DEVELOPMENT SERVICES DEPARTMENT
ENVIRONMENTAL COORDINATOR
11511 MAIN ST., P.O. BOX 90012
BELLEVUE, WA 98009-9012

DETERMINATION OF NON-SIGNIFICANCE

PROPONENT: Phil and Leslie Scott

LOCATION OF PROPOSAL: 407 Detwiller Lane

NAME & DESCRIPTION OF PROPOSAL: Scott Slide Repair

Construction of a soldier pile wall and vegetation restoration to repair a landslide in a steep slope critical area and protect an existing single-family residence and associated infrastructure.

FILE NUMBER: 11-119016-LO

The Environmental Coordinator of the City of Bellevue has determined that this proposal does not have a probable significant adverse impact upon the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(C). This decision was made after the Bellevue Environmental Coordinator reviewed the completed environmental checklist and information filed with the Land Use Division of the Development Services Department. This information is available to the public on request.

☐ There is no comment period for this DNS. There is a 14-day appeal period. Only persons who submitted written comments before the DNS was issued may appeal the decision. A written appeal must be filed in the City Clerk's office by 5:00 p.m. on _____.

☒ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS. There is a 14-day appeal period. Only persons who submitted written comments before the DNS was issued may appeal the decision. A written appeal must be filed in the City Clerk's Office by 5 p.m. on 9-15-11.

☐ This DNS is issued under WAC 197-11-340(2) and is subject to a 14-day comment period from the date below. Comments must be submitted by 5 p.m. on _____. This DNS is also subject to appeal. A written appeal must be filed in the City Clerk's Office by 5 p.m. on _____.

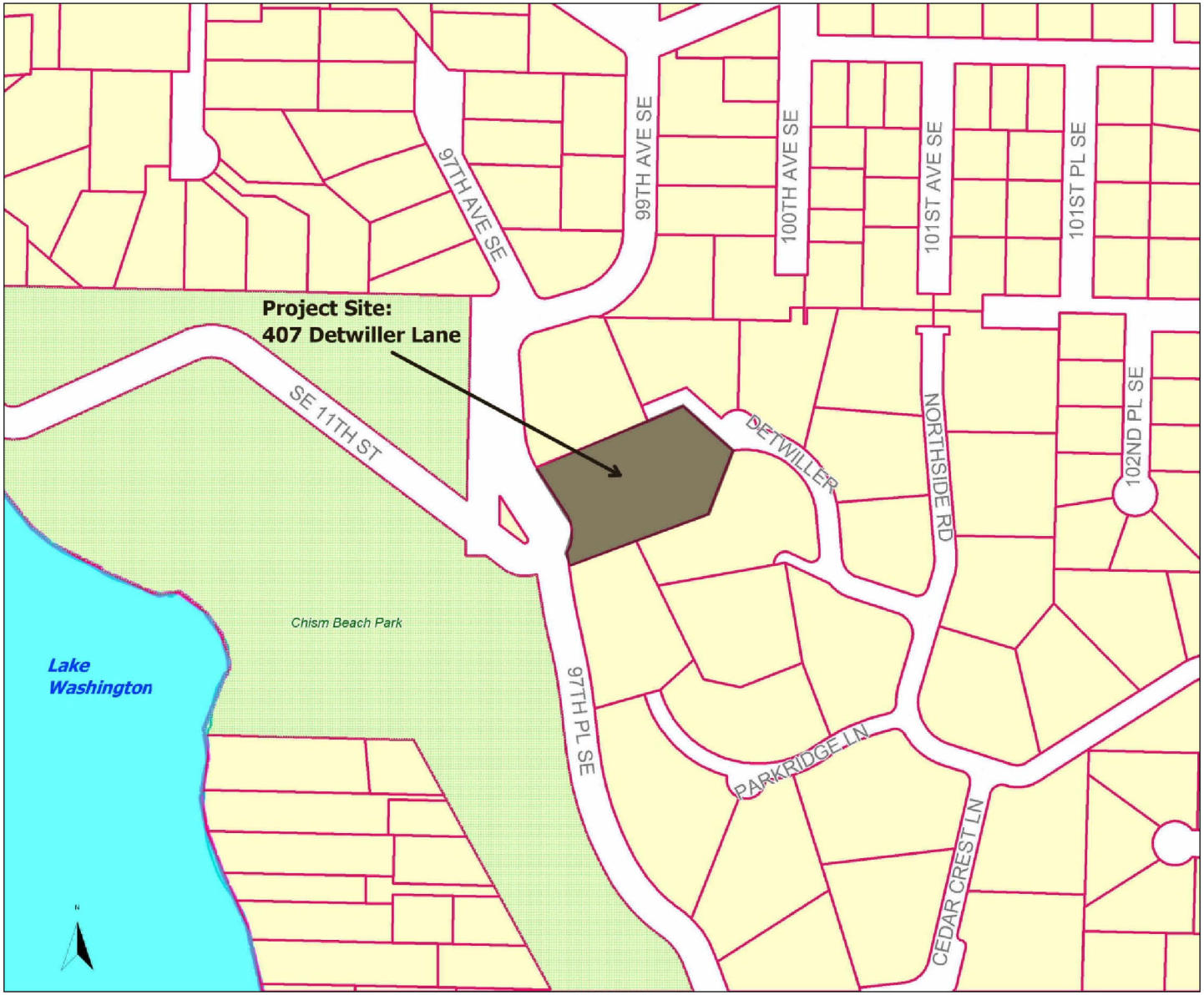
This DNS may be withdrawn at any time if the proposal is modified so that it is likely to have significant adverse environmental impacts; if there is significant new information indicating, or on, a proposals probable significant adverse environmental impacts (unless a non-exempt license has been issued if the proposal is a private project): or if the DNS was procured by misrepresentation or lack of material disclosure.

Environmental Coordinator

9-1-11
Date

OTHERS TO RECEIVE THIS DOCUMENT:
State Department of Fish and Wildlife
State Department of Ecology,
Army Corps of Engineers
Attorney General
Muckleshoot Indian Tribe

Scott Slide Repair
File Number: 11-119016-LO



City of Bellevue
Development Services Department
Land Use Staff Report

Proposal Name:	Scott Slide Repair
Proposal Address:	407 Detwiller Lane
Proposal Description:	Land Use review to construct a solider pile wall and restore vegetation within a steep slope critical area to repair a prior landslide.
File Number:	11-119016-LO
Applicant:	Phil and Leslie Scott, Property Owners
Decisions Included	Critical Areas Land Use Permit (Process II. 20.30P)
Planner:	Reilly Pittman, Land Use Planner
State Environmental Policy Act Threshold Determination:	**Determination of Non-Significance** Carol V. Helland, Environmental Coordinator Development Services Department
Director's Decision:	**Approval with Conditions** Michael A. Brennan, Director Development Services Department By: Carol V. Helland, Land Use Director

Application Date:	July 14, 2011
Notice of Application Date:	July 28, 2011
Decision Publication Date:	September 1, 2011
Project Appeal Deadline:	September 15, 2011

For information on how to appeal a proposal, visit Development Services Center at City Hall or call (425) 452-6800. Comments on State Environmental Policy Act (SEPA) Determinations can be made with or without appealing the proposal within the noted comment period for a SEPA Determination. Appeal of the decision must be received in the City's Clerk's Office by 5 PM on the date noted for appeal of the decision.

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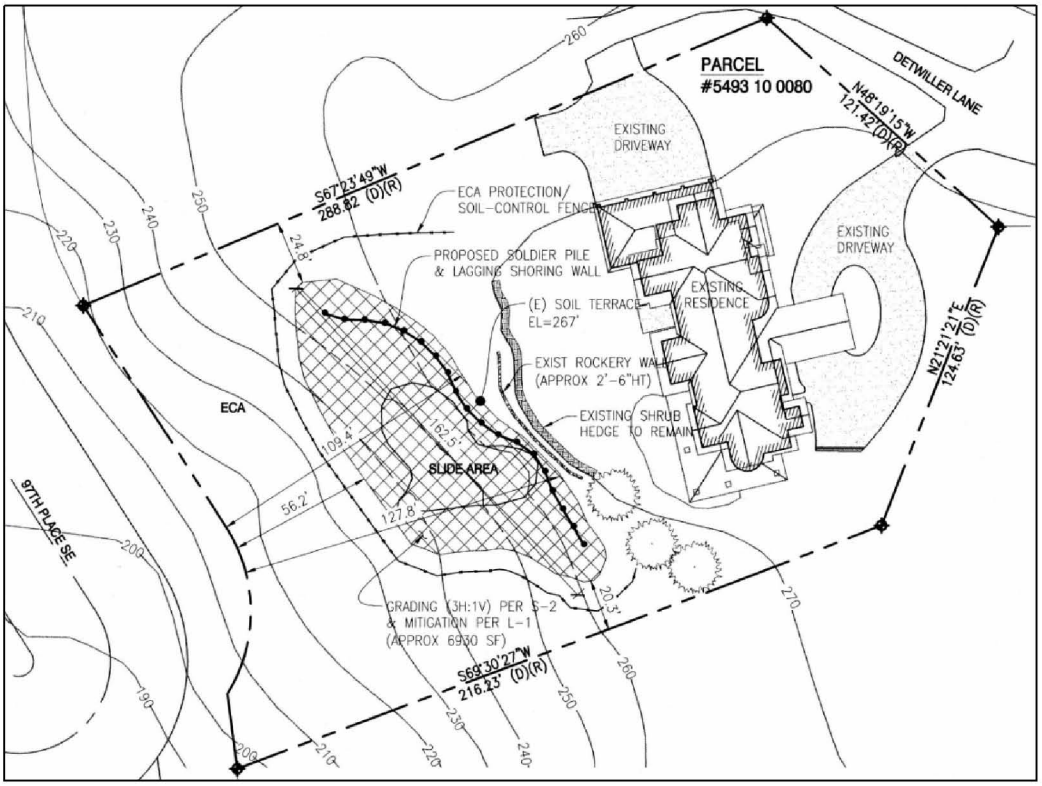
Attachments

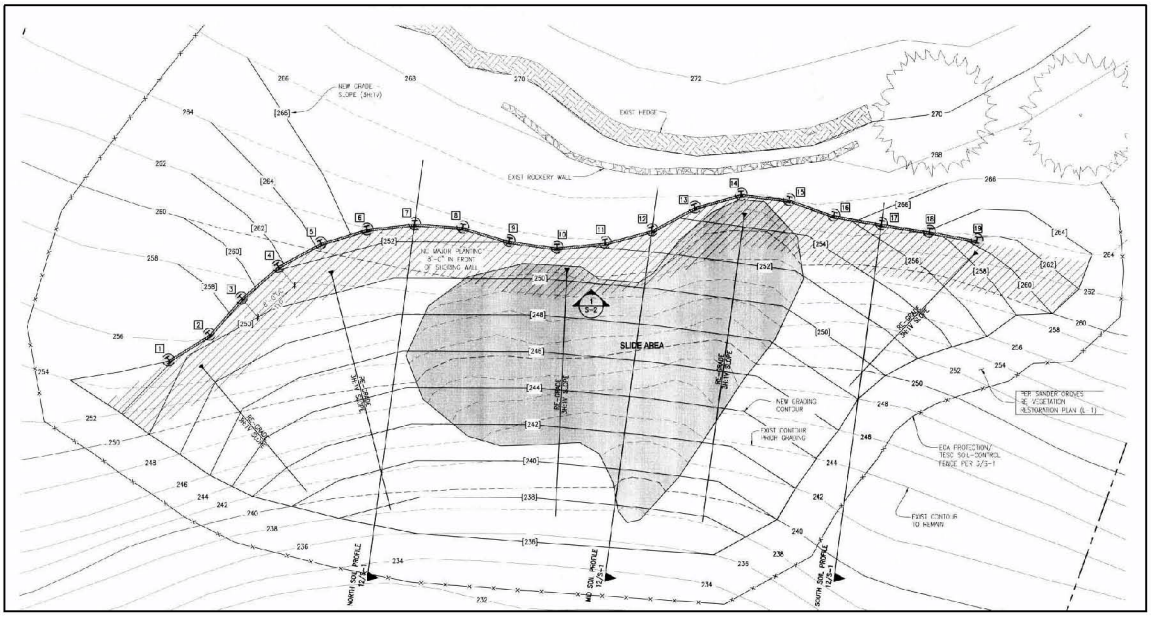
1. Site Plan – Enclosed
2. Geotech Report and Revision Letters prepared by Associated Earth Sciences – Enclosed
3. Restoration Plan – Enclosed
4. Public Comments and City Response – In File
5. Geotech Peer Review, Structural Review Summary, SEPA Checklist, application materials – In File

I. Proposal Description

The applicant proposes to construct a solider pile wall and restore vegetation to the steep slope below the wall in order to repair a prior landslide. This activity is classified as slope stabilization and is an allowed use in a critical area per LUC 20.25H.055. This proposal requires the approval of a Critical Areas Land Use Permit for the improvements to be allowed. See Figure 1 below for a site plan showing the proposal.

Figure 1





II. Site Description, Zoning, Land Use and Critical Areas

A. Site Description

The project site is located at 407 Detwiller Lane in the Southwest Bellevue subarea of the City. Other developed single-family zoned properties are located to the north, east, and south. The property is adjacent to 97th Pl. SE to the west, which separates the property from Chism Beach Park. The property obtains vehicle access from Detwiller Lane which is adjacent to the northwest. The steep slope critical areas on the property are located along the western half of the property, sloping steeply upward from 97 Pl. SE. The landslide occurred just below an existing rubble wall at the edge of the yard above the slope. The slide was approximately 2 feet in depth and impacted slopes on the middle of the site. See Figure 2 for existing site condition. The slide area is depicted on Figure 1.

Figure 2

B. Zoning

The property is zoned R-1.8, single-family residential which allows the construction of walls associated with single family development.

C. Land Use Context

The property has a Comprehensive Plan Land Use Designation of SF-L (Single Family Low Density). Construction of a wall is consistent with this residential land use.

D. Critical Areas On-Site and Regulations

i. Geologic Hazard Areas

Geologic hazards pose a threat to the health and safety of citizens when commercial, residential, or industrial development is inappropriately sited in areas of significant hazard. Some geologic hazards can be reduced or mitigated by engineering, design, or modified construction practices. When technology cannot reduce risks to acceptable levels, building in geologically hazardous areas is best avoided (WAC 365-190).

Steep slopes may serve several other functions and possess other values for the City and its residents. Several of Bellevue's remaining large blocks of forest are located in steep slope areas, providing habitat for a variety of wildlife species and important linkages between habitat areas in the City. These steep slope areas also act as conduits for groundwater, which drains from hillsides to provide a water source for the City's wetlands and stream systems. Vegetated steep slopes also provide a visual amenity in the City, providing a "green" backdrop for urbanized areas enhancing property values and buffering urban development.

III. Consistency with Land Use Code Requirements:

A. Zoning District Dimensional Requirements:

The R-1.8 zoning dimensional requirements found in LUC 20.20.010 apply to the proposed wall construction. The plans submitted generally demonstrate conformance with zoning dimensional standards, however conformance will be verified during building permit review.

