Tillamook County

DEPARTMENT OF COMMUNITY DEVELOPMENT
BUILDING, PLANNING & ON-SITE SANITATION SECTIONS

1510 – B Third Street
Tillamook, Oregon 97141
www.tillamookcounty.gov
(503) 842 – 3408

Land of Cheese, Trees and Ocean Breeze

NOTICE TO MORTGAGEE, LIENHOLDER, VENDOR OR SELLER:
ORS 215 REQUIRES THAT IF YOU RECEIVE THIS NOTICE,
IT MUST BE PROMPTLY FORWARDED TO THE PURCHASER

NOTICE OF PUBLIC HEARING
TILLAMOOK COUNTY PLANNING COMMISSION

Date of Notice: November 14, 2024
Date of Planning Commission Hearing: December 12, 2024

A public hearing will be held by the Tillamook County Planning Commission at 7:00p.m. on Thursday, December 12, 2024, in the Port of Tillamook Bay Conference Center, 4000 Blimp Boulevard, Tillamook, OR 97141 to consider the following:

#851-24-000527-PLNG: A Variance request to exceed the 24-foot height maximum by 14-feet for a maximum building height of 38-feet as measured from existing, pre-construction grade. Located in the Unincorporated Community of Neskowin, the subject property is accessed via South Beach Road, a private road, zoned Neskowin Low Density Residential (NeskR-1), and designated as Tax Lot 214 of Section 35, Township 5 South, Range 11 West of the Willamette Meridian, Tillamook County, Oregon. The Applicant is Clinton Mugge. The property owner is Clinton & Michelle Mugge.

Notice of public hearing, a map of the request area, applicable specific request review criteria and a general explanation of the requirements for submission of testimony and the procedures for conduct of hearing has been mailed to all property owners within 250-feet of the exterior boundary of the subject properties for which application has been made at least 28 days prior to the date of the hearing.

Applicable criteria are contained within the Tillamook County Land Use Ordinance Section 8.030: Variance Review Criteria. Only comments relevant to the approval criteria are considered relevant evidence. Relevant standards include and may not be limited to applicable standards contained within TCLUO Section 3.322: Neskowin Low Density Residential (NeskR-1) Zone.

The hearing will take place at the Port of Tillamook Bay Conference Center with an option for virtual participation. For instructions on how to provide oral testimony at the December 12, 2024 hearing and hearing protocol, please visit the Tillamook County Community Development Planning Commission page at https://www.tillamookcounty.gov/bc-pc or email Sarah Thompson, Office Specialist, at sarah.thompson@tillamookcounty.gov. The virtual meeting link can be found at the bottom of the Community Development Department homepage as well as a dial in number for those who wish to participate via teleconference.

Written testimony may be submitted to the Tillamook County Department of Community Development, 1510-B Third Street, Tillamook, Oregon, 97141 prior to 4:00 p.m. on the date of the December 12 2024, Planning Commission hearing. Testimony submitted by 4:00pm on Tuesday, December 3, 2024, will be included in the packet mailed to the Planning Commission the week prior to the December 12, 2024, hearing. Failure of an issue to be raised in a hearing, in person or by letter, or failure to provide sufficient specificity to afford the decision-maker an opportunity to respond to the issue precludes appeal to the Land Use Board of Appeals on that issue. Please contact Sarah Thompson, Office Specialist, Tillamook County Department of Community Development, sarah.thompson@tillamookcounty.gov as soon as possible if you wish to have your comments included in the staff report that will be presented to the Planning Commission.

Documents and submitted application are also available on the Tillamook County Department of Community Development website (https://www.tillamookcounty.gov/commdev/landuseapps) or at the Department of Community Development office located at 1510-B Third Street, Tillamook, Oregon, 97141. A copy of the application and related materials may be purchased from the Department of Community Development at a cost of 25 cents per page. The staff report will be available for public inspection seven days prior to the hearing. Please contact Sarah Thompson for additional information sarah.thompson@tillamookcounty.gov or call 1-800-488-8280 x3423.

In addition to the specific applicable review criteria, the Tillamook County Land Use Ordinance, Tillamook County Comprehensive Plan and Statewide Planning Goals which may contain additional regulations, policies, zones and standards that may apply to the request are also available for review at the Department of Community Development.

The Port of Tillamook Bay Conference Center is accessible to persons with disabilities. If special accommodations are needed for persons with hearing, visual, or manual impairments who wish to participate in the hearings, call 1-800-488-8280 ext. 3423 or email sarah.thompson@tillamookcounty.gov at least 24 hours prior to the hearing so that the appropriate communications assistance can be arranged.

If you need additional information, please contact Sarah Thompson, DCD Office Specialist, at 1-800-488-8280 ext. 3423 or email sarah.thompson@tillamookcounty.gov.

Tillamook County Department of Community Development

Melissa Jenck, Senior Planner, CFM

Sarah Absher, CFM, Director

Enc. Maps & Testimony Tips

<u>SECTION 8.030: REVIEW CRITERIA:</u>

A VARIANCE shall be granted, according to the procedures set forth in Section 8.020, if the applicant adequately demonstrates that the proposed VARIANCE satisfies all of the following criteria:

(1) Circumstances attributable either to the dimensional, topographic, or hazardous characteristics of a legally existing lot, or to the placement of structures thereupon, would effectively preclude the enjoyment of a substantial property right enjoyed by the majority of landowners in the vicinity, if all applicable standards were to be met. Such circumstances may not be self-created.

(2) A VARIANCE is necessary to accommodate a use or accessory use on the parcel which can be reasonably expected to occur within the zone or vicinity.

(3) The proposed VARIANCE will comply with the purposes of relevant development standards as enumerated in Section 4.005 and will preserve the right of adjoining property owners to use and enjoy their land for legal purposes.

(4) There are no reasonable alternatives requiring either a lesser or no VARIANCE

Citizen Tips for Providing Testimony at a Planning Commission/Board of County Commissioner Hearing

Goal 1 of Oregon's Statewide Planning Goals recognizes the importance of citizen involvement "in all phases of the planning process." One of the principal ways for citizens to be involved is by testifying at local land use hearings. These citizen tips are designed to help citizens prepare and deliver testimony during Tillamook County land use hearing processes.

Know the Process

The Chair of the decision-making body will always read aloud the order of presentation and the process. Presentation is generally as follows:

- Planning Staff Presentation (generally 15 minutes)
  - Questions to Staff by the Decision-Maker
- Applicant's Presentation (generally 15 minutes)
  - Questions to Applicant by the Decision-Maker
- Public Comment Period
  - Generally limited to 3 minutes per person.
- Applicant Rebuttal & Final Statements
- Staff Final Statements
- Public Hearing Closed for Decision-Maker Deliberation
  - No further public testimony accepted.
- Decision-Maker may ask questions of staff.
- Decision-Makers vote on issue.
- Notice of Decision mailed to all parties.

Understand the Issue

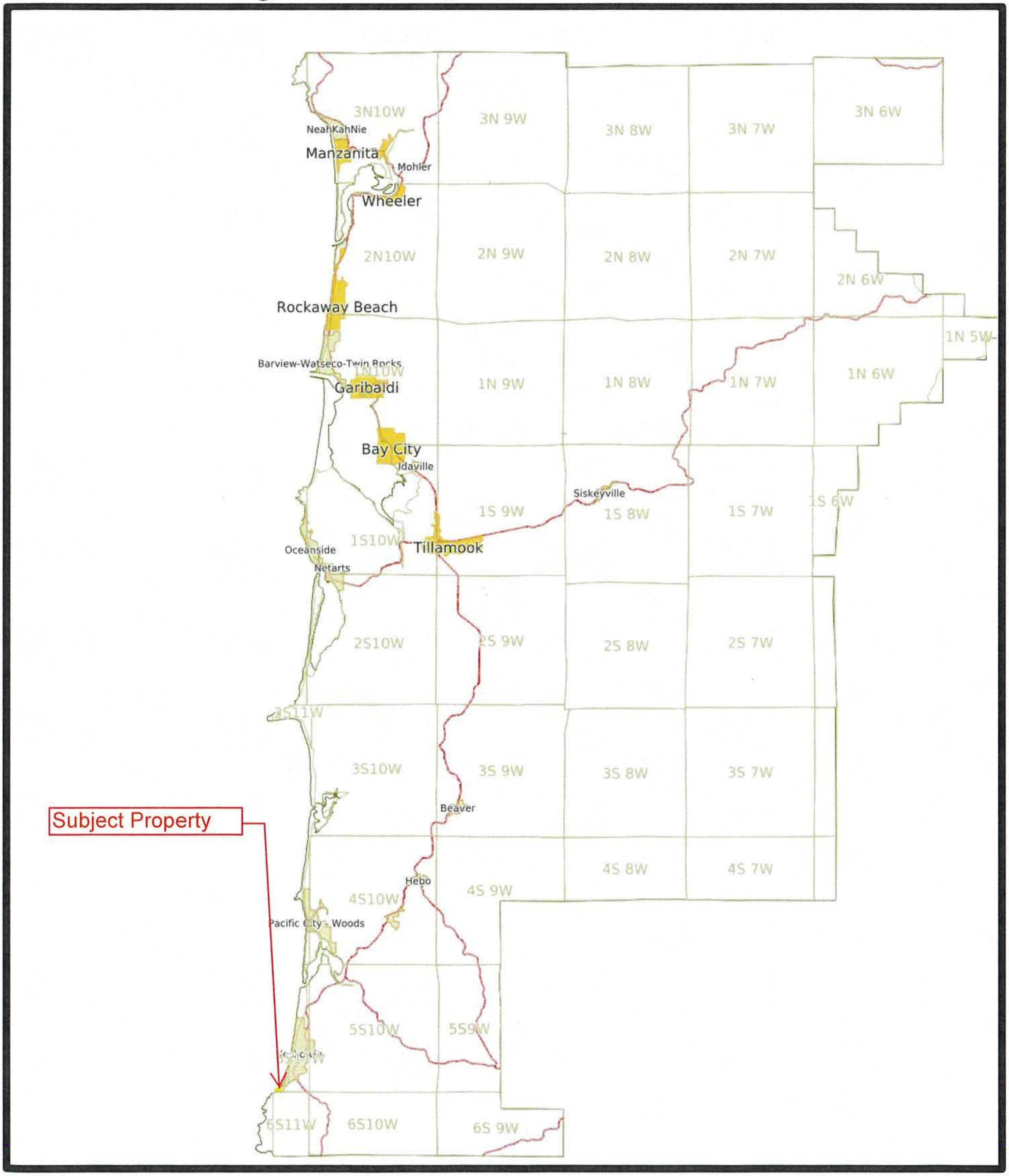
- Become familiar with the land use record (application, staff report and hearing materials) found on the Land Use Applications page under the Planning tab of the Community Development website.
- Become familiar with the relevant criteria (included in notice of public hearing).
- Prepare an outline of your testimony to use while testifying and focus testimony to the relevant criteria
- Decisions to approve or deny a request are based on the relevant criteria.
- Know when, where and who you are speaking to.
  - Tillamook County Planning Commission or Board of County Commissioners- depending on nature of request, application review process, and current phase of hearing process.
- Public testimony is generally limited to 3 minutes per person.
- Be sure to state your name and address for the record at the beginning of your testimony to ensure you receive notice of decision after hearing process has ended.

Check Department Website for Updates

- Visit the Land Use Applications page.
- Follow posted calendar dates for written testimony submittal opportunities if the hearing is ongoing.
- Review additional written testimony received during the open comment periods.
- Review hearing packets and agendas if hearing process is ongoing.
- Review Notice of Decision and remain informed on appeal dates.

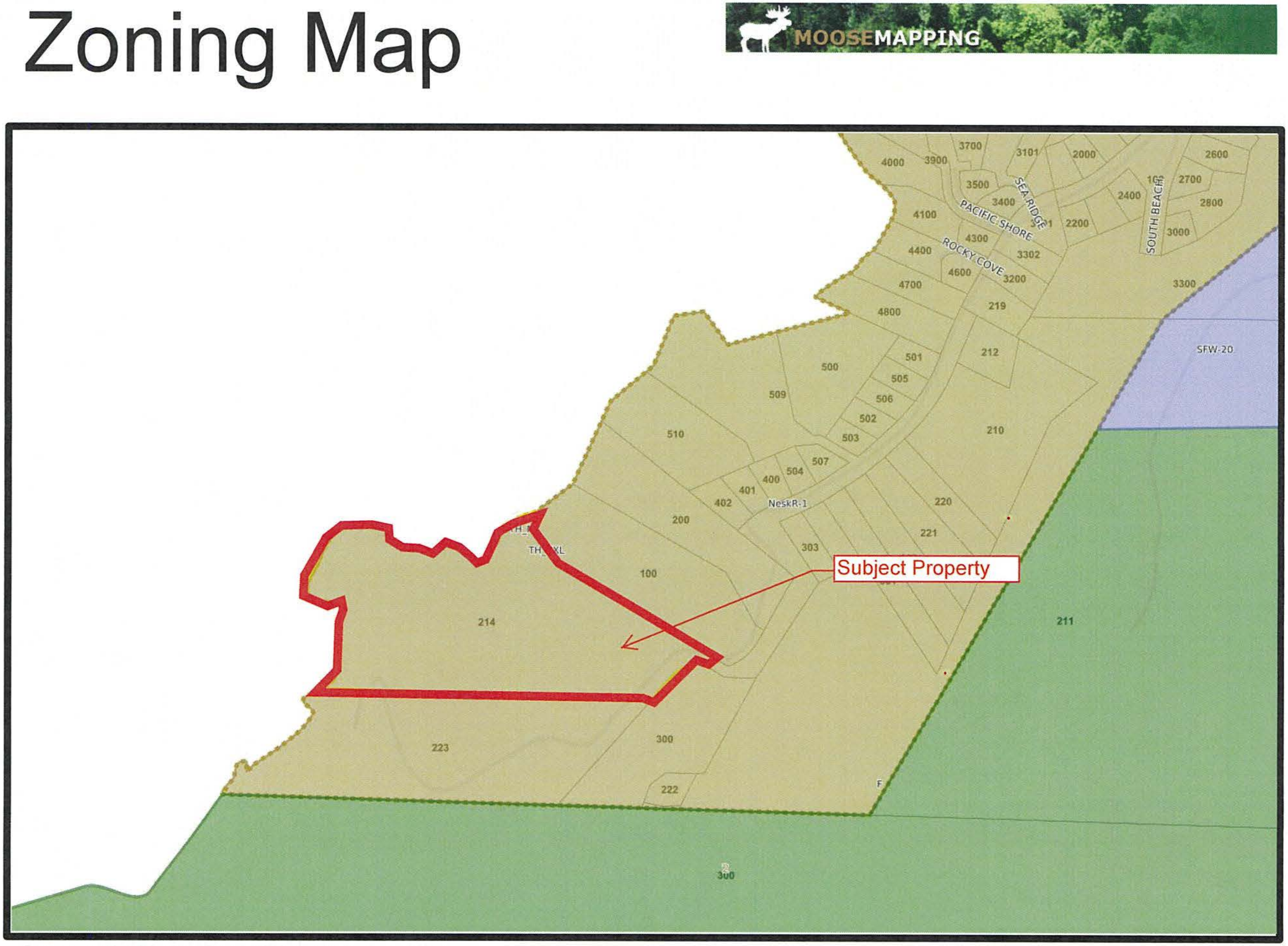
EXHIBIT A

Vicinity Map



Generated with the GeoMOOSE Printing Utilities

Zoning Map



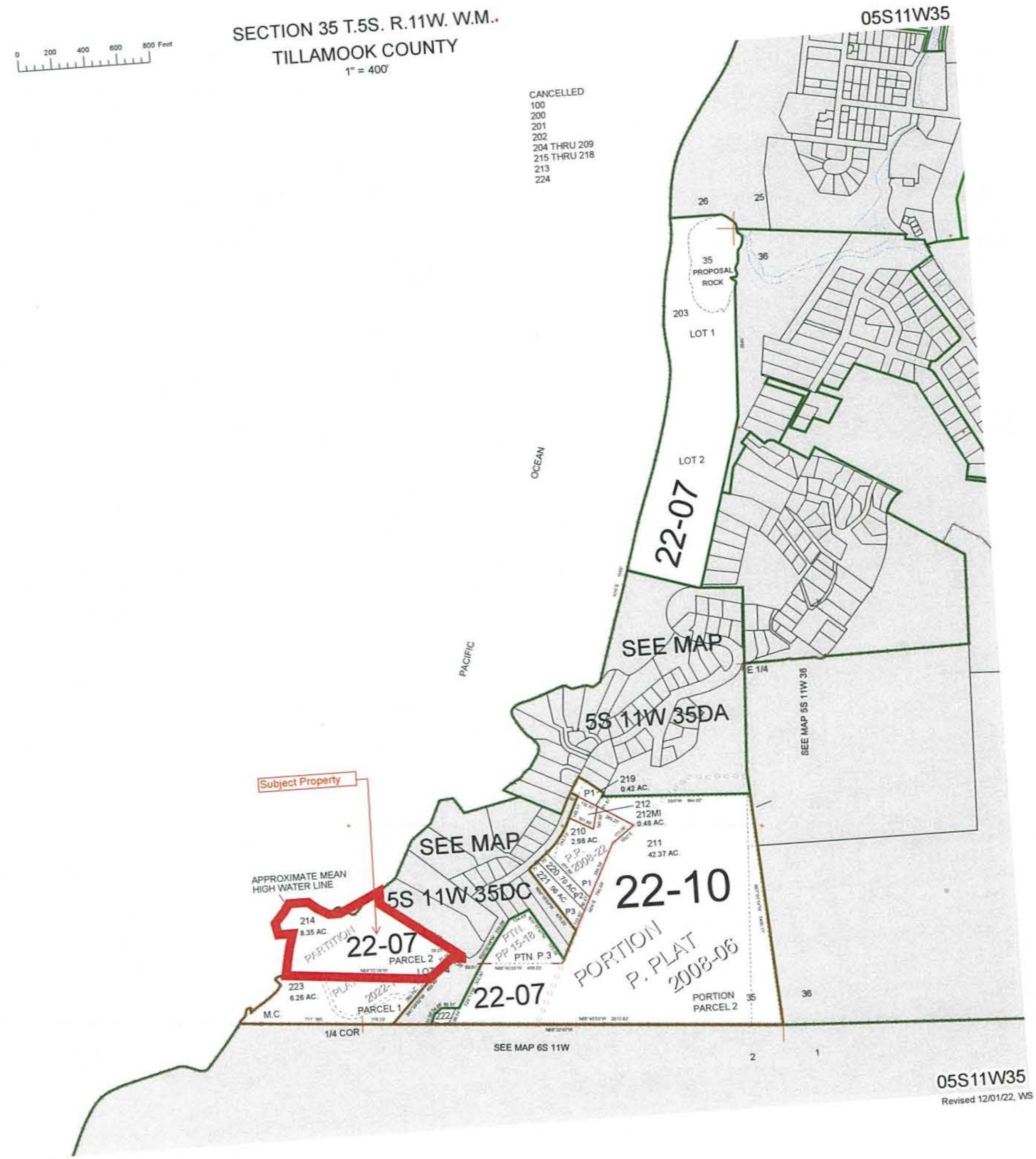
Generated with the GeoMOOSE Printing Utilities

SECTION 35 T.5S. R.11W. W.M.

TILLAMOOK COUNTY

1" = 400'

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY



Tillamook County
2024 Real Property Assessment Report
Account 412599

Map	5S11350000214	**Tax Status**	Assessable
Code - Tax ID	2209 - 412599	**Account Status**	Active
		Subtype	NORMAL
Legal Descr	Multiple Lots - See legal report for full description		
Mailing	MUGGE, CLINTON & MICHELLE 42120 N OLYMPIC FIELDS CT ANTHEM AZ 85086	**Deed Reference #**	2022-6176
		Sales Date/Price	10-04-2022 / $0
		Appraiser	KARI FLEISHER

		MA	**SA**	**NH**
Property Class	400			
RMV Class	400	09	OF	986

Site	Situs Address	City

Value Summary

Code Area		RMV	MAV	AV		RMV Exception	CPR %
2209	Land	412,800			Land	0	
	Impr	0			Impr	0	
Code Area Total		412,800	234,230	234,230		0	
Grand Total		412,800	234,230	234,230		0	

Land Breakdown

Code Area	ID #	RFPD	Ex	Plan Zone	Value Source	Trend %	Size	Land Class	Trended RMV
2209				NESKR-1	Market	117	8.35 AC		412,800
					Code Area Total		8.35 AC		412,800

Improvement Breakdown

Code Area	ID #	Year Built	Stat Class	Description	Trend %	Total Sqft	Ex%	MS Acct	Trended RMV

Exemptions / Special Assessments / Notations

Notations
- CHANGES TO VALUATION JUDGMENT (REDUCTION) 308.242 ADDED 2020

Fire Patrol	**Amount**	**Acres**	**Year**
■ FIRE PATROL SURCHARGE	0.00		2024

Code Area 2209

Fire Patrol	**Amount**	**Acres**	**Year**
■ FIRE PATROL NORTHWEST	18.75	8.35	2024

Comments 6/29/07 Apportioned value after Partition from Tax Lot 210. dv. 04/09/08 Land brought to market after partition. SM 5/12 Portion of parcel segd. out to TL #223 prior to 1/1/Land to market value @ OF site/Value made similar to adjacent map/lots 5S11 35DC. RCW 04/18/14 Reappraised land, tabled values.ef 3/2018 Market review of parcel w/tabled values/Reviewed land adjs. and updated RMV. RCW 12/2020 Changes to valuation judgment/Owner requested review of parcel due to sale. The site was reviewed and adjustments were made to the land components regarding development of parcel with account rolled forward from 2020. RCW 12/20/22 Due to partition plat 2022-17, TL 214 and TL 223 have a new legal description and the acreage was updated to match plat. Reset MAV. KF

National Flood Hazard Layer FIRMette

FEMA

124°W 45°5'33"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

123°59'22"W 45°5'7"N

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

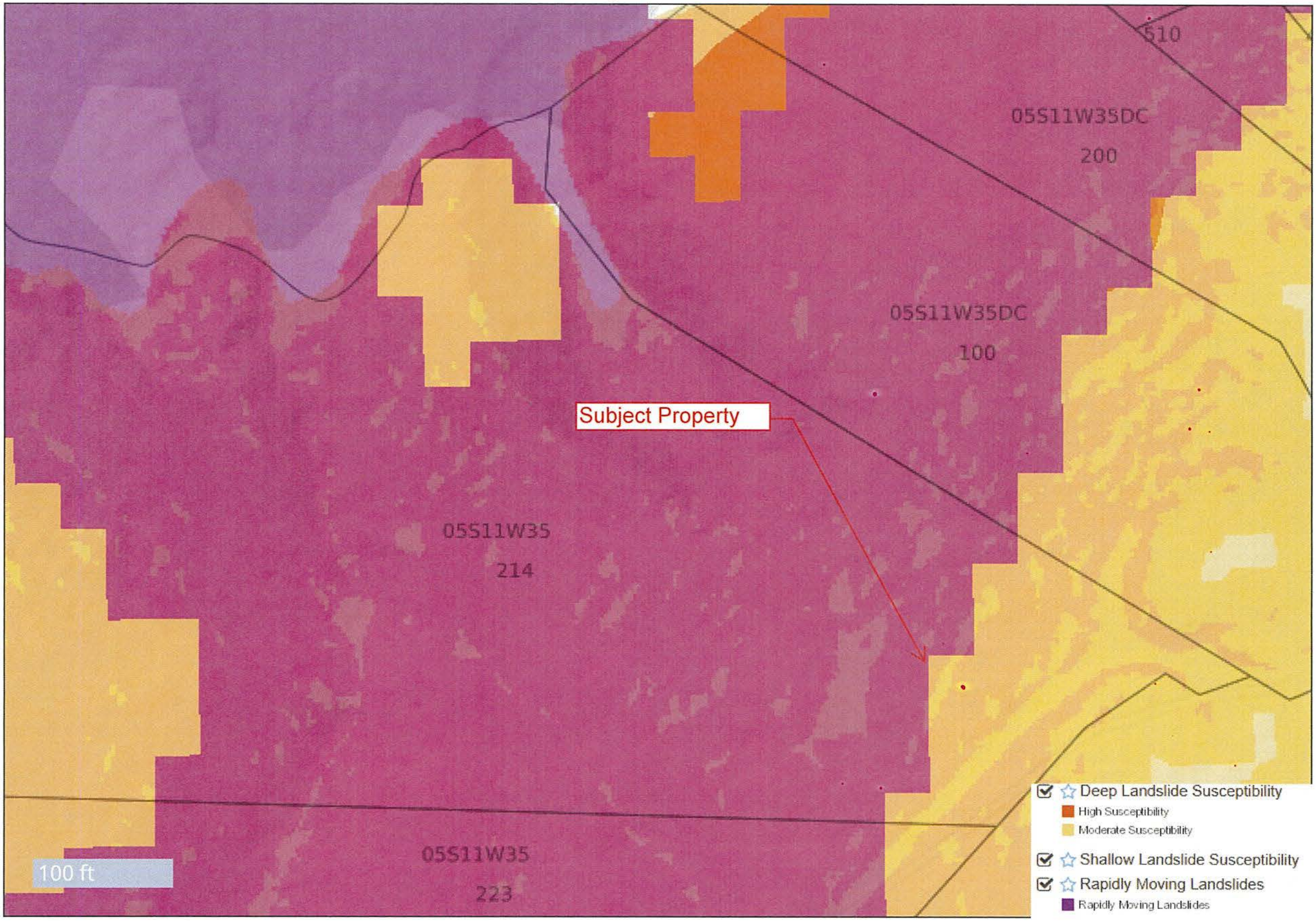
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/14/2024 at 10:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

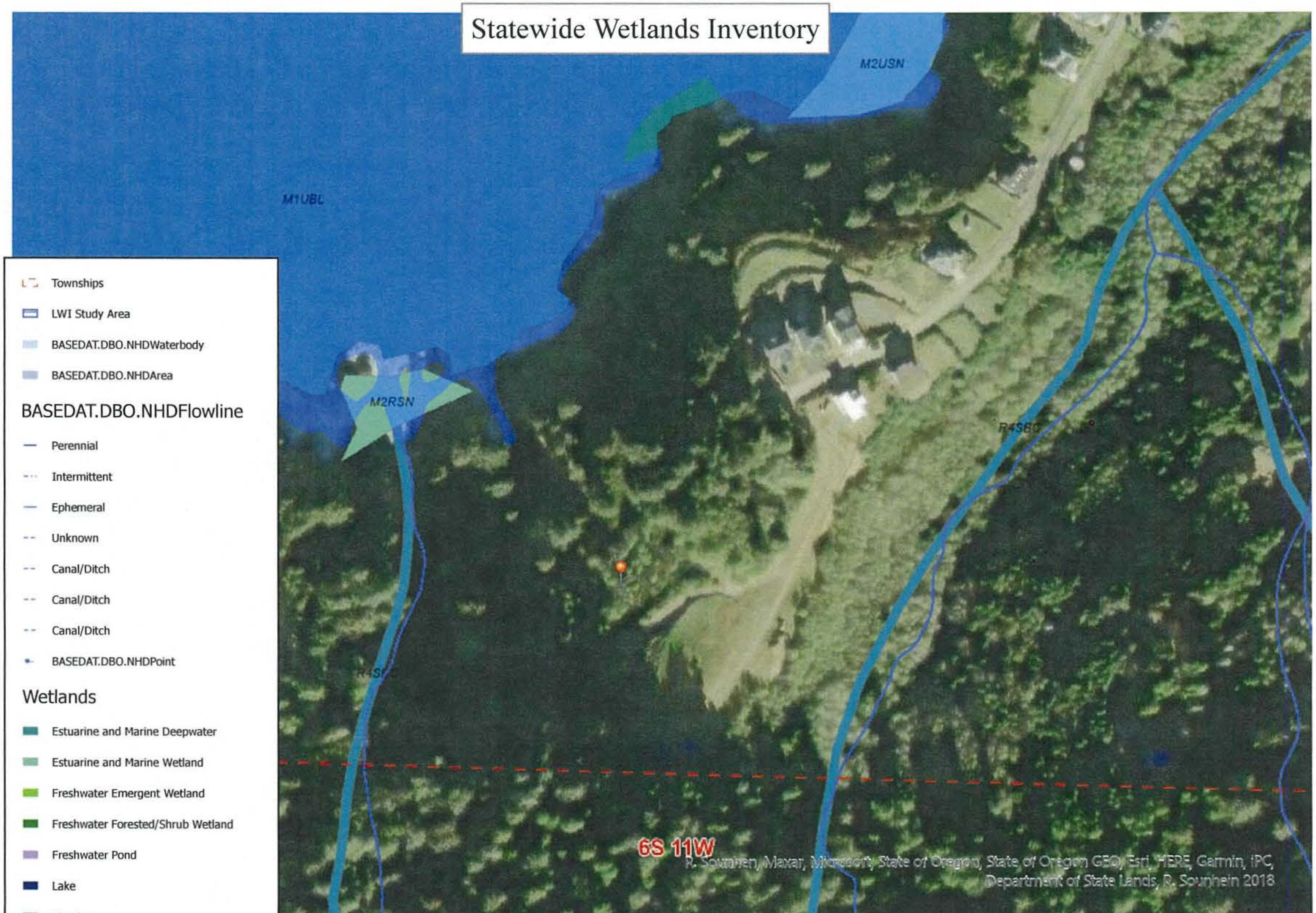
Hazard Map

Oregon Coastal Atlas



Printed 11 / 14 / 2024

Statewide Wetlands Inventory



- Townships
- LWI Study Area
- BASEDAT.DBO.NHDWaterbody
- BASEDAT.DBO.NHDArea

BASEDAT.DBO.NHDFlowline

- Perennial
- Intermittent
- Ephemeral
- Unknown
- Canal/Ditch
- Canal/Ditch
- Canal/Ditch
- BASEDAT.DBO.NHDPoint

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- SWI Agate-Winlo Soils
- SWI Predominantly Hydric Soil Map Units

1:4,514

0 0.03 0.06 0.11 0.17 0.22 mi

The Statewide Wetlands Inventory (SWI) represents the best data available at the time this map was published and is updated as new data becomes available. In all cases, actual field conditions determine the presence, absence and boundaries of wetlands and waters (such as creeks and ponds). An onsite investigation by a wetland professional can verify actual field conditions.

https://www.oregon.gov/dsl/WW/Pages/SWI.aspx

N

Date: 11/14/2024

State of Oregon
Department of State Lands
775 Summer Street, NE, Ste 100
Salem, OR 97301-1279

EXHIBIT B

Tillamook County Department of Community Development
1510-B Third Street. Tillamook, OR 97141 | Tel: 503-842-3408 Fax: 503-842-1819
www.co.tillamook.or.us

PLANNING APPLICATION

OFFICE USE ONLY
Date Stamp RECEIVED BY: Mail
☐Approved ☐Denied
Received by: MJ
Receipt #:
Fees: 1900 +51.
Permit No: 851-24-000527-PLNG

Applicant ☑ *(Check Box if Same as Property Owner)*

Name: clinton mugge Phone: 480-703-7975

Address: 42120 n olympic fields court

City: anthem State: az Zip: 85086

Email: muggec1@gmail.com

Property Owner

Name: clinton mugge, michelle mugge Phone: 480-703-7975

Address: 42120 n olympic fields court

City: anthem State: az Zip: 85086

Email: muggec1@gmail.com

Request: Variance request for max building height of 38 feet for the downslope side of development due to overly steepened lot.

Type II	Type III	Type IV
☐ Farm/Forest Review	☐ Detailed Hazard Report	☐ Ordinance Amendment
☐ Conditional Use Review	☐ Conditional Use (As deemed by Director)	☐ Large-Scale Zoning Map Amendment
☑ Variance	☐ Ordinance Amendment	☐ Plan and/or Code Text Amendment
☐ Exception to Resource or Riparian Setback	☐ Map Amendment	
☐ Nonconforming Review (Major or Minor)	☐ Goal Exception	
☐ Development Permit Review for Estuary Development	☐ Nonconforming Review (As deemed by Director)	
☐ Non-farm dwelling in Farm Zone	☐ Variance (As deemed by Director)	
☐ Foredune Grading Permit Review		
☐ Neskowin Coastal Hazards Area		

Location:

Site Address: Tax Lot 214 on South end of South Beach Road, Neskowin, OR

Map Number:	05S	11W	35	214
	Township	Range	Section	Tax Lot(s)

Clerk's Instrument #: ____________________

Authorization

This permit application does not assure permit approval. The applicant and/or property owner shall be responsible for obtaining any other necessary federal, state, and local permits. The applicant verifies that the information submitted is complete, accurate, and consistent with other information submitted with this application.

[signature] 9/28/24
Property Owner Signature (Required) Date

[signature] 9/28/24
Applicant Signature Date

MICHELLE AND CLINTON MUGGE

MELISSA JENK
Senior Land Use Planner
Tillamook County | Community Development | 1510-B Third Street | Tillamook, OR 97141

September, 2024

RE: Mugge Residence Variance Request

Dear Ms. Jenck:

Enclosed is an application for a height variance. The topographic and geohazard constraints of the property create a hardship for the development of the property as a residence without such approval. This application includes the following documents:

1. Tillamook County Type II Planning Application
2. Height Variance Criteria
3. Appendix A Earth Engineers Geotechnical Report
4. Appendix B Carlson Engineering Geological Report
5. Appendix C Studio.e Architecture House Design
6. Appendix D Topographic Survey by Bayside Surveying, LLC.

Sincerely,

Landowners

Michelle and Clinton Mugge

HEIGHT VARIANCE CRITERIA

PROPERTY DESCRIPTION

The site encompasses 8.31 acres on Tax Lot 214 within Township 5 South, Range 11 West, Section 35 of the Willamette Meridian near the south terminus of South Beach Road in Neskowin, Oregon. Article II of the Tillamook County land use ordinance establishes the property belongs to the NESKOWIN LOW DENSITY RESIDENTIAL ZONE (NeskR-1). The property is roughly 1,000 feet long by 650 feet wide, oriented longitudinally along its long axis. Broadly, the subject property slopes downward to the west at an average slope of approximately 1.5H:1V (Horizontal:Vertical) until it becomes near vertical at the ocean front cliffs. The site is roughly bisected by an unnamed creek that flows from Cascade Head in the south toward the north across the site before discharging into the Pacific Ocean. The site's topographic relief is dominated by oceanfront cliffs and heavily steepened slopes, meeting at a 200-foot-deep ravine incised by the creek. The lowest most portion of the site is where the creek discharges into the Pacific Ocean along the north property boundary, and the highest portion of the Ocean facing site is due west of the proposed build location along the western boundary at an elevation of an approximately 250 feet cliff above the Pacific Ocean.

