Tillamook County

Land of Cheese, Trees and Ocean Breeze

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

1510 - B Third Street
Tillamook, Oregon 97141
www.tillamook.or.us

Building (503) 842-3407
Planning (503) 842-3408
On-Site Sanitation (503) 842-3409
Fax (503) 842-1819
Toll Free 1 (800) 488-8280

VARIANCE REQUEST #851-21-000218-PLNG: BALLMAN/WOLVES ABOVE LLC

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 ADMINISTRATIVE REVIEW
Date of Notice: October 15, 2021

Notice is hereby given that the Tillamook County Department of Community Development is considering the following:

#851-21-000218-PLNG: A Variance request to expand the required 24-foot height requirement to 35-feet for the construction of a single-family dwelling on a property located in the Unincorporated Community of Neahkahnie. The subject property is accessed via Twana Trace Rd, a private road, zoned Neahkahnie Urban Residential (NK-15) and designated as Tax Lot 1700 of Section 20BB, Township 3 North, Range 10 West, W.M., Tillamook County, Oregon. The applicant is Peter Ballman. The property owner is Wolves Above LLC.

Written comments received by the Department of Community Development prior to 4:00 p.m. on October 29, 2021 will be considered in rendering a decision. Comments should address the criteria upon which the Department must base its decision. A decision will be rendered no sooner than the next business day, November 1, 2021. Notice of the application, a map of the subject area, and the applicable criteria are being mailed to all property owners within 250 feet of the exterior boundaries of the subject parcel for which an application has been made and other appropriate agencies at least 14 days prior to this Department rendering a decision on the request.

A copy of the application, along with a map of the request area and the applicable criteria for review are available for inspection at the Department of Community Development office located at 1510-B Third Street, Tillamook, Oregon 97141. They are also available on the Tillamook County Department of Community Development website: http://www.co.tillamook.or.us/gov/ComDev/planning/default.htm.

If you have any questions about this application, please contact the Department of Community Development at (503) 842-3408 ext. 3301 or mjenck@co.tillamook.or.us.

Sincerely,

Melissa Jenck, CFM, Land Use Planner II
Sarah Absher, CFM, Director

Enc. Maps and applicable ordinance criteria

REVIEW CRITERIA

ARTICLE VIII - VARIANCE PROCEDURES AND CRITERIA

SECTION 8.030: REVIEW 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 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.

SECTION 4.005: RESIDENTIAL AND COMMERCIAL ZONE STANDARDS

In all RESIDENTIAL AND COMMERCIAL ZONES, the purpose of land use standards is the following:

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

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

(3) To adequately separate structures for emergency access;

(4) To enhance privacy for occupants of residences;

(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;

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

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

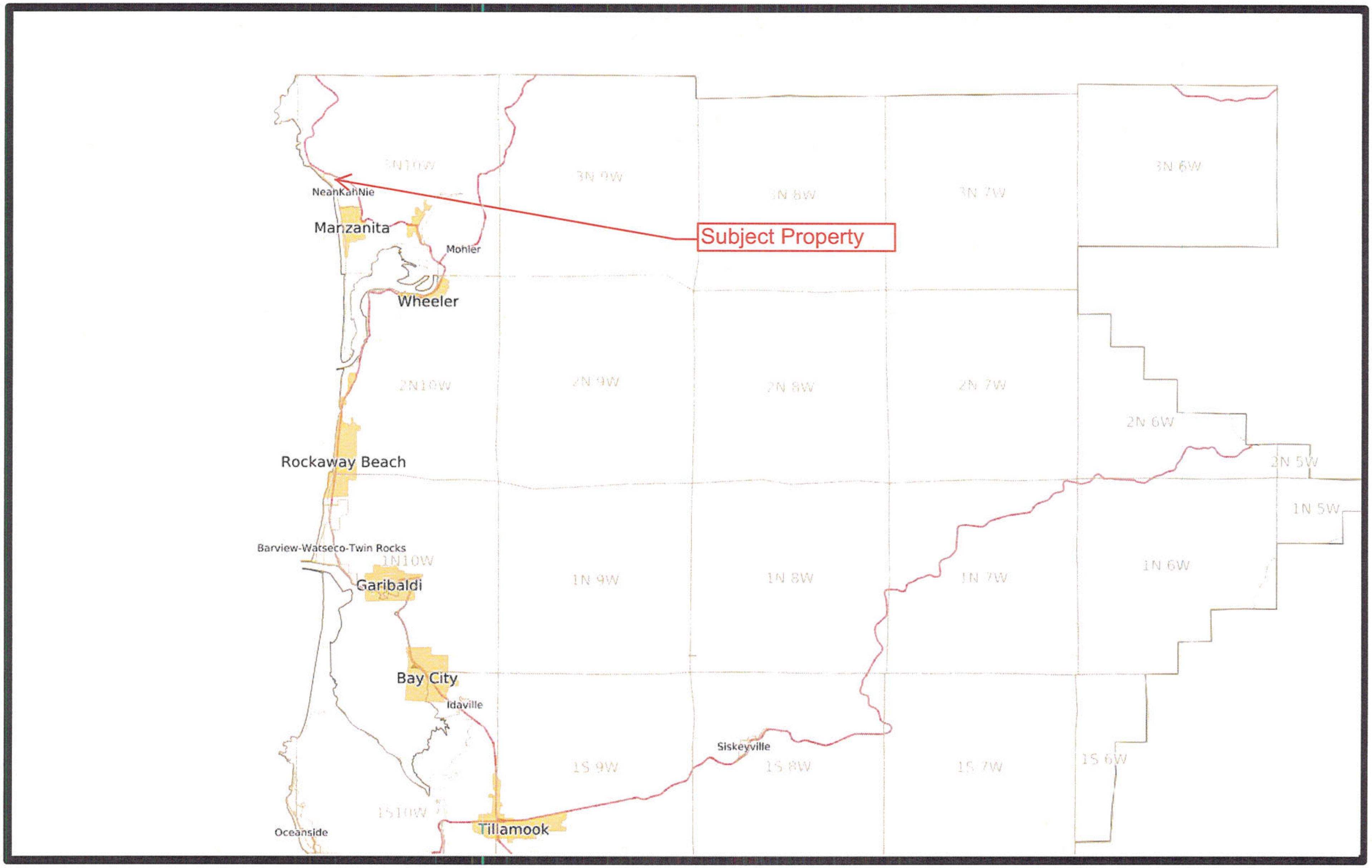
(8) To ensure that pleasing views are neither unreasonably obstructed nor obtained;

(9) To separate potentially incompatible land uses;

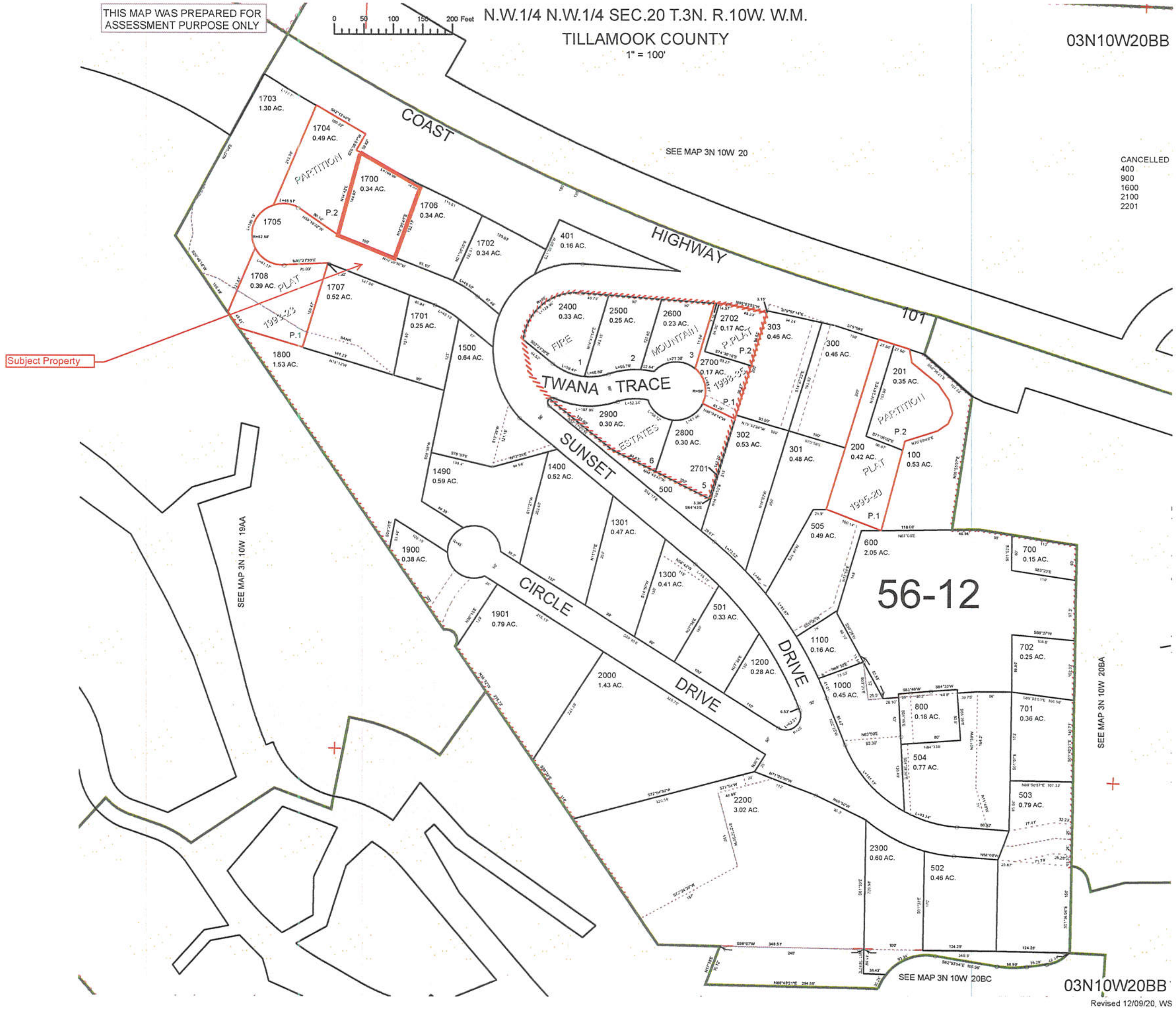
(10) To ensure access to solar radiation for the purpose of alternative energy production.

