown in Sheets SL-1 and SC-1.

Geologic Hazards and Mitigation

Erosion Hazard Considerations

As currently envisioned earthwork construction for the proposed development will require cut and fill slopes and retaining walls. The slopes will be configured at 2H:1V (horizontal:vertical) or flatter, which will be stable at the site. Any disturbed slopes will be re-vegetated to provide resistance to erosion on these surfaces. Accordingly, in our opinion the constructed project will maintain or reduce the overall soil erosion potential.

The primary erosion hazard at the site is from temporary conditions created during construction. Significant excavation of existing materials and placement of fill materials will occur. In our opinion, provided typical erosion and sedimentation controls are implemented during construction, the project construction will not present a significant erosion hazard. Stormwater should be prevented from flowing across disturbed areas and not directed toward the slopes during construction. Temporary erosion control measures should be used during construction depending on the weather, location, soil/rock type, and other factors. Temporary erosion protection (e.g., straw, plastic, or rolled erosion control products [RECPs]) may be necessary to reduce sediment transport until vegetation is established or permanent surfacing applied. Appropriate best management practices (BMPs) have been incorporated into the temporary erosion and sediment control plan (TESCP) by the civil engineer for the project. All finished slopes should be protected and/or vegetated before the rainy season. During construction, the

contractor would be subject to Department of Ecology regulations which require performance based testing of turbidity at all discharge points. Proper construction practices and monitoring procedures will manage the risks to the standard of practice.

Landslide Hazard Considerations

The hazard identified is the steep slope along the east margin of the site, which consists of fill from the Puget Street ROW. The proposed site development will require temporary excavation into the steep slope construction of a retaining wall. The temporary slope will be completed in accordance with applicable codes and in such a manner to not undermine the integrity of the road during construction.

The design and specific retaining wall system is not identified at this time. However, we have recommended a mechanically stabilized earth system (MSE). This will likely consist of large concrete blocks such as Redi-Rock with geogrid reinforced fill and/or an anchor system for stability. The retaining wall will be designed by GeoEngineers or the contractor's engineer to include surcharge loading from slope and road above and include appropriate drainage measures. The wall will be design for internal stability and global stability and therefore mitigate the risk of landslide hazard. In fact, the wall will likely result in an improved stability situation rather than the oversteepened fill soils that are currently subject to stormwater discharge from the Puget Street ROW.

This same type of system may be used for other retaining walls incorporated into the project. Lower walls without significant surcharge can be designed as gravity walls without reinforcement. Surcharges from parking, buildings and other considerations will be incorporated as appropriate.

Seismic Hazard Considerations

SITE SEISMICITY AND GROUND SHAKING

The site seismicity will be discussed at greater detail in our future final geotechnical report. As is the case for all of Puget Sound, the site is subject to ground shaking during a design earthquake. The site is underlain by glacial soils and bedrock at shallow depths. A Site Class D can be used in accordance with International Building Code (IBC).

The project will be designed using the 2009 or 2012 IBC. The code incorporates design procedures to mitigate the risk of ground shaking. No known faults are located in the site vicinity therefore the site has a very low risk of ground fault rupture. The site is underlain by soils considered to have a low susceptibility to liquefaction. We conclude that no additional mitigation for seismic considerations is necessary.

LIMITATIONS

We have prepared this report for use by Ronald T. Jepson & Associates, Inc. and members of the design team for use in design of the Proposed University Ridge Student Apartment Development in Bellingham, Washington.

Our services were provided to assist in the permitting of planned structures and field improvements to be located near geologically hazardous areas. Within the limitations of scope, schedule and budget, our services have been accomplished in accordance with generally accepted geotechnical practices followed

in this area at the time this letter was prepared. No warranty or other conditions, express or implied, should be understood.

We appreciate the opportunity to provide these services. Please call if you have any questions or require additional information.