VARIANCE REQUESTED

This narrative and the provided documentation support our request for a variance to increase the building height on the **downslope side** of the proposed home up to 38 feet. The property is an ocean-front lot per Tillamook County zoning map, the maximum building height without a variance is 24 feet from the existing natural grade to any point of the structure, Section 3.322(4). This height variance is required due to the extreme downslope 1.5H:1V across the entire property. To minimize the exception for height to any adjacent properties the design approach of the property is to minimize any impediment of neighboring property views, maximize the incorporation of the existing site topography, reduce land excavation, and minimize disruption of natural drainage of the existing site, applying the variance only where it is required to enjoy the property as others enjoy neighboring properties.

VARIANCE CRITERIA

A VARIANCE shall be granted, according to the procedures set forth in Section 8.020, if the applicant adequately demonstrates that the proposed VARIANCE satisfies all the following criteria:

1. **Circumstances attributable either to the dimensional, topographic, or hazardous characteristics of a legally existing lot, or to the placement of structures thereupon, would effectively preclude the enjoyment of a substantial property right enjoyed by the majority of landowners in the vicinity, if all applicable standards were to be met. Such circumstances may not be self-created.**

The dimensional and topographic conditions of the property present significant challenges to development as a single-family residence permitted outright by 3.322(2) without a height variance. The average natural slope across the property is 70% (1.5H:1V) (Appendix A: EARTH ENGINEERS GEOTECHNICAL REPORT, Section 4.0) and is considered oversteepened. The slope significantly impacts the downslope height above grade of any home developed. A home depth of approximately 30 feet at grade results in a rear floor height on the outermost corner accommodating the garage entry of approximately 25 feet, placing the floor above the 24-foot height limit (Appendix C STUDIO.E ARCHITECTURE HOME DESIGN, page 3 cross-section 1).

The extreme slope across the property is illustrated in Figure 1.0, "Topographic Map," generated from ArcGIS Pro using 0.5-meter height increments from the USGS LPC CA WestCoastElNinoUTM10 2016 LAS 2017 Lidar survey, and overlaid on the property plat.

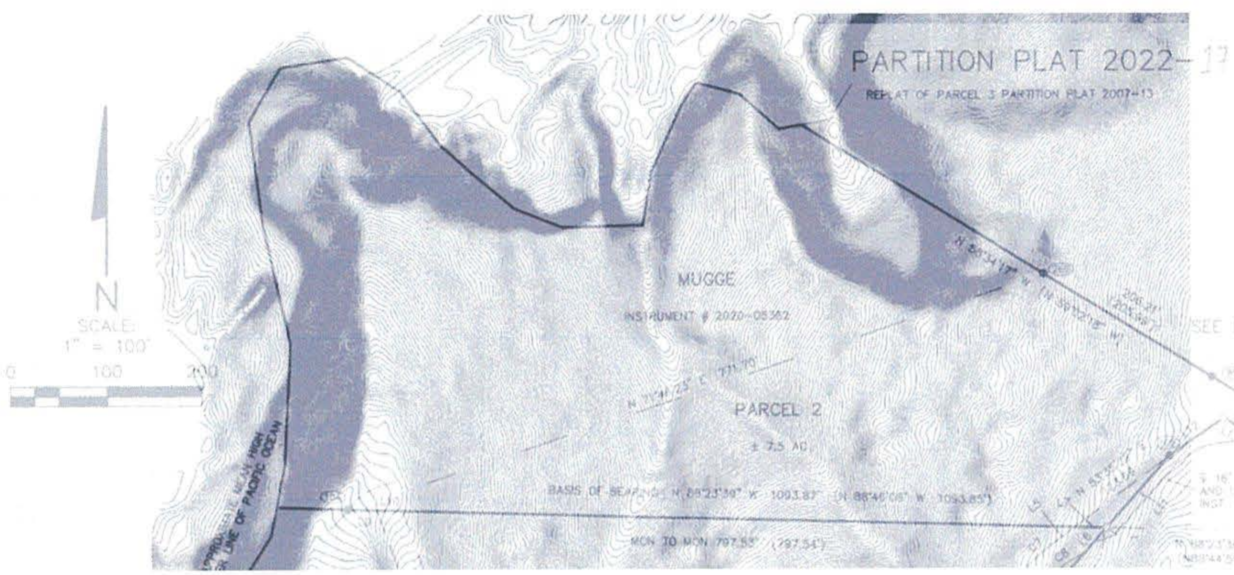


Figure 1 Topographic Map (1.5 feet elevation lines)

An initial geotechnical review of the property, presented in Appendix B: Carlson Engineering Geological Report, determined two locations potentially suitable for development. These locations are defined by setback requirements imposed by the natural topography and hazards detailed in the Appendix B and shown in Figure 3 below (taken from Figure 9 in Appendix B).

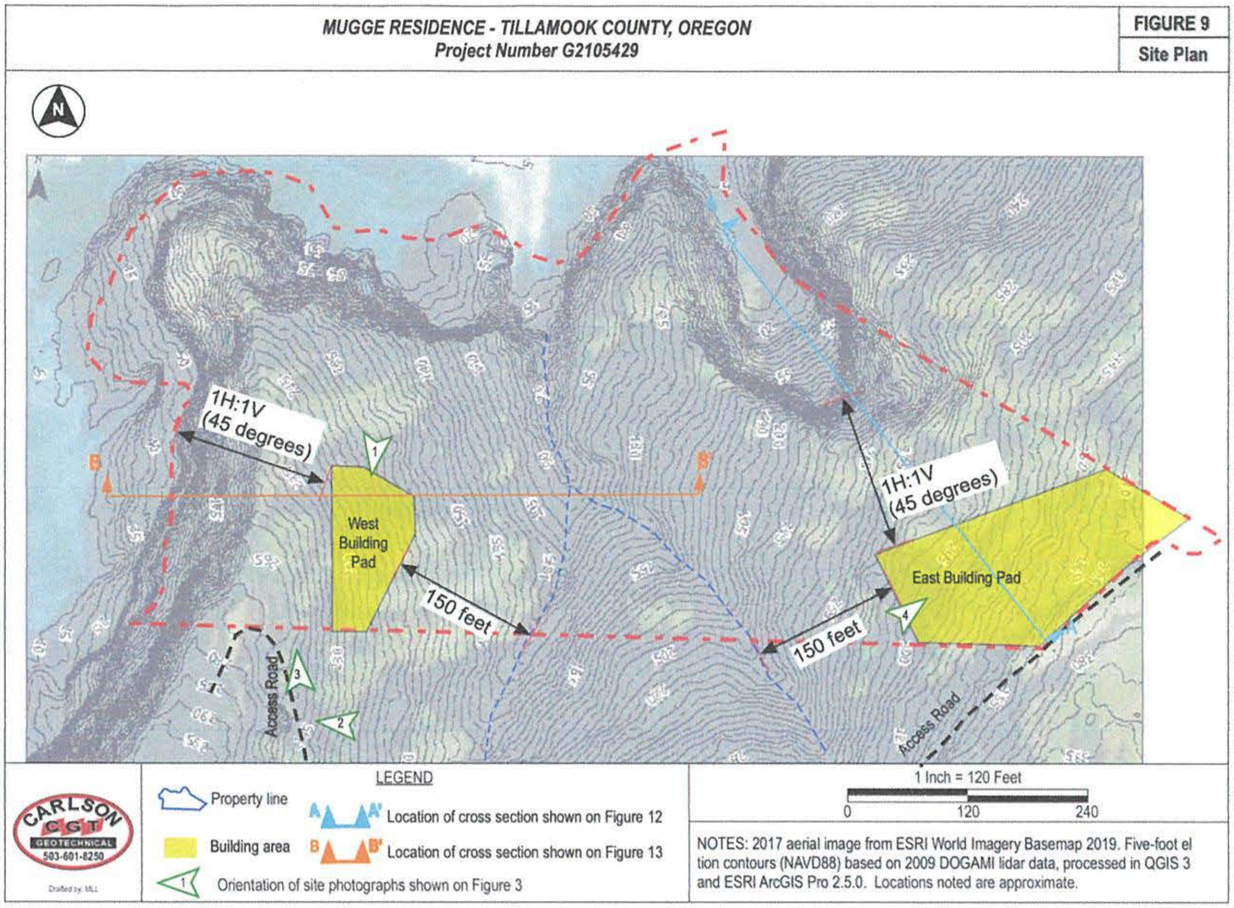


Figure 2 Building Pad Setback

The East Building Pad is the focus of this variance request as it meets zoning requirements for Tillamook County and Oregon except for the impact of the terrain on the height limit for NeskR-1. The West Building Pad in Figure 2 was deemed unsuitable for a primary residence during subsequent geotechnical and architecture discussions due to its isolated location, lack of access for driveway and emergency vehicles. Further, the location presents the same steep slope equation to the building height and if development was pursued, forgoing all the reason listed, permitting would require a similar or greater height variance.

The design on the East Building Pad is approached to best fit into the site's unique topology with a lower level placed below grade and the upper level at grade parallel to the existing topography. The driveway will incorporate an existing cut on the slope created for logging in the1990's. The cut straddles the minimum 20 foot required setback and provides for minimal grading and disturbance to provide a driveway on the property. The entry level for the house is placed at an approximate elevation of 350 feet, providing for emergency access and ensuring view lanes of neighboring properties are unrestricted. The footprint of the home is built to minimize the depth of the home and reduce the downslope impact, thirty feet depth provides for a building footprint to accommodate the entry, stairway, and 1 deep room living quarters on the main building and support a garage depth of 26 feet within walls, to provide for safe ingress and egress during inclement weather enjoyed across new homes constructed within Neskowin. Variances approved for homes facing similar environmental constraints related to slope impact on downside have been approved #851-22-000267-PLNG.

2. **A VARIANCE is necessary to accommodate a use or accessory use on the parcel which can be reasonably expected to occur within the zone or vicinity.**

A reasonably expected use as a single-family dwelling is explicitly allowed under Section 3.322 of the Land Use Ordinance. The homeowners of the single-family dwelling want to ensure the home supports ingress and safety of occupants during times of inclement weather often present on the Oregon coast to include a garage and covered entry.

3. **The proposed VARIANCE will comply with the purposes of relevant development standards as enumerated in Section 4.005 and will preserve the right of adjoining property owners to use and enjoy their land for legal purposes.**

Granting the requested variances to construct a single-family residence will comply with the development standards as enumerated in 4.005 as described below.

4.005 (1) To ensure the availability of private open space;

Approval of the requested variances is essential to create private open space on this land for enjoyment of the surrounding natural environment. Granting the variances as requested does not infringe on the right of neighboring property owners to enjoy private open space on their land.

4.005 (2) To ensure that adequate light and air are available to residential and commercial structures;

Adequate light and air to residential structures will be preserved by the granting of the requested variances. The design proposal for the dwelling is specifically arranged to capture sunlight from the west side of the house. Since the property is a west-facing slope with an elevation well below the grade of adjacent properties the proposed design will cause no loss of sunlight to surrounding structures built in the future. The nearest home location on adjacent lots, after setback will be approximately 80-100 feet away and separated by trees, the downslope height variance away from their views will have no impact on access to air.

4.005 (3) To adequately separate structures for emergency access;

As described in the previous response, the proposed dwelling maintains ample distance between structures. Granting of the requested variances will not constrain emergency access, the positioning of the house meets the Oregon Fire Code 2022 Appendix D and was reviewed during an onsite visit on January 11, 2024 with Chief Oeder.

4.005 (4) To enhance privacy for occupants of residences;

The house location, at an elevation of 350 feet, is designed to meet the geographical constraints AND maximize privacy for all surrounding property owners. Reducing the line of sight from the front of the house toward any future homes constructed east or north-east of the proposed location ensures their own west facing views will maintain privacy (Figure 2 adjacent lots). TaxLot 5S1135DC00100 has a grade elevation of approximately 377 feet, TaxLot 5S1135DC00300 has a grade elevation above 380 feet (see Figure 3-6 Homesite Elevations in Section 4.005(8) below), TaxLot 5S11350000223 proposed residence location is located approximately 700 feet to the west, with multiple changes in elevation and separated by old growth Sitka Forest adjacent to Suislaw

National Forest. With the variance applying only to the downslope side, the front will be under the standard height allowed. Modest east facing windows associated with the entrance will face a steep hillside separated by trees between adjacent lots further preserving privacy for all.

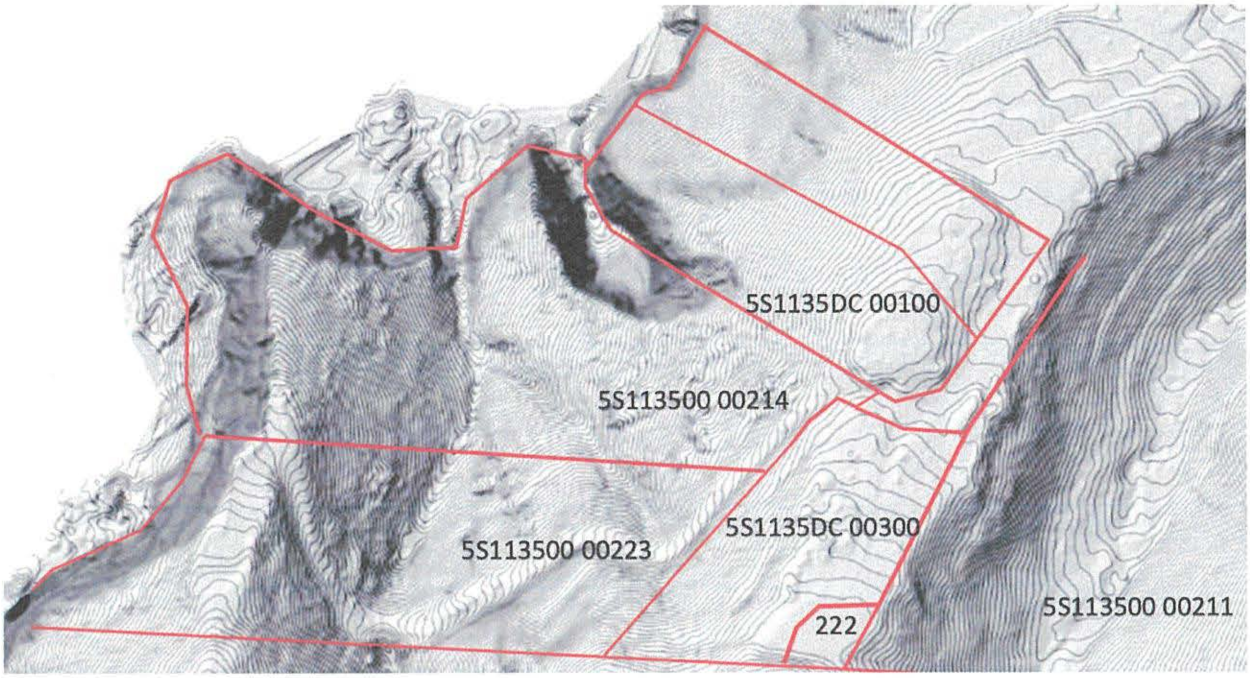


Figure 2 Adjacent lots

4.005 (5) To ensure that all private land uses that can be reasonably expected to occur on private land can be entirely accommodated on private land, including but not limited to dwellings, shops, garages, driveways, parking, areas for maneuvering vehicles for safe access to common roads, alternative energy facilities, and private open spaces;

The proposed house will be constructed entirely on private land. This includes the driveway which connects safely to South Beach Road.

4.005 (6) To ensure that driver visibility on adjacent roads will not be obstructed;

No obstructions for drivers are created by this proposal. Approval of the requested variance on the downslope side to allow construction of the proposed design will not alter driver visibility. The private drive on TaxLot 5S11350000223 supports only one homesite to the west and the safety and visibility of that driveway is unaffected by the proposed variances.

4.005 (7) To ensure safe access to and from common roads;

The proposed dwelling is at the end of the common road with no common road through traffic.

4.005 (8) To ensure that pleasing views are neither unreasonably obstructed nor obtained;

The proposed design incorporates an extensive consideration of neighboring lots to ensure their ocean views are retained and this home is well secluded, with visibility from adjacent properties greatly reduced, as a result the views from the adjacent properties are not obstructed in any way by the proposed design with the requested variance. Views from the adjacent lots are preserved in such a way that does not preclude the project site from rightfully enjoying similar views.

Care has been taken with the proposed design, placing the home elevation below the grade elevations of neighboring lots, to ensure the views are unimpeded. Other considerations made include designing the driveway using the existing road 1990 logging activity, to minimize grading per the geotechnical report and providing a slope to safely reach the garage structure and meet emergency service access requirements, placing the front home grade elevation at 350 feet. The proposed front elevation is 25'-30' below the existing lot grades of neighboring properties, and the roof height does not obstruct ANY view lanes (Figure 3-6 view lanes and elevation profiles). Furthermore, trees, building materials and other natural topography will further hide views of the house.

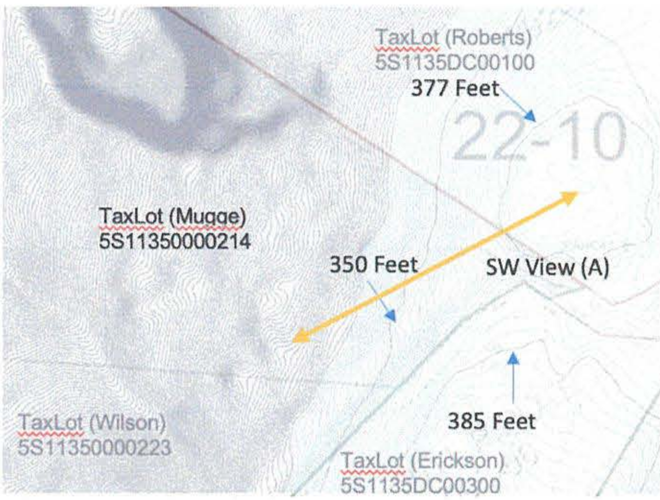


Figure 3 Lot 5S1135DC00100 view lane

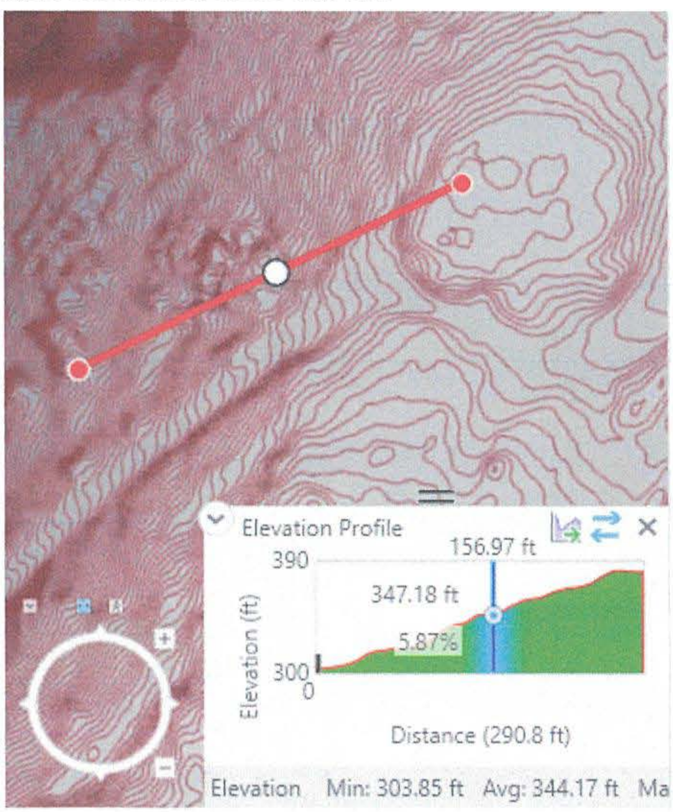


Figure 4 Lot 5S1135DC00100 elevation profile with ground floor illustrated at approximately 350'.

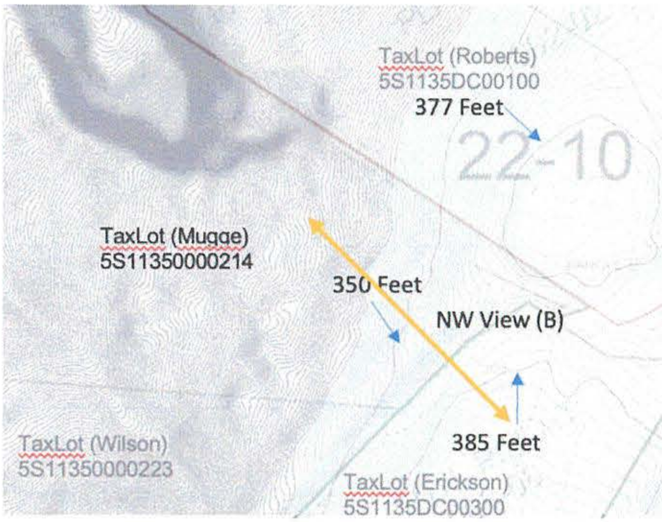


Figure 5 Lot 5S1135DC00300 view lane

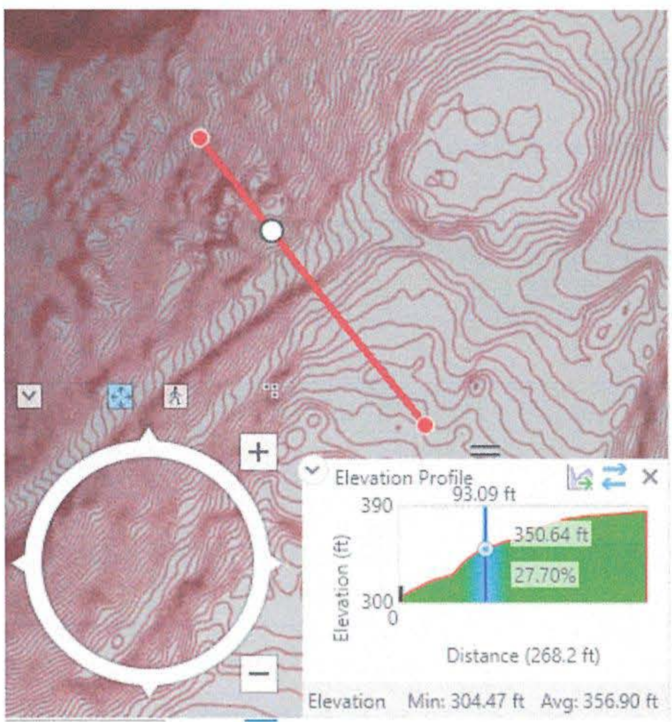


Figure 6 Lot 5S1135DC00300 elevation profile with ground floor illustrated at approximately 350'.

4.005 (9) To separate potentially incompatible land uses;

The proposed development of the property as a single-family house is permitted outright within the NeskR-1 zone. No incompatible land uses are proposed.

4.005 (10) To ensure access to solar radiation for the purpose of alternative energy production.

This lot has no impact on the availability of solar radiation on any of the neighboring buildable parcels. The properties to the north and east are significantly higher, and the building height is well under the maximum for the upslope facing side.

4. There are no reasonable alternatives requiring either a lesser or no VARIANCE.

To meet geological and geohazard restrictions documented in Appendix A (Earth Engineers Geotechnical Report) and Appendix B (Carlson Engineering Geological Report), the available location to construct a home is restricted to an area approximately one acre on the eastern side of the property. Due to the nature of site topography a structure 30-feet deep at grade for the garage entry is approximately 20-25 feet above grade on the rear wall, varying some due to slope. A 10-foot clear space inside the home and a 24-30 inch thick ceiling/roof construction results in the downslope height of the structure is at approximately 35-37.5 feet above grade.

Alternatives explored included a garage at a 20-foot setback on the front edge of the property but due to the slope impact on the backwall of the living quarters this does reduce the variance required for the home. A more compact footprint, set at the minimum distance from the property line of 20 feet in front and 5 feet on the side requires a height variance of 35 feet, but substantially increases the overall percentage of the roof area that exceeds the 24-foot maximum, as seen in Figure 7.0 alternate overhead and 8.0 alternate cutaway. This alternative layout further impacts views for adjacent properties to the north and east as the front grade is at 368 feet and the front roof height is approximately 388 feet, while it is a lesser variance it does affect those landowners under Section 4.005 (4) and (8), as it relates to sightlines and a sense of private open space.

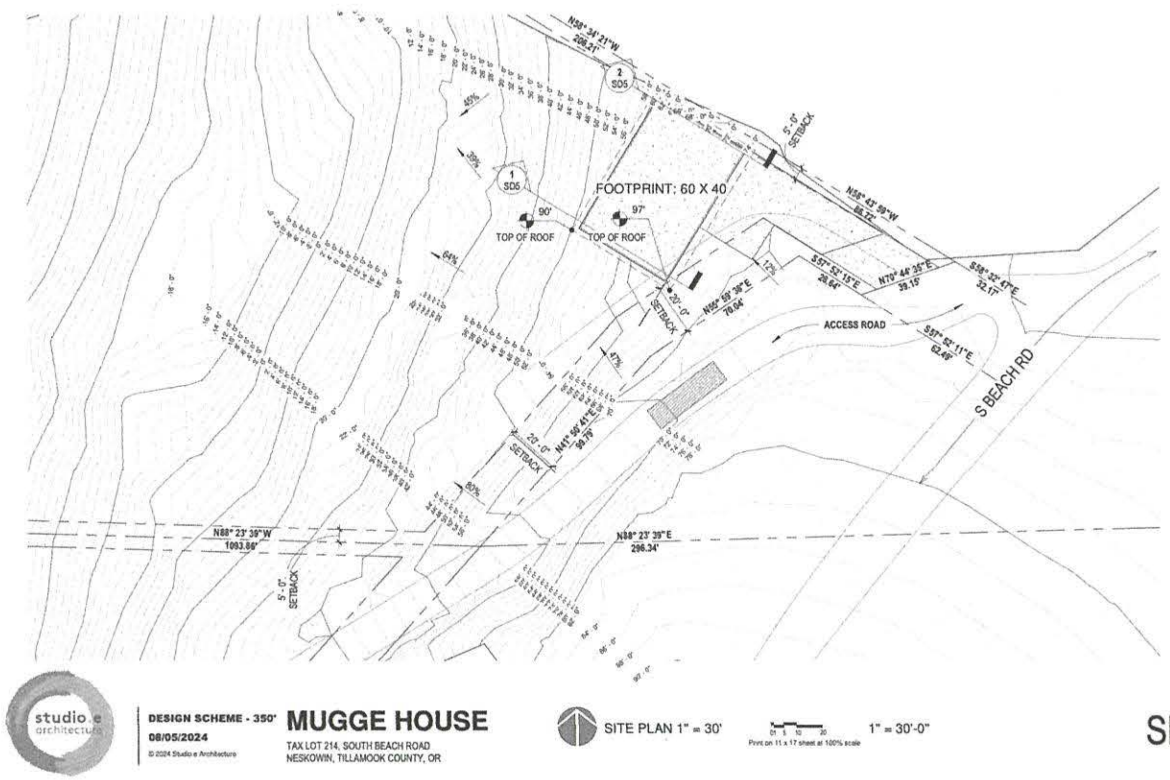
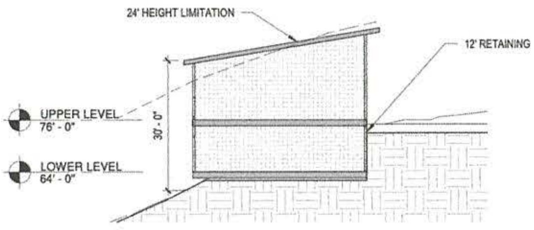
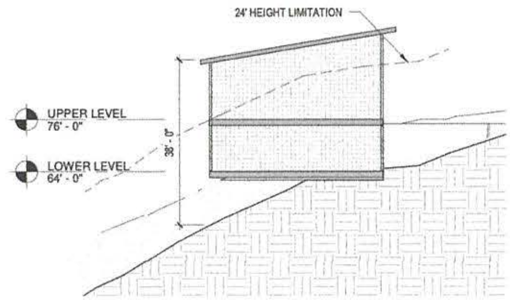


Figure 7.0 Alternate design overhead



2 SECTION - NORTH
1" = 20'-0"



1 SECTION - SOUTH
1" = 20'-0"

Figure 8 Alternate design cutaway

CONCLUSION

Denying the requested variance would prevent the property owners from fully enjoying the Oregon coastal lifestyle that their neighbors embrace. It would also have a significantly impact to the landowners as they have made a considerable financial investment in this legally platted property, which is valued as real estate and has received Tillamook County's approval for a single-family home.

A key aspect of the NeskR-1 height limit is to safeguard and limit the impact of development to views of neighboring homeowners and the natural scenery along the coast. The proposed variance would not obstruct the views of nearby properties or coastal vistas, as the downslope is only visible from boats offshore. Additionally, the distance from the minimal oceanfront setback is three times greater than completed and ongoing homes construction along the western edge of South Beach Road.

This property stands out among most lots on South Beach Road, as it is one of the steepest, with nearly all 8.1 acres classified as oversteepened. This limits the feasible areas for safely constructing a single-family residence, underscoring the need for favorable consideration of the requested variance to create a livable, full-time home. Various alternatives were explored in consultation with engineers and architects as part of a comprehensive design process. These included different home arrangements, floor plan configurations, and garage entry options, none of which significantly reduced the required variance below 35 feet. Many alternatives also posed drawbacks, such as negatively impacting neighboring views, increasing runoff issues, and necessitating large retaining walls that could threaten tree and lot preservation.

The proposed design, with approval of the requested height variance on the downslope building height, is an optimal solution grounded in the Tillamook County Development Standards and environmental considerations.

APPENDIX A EARTH ENGINEERS GEOTECHNICAL REPORT

Earth
Engineers,
Inc.

2411 Southeast 8th Avenue • Camas • WA 98607
Phone: 360-567-1806
www.earth-engineers.com

January 24, 2023

Clinton Mugge
42120 North Olympic Fields
Anthem, Arizona 85086

Phone: (480) 703-7975
E-mail: muggec1@gmail.com

Subject: **Geotechnical Investigation and Geologic Hazard Report**
Proposed Mugge Single Family Residence
Tax Lot 214, South Beach Road
Neskowin, Tillamook County, Oregon
EEI Report No. 22-230-1

Dear Mr. Mugge:

Earth Engineers, Inc. (EEI) is pleased to transmit our report for the above referenced project. The attached report includes the results of field and laboratory testing, an evaluation of geologic hazards that may influence the proposed development, recommendations for building design, as well as recommendations for general site development.

We appreciate the opportunity to perform this geotechnical study and look forward to continued participation during the design and construction phases of this project. If you have any questions pertaining to this report, or if we may be of further service, please contact our office.

Respectfully submitted,
Earth Engineers, Inc.

Jake Munsey, R.G., C.E.G.
Senior Engineering Geologist

Troy Hull, P.E., G.E.
Principal Geotechnical Engineer

Attachment: Geotechnical Investigation and Geologic Hazard Report

Distribution (electronic copy only): Addressee

GEOTECHNICAL INVESTIGATION AND GEOLOGIC HAZARD REPORT

for the

Proposed Mugge Single Family Residence
Tax Lot 214, South Beach Road
Neskowin, Tillamook County, Oregon

Prepared for

Clinton Mugge
42120 North Olympic Fields
Anthem, Arizona 85086

Prepared by

Earth Engineers, Inc.
2411 Southeast 8th Avenue
Camas, Washington 98607
Telephone (360) 567-1806

EEI Report No. 22-230-1

January 24, 2023

Earth Engineers, Inc.

CERTIFIED OREGON Jake G. Munsey E2521 ENGINEERING GEOLOGIST
EXP 5/1/2023

Jake Munsey, R.G., C.E.G.
Senior Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER 19206PE OREGON JULY 15, 1997 TROY M. HULL
EXPIRES: 6/30 23

Troy Hull, P.E., G.E.
Principal Geotechnical Engineer

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1.0 PROJECT INFORMATION

1.1 Project Authorization

Earth Engineers, Inc. (EEI) has completed a geotechnical engineering and geologic hazard evaluation for the proposed single-family residence located at Tax Lot 214 along South Beach Road in Neskowin, Tillamook County, Oregon. Our services were authorized by Clinton Mugge on September 13, 2022 by signing EEI proposal No. 22-P365-1 issued on that same date.

1.2 Project Description

Our current understanding of the project is based on the information provided to EEI Principal Engineering Geologist Adam Reese. We have received the following documents via e-mail:

- **"Engineering Geologic Report, Mugge Residence, Tax Lot 214, South Beach Road, Tillamook County, Oregon" dated March 1, 2021 and prepared by Carlson Geotechnical.**

- **"Geologic Hazards Evaluation, Proposed S Beach Road Residential Development" dated April 29, 2019 and prepared by GeoDesign, Inc.**

Briefly, we understand the plan is to construct a single family residence on the easternmost portion of the property and possibly a small gazebo structure on the western portion of the property. We have not been provided detailed foundation loading or grading plans for the proposed home and gazebo construction. For the purposes of this report, we are assuming typical, residential foundation loads of 4 kips per linear foot for wall footings, 50 kips per column footing, and 150 psf for floor slabs. We are assuming the gazebo structure will be very lightly loaded (i.e. no more than 1 kip per linear foot for continuous footings and no more than 6 kips per isolated pad footing). With regard to design grades, we are assuming cuts and fills for the house will generally be limited to approximately 15 feet below existing grade (assuming the building envelope will be cut into the slope, or if a basement is constructed). For the gazebo, we are assuming cuts and fill will be minimal (i.e no more than about 2 feet). We assume the house and gazebo will be designed in accordance with the 2021 Oregon Residential Specialty Code (ORSC), an amendment to the 2018 International Residential Code (IRC).

1.3 Purpose and Scope of Services

The purpose of our services was to explore the subsurface conditions at the site to better define the subsurface soil, rock, and groundwater properties in order to provide geotechnical recommendations for the proposed construction, as well as to conduct a Geologic Hazard Assessment to meet the requirements of Tillamook County Code Section 4.130 for properties located in geologic hazard areas.

Our site investigation consisted of advancing two Standard Penetration Test (SPT) borings (B-1 and B-2) to depths of up to 26.5 feet below ground surface (bgs) in the vicinity of the proposed residence, as well as a hand auger and drive probe boring that extended to a depth of 2½ feet bgs in the vicinity of the proposed gazebo. Soil samples were taken and returned to our laboratory for testing, which was accomplished in general accordance with ASTM test procedures.

This report briefly outlines the testing procedures, presents available project information, describes the site and subsurface conditions, and presents recommendations regarding the following:

- A discussion of subsurface conditions encountered including pertinent soil and rock properties and groundwater conditions.
- A Geologic Hazard Assessment in accordance with Tillamook County requirements.
- Seismic design parameters in accordance with ASCE 7-16.
- Geotechnical related recommendations for deep foundation design.
- Structural fill recommendations, including an evaluation of whether the in-situ soils can be used as structural fill.
- General retaining wall design recommendations, including earth pressures, drainage, and backfill.
- Floor slab on grade support recommendations.
- Discussions on geotechnical issues that may impact the project.

Our scope of services does not include infiltration testing of the site for on-site stormwater disposal design. Additionally, our scope of services does not include drafting any design drawings that might be required in the future by Tillamook County.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 Site Location and Description

The project site is located at Tax Lot 214 (Map 5S-11-35) along South Beach Road in Neskowin, Tillamook County, Oregon. The property is ocean front, and sits atop a sea cliff approximately a mile south of Neskowin. The property location relative to surrounding features is provided in Appendix A – Site Location Plan.