B. Critical Areas Requirements LUC 20.25H:

The City of Bellevue Land Use Code Critical Areas Overlay District (LUC 20.25H) establishes performance standards and procedures that apply to development on any site which contains in whole or in part any portion designated as critical area, critical area buffer or structure setback from a critical area or buffer. The proposed soldier pile wall is stabilization which is an allowed use, provided certain requirements are met. The project is subject to the performance standards found in LUC 20.25H.055.C.3.m and LUC 20.25H.125 which are reviewed below.

i. Consistency With LUC 20.25H.055.C.3.m

Stabilization Measures. Proposed stabilization measures within a critical area or critical area buffer to protect against steep slopes or landslide hazards may be approved in accordance with this subsection.

a. When Allowed. New or enlarged stabilization measures shall be allowed only to protect existing primary structures and infrastructure, or in connection with uses and development allowed pursuant to subsection B of this section. Stabilization measures shall be allowed only where avoidance measures are not technically feasible.

Part of this proposal is to construct a soldier pile wall to protect an existing single

family primary structure and associated infrastructure. Due to the location of the landslide and existing improvements, avoidance of placing the solider pile wall in the steep slope is not possible. The wall is located as close to the top-of-slope as possible while also below the improvements which the wall is protecting.

b. **Type of Stabilization Measure Used. Where a stabilization measure is allowed, soft stabilization measures shall be used, unless the applicant demonstrates that soft stabilization measures are not technically feasible. An applicant asserting that soft stabilization measures are not technically feasible shall provide the information relating to each of the factors set forth in this section for a determination of technical feasibility by the Director. Only after a determination that soft stabilization measures are not technically feasible shall hard stabilization measures be permitted. The determination of whether a technique or stabilization measure is "technically feasible" shall be made by the Director as part of the decision on the underlying permit after consideration of a report prepared by a qualified professional addressing the following factors:**

1. **Site conditions, including topography and the location of the primary structure in relation to the critical area;**

2. **The location of existing infrastructure necessary to support the proposed measure or technique;**

3. **The level of risk to the primary structure or infrastructure presented by erosion or slope failure and ability of the proposed measure to mitigate that risk;**

4. **Whether the cost of avoiding disturbance of the critical area or critical area buffer is substantially disproportionate as compared to the environmental impact of proposed disturbance, including any continued impacts on functions and values over time; and**

5. **The ability of both permanent and temporary disturbance to be mitigated**

   The site was analyzed by a geotechnical consultant (Associated Earth Sciences) in a report dated February 9, 2011. A soldier pile wall and vegetation restoration is proposed to stabilize the steep slope which recently slid. Generally, due to the slope's proximity to the existing residence and infrastructure, the stability issues associated with the slope, and the existing grade of the slope, utilization of only soft stabilization was ruled out as vegetation by itself would not sufficiently protect existing infrastructure. The geotech found that the proposed solider pile wall will "effectively mitigate the risk of damage" to the improvements on the property (Pg. 9). The project will install a wall and restore the slope to a more stable condition which will then

be replanted. The existing vegetation on the slope is primarily blackberry; invasive and noxious species will remain dominant on the slope as long as the slope continues to have frequent movement that prevents more significant vegetation from establishing. A more stable slope will create opportunity for significant vegetation to establish, which will be started by the proposed restoration planting.

ii. Consistency with LUC 20.25H.125

Development within a landslide hazard or steep slope critical area or the critical area buffers of such hazards shall incorporate the following additional performance standards in design of the development, as applicable. The requirement for long-term slope stability shall exclude designs that require regular and periodic maintenance to maintain their level of function.

1. **Structures and improvements shall minimize alterations to the natural contour of the slope, and foundations shall be tiered where possible to conform to existing topography;**
   The proposed solider pile wall is not altering the natural contour of the slope. The natural contour has already been altered by the previous landslide. The geotech recommends that soil on the down-slope side of the wall be excavated "to a depth of 2 vertical feet" to create a flat area and "remove the driving force at the top of the steep slope" (Geotech Report, Pg. 6). No building foundations are proposed.

2. **Structures and improvements shall be located to preserve the most critical portion of the site and its natural landforms and vegetation;**
   The proposed development on the property is located in the steep slope near the top of the slope. The intent of the wall is to not alter the existing topography or to remove the steep slope from status as a critical area. The wall does not remove any significant vegetation or trees. Once the construction is complete the slope will be restored with planting per Attachment 3.

3. **The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties;**
   The project geotechnical engineer (Associated Earth Sciences) reviewed the proposal and provided recommendations. The geotechnical analysis and structural elements of the wall design was peer reviewed by an independent geotechnical consultant (GeoEngineers) who generally agreed with the applicant's geotechnical analysis. The project geotechnical engineer reviewed the issue of increased risk on neighboring properties and found that "the proposed development will not result in a greater risk to, or a need for, increased buffers on neighboring properties" (geotech response letter, Pg. 1). The applicant will be required to record a hold harmless agreement which releases the City from liability for any damage arising from the location of improvements within a critical area buffer in accordance with LUC 20.30P.170. See Conditions of Approval in Section X of this report.

4. **The use of retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes where graded slopes would result in increased disturbance as compared to use of retaining wall;**
   The proposed solider pile wall is part of the restoration of the slope which previously slid on this property. The wall will help maintain the restored grades but is not designed to totally prevent future sliding on the site.

5. **Development shall be designed to minimize impervious surfaces within the critical area and critical area buffer;**
   No impervious surfaces are proposed within the steep slope critical area.

6. **Where change in grade outside the building footprint is necessary, the site retention system should be stepped and regrading should be designed to minimize topographic modification. On slopes in excess of 40 percent, grading for yard area may be disallowed where inconsistent with this criteria;**
   The proposed wall is part of the restoration of the steep slope. This wall is not creating yard space and is intended to protect existing development above the wall.

7. **Building foundation walls shall be utilized as retaining walls rather than rockeries or retaining structures built separately and away from the building wherever feasible. Freestanding retaining devices are only permitted when they cannot be designed as structural elements of the building foundation;**
   No foundations are proposed and the existing house foundation cannot provide the same function as the proposed solider pile wall.

8. **On slopes in excess of 40 percent, use of pole-type construction which conforms to the existing topography is required where feasible. If pole-type construction is not technically feasible, the structure must be tiered to conform to the existing topography and to minimize topographic modification;**
   No enclosed structure is proposed.

9. **On slopes in excess of 40 percent, piled deck support structures are required where technically feasible for parking or garages over fill-based construction types; and**
   No parking area or garage is proposed.

10. **Areas of new permanent disturbance and all areas of temporary disturbance shall be mitigated and/or restored pursuant to a mitigation and restoration plan meeting the requirements of LUC 20.25H.210.**
    Once the slope is restored it will be planted per the plan as Attachment 3. The planting is required to be maintained and monitored for a period of at least three

years. An installation and maintenance surety will be required based on cost estimate which determines the installed costs of the plants and the cost to maintain and monitor the planting for three years. The installation surety will be released after planting installation and the maintenance surety will be released after the three-year monitoring, assuming restoration has been successful. The monitoring plan can be found in the conditions of approval at the end of this report. See Conditions of Approval in Section X of this report.

IV. Public Notice and Comment

Application Date:	July 14, 2011
Public Notice (500 feet):	July 28, 2011
Minimum Comment Period:	August 11, 2011

The Notice of Application for this project was published the City of Bellevue weekly permit bulletin on July 28, 2011. It was mailed to property owners within 500 feet of the project site. Comments were received from an adjacent property owner, Ms. Vaskevitch found in Attachment 4. Staff responses to each issue were provided by email and are also found in Attachment 4. The main concern was related to the potential for impacts to steep slopes on adjacent property as a result the proposed wall construction. Staff found that the project geotechnical analysis sufficiently addressed potential impacts to adjacent property as the geotech determined the project "will not increase the threat of geological hazard to adjacent properties over conditions that would exist" if the wall was not constructed (geotech response letter, Pg. 2).

V. Summary of Technical Reviews

A. Clearing and Grading

The Clearing and Grading Division of the Development Services Department has reviewed the proposed site development for compliance with Clearing and Grading codes and standards. The Clearing and Grading staff found no issues with the proposed development and has approved the application.

VI. State Environmental Policy Act (SEPA)

The environmental review indicates no probability of significant adverse environmental impacts occurring as a result of the proposal. The Environmental Checklist submitted with the application adequately discloses expected environmental impacts associated with the project. The City codes and requirements, including the Clear and Grade Code, Utility Code, Land Use Code, Noise Ordinance, Building Code and other construction codes are expected to mitigate potential environmental impacts. Therefore, issuance of a Determination of Non-Significance (DNS) is the appropriate threshold determination under the State Environmental Policy Act (SEPA) requirements.

A. Earth, Air, and Water

The nature of the soldier pile wall construction will result in some temporary earth movement and restoration of the slope which slid previously. Forty cubic yards of cut and forty cubic

yards for fill is anticipated. Sediments encountered are silt with fine sand in minor amounts. The silt becomes hard at a depth of 12 feet, consisting of very dense sand. The area soils are mapped as Vashon lodgement till with Vashon advance outwash. Erosion and sedimentation control requirements and BMPs will be reviewed by the Clearing and Grading Division under the building permit to construct the wall. See Conditions of Approval in Section X of this report.

B. Plants and Animals

No significant trees will be removed and no impacts to species of local importance are anticipated. The vegetation removed will be blackberry or other invasive plants. Once work is completed the slope will be restored with native vegetation.

D. Noise

The only noise anticipated as a result of this work will be from construction equipment. Noise is regulated by Chapter 9.18 BCC. See Conditions of Approval in Section X of this report.

VII. Changes to Proposal Due to Staff Review

Staff requested addition information from the geotechnical consultant to address the submitted comments regarding potential for risk to steep slopes on adjacent properties.

VIII. Decision Criteria

A. 20.30P.140 Critical Area Land Use Permit Decision Criteria – Decision Criteria

The Director may approve, or approve with modifications an application for a Critical Area Land Use Permit if:

1. **The proposal obtains all other permits required by the Land Use Code.**
   The applicant must obtain a building permit and any other required development permits. See Conditions of Approval in Section X of this report.

2. **The proposal utilizes to the maximum extent possible the best available construction, design and development techniques which result in the least impact on the critical area and critical area buffer.**
   The solider pile versus other alternatives such as rockeries, soil nailing, and stepped walls was determined to be the "most efficient method of protecting the property with the least amount of disturbance" to the steep slope critical areas. (Structural Review Summary, Pg. 1). In addition to the wall, the project also proposes restoration of the slope area with native planting to provide soft-stabilization on the slope.

3. **The proposal incorporates the performance standards of Part 20.25H to the maximum extent applicable.**
   As discussed in Section III of this report, the applicable performance standards of LUC Section 20.25H are being met.

4. **The proposal will be served by adequate public facilities including street, fire protection, and utilities.**
   The proposed activity will not impact public facilities.

5. **The proposal includes a mitigation or restoration plan consistent with the requirements of LUC Section 20.25H.210.**
   The restoration planting is proposed to be consistent with the City's planting templates for steep slopes. At time of building permit a cost estimate for the installed costs of planting will be required. The building permit must also include the submitted planting plan which shows where the plants are installed on the property. Part of the building permit inspection process will include an inspection by Land Use staff to ensure the planting is installed. The planting installation is required to be guaranteed by a performance surety which can be released once the plants are installed. A maintenance surety is also required which will be held for the 3-year monitoring period. See Conditions of Approval in Section X of this report.

6. **The proposal complies with other applicable requirements of this code.**
   As discussed in this report, the proposal complies with all other applicable requirements of the Land Use Code.

IX. Conclusion and Decision

After conducting the various administrative reviews associated with this proposal, including Land Use Code consistency, SEPA, City Code and Standard compliance reviews, the Director of the Development Services Department does hereby **approve with conditions** the proposed construction of a solider pile wall and vegetation restoration within a steep slope critical area. **Approval of this Critical Areas Land Use Permit does not constitute a permit for construction. A building permit, clear and grade permit, and/or utility permit is required and all plans are subject to review for compliance with applicable City of Bellevue codes and standards.**

Note- Expiration of Approval: In accordance with LUC 20.30P.150 a Critical Areas Land Use Permit automatically expires and is void if the applicant fails to file for a building permit or other necessary development permits within one year of the effective date of the approval.

X. Conditions of Approval

The applicant shall comply with all applicable Bellevue City Codes and Ordinances including but not limited to:

Applicable Ordinances	Contact Person
Clearing and Grading Code- BCC 23.76	Savina Uzunow, 425-452-7860
Land Use Code- BCC Title 20	Reilly Pittman, 425-452-4350
Noise Control- BCC 9.18	Reilly Pittman, 425-452-2973

The following conditions are imposed under the Bellevue City Code or SEPA authority referenced:

1. **Building Permit:** Approval of this Critical Areas Land Use Permit does not constitute an approval of a development permit. Application for a building permit or other required permits must be submitted and approved. Plans submitted as part of either permit application shall be consistent with the activity permitted under this approval.

   Authority: Land Use Code 20.30P.140
   Reviewer: Reilly Pittman, Development Services Department

2. **Geotechnical Recommendations:** The project shall be constructed per the recommended procedures and practices in the geotechnical report dated February 9, 2011 and the revision letters dated August 4, 2011 and August 18, 2011.

   Authority: Land Use Code 20.30P.140
   Reviewer: Reilly Pittman, Development Services Department

3. **Hold Harmless Agreement:** The applicant shall submit a hold harmless agreement in a form approved by the City Attorney which releases the City from liability for any damage arising from the location of improvements within a critical area buffer in accordance with LUC 20.30P.170. The hold harmless agreement is required to be recorded with King County prior to building permit issuance. Staff will provide the applicant with the hold harmless form.

   Authority: Land Use Code 20.30P.170
   Reviewer: Reilly Pittman, Development Services Department

4. **Maintenance and Monitoring:** The following monitoring plan is required for the mitigation planting associated with this approval. Monitoring reports should be mailed to:

   Environmental Planning Manager
   Development Services Department
   City of Bellevue
   PO Box 90012
   Bellevue, WA 98009-9012

   Goal:
   Establish vegetation on the restored slope.

   Objectives:
   Plant 4 species of trees, 9 species of shrub, and 3 species of ground cover

   Monitoring:
   Annual monitoring reports are to be submitted to Land Use each year for three years, with maintenance occurring in all 3 years. Photos from selected photo points will be

included in the monitoring reports to document the planting. The following schedule and performance standards apply:

Year 1 (one year from date of plant acceptance)
100% survival of all installed material or replanted in following dormant season to reestablish 100%
All installed large woody material shall be present and in the same location as when installed.

Year 2 (two years from date of plant acceptance)
90% survival of all installed material
Less than 10% coverage of planting area by invasive species or non-native/ornamental vegetation

Year 3 (three years from date of plant acceptance)
80% survival of all installed material
Less than 10% coverage by invasive species or non-native/ornamental vegetation

Authority: Land Use Code 20.30P.140; 20.25H.220
Reviewer: Reilly Pittman, Development Services Department

5. **Planting Cost Estimate:** A cost estimate for the installed costs of planting must be submitted prior to building permit issuance. The estimate shall also include the costs associated with maintenance and monitoring reporting for a period of three years.