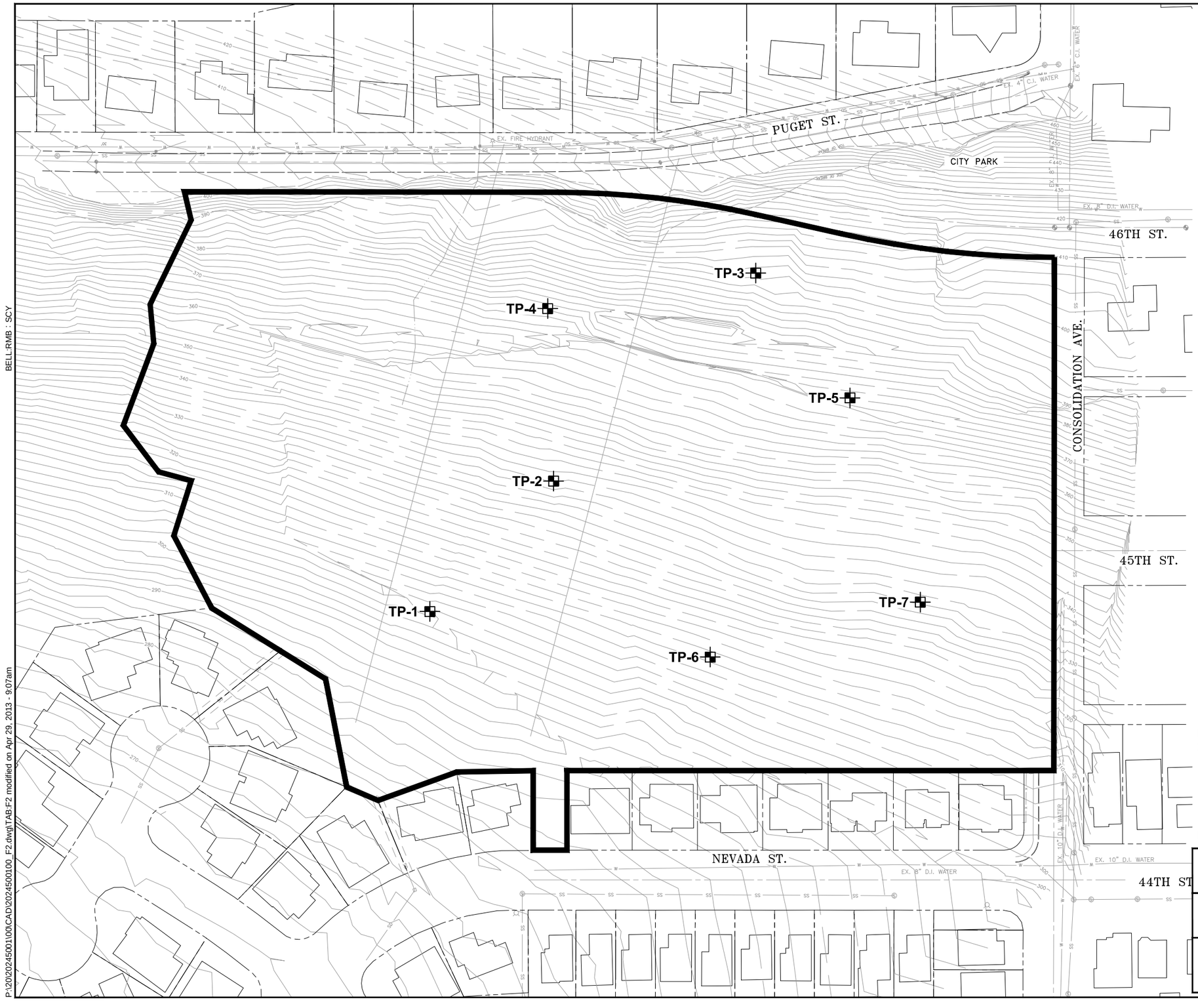
Sincerely,
GeoEngineers, Inc.

J. Robert Gordon, PE
Principal

AJH:JRG:tln

Attachments:
Figure 1. Site Plan (Figure 2 in April 9, 2013 Memorandum)
Sheet CG-1. Geohazard Areas (40%+ Slopes)
Sheet SL-1. Prop. Site Layout and Grading
Sheet SC-1. Proposed Site Section

One copy submitted electronically



Legend

TP-1 Test pit number and approximate location

N E S W

100 0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Drawing provided by Ronald T. Jepson & Assoc.

Site and Exploration Plan

University Ridge Development
Bellingham, Washington

GeoEngineers

Figure 1

BELL:RMB : SCY

P:\20202450010\CAD\2024500100_F2.dwg[TAB:F2 modified on Apr 29, 2013 - 9:07am

REVISIONS

DESIGNED BY	RTJ
DRAWN BY	EJP
DATE:	PRELIMINARY

RONALD T. JEPSON
SURVEYOR
PLS: 9361

PRELIMINARY
NOT FOR CONSTRUCTION

RONALD T. JEPSON & ASSOC.
CIVIL ENGINEERING – SURVEYING – LAND PLANNING
222 GRAND AVENUE, SUITE C, BELLINGHAM, WASHINGTON 98225
360-733-5760 FAX 360-647-8839 WWW.JEPSONENGINEERING.COM