EXHIBIT A

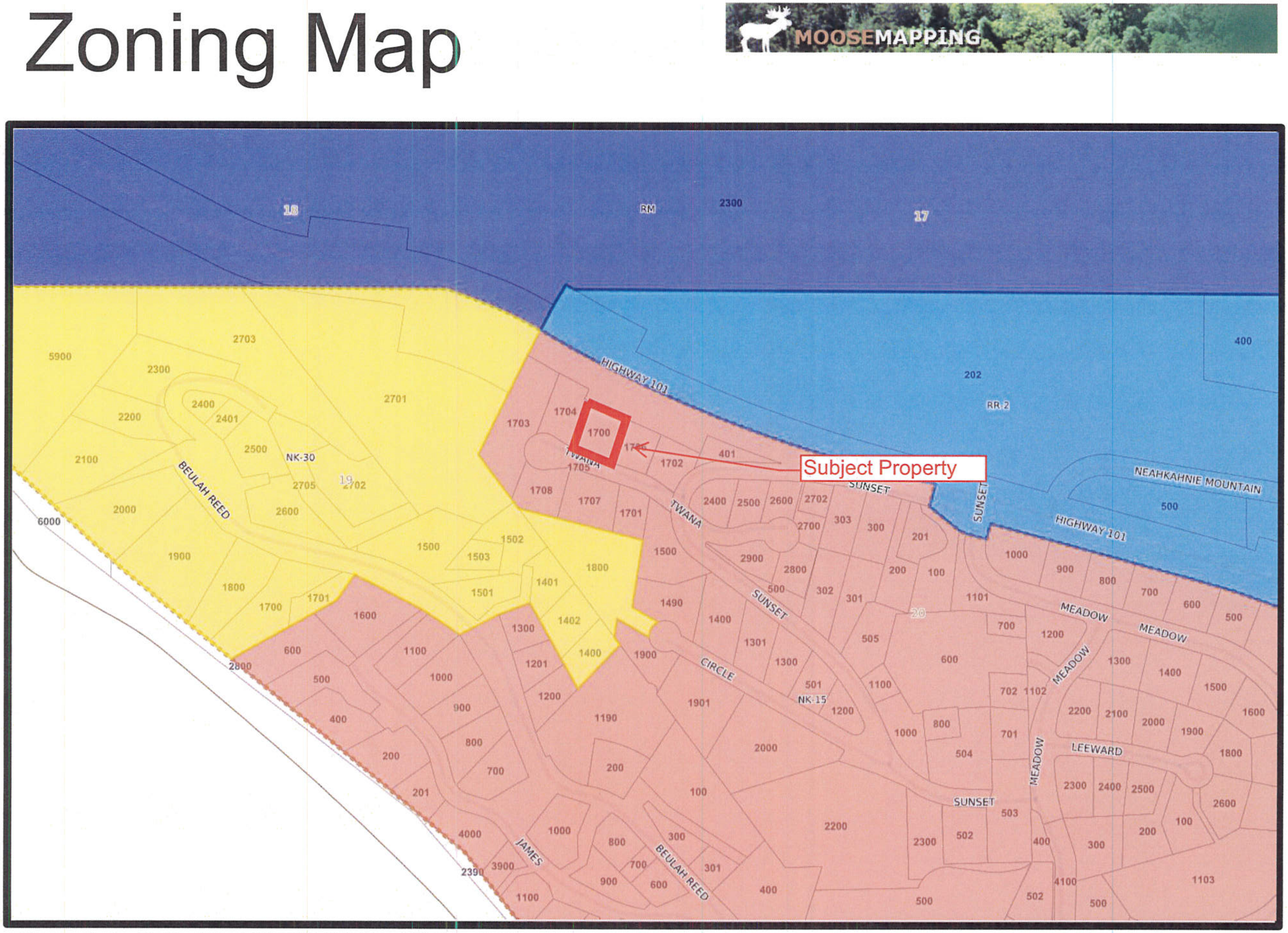
Vicinity Map



Generated with the GeoMOOSE Printing Utilities


THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSE ONLY
0 50 100 150 200 Feet
N.W.1/4 N.W.1/4 SEC.20 T.3N. R.10W. W.M.
TILLAMOOK COUNTY
1" = 100'
03N10W20BB
CANCELLED
400
900
1600
2100
2201
SEE MAP 3N 10W 20
COAST HIGHWAY 101
SUNSET DRIVE
CIRCLE DRIVE
TWANA TRACE
FIRE MOUNTAIN ESTATES
PARTITION PLAT 1993-23
PARTITION PLAT 1995-20
PARTITION PLAT 1998-35
Subject Property
1703 1.30 AC.
1704 0.49 AC.
1700 0.34 AC.
1705
1706 0.34 AC.
1702 0.34 AC.
401 0.16 AC.
1708 0.39 AC.
1707 0.52 AC.
1701 0.25 AC.
1800 1.53 AC.
1500 0.64 AC.
1490 0.59 AC.
1400 0.52 AC.
2400 0.33 AC.
2500 0.25 AC.
2600 0.23 AC.
2702 0.17 AC.
2700 0.17 AC.
2900 0.30 AC.
2800 0.30 AC.
2701
500
303 0.46 AC.
300 0.46 AC.
201 0.35 AC.
302 0.53 AC.
301 0.48 AC.
200 0.42 AC.
100 0.53 AC.
505 0.49 AC.
600 2.05 AC.
700 0.15 AC.
56-12
1900 0.38 AC.
1901 0.79 AC.
1301 0.47 AC.
1300 0.41 AC.
501 0.33 AC.
1100 0.16 AC.
1200 0.28 AC.
1000 0.45 AC.
800 0.18 AC.
702 0.25 AC.
701 0.36 AC.
2000 1.43 AC.
504 0.77 AC.
503 0.79 AC.
2200 3.02 AC.
2300 0.60 AC.
502 0.46 AC.
SEE MAP 3N 10W 19AA
SEE MAP 3N 10W 20BA
SEE MAP 3N 10W 20BC
03N10W20BB
Revised 12/09/20, WS

Zoning Map



Generated with the GeoMOOSE Printing Utilities

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 JUN 1 1 2021 BY: email
☐Approved ☐Denied
Received by: SS
Receipt #:
Fees: 1089.00
Permit No: 851-21-00218-PLNG

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

Name: PETER BALLMAN Phone: 917-676-2497
Address: 209 WHITE PARK ROAD
City: ITHACA State: NY Zip: 14850
Email: BALLMAN@BALLKHAP.COM

Property Owner

Name: WOLVES ABOVE LLC Phone: 503-572-8907
Address: 15225 NORTHEAST NORTH VALLEY ROAD
City: NEWBERG State: OR Zip: 97132
Email: JIM@PATRICIAGREENCELLARS.COM

Request: Requesting variance for height. Reference materials are attached that speak to the various criteria for requesting a variance. In summary, the design seeks to minimize the site footprint (ref. EEI Geohazard report) while providing the appropriate square footage for the single-family residence, while Providing other energy-related opportunities and while meeting all criteria for Article 4 Section 4.005.

Type II
- ☐ Farm/Forest Review
- ☐ Conditional Use Review
- ☒ Variance
- ☐ Exception to Resource or Riparian Setback
- ☐ Nonconforming Review (Major or Minor)
- ☐ Development Permit Review for Estuary Development
- ☐ Non-farm dwelling in Farm Zone
- ☐ Foredune Grading Permit Review
- ☐ Neskowin Coastal Hazards Area

Type III
- ☐ Extension of Time
- ☐ Detailed Hazard Report
- ☐ Conditional Use (As deemed by Director)
- ☐ Ordinance Amendment
- ☐ Map Amendment
- ☐ Goal Exception

Type IV
- ☐ Ordinance Amendment
- ☐ Large-Scale Zoning Map Amendment
- ☐ Plan and/or Code Text Amendment

Location:

Site Address: 7780 TWANA TRACE

Map Number:	3N	10	20BB	1700
	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.

Property Owner Signature (Required) Date 6/9/21

Applicant Signature Date 6/9/21

7780 TWANA TRACE

Neahkahnie Urban Residential Zone (NK-15)

CONTENTS:

7780 TWANA TRACE

Neahkahnie Urban Residential Zone (NK-15)

DESIGN NARRATIVE AND VARIANCE CRITERIA

With this narrative and the supporting documentation, we request a variance for building height. The current design has an average building height of 35', taken from the midpoint of each elevation to the overall highest point of the building (these dimensions are called out on the elevations in the attached Progress Set dated 5/1/21). The main ideas behind the design of the house, driving its volume, siting and ultimately the height, are as follows:

1. To minimize the footprint on the site, and to maximize the potential for plantings on the slope, creating a living garden and allowing the site to serve as a continuation of the surrounding forest. This should enhance the beauty of the overall neighborhood.
2. To reduce excavation on the site in order to maintain the integrity of the site and strength of the soil. This is in accordance with our discussions with the geotechnical engineer (EEI) and their report.
3. To provide an efficient amount of living space for one couple to live permanently. 1500 square feet proved to be the ideal amount of living space, with an additional 600 square feet of moderately finished entry, utility and guest spaces below the main living space.
4. To be able to access the garden directly from the main living space of the house. This causes the first floor (living room, kitchen) to be align with ground level on the high side of the slope.
5. To minimize the amount of excavation for outdoor space including the driveway, so that the basement and secondary entry from the carport are approximately in accordance with the natural slope of the site.
6. To provide at all times and from all spaces within the house a view up Neahkahnie Mountain and out to the Pacific Ocean. This is the reason for the openness of the North side of the house, in particular the raised north side of the roof that allows connection through views from the second floor of the house.
7. In raising the roof, to create a volume that is visually harmonious with the mountain, lying against it rather than protruding from it, as a more conventional pitched roof might do.
8. To use the shape of the roof to act as a water collection system, to redirect water volume from the house into collection basins on the east and west sides. The intention is to control the runoff and to create a water feature that is both aesthetic and functional, in that it collects, filters and slows absorption by the earth around the house.
9. For the raised roof, which is south facing, to provide space for photovoltaic panels to be installed in the future, if the owners so desire and if these are agreeable to neighbors. In this case the orientation and elevated height are beneficial to potential solar collection and alternative energy production.
10. To provide as much surrounding space as possible with adjacent lots, maximizing setbacks including that to the road, which should not be crowded by a garage or parking spaces.

The following are responses to each of the Variance Criteria (Section 8.030) based on the design goals:

(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.*

If all applicable standards (i.e., the maximum height of 24') were to be met, there would be no reduction to the enjoyment of property rights by other landowners. However, we feel that by granting the variance and allowing the house as designed, no rights would be infringed upon. The design of the house increases privacy for the owner and for neighbors, allows additional light and air circulation, provides a unique opportunity for a scenic reforestation, and preserves/enhances the stability of the land. We see these factors as an overall benefit without risk or infringement upon neighboring properties.

(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.*

Several of the above design goals, namely the footprint and volume of the house, the desire to maintain the original, natural slope and the intention to fit the house on the site to maximize the connection to the surrounding garden, could not be realized within the allotted 24' maximum height. Building within the existing envelope would cause the footprint to expand, reducing space for the intended garden and increasing the need for excavation/disruption of the slope.

Specifically, the function of the garden is both aesthetic and functional. While we intend for the site to serve as a beautiful garden for all to appreciate, we also want to provide a continuous root/planting network from top of site (at Hwy 101) down to the public road (Twana). This ensures maximum soil stability as the plantings mature and should be as extensive as possible. Without a variance, our footprint will expand and will minimize the allowable ground area for this to occur.

(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.*

It is our intention not only to meet the standards enumerated in Section 4.005, but to exceed those standards. We feel that a smaller footprint provides more open space, natural light, and view up the mountain to neighbors. The slightly elevated living space (first and second floors) also increase privacy for the owners as well as for neighbors, as the current design seeks to provide openings where surrounding buildings are not and to use the building volume to block views into and out of the house.