The 8.31-acre property is irregularly shaped and is bordered by South Beach Road to the east, residential properties to the north and south, and the Pacific Ocean the west, as shown below in Figure 1.

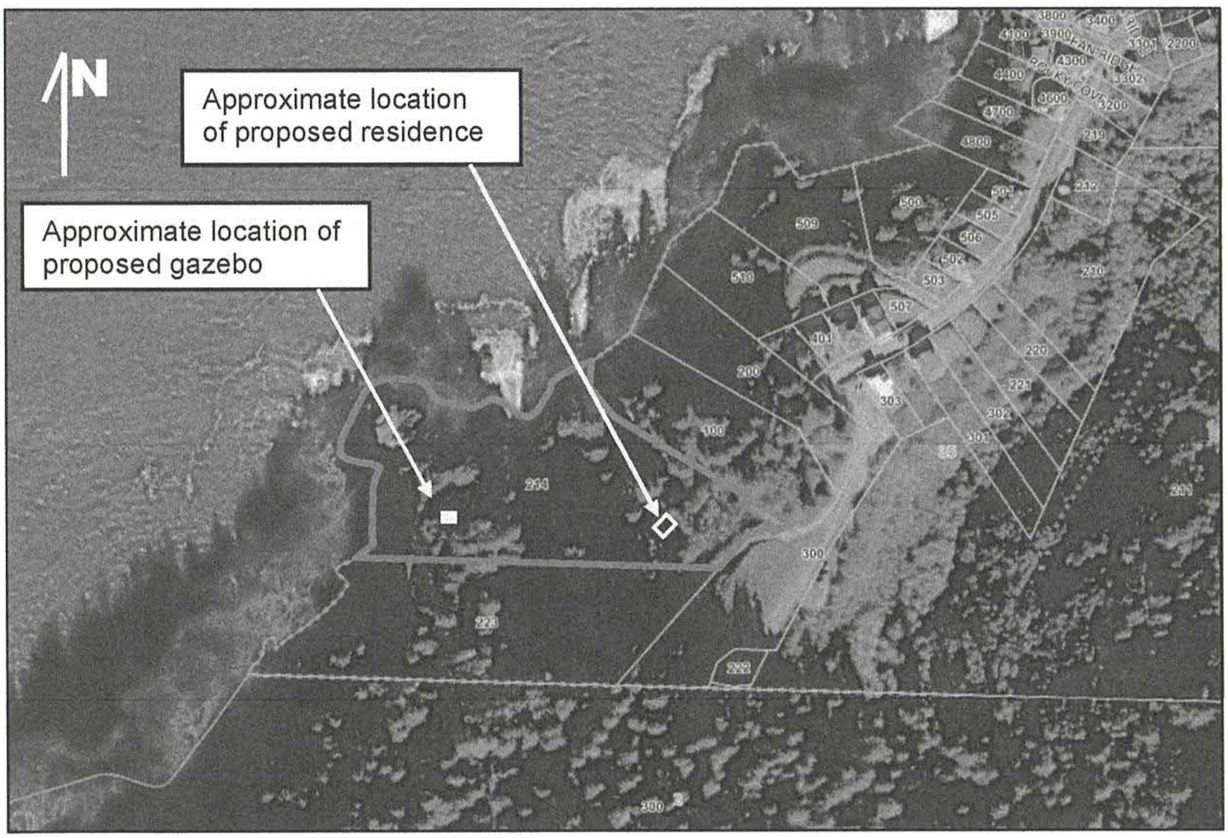

Figure 1: Property location, outlined in red (base image source: http://tillamookcountymaps.co.tillamook.or.us/).

The subject lot is roughly 1,000 feet long by 650 feet wide and oriented longitudinally along its long axis. Broadly, the subject property slopes downward to the west at an average slope of approximately 1.5H:1V (Horizontal:Vertical) to vertical at the ocean front cliffs. Excluding the site's west facing slopes, the site is roughly bisected by an unnamed creek that flows from the south toward the north across the site before discharging into the Pacific Ocean. The site's topographic relief is dominated by approximately 230-foot-high oceanfront cliffs and the approximately 200-

foot-deep ravine incised by the creek. Aside from the base of the cliffs, the lowest most portion of the site is where the creek discharges into the Pacific Ocean near sea level along the north property boundary, and the highest portion of the site is due east of the proposed build location along the eastern boundary of the property at an elevation of approximately 370 feet. An access road winds from the northeast portion of the site to the proposed residence location. The proposed residence location is at an elevation of approximately 290 feet above the Pacific Ocean beach below and is generally sloping toward the west at approximately 1.5H:1V for approximately 100 feet horizontally then transitions to a near-vertical to vertical face to a small cove in the rocky shoreline. The proposed gazebo location is located on a northeast facing ridge in the southwest portion of the property. See Figure 1 above for approximate locations of the proposed residence and gazebo locations. See Figure 2 below for a Google Earth view of the site atop the sea cliff from the west. See Photo 1 and 2 below for the existing site conditions.

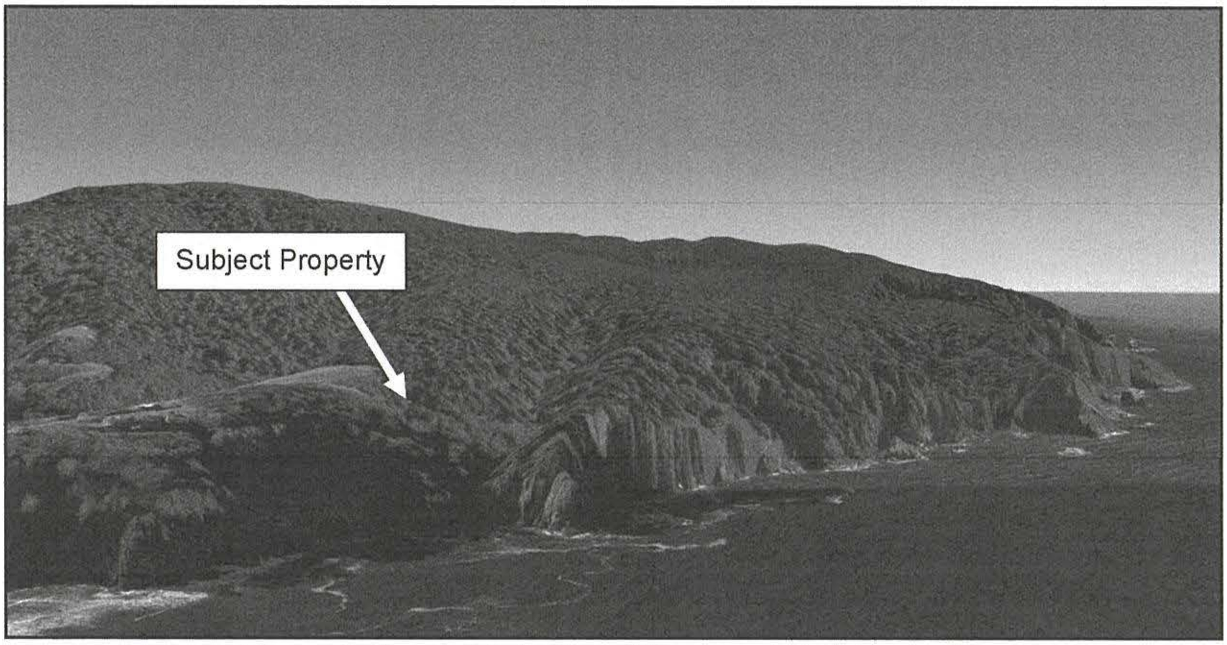

Figure 2: Google Earth view of the property looking south.

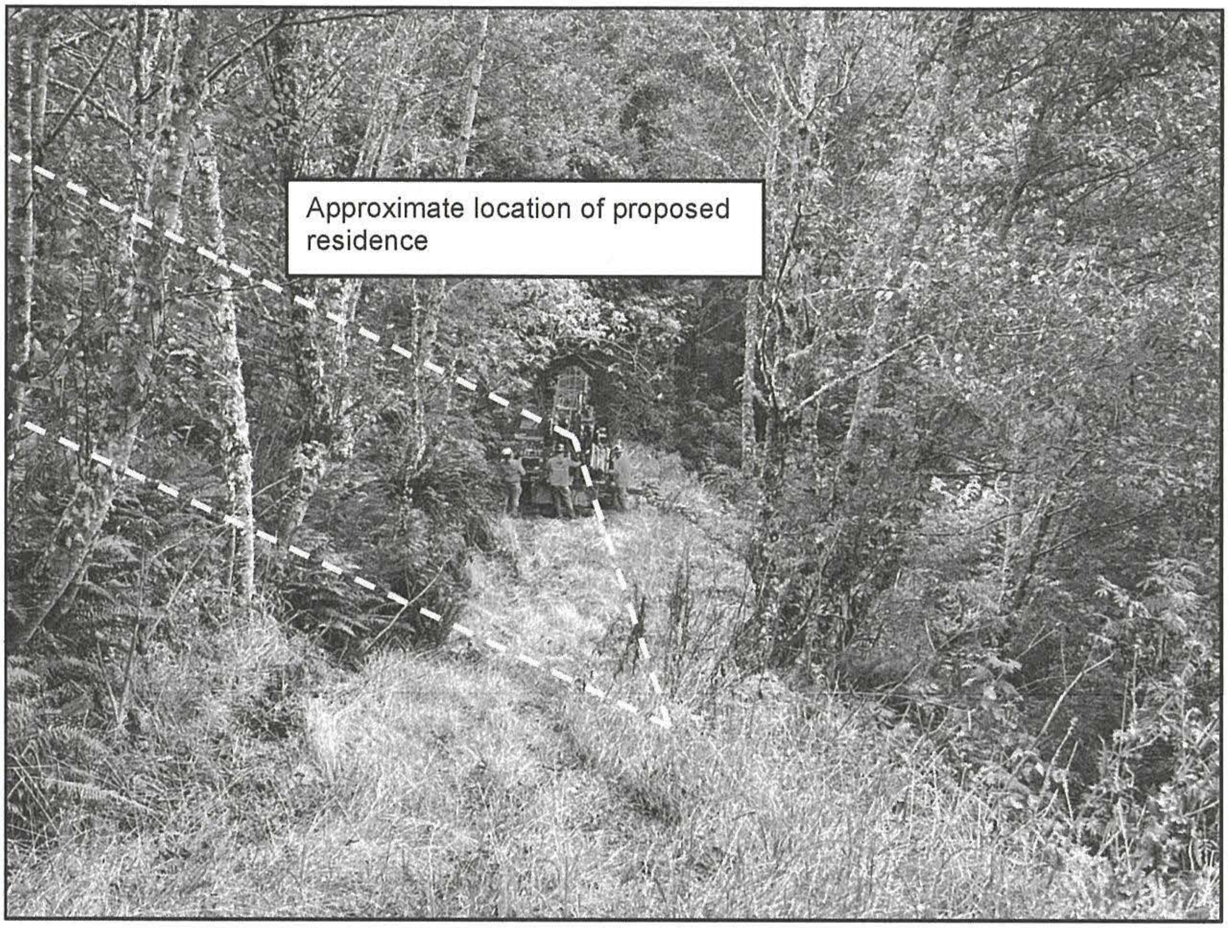

Photo 1: Photo looking south at the proposed residence location.

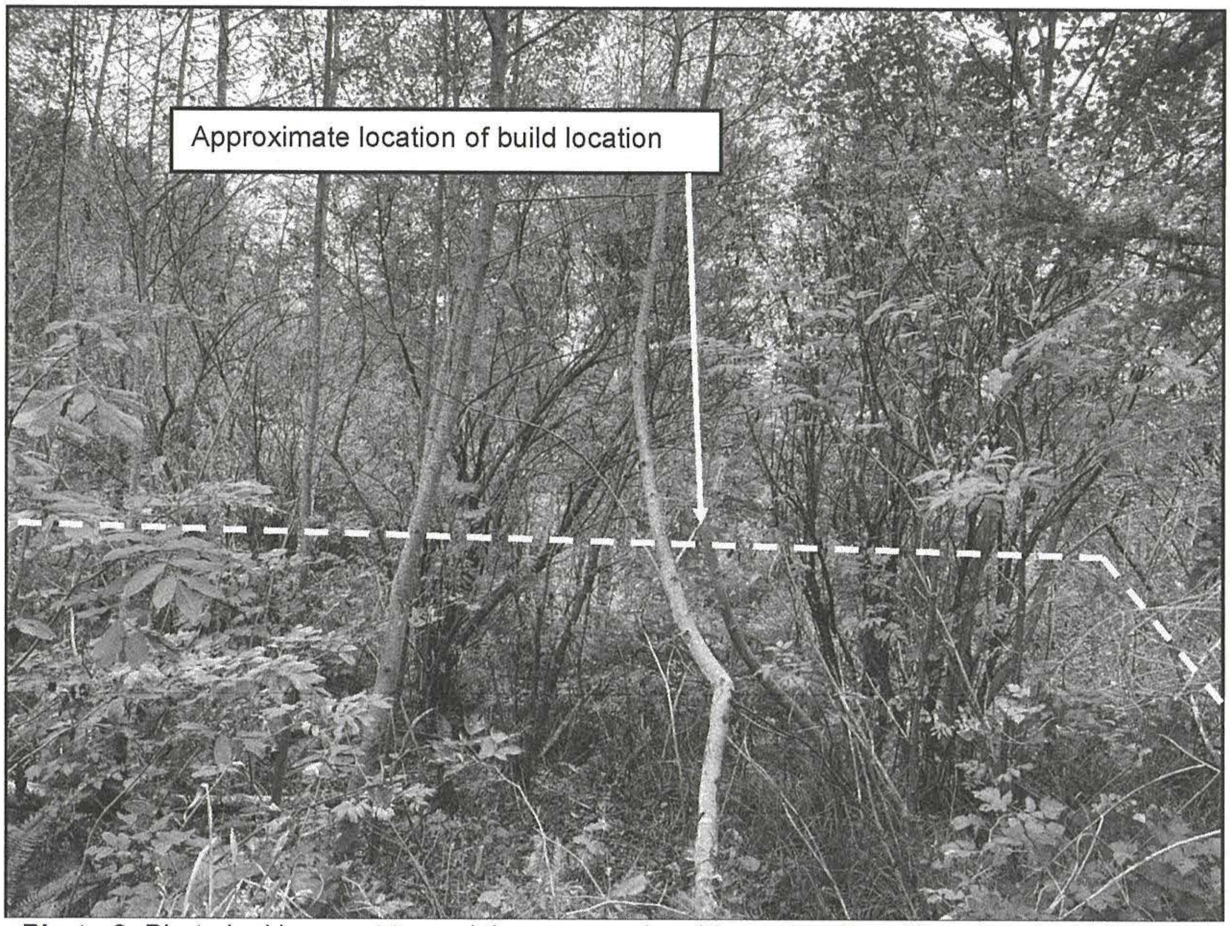

Photo 2: Photo looking west toward the proposed residence location. Note that the drilling rig mast can be seen through the trees where it is set up below at location B-1.

2.2 Subsurface Materials

The site was explored with two SPT borings (B-1 and B-2) in the vicinity of the proposed residence. The SPT borings were advanced with a subcontracted tracked Mobile B57 drill rig from PLi Systems of Hillsboro, Oregon. Using hollow stem auger drilling techniques, the borings were advanced to depths between 21 and 26.5 feet bgs.

We supplemented the drilled borings with a hand auger boring (HA-1) with accompanying drive probe testing at the approximate location of the proposed gazebo. The hand auger boring extended to a depth of 2½ feet bgs, while the drive probe testing in the hand auger boring extended to 3 feet bgs. For the approximate exploration locations, see the Exploration Location Plan, Appendix B. Results of the drilled borings and hand auger borings are reported in the Exploration Logs in Appendix C.

Drive probe testing extended from the ground surface at the hand auger boring location. The drive probe test is based on a "relative density" exploration device used to determine the distribution and to estimate strength of the subsurface soil and decomposed rock units. The resistance to penetration is measured in blows-per-1/2 foot of an 11-pound hammer which free falls roughly 39 inches, driving a ¾-inch diameter (O.D.) pipe with a 1-inch diameter end cap into the ground. This measure of resistance to penetration can be used to estimate relative density of soils. For a more detailed description of this geotechnical exploration method, refer to the Slope Stability Reference Guide for National Forests in the United States, Volume I, United States Department of Agriculture, EM-7170-13, August 1994, P 317-321.

SPT samples were taken every 2.5-feet in the upper 15-feet, and then in 5-foot intervals to the terminal depths in the drilled borings. Disturbed "grab" soil samples were obtained in the hand auger boring of each major soil unit encountered. Each sample was marked and identified by the date sampled, project number, hand auger number, and sample depth. The samples were transported to our laboratory for visual identification and laboratory testing, and will be retained for at least 90 days from the date of this report.

Select soil samples were tested in our laboratory to determine material properties for our evaluation. Laboratory testing was accomplished in general accordance with ASTM procedures. The testing performed included moisture content tests (ASTM D 2216) and fines content determinations (ASTM D1140). The test results have been included on the Exploration Logs in Appendix C.

In general, we encountered a surficial layer of topsoil mantling silt soils, underlain by weathered basalt. Each individual stratum encountered is discussed in further detail below.

Topsoil: The surficial layer consisted of a dark brown silt with roots and decomposed organics. Stratum thickness was approximately two to six inches in our explorations.

Silt (ML): Immediately below the topsoil was medium to dark brown silt in a very soft to medium stiff condition. Laboratory testing conducted on samples obtained in this stratum resulted in moisture contents that ranged from 46 to 96 percent. Some sand, angular basalt clasts, and organics were also present. The thickness of the stratum ranged from approximately 4 to 6 feet. The material extended to a maximum depth of approximately 6.5 feet (at location B-2).

Silty Sand (SM) (Decomposed to Intensely Weathered Basalt): The terminal stratum in each of the borings was basalt bedrock. The basalt was encountered in explorations B-1, B-2, and HA-1 at depths of 4.5 feet, 6.5 feet, and 2.5 feet, respectively. The weathered basalt graded from loose to medium dense residuum when first encountered to very dense at depths of 20 feet, 12.5 feet, and 2.5 feet at locations B-1, B-2, and HA-1, respectively. The rock was generally friable and showed signs of separation along the mineral grain boundaries. The basalt can be described as light to dark brown in color. The basalt classifies as a silty sand soil In the USCS (Unified Soil Classification System) due to the sizes of grains that separate from the rock. The depth at which this material becomes very dense is intended to be the foundation bearing stratum for all structures as later discussed in this report.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The exploration logs included in the Appendix should be reviewed for specific information at specific locations. This record includes soil descriptions, stratifications, and locations of the samples. The stratifications shown on the logs represent the conditions only at the actual exploration locations. Variations may occur and should be expected between locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on the logs.

2.3 Groundwater Information

Groundwater was not encountered in our explorations. During our research, we found one publicly available historical water well log for the area as published by Oregon Water Resources Department. This nearby well log (at the end of South Beach Road) indicated static water level at approximately 199 feet below the ground surface. According to mapping by Google Earth, this well is located just east of the property and similar in elevation as the proposed build site. A copy of this well report can be seen in Appendix E.

It should be noted that subsurface groundwater levels can fluctuate seasonally during periods of extended wet or dry weather or from changes in land use.

3.0 GEOLOGIC HAZARD ASSESSMENT

3.1 Soil Survey

The United States Department of Agriculture (USDA) Soil Survey provides geographical information of the soils in Tillamook County as well as summarizing various properties of the soils. The USDA shows the native soils on the eastern part of the site mapped as Neskowin-Rock Outcrop-Necanicum complex with 60 to 100 percent slopes[1]. This well drained complex is formed on mountain slopes from a parent material of colluvium and residuum derived from igneous rock.

3.2 Geology

The region is underlain by a framework of Miocene aged (23 to 5 million years ago) volcanic rocks and Oligocene (33 to 23 million years ago) to Miocene aged marine sedimentary deposits that have been deposited over a basement rock of Eocene-aged (54 to 33 million years ago) volcanic arc deposits. Overlying this framework are Quaternary–aged (1.8 million years ago to present) marine terrace deposits, beach and dune deposits and landslide deposits.

The project area was mapped by Snavely, Macleod and Minasian (1990) of the U.S. Geological Survey to include the bedrock units of Tchb-Basalt of Cascade Head (Upper Eocene)[2]. The Basalt of Cascade Head is described as subaerial flows of massive to platy basalt that is locally very vesicular. Previously, Schlicker and others (1972)[3] mapped the project area as Undifferentiated Eocene Volcanic Rocks (Tevu), which is described as "several thousand feet of chloritized basalt flows and basalt breccias of submarine and subaerial origin. See Figure 3 below for the 1972 mapped area.

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[1] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ accessed September 22,2022.

[2] Snavely, P.D., MacLeod, N.S., and Minasian, D.L., 1990, Preliminary geologic map of the Neskowin quadrangle, Lincoln and Tillamook Counties, Oregon: U.S. Geological Survey, Open-File Report OF-90-413, scale 1:24,000

[3] Schlicker and others, 1972. Environmental Geology of the Coastal Region of Tillamook and Clatsop Counties, Oregon, Oregon Department of Geology and Mineral Industries, Bulletin 74.

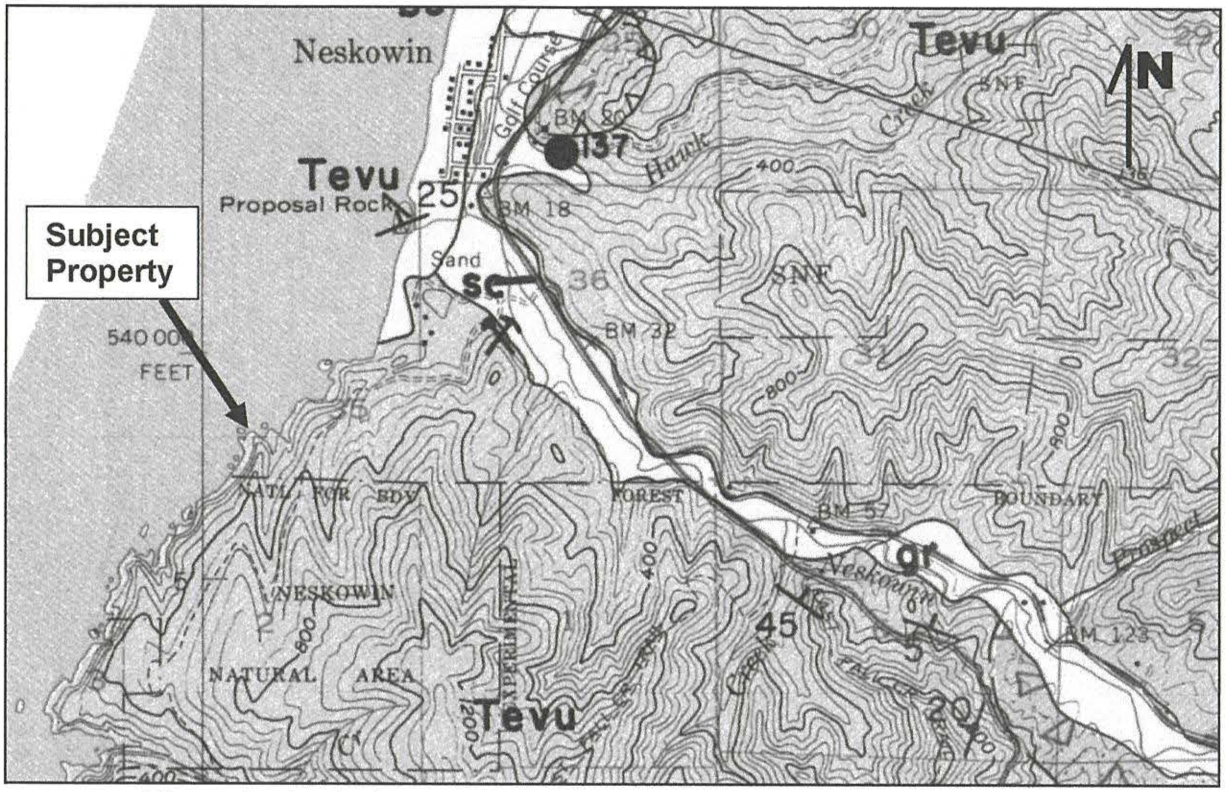


Figure 3: Geologic map of the area (source: Schlicker and others, 1972).

3.3 Seismicity

Oregon's position at the western margin of the North American Plate and its location relative to the Pacific and Juan de Fuca plates have had a major impact on the geologic development of the state. The interaction of the three plates has created a complex set of stress regimes that influence the tectonic activity of the state. The western part of Oregon is heavily impacted by the influence of the active subduction zone formed by the Juan de Fuca Oceanic Plate converging upon and subducting beneath the North American Continental Plate off the Oregon coastline.

The Cascadia Subduction Zone, located approximately 100 kilometers off of the Oregon and Washington coasts, is a potential source of earthquakes large enough to cause significant ground shaking at the subject site. Research over the last several years has shown that this offshore fault zone has repeatedly produced large earthquakes, on average, every 300 to 700 years. It is generally understood that the last great Cascadia Subduction Zone earthquake occurred about 300 years ago, in 1700 AD. Although researchers do not necessarily agree on the likely magnitude, it is widely believed that an earthquake moment magnitude (M_w) of 8.5 to 9.5 is possible. The duration of strong ground shaking is estimated to be greater than 1 minute, with minor shaking lasting on the order of several minutes.

Additionally, earthquakes resulting from movement in upper plate local faults are considered a possibility. Crustal earthquakes are relatively shallow, occurring within 10 to 20 kilometers of the surface. Oregon has experienced at least two significant crustal earthquakes in the past decade—the Scotts Mills (Mt. Angel) earthquake (M_w 5.6) on March 25, 1993 and the Klamath Falls earthquake (M_w 5.9) on September 20, 1993. Based on limited data available in Oregon, it would be reasonable to assume a M_w 6.0 to 6.5 crustal earthquake may occur in Oregon every 500 years (recurrence rate of 10 percent in 50 years). The USGS Quaternary Fault and Fold Database of the United States does not map any crustal faults in the immediate vicinity of the property; however, a mapped segment of the Cascadia fold and fault belt is located approximately 2.8 miles offshore to the west of the site.

In accordance with ASCE 7-16 we recommend a Site Class C (very dense soil or soft rock profile with an average standard penetration resistance of 15 to 50 blows per foot) when considering the average of the upper 100 feet of bearing material beneath the surface. This recommendation is based on the SPT blow counts, as well as our local knowledge of the area geology.

Inputting our recommended Site Class as well as the site latitude and longitude into the ASCE 7 Hazard Tool website (https://asce7hazardtool.online), we obtained the seismic design parameters shown in Table 1 below.

Table 1: Seismic Design Parameter Recommendations (ASCE 7-16)

PARAMETER	RECOMMENDATION
Site Class	C
S_s	1.304g
S_1	0.680g
F_a	1.200
F_v	1.400
S_{MS} (= S_s x F_a)	1.565g
S_{M1} (= S_1 x F_v)	0.951g
S_{DS} (=2/3 x S_s x F_a)	1.043g
Design PGA (= S_{DS} / 2.5)	0.417g
MCE_G PGA	0.646g
F_{PGA}	1.200
PGA_M (MCE_G PGA * F_{PGA})	0.776g

Note: Site latitude = 45.089327, longitude = -123.995944

The return interval for the ground motions reported in the table above is 2 percent probability of exceedance in 50 years.

3.4 Site Reconnaissance

EEI Principal Engineering Geologist Adam Reese R.G., C.E.G. and Senior Engineering Geologist Jake Munsey R.G., C.E.G. conducted a reconnaissance of the subject property and the local site vicinity making observations of the slopes, vegetation, surface drainage, exposed soils and bedrock, and general topography of the surrounding areas. We observed the slope for evidence of instability, and checked for on-site evidence of slope creep or recent landslide movement.

While in the project area we also observed the condition of existing streets, adjacent homes, slopes and graded areas, and other engineered structures in the local site vicinity. While we did consider the general effects potentially caused by a major earthquake, we did not analyze the site-specific effects of a major earthquake, or conduct global slope stability analyses.

Based on Google Earth, the proposed residence portion of the site is at an elevation of approximately 290 feet above mean sea level and the proposed gazebo location is approximately 260 feet above mean sea level. In the vicinity of the proposed residence portion of the lot, the site slopes at an approximate 1.5H:1V toward the west for approximately 100 feet horizontally then transitions to a near-vertical to vertical face to a small cove in the rocky shoreline. The proposed gazebo area of the lot slopes northeast toward the unnamed creek at an approximate 1.5H: 1V slope. In the vicinity of the proposed residence area, we observed a couple of younger, slightly deformed trees, suggesting some shallow soil creep. However, this is limited to a couple of young deciduous trees. The larger conifers that we observed did not appear to have any deformation. In the vicinity of the proposed gazebo, we did not observe any deformed trees. Other than these observations, we did not observe severely leaning or deformed trees, which can be an indicator of slope instability. In our limited observations, we did not observe evidence of distress in roads or adjacent house foundations in the vicinity of the site caused by slope movement.

Clearly definable site drainage, such as eroded areas, swales, or shallow depressions were also not observed. Based on the topography of the lot, we assume that most of the surface moisture introduced to the site is infiltrated into the surface soils, sheet flows down to the unnamed creek, or flows west toward the Pacific Ocean.

3.5 Geologic Hazards

The Oregon Department of Geology and Mineral Resources (DOGAMI) maps various geologic hazards, such as 100-year flooding, earthquake ground shaking, tsunamis, and landslides.[4] Based on this service, the geologic hazards associated with development of this property include the following:

- Low to very high coastal erosion hazard
- Severe expected shaking from a Cascadia earthquake (estimated magnitude 9.0+/-)
- Tsunami inundation
- Very strong expected earthquake shaking
- Moderate to high landslide hazard
- Effective FEMA 100-year flood plain

It should be noted that liquefaction was not a mapped hazard on or near the property. We recommend that the impacts of coastal erosion, tsunami inundation, landslide hazard, and FEMA floodplain designation do not pertain to the limited eastern upland portion of the lot proposed for

[4] Oregon HazVu: Statewide Geohazards Viewer, available online at: http://www.oregongeology.org/sub/hazvu/ accessed 9/22/2022.

building, provided that our foundation recommendations are observed. Figures 4 through 8 below show mapping of the geologic hazards presented by Oregon's HazVu.

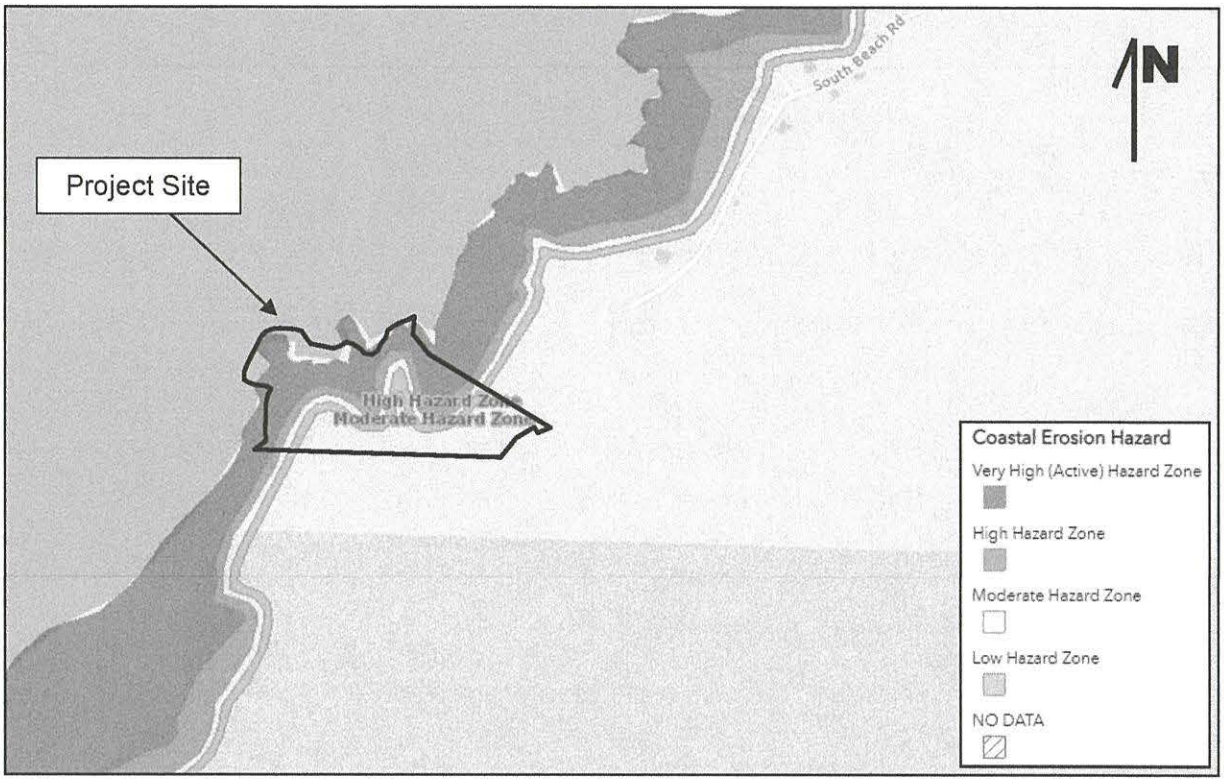


Figure 4: HazVu map showing extent and degree of coastal erosion hazard areas.