PREPARED FOR: AMBLING UNIVERSITY DEVELOPMENT GROUP

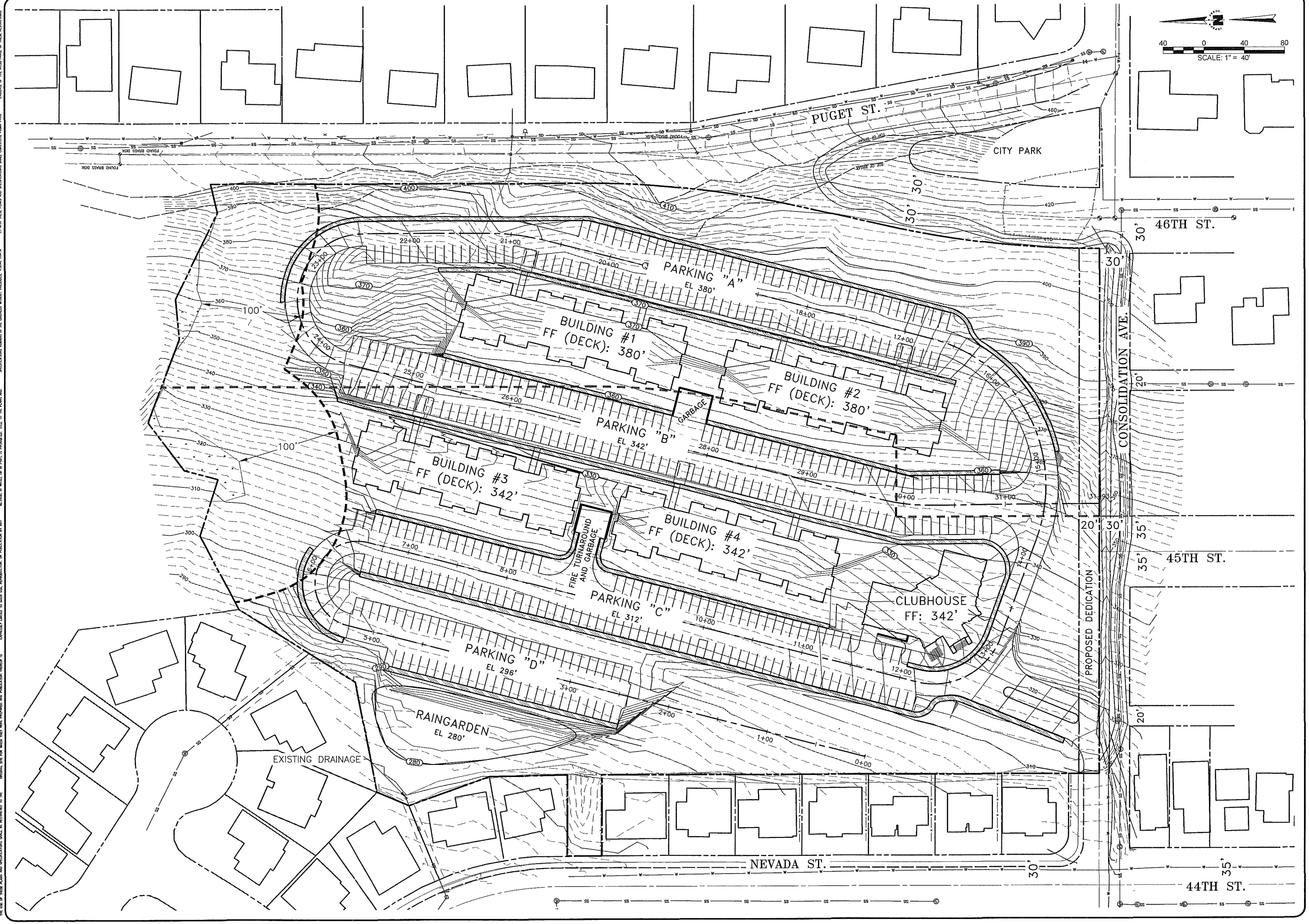
GEOHAZARD AREAS (40%+ SLOPES)