In speaking directly to standard #8, given the lot's placement within the residential district, no views from adjacent lots will be inhibited in any way. The lot in question is part of the highest row in the neighborhood and backs up to Highway 101 and Neahkahnie Mountain. There are no lots or houses to block. Additionally, the turnout/viewpoint above the lot on Hwy 101 is high enough that the building height will in no way impede views for drivers.

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

It is our belief that without a variance, the majority of design goals for the house will not be met. Without a variance, we will redesign the house to accommodate a lower, wider building volume which we feel might crowd neighboring lots and diminish the experience and functionality of the garden as intended.

In conclusion, we believe (and hope) that the intentions stating in the goals above, and the subsequent design of the house – namely, the intention to create a garden, to not diminish the stability of the existing slope, to collect and utilize water, and to provide a minimum of living space – justify the additional height of the building. We consider these to be in keeping with the spirit of the site, the neighborhood, and with Neahkahnie Mountain.

We are available to answer questions, provide further clarification and participate in public discussions as required.

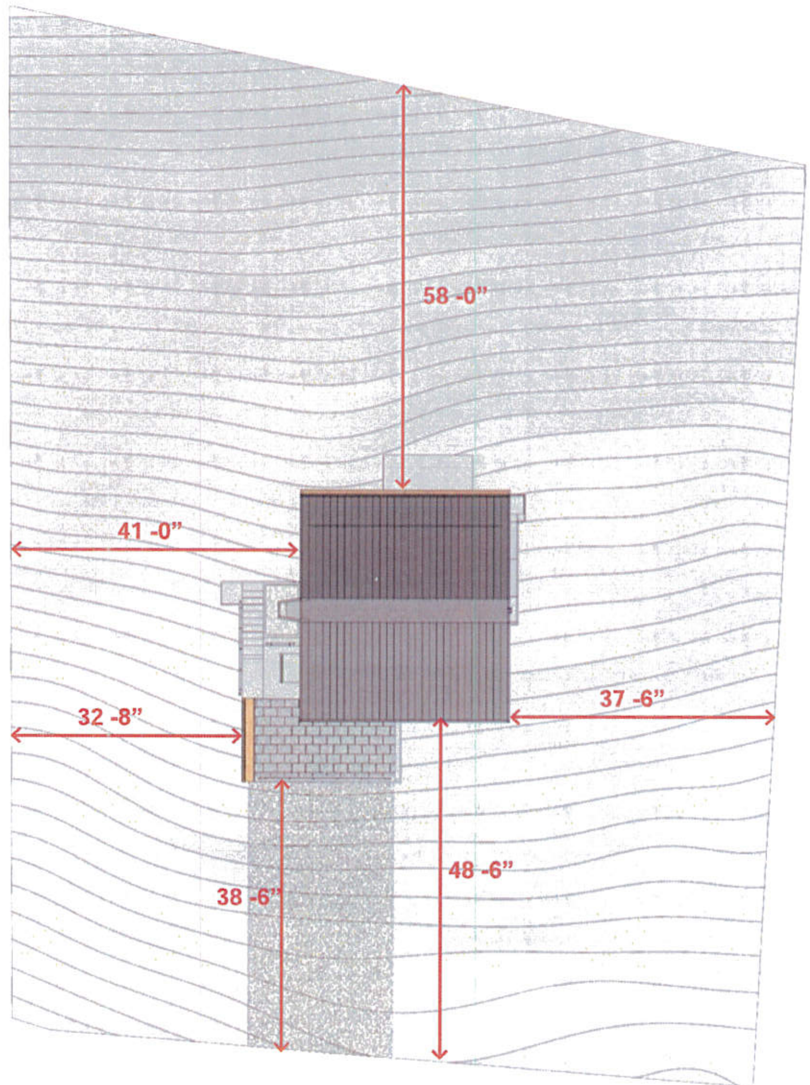
Peter Ballman
Principal, Ballman Khapalova
On behalf of Wolves Above LLC