   Authority: Land Use Code 20.30P.140
   Reviewer: Reilly Pittman, Development Services Department

6. **Installation Surety**: An installation surety is required based on the cost estimate. The installation surety is required prior to building permit issuance. The surety will be completed on a form provided by the City. This surety will be released after Land Use inspection of the planting installation.

   Authority: Land Use Code 20.30P.140
   Reviewer: Reilly Pittman, Development Services Department

7. **Maintenance Surety:** A maintenance surety is required based on the cost estimate. The maintenance surety is required to be held until completion of the 3-year monitoring. Release of this surety is contingent upon successful maintenance established by the plan above. The surety will be completed on a form provided by the City. Land Use inspection of the planting after 3 years is required to release the surety.

   Authority: Land Use Code 20.30P.140
   Reviewer: Reilly Pittman, Development Services Department

8. **Land Use Inspection:** Following installation of planting the applicant shall contact Land

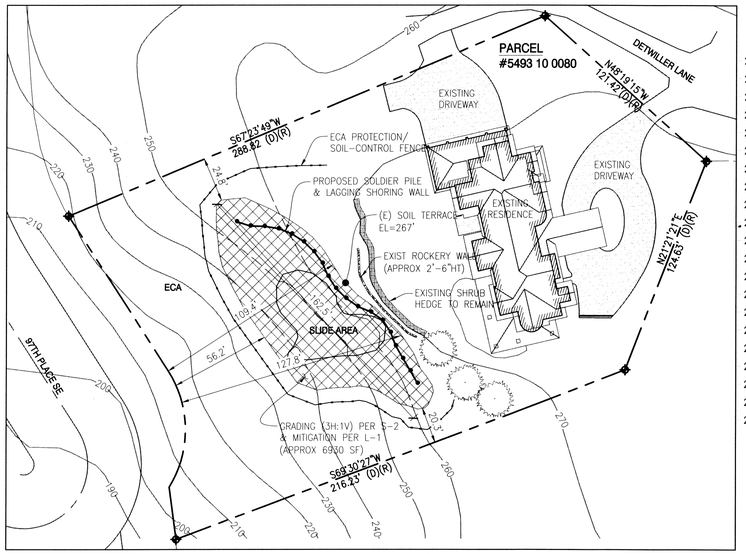
Use staff to inspect the planting area prior to final building inspection. Staff will need to find that the plants are in a healthy and growing condition. Land Use inspection is also required to release the maintenance surety at the end of the 3-year monitoring period. Release of the maintenance surety is contingent upon successful monitoring and maintenance.

Authority: Land Use Code 20.30P.140
Reviewer: Reilly Pittman, Development Services Department

9. **Noise Control:** Noise related to construction is exempt from the provisions of BCC 9.18 between the hours of 7 am to 6 pm Monday through Friday and 9 am to 6 pm on Saturdays, except for Federal holidays and as further defined by the Bellevue City Code. Noise emanating from construction is prohibited on Sundays or legal holidays unless expanded hours of operation are specifically authorized in advance. Requests for construction hour extension must be done in advance with submittal of a construction noise expanded exempt hours permit.

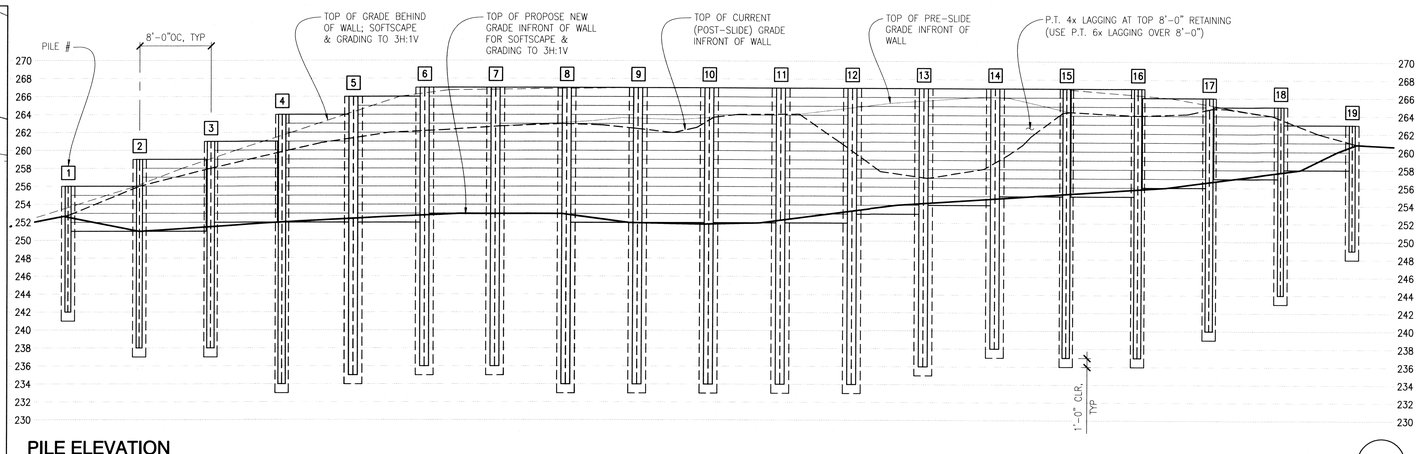
Authority: Bellevue City Code 9.18
Reviewer: Reilly Pittman, Development Services Department

Attachment 1
Site Plan



SITE PLAN

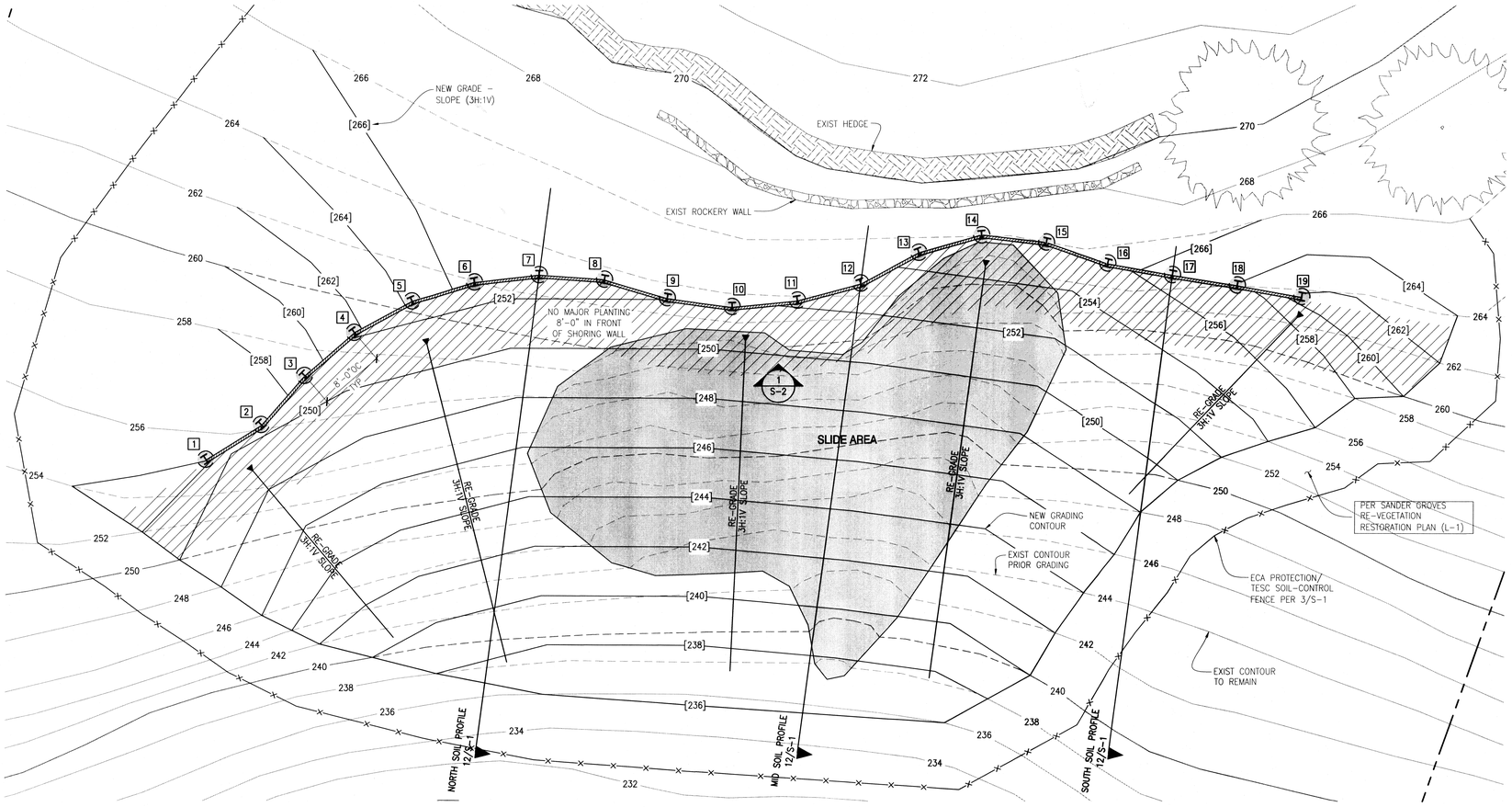
SCALE: 1" = 40'-0"



PILE ELEVATION

SCALE: 1/8" = 1'-0"

1



PILE LAYOUT PLAN

SCALE: 1/8" = 1'-0"

PILE SCHEDULE						
PILE #	AUGER DIA	PILE SIZE	MAX RETAIN HEIGHT	EMBED DEPTH	PILE LENGTH	QTY
1, 19	18"ø	W8x35	5'-0"	9'-0"	14'-0"	2
2, 18			8'-0"	13'-0"	21'-0"	2
3		W10x68	9'-0"	14'-0"	23'-0"	1
17			10'-0"	16'-0"	26'-0"	1
4, 15, 16			12'-0"	18'-0"	30'-0"	3
14	24"ø	W12x106	13'-0"	16'-0"	29'-0"	1
5-7, 13			14'-0"	17'-0"	31'-0"	4
8-12			15'-0"	18'-0"	33'-0"	5

PILE SCHEDULE

SCALE: 1/8" = 1'-0"

2

DIBBLE ENGINEERS, INC.

PROFESSIONAL STRUCTURAL ENGINEERING SERVICES

1029 Market Street, Kirkland, WA 98033
Phone (425) 828-4200 - Fax (425) 827-6131

Robb A. Dibble, PE, Principal
Travis S. Colliander, PE, SE, Associate
Juleen J. Rogness, PE, SE, Associate

WWW.DIBBLEENGINEERS.COM

SEAL:

ROBB A. DIBBLE — STATE OF WASHINGTON — 37445 — REGISTERED PROFESSIONAL ENGINEER — 7/14/11

PROJECT NAME:

SCOTT RESIDENCE
SITE STABILIZING SHORING WALL

407 DETWILLER LANE
BELLEVUE, WA 98004

PROJECT #: 11-047
DRAWN BY: TTP
REVIEWED BY: PK
DATE: 7/14/11

REVISIONS:

#	DATE	COMMENTS

SHEET TITLE:

STRUCTURAL
PILE LAYOUT PLAN,
SECTIONS & DETAILS

PERMIT SET

SHEET NUMBER:

S-2

Received
JUL 14 2011
Permit Processing

2011 | Projects | CAD Std Addenda | ed2D\2011-047 S-2 (Shoring_Details_7-13-2011 11:44:41 AM_Travis Hall, Dibble Engineers, Inc. (S).dwg)

Attachment 2
Geotech Reports and Revision Letter

Associated Earth Sciences, Inc.

Celebrating Over 25 Years of Service

February 9, 2011
Project No. KE100403A

Phil and Leslie Scott (Schlaepfer)
407 Detwiller Lane
Bellevue, Washington 98004

Subject: Landslide Evaluation
Scott Residence
407 Detwiller Lane
Bellevue, Washington

Dear Mr. and Ms. Scott (Schlaepfer):

This letter summarizes our findings of the subsurface exploration and geotechnical engineering study, and provides recommendations for mitigation of landslide hazards at the subject site. Our work has been completed in accordance with our authorized scope, schedule, and budget in accordance with generally accepted geotechnical engineering practices. This letter was prepared for the exclusive use of Phil and Leslie Scott (Schlaepfer), and their agents, for specific application to this project. No other warranty, express or implied, is made.

SITE AND PROJECT DESCRIPTION

The project site consists of a single-family residence located at 407 Detwiller Lane in Bellevue, Washington (Figure 1). A relatively level area of grass lawn and other landscaping located on the west (back) side of the home leads to the top of a steep, west-facing slope. The top of the steep slope is located approximately 60 feet west of the house. A concrete rubble wall, approximately 3 feet high, is located at the top of the slope.

A landslide recently occurred on the upper portion of the slope, approximately where shown on Figure 2. The top of the landslide is located approximately 1 foot below the toe of the rubble wall. The slide consisted of a shallow failure, less than approximately 2 feet in maximum depth. The total height of the portion of the slope over which the landslide occurred was visually estimated to be approximately 20 feet. At the time of our January 20, 2011 site visit, the slide area had been overlain by jute matting to control erosion. Vegetation remaining on the upper slope along the edges of the landslide consists predominantly of blackberries. The portion of the slope below the slide is forested (primarily with evergreen trees) with moderately thick to thick underbrush.

Received
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Permit Processing

It should be noted that another slide recently occurred on the lower portion of the northern extension of the slope, on the adjoining property to the north. This slide reportedly occurred in mid-December and is located approximately 150 feet northwest of the slide on the subject property. The off-site slide is more deeply seated (approximately 7 feet deep) than the slide on the subject site. During a brief reconnaissance of the off-site slide, we observed emergent seepage flowing from the base of the slide scarp. Because no ground water seepage was observed in the area of the landslide on the subject site, it is apparent that the subsurface conditions, and factors that triggered the off-site slide are likely different than those within the area of the slide on the Scott property.

A detailed topographic survey of the property was not available at the time of our study. A 3-dimensional depiction of the morphology of the slope and surrounding area is shown in the LIDAR-based image of the site shown on Figure 3. LIDAR (Light Detection and Ranging) is a technology that utilizes lasers to determine the distance to an object or surface, such as the surface of the earth. LIDAR-generated images of the type shown on Figure 3, project an image of the ground surface that is free of vegetation or other surface obstructions. These images can reveal geomorphologic details not readily apparent in conventional aerial photographs. The topographic contours shown on Figure 3 are based on the LIDAR data. Slope gradients depicted on Figure 3 on the steep slope west of the house range from approximately 35 to 60 percent grade, with the steepest gradients occurring just below the top of the slope. The total height of the slope from its top in the rear yard of the subject site to its toe adjacent to 97th Place SE is approximately 70 feet.

The purpose of this study was to evaluate the stability of the slope and to provide geotechnical design recommendations for landslide hazard mitigation.