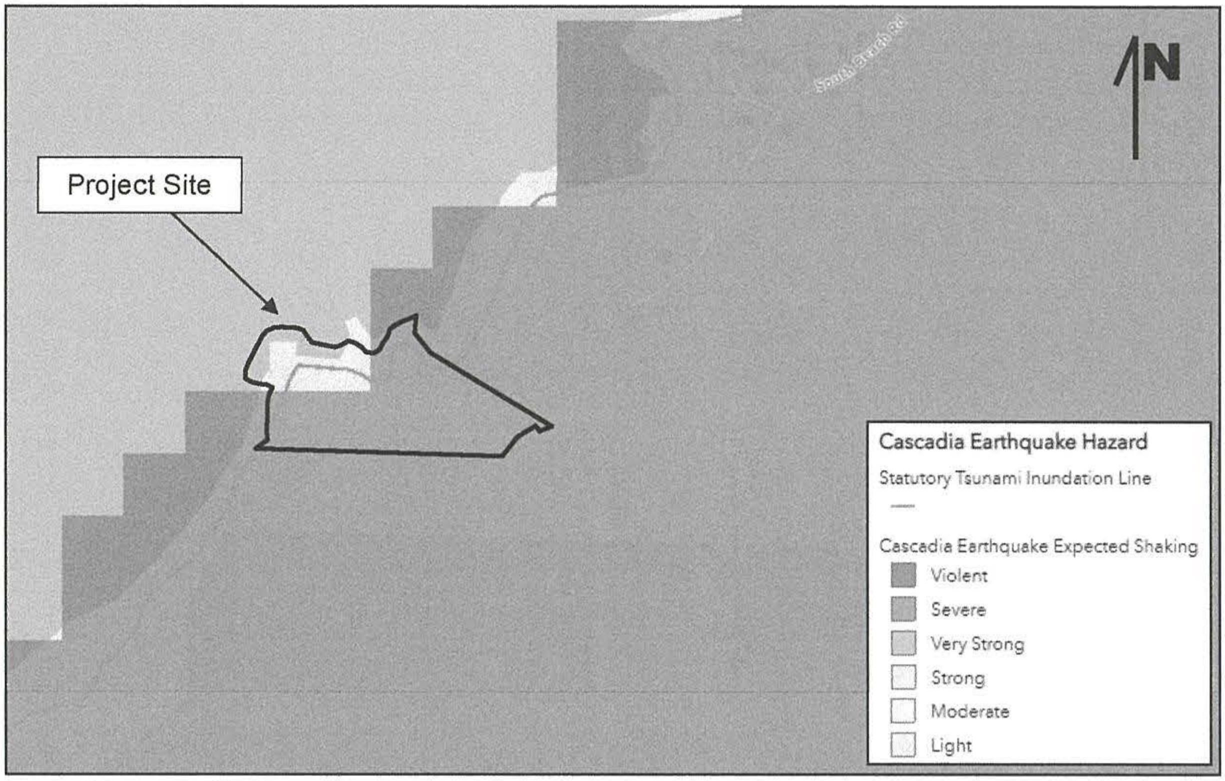


Figure 5: HazVu map showing extent and degree of Cascadia earthquake hazards.

Figure 6: HazVu map showing extent and degree of expected earthquake shaking hazard.

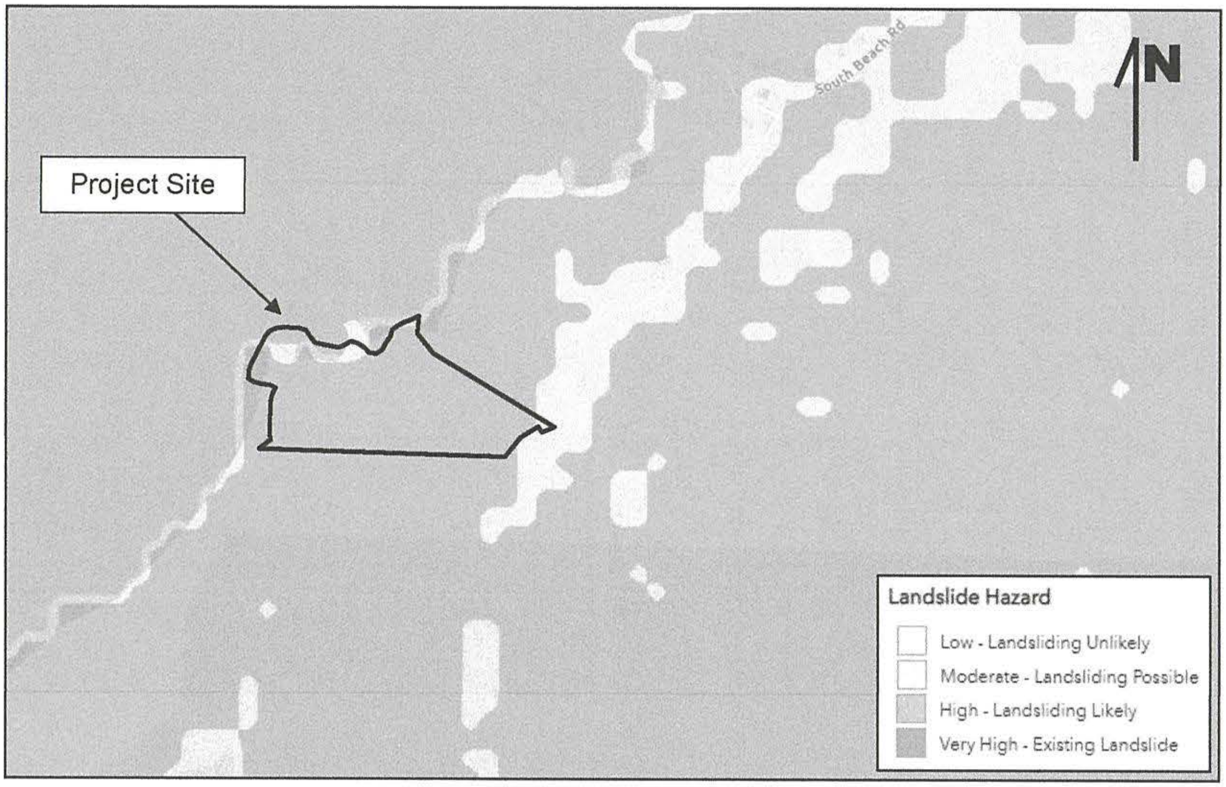


Figure 7: HazVu map showing extent and degree of landslide hazards.

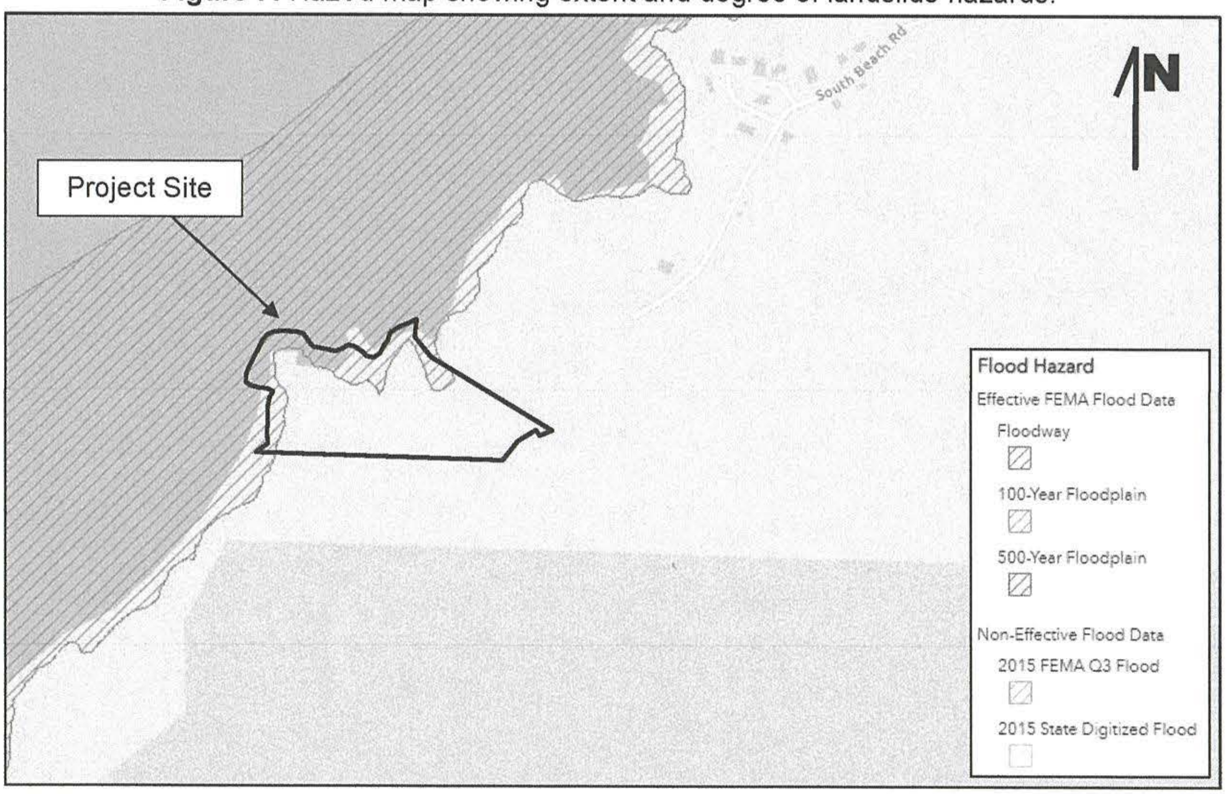


Figure 8: HazVu map showing extent and degree of mapped flood hazards.

Based on our site reconnaissance and subsurface explorations, we consider the site to have the following geologic hazards:

- Minor shallow soil creep;
- Potential local slope instability associated with loose, near surface soils on the upper portion of the slope;
- Possible slope instability concerns resulting from regional seismic activity.
- Coastal erosion.

Based on the subsurface conditions identified in our explorations, we believe that the slope hazards can be mitigated by a deep foundation system that transmits the load of the house to the very dense basalt bedrock below the soft silts and decomposed basalt. With regard to the proposed gazebo, we anticipate that it may be supported on a shallow foundation as long as it meets the following criterea: the gazebo will be minor in nature, unoccupied, and the owner is willing to take the risk that it could be damaged from shallow slope creep or landsliding.

Although a major seismic event could cause increased slope erosion, to what degree is not known. We do not believe this property is at any greater risk from this hazard than other existing structures located on coastal bluffs in the area. Given the apparent density of the encountered subsurface soils and the absence of groundwater, we do not consider earthquake-induced liquefaction to be a hazard at this site.

We do not consider the site to be in a coastal erosion hazard area since it is located at an elevation of over 290 feet on a headland of dense basalt bedrock. Similarly, we do not consider tsunamis, flooding, and storm surges as hazards for this site. It is our opinion that the proposed residential development on this property is feasible subject to the geologic hazard risks outlined above and the geotechnical engineering recommendations presented later in this report. Primary considerations to maintaining the existing static site slope stability include limiting the placement of fill to raise site grades, limiting the size of the building footprint to minimize disruption of the native soils and vegetation, and maintaining adequate site surface and subsurface drainage to prevent saturation of the slope. These recommendations are discussed in more detail in Section 4 below.

Ultimately, just like other numerous properties already developed, owning a home in this area of Neskowin means there is an acceptance of risk by the homeowner that the property is located on a steep cliff along the Oregon coast that is extremely dynamic and can change drastically from year to year.

3.6 Slope Stability

We qualitatively evaluated the slope stability of the site. Based on the soft soils we encountered above the very dense basalt, we consider the site slope stability to be at risk of impacts from shallow land sliding. However, we do not consider the proposed residence or proposed gazebo portions of the site to be at risk for substantial coastal erosion, since they are located at an elevation of over 270 feet on a headland of dense basalt bedrock and are set back from cliff edges at least 100 feet. The property appears currently stable when considering global, deep-seated landsliding, but the destabilizing effects of the slope due to a major earthquake are unknown. We believe that the risk of shallow land sliding can be reduced by founding the entire proposed structure on a deep foundation system that penetrates into the very dense basalt, thus the proposed structure will not be surcharging the soft soils.

4.0 EVALUATION AND FOUNDATION RECOMMENDATIONS

4.1 Geotechnical Discussion

Based on the subsurface investigation and evaluation of geologic hazards, it is our professional opinion that the primary factors impacting the proposed development include the following:

1. **Potential slope instability.** The primary slope stability concern is the layer of soil overlying the decomposed basalt bedrock. We are recommending mitigating this concern by recommending a deep pile foundation that penetrates into the basalt, and by recommending that site grades should not be raised with fill.

2. **Presence of steep slopes** – As stated in Section 2.1 above, the subject property generally slopes down to the west at 1.5H:1V in the vicinity of the proposed residence area. We consider soil slopes greater than about 2H:1V to be oversteepened. As such, the slope onsite is considered oversteepened. We consider the upper oversteepened native soil layer (approximately 12.5 to 20 feet thick in our borings) is potentially unstable. The underlying basalt bedrock stratum is stable. To mitigate the unstable soil unit, the proposed residential structure on the slope will need to be supported by a deep foundation system (micropiles and tiebacks) all connected with an integrated system of grade beams. Additionally, permanent cuts in the soil stratum should be retained with engineered retaining walls, as the slope is prone to lateral soil creep.

3. **Lightweight Geofoam–** If the project requires raising site grades, then we recommend the use of lightweight geofoam to mitigate slope stability concerns. It is acceptable to raise site grades with up to 12 inches of topsoil, where desired.

4. **Presence of Bedrock** – As stated above, we encountered bedrock at this site in our soil explorations. The depth to competent bedrock ranged from as shallow as 12.5 feet bgs to as deep as 20 feet bgs. Excavations into the bedrock could be difficult.

5. **Risks associated with earthquake shaking**. It is well-known that the Oregon coast is at risk of a major Cascadia Subduction Zone earthquake (predicted by some to be as high as magnitude 8 or 9) within the life of the proposed structure (the next Cascadia Subduction Zone earthquake is generally predicted to occur sometime within the next 400 years). Should this earthquake strike, there is high risk that it could cause a landside to occur on the subject property. We do not anticipate that it will be possible to completely mitigate the risk of damage from such an event. It should be noted that other similar properties already developed with homes in the Neskowin area are at a similar risk.

6. **Moisture-sensitive soils –** The fine-grained portion of the soils encountered at the site are expected to be moisture-sensitive. The increase in moisture content during periods of wet weather can cause significant reduction in the soil strength and support capabilities and will also be slow to dry. As such, water should not be allowed to collect in excavations, and care

should be taken when operating construction equipment on the exposed subgrade. While not required, we strongly recommend consideration be given to performing construction in the dry summer months to reduce the risk of damaging the site soils with the construction equipment or destabilizing slopes. Earthwork construction during the wet winter months will likely be more difficult and expensive, and our geotechnical inspections will likely be more costly. See more detailed recommendations for drainage in Section 5.2.

7. **Detailed construction drawings are not available at this time.** Our analysis for this property depends a lot on how it is developed. At this time, development plans are still very preliminary. As such, we have had to make some assumptions about the future development. It will be very important that EEI be retained to review the final development drawings and update our geotechnical recommendations as needed. As such, the geotechnical engineering recommendations in this report should be considered preliminary.

In summary, assuming that the unmitigable risks outlined above are acceptable, this site appears to be developable provided our mitigation recommendations are followed.

4.2 Site Preparation

Topsoil, vegetation, roots, and any other deleterious soils will need to be stripped from beneath the building areas. The topsoil thickness in our borings was approximately 2-6 inches. The existing site vegetation should not be removed beyond the proposed construction areas of the site, with the exception for construction access road, materials storage areas or stockpile locations. A representative of the Geotechnical Engineer should determine the depth of removal at the time of construction.

Given the difficult access to large machinery due to the steep slope at the site, the contractor will need to consider this for the installation of the deep foundation system. Any minor fill to backfill areas excavated to allow for temporary construction access should be benched as detailed below in Section 4.3.

Any utilities present beneath the proposed construction will need to be located and rerouted as necessary and any abandoned pipes or utility conduits should be removed to inhibit the potential for subsurface erosion. Utility trench excavations should be backfilled with properly compacted structural fill in accordance with Section 4.3.

As mentioned above, vegetation should only be removed where needed to complete the proposed construction. This includes the building, and site improvement and grading areas, as well as areas used to temporarily store soil and rock on the site.

Based on our past experience, site preparation will be very difficult to conduct during the wet season (i.e. typically about October to May). In addition, the geotechnical inspections will likely need to be more intensive (and costly) during wet weather construction. While not required, we recommend consideration be given to performing all earthwork during the drier summer months.

4.3 Structural Fill

Again, other than up to 12 inches of topsoil, no new fill should be placed on the existing site slopes that raise the grade from its original configuration. If fills are required to raise site grade, we recommend the use of lightweight geofoam. We recommend all excavated soil be removed from the property. Any minor amount of structural fill required to backfill excavations or utility trenches should be free of organics or other deleterious materials, have a maximum particle size less than 3 inches, be relatively well graded, and have a liquid limit less than 45 and a plasticity index less than 25. In our professional opinion, the on-site native silt soils meeting the above criteria are appropriate for use as structural fill. We recommend fill be moisture conditioned to within 3 percentage points below and 2 percentage points above optimum moisture as determined by ASTM D1557 (Modified Proctor). Given the fine grained nature and moisture content of the native soils, it may be difficult to achieve proper moisture content. As such the contractor should plan to import any structural fill if any is needed beneath slabs or the wall foundation.

Fill should be placed in relatively uniform horizontal lifts on the prepared subgrade. Each loose lift should be about 1-foot thick. The type of compaction equipment used will ultimately determine the maximum lift thickness. Structural fill should be compacted to at least 92 percent of a Modified Proctor maximum dry density as determined by ASTM D1557. Each lift of compacted engineered fill should be density tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts.

4.4 Foundation Recommendations

Based on the soils encountered in our subsurface explorations, and our experience with similar projects, in our opinion, a deep foundation is appropriate for this site. We provide the following preliminary foundation recommendations to aid you in developing a preliminary construction budget. Once a structural engineer is retained and has developed some of the foundation load demands, we can provide supplemental recommendations upon request. We envision that once structural load demands are known, we can update our recommendations to match the needs of the new house and optimize construction costs. It should be noted that because construction plans and drawings are not yet available to us, we have made some assumptions about the proposed residence layout in relation to the slope. As with other similar projects we have worked on, we have assumed that it would be preferable and cost effective to cut into the slope rather than raising the house above native grade on larger diameter piles. If it is discovered throughout the planning process that it is preferable to raise the structure above the existing native grade (e.g., to potentially improve the view), then we would be happy to modify our recommendations to reflect that. However, from our experience, that would be the more costly option.

As stated above, because the proposed residential house is located on a steep slope, and in order to provide uniform conditions for the foundation system (due to variability of upper soils and depth to bedrock), we recommend the house be supported on drilled and grouted micropiles that extend through the upper soils/decomposed rock and a minimum 5 feet into the competent hard bedrock. Based on our SPT borings, it appears that the competent bedrock may first be encountered between 12.5 and 20 feet bgs.

As mentioned previously, shallow basalt rock was encountered at a depth of 2.5 feet bgs in the vicinity of the proposed gazebo area. We anticipate that the gazebo structure may be supported on a shallow foundation (less costly option) as long as: the gazebo will be minor in nature, unoccupied, and the owner is willing to take the risk that it could be damaged from shallow slope creep or landsliding. Otherwise, the owner may elect to support the gazebo structure on micropiles as discussed in section 4.4.1 of this report to reduce the likelihood of the gazebo being damaged by shallow soil creep or landsliding.

In order to provide a rigid foundation, we recommend the pile caps be tied together with an integrated grid of grade beams (i.e. no isolated pad footings). For lateral support we recommend (at a minimum) the downhill-most pile line have tiebacks that also extend a minimum 5 feet into competent basalt bedrock. A representative of the Geotechnical Engineer should be present to determine at what depth competent bedrock is first encountered for micropiles and tiebacks. If additional lateral support is required for interior footings/grade beams, tiebacks may be installed or the micropiles can be battered. Below are detailed geotechnical recommendations (to be used by the project Structural Engineer) for design of vertical micropiles as well as grouted tiebacks.

4.4.1 Micropile Recommendations

We recommend the following criteria be used in the micropile design:

- The micropiles should be installed vertically.
- If additional lateral support is required (as stated above) tiebacks may be incorporated in the interior grade beams/footings) or the micropiles can be battered. To determine the vertical capacity of a battered micropile, the calculated vertical compressive strength can be multiplied by the cosine of the installation angle (from vertical). To determine the horizontal (lateral) capacity of a battered micropile the calculated vertical compressive strength can be multiplied by the sine of the installation angle (from vertical).
- The micropiles should consist of a minimum 4.5-inch nominal diameter borehole with a Grade 150 Williams solid bar or Titan IBO hollow bar capable of being tested to 200% design load as determined by the Structural Engineer. The Structural Engineer should select the appropriately sized bar following the manufacturer's recommendation using 80% of the listed yield strength values.
- The micropile center bars should be epoxy coated, galvanized, or metalized for corrosion protection because they are permanent.

- The portion of the micropile within the soil stratum should be unbonded. The unbonded portion of the micropile can be achieved by installing a pvc sleeve over the center bar.
- We recommend a minimum micropile embedment of 5 feet into competent basalt bedrock as determined by the Geotechnical Engineer. Based on our explorations we anticipate weathered rock will be encountered at approximately 12.5 to 20 feet bgs. Due to the sloping nature of the topography, the competent rock surface may be deeper or shallower. Ultimately the total length will be determined by the depth to competent rock during construction plus the bonded length as determined by the Structural Engineer.
- For pressure grouted micropiles we recommend using an allowable design rock-grout bond strength of 60 psi within the competent basalt bedrock. This recommended value includes a factor of safety of 2, which is appropriate when at least one micropile will be load tested to verify its load carrying capacity.
- The grout should consist of a high performance, non-shrink grout having a minimum compressive strength (f'g) no less than 5,000 psi at 28 days. Compressive strength samples (2-inch cubes) should be made by the geotechnical special inspector each day that grout is placed.
- Center bar centralizers should be used during the micropile installation at a spacing not to exceed 7 feet. The first centralizer should be installed within 18 inches of the end of the bar.
- The quantity, spacing, and location of the micropiles should be specified by the Structural Engineer.
- For the micropiles, in order to verify the above design side shear, it is recommended that at least 1 micropile be load tested at the site to verify the axial compressive strength. It is acceptable to perform a pull test in lieu of a compression test to prove the axial compressive capacity of the pile. The micropile should be loaded in 10 percent increments to two times (200%) the design load as determined by the Structural Engineer. Vertical movement (pullout) of the test anchor should be recorded to the nearest 0.001 inches via an independent dial gauge at each loading increment. Each incremental load should be held until vertical movement of the micropile has essentially ceased (i.e. for at least 1 minute), except for the 100%, 150%, and 200% load increments. At these increments, readings shall be taken at 1, 2, 3, 4, 5, 6 and 10 minutes. If the total creep movement exceeds 0.040 inches between 1 and 10 minutes (i.e. one log cycle), then the test load shall be maintained for an additional 50 minutes, with recordings at 20, 30, 40 50 and 60 minutes. A representative of the Geotechnical Engineer should be present at the time of testing to evaluate the proof test results and verify the piles will achieve their designed capacity without excessive movement.
- Provided our recommendations above are followed, we anticipate that total and differential settlement will be less than 1 inch and ½-inch over 20 horizontal feet, respectively.

Micropile installation and load testing should be performed under the observation of a representative of the Geotechnical Engineer (i.e. the geotechnical special inspector).

4.4.2 Tieback Recommendations

For lateral support we recommend the downhill-most pile line (at a minimum) have pressure grouted tiebacks installed a minimum 5 feet into competent basalt bedrock. The actual bedrock embedment will need to be determined based on the lateral loading requirements of the Structural Engineer. The following criteria should be used for design of tiebacks.

For pressure grouted tiebacks an allowable grout-rock interface bond strength of 60 psi may be used to design the bonded length. Regardless of the actual calculated bond length by the Structural Engineer we recommend a minimum embedment into competent bedrock of 5 feet.

Additional tieback installation recommendations are included below:

- Tiebacks should be installed at 30 degrees from horizontal.
- The tiebacks should consist of a minimum 4.5-inch nominal diameter hole with a Grade 150 Williams solid bar or Titan IBO hollow bar capable of being pull tested to 150% design load as determined by the Structural Engineer. The Structural Engineer should select the appropriately sized bar following the manufacturer's recommendation using 80% of the listed yield strength values.
- The tiebacks should be epoxy coated, galvanized, or metalized because they are permanent.
- We strongly encourage the installation of post-grout tubes (if solid bar is used). However, if injection bored hollow bar tiebacks (Titan IBO) are used instead of our recommended Williams solid bar, there may be some cost savings, but it may be difficult if not impossible to install materials needed to post-grout. As such, there is some risk to the owner that if hollow bar tiebacks do not pass pull testing, they have to be replaced/supplemented with additional tiebacks. Our preference would be to use solid bar tiebacks with post-grout tubes to mitigate this risk.
- We recommend the portion of the tiebacks within the soil stratum be unbonded. This can be attained by placing a PVC sleeve, or other material not adhering to grout, around the anchor's un-bonded region.
- We recommend the grout used for the tiebacks have a minimum 28-day compressive strength of 5,000 psi. Compressive strength samples (2-inch cubes) should be made by the geotechnical special inspector each day that grout is placed.
- Centralizers should be used within the bonded zone of the tieback at a spacing not to exceed 7 feet. The first centralizer should be installed within 18 inches of the end of the bar.

100% percent of the tiebacks should be proof tested to 150 percent of the design load at the load intervals listed below: AL=alignment load; DL=design load

> AL, 0.25*DL, 0.50*DL, 0.75*DL, 1.00*DL, 1.25*DL, 1.5*DL, AL, Lockoff Load (as determined by the project Structural Engineer)

Proof test readings shall be taken immediately after reading each load increment, except at 1.00*DL, 1.25*DL, and 1.5*DL. At these increments, readings shall be taken at 1, 2, 3, 4, 5, 6 and 10 minutes. If the total creep movement exceeds 0.040 inches between 1 and 10 minutes (i.e. one log cycle), then the test load shall be maintained for an additional 50 minutes, with recordings at 20, 30, 40, 50 and 60 minutes. The test shall be considered to have passed, if the creep movement between 6 and 60 minutes does not exceed 0.080 inches.

We recommend each tieback not be pull tested until it has cured for at least 72 hours and the grout has reached a compressive strength of at least 3,500 psi. The contractor may elect to test tiebacks sooner than this at their own risk.

All tiebacks should be drilled, installed, and proof tested under the observation of a representative of the Geotechnical Engineer. Adjustments to planned tieback lengths may be necessary depending on the results of the tieback load testing, and therefore we recommend the first tieback installed be load tested before the subsequent installation of remaining tiebacks. We recommend the project construction budget include a contingency in case the tieback load tests prove that the tieback bond length needs to be increased.

4.5 Floor Slab Recommendations

Reinforced concrete floor slabs can be grade supported on at least 6-inches of properly compacted, well-graded, granular structural fill (i.e., crushed rock gravel) placed upon approved subgrade (i.e. silty sand encountered in our borings at a depth of approximately 4.5 to 6.5 feet). We believe this material may be exposed if a bench for the proposed residence is cut back into the hillside. Based on the existing soil conditions, the design of slabs-on-grade can be based on a subgrade modulus (k) of 100 pci. This subgrade modulus value represents an anticipated value which would be obtained in a standard in-situ plate test with a 1-foot square plate. Use of this subgrade modulus for design or other on-grade structural elements should include appropriate modification based on dimensions as necessary.

As noted above in Section 4.3, structural fill should be compacted to at least 92 percent of the maximum dry density, and moisture conditioned to within 3 percentage points below and 2 percentage points above optimum moisture as determined by ASTM D1557 (Modified Proctor).

The floor slabs should have an adequate number of joints to reduce cracking resulting from any differential movement and shrinkage.

The 6 inches of well-graded crushed rock gravel recommended will act as a relatively free draining granular mat that provides a capillary break to limit migration of moisture through the slab. If additional protection against moisture vapor is desired, a vapor retarding membrane may also be incorporated into the design. Factors such as cost, special considerations for construction, and the floor coverings suggest that decisions on the use of vapor retarding membranes be made by the owner.

4.6 Retaining Wall Recommendations

We have not been provided with any retaining wall details therefore, the recommendations below are considered preliminary. We have assumed that a retaining wall will be constructed to support the soils behind (east) the proposed residence to created sufficient room for construction when the building pad is cut into the slope. If retaining wall plans become available, we should be provided the detailed retaining wall information so that we can review our recommendations and confirm they are appropriate for the planned development.

The slope in the proposed build area is approximately 1.5H:1V. While this slope is stable in its present configuration (with the exception of gradual slope creep), significant cuts or removal of large amounts of soil along the toe of the slope without engineered retaining walls or shoring walls could alter the long-term stability of the hillside. EEI should be contacted for additional recommendations if cuts will exceed heights of about 15-feet.

We are anticipating that the building envelope will have a cut on the order of 15 feet in height along the backside of the proposed residence. The cut is required in order to install the wall and to develop sufficient room for the bottom level of the proposed residence. Soil pressures acting on this retaining wall will be relatively high because of the slope behind the wall. We recommend that the project Structural Engineer, and ultimately the retaining wall contractor, work in concert with Earth Engineers during the design and construction processes for this wall. Care will need to be taken not to cause a landslide when constructing the wall.

Dependent upon the height of the cut, the installation of post stressed tieback anchors might also be required for a soldier pile wall or sheet pile wall. Normally the design for stabilization of the cut slope is provided by the contractor selected to build the retaining wall. However, we have provided tieback recommendations in section 4.4.2 in order to aid in project planning.

Retaining wall footings should be designed in general accordance with the recommendations contained in Section 4.4 above (i.e. walls should be supported on a deep foundation system). Lateral earth pressures on walls, which are not restrained at the top may be calculated on the basis of an "active" equivalent fluid pressure of 35 pcf for level backfill, and 70 pcf for sloping backfill with a maximum 1.5H:1V slope. Lateral earth pressures on walls that are restrained from yielding at the top (i.e. stem walls) may be calculated on the basis of an "at-rest" equivalent fluid pressure of 55 pcf for level backfill, and 100 pcf for sloping backfill with a maximum 1.5H:1V slope. The stated equivalent fluid pressures do not include surcharge loads, such as foundation, vehicle, equipment, etc., adjacent to walls, hydrostatic pressure buildup, or earthquake loading.

For seismic loading on retaining walls with level backfill, new research indicates that the seismic load is to be applied at 1/3 H of the wall instead of 2/3 H, where H is the height of the wall. We recommend that a Mononobe-Okabe earthquake thrust per linear foot of 10.3 psf * H^2 be applied at 1/3 H. For sloping backfill no steeper than 1.5H:1V, we recommend an earthquake thrust per linear foot of 25 psf * H^2.

We do not recommend resisting lateral loads with frictional resistance between the base of the retaining wall footing and the subgrade because of the risk of the site soils settling away from the base of the footing. Lateral loads may be resisted by passive earth pressures based on an equivalent fluid density of 300 pounds per cubic foot (pcf) for footings poured "neat" against in-situ soils, or properly backfilled with structural fill. This is an ultimate value. We recommend a factor of safety of 1.5 be applied to the equivalent fluid pressure, which is appropriate due to the amount of movement required to develop full passive resistance.

All backfill for retaining walls should be select granular material, such as sand or crushed rock with a maximum particle size between ¾ and 1 ½ inches, having less than 5 percent material passing the No. 200 sieve. The native sandy soils are generally appropriate for use as backfill. Alternatively, granular material may be imported to the project for structural backfill behind walls. Silty soils can be used for the last 18 to 24 inches of backfill, thus acting as a seal to the granular backfill. All backfill behind retaining walls should be moisture conditioned to within ± 2 percent of optimum moisture content, and compacted to a minimum of 90 percent of the material's maximum dry density as determined in accordance with ASTM D1557 (Modified Proctor). Fill materials should be placed in layers that, when compacted, do not exceed about 8 inches. Care in the placement and compaction of fill behind retaining walls must be taken in order to insure that undue lateral loads are not placed on the walls.

An adequate subsurface drain system will need to be designed and installed behind retaining walls to prevent hydrostatic buildup. A waterproofing system should be designed for the basement walls where moisture intrusion is not desirable.

Our above recommendations do not include the weight of surcharge loads, such as foundation, vehicle, equipment, etc., adjacent to walls, hydrostatic pressure buildup, or earthquake loading. Appendix F of this report provides guidance for the design of retaining walls where surcharges are present.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Moisture Sensitive Soils/Weather Related Concerns

The upper soils encountered at this site are expected to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

5.2 Drainage, Groundwater, and Stormwater Considerations

Water should not be allowed to collect in the foundation excavations or on prepared subgrades for the floor slab during construction. Positive site drainage should be maintained throughout construction activities. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff.

The site grading plan should be developed to provide rapid drainage of surface water away from the building areas and to inhibit infiltration of surface water around the perimeter of the building and beneath the floor slab. The grades should be sloped away from the building area.

Because this site is adjacent to a very tall, steep cliff, we strongly recommend that stormwater be hard piped to a public stormwater disposal system off the property. Our preference would not be to dispose of stormwater on site.

5.3 Excavations

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document and subsequent updates were issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that excavations, whether they be utility trenches, basement excavations or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. EEI does not assume responsibility for construction site safety or the contractor's compliance with local, state, and federal safety or other regulations.

5.4 Geotechnical Construction Inspection

EEI should be retained to perform geotechnical construction inspections to verify construction complies with the geotechnical engineering recommendations contained in this report. EEI cannot accept responsibility for any conditions that deviate from those described in this report, if not engaged to also provide construction observation for this project.

At a minimum, we recommend the following geotechnical inspections be performed by EEI during construction.

- Stability of temporary excavations (periodic).
- Subgrade preparation for footings (if the owner elects to support the gazebo structure on a shallow foundation), floor slabs on grade, and pavement (periodic).
- Structural fill placement and compaction (periodic).
- Utility trench backfill compaction (periodic).
- Micropile installation and load testing (continuous)
- Tieback installation, load testing, and lockoff (continuous).

We may need to update this list once the construction drawings are completed. Note that the project design team and/or governing jurisdiction may require additional inspections.

6.0 GEOLOGIC HAZARD SUMMARY FINDINGS AND CONCLUSIONS

We are providing this section of our report to facilitate the review of the anticipated building permit per Tillamook County Land and Water Development and Use Ordinance (TCLWUO), Section 4.130 (Development Requirements for Geologic Hazard Areas) and Section 3.530 (Beach and Dune Overlay Zone) as adopted on May 11, 2022.

This Geologic Hazard Report was prepared to contain the applicable provisions outlined in the Oregon State Board of Geologist Examiners (OSBGE) publication "Guidelines for the Preparation of Engineering Geologic Reports" 2nd Edition dated May 30, 2014. This report is valid for purposes of meeting the requirements of Section 4.130 and Section 3.530 for a period of five years from the report date, and is only valid for the development plan addressed in the report. We have reviewed the requirements of Section 3.530 (Beach and Dune Overlay Zone) and have determined that it does not apply to this project as it is out of the Beach and Dune Overlay Zone. Therefore, it is not part of our Geologic Hazard Summary.

This report was prepared by Jake Munsey, R.G., C.E.G., and Troy Hull, P.E. and G.E.. Both of whom have been licensed in their respective fields and practicing in the State of Oregon for 10 and 30 years, respectively. These preparers have the appropriate qualifications to complete this report and all its contents.

6.1 Applicable Content of 4.130(4)

As detailed below, all applicable content requirements of subsection 4.130(4) have been addressed, or are not applicable to the review.

A. Development standard recommendations to protect development on the property and surrounding properties.

(a) Development density (when more than one use is possible): It is our professional opinion that the lot is suitable for the development of the proposed single family residence provided our recommendations are followed.

(b) Locations for structures and roads: The planned location for the proposed house is approximately 100 feet horizontally from the top of the cliff, near the eastern side of the property. It is our understanding that the location of the house will not substantially change.

(c) Land grading practices, including standards for cuts and fills: Our recommended standards for cuts and fills are outlined in Section 4.3. We recommending that site grades not be raised with normal weight fill. If the project requires it, then fill should be lightweight geofoam to minimize surcharge loading to the site slope. It is acceptable to raise site grades with up to 12 inches of topsoil.