NEAHKAHNIE HOUSE

May 16, 2021

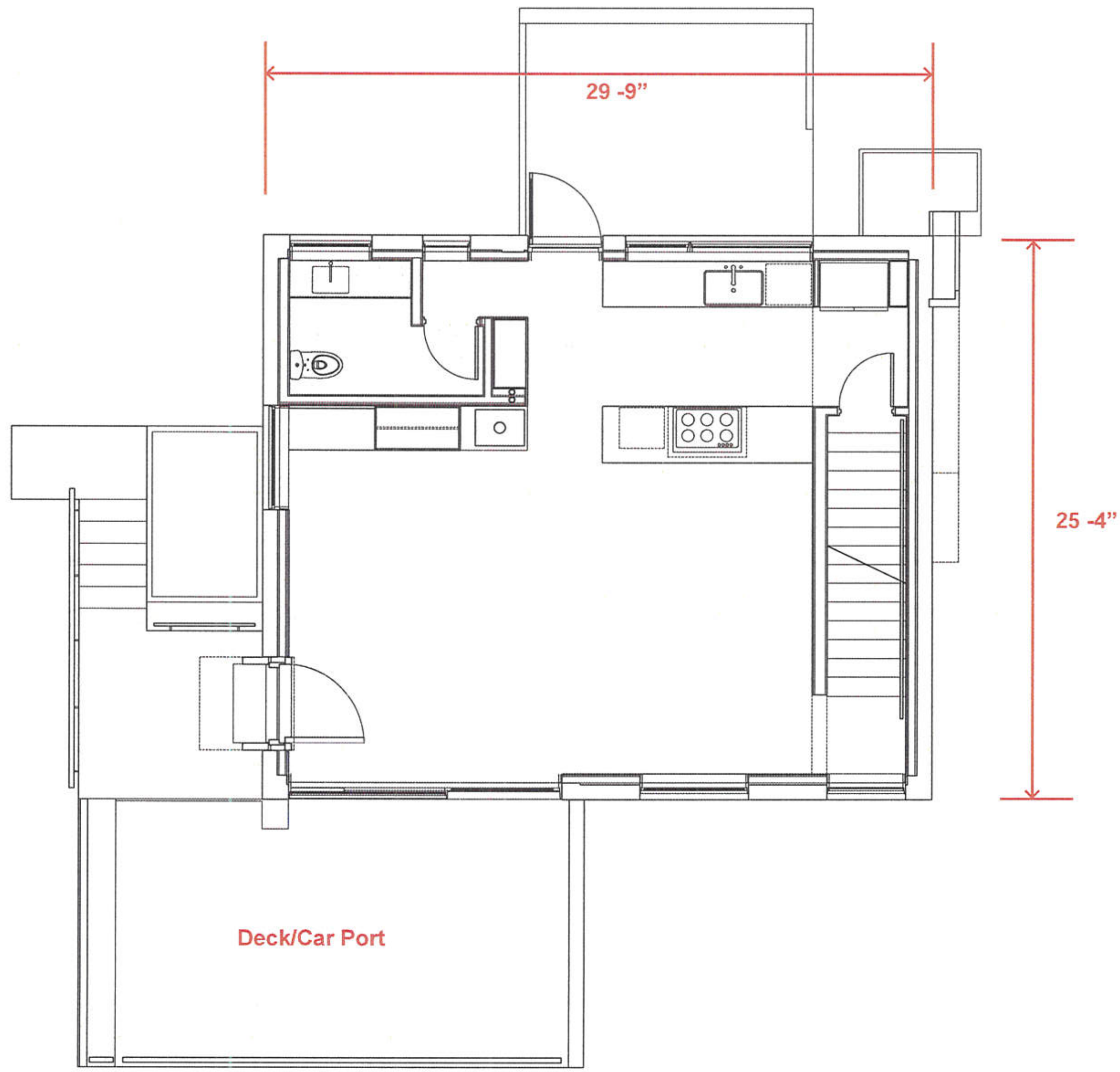
Building Height Variance

Aerial view of Neahkahnie House within neighborhood

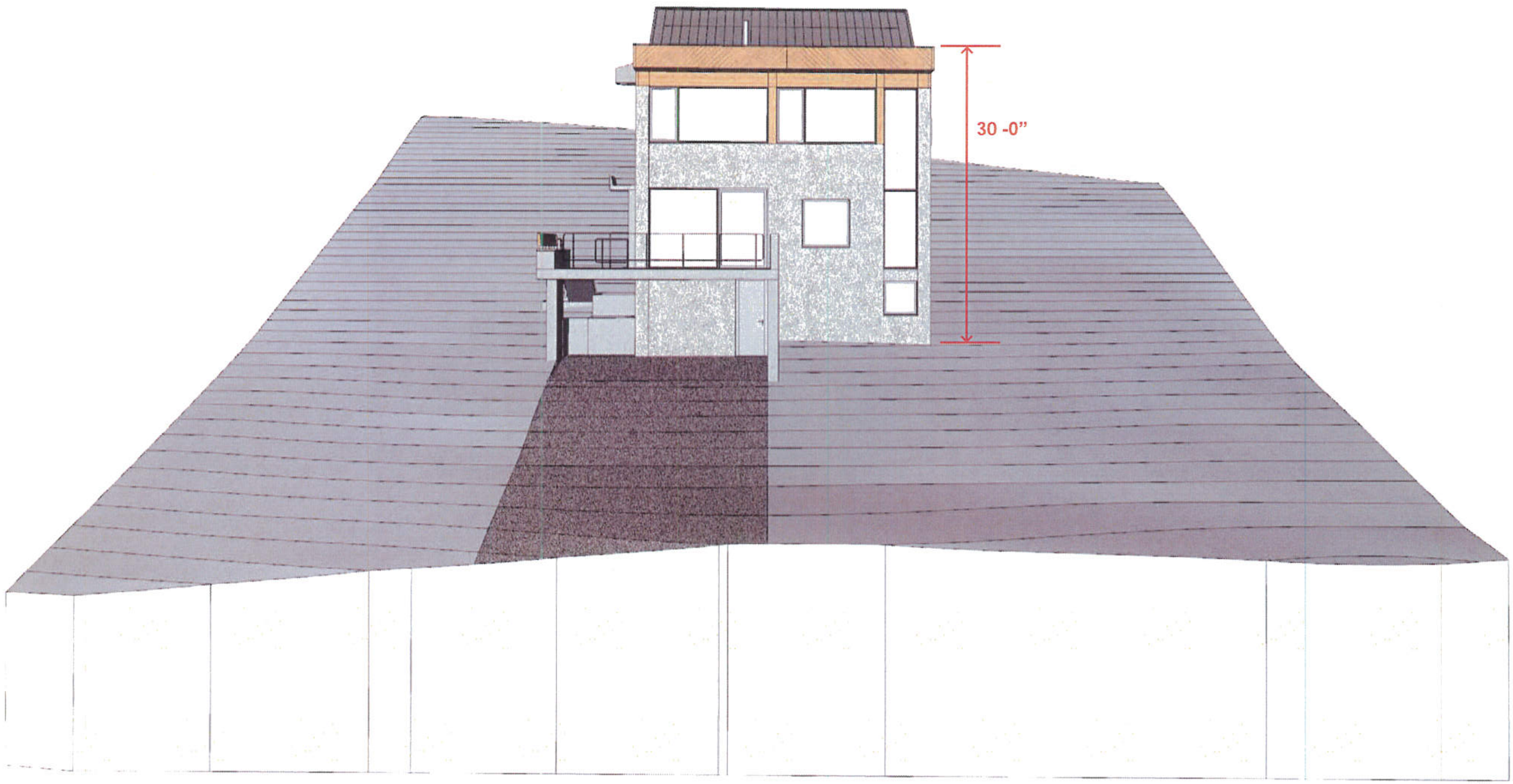


Site plan with setback dimensions

BALLMAN KHAPALOVA

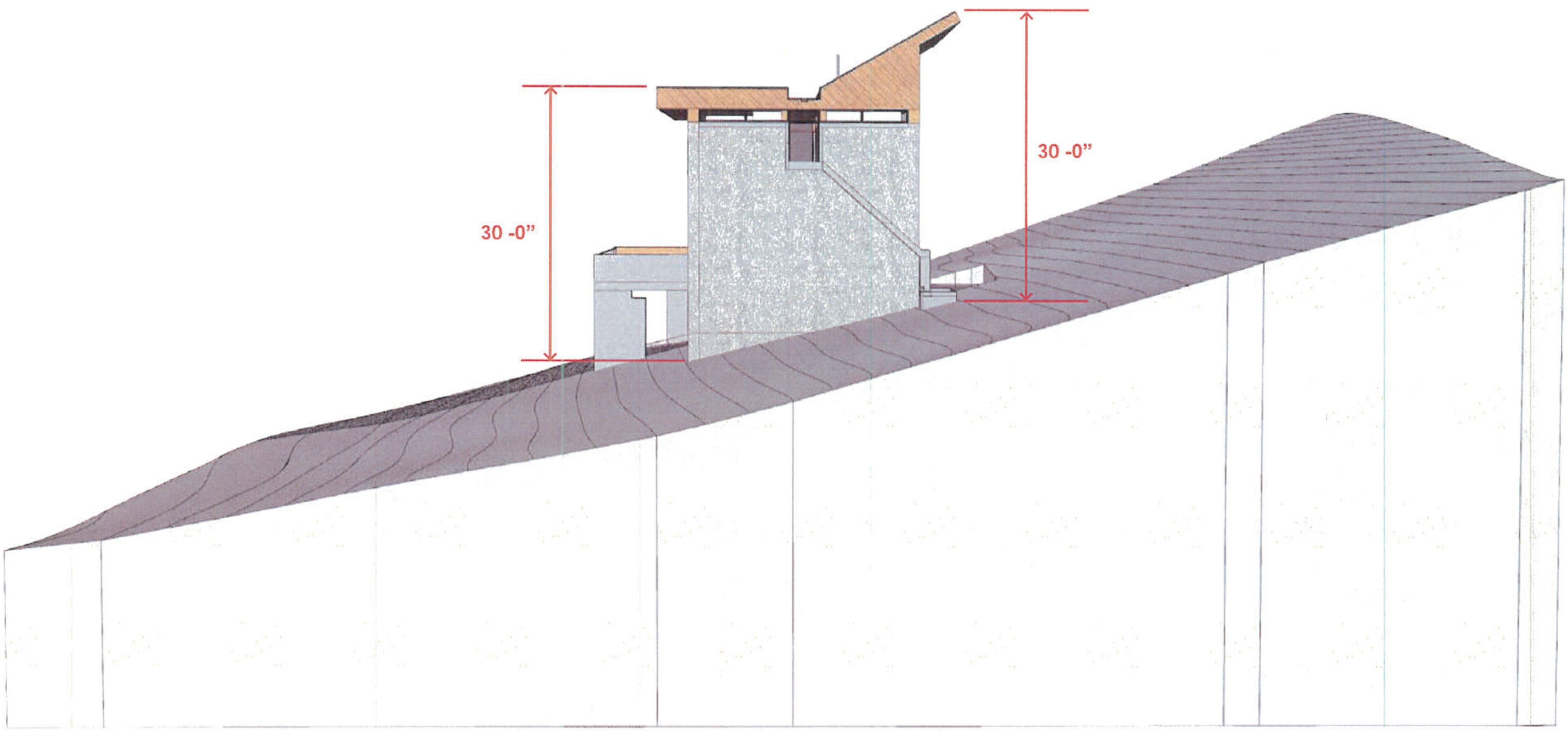


Site plan with setback dimensions



South (street facing) elevation

BALLMAN KHAPALOVA

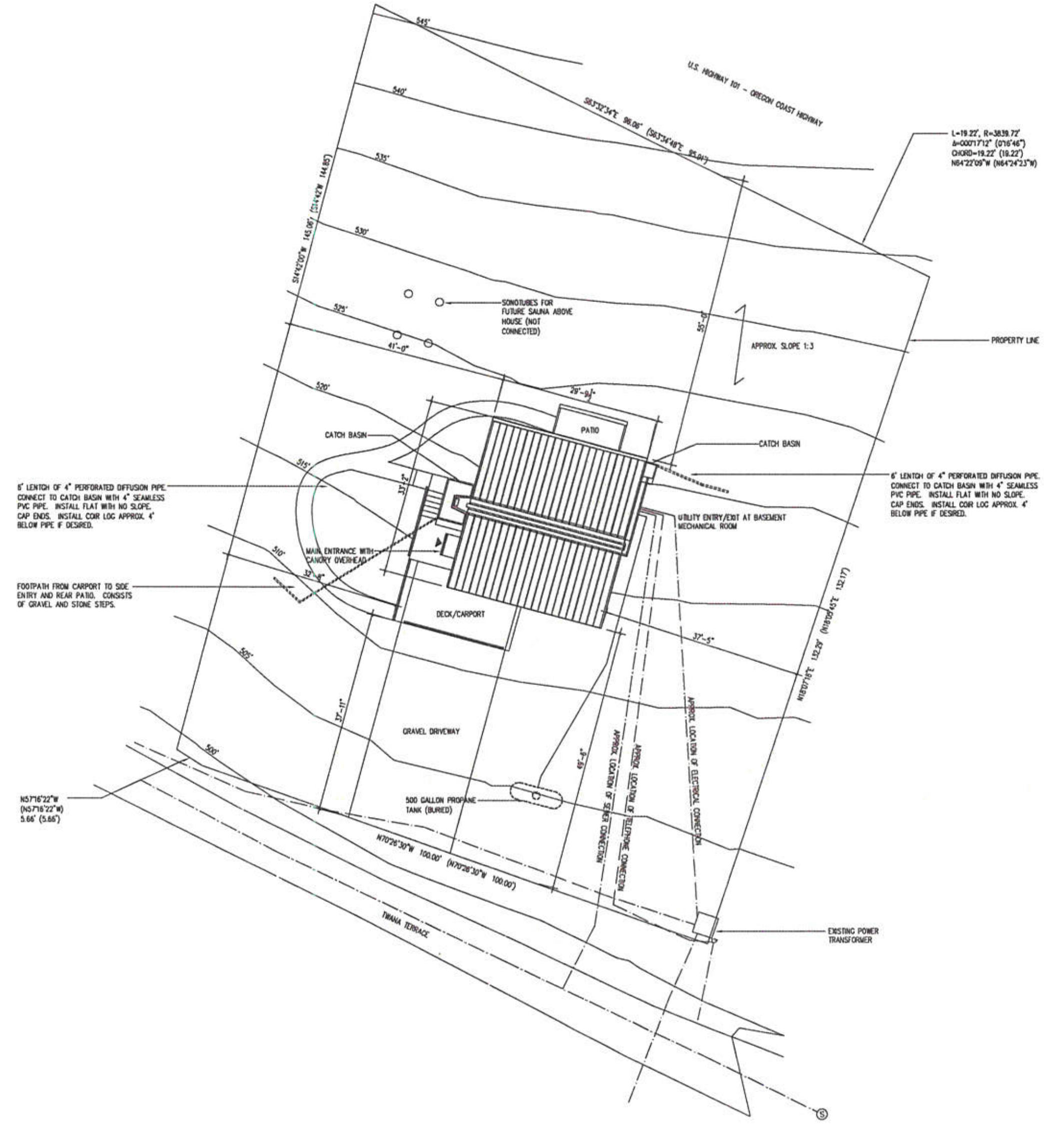


East (neighbor facing) elevation

BALLMAN KHAPALOVA

Height Variance Bullet Points

- Design concept
  - ... design of the house is based on forming a relationship to the Pacific Ocean and Neahkahnie Mountain. We feel that this honors both the site and the community.
  - we wanted to make the house as efficient as possible, and take up as little of the site as possible in order to reforest the site as much as possible
- Smaller footprint gives more space to neighbors houses are farther apart
- Smaller footprint reduces amount of raw material, resources and construction
  - reduces excavation
  - reduces roof area materials
  - reduces sie of foundation
- Water management
  - smaller roof area reduces site run-off by increasing garden area
  - we will also have water collection pools for roof run-off
- Soil and stability
  - ancient landslide site
  - smaller footprint reduces amount of soil that has to be disturbed
  - small and heavy better than large for foundations relative to seismic and soil conditions
  - small footprint increases area for tree planting that helps to stabilie soil against landslides
- iew
  - No houses above us, not blocking anyone's view (including cars on 101)
- arden
  - small footprint means more area for garden and tree planting, adding to the beauty of the neighborhood
- Energy
  - small footprint and stacked floors creates greater efficiency with heating and cooling
  - potential for solar panels



NOTE: ALL DRAINAGE AND SITE WORK SCOPE TO BE DETERMINED THROUGH STRUCTURAL, GEOTECHNICAL DESIGN AND AS REQUIRED BY COUNTY

LANDSCAPE NOTE: ALL OPEN SITE AREA TO BE PLANTED BY OWNER WITH NATIVE VEGETATION AND TREES

1 SITE PLAN A100 3/32" = 1'-0"

ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH ALL CODES AND REGULATIONS HAVING JURISDICTION OVER THIS SITE LOCATION.

ALL DIMENSIONS AND INFORMATION SHALL BE CHECKED AND VERIFIED ON THE JOB AND ANY DISCREPANCIES MUST BE REPORTED TO THE ARCHITECT. THESE DRAWINGS MUST NOT BE SCALED.