SUBSURFACE CONDITIONS

In order to evaluate subsurface conditions in the area of the landslide, two exploration borings were drilled near the top of the slope, approximately where shown on Figure 2. Drilling was conducted using a limited-access, dolly-mounted, hollow-stem auger drill rig. During drilling, soil samples were collected at depth intervals of approximately 2.5 to 5.0 feet 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-Value"), or blow count. If a total of 50 blows 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 Standard Penetration Resistance provides a measure of the relative density of granular soils, or the relative consistency of cohesive soils; these values are plotted on the boring logs in Appendix A.

The samples obtained from the split-barrel SPT samplers were classified in the field and representative portions placed in water-tight containers. The samples were then transported to our laboratory for further visual classification and laboratory testing, as necessary.

Stratigraphy

Sediments encountered in the upper portions of both borings generally consisted of stiff to very stiff, tan to grayish tan silt with minor quantities of fine sand. At the location of exploration boring EB-1, the silt became hard below a depth of approximately 12 feet with slight fracturing, oxidized fracture surfaces, and scattered laminated zones. Similar sediments were encountered to the maximum depth explored in this boring of approximately 21.5 feet below the ground surface. Sediments encountered below a depth of approximately 12 feet in exploration boring EB-2 generally consisted of very dense, clean, fine sand. The very dense sand was encountered in this boring to the maximum depth explored of approximately 26.5 feet. Although the soil conditions encountered in the two borings were fairly different, the two borings were only drilled approximately 15 feet apart.

It is our opinion that the sediments encountered in the borings are representative of material deposited prior to the most recent glaciation of the subject area. This glacial period, known as the Vashon Stade of the Fraser Glaciation, occurred approximately 12,500 to 15,000 years ago. Review of the *Geologic Map of King County*, by Booth, Troost, and Wisher (2006) indicates that the area of the subject site is mapped as Vashon lodgement till with Vashon advance outwash sediments mapped on the lower portion of the slope. Although no pre-Vashon-aged sediments are mapped in the immediate vicinity of the subject site, some exposures of pre-Vashon sediments are mapped northwest of Meydenbauer Bay approximately 2 miles northwest of the subject site.

Hydrology

Although no ground water seepage was encountered in either of our borings, a minor amount of emergent seepage was observed near the toe of the slope, a few feet above 97th Place SE. It should be noted that the occurrence and level of ground water seepage below the site may vary in response to such factors as changes in season and precipitation patterns.

SLOPE STABILITY ANALYSIS

In order to evaluate the global stability of the proposed wall, we conducted a stability analysis of the slope using the slope modeling program Slope/W (Version 2007), by Geo-Slope International. The program used the Morgenstern-Price method for evaluating a rotational failure. Input parameters for the analysis included slope geometry, geology and ground water conditions, soil strength parameters, and dynamic (i.e., seismic) conditions. For our model, we assumed a slope inclination of 65 percent for the upper 20 feet of the slope, and an inclination of 50 percent for the remainder of the slope along the trace of section line A-A' (Figure 2). The 65 percent inclination used for the upper slope was estimated from maximum

hand-held inclinometer measurements observed within the area of the recent landslide. The 50 percent inclination used for the lower slope was based on the topography depicted on Figure 3.

For evaluation of slope stability under seismic conditions, a horizontal ground acceleration of 0.19g was used in our analysis. This seismic coefficient is equal to 0.5 times the 2009 *International Building Code* (IBC) peak ground acceleration. Soil strength parameters used for our analysis were assumed based on typical published values and our prior experience. The values assumed were conservatively selected to fall within the mid to lower range of typical values for the sediment types encountered. These values are shown in Appendix B.

As previously discussed, soil conditions differed fairly significantly between the two borings even though they were only located about 15 feet apart. For this reason, two separate models were evaluated for our analysis: one based on the conditions encountered in boring EB-1, and one based on the conditions encountered in boring EB-2. Because a minor amount of seepage was observed at the toe of the slope adjacent to 97th Place SE, a piezometric surface was included in the model, emerging a few feet above the toe of the slope.

The stability of a slope can be expressed in terms of its factor of safety. The factor of safety is the ratio between the forces that resist sliding to the forces that drive sliding. For example, a factor of safety of 1.0 would indicate a slope where the driving forces and the resisting forces are exactly equal. Increasing factor of safety values greater than 1.0 indicate increased stability. Factors of safety below 1.0 indicate conditions where driving forces exceed resisting forces and landsliding is imminent. In accordance with generally accepted engineering practice, factors of safety of 1.5 and 1.1 were considered to be the minimum acceptable values for slope stability under static and seismic conditions, respectively.

The results of the slope stability analyses are summarized below in Table 1. Copies of the Slope/W profiles, the soil strength parameters used for our analysis, and the calculated minimum factors of safety are provided in Appendix B.

Table 1
Summary of Slope Stability Analysis Results

Case	Minimum Factor of Safety	
	Static	Seismic
EB-1 Soil Conditions (Silt)	1.91	1.32
EB-2 Soil Conditions (Silt/Sand)	1.78	1.20
Minimum Acceptable Value	1.5	1.1

Our exploration was intended to evaluate the subsurface conditions in the area of the recent landslide. As previously discussed, the off-site landslide on the adjoining property to the north is deeper-seated than the sliding that occurred on the subject site, and occurred in an area of emergent seepage. Although no emergent seepage was observed in the area of the landslide on the Scott property, an area near the toe of the slope below the slide (adjacent to 97th Place SE)

was wet, indicating the presence of some emergent seepage in this area as well. Although no geomorphologic indications of previous sliding on the lower slope was observed, the presence of emergent seepage is a factor that increases the risk of sliding in this area. Review of the LIDAR image (Figure 3) indicates that the location of the recent off-site slide lies in a bowl-shaped depression on the lower slope. The morphology of this area suggests it may have been subjected to landslides in the past.

DESIGN RECOMMENDATIONS

Discussion

Our analysis indicates that the factors of safety calculated for the slope exceed the minimum generally accepted values of 1.5 and 1.1 for static and seismic conditions, respectively. It is important to recognize that the calculated values represent factors of safety with respect to the global stability of the slope. The recent slide that occurred on the slope is shallow, with a maximum estimated depth of approximately 2 feet or less and the slope stability analyses conducted for our study are not intended to model the potential for this sort of shallow landslide event.

In our opinion, this slide likely occurred as a result of saturation of the near-surface soils on the slope. The density/consistency of soils exposed on the face of such slopes is typically significantly lower than the underlying soils due to weathering and colluvial deposition. As a result, the shear strength of these materials is lower than the underlying intact sediments. Because of their reduced density, the permeability of weathered or colluvial sediments exposed on slope faces is also typically higher than that of the underlying unweathered sediments, increasing their vulnerability to saturation and further weakening. Although our analyses indicate that there is a low potential for a global, deep-seated failure of this slope, it is our opinion that there is a high risk of future, shallow failures similar to the recent slide. In particular, the head scarp of the recent slide is oversteepened and lies within approximately 1 foot of the toe of the existing rubble wall. There is a high risk that the head scarp will ravel to a more stable inclination, and such raveling could adversely impact the rubble wall.

Recommended Mitigation – Soldier Pile Wall Recommendations

In order to mitigate the risk damage to the existing rubble wall and landscaped portion of the yard, we recommend construction of a retaining wall at the top of the slope. It is our opinion that a soldier pile wall would be a suitable type of retaining structure for this application. Soldier piles consist of wide-flanged steel beams placed in pre-drilled holes that extend below the bottom of the retained soil zone. The portion of each soldier pile that extends below the retained soil height is grouted in place with sufficient-strength concrete to transmit the load from the soldier beams into the soil below the full depth of the retained soil. The portion of the soldier pile within the retained soil zone is backfilled with a relatively weak grout so that it may be removed, as necessary, for placement of lagging.

The soldier pile wall could be constructed in front of the existing rubble wall, and then backfilled, burying the rubble wall. Alternatively, the rubble wall could be removed. At a minimum, we recommend that the soldier pile wall extend laterally along the top of the slope at least 10 feet beyond the edges of the adjacent recent slide zone. The length of the wall could be increased beyond these points, if desired, to provide mitigation of additional area at the top of the slope.

We recommend that the soil immediately adjacent to the downslope side of the wall be excavated to a depth of 2 vertical feet below the existing grade to form a horizontal bench in front of the wall. The soil removed from this bench will reduce the driving force at the top of the steep slope and construction of the bench would eliminate the upper portion of the oversteepened slide scarp. Lagging should be placed between the soldier piles above the level of the bench. Given the height of the existing rubble wall of approximately 3 feet, removal of 2 feet of soil in front of the soldier pile wall would result in a total exposed wall height of 5 feet.

Because of the potential for continued landsliding on the downslope side of the wall, we recommend that the wall be designed to allow up to 5 vertical feet of additional soil loss on the east side of the wall. This would result in a wall designed to cantilever a vertical distance of 10 feet below the top of the wall. Greater loss of soil from in front of the wall would require supplemental soil anchors. A channel section should be welded to the soldier beams at the base of the lagging to provide support for the lagging in the event that continued loss of ground in front of the wall occurs. In the event of continued loss of ground in front of the wall, additional lagging should be added, as necessary, up to the full-recommended cantilever design height of 10 feet.

For wall heights of approximately 15 feet or less, soldier piles typically may be cantilevered without the use of tiebacks. For applications such as this where there are no settlement-sensitive structures near the back (upslope) side of the wall, the soldier pile wall may be designed using active lateral earth pressure conditions. Active earth pressure conditions will allow a small amount of movement of the retained soil and wall to develop the shear strength within the retained soil, and reduce the shoring design loads. Under these conditions, the amount of lateral movement of the wall will be equal to approximately 0.1 percent of the wall height. If minor settlement behind the wall does occur, we estimate that it will occur within a distance behind the wall approximately equal to the height of the retained soil.

For a cantilever shoring system, the applied lateral pressure can be represented by a triangular pressure distribution termed as an equivalent fluid density. We have provided equivalent fluid densities for shoring design based on a horizontal backslope behind the soldier pile wall. The equivalent fluid density presented subsequently does not account for stockpiled materials or additional surcharge loads within the influence zone behind the top of the wall. Based on these considerations and the anticipated soil conditions in the vicinity of the proposed retaining wall, we recommend design of the shoring with an active earth pressure condition using an equivalent fluid density of 35 pounds per cubic foot (pcf). The active pressure distribution should be assumed to be applied over the pile spacing above the base of the future soil level in

front of the wall (10 vertical feet). Below the base of the future downslope soil level, the lateral pressure should be applied over one concreted soldier pile diameter. To resist lateral loads, an allowable passive equivalent fluid unit weight of 250 pcf should be used for design assuming the soldier piles are embedded in the undisturbed, stiff to hard pre-Vashon silt or very dense sand sediments. The passive fluid pressure can be assumed to act over two concreted pile diameters. The passive pressure presented incorporates a factor of safety of at least 1.5.

Embedment depths of soldier piles below the design wall height of 10 feet must be designed to provide adequate lateral and/or kickout resistance to horizontal loads and satisfy force equilibrium. The design lateral resistance may be computed on the basis of the pressures presented previously. We recommend that lagging be installed over the full exposed height of the wall, with additional lagging to be added up to the maximum design height of 10 feet should additional loss of ground occur in front of the wall. Due to soil arching effects, lagging may be designed for 50 percent of lateral earth pressures used for wall design. Prompt and careful installation and backfilling of lagging will reduce potential loss of ground. Requirements for lagging should be made the responsibility of the wall contractor to prevent soil failure, sloughing, and loss of ground and to provide a safe working condition. We recommend that any voids between the lagging and the retained soil be backfilled. However, the backfill should not allow potential hydrostatic buildup behind the wall. Drainage behind the wall must be maintained. To help reduce the likelihood of soil migration from behind the lagging, we recommend the use of pea gravel for filling the voids behind the lagging.

Vertical loads on piles could be resisted by a combination of friction and end bearing. We recommend an allowable side friction value of 500 pounds per square foot (psf) and an end-bearing value of 10 kips per square foot (ksf) for design. The 10 ksf end-bearing value is predicated on embedment of at least 10 feet below the base of the retained soil zone and assumes penetration into the very stiff to hard pre-Vashon silt or very dense sand. These values include a factor of safety of at least 1.5.

A graphic representation of the active and lateral soil distributions is shown on Figure 4, "Soldier Pile Wall Design Criteria." The required pile lengths, steel reinforcement, and other design details should be determined by a structural engineer.

Although it is our opinion that the borings drilled for the soldier piles will generally remain open for a sufficient length of time to allow installation of the soldier piles, the contractor should be prepared to case the soldier pile borings if caving conditions are encountered to prevent loss of ground and facilitate proper grout placement.

Since completion of the piling takes place below ground, the judgment and experience of the geotechnical engineer or his field representative must be used for determining the acceptability of each pile. Consequently, the use of the presented design information requires that all piles be inspected by a qualified geotechnical engineer or engineering geologist from our firm who can interpret and collect the installation data and observe the contractor's operations. AESI,

acting as the owner's field representative, would keep records of pertinent installation data. A final summary report would then be distributed following completion of pile installation.

A survey of the surrounding structures and other critical reference points should be performed prior to construction activities. These points should then be accurately monitored both horizontally and vertically by a licensed surveyor, until the excavation is complete and permanent walls are constructed. A photographic and/or video survey is also recommended for surrounding structures to document their condition prior to development. This monitoring would act to provide early notice of slope movement or site settlement and provide an accurate record of pre-construction site conditions.

Future Wall Performance

The intent of the wall design presented in this report is to reduce the risk that loss of ground will occur within the landscaped portion of the yard in the event that additional landsliding should occur on the steep slope. Stabilization of a landslide mass from the top of the slide is difficult or impossible to accomplish and stabilization of the slope is not the intended purpose of the wall. The design recognizes the likelihood of future movement and incorporates the flexibility to accommodate a finite amount of movement. Building a wall that would not be affected by any future movement downslope may not be economically feasible. Therefore, the design as presented may need to be improved (i.e., tieback anchors) or augmented in the future.

PERMITTING CONSIDERATIONS

The steep slope on which the landslide occurred is classified by the City of Bellevue as a critical area due to the presence of the recent slope movement and due to the presence of slope inclinations in excess of 40 percent grade over a height exceeding 10 feet. Subsection 20.25H.055.C.3.M of the *Bellevue Municipal Code* (BMC) states that *"proposed stabilization measures within a critical area or critical area buffer to protect against streambank erosion or steep slopes or landslide hazards may be approved in accordance with this subsection."* In order for such work to be approved, the stabilization measure must be demonstrated to be technically feasible by addressing five factors. These five factors, along with our comments responding to the technical feasibility of each factor, are listed below.

1. **Site Conditions, including topography and the location of the primary structure in relation to the critical area.**

   The primary structure would consist of a soldier pile wall to be constructed near the top of the steep slope (i.e., near the top of the critical area). In order to protect the existing landscaped portion of the backyard, the wall would be constructed several feet in front (downslope) of the existing rubble wall. Because the top of the steep slope currently extends to within approximately 1 foot of the toe of the rubble wall, positioning the soldier

pile wall in front of the rubble wall would place the new wall within the critical area. The inclination of this portion of the slope is estimated to be approximately 60 percent grade.