(d) Vegetation removal and re-vegetation practices: As outlined in Sections 4.1 and 4.2, we recommend vegetation removal be limited to the area of construction and that replanting occur after construction is completed at areas that were stripped of vegetation.

(e) Foundation design (if special design is necessary): As noted in sections 4.1, and 4.4, we are recommending the house be supported by a deep foundation system (micropiles and tiebacks) all connected with an integrated system of grade beams.

(f) Road design (if applicable): Not applicable.

(g) Management of storm water runoff during and after construction: As discussed in Section 5.2, we recommend that stormwater be solid piped to an approved off-site system.

B. Summary findings and conclusions:

(a) The type of use proposed and the adverse effects it might have on adjacent areas: As noted in Section 1.2 above, the type of use is a single family residence. Provided the recommendations in our report are followed, there will be no increased adverse effects on adjacent areas.

(b) Hazards to life, public and private property, and the natural environment which may be caused by the proposed use: It is our professional opinion that if our recommendations in this report are followed, the increased hazard risk to life, public and private property, and the natural environment is low.

(c) Methods for protecting the surrounding area from any adverse effects of the development: We are recommending site stripping and vegetation removal for construction be limited to the construction area. Once construction is complete, disturbed soil areas should be replanted or covered with other soil erosion prevention measures.

(d) Temporary and permanent stabilization programs and the planned maintenance of new and existing vegetation: As discussed previously, we are recommending site stripping and vegetation removal for construction be limited to the construction area. Once construction is complete, disturbed soil areas should be replanted or covered with other soil erosion prevention measures.

(e) The proposed development is adequately protected from any reasonably foreseeable hazards including but not limited to geologic hazards, wind erosion, undercutting, ocean flooding, and storm waves: Ocean flooding and storm waves are not hazards at this site. The only geologic hazards include shallow slope creep, settlement, and earthquake-induced damage from landsliding and severe ground shaking. We are recommending mitigation measures that include a deep foundation system with the bearing stratum being stable, weathered basalt bedrock, and connecting all the footings together with rigid grade beams (i.e. no isolated pad footings).

(f) The proposed development is designed to minimize adverse environmental effects: We can confirm that the project has been designed to minimize an increase in adverse environmental effects. Vegetation disturbance is recommended to be limited, and the proposed structure will be supported on an integrated system of micropiles, tiebacks, and grade beams.

7.0 REPORT LIMITATIONS

As is standard practice in the geotechnical industry, the conclusions contained in our report are considered preliminary because they are based on assumptions made about the soil, rock, and groundwater conditions exposed at the site during our subsurface investigation. A more complete extent of the actual subsurface conditions can only be identified when they are exposed during construction. Therefore, EEI should be retained as your consultant during construction to observe the actual conditions and to provide our final conclusions. If a different geotechnical consultant is retained to perform geotechnical inspection during construction, then they should be relied upon to provide final design conclusions and recommendations, and should assume the role of geotechnical engineer of record, as is the typical procedure required by the governing jurisdiction.

The geotechnical recommendations presented in this report are based on the available project information, and the subsurface materials described in this report. If there are any revisions to the plans for this project, or if deviations from the subsurface conditions noted in this report are encountered during construction, EEI should be notified immediately to determine if changes in the foundation recommendations are required. Furthermore, if the plans change regarding the location of the structure, we should be notified to see if our recommendations are still valid or modify our recommendations. EEI is not retained to review these changes, we will not be responsible for the impact of those conditions on the project.

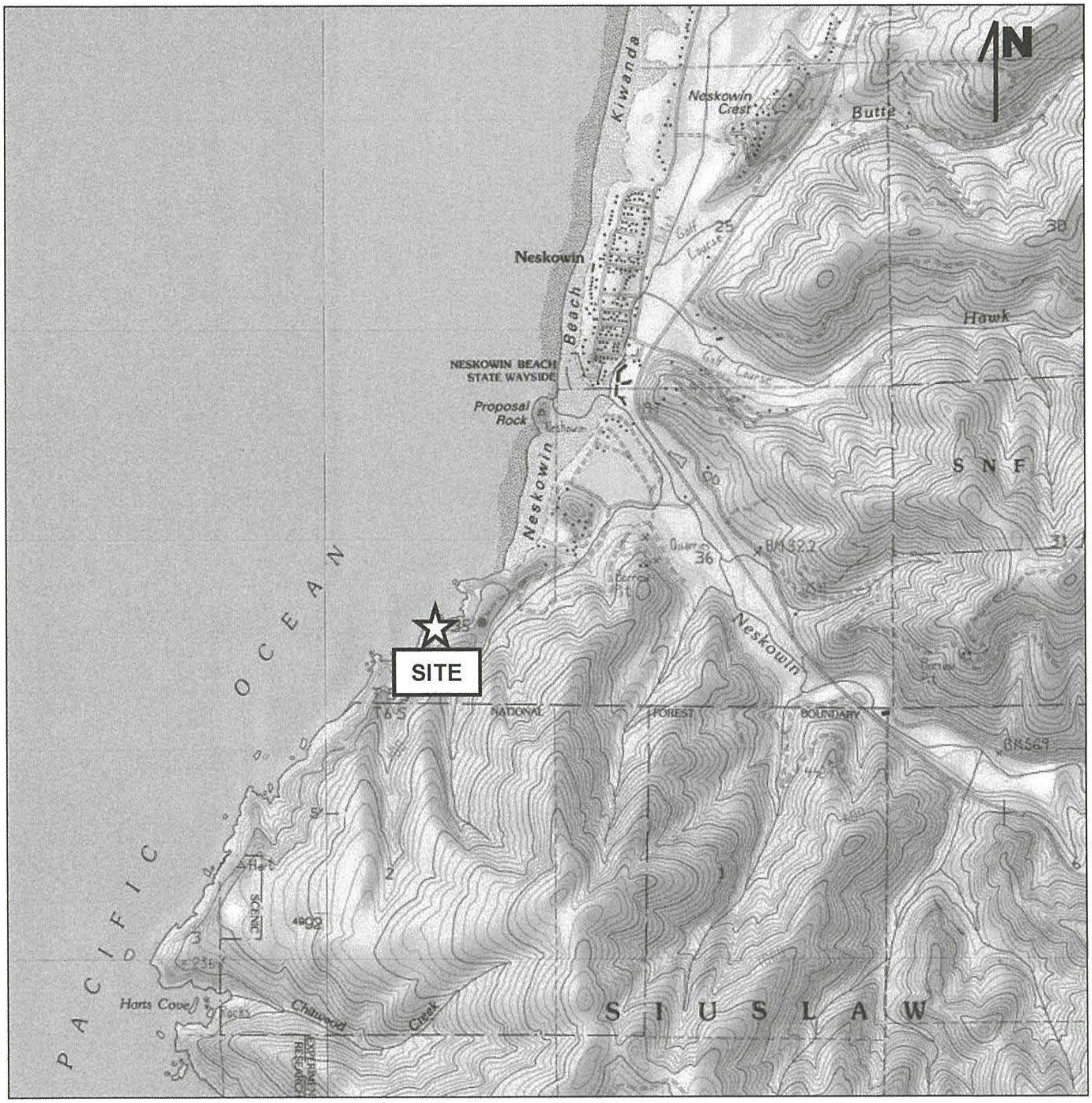
The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, EEI's Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations.

This report has been prepared for the exclusive use of Clinton Mugge for the specific application to the proposed single family residence and gazebo to be located at Tax Lot 214 along South Beach Road in Neskowin, Tillamook County, Oregon. EEI does not authorize the use of the advice herein nor the reliance upon the report by third parties without prior written authorization by EEI.

APPENDICES

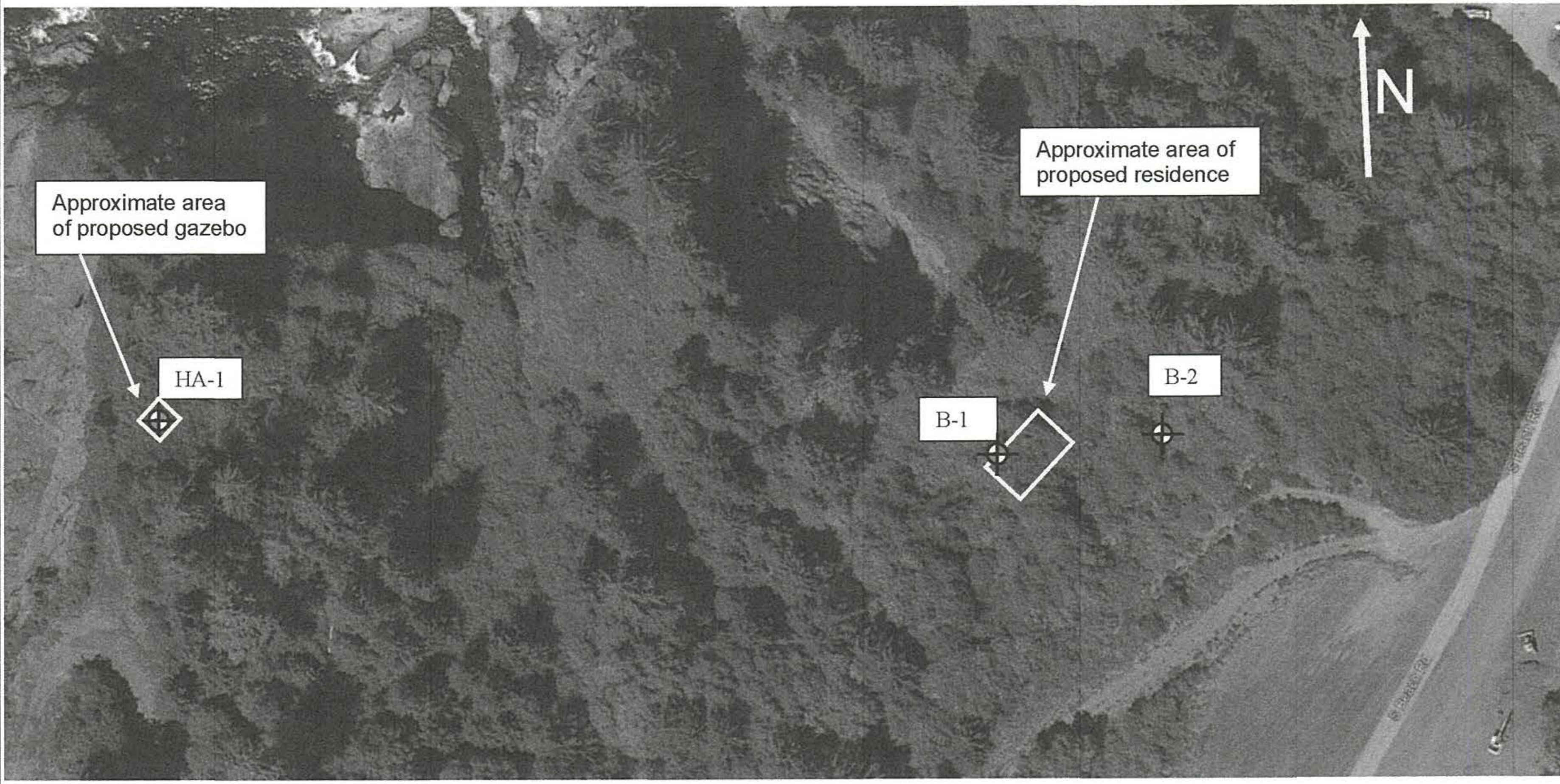
APPENDIX A – SITE LOCATION PLAN



Map Source: https://viewer.nationalmap.gov/advanced-viewer/

Earth Engineers, Inc.	Proposed Mugge Single Family Residence Tax Lot 214, South Beach Road Neskowin, Tillamook County, Oregon	**Report No. 22-230-1** **January 24, 2023**

APPENDIX B: EXPLORATION LOCATION PLAN



= Approximate boring location

Source: Google Earth Image Dated 7/24/2019

Earth Engineers, Inc.	**Proposed Mugge Single Family Residence** **Tax Lot 214, South Beach Road** **Neskowin, Tillamook County, Oregon**	**Report No. 22-230-1**	**January 24, 2023**

Earth Engineers, Inc.

Appendix C: Boring B-1

Sheet 1 of 1

Client: Clinton Mugge
Project: Proposed Mugge Single Family Residence
Site Address: Tax Lot 214, South Beach Road
Neskowin, Tillamook County, Oregon
Location of Exploration: See Appendix B
Logged By: Jake Munsey R.G., C.E.G.

Report Number: 22-230-1
Drilling Contractor: PLI Systems, Inc.
Drilling Method: Hollow Stem Auger/ SPT-Autohammer
Drilling Equipment: Mobile B-57-Track Mounted
Approximate Ground Surface Elevation (ft msl): 290
Date of Exploration: 10/4/2022

Depth (ft)	Water Level	Lithologic Symbol	Geologic Description of Soil and Rock Strata	Sample Number	Blows per 6 Inches	N value	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Pocket Pen (tsf)	Remarks
0			TOPSOIL- Dark brown SILT with roots and decayed organics-2 inches thick SILT (ML) - Medium brown, wet, non plastic, soft, trace sand and organics	SPT-1	1 2 1	3	94					Grass surface
3				SPT-2	1 1 2	3	70					
4.5			Silty SAND (SM)-Brown with orange mottling, wet, well graded, loose. (Decomposed Basalt)									
6				SPT-3	4 4 4	8	29					
8			Becomes medium dense	SPT-4	4 8 9	17	37	35				
11				SPT-5	9 11 10	21	32	45				Drill rig begins grinding
13				SPT-6	9 12 15	27	30					
16				SPT-7	6 9 7	16	42					
20			Becomes very dense, moist	SPT-8	33 50/4"	50	17					50 Blows for 4-inches of penetration

Notes : Boring terminated at a depth of approximately 20 feet below ground surface (bgs). Maximum exploration depth was 21 feet bgs. No Groundwater was encountered at the time of our exploration. Boring backfilled with bentonite chips on 10/4/2022. Approximate elevation interpolated from Google Earth.

Appendix C: Boring B-2

Earth Engineers, Inc.

Sheet 1 of 1

Client: Clinton Mugge
Project: Proposed Mugge Single Family Residence
Site Address: Tax Lot 214, South Beach Road
Neskowin, Tillamook County, Oregon
Location of Exploration: See Appendix B
Logged By: Jake Munsey R.G., C.E.G.

Report Number: 22-230-1
Drilling Contractor: PLI Systems, Inc.
Drilling Method: Hollow Stem Auger/ SPT-Autohammer
Drilling Equipment: Mobile B-57-Track Mounted
Approximate Ground Surface Elevation (ft msl): 332
Date of Exploration: 10/4/2022

Depth (ft)	Water Level	Geologic Description of Soil and Rock Strata (Lithology)	Sample Number	Blows per 6 Inches	N value	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Pocket Pen (tsf)	Remarks
0		TOPSOIL- Dark brown SILT with roots and decayed organics- 2 inches thick SILT (ML) - Medium brown, wet, non plastic, soft, trace sand and organics	SPT-1	2, 1, 1	2	66					Grass surface Poor recovery (4")
			SPT-2	1, 2, 2	4	56					
			SPT-3	0, 1, 2	3	46					
		Silty SAND (SM)-Medium brown with some light gray and orange mottling, moist, well graded, medium dense. (Decomposed Basalt)	SPT-4	5, 9, 8	17	30					
10		Becomes medium brown	SPT-5	6, 9, 15	24	29	39				
		Becomes light orange brown and very dense	SPT-6	12, 22, 30	52	27	38				
			SPT-7	16, 30, 50/5"	90	25	37				
20			SPT-8	20, 29, 27	56	20					
			SPT-9	29, 46, 50/5"	96	17					

Notes : Boring terminated at a depth of approximately 25 feet below ground surface (bgs). Maximum exploration depth was 26.5 feet bgs. No Groundwater was encountered at the time of our exploration. Boring backfilled with bentonite chips on 10/4/2022. Approximate elevation interpolated from Google Earth.

Earth Engineers, Inc.

Appendix C: Hand Auger HA-1

Sheet 1 of 1

Client: Clinton Mugge
Project: Proposed Mugge Single Family Residence
Site Address: Tax Lot 214, South Beach Road
Neskowin, Tillamook County, Oregon
Location of Exploration: See Appendix B
Logged By: Jake Munsey R.G., C.E.G./ Taner Schiller

Report Number: 22-230-1
Drilling Contractor: EEI
Drilling Method: Manual
Drilling Equipment: Hand auger/ drive probe
Approximate Ground Surface Elevation (ft msl): 255
Date of Exploration: 11/4/2022

Depth (ft)	Water Level	Lithology: Lithologic Symbol	Lithology: Geologic Description of Soil and Rock Strata	Sample Number	Drive Probe Blows Per 6 Inches (0 20 40 60 80)	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Remarks
0			TOPSOIL- Dark brown SILT with roots and decayed organics		1					
			SILT (ML)-Dark brown, moist, non plastic, very soft to medium stiff, some clasts of angular basalt		1					
1					2					
					6					
2			Silty SAND (SM)- light brown, wet, well graded, medium dense, some clasts of angular basalt.		20					Hand auger refusal on decomposed basalt at 2.5 feet.
			Becomes decomposed basalt	GRAB 1	50	45				50 blows for 3" of penetration.
3										

Notes : Boring terminated at a depth of approximately 2.5 feet below ground surface (bgs). No Groundwater was encountered at the time of our exploration. Boring backfilled with hand auger spoils on 11/4/2022. Approximate elevation interpolated from Google Earth.

APPENDIX D: SOIL CLASSIFICATION LEGEND

APPARENT CONSISTENCY OF COHESIVE SOILS (PECK, HANSON & THORNBURN 1974, AASHTO 1988)				
Descriptor	**SPT N_{60} (blows/foot)***	**Pocket Penetrometer, Qp (tsf)**	**Torvane (tsf)**	**Field Approximation**
Very Soft	< 2	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	2 – 4	0.25 – 0.50	0.12 – 0.25	Easily penetrated several inches by thumb
Medium Stiff	5 – 8	0.50 – 1.0	0.25 – 0.50	Penetrated several inches by thumb w/moderate effort
Stiff	9 – 15	1.0 – 2.0	0.50 – 1.0	Readily indented by thumbnail
Very Stiff	16 – 30	2.0 – 4.0	1.0 – 2.0	Indented by thumb but penetrated only with great effort
Hard	> 30	> 4.0	> 2.0	Indented by thumbnail with difficulty

* Using SPT N_{60} is considered a crude approximation for cohesive soils.

APPARENT DENSITY OF COHESIONLESS SOILS (AASHTO 1988)	
Descriptor	**SPT N_{60} Value (blows/foot)**
Very Loose	0 – 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	> 50

MOISTURE (ASTM D2488-06)	
Descriptor	**Criteria**
Dry	Absence of moisture, dusty, dry to the touch, well below optimum moisture content (per ASTM D698 or D1557)
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table, well above optimum moisture content (per ASTM D698 or D1557)

PERCENT OR PROPORTION OF SOILS (ASTM D2488-06)	
Descriptor	**Criteria**
Trace	Particles are present but estimated < 5%
Few	5 – 10%
Little	15 – 25%
Some	30 – 45%
Mostly	50 – 100%
Percentages are estimated to nearest 5% in the field. Use "about" unless percentages are based on laboratory testing.	

SOIL PARTICLE SIZE (ASTM D2488-06)	
Descriptor	**Size**
Boulder	> 12 inches
Cobble	3 to 12 inches
Gravel - Coarse Fine	¾ inch to 3 inches No. 4 sieve to ¾ inch
Sand - Coarse Medium Fine	No. 10 to No. 4 sieve (4.75mm) No. 40 to No. 10 sieve (2mm) No. 200 to No. 40 sieve (.425mm)
Silt and Clay ("fines")	Passing No. 200 sieve (0.075mm)

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2488)				
Major Division			**Group Symbol**	**Description**
Coarse Grained Soils (more than 50% retained on #200 sieve)	**Gravel** (50% or more retained on No. 4 sieve)	Clean Gravel	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with fines	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	Sand (> 50% passing No. 4 sieve)	Clean sand	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly-graded sands and gravelly sands, little or no fines
		Sand with fines	SM	Silty sands and sand-silt mixtures
			SC	Clayey sands and sand-clay mixtures
Fine Grained Soils (50% or more passing #200 sieve)	**Silt and Clay** (liquid limit < 50)		ML	Inorganic silts, rock flour and clayey silts
			CL	Inorganic clays of low-medium plasticity, gravelly, sandy & lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silt and Clay (liquid limit > 50)		MH	Inorganic silts and clayey silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Earth Engineers, Inc.

GRAPHIC SYMBOL LEGEND		
GRAB	☒	Grab sample
SPT		Standard Penetration Test (2" OD), ASTM D1586
ST		Shelby Tube, ASTM D1587 (pushed)
DM		Dames and Moore ring sampler (3.25" OD and 140-pound hammer)
CORE		Rock coring

APPENDIX E:

NEARBY HISTORICAL WELL REPORT

Till 1141

5S/11W/35aa

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 48554

(1) OWNER: Well Number 1
Name Eugene R. + Carol L. Maule
Address P.O. Box 67
City Pacific City State Oregon Zip 97135-0067

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 400 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount (sacks) or pounds
10	0	25	Bentonite	0	25	17
7 3/8	25	137	—	—	—	—
6	137	400	—	—	—	—

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other Placed in dry + prodded
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6	+1	138	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	4	0	400	160	☐	☒	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 138

(7) PERFORATIONS/SCREENS:
☒ Perforations Method Drilled
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
280	400	—	480	9/16	4	☐	☒
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
3	181	380	1 hr.

Temperature of Water 53 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Tillamook Latitude Longitude
Township 5S N or S. Range 11W E or W. WM.
Section 35 NE ¼ NE ¼
Tax Lot 204 Lot Block Subdivision
Street Address of Well (or nearest address) End of S. Beach Rd., Neskowin, Oregon

(10) STATIC WATER LEVEL:
199 ft. below land surface. Date 7-27-93
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 199

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
Brown Clay w/ Med. Gravel	0	19	
Gray Claystone w/ Rock embedded	19	400	199

RECEIVED
AUG 2 1993
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 7-20-93 Completed 7-27-93

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

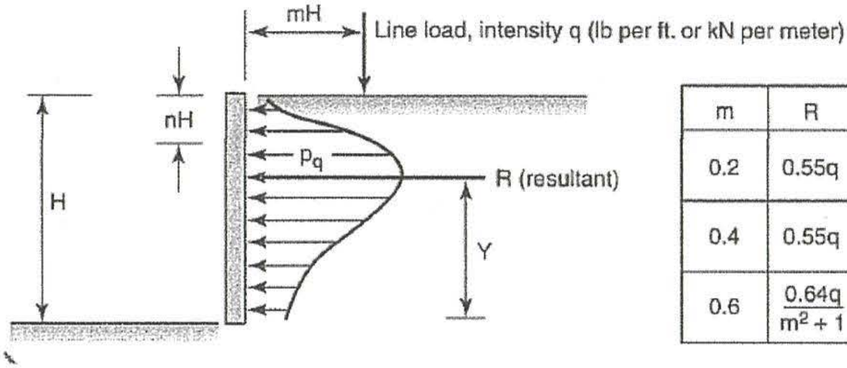
WWC Number
Signed Date

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1221
Signed Larry C Evey Date 7-27-93

APPENDIX F: SURCHARGE-INDUCED LATERAL EARTH PRESSURES FOR WALL DESIGN

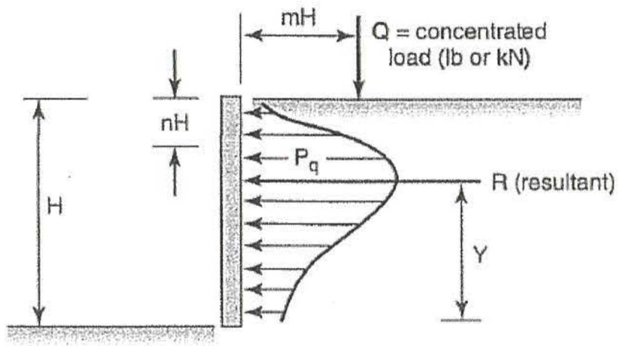
LINE LOAD (applicable for retaining walls not exceeding 20 feet in height):



m	R	Y
0.2	0.55q	0.60 H
0.4	0.55q	0.58 H
0.6	$\frac{0.64q}{m^2+1}$	0.52 H

Figure 16-28 Pressure distribution against vertical wall resulting from line load of intensity *q*.

CONCENTRATED POINT LOAD (applicable for retaining walls not exceeding 20 feet in height):



m	R	Y
0.2	$0.78\frac{Q}{H}$	0.59 H
0.4	$0.78\frac{Q}{H}$	0.59 H
0.6	$0.48\frac{Q}{H}$	0.48 H

Figure 16-27 Pressure distribution against vertical wall resulting from point load, *Q*.

AREAL LOAD:

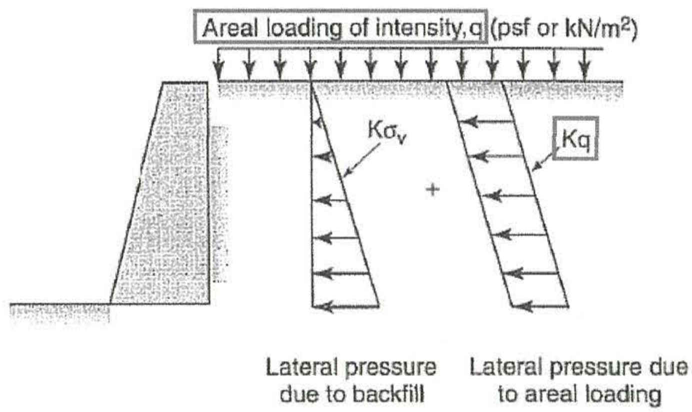
Figure 16-26 Influence of areal loading on wall pressures.

use K=0.4 for active condition (i.e. top of wall allowed to deflect laterally)

use K=0.9 for at-rest condition (i.e. top of wall not allowed to deflect laterally)

Resultant, R = K * q * H

Where H = wall height (feet)



Source of Figures: McCarthy, D.F., 1998, "Essentials of Soil Mechanics and foundations, Basic Geotechnics, Fifth Edition."

APPENDIX B CARLSON ENGINEERING GEOLOGICAL REPORT

Carlson Geotechnical
A Division of Carlson Testing, Inc.
Phone: (503) 601-8250
www.carlsontesting.com

Bend Office **(541) 330-9155**
Eugene Office **(541) 345-0289**
Salem Office **(503) 589-1252**
Tigard Office **(503) 684-3460**

Engineering Geologic Report
Mugge Residence
Tax Lot 214, South Beach Road
Tillamook County, Oregon

CGT Project Number G2105429

Prepared for

Clinton Mugge
42120 N Olympic Fields Court
Anthem, Arizona 85086

March 1, 2021

March 1, 2021

Clinton Mugge
42120 N Olympic Fields Court
Anthem, Arizona 85086

Engineering Geologic Report
Mugge Residence
Tax Lot 214, South Beach Road
Tillamook County, Oregon

CGT Project Number G2105429

Dear Mr. Mugge:

Carlson Geotechnical (CGT), a division of Carlson Testing, Inc. (CTI), is pleased to submit this engineering geologic report for the proposed Mugge Residence project. The site is located at Tax Lot 214, South Beach Road in Tillamook County, Oregon. We performed our work in general accordance with CGT Proposal GP9196, dated December 21, 2020. Written authorization for our services was received on January 20, 2021.

We appreciate the opportunity to work with you on this project. Please contact us at (503) 601-8250 if you have any questions regarding this report.

Respectfully Submitted,
CARLSON GEOTECHNICAL

CERTIFIED OREGON RYAN T. HOUSER E1914 ENGINEERING GEOLOGIST
EXPIRES 12/1/21

Melissa L. Lehman, GIT
Geotechnical Project Manager
mlehman@carlsontesting.com

Ryan T. Houser, CEG
Senior Engineering Geologist
rhouser@carlsontesting.com

Doc ID: G:\GEOTECH\PROJECTS\2021 Projects\G2105429 - Mugge Residence - Serenity\G2105429 - GEO\008 - Deliverables\Report - Task 1\G2105429 Engineering Geologic Report-edits.docx

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ATTACHMENTS

1.0 INTRODUCTION

Carlson Geotechnical (CGT), a division of Carlson Testing, Inc. (*CTI*), *is pleased to submit this engineering* geologic report for the proposed Mugge Residence - Serenity project. The site is located at Tax Lot 214, South Beach Road in Tillamook County, Oregon, as shown on the attached Site Location, Figure 1.

1.1 Project Information

CGT developed an understanding of the proposed project based on our correspondence with you and review of the provided Site Plan. Based on our review, we understand proposed development will include a new, two-story, wood-framed, single-family residence with a footprint of about 2,000 square feet. Two areas of potential development were identified when CGT performed a site walkthrough with the client and the client's contractor on January 29, 2021. One area is located on the east side of the western ridgeline, which will be referred to as the "west building pad" in the remainder of this report. The "east building pad" is located on the northwest-facing slope near the eastern edge of the site. We anticipate stormwater collected from new impervious areas of the site will be collected and routed to the nearest storm drain or other suitable discharge point. We understand the building pads are required to be setback 150 feet from onsite creeks.

We understand that the Tillamook County requires a geologic hazard report be completed for the project prior to issuance of a building permit.

1.2 Scope of Services

Our engineering geology report was prepared in general accordance with Section 4.130 of the Tillamook County Department of Community Development and 2014 State of Oregon Guideline for Preparing Engineering Geologic Reports. Our specific scope of work included the following:

- Review available literature for geologic hazards in the vicinity of the site. Specific hazards addressed by this study include:
    - Erosion potential
    - Landslide potential / Slope stability
    - Seismic hazards (ground shaking, subsidence, tsunami, liquefaction, surface rupture) potential
    - Flood potential
    - Volcanic hazards potential
- Review available topographic, geologic, and geologic hazard maps for the area.
- Perform a surface reconnaissance of the site.
- Detail geologic hazards that may affect the proposed land use.
- Provide an opinion regarding the geologic feasibility of the site for the proposed development, including a **qualitative** conclusion regarding the effects of the geologic conditions on the proposed land use, the effects of the proposed land use on future geologic processes, and the effects of the geologic conditions and proposed land use on surrounding properties.
- Provide recommendations for hazard mitigation.
- Provide this written report summarizing the results of our study.

2.0 GEOLOGY

2.1 Regional Geology

The site is located within the western edge of the Coast Range geologic province south of Neskowin, Oregon. The Coast Range began forming during the Eocene (approximately 57 to 37 million years before present) as an oceanic chain of volcanoes, which was later accreted to the North American Plate along the active subduction zone. These volcanic rocks form the core of the Coast Range. Thick sequences of marine sedimentary rocks accumulated between the Coast Range volcanoes and the developing Cascade arc. During the Miocene (approximately 24 to 5 million years before present), Columbia River Basalts originating from fissures in eastern Oregon flowed as far west as the Pacific Ocean through the ancestral Columbia River drainages. Thick accumulations of lava penetrated downward into soft sediments forming large invasive sills and dikes that form many of the prominent peaks and headlands along the northern Oregon Coast. Subsequent uplift and deformation along the accreting edge of the subduction zone has created the Coast Range of today[1].

2.2 Site Geology

Based on available geologic mapping of the area[2], the site is underlain by the Basalt of Cascade Head (Figure 2), which consists of subaerial basalt flows commonly veined with calcite. The basalt is locally very vesicular, and includes some layers of lapilli tuff, tuffaceous siltstone, and flow breccia. This unit was later intruded with basalt dikes and hornblende dacite dikes. Basalt was exposed on the cliff faces on the subject property.

3.0 SEISMICITY

The site is located in a tectonically and seismically active area that may be affected by earthquakes generated by crustal and subduction zone sources.

3.1 Earthquake Sources

3.1.1 <u>Crustal Sources</u>

Crustal earthquakes typically occur at depths ranging from 15 to 40 kilometers bgs[3]. According to the United States Geological Survey Quaternary fault and fold database[4], nearby seismic sources capable of producing damaging earthquakes in this region include Cascadia Fold and Thrust Belt, Unnamed offshore faults, Siletz Bay faults, and the Cape Foulweather fault. Quaternary faults in the vicinity of the site are shown on the attached Figure 3, and are summarized in the following table:

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1 Orr, Elizabeth L., and Orr, William N., 1999, Geology of Oregon, Fifth Edition: Kendall/Hunt Publishing, pp. 167-202.

2 Snavely, P.D., MacLeod, N.S., and Minasian, D.L., 1990, Preliminary geologic map of the Neskowin quadrangle, Lincoln and Tillamook Counties, Oregon: U.S. Geological Survey, Open-File Report OF-90-413, scale 1:24,000.

3 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

4 U.S. Geological Survey, 2021. Quaternary fault and fold database for the United States, *accessed February 2021*, from USGS web site: http://earthquakes.usgs.gov/regional/qfaults/.

Table 1 Known Active or Potentially Active Crustal Faults in the Vicinity of the Site

USGS Fault No.	Fault Name	Distance and Direction from Site	USGS Fault Class[1]
784	Cascadia Fold and Thrust Belt	4 km NW	A
785	Unnamed offshore faults	14 km NW	A
883	Siletz Bay faults	17.5 km SW	A
884	Cape Foulweather fault	30 km SE	A

1 USGS Fault Classes from USGS Earthquake Hazards Program, 2008 National Seismic Hazard Maps
Class A: Fault with convincing evidence of Quaternary activity (ACTIVE)
Class B: Fault that requires further study in order to confidently define their potential as possible sources of earthquake-induced ground motion (POTENTIALLY ACTIVE)
Class C: Fault with insufficient evidence for Quaternary activity (LOW POTENTIAL FOR ACTIVITY)

3.1.1.1 *Cascadia Fold and Thrust Belt (USGS 784)*

The Cascadia Fold and Thrust Belt consists of a group of generally north-striking folds and related thrust faults that deform sediments on the continental shelf. Two primary fold domains have been characterized within the fold and thrust belt based on the wavelength of the folds: 1) short wavelength folds that occur in thick accretionary wedge sediments, and 2) longer wavelength folds that occur in continental shelf sediments underlain by Siletz River Volcanic (basement rock). Displacements on these faults may occur concurrently with megathrust earthquakes on the Cascadia Subduction Zone or may be seismically independent of the megathrust earthquakes. While most of these faults have orientations similar to the Cascadia deformation front, some faults have strikes oblique to the Cascadia deformation front, implying a strike-slip or dip-slip deformation.

3.1.1.2 *Unnamed offshore faults (USGS 785)*

The unnamed offshore faults are a group of offshore faults related to accretion of sediments on the continental shelf and slope in the forearc of the Cascadia Subduction Zone. These faults are considered part of the Cascadia Fold and Thrust Belt (USGS Fault No. 784). The majority of these faults have strikes oblique to the Cascadia deformation front, implying a strike-slip deformation. Seismicity of these unnamed faults is inherently linked to Cascadia faulting. While no detailed information is available, studies suggest that these faults have experienced deformation during the Holocene.