T	TELEPHONE RISER
S	SANITARY MANHOLE
— T —	TELEPHONE
— SS —	SANITARY SEWER
— W —	WATER
— E —	POWER

Structural Engineer:
STRICKER ENGINEERING
14500 OLD CONDOR BRIDGE ROAD
CLOVERDALE, OR 97112
503 332 2442
WWW.STRICKERENGINEERING.COM

Architect:
BALLMAN KHAPALOVA
209 WHITE PARK RD,
ITHACA NY 14850
917 678 2497
WWW.BALLKHAP.COM

Project:
NEAHKAHNIE HOUSE
7780 TWANA TERRACE
NEHALEM, OR 97131

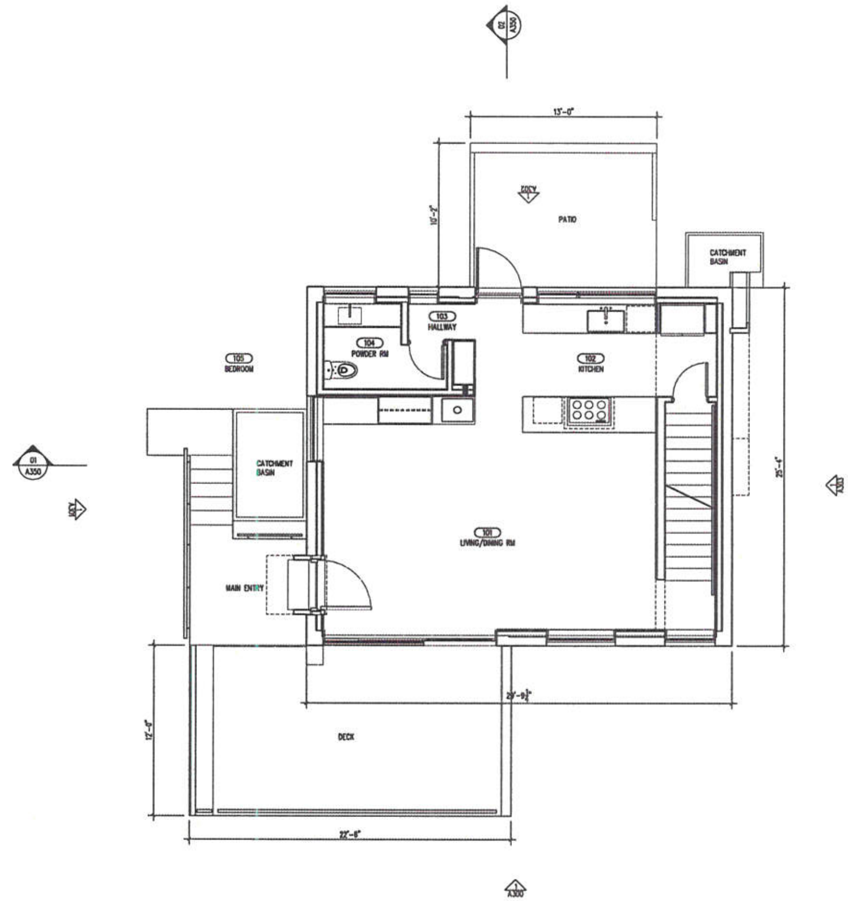
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

Scale:
3/32" = 1'-0"

SITE PLAN

A100



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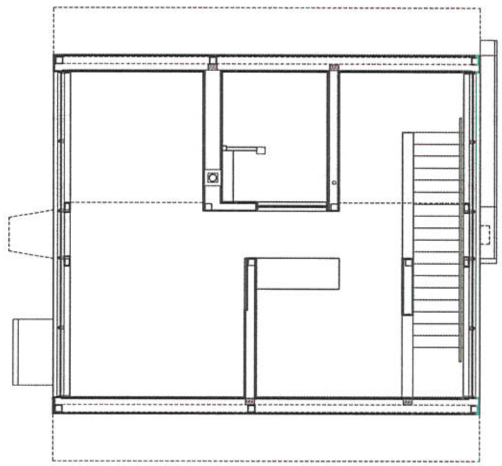
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

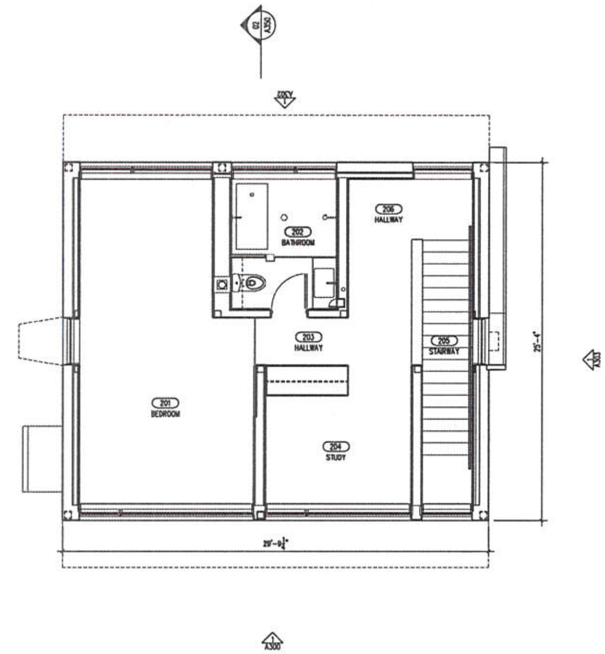
Scale:
1/4" = 1' - 0"

GROUND FLOOR PLAN

A200



2 A201 SECOND FLOOR PLAN AT CLARESTORY
1/4" = 1'-0"



1 A201 SECOND FLOOR PLAN
1/4" = 1'-0"

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7780 TWANA TERRACE
NEHALEM, OR 97131

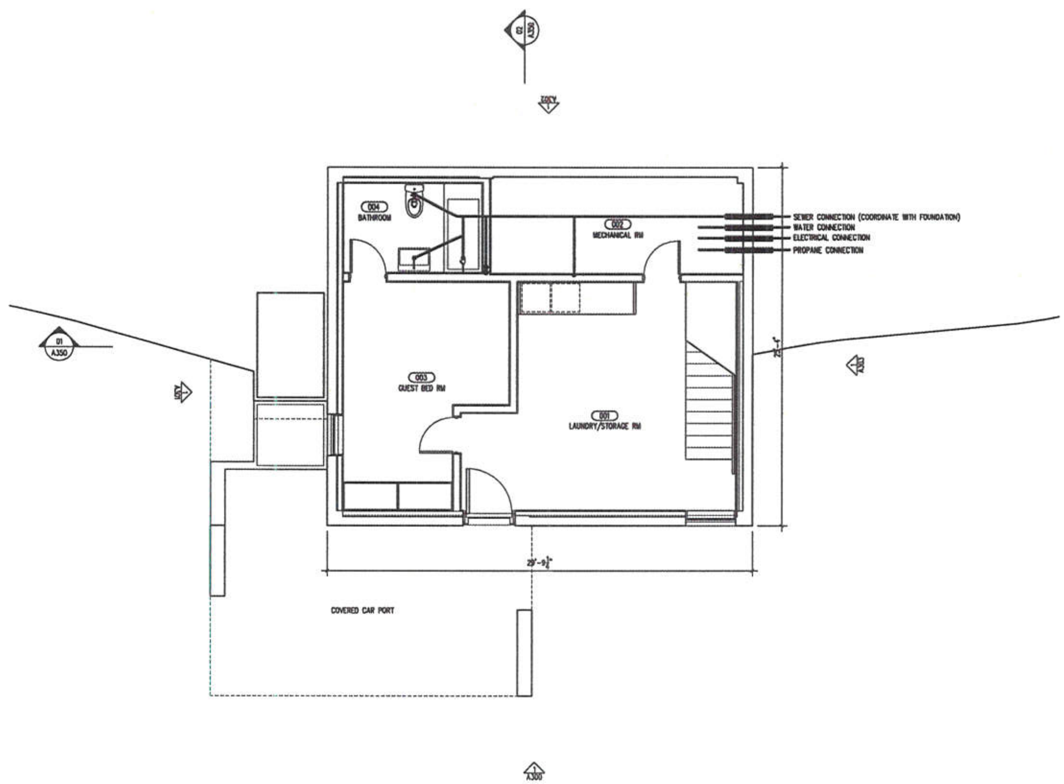
Drawing Status:
PERMIT SET - NOT FOR CONSTRUCTION
Date:
8 JUNE 2021
Drawing History:

SEAL

Scale:
1/4" = 1'-0"

SECOND FLOOR PLANS

A201



1 A202 BASEMENT FLOOR PLAN
1/4" = 1'-0"

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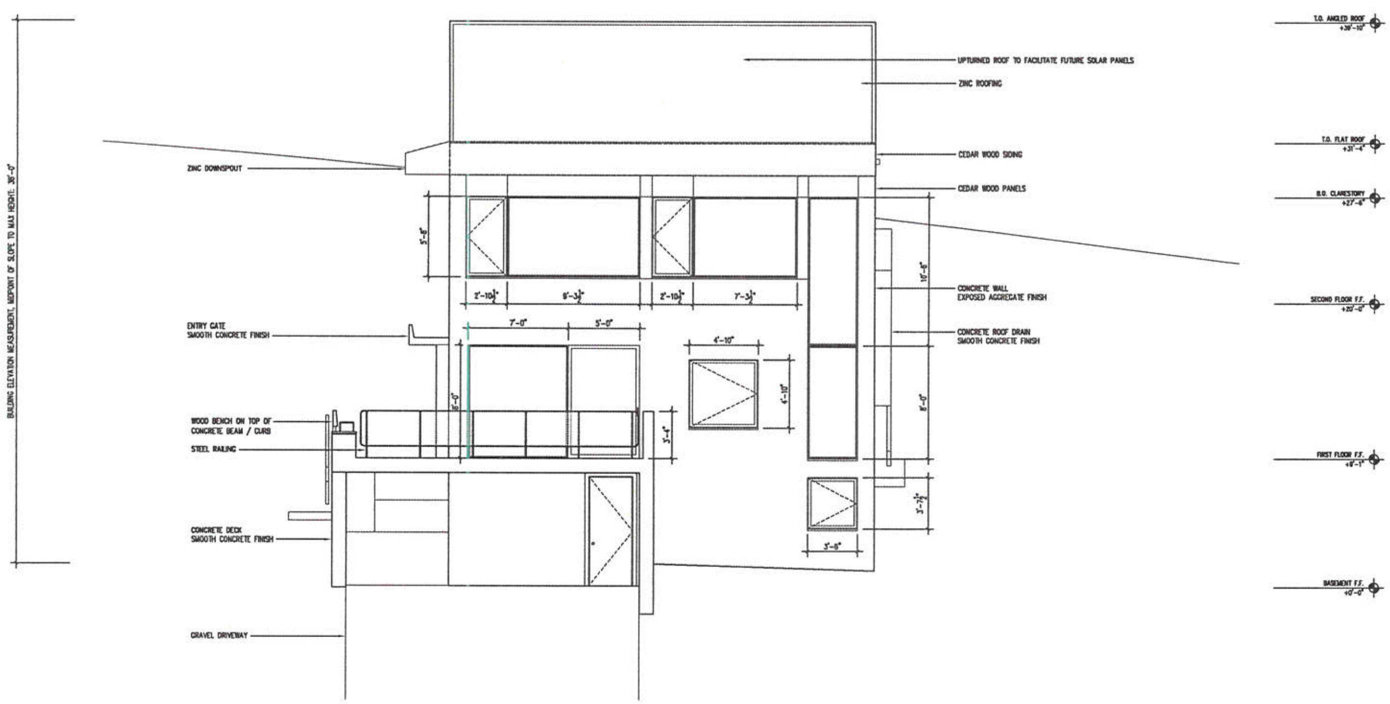
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