2. **The location of existing infrastructure necessary to support the proposed measure or technique.**

   Existing infrastructure currently at risk of damage by landsliding includes the rubble wall and adjacent landscaped area of the backyard.

3. **The level of risk to the primary structure or infrastructure presented by erosion or slope failure and the ability of the proposed measure to mitigate that risk.**

   As previously discussed in this letter, it is our opinion that the risk of future shallow landslide events, similar in nature to the recent landslide event, is high. It is also our opinion that the recent landslide has resulted in an oversteepened condition that will likely ravel to a more stable inclination over time. Because the top of the existing slide scarp extends to within approximately 1 foot of the toe of the rubble wall, the risk posed by additional earth movement in this area to the rubble wall and adjacent portion of the yard is high. Construction of a soldier pile retaining wall at the top of the slope will effectively mitigate the risk of damage to the developed (landscaped) portion of the yard.

4. **Whether the cost of avoiding disturbance of the critical area or critical area buffer is substantially disproportionate as compared to the environmental impact of proposed disturbance, including any continued impacts on functions and values over time.**

   The rubble wall and adjacent landscaped portion of the yard are already existing so avoiding the critical area through the use of setbacks from these features does not apply in this case. The adjacent portion of the steep slope is vegetated primarily with blackberries. The area within the recent landslide is currently devoid of vegetation. The quality of the existing vegetation within the area of the proposed soldier pile wall is low.

5. **The ability of both permanent and temporary disturbance to be mitigated.**

   Permanent disturbance posed by the proposed wall construction will be limited to the footprint of the wall. Because the proposed retaining wall will have a small footprint, the area of permanent disturbance will be low. In addition, construction of the wall will provide a long-term reduction in disturbance by mitigating the risk of landslide-related disturbance behind (upslope of) the wall. Temporary disturbance resulting from construction of the wall will be limited to a relatively small area adjacent to the wall and in the adjacent upslope area outside of the critical area. This disturbance to the site can be readily mitigated through the use of prudent erosion control management practices, including, but not necessarily limited to:

- The use of properly embedded silt fencing around the lower perimeter of the cleared area.

- Stabilizing the construction entrance with a gravel pad to minimize tracking sediment off-site.

- Limiting the construction to the dry season (typically April 1st to October 31st).

- Temporarily covering areas stripped of vegetation during construction with mulch, plastic sheeting, or other temporary cover measures.

- Directing runoff from upslope areas away from the areas of disturbance.

- Hauling off or covering soil stockpiles with plastic sheeting, and limiting placement of stockpiled soils locations outside of the critical area.

- Monitoring the effectiveness of the erosion control practices in use and maintaining/improving these practices, as appropriate.

- Re-establishing vegetation in disturbed areas of the slope by placement of hydroseed and/or landscaping plants.

Removal of the existing blackberry cover in the disturbed portion of the steep slope and replacing these plants with hydroseed or native plants will result in a higher quality vegetative cover.

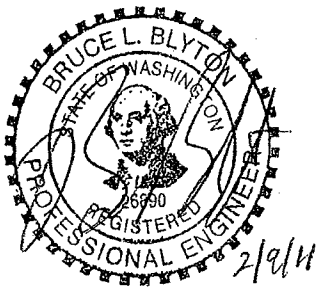
PROJECT DESIGN AND CONSTRUCTION MONITORING

Prior to proceeding with further design work, we recommend scheduling a pre-application meeting with the City of Bellevue to discuss any permitting/code issues the City may have for the project, prior to proceeding forward with further design work. A topographic survey of the project area will be needed to verify the estimated slope gradients assumed for our analysis and to determine the wall layout. We are available to assist you in arranging for this service.

We recommend that AESI perform a geotechnical review of the plans prior to final design completion. In this way, our earthwork and foundation recommendations may be properly interpreted and implemented in the design. We are also available to provide geotechnical engineering and monitoring services during construction. The integrity of the soldier pile wall will depend on proper 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. If these services are desired, please let us know, and we will prepare a proposal.

We appreciate this opportunity to have been of service to you with your project. Should you have any questions, or require additional information, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



Timothy J. Peter, L.E.G., L.Hg.
Senior Project Geologist

Bruce L. Blyton, P.E.
Principal Engineer

Attachments:
Figure 1: Vicinity Map
Figure 2: Site and Exploration Plan
Figure 3: Site – LIDAR Imagery
Figure 4: Soldier Pile Wall Design Criteria
Appendix A: Exploration Logs
Appendix B: Slope/W Slope Stability Analysis Profiles

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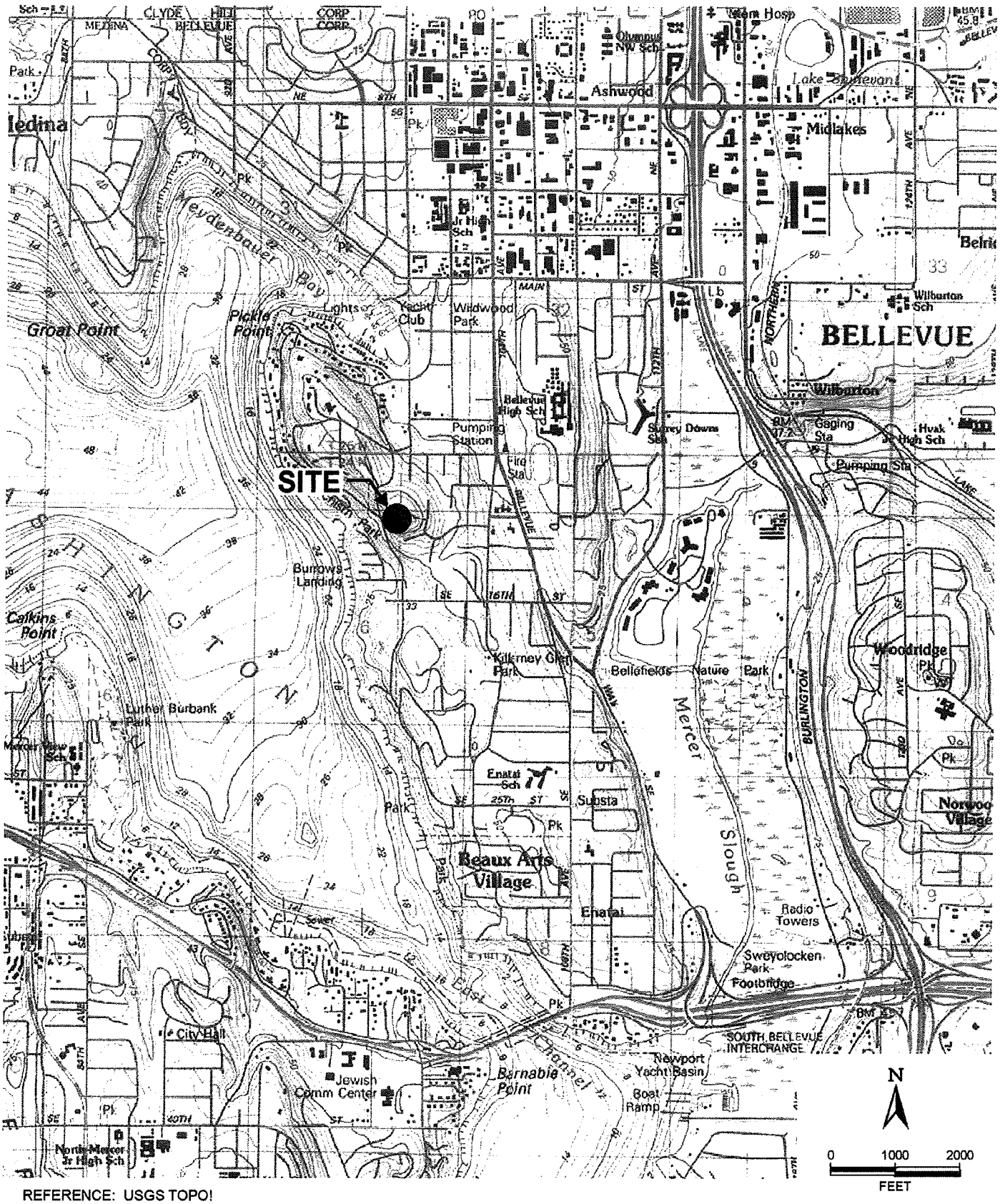


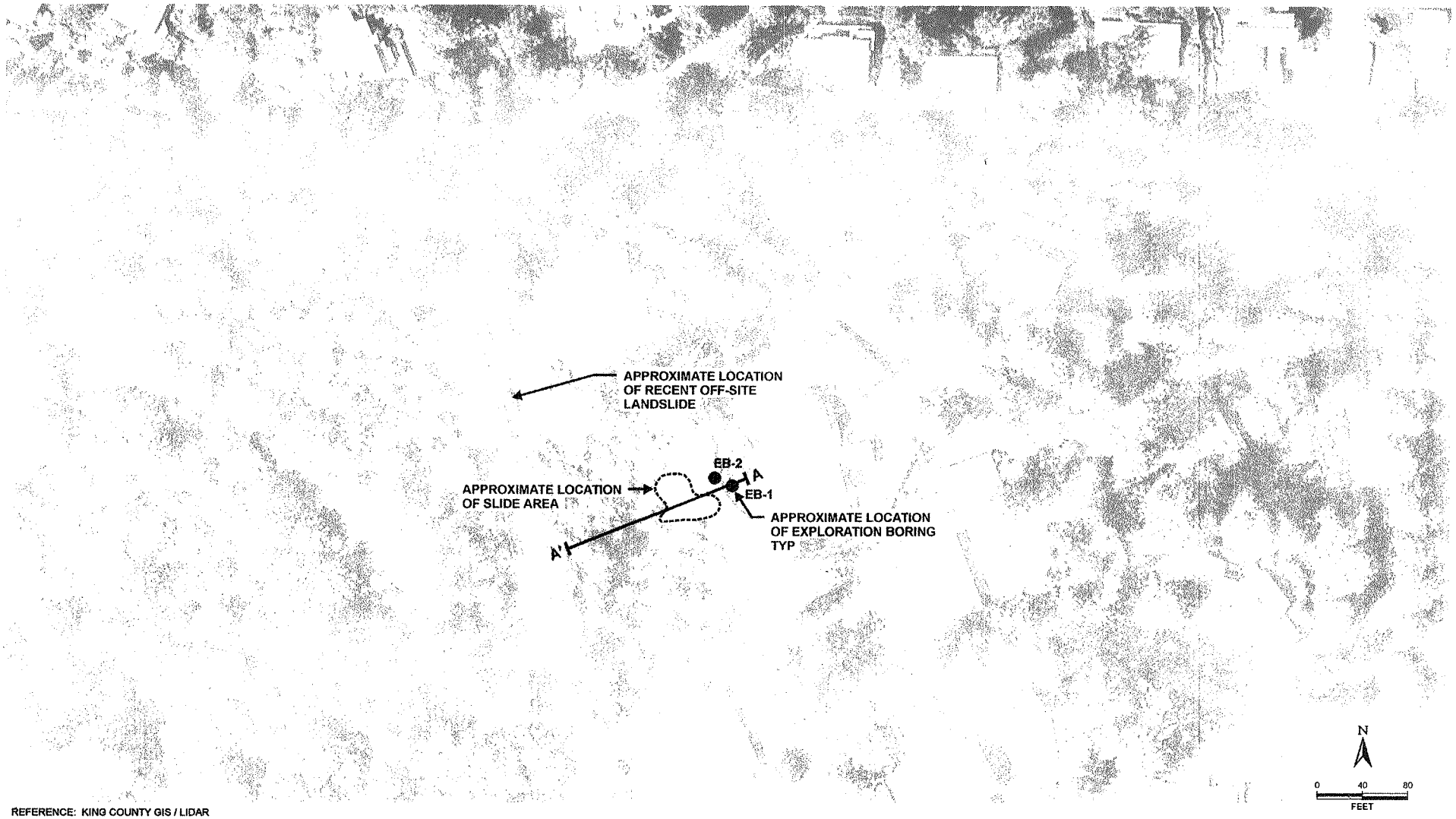
REFERENCE: USGS TOPO!

Associated Earth Sciences, Inc.

VICINITY MAP
SCOTT RESIDENCE
BELLEVUE, WASHINGTON

FIGURE 1
DATE 2/11
PROJ. NO. KE100403A

100403 Scott Residence \ 100403 Vicinity.cdr



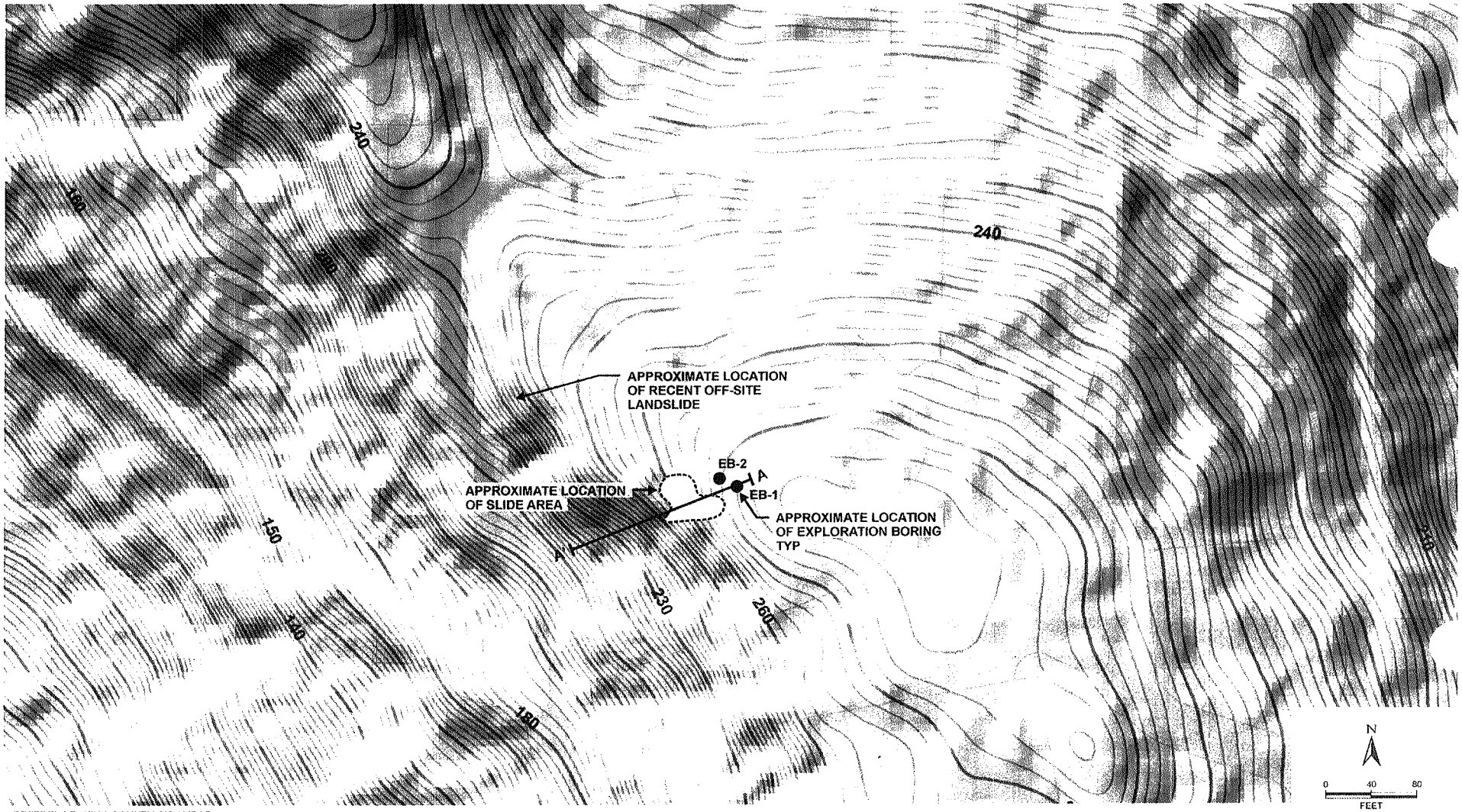
REFERENCE: KING COUNTY GIS / LIDAR

100403 Scott Residence \ 100403 Site and Expl.cdr PAGE 2: Expl

Associated Earth Sciences, Inc.