3.1.1.3 *Siletz Bay faults (USGS 883)*

The Siletz Bay faults consist of a series of north-northwest-striking high angle faults on the Oregon Coast that apparently offset marine terrace sediments. The sense of movement of the Siletz Bay faults are not well documented, and may experience seismic displacement during megathrust earthquakes on the Cascadia Subduction Zone. The Siletz Bay faults appear to project to offshore structures. The faults appear to offset 80,000-year-old marine terrace deposits, so the Siletz Bay faults are considered to be active.

3.1.1.4 *Cape Foulweather fault (USGS 884)*

The Cape Foulweather fault is a northeast-striking fault on the Oregon Coast that offsets marine terrace sediments and older sedimentary and volcanic rocks. The 80,000-year-old marine terrace deposits have been offset by about 20 meters. The 125,000-year old sedimentary and volcanic rocks appear to have been offset by up to about 80 meters. The Cape Foulweather fault may experience seismic displacement during megathrust earthquakes on the Cascadia Subduction Zone. The fault is considered active since it has experienced displacement during the Quaternary

3.1.2 Cascadia Subduction Zone Seismic Sources

The Cascadia Subduction Zone (CSZ) is a 1,100-kilometer-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continental plate at a rate of about 3 to 4 centimeters per year[5]. The fault trace is located off of the coast of southern British Columbia, Washington, Oregon, and northern California; approximately 110 kilometers west of the site (see attached Figure 4).

Two primary sources of seismicity are associated with the CSZ: relatively shallow earthquakes that occur on the interface between the two plates (Subduction Zone earthquakes), and deep earthquakes that occur along faults within the subducting Juan de Fuca plate (intraplate earthquakes).

3.1.2.1 Subduction Zone Earthquakes

Large subduction zone (megathrust) earthquakes occur within the upper approximate 30 kilometers of the contact between the two plates[6]. As the Juan de Fuca Plate subducts beneath the North American Plate through this zone, the plates are locked together by friction[7]. Stress slowly builds as the plates converge until the frictional resistance is exceeded, and the plates rapidly slip past each other resulting in a "megathrust" earthquake. The United States Geologic Survey estimates megathrust earthquakes on the CSZ may have magnitudes up to M9.2.

Geologic evidence indicates a recurrence interval for major subduction zone earthquakes of 250 to 650 years, with the last major event occurring in 1700[8,9]. The site is within the seismogenic portion of the Cascadia Subduction zone, as shown on Figure 4.

3.1.2.2 Intraplate Earthquakes

Below about 30 kilometers, the plate interface does not appear to be locked by friction, and the plates slowly slide past each other. The curvature of the subducted plate increases as the advancing edge moves east, creating extensional forces within the plate. Normal faulting occurs in response to these extensional forces. This region of maximum curvature and faulting of the subducting plate is where large intraplate earthquakes are expected to occur, and is located at depths ranging from 30 to 60 kilometers[10,11,12]. Intraplate earthquakes within the Juan de Fuca plate generally have magnitudes less than M7.5[13].

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5 DeMets, C., Gordon, R.G., Argus, D.F., Stein, S., 1990. Current plate motions: Geophysical Journal International, v. 101, p. 425-478.

6 Pacific Northwest Seismic Network, 2021. Pacific Northwest Earthquake Sources Overview, *accessed February 2021,* from PNSN web site, http://pnsn.org/outreach/earthquakesources/.

7 Pacific Northwest Seismic Network, 2021. Pacific Northwest Earthquake Sources Overview, *accessed February 2021,* from PNSN web site, http://pnsn.org/outreach/earthquakesources/.

8 Atwater, B.F., 1992. Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

9 Peterson, C.D., Darienzo, M.E., Burns, S.F., and Burris, W.K., 1993. Field trip guide to Cascadia paleoseismic evidence along the northern California coast: evidence of subduction zone seismicity in the central Cascadia margin. Oregon Department of Geology and Mineral Industries, Oregon Geology, Vol. 55, p. 99-144.

10 Geomatrix Consultants, 1995. Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

11 Geomatrix Consultants, 1993. Seismic margin Earthquake For the Trojan Site: Final Unpublished Report For Portland General Electric Trojan Nuclear Plant, Rainier, Oregon, May 1993.

12 United States Geologic Survey, 2021. Earthquake Catalog, *accessed February 2021*, https://earthquake.usgs.gov/earthquakes/.

13 Cascadia Region Earthquake Workshop, 2008. Cascadia Deep Earthquakes. Washington Division of Geology and Earth Resources, Open File Report 2008-1.

The 2001 M6.8 Nisqually earthquake near Olympia, Washington, occurred within this seismogenic zone at a depth of 52 kilometers. The western margin of the intraplate seismogenic zone is located approximately 16 kilometers east of the site, as shown on Figure 4.

3.2 Historic Seismicity

The Pacific Northwest is a seismically active area. Epicenters for historic earthquakes[14] in western Oregon from 1910 to 2020 are shown on Figure 5. The majority of these earthquakes are shallow (crustal) in nature, with a lesser amount of intraplate sources. No large-scale subduction-zone earthquakes occurred during this period.

4.0 LOCAL TOPOGRAPHY

Topography in the vicinity of the site is shown on the attached Figures 1 and 6. The site is located on the north side of Cascade Head, which is a rocky headland. The entirety of the property ranges in elevation from 20 to 370 feet above mean sea level (MSL). The site consists of two north-trending ridges that terminate in the Pacific Ocean. Slopes on the site are typically characterized as near vertical where adjacent to the ocean, and generally decrease in gradient near the southern and eastern edges of the site. The west building pad typically descends to the east at a gradients of about 1½ horizontal to 1 vertical (1½H:1V). The east building pad generally descends to the northwest at a gradient of about 2H:1V. Similar topography borders the property to the south and east, and the Pacific Ocean abuts the property to the north and west.

5.0 HAZARDS

5.1 Coastal Erosion

The Coastal Erosion Hazard information is shown on the Statewide Geohazards Viewer[15] maintained by DOGAMI, which is reproduced as Figure 7. HazVu indicates that the majority of the site is located within the Moderate to Very High Hazard Zone for Coastal Erosion. These zones are based on geology, slope, and wave activity.

5.2 Flooding

The Federal Emergency Management Agency (FEMA) publishes the Flood Insurance Rate Maps (FIRM) for flood insurance purposes[16]. The northern edge of the property is within a regulatory floodway towards the bottom of the bluff. We understand proposed development will be located well above this zone at an elevation of 180 to 360 feet above MSL.

5.3 Landslides

Landsliding is a common hazard in the Pacific Northwest that can be initiated on marginally stable slopes by human disturbances such as grading and deforestation, and by natural processes including earthquake shaking, volcanism, heavy rainfalls, and rapid snow melt. Recent studies indicate that the most common causes for slope failures are intense rainfall and human alteration, including the placement of building loads

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14 U.S. Geological Survey, 2021. Earthquake Catalog, *accessed February 2021*, from USGS web site: https://earthquake.usgs.gov/earthquakes/.

15 DOGAMI, 2021, Oregon HazVu: Statewide Geohazards Viewer available at http://www.oregongeology.org/hazvu/

16 Federal Emergency Management Agency, 2021. FEMA Map Service Center, *accessed February 2021*, from FEMA web site: https://msc.fema.gov/portal.

on slopes, excavating or over-steepening slopes, and the infiltration or diversion of storm water runoff[17]. For example, excavation into the base of marginally stable slopes may reduce forces resisting failure on those slopes, thus causing movement. Adding fill and/or a structure to the top or mid portion of a slope increases the driving forces on a slope and may contribute to failure. Redirecting water onto or into slopes may exploit existing planes of weakness within those slopes, causing failure.

5.3.1 Regional Mapping

Review of the Statewide Landslide Information Database for Oregon (SLIDO)[18], indicates that no landslides are mapped on the site. A large translational debris slide is located about 300 feet northeast of the site, on the opposite side of the local ridgeline. This landslide mass is considered ancient and is not anticipated to impact the subject property. Several historic landslides are located north of the site along South Beach Road. These landslides are all remote to the site. A portion of the landslide inventory map is shown on the attached Figure 8.

Much of the SLIDO mapping is based on Light Detection and Ranging (lidar) data and imagery available from the Oregon Department of Geology and Mineral Industries (DOGAMI). We also reviewed the lidar imagery available on the DOGAMI lidar data viewer website[19]. DOGAMI provides contours and bare earth imagery, which has been filtered to remove foliage and buildings. The lidar data portray the topography at a much greater level of detail than traditional mapping methods, and can reveal features that are otherwise difficult to ascertain. In areas where human activity has modified the topography extensively, such as through road-building and general grading, the resulting "background noise" can mask features that might otherwise be apparent. Contours in the immediate vicinity of the site derived from the lidar data are shown on Figure 9. Based on our review of the lidar data, some signs of shallow soil creep and/or slumping were noted along the cut associated with the access road. In addition, hummocky topography was noted along the vertical cliffs below the site.

DOGAMI developed a statewide landslide susceptibility map[20] using the lidar data, USGS topography, SLIDO historical landslide information, and the state geologic map. The landslide susceptibility hazard mapping available via the DOGAMI Oregon Statewide Geohazards Viewer[21] (HAZVU) indicates a "moderate" (landsliding possible) to "high" (landsliding likely) for the site and surrounding properties based on their relative slope gradients.

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17 Hofmeister, R., Madin, I., Wang, Y., and Hasenberg, C. 2003, Earthquake and Landslide Hazards Maps and Future Earthquake Damage Estimates, Clackamas County, Oregon: Oregon Department of Geology and Mineral Industries, Open File Report OFR 0-03-10.

18 Oregon Department of Geology and Mineral Industries, 2021. Statewide Landslide Information Database for Oregon (SLIDO), *accessed February 2021,* from DOGAMI web site: http://www.oregongeology.org/sub/slido/index.htm.

19 Oregon Department of Geology and Mineral Industries, 2021. Oregon Lidar Data Viewer, *accessed February 2021,* from DOGAMI web site: http://www.oregongeology.org/sub/LiDARdataviewer/index.htm.

20 Burns, William J, Mickelson, Katherine A., and Madin, Ian P, 2021. Landslide susceptibility overview map of Oregon. Oregon Department of Geology and Mineral Industries, Open-File Report O-16-02. Available on Oregon Statewide Geohazards Viewer, *accessed February 2021*, from DOGAMI web site: http://www.oregongeology.org/sub/hazvu/index.htm.

21 Oregon Department of Geology and Mineral Industries, 2021. Oregon Statewide Geohazards Viewer, *accessed February 2021*, from DOGAMI web site: http://www.oregongeology.org/sub/hazvu/index.htm.

5.4 Seismic Hazards

5.4.1 Liquefaction

A wide variety of slope and ground failures can occur in response to intense seismic shaking during large magnitude earthquakes. These failures are often related to the phenomenon of liquefaction, the process by which water-saturated sediment changes from a solid to a liquid state. Since liquefied sediment may not support the overlying ground, or any structure built thereon, a variety of failures may occur, including lateral spreading, landslides, ground settlement and cracking, sand boils, oscillation lurching, etc. The conditions necessary for liquefaction to occur are: (1) the presence of poorly consolidated, generally cohesionless sediment; (2) saturation of the sediment by groundwater; and (3) an earthquake that produces intense seismic shaking (generally a moment magnitude greater than M5.0). In general, older, more consolidated sediment, and sediment above the water table will not liquefy[22]. Field performance data and laboratory tests indicate that liquefaction occurs predominantly in well-sorted, loose to medium dense sand or silty sand, but can also occur in lean clays and silts[23].

The liquefaction hazard mapping available via HAZVU[24] indicates the soils at the site are non-liquefiable.

5.4.2 Expected Ground Shaking

The HAZVU[25] website includes a layer indicating the expected earthquake shaking felt at a site for a magnitude 9.0 Cascadia Subduction Zone earthquake (as discussed in Section 3.1.2). The mapping is based on six categories of ground shaking ranging from "light" (category 1) to "violent" (category 6). The map indicates a "severe" (category 5) level of ground shaking anticipated at the site during a design level earthquake.

5.4.3 Coseismic Subsidence

Permanent subsidence, or a lowering of the land level, is expected to occur along the coast during a large magnitude, subduction zone earthquake. DOGAMI produced maps showing the estimated subsidence expected during a magnitude 9 Cascadia Subduction Zone earthquake[26]. The maps present the subsidence estimates in wide, color-coded bands. The site and most of the surrounding area, is expected to undergo approximately 2 to 3 feet of coseismic subsidence.

5.4.4 Surface Rupture

5.4.4.1 Faulting

As discussed above, the site is situated in a region of the country characterized by extensive faulting and known for seismic activity. However, no known faults are mapped on or immediately adjacent to the site, the risk of surface rupture impacting the proposed development at the site due to faulting is considered very low.

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22 Youd, T.L. and Hoose, S.N. 1978. Historic ground failures in Northern California triggered by earthquakes: U.S. Geological Survey Professional Paper 993, p.117.

23 Seed, R.B., et al. 2003. Recent Advances In Soil Liquefaction Engineering: A Unified And Consistent Framework. Earthquake Engineering Research Center College Of Engineering University Of California, Berkeley.

24 Oregon Department of Geology and Mineral Industries, 2021. Oregon Statewide Geohazards Viewer, *accessed February 2021*, from DOGAMI web site: http://www.oregongeology.org/sub/hazvu/index.htm.

25 Oregon Department of Geology and Mineral Industries, 2021. Oregon Statewide Geohazards Viewer, *accessed February 2021*, from DOGAMI web site: http://www.oregongeology.org/sub/hazvu/index.htm.

26 Madin, I.P. and Burns, William J., 2013. Ground motion, ground deformation, tsunami inundation, coseismic subsidence, and damage potential maps for the 2012 Oregon Resilience Plan for Cascadia Subduction Zone Earthquakes. Oregon Department of Geology and Mineral Industries (DOGAMI) Open-File Report O-13-06.

5.4.4.2 Lateral Spread

Surface rupture due to lateral spread can occur on sites underlain by liquefiable soils that are located on or immediately adjacent to slopes steeper than about 3 degrees (20H:1V), and/or adjacent to a free face, such as a stream bank or the shore of an open body of water. During lateral spread, the materials overlying the liquefied soils are subject to lateral movement downslope or toward the free face. The Pacific Ocean abuts the site to the north and could act as a free face during a liquefaction event, however, recognizing the lack of liquefiable soils and underlying bedrock, we characterize the risk of lateral spread to be negligible.

5.5 Coastal Flooding

Lower portions of the site (below the cliffs) are subject to coastal flooding. The two building pad areas where potential development will occur are located on an ocean bluff, about 180 to 360 feet above Mean Sea Level, and are well above the mapped inundation level for coastal flooding.

5.6 Tsunami

Review of the tsunami hazard map available on the DOGAMI HazVu website indicates both potential building pads are well above the mapped tsunami inundation zone. A portion of the Tsunami Inundation map showing the location of the site is included on Figure 10.

6.0 SITE RECONNAISSANCE

CGT Senior Engineering Geologist Ryan Houser, RG, CEG, and Melissa Lehman, GIT, performed a reconnaissance of the site on January 29, 2021.

6.1 Surface Conditions

6.1.1 On Site

The proposed site layout and conditions are shown on the attached Site Plan (Figure 9) and Site Photographs (Figure 11).

The 8.31-acre site was located southwest of the terminus of South Beach Road, south of Neskowin. Access to the site was by a shared driveway off of the terminus of South Beach Road. The site was bordered by rural residential properties to the south, northeast, and east, and the Pacific Ocean to the north and west.

The shared driveway traversed west from the terminus of South Beach Road and circumnavigated the area south of the southern property line. The road descended to the southwest at a gradient of approximately 3½H:1V across two deeply incised drainages before ascending to the northwest at a gradient of 5½H:1V. One of the drainage crossings along the road had been reinforced with rip rap and a culvert had been installed beneath the road. Road cuts on the upslope side of the access road typically exhibited gradients of about 1H:1V or steeper. Several slumps were noted along the road cuts. In addition, several of the exposed walls were "weeping" with shallow subsurface runoff from ongoing rains.

Based on our observations from limited access points, well developed talus slopes were located at the base of the ocean cliffs where protected from ongoing wave erosion. Cliffs with wave action acting at their base were generally steeper and did not have a developed talus slope. This is generally indicative of ongoing, gradual erosion and landward migration of the cliff face.

The east building pad was located near the eastern edge of the property and was located directly below the shared gravel driveway, as shown on the Site Plan, attached as Figure 9. Previous logging was evident in a few areas with remnant skid roads that generally followed slope contours. The proposed east building pad generally descended to the northwest from the access road at a gradient of approximately 1½H:1V to 2½H:1V. The site was overgrown with dense vegetation, as indicated on the Site Photographs (Figure 11). Some curved tree trunks were noted along the slope indicating some shallow soil creep. A topographic profile showing the location of the east building pad is attached as Figure 12 (A-A').

The west building pad was located on the east side of a north-trending ridge at the west end of the property. The ridge was densely vegetated with coniferous trees. The west side of the ridge descended to the west at a vertical gradient. We understand a portion of this cliff is undercut. The east side of the ridge (in the area of the proposed west building pad) descended to the east-northeast at gradients of about 1½H:1V. Access to the area of the building pad for exploration was very limited by topography and dense vegetation. Some curved tree trunks were noted along the slope indicating shallow soil creep. A topographic profile showing the location of the west building pad is attached as Figure 13 (B-B').

No indicators of deep-seated slope instability were noted on the proposed building pads.

6.1.2 Area Conditions

As indicated above some small slumps and weepage were observed along the road cut south of the property.

6.1.3 Groundwater

To determine approximate regional groundwater levels in the area, we researched well logs available on the Oregon Water Resources Department (OWRD)[27] website for wells located within Section 35, Township 5 South, Range 11 West, Willamette Meridian. Our review indicated that few well logs are located in the vicinity of the site. Available well logs indicate groundwater is not within 40 feet of the ground surface. We anticipate groundwater levels in the area will be close to sea level, which is about 180 feet below the proposed lower of the proposed residence pads. We anticipate that groundwater levels will fluctuate due to seasonal and annual variations in precipitation, changes in site utilization, or other factors.

7.0 FINDINGS & RECOMMENDATIONS

The primary geologic hazard that may affect the site is the potential for slope instability and seismic shaking. Portions of the site are also subject to coastal erosion, coastal flooding, and tsunami. Coastal erosion may impact the stability of site slopes. The proposed building pads are located well above the level of coastal flooding and tsunami inundation.

7.1 Slope Instability

As described above, the site is located along an ocean bluff, and some areas of shallow soil creep and slumping were noted in both building pad areas. A landslide was located northeast of the site on the opposite side of a ridgeline. Based on these factors, it is our opinion that the site is correctly mapped as having a moderate to high hazard of landsliding, which may be exacerbated by coastal erosion.

[27] Oregon Water Resources Department, 2021. Well Log Records, *accessed February 2021*, from OWRD web site: http://apps.wrd.state.or.us/apps/gw/well_log/.

Based on our observations, ongoing coastal erosion, and nearby landslides on similar slopes, CGT recommends the following to mitigate potential impacts of shallow and deep seated slope instability for the proposed future development of the site:

- CGT recommends no construction occur within a 1 horizontal to 1 vertical slope projected up from the base of the cliffs. This setback line is approximately shown on the topographic profiles (Figures 12 and 13), and has been taken into account when determining the building pads as shown on Figure 9. This recommended setback does not reduce the code-based requirement for setback from descending slope (R403.1.9.2 of the 2017 Oregon Residential Specialty Code – see below). The setback areas were determined based on topography from lidar data available online, and should not be considered a survey of the site.
- Once a building pad has been selected, CGT recommends a quantitative slope stability analyses be completed for the selected building as part of a full geotechnical investigation of the site. Such an analysis would require borings using powered drilling equipment, and is outside the scope of this assignment. Clearing and grading of temporary access roads for drilling equipment will be required due to dense vegetation at the site and steep slopes present within both potential building pads.

Any construction within hillside areas inherently bears greater risk of slope instability. The on-site and off-site slopes may be susceptible to slope instability resulting from factors beyond the owner's control, such as off-site grading, erosion and other ground disturbance, a major earthquake, or heavy precipitation. The owners must recognize and accept the risk of potential slope instability from causes beyond their control or as yet unrecognized.

7.1.1 Foundation Setback from Descending Slope

Section R403.1.9.2 of the Oregon Residential Specialty Code (2017 ORSC) requires that structures be set back from descending slopes, a minimum of ⅓ the height of the slope, or 40 feet maximum, measured horizontally from the base of the foundation to the slope face. On the subject property, the slope descends below the proposed building pad areas between 160 and 200 feet; therefore, the code required horizontal setback is 40 feet. This setback helps to determine a minimum depth of the foundations supporting the proposed residence, and may be modified depending on the results of the recommended slope stability analysis. Based on the building code section, CGT anticipates the new residence will be supported by deep foundations. The type of foundation will be determined during the geotechnical investigation phase.

7.1.2 Setback from Toe of Slope

Section R403.1.9.1 of the 2017 ORSC requires a setback between the toe of an ascending slope with a gradient in excess of 3H:1V and the nearest wall of the proposed structure. The purpose of the setback is to help provide protection from surficial failures, erosion of the slope, and slope drainage. The toe of slope clearance should be ½ the slope height or a maximum of 15 feet. For retained slopes, the height of the slope should be measured considering the top of the retaining wall as the toe of the slope. Where slopes are steeper than 3H:1V the structure should be setback in accordance with these guidelines.

7.1.3 Drainage & Erosion

In no case should surface runoff or discharge from drains be directed onto the site slopes. The ground surface adjacent to the building should be sloped to drain away from the building and surface runoff should be collected and routed to a suitable discharge point. Surface water should not be directed into foundation drains. Surface and any subsurface drains should be connected to the nearest storm drain or other suitable discharge point.

The established vegetation observed at the site should generally provide protection from excessive erosion and no remedial measures are warranted at this time. Any areas of exposed soils, should, at a minimum, be monitored for erosion and preferably be vegetated or otherwise protected from erosion.

7.2 Seismic Shaking

To minimize the risk that this hazard will adversely impact the proposed development, the structure should be designed and constructed in accordance with current building codes. The proposed development will have no impact on this hazard.

7.3 Other Hazards

Other geologic hazards identified in the State of Oregon Engineering Geology Report guidelines include:

- Shallow Groundwater
- Fault Rupture
- Expansive Soils
- Volcanic Hazards

Based on our research, field reconnaissance, and previous experience in the area, none of these hazards are present at the site.

8.0 LIMITATIONS

The scope of this assignment did not include services related to geotechnical engineering for the proposed development such as bearing capacity evaluation, settlement estimates, recommendations regarding stripping and filling, or the use of footing/floor slab drains, etc. Additionally, quantitative soil or rock slope stability analyses was not performed. Our recommendations are not intended to indicate that all geologic hazards can be mitigated by proper engineering. They are provided in order to assist the project engineer in evaluating site conditions based on geologic research and preliminary, site specific, surface and shallow subsurface exploration. If you would like CGT to provide geotechnical recommendations or geotechnical construction observations during site construction, we can prepare a geotechnical report for the site for an additional fee.

We have prepared this report for use by the owner/developer and other members of the design and construction team for the proposed development. The opinions and recommendations contained within this report are not intended to be, nor should they be construed as, a warranty of subsurface conditions, but are forwarded to assist in the planning and design process.

This site evaluation consisted of visual examinations of exposed soil conditions within shallow excavations and a review of readily available geologic resources judged pertinent to the evaluation. Accordingly, the limitations of the site evaluation must be recognized. An exploration of subsurface conditions at depth was not conducted for this evaluation. An investigation to explore subsurface conditions at depth using deeper soil borings or excavations could be conducted at additional cost to the owner to further define the risk of unforeseen, adverse geological issues on this site. However, based on our observations and the information available, the risk of unforeseen adverse geological issues on this site appear to be small and could, in our opinion, be assumed by the owner.

We have made observations based on our explorations that indicate the soil conditions at only those specific locations and only to the depths penetrated. These observations do not necessarily reflect soil types, strata thickness, or water level variations that may exist between or away from the explorations. If subsurface conditions vary from those encountered in our site exploration, CGT should be alerted to the change in conditions so that we may provide additional recommendations, if necessary. Observation by experienced geotechnical personnel should be considered an integral part of the construction process. The owner/developer is responsible for insuring that the project designers and contractors implement our recommendations.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, should be understood. This report is subject to review and should not be relied upon after a period of three years.

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 1

Site Location

CARLSON CGT GEOTECHNICAL 503-601-8250
Drafted by: AET

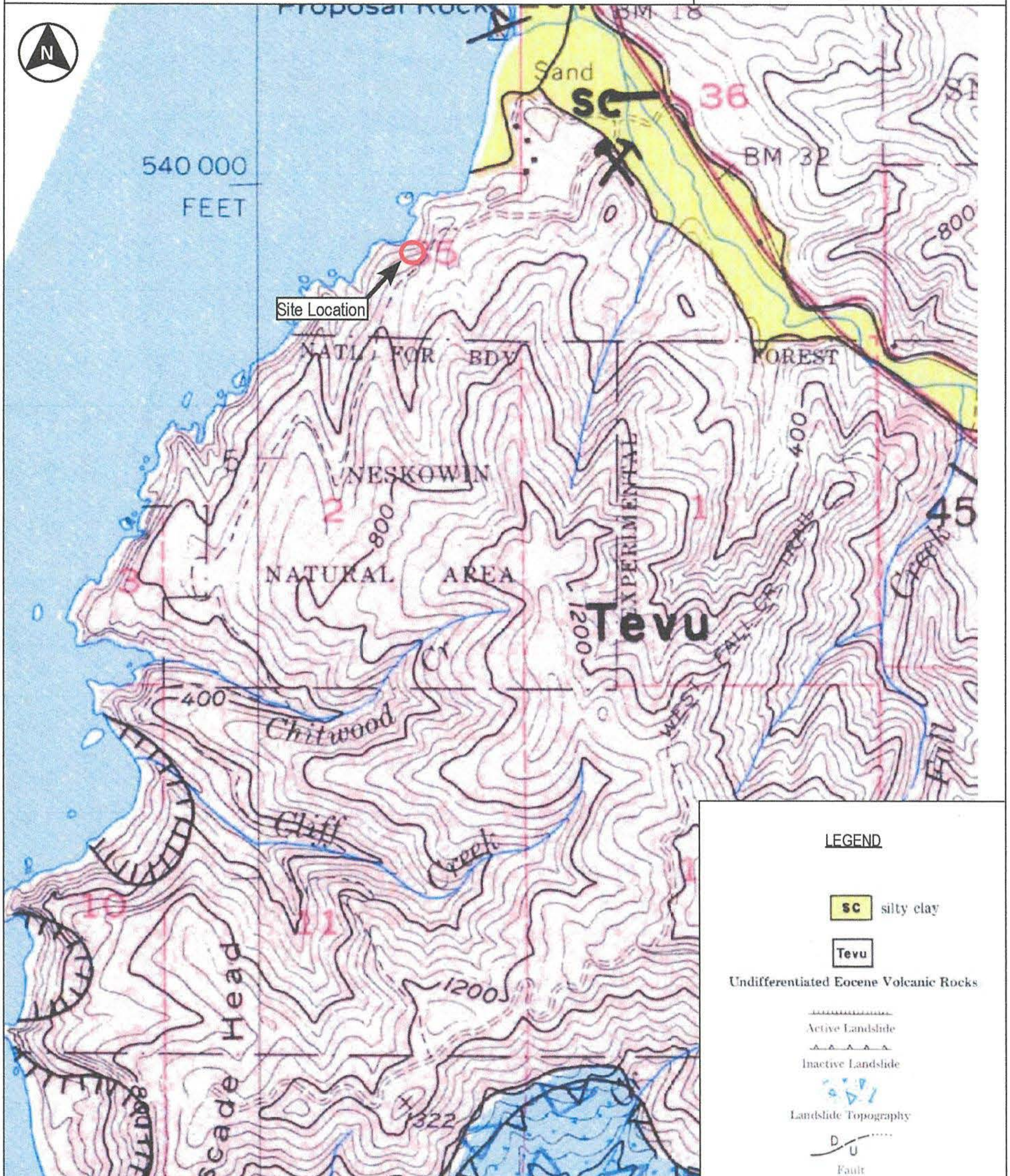
USGS Topographic base map created with The National Map, 2021, at https://viewer.nationalmap.gov/advanced-viewer/

Township 05 South, Range 11 West, Section 35, Willamette Meridian

Latitude: 45.089404° North
Longitude: 123.997519° West

1 Inch = 2,000 feet
0 2000 4000

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON Project Number G2105429	FIGURE 2 Geologic Map



Map adapted from Schlicker, H.G., R.J. Deacon, J.D. Beaulieu, and G.W. Olcott, 1972, Engineering Geologic Map of the Hebo Quadrangle, Oregon, Department of Geology and Mineral Industries.

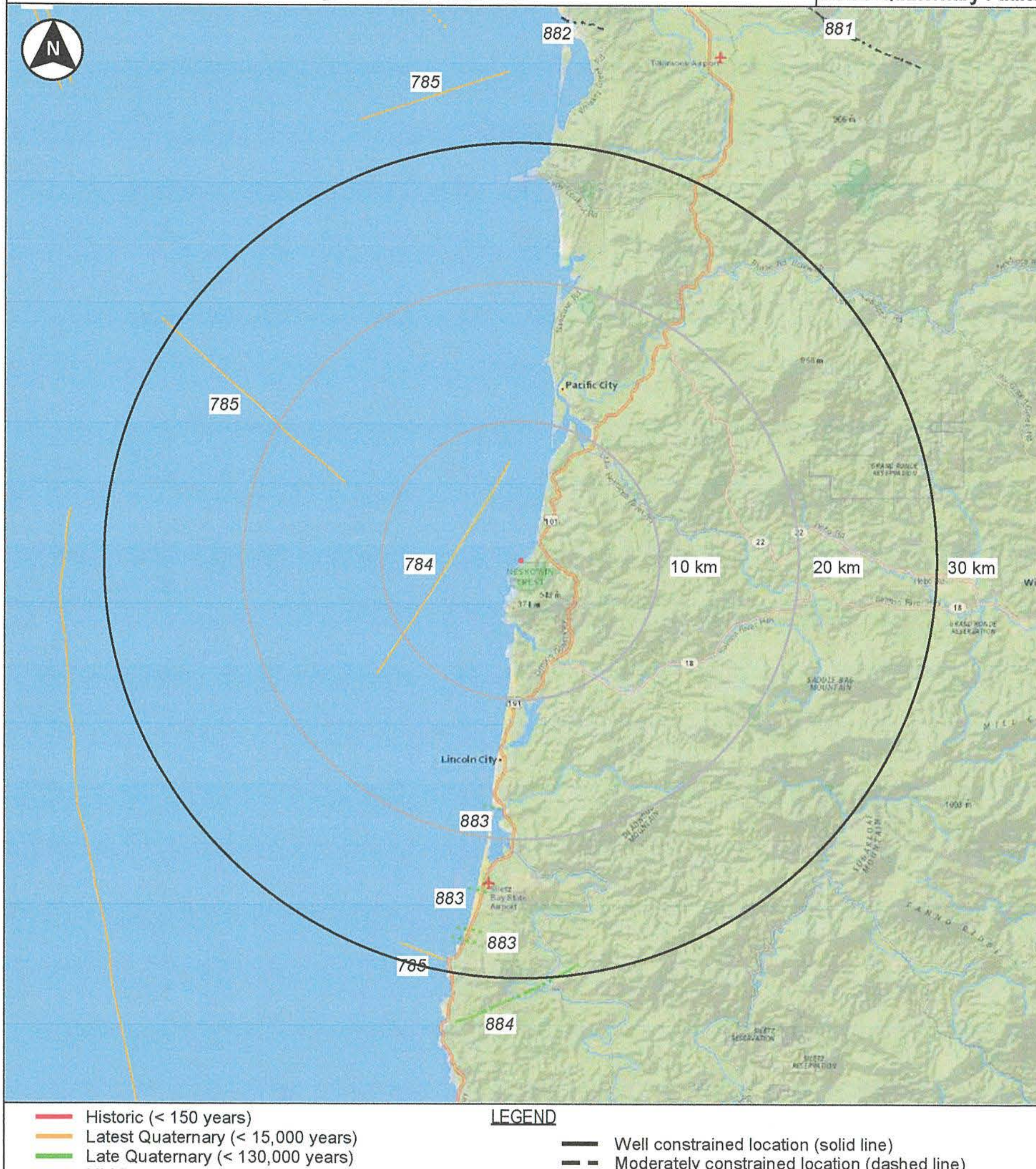
Township 5 South, Range 11 West, Section 35 Willamette Meridian

Latitude: 45.089404° North
Longitude: 123.997519° West

1 Inch = 2,000 feet

0 2000 4000

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON *Project Number G2105429*	FIGURE 3 **USGS Quaternary Faults**



LEGEND

- Historic (< 150 years)
- Latest Quaternary (< 15,000 years)
- Late Quaternary (< 130,000 years)
- Middle and late Quaternary (< 750,000 years)
- Undifferentiated Quaternary (< 1.6 million years)
- Unspecified Age
- Class B (age varies)

- Well constrained location (solid line)
- Moderately constrained location (dashed line)
- Inferred location (dotted line)

716 USGS Fault Number

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NOTES: Data from USGS Quaternary Fault and Fold Database, *accessed February 2021*, at website: https://earthquake.usgs.gov/cfusion/qfault/.