Scale:
1/4" = 1' - 0"

BASEMENT FLOOR PLAN

A202



1 A300 SOUTH EXTERIOR ELEVATION
1/4" = 1'-0"

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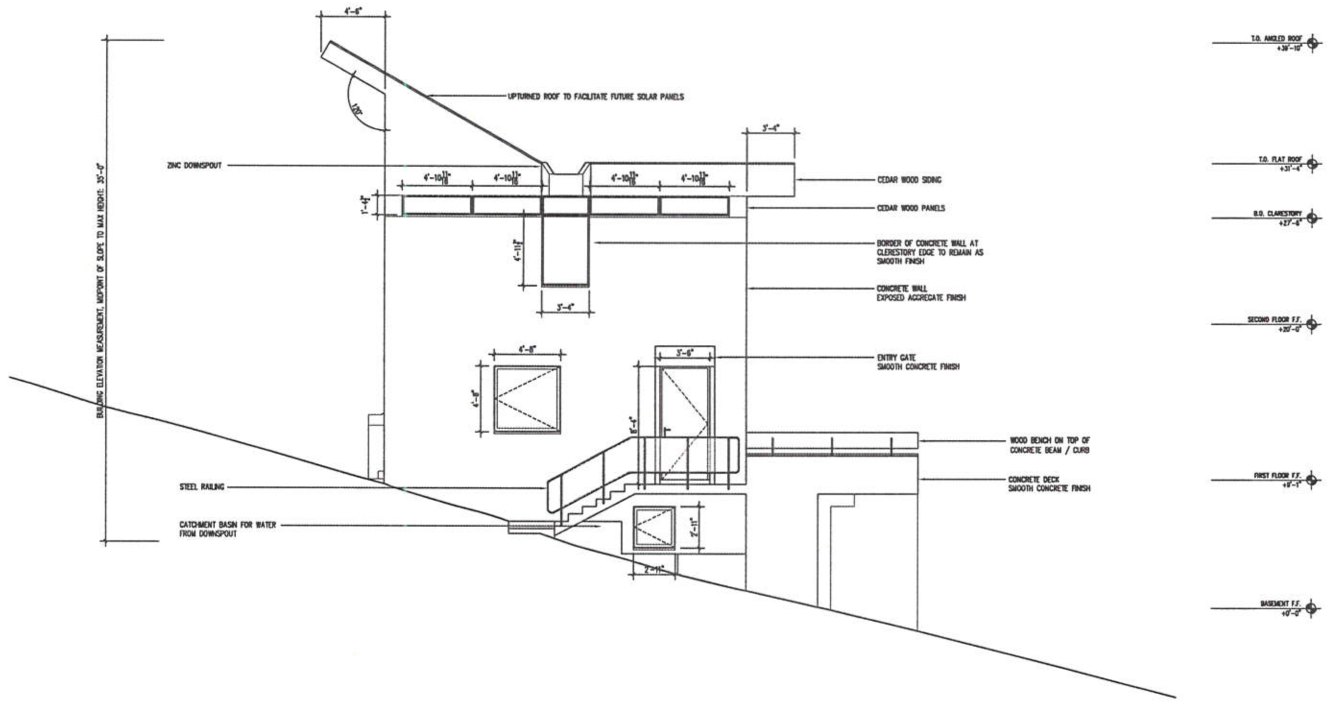
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

Scale:
1/4" = 1'-0"

SOUTH EXTERIOR ELEVATION

A300



1 A301 WEST EXTERIOR ELEVATION 1/4" = 1'-0"

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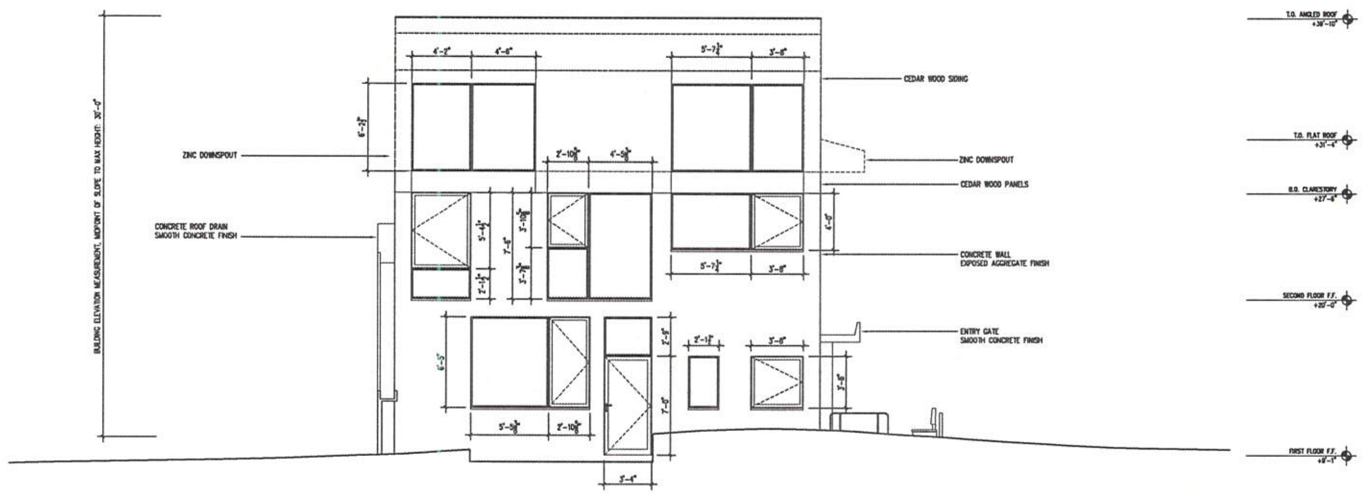
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

Scale:
1/4" = 1' - 0"

WEST EXTERIOR ELEVATION

A301



1 / A302 NORTH EXTERIOR ELEVATION
1/4" = 1'-0"

Structural Engineer:
STRICKER ENGINEERING
14500 OLD CONDOR BRIDGE ROAD
CLOVERDALE, OR 97112
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Architect:
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ITHACA NY 14850
917 878 2497
WWW.BALLKHAP.COM

Project:
NEAHKAHNIE HOUSE
7780 TWANA TERRACE
NEHALEM, OR 97131

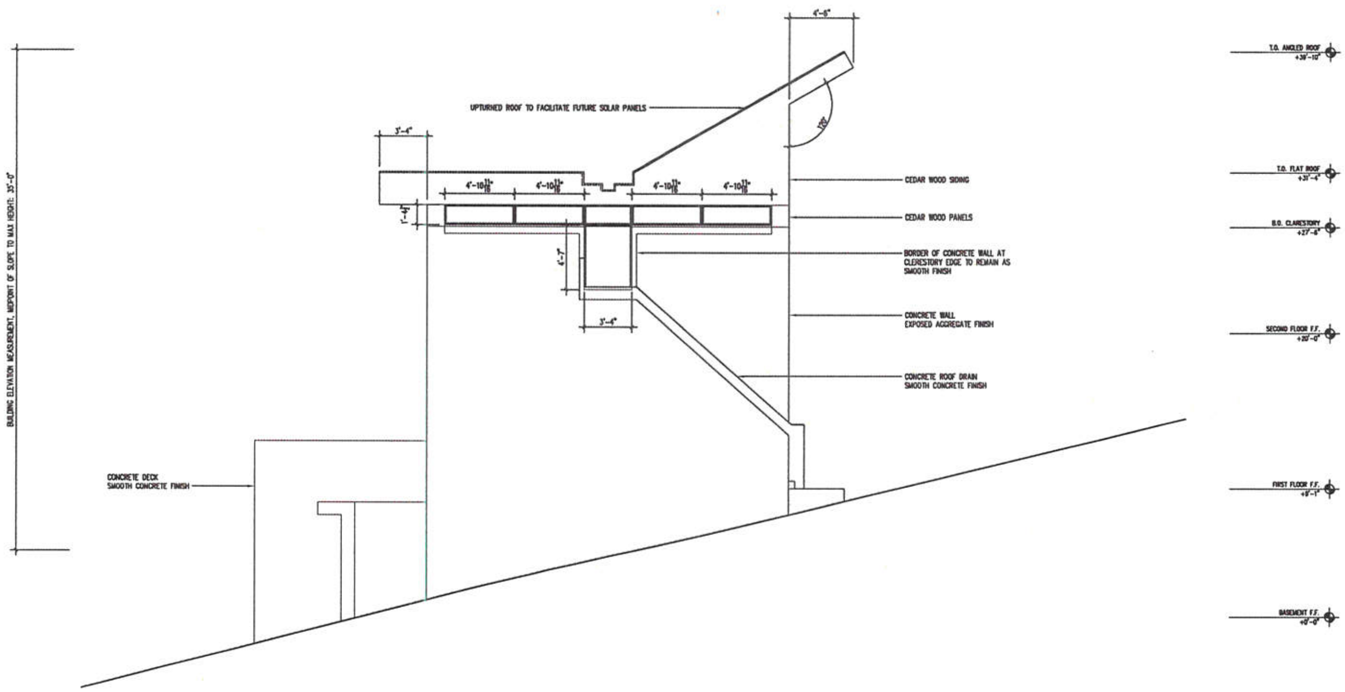
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

Scale:
1/4" = 1' - 0"

NORTH EXTERIOR ELEVATION

A302



1 A303 EAST EXTERIOR ELEVATION 1/4" = 1'-0"

ALL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH ALL CODES AND REGULATIONS HAVING JURISDICTION OVER THIS SITE LOCATION.

ALL DIMENSIONS AND INFORMATION SHALL BE CHECKED AND VERIFIED ON THE JOB AND ANY DISCREPANCIES MUST BE REPORTED TO THE ARCHITECT. THESE DRAWINGS MUST NOT BE SCALED.