SITE AND EXPLORATION PLAN
SCOTT RESIDENCE
BELLEVUE, WASHINGTON

FIGURE 2
DATE 2/11
PROJ. NO. KE100403A



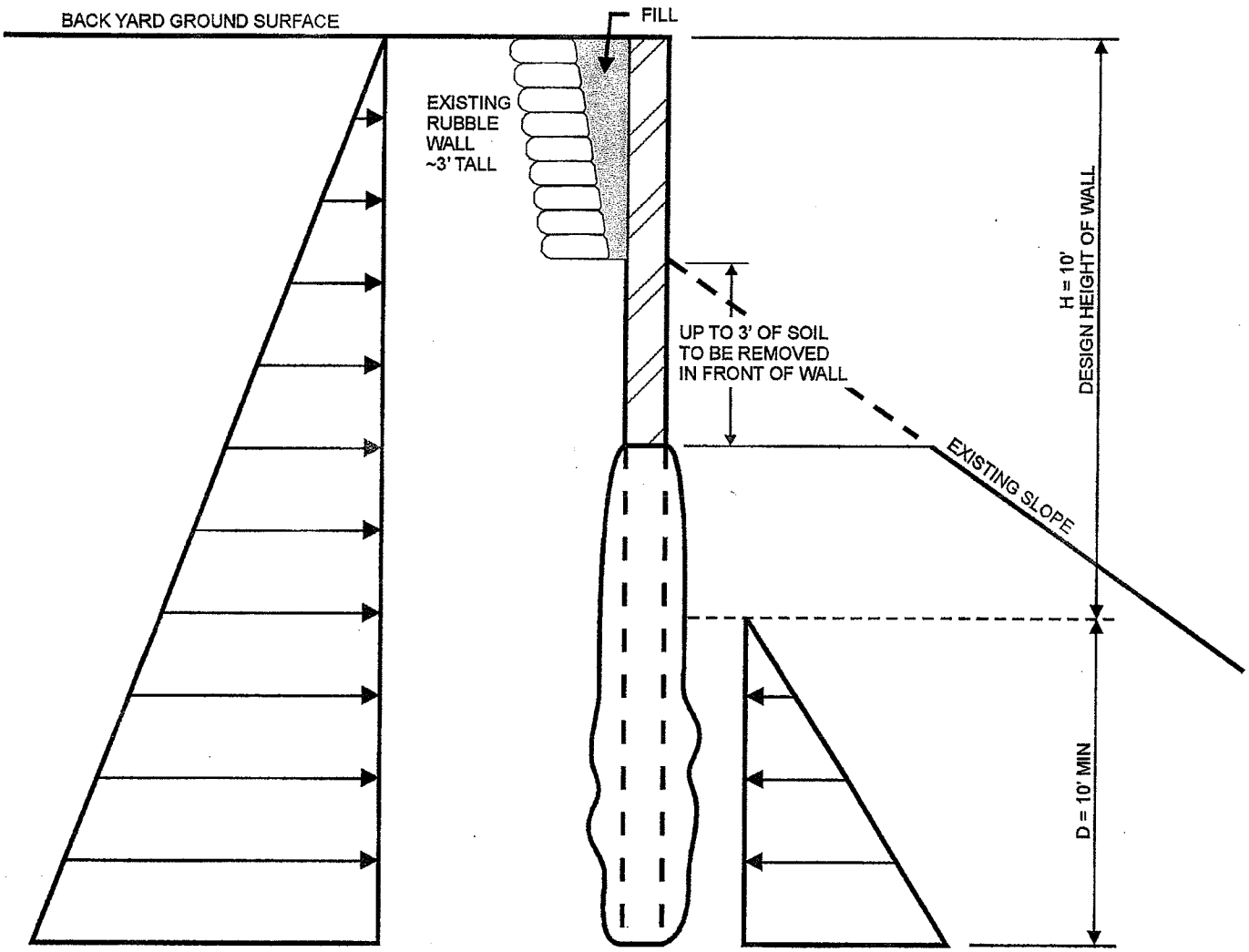
REFERENCE: KING COUNTY GIS / LIDAR

Associated Earth Sciences, Inc.

SITE - LIDAR IMAGERY
SCOTT RESIDENCE
BELLEVUE, WASHINGTON

FIGURE 3
DATE 2/11
PROJ. NO. KE100403A

100403 Scott Residence \ 100403 Site and Exploration PAGE 1 Lidar



NOTES:

1. SOLDIER PILE EMBEDMENT DEPTH "D" SHOULD CONSIDER NECESSARY VERTICAL CAPACITY, KICK-OUT, AND OVERTURNING RESISTANCE.
2. PASSIVE PRESSURE INCLUDES A FACTOR SAFETY OF 1.5.
3. DIAGRAM DOES NOT INCLUDE HYDROSTATIC PRESSURES AND ASSUMES WALLS ARE SUITABLY DRAINED TO PREVENT BUILDUP OF HYDROSTATIC PRESSURE.
4. DIAGRAM IS ILLUSTRATIVE AND NOT REFERENCED TO A PARTICULAR LOCATION.
5. DIAGRAM DOES NOT INCLUDE PRESSURES DUE TO SURFACE SURCHARGES INCLUDING, BUT NOT LIMITED TO SOIL STOCKPILES AND CONSTRUCTION EQUIPMENT.
6. LAGGING MAY BE DESIGNED USING 50 PERCENT OF THE ACTIVE EARTH PRESSURE.
7. ALLOWABLE SKIN FRICTION OF SOLDIER PILE: 500 PSF OVER DEPTH "D". ALLOWABLE END BEARING: 10 KIPS PER SQUARE FOOT.

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
		≥15% 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
		≥15% 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

	Density	SPT [2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT [2] blows/foot**
Fine-Grained Soils	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
Few	5 to 10
Little	15 to 25
With	- Non-primary coarse constituents: ≥ 15% - Fines content between 5% and 15%

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch

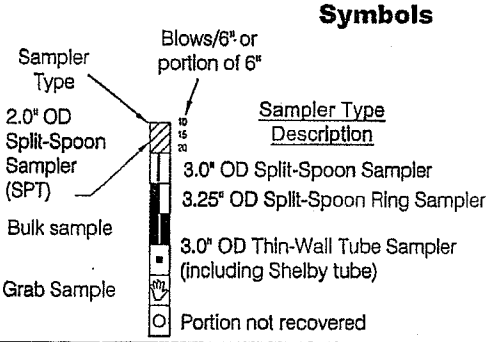
Slightly Moist - Perceptible moisture

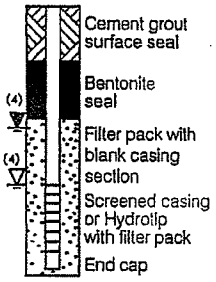
Moist - Damp but no visible water

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 15%

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 KEY

FIGURE A1

blocks\log_key.dwg LAYOUT: Layout2

Associated Earth Sciences, Inc.

Exploration Log

Project Number	Exploration Number	Sheet
KE100403A	EB-1	1 of 1

Project Name	Scott Residence	Ground Surface Elevation (ft)	Unknown
Location	Bellevue, WA	Datum	N/A
Driller/Equipment	CN Drilling/Acker	Date Start/Finish	1/18/11,1/18/11
Hammer Weight/Drop	140# / 30"	Hole Diameter (in)	4 1/2"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-1		3 inches sod/topsoil.			2 2 4	▲6	
				Pre-Vashon Undifferentiated Very moist, tan, fine sandy SILT (ML).					
		S-2		Becomes mottled, slight increase in moisture, few fine sand.			2 5 8	▲13	
5		S-3		Becomes grayish tan with rust mottling; trace fine sand.			5 8 15	▲23	
10		S-5		Contains scarce fine sand partings.			6 11 13	▲24	
		S-6		Slight decrease in moisture and no mottling; slightly fractured with oxidized fracture surfaces.			10 15 21	▲36	
15		S-7					8 12 22	▲34	
		S-4		(Driller adding water)			7 16 19	▲31	
20		S-8		Becomes gray, contains laminated zones.			15 22 26	▲48	
				Bottom of exploration boring at 21.5 feet Exploration terminated due to refusal.					
25									
30									
35									

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: TJP

Approved by:

AESIBOR 100403A.GPJ January 21, 2011

Associated Earth Sciences, Inc.

Exploration Log

Project Number	Exploration Number	Sheet
KE100403A	EB-2	1 of 1

Project Name: Scott Residence
Location: Bellevue, WA
Driller/Equipment: CN Drilling/Acker
Hammer Weight/Drop: 140# / 30"

Ground Surface Elevation (ft): Unknown
Datum: N/A
Date Start/Finish: 1/18/11 ,1/18/11
Hole Diameter (in): 4 1/2"

Depth (ft)	ST	Samples	Graphic Symbol	DESCRIPTION	Well Completion	Water Level	Blows/6"	Blows/Foot (10 20 30 40)	Other Tests
		S-1		Topsoil			1 2 3	▲5	
				Pre-Vashon Undifferentiated Very moist, tan, SILT (ML).					
		S-2					2 3 4	▲7	
5		S-3		(Driller adding water) Lightly mottled.			6 8 15	▲23	
		S-4		Contains fine sand partings.			10 20 29	▲49	
10		S-5		Moist to very moist, tan, fine SAND, few silt.			15 16 10	▲26	
		S-6		Very moist, tan, SILT (ML). Moist, tan, fine SAND, few silt (SP).			18 27 40	▲67	
15		S-7		Gravelly drilling action at approximately 14 1/2 to 15 1/2 feet.			23 28 32	▲60	
				(Driller adding water)					
20		S-8		Becomes grayish tan, trace silt.			21 32 50	▲82	
25		S-9		Trace gravel, little silt at tip of sampler.			32 37 50/5"	▲50/5"	
				Bottom of exploration boring at 26.5 feet No ground water encountered.					
30									
35									

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: TJP
Approved by:

AESIBOR 100403A.GPJ February 2, 2011

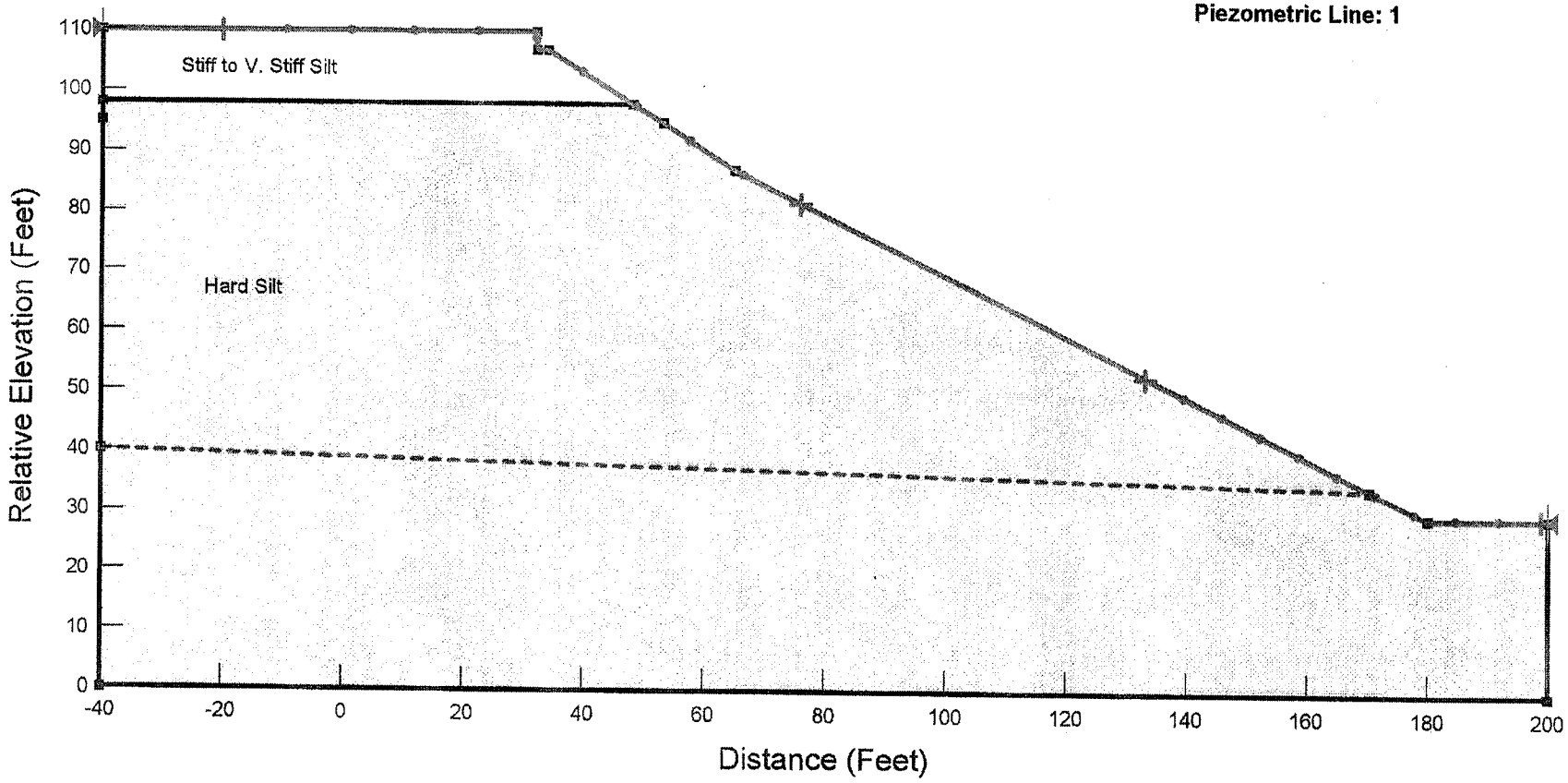
APPENDIX B

Slope/W Slope Stability Analysis Profiles

Scott Residence

Slope A-A' - Slope Geometry with Subsurface Conditions
Case 1: Stiff to Very Stiff Silt Over Hard Silt

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °
Piezometric Line: 1
Name: Hard Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 1000 psf
Phi: 25 °
Piezometric Line: 1