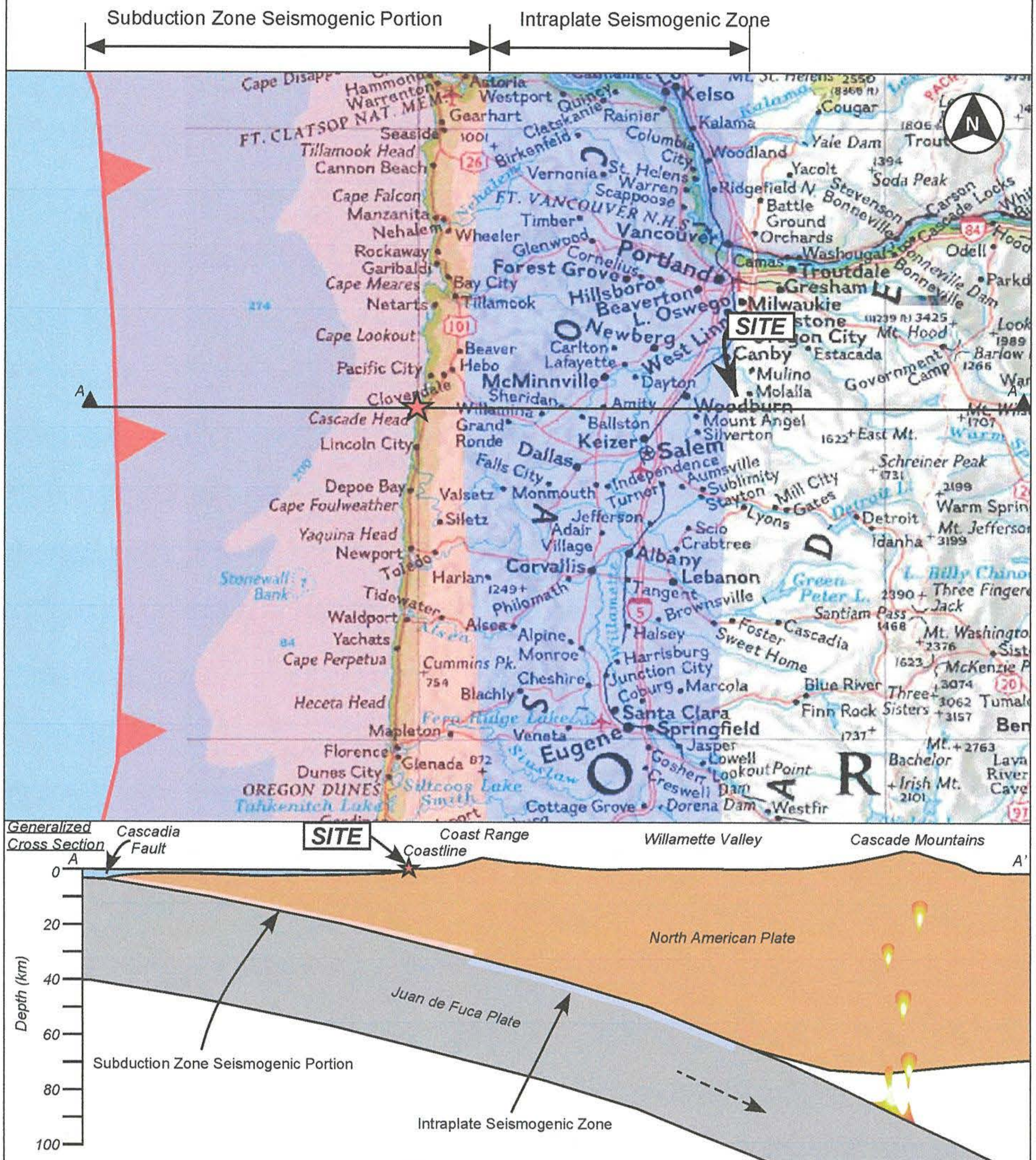
1 Inch = 10 Kilometers

0 10 20

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G1604493

FIGURE 4

Cascadia Subduction Zone



McCrory, Blair, Oppenheimer, and Walter, 2004. Depth to the Juan de Fuca slab beneath the Cascadia subduction margin - A 3-D model for storing earthquakes: U.S. Geological Survey Data Series 91.

Scale 1 Inch = 50 kilometers

0 50 100

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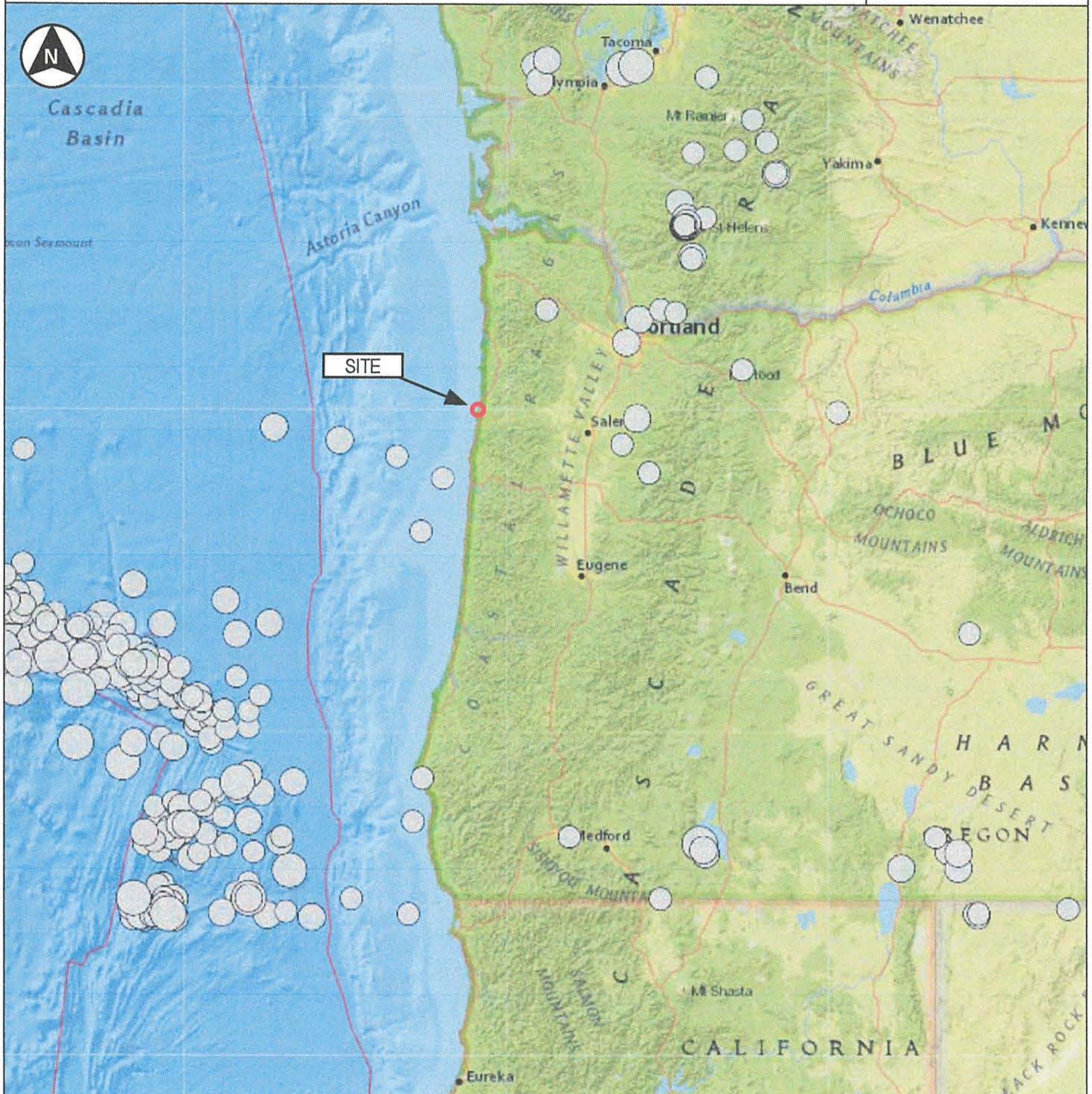
MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 5
Historical Earthquakes



1910 - 2020 Earthquakes with Magnitude above M4.5

Magnitude: 0, M2, M3, M4, M5, M6, 7+

Age (past): Hour, Day, Week, Month, Older

Map created from USGS Earthquake Catalog at https://earthquake.usgs.gov/earthquakes/ *accessed February 2021.*

Latitude: 45.089404° North
Longitude: 123.997519° West

1 Inch = 100 kilometers

0 100 200

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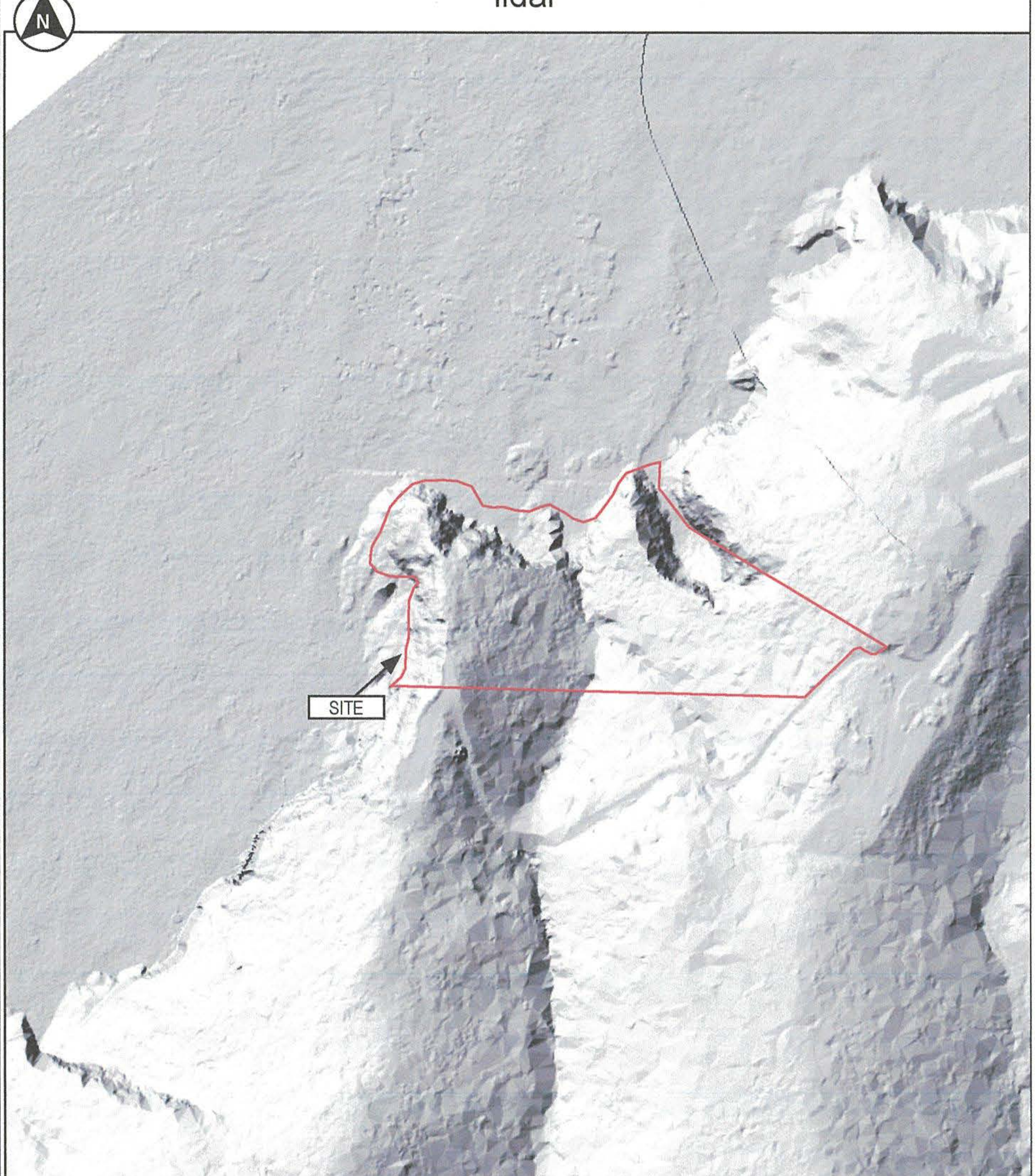
MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON ***Project Number G2105429***	**FIGURE 6** **Local Topography**

lidar



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Drafted by: MLL

Lidar imagery obtained from Oregon Department of Geology and Mineral Industries, DOGAMI Lidar Information Layer for Oregon. https://www.oregongeology.org/lidar/index.htm

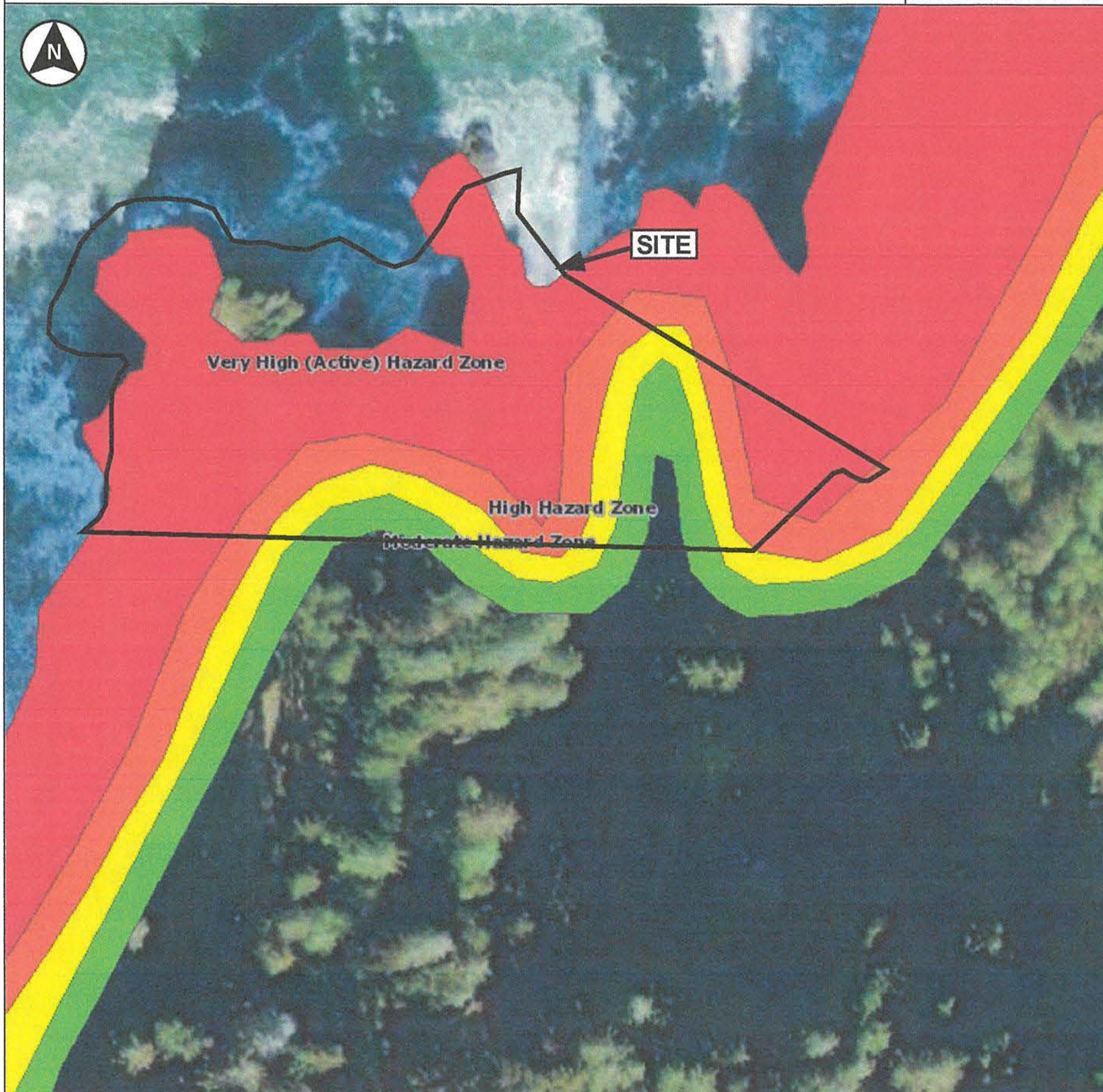
Latitude: 45.089404° North
Longitude: 123.997519° West

1 Inch = 300 feet

0 300 600

MUGGE RESDIENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 7
Erosion Hazard Zone



LEGEND

Statutory vegetation line

Active Hazard Zone

High Hazard Zone

Low Hazard Zone

Moderate Hazard Zone

CARLSON CGT GEOTECHNICAL 503-601-8250

NOTES: DOGAMI. Coastal Erosion Hazard Zone information obtained from Ocean Shores Viewer at the Coast Atlas Website http://www.coastatlas.net/oceanshores/

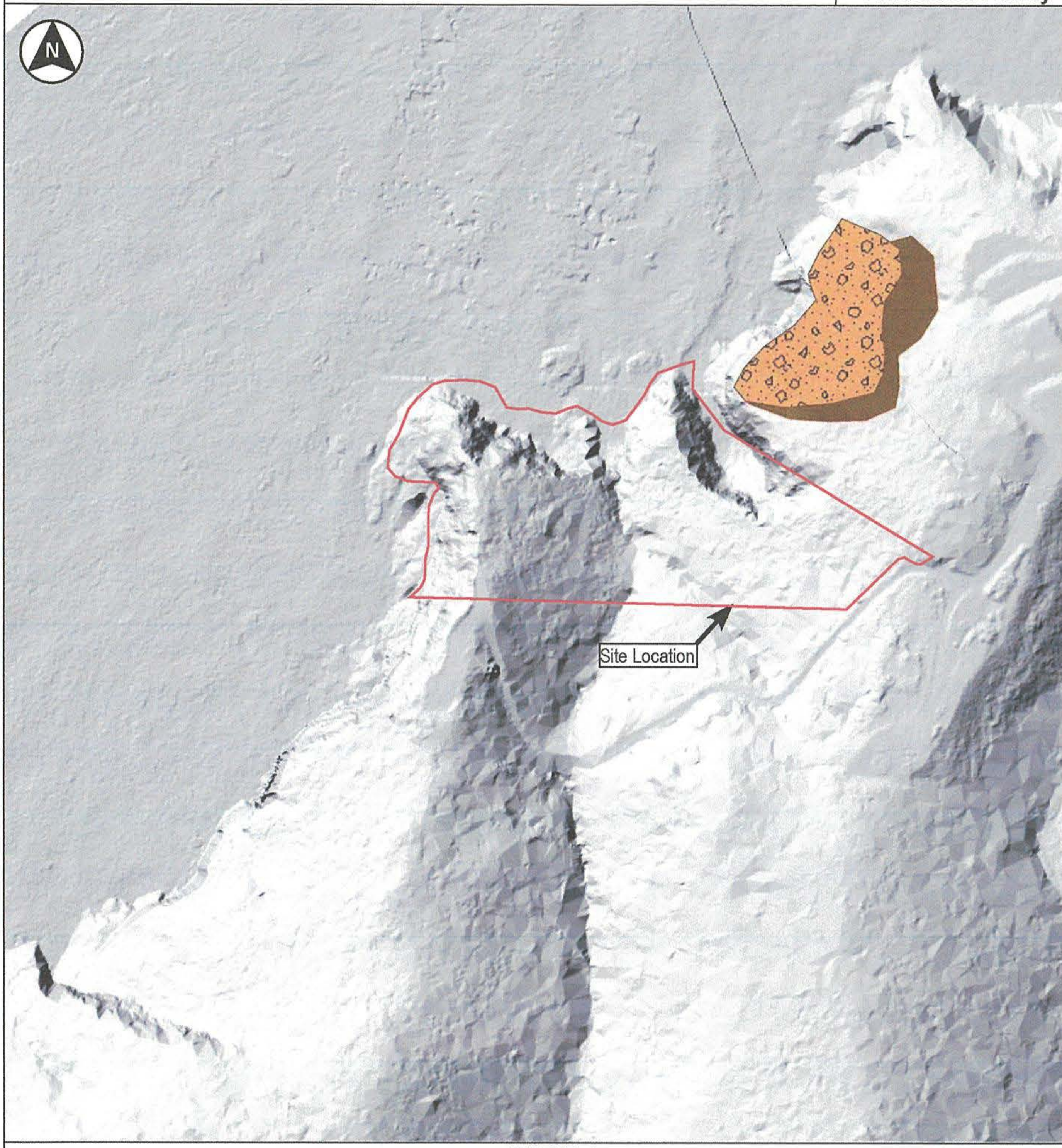
Township 5 South, Range 11 West, Section 35 Willamette Meridian

1 Inch = 200 Feet

0 200 400

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 8
Landslide Inventory



LEGEND

Landslide

CARLSON GEOTECHNICAL 503-601-8250

Drafted by: MLL

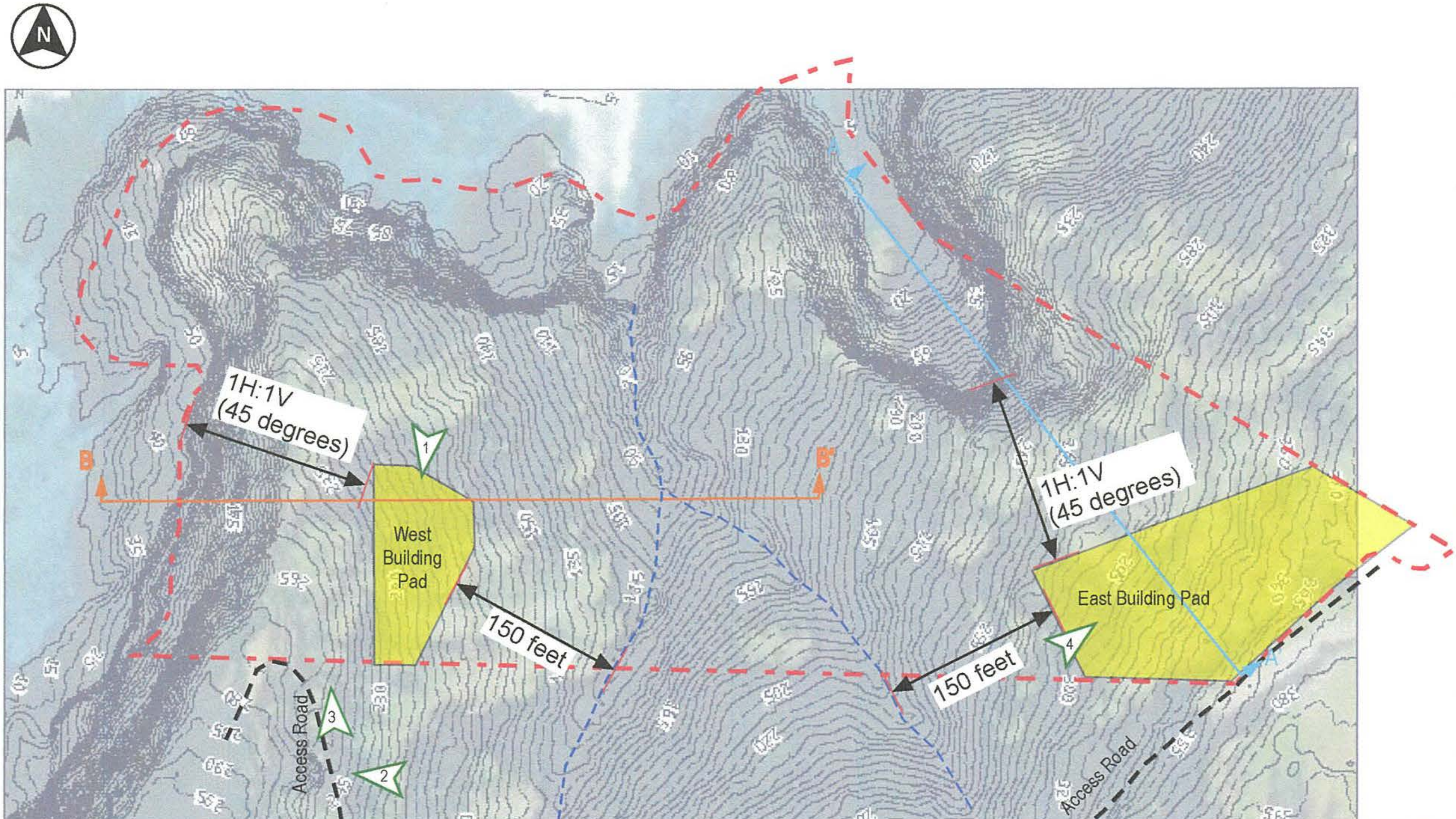
NOTES: Landslide inventory mapping obtained from Oregon Department of Geology and Mineral Industries, Statewide Landslide Information Layer for Oregon (SLIDO), accessed February 2021 at http://www.oregongeology.org/slido/index.htm

Latitude: 45.089404° North
Longitude: 123.997519° West

1 Inch = 300 Feet
0 300 600

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 9
Site Plan



LEGEND

Property line
Building area
Orientation of site photographs shown on Figure 3
A A' Location of cross section shown on Figure 12
B B' Location of cross section shown on Figure 13

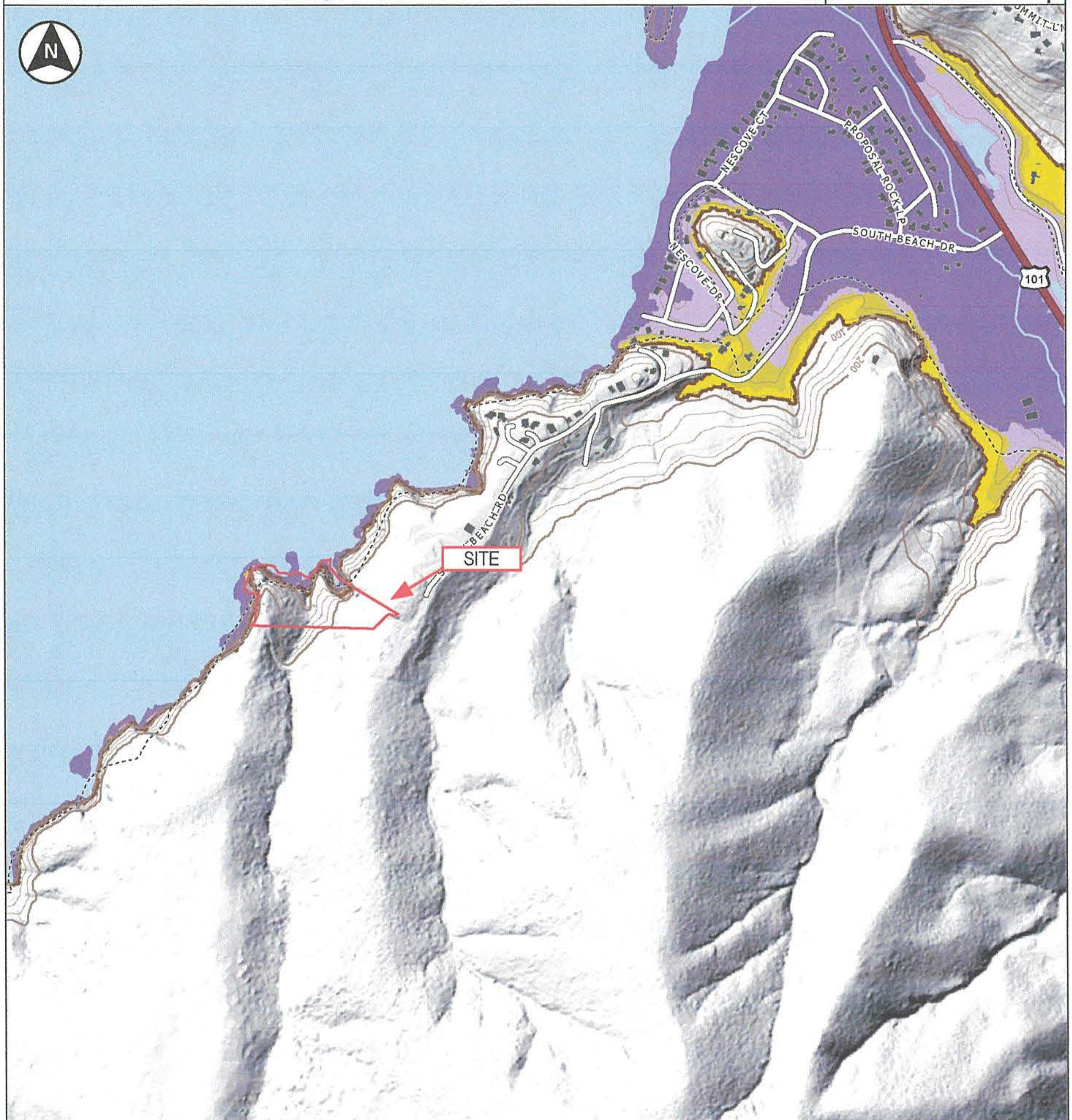
1 Inch = 120 Feet
0 120 240

NOTES: 2017 aerial image from ESRI World Imagery Basemap 2019. Five-foot el tion contours (NAVD88) based on 2009 DOGAMI lidar data, processed in QGIS 3 and ESRI ArcGIS Pro 2.5.0. Locations noted are approximate.

CARLSON CGT GEOTECHNICAL 503-601-8250

Drafted by: MLL

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON *Project Number G2105429*	**FIGURE 10** **Tsunami Inundation Map**



LEGEND

Earthquake Size (Magnitude)

S (~8.7)	L (~9.0)	XXL (~9.1)
M (~8.9)	XL (~9.1)	XXL (Wet/Dry Zone)

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Drafted by: MLL

Map adapted from Zhang, Joseph, 2012, Local Source (Cascadia Subduction Zone) Tsunami Inundation Map, Sand Lake , Oregon, State of Oregon Department of Geology and Mineral Industries, Tsunami Inundation Map Till-11, Tsunami Inundation Maps for Sand Lake, Tillamook County, Oregon.

1 Inch = 1000 Feet

0 1000 2000

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON Project Number G2105429	FIGURE 11 Site Photographs

Photograph 1

Photograph 2

Photograph 3

Photograph 4

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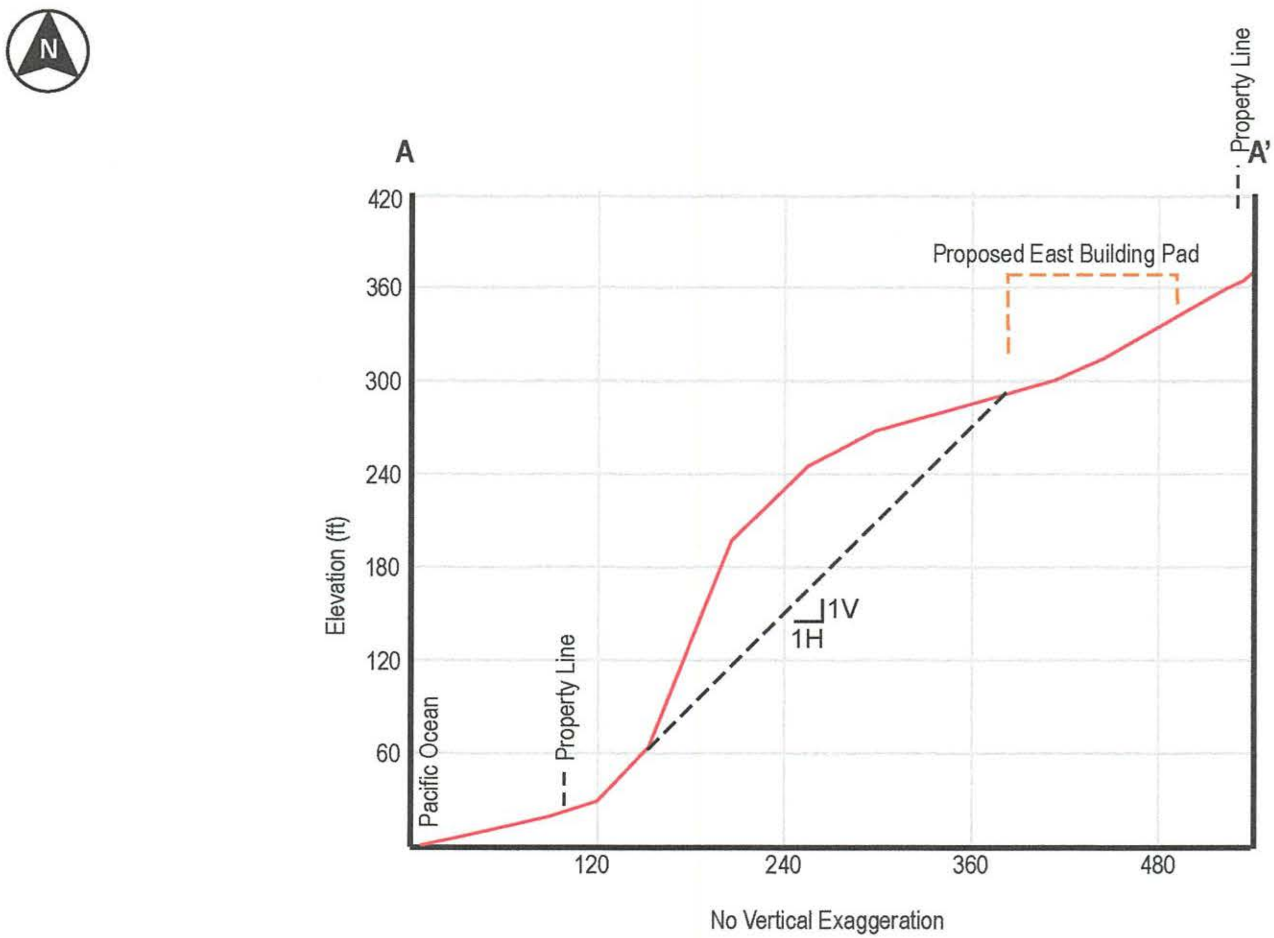
Drafted by: MLL

See Figure 9 for approximate photograph locations and directions. Photographs were taken at the time of our fieldwork.

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 12

A-A' Topographic Profile



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Drafted by MLL

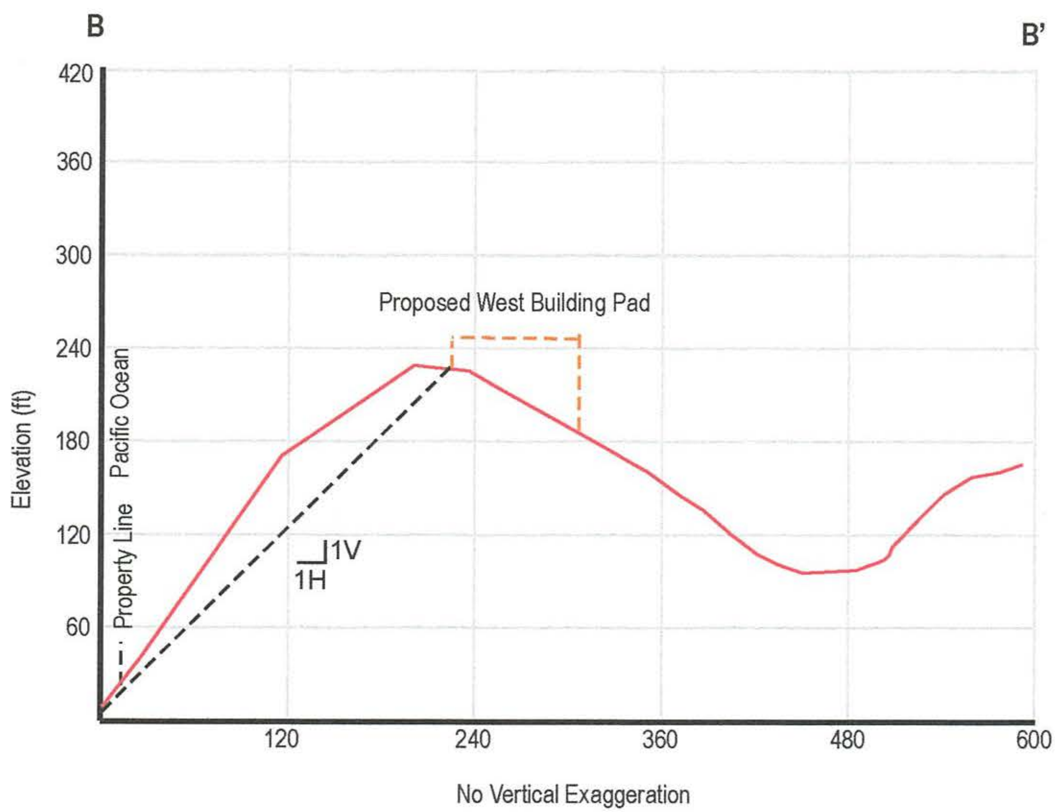
Cross-section location shown on Figure 9

Horizontal and Vertical Scale
1 Inch = 120 Feet
0 120 240

MUGGE RESIDENCE - TILLAMOOK COUNTY, OREGON
Project Number G2105429

FIGURE 13

B-B' Topographic Profile



Cross-section location shown on Figure 9

Horizontal and Vertical Scale

1 Inch = 120 Feet

0 120 240

CARLSON CGT GEOTECHNICAL 503-601-8250

Drafted by MLL

APPENDIX C STUDIO.E ARCHITECTURE HOUSE DESIGN

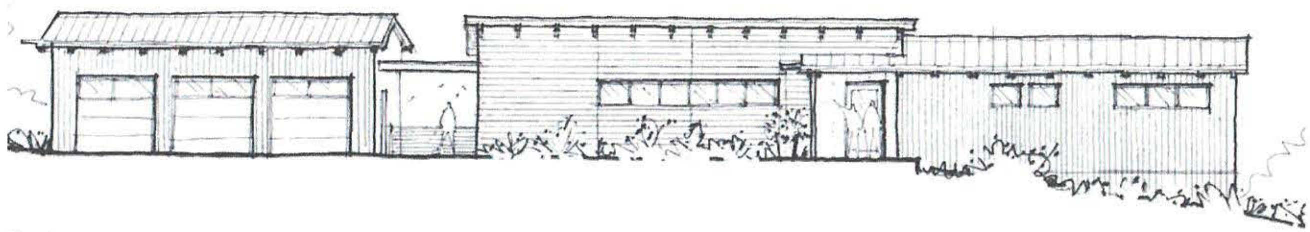


Illustration of the front view of the proposed design with low impact to views from properties above on the upslope.