Structural Engineer:
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Project:
NEAHKAHNIE HOUSE
7780 TWANA TERRACE
NEHALEM, OR 97131

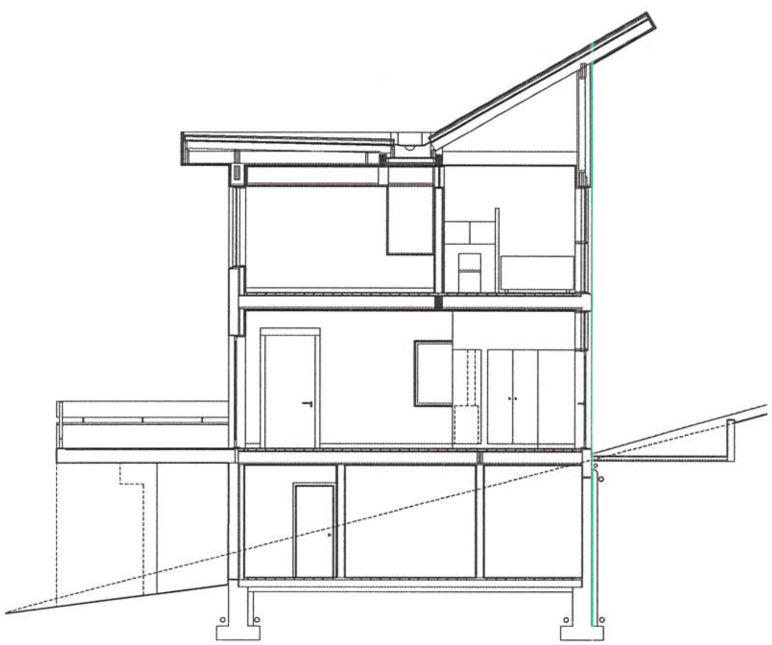
Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

SEAL

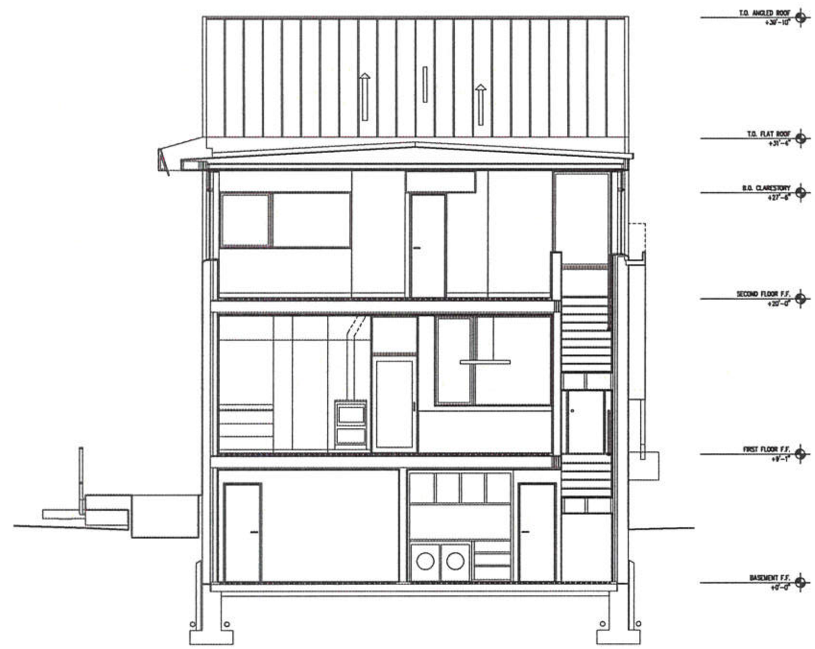
Scale:
1/4" = 1' - 0"

EAST EXTERIOR ELEVATION

A303



2 / A350 — SHORT BUILDING SECTION 1
1/4" = 1'-0"



1 / A350 — LONG BUILDING SECTION A
1/4" = 1'-0"

Structural Engineer:
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Project:
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7780 TWANA TERRACE
NEHALEM, OR 97131

Drawing Status:
PROGRESS SET - NOT FOR CONSTRUCTION
Date:
1 MAY 2021
Drawing History:

Scale:
1/4" = 1'-0"

BUILDING SECTIONS

A350

GENERAL NOTES

1. These plans were designed to conform to the latest edition of the OSSC at the time the plans were drawn. In the event of a conflict between applicable codes and regulations, and reference standards of these plans and specifications, the more stringent provisions shall govern. Any additional design or drawing services required by the building official or requested by the contractor or owner are subject to Stricker Engineering's standard service fees.
2. The contractor shall verify all dimensions and conditions prior to construction and notify the owner and Stricker Engineering of any discrepancies.
3. Written dimensions shall take precedence over scaled dimensions, DO NOT SCALE DRAWINGS.
4. Stricker Engineering does not guarantee the availability of any specified product. The contractor is advised to verify the availability of all material prior to construction.
5. All products shall be stored and installed following the manufacturers specifications.
6. The contractor shall be responsible for construction means and methods, procedures, and site conditions except as specifically indicated in the contract documents.
7. The contractor shall provide adequate bracing or otherwise support all portions of the structure until all members have been permanently connected
8. No amendments or modifications to these documents or the building they represent shall be made without the consent of the owner and Stricker Engineering. If changes are made without the consent of Stricker Engineering, the contractor takes sole responsibility
9. All Drawings and designs are to remain the sole property of Stricker Engineering. Any use of these drawings other then the one contracted is expressly prohibited.

STRUCTURAL DESIGN NOTES

1. Structure risk category: 2
2. Design floor live load: 40 PSF
3. Design roof live load: 20 PSF
4. SNOW DESIGN
   - 4.1. Design roof snow load: 20 PSF
   - 4.2. Flat roof snow load: 3.0 PSF
   - 4.3. Snow exposure factor, C_e = 0.8
   - 4.4. Snow load importance factor: I_s = 1.0
   - 4.5. Thermal factor, C_t = 1.0
5. WIND DESIGN
   - 5.1. Ultimate design wind V_{ULT} = 135 MPH
   - 5.2. Wind exposure: D
   - 5.3. Internal pressure coefficients GC_{pi} = +0.18, -0.18
   - 5.4. Design wind pressure used for components and cladding: 36.6 PSF
6. SEISMIC DESIGN
   - 6.1. Seismic importance factor, I_e = 1.0
   - 6.2. Mapped spectral response parameters, S_S and S_1: S_S = 1.292, S_1 = 0.678
   - 6.3. Design spectral response: S_{DS} = 1.033
   - 6.4. Site classification: D
   - 6.5. Seismic design category: D
   - 6.6. Basic seismic force resisting system: Special Reinforced Concrete Shear Walls
   - 6.7. Seismic response coefficient, C_s: C_s = 0.207
   - 6.8. Response modification factor, R: R = 5
   - 6.9. Analysis procedure used: Equivalent Lateral Force
   - 6.10. Design base shear, V: V = 76,460 LB
7. Design bearing pressure: 2000 PSF

FOUNDATIONS

1. Dimensions shown are for reference only, confirm w/ architectural plan & details.
2. Bottom of footings to be placed below frost depth or as noted in the geotechnical report.
3. Coordinate penetrations of site utilities, mechanical ducts, piping, and electrical conduit/panels to minimize impact to structural framing.
4. All footings are to be centered under columns unless noted otherwise. All wood posts to have Simpson base plate or equal.
5. All footings to bear on firm, undisturbed, non-organic, non-expansive native material, or structural fill.

CONCRETE

1. Concrete is reinforced and cast-in-place unless otherwise noted (U.O.N.). Where reinforcing is not specifically shown or where details are not given, provide reinforcing similar to that shown for similar conditions, subject to review by the owner's representative.
2. All phases of work pertaining to the concrete construction shall conform to the latest edition of ACI 318 "Building Code Requirements for Reinforced Concrete" and the latest edition of ACI 117 "Specifications for Tolerances for Concrete Construction and Materials"
3. All structural concrete shall have a minimum compressive strength at 28 days as follows
   - 3.1. All locations U.O.N. — 2,500 psi
   - 3.2. Slab on grade — 2,500 psi
   - 3.3. Elevated slab — 2,500 psi
   - 3.4. Walls — 2,500 psi
4. Apply "PARASEAL" or equal foundation coating on all exterior faces of walls below grade.

REINFORCING STEEL

1. All reinforcing steel shall be deformed steel bars conforming to ASTM A615, grade 60 for #4 and larger, grade 40 for #3.
2. All reinforcing steel shall be manufactured, detailed, fabricated and placed in accordance with A.C.I. 318R, A.C.I. 315R, AND A.C.I. SP 66.
3. Welded wire fabric shall conform to ASTM A185, in as long a length as is practical. Welded wire fabric shall be lapped at least one grid width plus 2".
4. Reinforcement shall be bent cold and shall not be welded.
5. Reinforcement in concrete and masonry shall have lap lengths as follows unless otherwise specified on drawings:
   - 5.1. #3 bar: 1'-6" in concrete, 2'-0" in masonry
   - 5.2. #4 bar: 2'-0" in concrete, 2'-6" in masonry
   - 5.3. #5 bar, 2'-6" in concrete, 3'-0" in masonry
6. Reinforcement shall be accurately placed and supported by concrete, metal or other approved chairs, spacers, or ties and secure against displacement during concrete or grout placement.
7. Except where otherwise noted, reinforcement shall hove concrete cover as follows:
   - 7.1. Concrete deposited against earth — 3"
   - 7.2. Formed concrete against earth — 2"
   - 7.3. Exterior faces of walls — 1-1/2"
   - 7.4. Interior faces of walls — 3/4"
   - 7.5. To top of slab-on-grade — 3/4"

WOOD FRAMING

1. All solid sawn lumber shall be Douglas Fir-Larch (D.F.), installed as noted on the plans and connected as specified in the nailing schedule below unless otherwise noted (U.O.N.). Lumber shall be graded in accordance with current Western Wood Product Association (WWPA) standard grading rules. Lumber grades shall be as follows:
   - 1.1. Posts, beams, & Headers: #2 D.F. U.O.N.
   - 1.2. Floor joists & ceiling rafters: #2 D.F. OR BETTER U.O.N.
   - 1.3. Sill plates & blocking: Pressure treated #2 D.F. U.O.N.
   - 1.4. Studs: #2 D.F. U.O.N.
   - 1.5. 2" T&G sub-floor decking: 1/2" C-D ext. glue U.O.N.
   - 1.6. Wall and roof sheathing: Plywood 32/16 U.O.N.
   - 1.7. Sub-floor over joists: ¾" underlayment grade plywood (exterior grade) U.O.N.
   - 1.8. Glu-laminated Beams: f_b = 2,000 psi, f_v = 165 psi, E = 1,800,000 psi U.O.N.
2. Lumber at visually exposed locations shall be pressure treated (PT) #2 D.F. or better. All exterior and interior openings shall have use a #2 D.F. 4x12 header U.O.N.