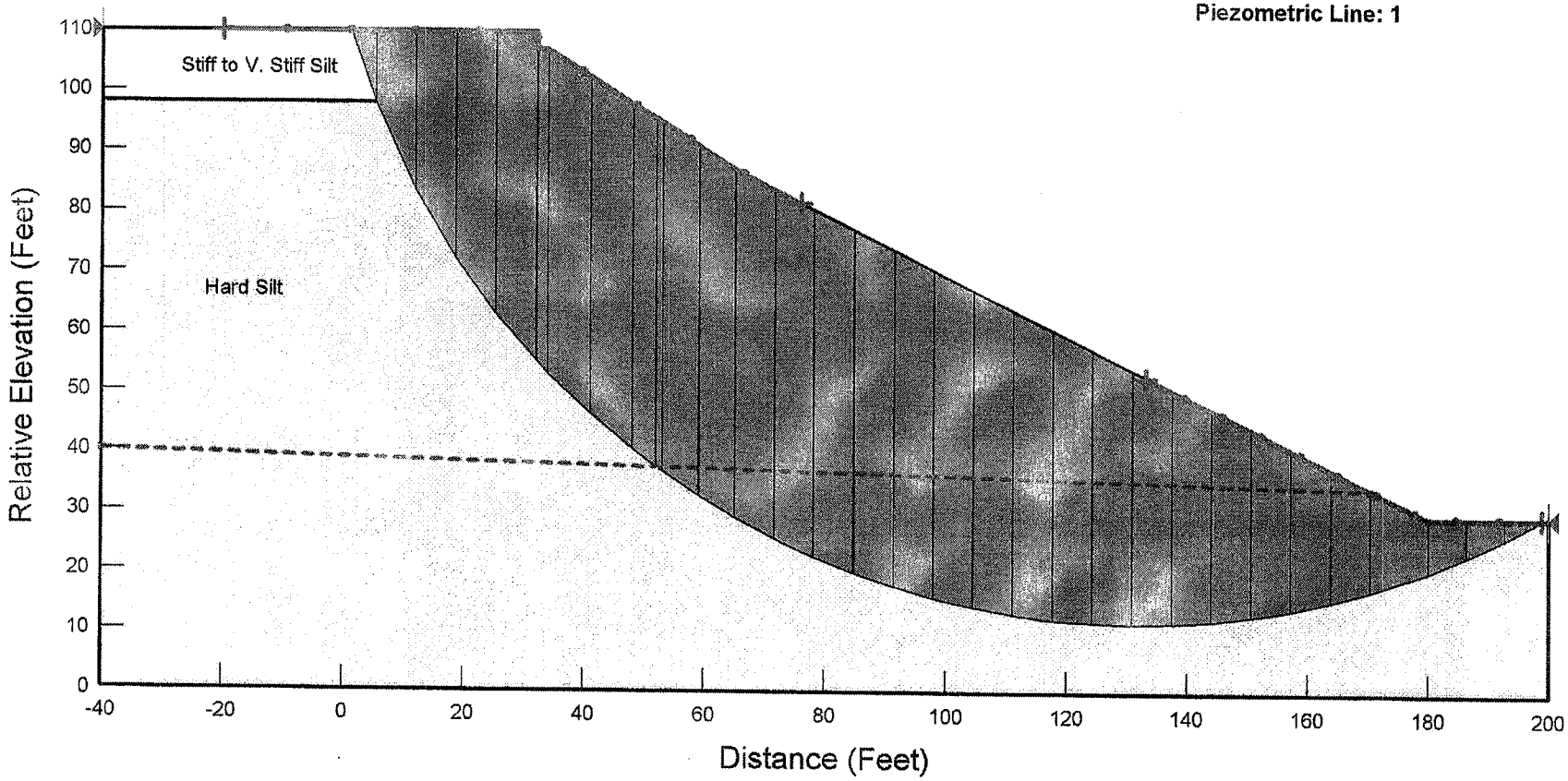


Scott Residence

Slope A-A' - Static Analysis
Case 1: Stiff to Very Stiff Silt Over Hard Silt

1.91

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °
Piezometric Line: 1
Name: Hard Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 1000 psf
Phi: 25 °
Piezometric Line: 1

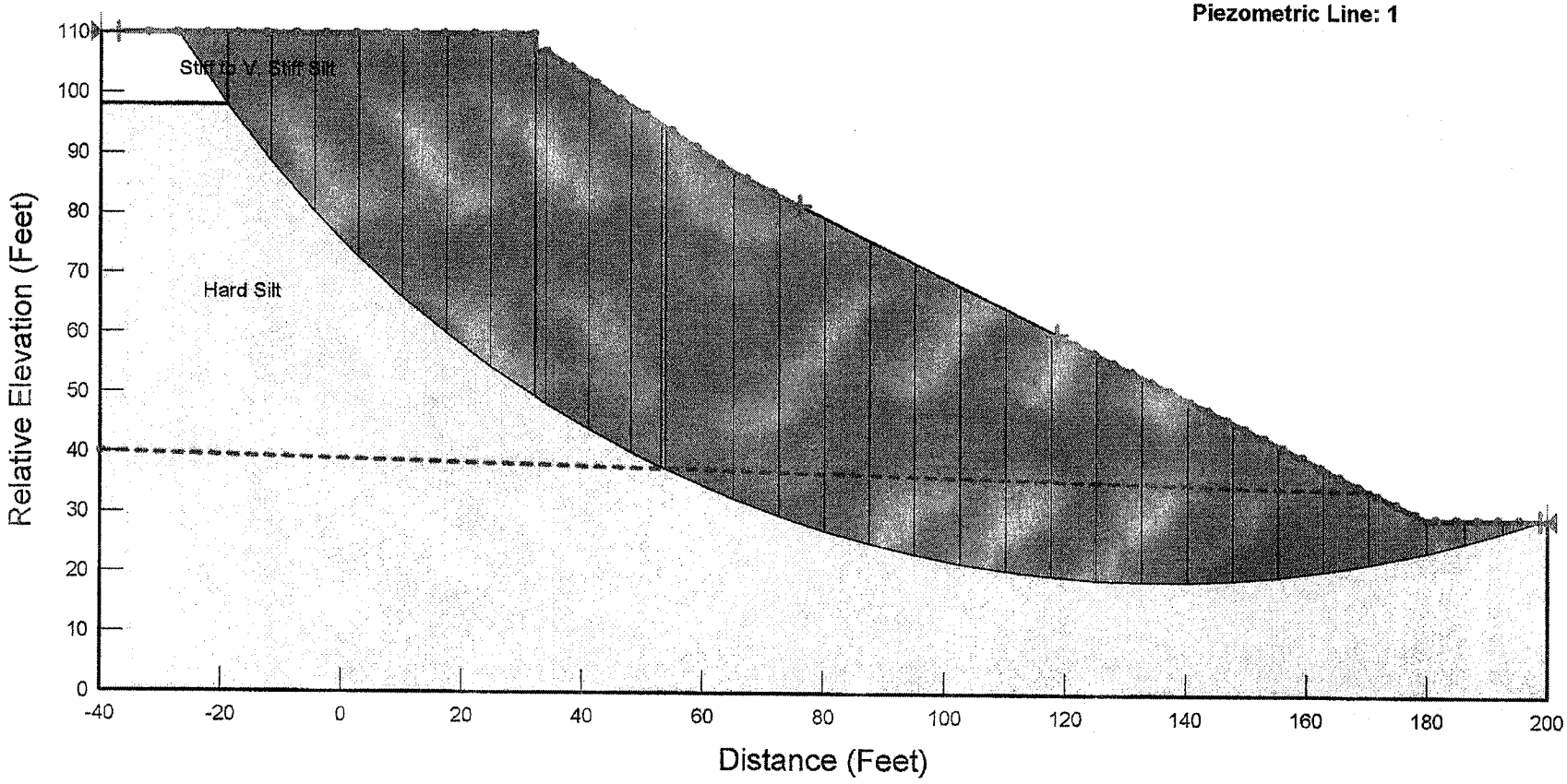


Scott Residence

Slope A-A' - Seismic Analysis 0.19g
Case 1: Stiff to Very Stiff Silt Over Hard Silt

1.32

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °
Piezometric Line: 1
Name: Hard Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 1000 psf
Phi: 25 °
Piezometric Line: 1

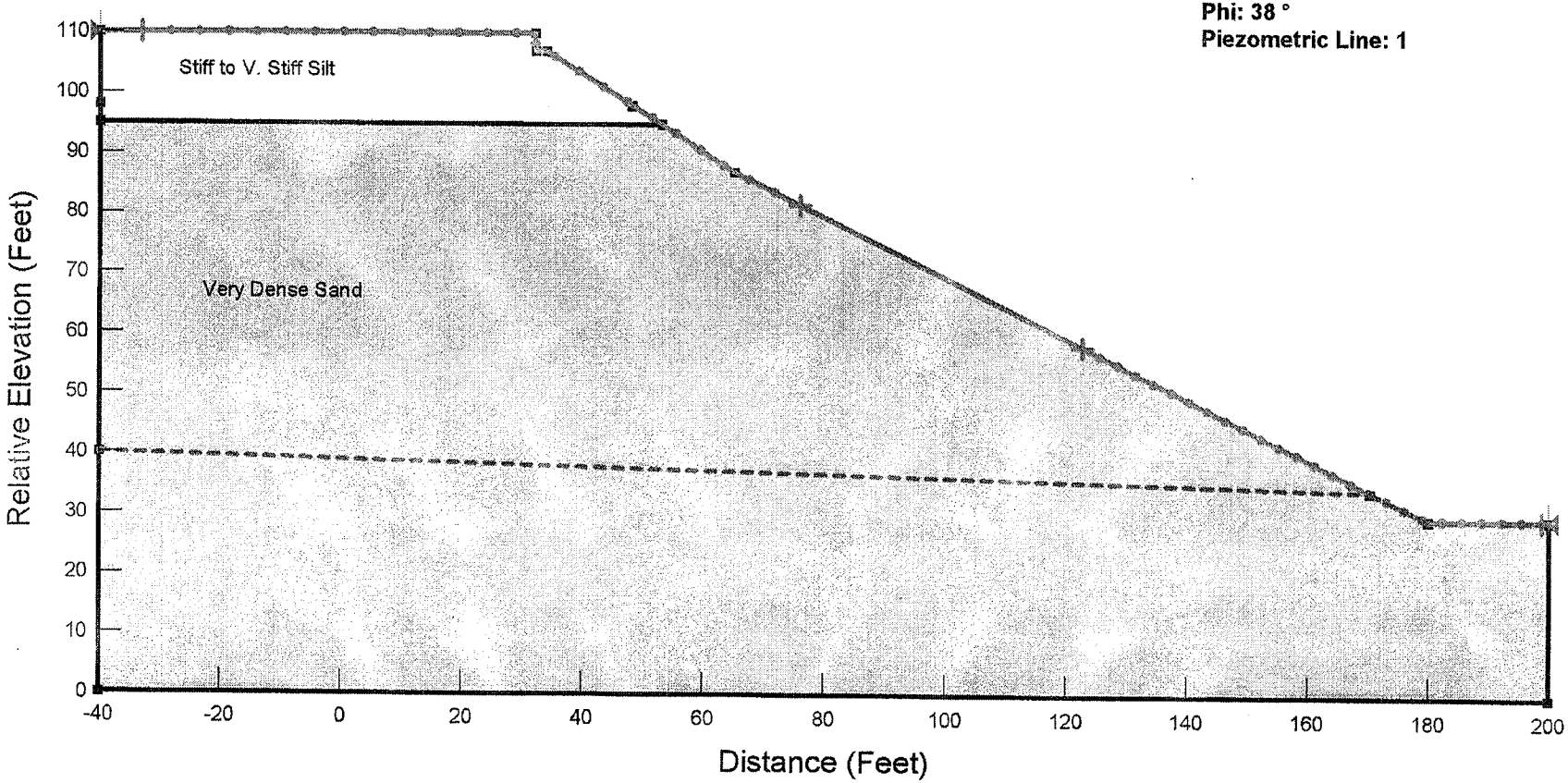


Scott Residence

Slope A-A' - Slope Geometry with Subsurface Conditions
Case 2: Stiff to Very Stiff Silt Over Very Dense Sand

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °

Name: Very Dense Sand
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 38 °
Piezometric Line: 1



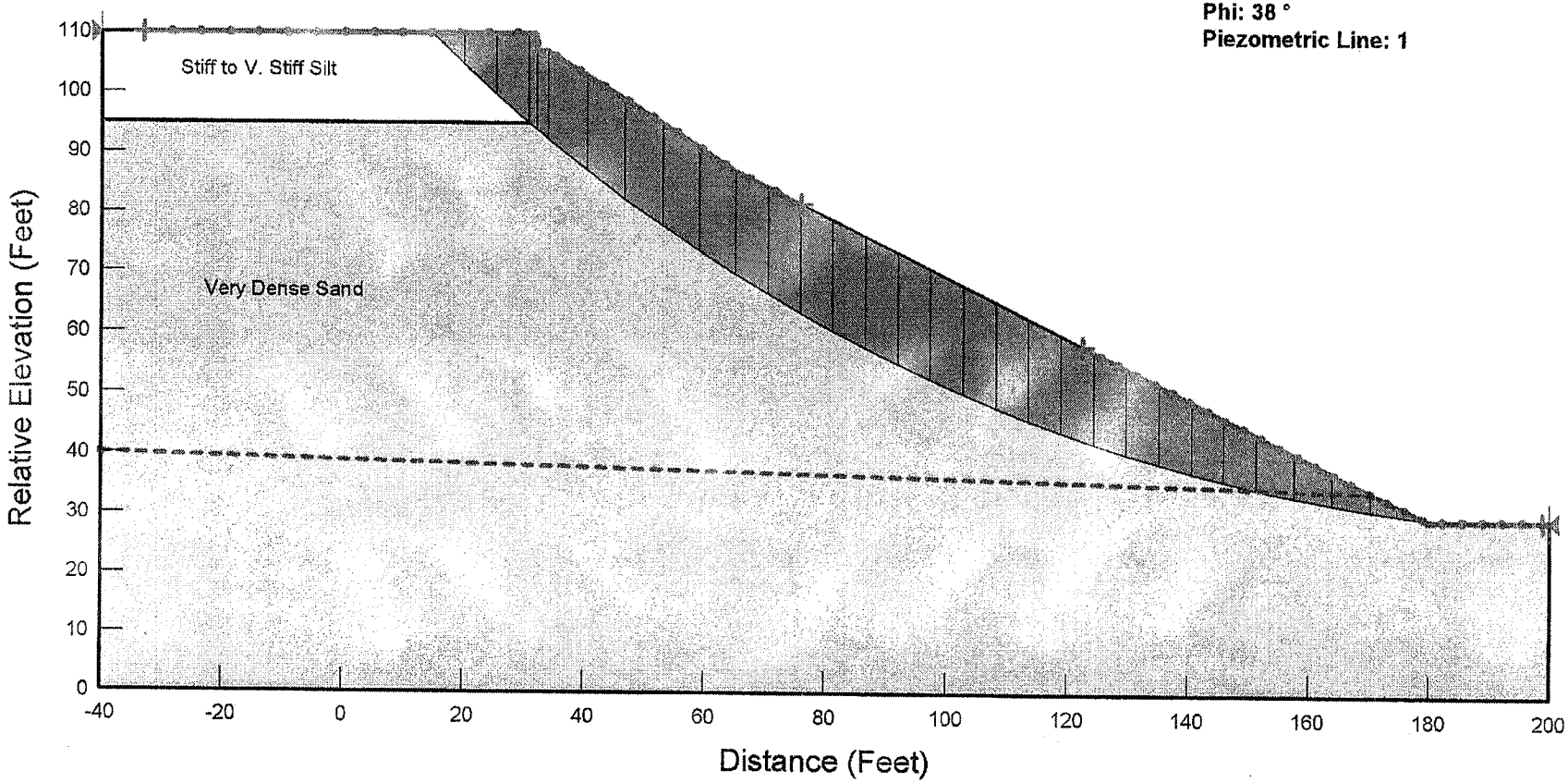
Scott Residence

Slope A-A' - Static Analysis
Case 2: Stiff to Very Stiff Silt Over Very Dense Sand