UNIVERSITY RIDGE STUDENT HOUSING

BELLINGHAM, WA

COUNTY OF WHATCOM, WASHINGTON

SCALE: AS SHOWN
DATE: 4/24/2013
SHEET: CG-1
WO: 11060



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PREPARED FOR: AMBLING UNIVERSITY DEVELOPMENT GROUP

PROP. SITE LAYOUT AND GRADING

UNIVERSITY RIDGE STUDENT HOUSING

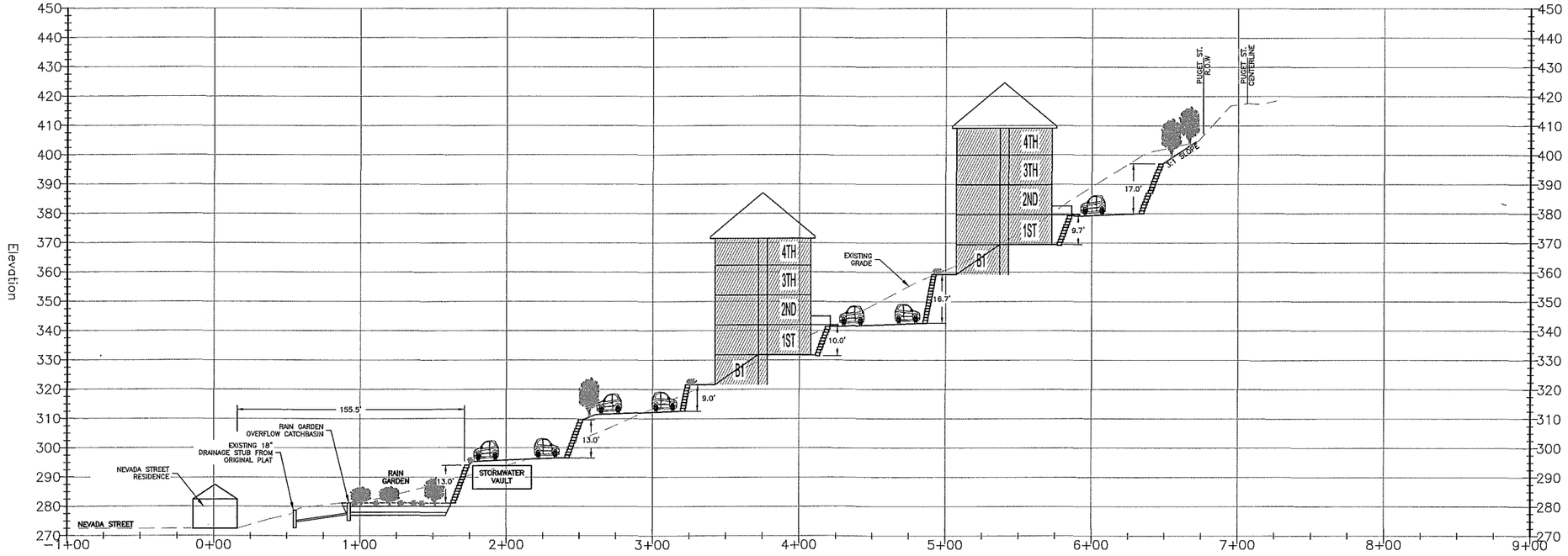
BELLINGHAM, WA

COUNTY OF WHATCOM, WASHINGTON

SCALE:	AS SHOWN
DATE:	4/22/2013
SHEET:	SL-1
WO:	11060

40 0 40 80
SCALE: 1" = 40'

SECTION A PROFILE STA −1+00 – 9+00
HORIZ: 1" = 40', VERT: 1" = 20'
VERTICAL EXAGGERATION: 2x



DESIGN NOTES

PROPOSED RETAINING WALLS ARE TYPICALLY LARGE BLOCK WALLS (REDI–ROCK OR EQUAL) WITH GEOTEXTILE ANCHORS. MULTIPLE SHORT WALLS IN A TERRACED CONFIGURATION WILL BE USED WHERE POSSIBLE IN THE FINAL DESIGN. IF TERRACED WALLS ARE NOT POSSIBLE PLANTER BLOCKS WILL BE UTILIZED PERIODICALLY TO PROVIDE OPPORTUNITY FOR TRAILING PLANTS ON THE WALL.

FOR CLARITY TYPICAL ITEMS SUCH AS HAND RAIL, CURBS, SIDEWALKS, DECKS, ETC HAVE NOT BEEN SHOWN.

CLEARING LIMITS EXCEED FINAL CUT/FILL LIMITS SHOWN ON THIS SHEET DUE TO EXCAVATION REQUIRED TO INSTALL WALLS. DISTURBED AREAS WILL BE LANDSCAPED PER THE LANDSCAPE PLAN.

ALL CUT AND FILL SLOPES ARE 2:1 MAXIMUM, 3:1 TYPICAL.

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PREPARED FOR: AMBLING UNIVERSITY DEVELOPMENT GROUP

PROPOSED SITE SECTION
UNIVERSITY RIDGE STUDENT HOUSING
BELLINGHAM, WA
COUNTY OF WHATCOM. WASHINGTON

SCALE: AS SHOWN
DATE: 4/24/2013
SHEET: SC–1
WO: 11060