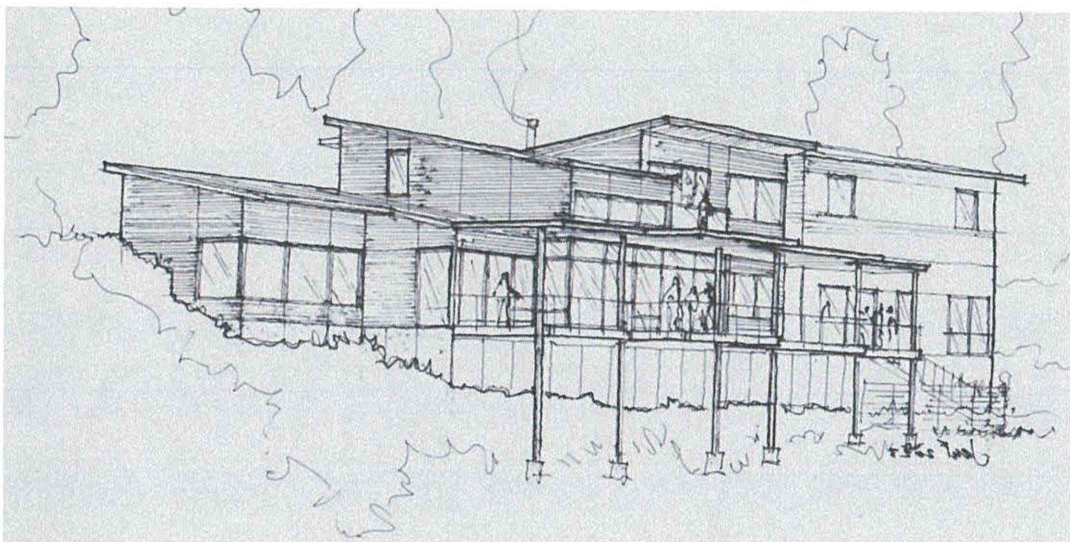


Illustration from northwest edge of property looking southeast, viewable only from owners' property due to natural topography.

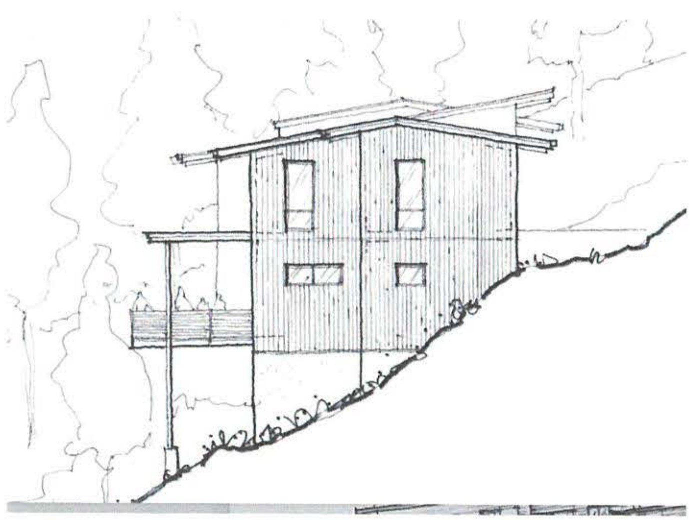


Illustration from southeast looking north, viewable only from owners' property due to natural topography.

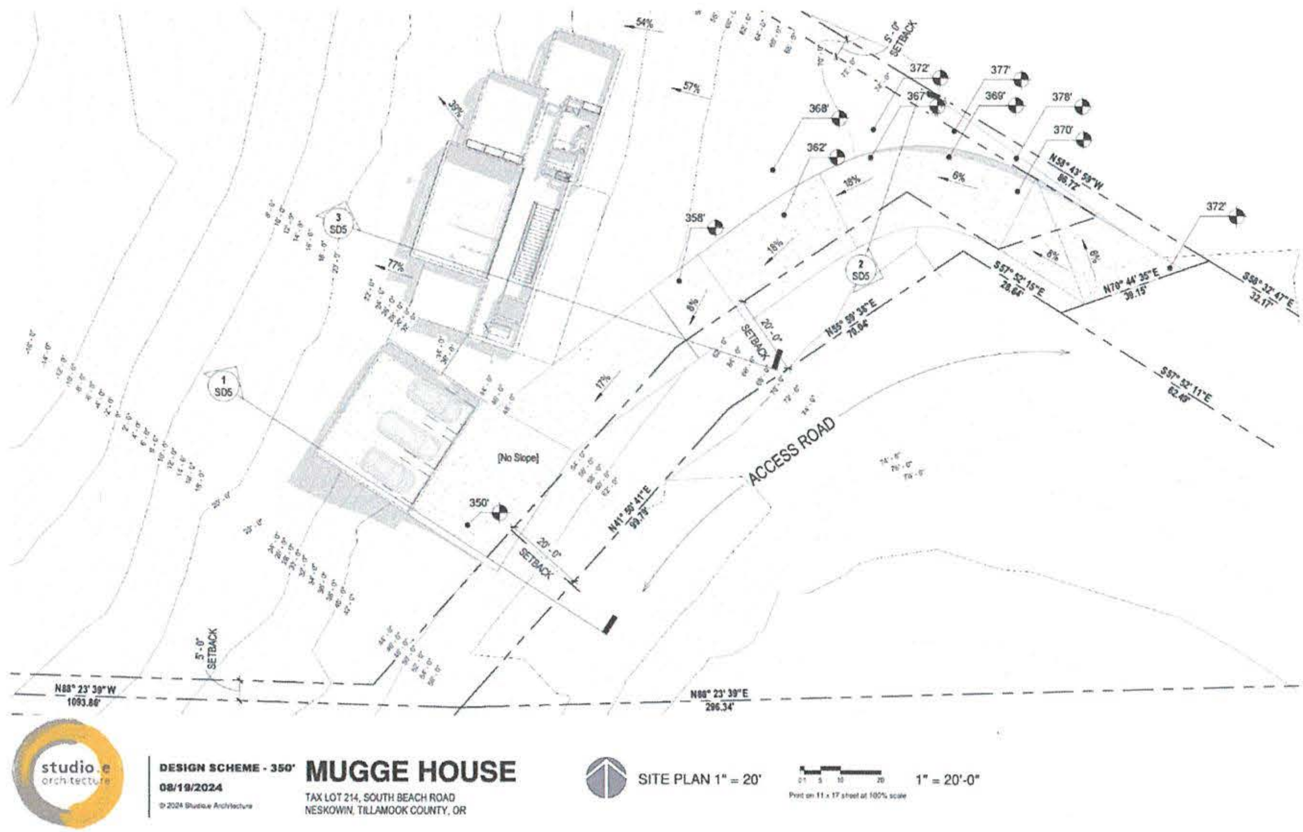


Illustration of home into natural topology with minimal excavation and disturbance of property.

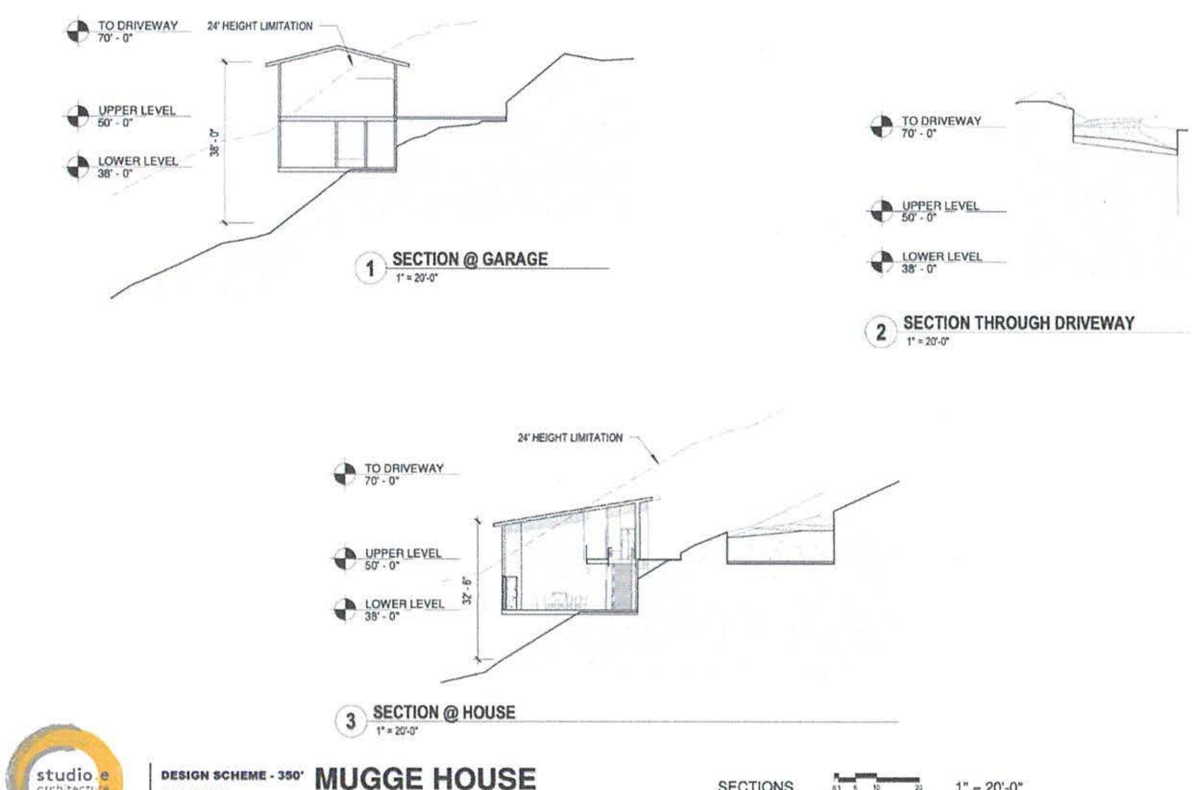
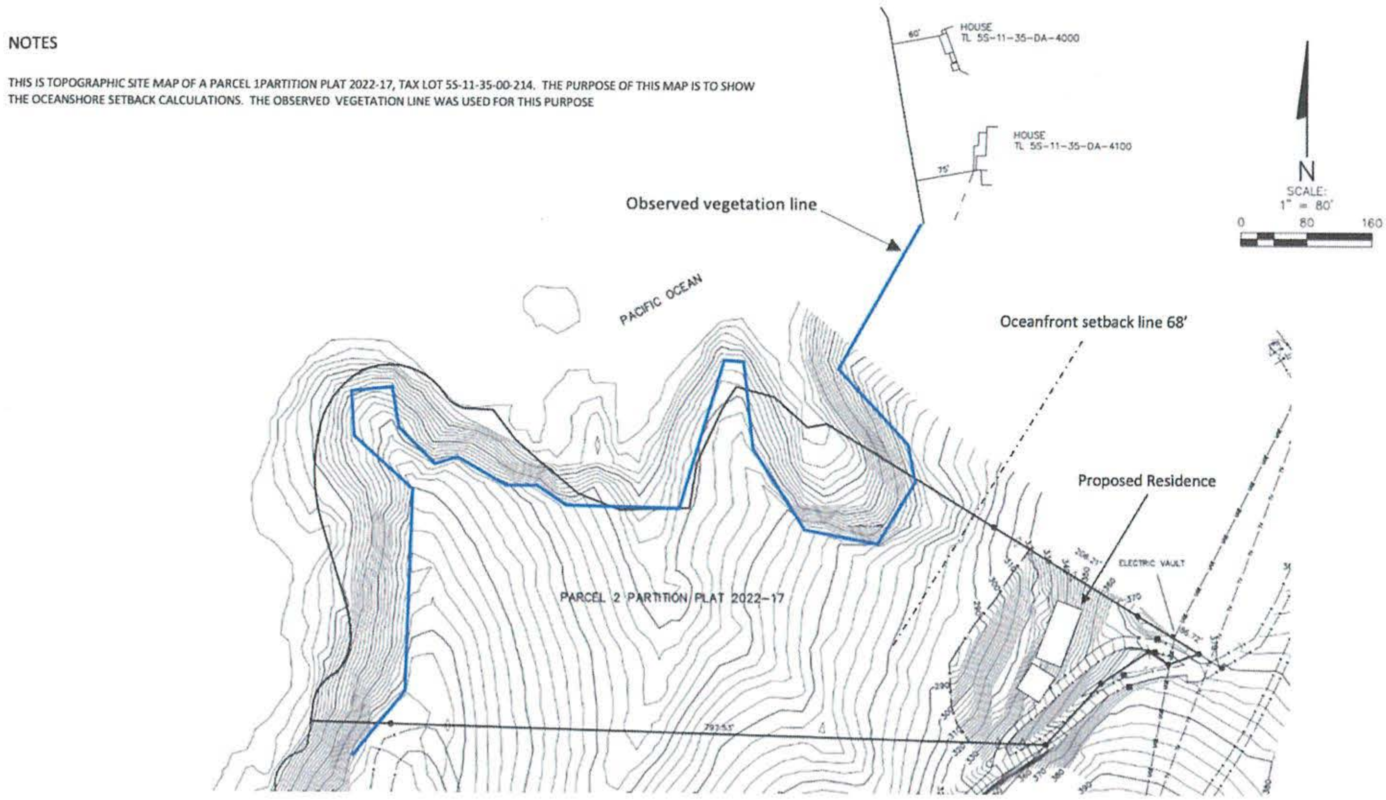


Illustration cutaways and impact on height restrictions.

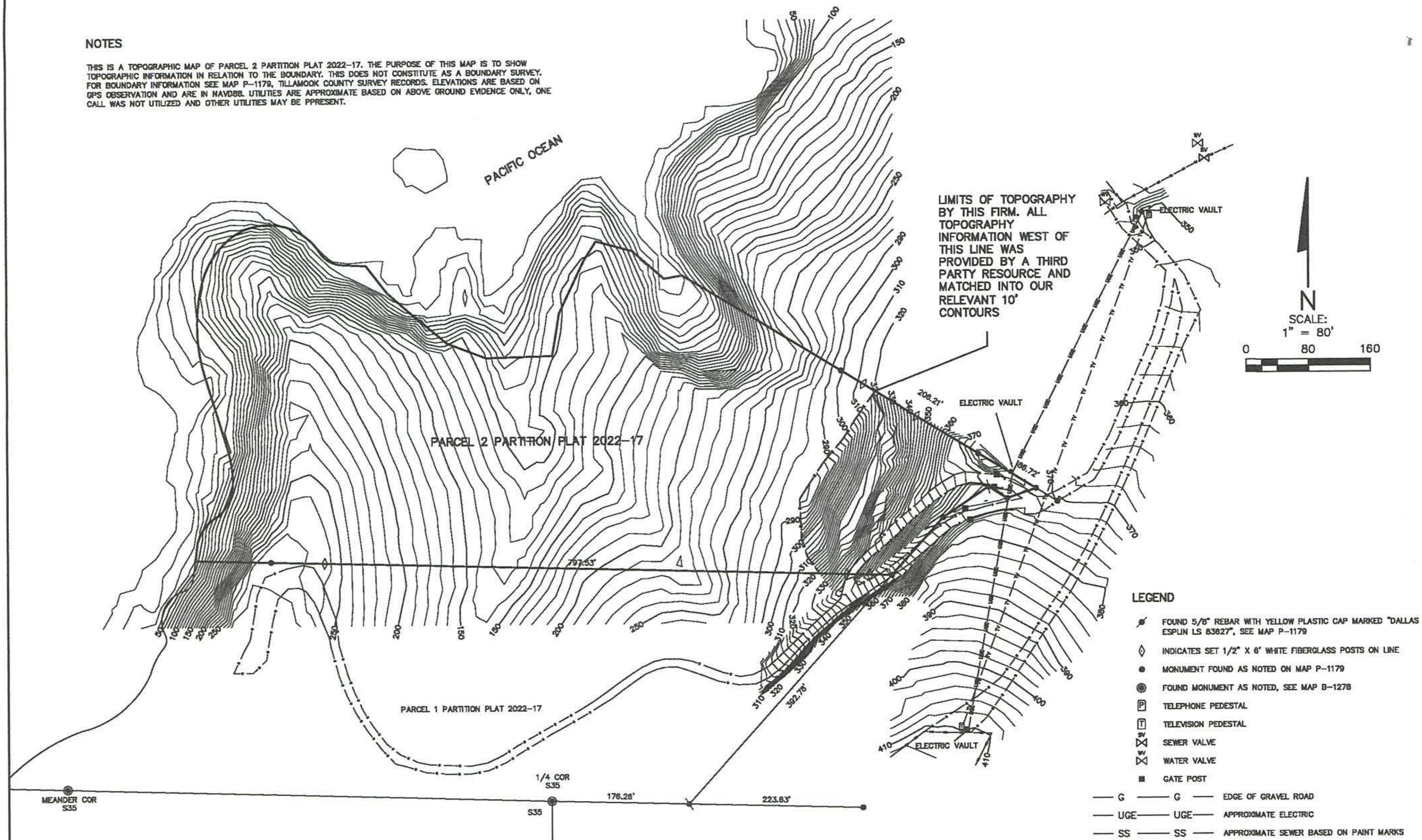


Location relative to existing oceanfront setback line.

APPENDIX D TOPOGRAPHIC SURVEY BY BAYSIDE SURVEYING, LLC

NOTES

THIS IS A TOPOGRAPHIC MAP OF PARCEL 2 PARTITION PLAT 2022-17. THE PURPOSE OF THIS MAP IS TO SHOW TOPOGRAPHIC INFORMATION IN RELATION TO THE BOUNDARY. THIS DOES NOT CONSTITUTE AS A BOUNDARY SURVEY. FOR BOUNDARY INFORMATION SEE MAP P-1179, TILLAMOOK COUNTY SURVEY RECORDS. ELEVATIONS ARE BASED ON GPS OBSERVATION AND ARE IN NAVD88. UTILITIES ARE APPROXIMATE BASED ON ABOVE GROUND EVIDENCE ONLY, ONE CALL WAS NOT UTILIZED AND OTHER UTILITIES MAY BE PPRESENT.



LEGEND

- FOUND 5/8" REBAR WITH YELLOW PLASTIC CAP MARKED "DALLAS ESPLIN LS 83627", SEE MAP P-1179
- INDICATES SET 1/2" X 6' WHITE FIBERGLASS POSTS ON LINE
- MONUMENT FOUND AS NOTED ON MAP P-1179
- FOUND MONUMENT AS NOTED, SEE MAP B-1278
- P TELEPHONE PEDESTAL
- T TELEVISION PEDESTAL
- SV SEWER VALVE
- WV WATER VALVE
- GATE POST
- — G —— G — EDGE OF GRAVEL ROAD
- — UGE —— UGE — APPROXIMATE ELECTRIC
- — SS —— SS — APPROXIMATE SEWER BASED ON PAINT MARKS
- — SD —— SD — STORM DRAIN
- — X —— X — LIMITS OF TOPOGRAPHY BY THIS FIRM

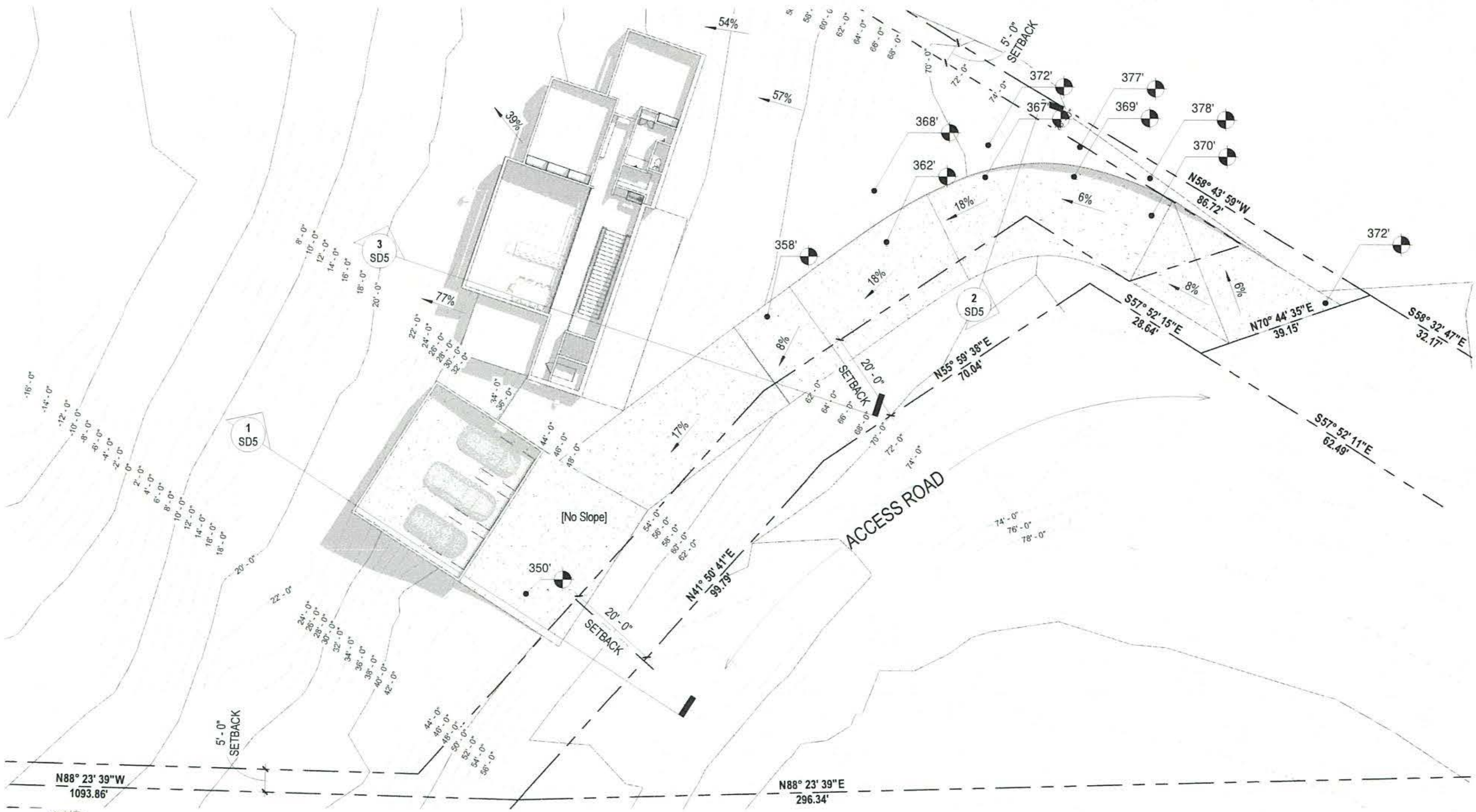
TOPO\MUGGE-TOPODWG
MUGGE-TOPO.TXT

REGISTERED
PROFESSIONAL
LAND SURVEYOR
Dallas Esplin
OREGON
DECEMBER 3, 2014
DALLAS W. ESPLIN
83627
RENEWS: DECEMBER 31, 2023

SURVEY BY:
BAYSIDE SURVEYING LLC ©
11765 HWY 101 SOUTH
TILLAMOOK, OR 97141
503-842-5551

TOPOGRAPHIC MAP FOR:
CLINTON MUGGE
PARCEL 1
PARTITION PLAT 2022-17
T5S, R11W, W.M.
SECTION 35
TILLAMOOK COUNTY, OREGON

DATE	EQUIPMENT	FIELD	DRAWN	CHECKED	JOB NUMBER
MAY 22, 2023	FC6000-ES103 TOPCON HIPER V	SDP, DGD	DCA	DWE	1512



studio.e architecture

DESIGN SCHEME - 350'

08/19/2024

MUGGE HOUSE

TAX LOT 214, SOUTH BEACH ROAD
NESKOWIN, TILLAMOOK COUNTY, OR

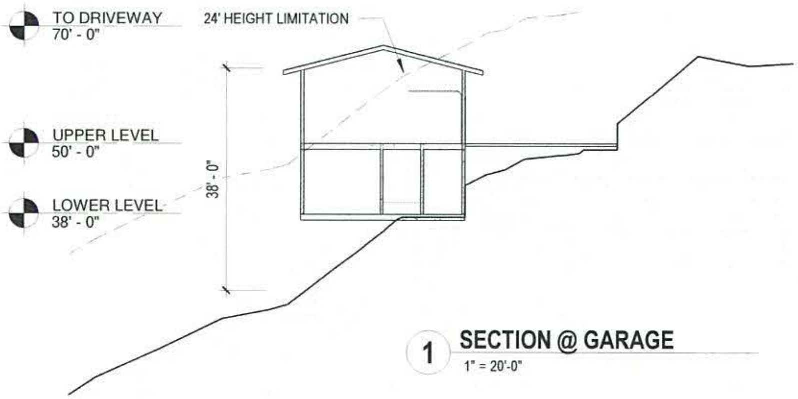
SITE PLAN 1" = 20'

0 1 5 10 20

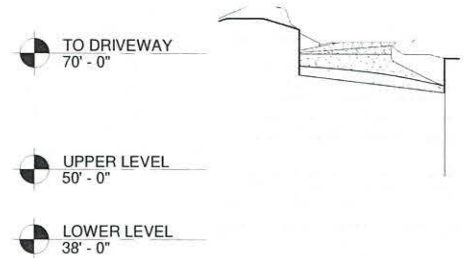
Print on 11 x 17 sheet at 100% scale

1" = 20'-0"

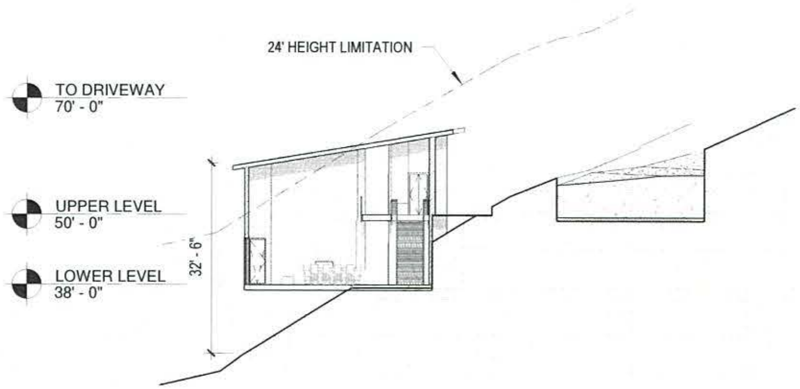
SD2



1 **SECTION @ GARAGE**
1" = 20'-0"



2 **SECTION THROUGH DRIVEWAY**
1" = 20'-0"



3 **SECTION @ HOUSE**
1" = 20'-0"

studio.e architecture

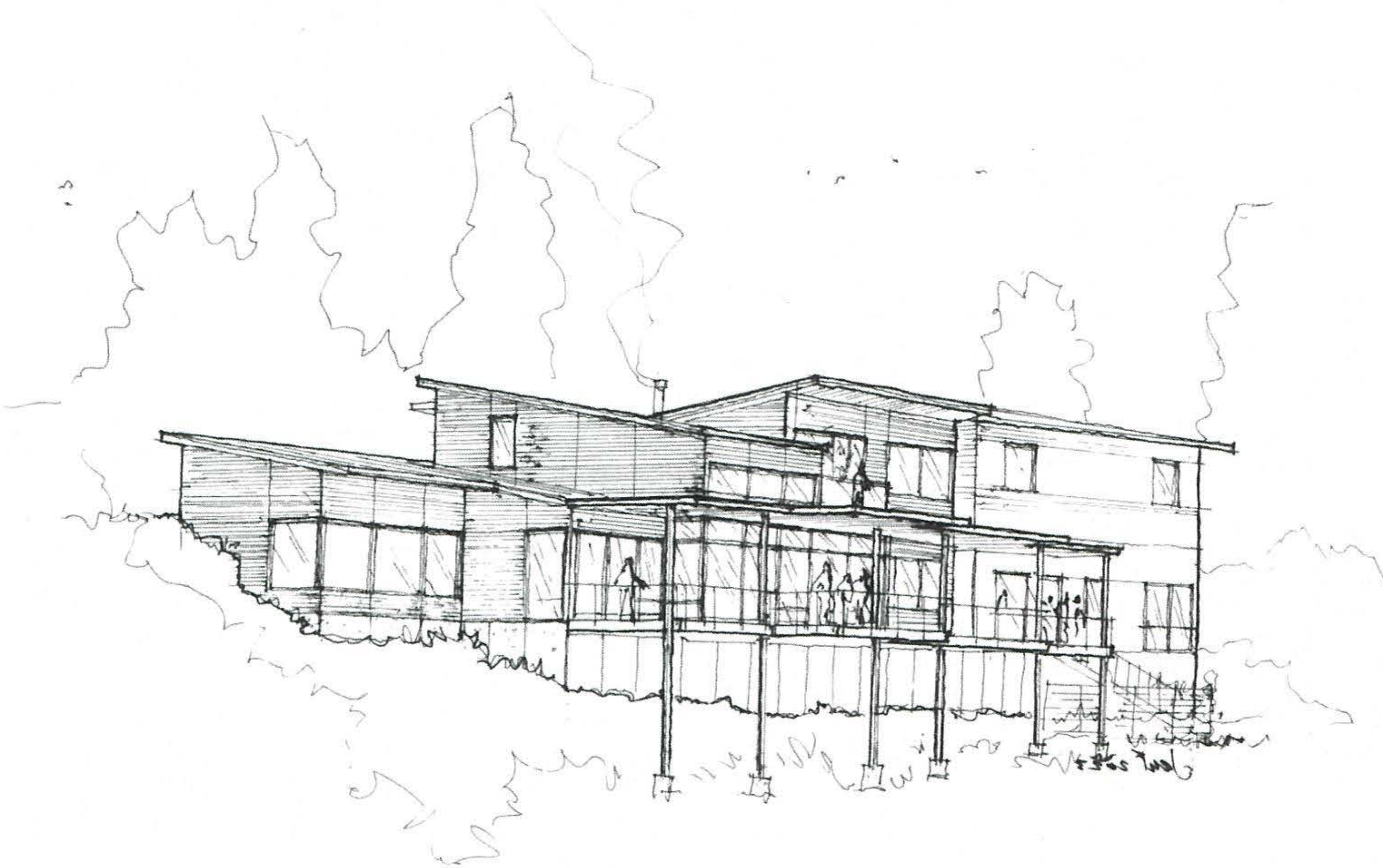
DESIGN SCHEME - 350'
08/19/2024

MUGGE HOUSE

TAX LOT 214, SOUTH BEACH ROAD
NESKOWIN, TILLAMOOK COUNTY, OR

SECTIONS 0 1 5 10 20 1" = 20'-0"
Print on 11 x 17 sheet at 100% scale

SD5



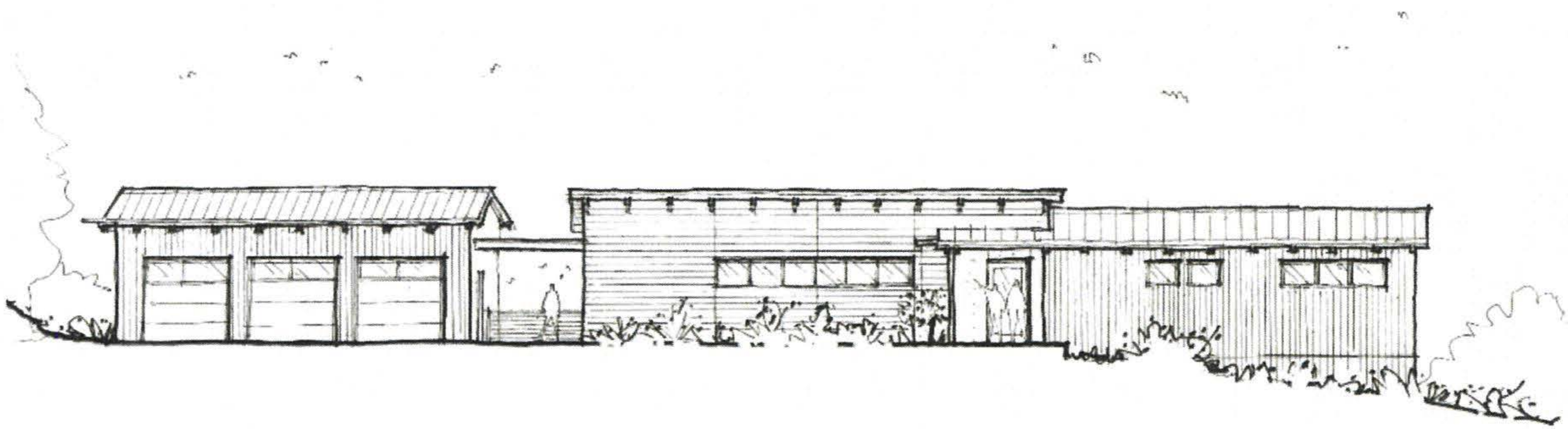
studio.e architecture

PRE-DESIGN
10/20/2023

MUGGE HOUSE

PERSPECTIVE

Print on 11 x 17 sheet at 100% scale



studio.e architecture

PRE-DESIGN
11/13/2023

MUGGE HOUSE

EAST ELEVATION

0 1 5 10
Print on 11 x 17 sheet at 100% scale

1" = 10'-0"

SD4

PRE-DESIGN
11/13/2023

MUGGE HOUSE

SOUTH ELEVATION

1" = 10'-0"
Print on 11 x 17 sheet at 100% scale

SD5