1.78

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °

Name: Very Dense Sand
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 38 °
Piezometric Line: 1



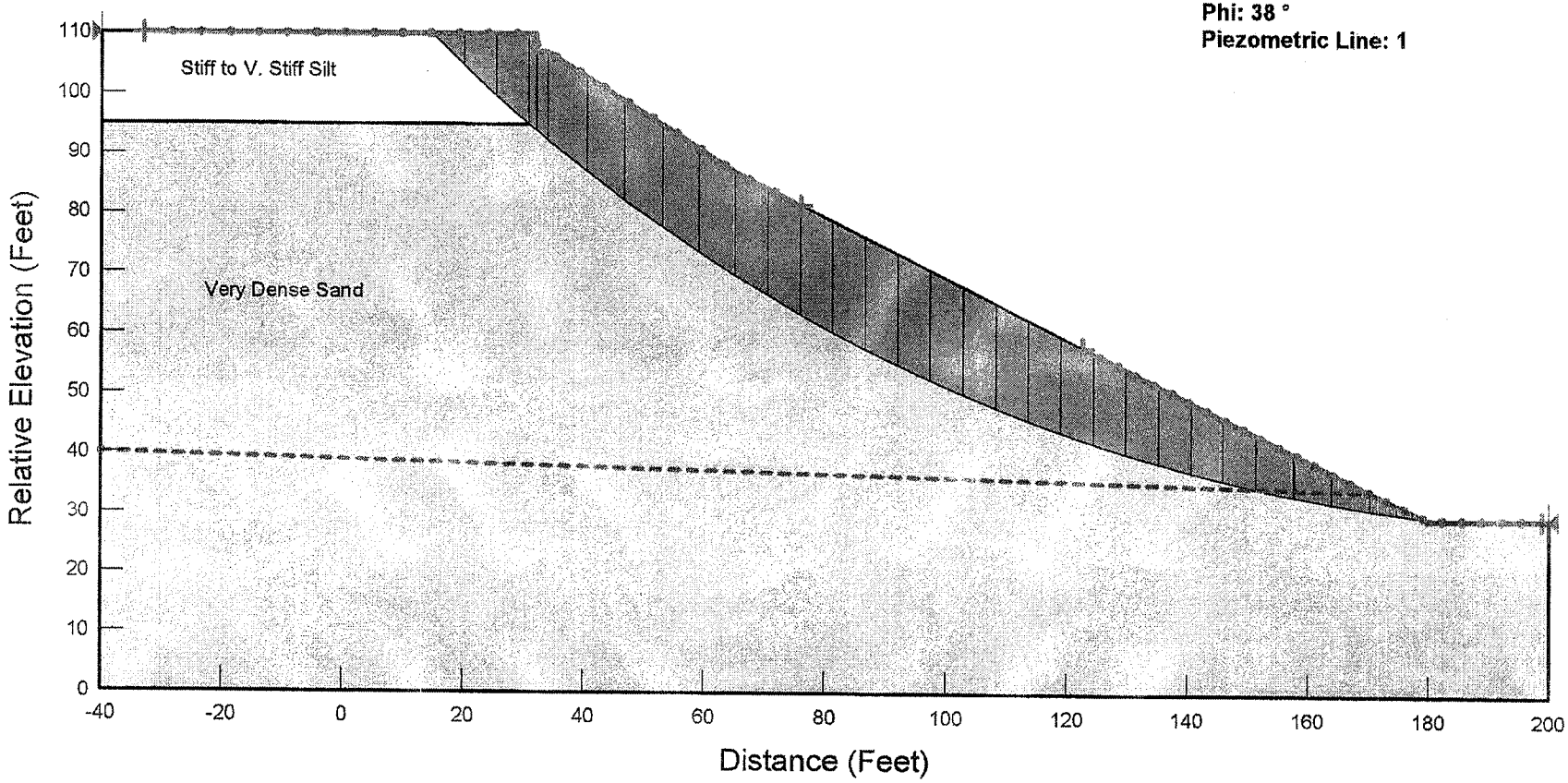
Scott Residence

Slope A-A' - Seismic Analysis 0.19g
Case 2: Stiff to Very Stiff Silt Over Very Dense Sand

1.20

Name: Stiff to Very Stiff Silt
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 500 psf
Phi: 20 °

Name: Very Dense Sand
Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion: 100 psf
Phi: 38 °
Piezometric Line: 1



Associated Earth Sciences, Inc.

Celebrating Over 25 Years of Service

August 18, 2011
Project No. KE100403A

Phil and Leslie Scott (Schlaepfer)
407 Detwiller Lane
Bellevue, Washington 98004

Subject: Response to City of Bellevue Comments
Scott Residence - Slide Stabilization and Retaining Wall
407 Detwiller Lane
Bellevue, Washington

Received
AUG 23 2011
Permit Processing

Dear Mr. and Ms. Scott (Schlaepfer):

This letter presents our response to selected comments made by the City of Bellevue for the subject project. The City's comments were summarized in an e-mail prepared by Reilly Pittman, Associate Planner, on August 12, 2011 and subsequently forwarded to AESI by Dibble Engineers. We have previously issued our "Landslide Evaluation" letter report, dated February 9, 2011, for the subject project, and our "Response to City Comments" letter, dated August 4, 2011, addressing selected third-party review comments made on behalf of the City of Bellevue by GeoEngineers.

Specifically, City of Bellevue staff has requested that we address City of Bellevue LUC 20.25H.125(C), which includes the following standard:

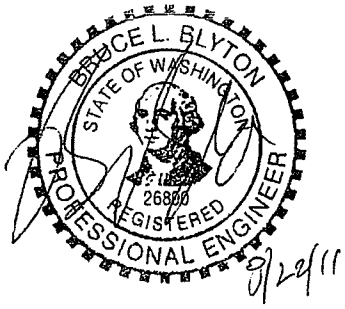
C. The proposed development shall not result in greater risk or a need for increased buffers on neighboring properties;

The intent of the proposed project is to repair the slide area located on the subject property and mitigate the risk of future slope movement. This mitigation will include an engineered soldier pile wall installed along the top of the slope, with the portion of the slope below the wall regraded to 3H:1V, which is less than the 40 percent threshold for a "steep slope" designation, per City of Bellevue LUC 20.25H.120(A)(2). In addition, the regraded toe slope is slated to be revegetated with a variety of native plantings, providing post-construction erosion control for the slope. Based on our explorations and our review of the proposed project plans, it is our opinion that the proposed development will not result in a greater risk to, or a need for increased buffers on, neighboring properties.

Also, in accordance with City of Bellevue LUC 20.25H.145, it is our opinion that the project "will not increase the threat of the geological hazard to adjacent properties over conditions that would exist if the provisions of this part were not modified."

We trust this information meets your current needs. Please do not hesitate to contact us if you require additional information or have any questions.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



Bruce L. Blyton, P.E.
Principal Engineer

Attachment 3
Restoration Plan

PLANT KEY

TREES

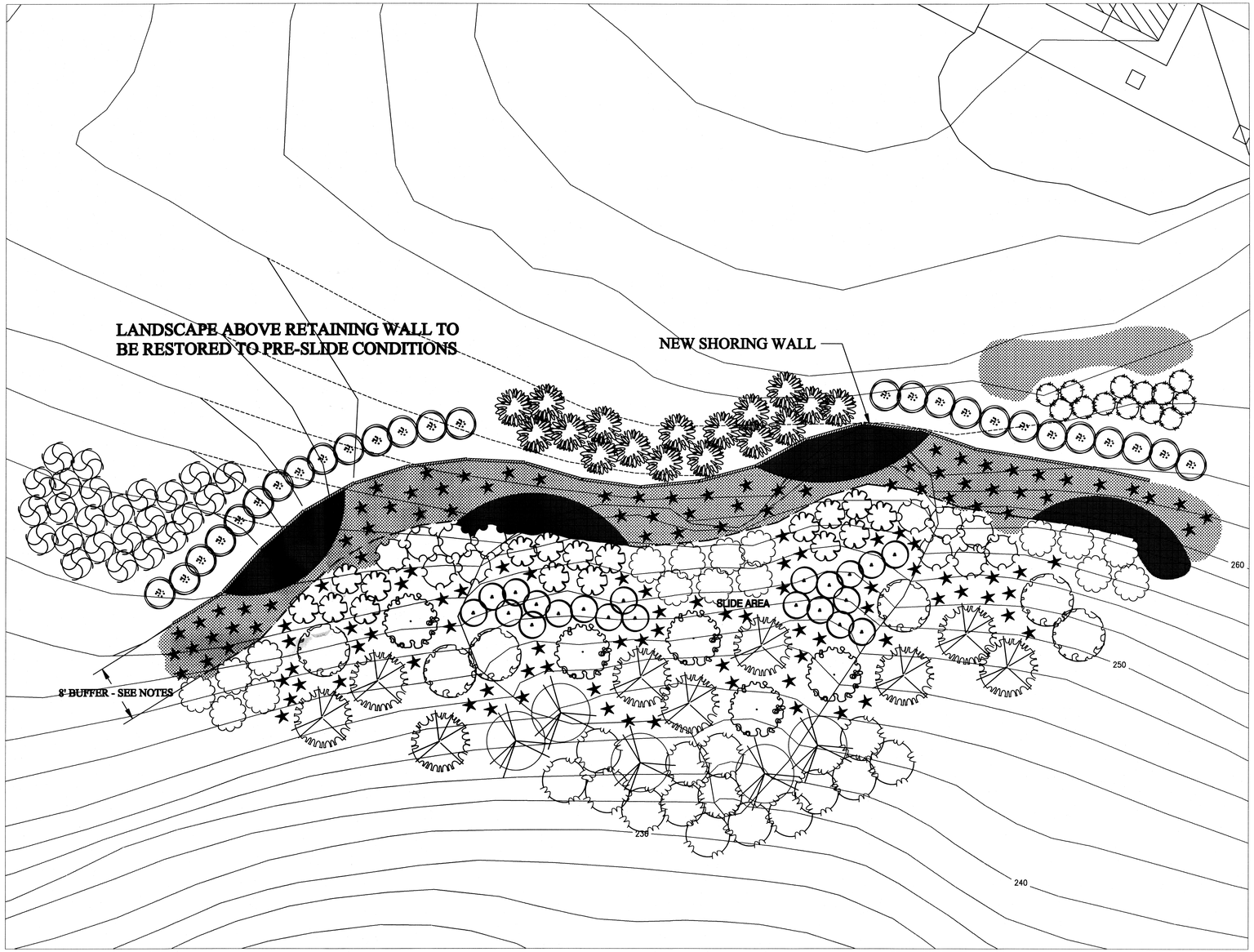
SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE
	Acer circinatum	VINE MAPLE	5-6' multi-trunk
	Amelanchier alnifolia	SERVICEBERRY	1.5 to 2" cal.
	Pseudotsuga menziesii	DOUG FIR	5-6'
	Thuja plicata	WESTER RED CEDAR	5-6'

SHRUBS

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE
	Cornus sericea	RED-OSIER DOGWOOD	#5
	Holodiscus discolor	OCEAN SPRAY	#2
	Mahonia aquifolium	TALL OREGON GRAPE	#1
	Prunus laurocerasus 'Schipkaensis'	SCHIPKA LAUREL	3-4' high, B&B
	Ribes sanguineum	FLOWERING CURRANT	#5
	Rosa nutkana	NOOTKA ROSE	#2
	Salix sitchensis	SITKA WILLOW	#5
	Sambucus racemosa	RED ELDERBERRY	#5
	Spiraea douglasii	DOUGLAS' SPIRAEA	#2

GROUND COVERS & FERNS

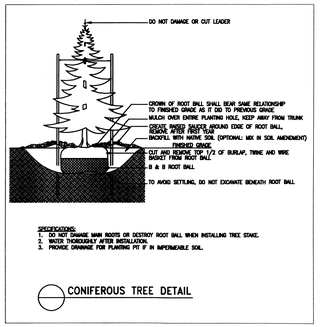
SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE
	Gaultheria shallon	SALAL	4"
	Mahonia nervosa	CASCADE OREGON GRAPE	4"
	Polystichum munitum	WESTERN SWORD FERN	#1

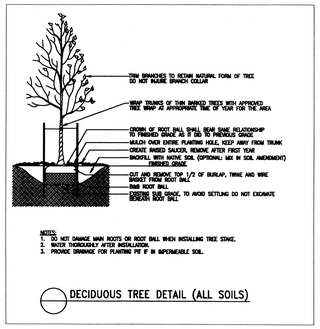


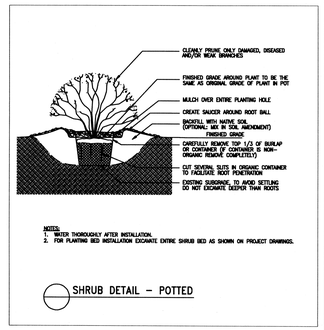
NOTES

1. 8' RESTRICTED BUFFER ON THE TOE SIDE OF THE SHORING WALL INCLUDES NO MAJOR VEGETATIVE PLANTINGS. TO BE PLANTED WITH FERNS AND GROUND COVERS THAT EXTEND NO MORE THAN 12" INTO THE NATIVE SOILS TO PREVENT REDUCING THE PASSIVE RESISTANCE CAPACITY IN FRONT OF THE WALL.
2. TOPSOIL AMENDED AS NEEDED WITH SANDY LOAM AND COMPOST.
3. ALL DISTURBED AREAS TO RECEIVE A 2" MULCH TOPDRESS FOR WATER RETENTION AND WEED CONTROL.
4. ALL TREES TO BE STAKED.

PLANTING DETAILS







Revisions	By

SANDER GROVES
landscape services
20018 ne 50th street
redmond, wa. 98053
tel: 425-868-2200
fax: 425-868-4212

THE SCOTT RESIDENCE

407 Detwiller, Bellevue, WA

SLOPE PLANTING PLAN

Received
JUL 14 2011
Permit Processing

Date 7/11/11

Scale 1/8" = 1'-0"

Drawn DG/AW

Sheet L of 1

4 Sheets