NAILING SCHEDULE

1. Joist to sill or beam: (3) 8d toe nails or (2) 16d
2. Bridging to joists: (2) 8d toe nails each end
3. 2" T&G decking to beams: (2) 16d toe nails through tongue
4. Rim joist to joist: (3) 16d face nails
5. Studs to sill plate: (2) 16d face nails each end
6. Sill plate to joists or blocking: (1) 16d @ 16" o/c, face nails
7. Sill plate or top plate to studs: (2) 16d face nails
8. Double top plate: (1) 16d @ 16" o/c, face nails
9. Double studs: (1) 16d @ 24" o/c, face nails
10. Corner studs: (1) 16d @ 24" o/c, face nails
11. Top plates at laps & intersections: (2) 16d face nails
12. Headers to top plates: (1) 16d @ 16" o/c, face nails
13. Ceiling rafters to plates: (3) 8d toe nails or (2) 16d
14. Plywood sub-floor to joists: (1) 8d common @ 6" o/c at edges & 12" o/c in field
15. Plywood walls & roof sheathing: (1) 8d common @ 6" o/c at edges & 12" o/c in field

NAILING SCHEDULE NOTES

1. All walls shall have studs place at 16" o/c, U.O.N.
2. Top plates shall be double on all walls, U.O.N.
3. Trimmers under all headers shall be continuous to sole plate.
4. Double joists under all walls parallel to joists, U.O.N.
5. Use 4x blocking in all shear walls.
6. Place solid blocking between all joists and rafters at support walls.
7. Beams, girders, and joists shall not be notched unless approved by Stricker Engineering.
8. Rafters shall not be notched at supports unless approved by Stricker Engineering.
9. Lap all joists a minimum of 6" each way at all interior supports

STRUCTURAL STEEL

1. All work shall be performed in accordance with the latest provisions of the OSSC/IBC, AISC Specifications for Steel Buildings, AWS Standard Code D1.1, and the associated ASTM standards noted below.
2. Structural steel materials shall be as follows:
   - 2.1. W-Shapes: ASTM A572, Grade 50 (Enhanced) or ASTM A992
   - 2.2. All other shapes and plates: ASTM A36
   - 2.3. HSS Tubing: ASTM A500, Grade B or C. Fy = 46 ksi
   - 2.4. High strength bolts and nuts: ASTM A325-N
3. Welding materials shall be as follows:
   - 3.1. AWS D1.1 with E70XX low hydrogen electrodes - type as required for materials being welded.
   - 3.2. Storage of electrodes in accordance with AWS guidelines.
4. Sill plate anchor bolts: Anchor bolts embedded in concrete shall be ASTM F1554 Gr. 36, ASTM A36, ASTM A307 or equivalent.
5. Fabrication and installation shall be as follows:
   - 5.1. All welding to be by certified welders.
   - 5.2. Shop fabricate to the greatest extend possible.
   - 5.3. All bolted joints shall be tightened to the "snug tight" condition.

SPECIAL INSPECTION

1. Structural welds require special inspections in accordance with OSSC Table 1705.2
2. A325 bolts require special inspection in accordance with OSSC Table 1705.2
3. Anchors cast in concrete require special inspection in accordance with OSSC Table 1705.3
4. Concrete construction requires special inspection in accordance with OSSC Table 1705.3

STRICKER Engineering

SHEET INDEX:

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

REV	DATE	DESCRIPTION

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STRICKER Engineering

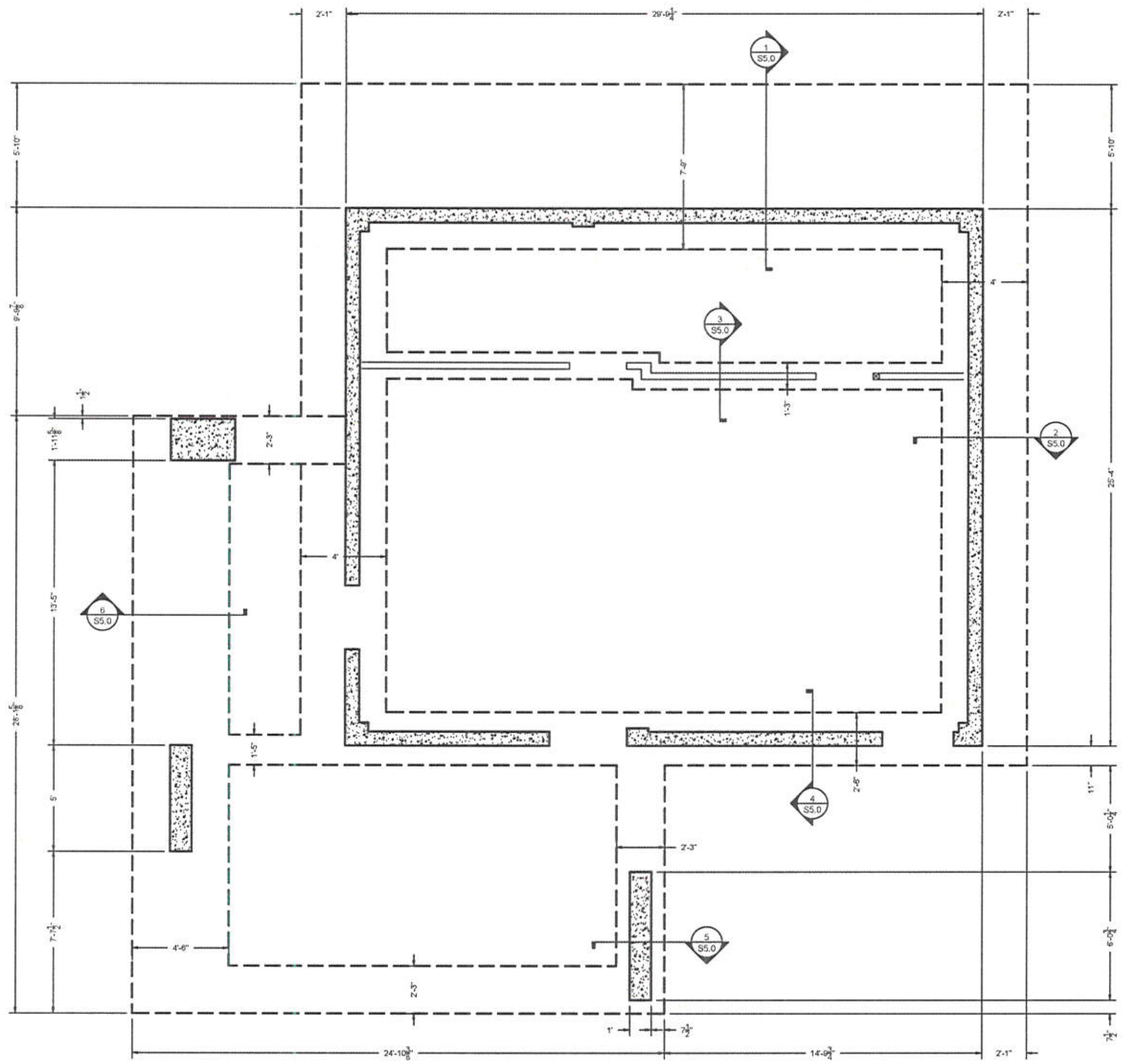
NEAHKAHNIE HOUSE
NEW RESIDENCE
7780 TWANA TERRACE
NEHALEM, OR

COVER SHEET

DRAWN: 04/19/2021
ISSUED: 05/24/2021
SCALE: AS SHOWN
JOB N.O: 201113858

Drawing N.O:

S0.0



NOT FOR CONSTRUCTION
FOR REVIEW ONLY

1/S1.0 **FOUNDATION PLAN**
SCALE: 3/8"= 1'-0"

105 East Cypress
Garibaldi, OR 97118
503-322-2442
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SE STRICKER Engineering

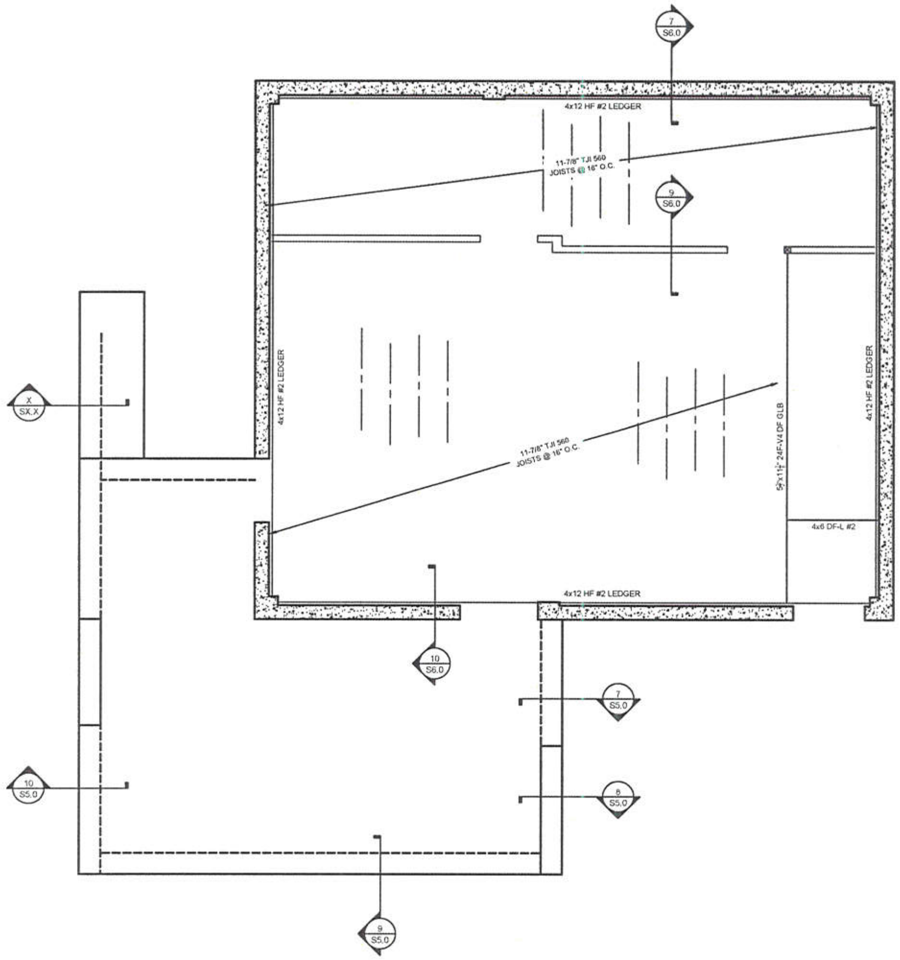
REV	DATE	DESCRIPTION

REVISIONS

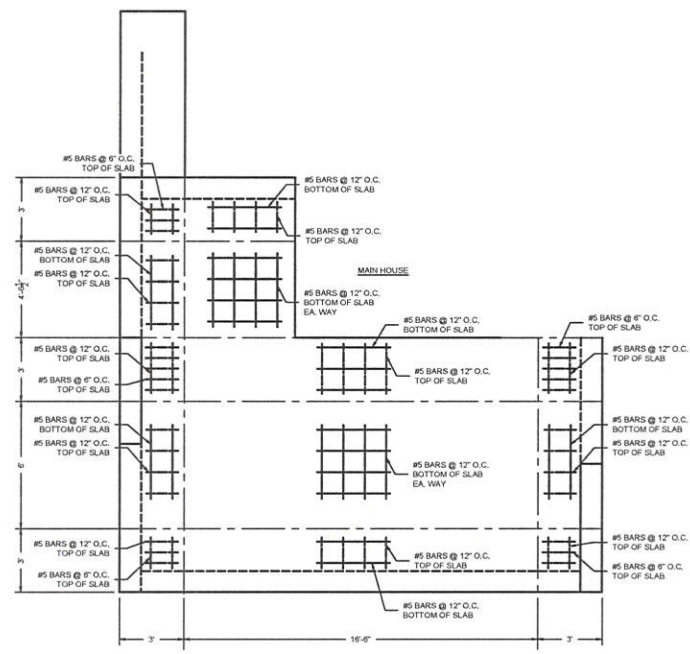
NEAHKAHNIE HOUSE
NEW RESIDENCE
7780 TWANA TERRACE
NEHALEM, OR
FOUNDATION PLAN

DRAWN: 04/19/2021
ISSUED: 05/24/2021
SCALE: AS SHOWN
JOB N.O: 201113656

Drawing N.O:
S1.0



1 S2.0 **FIRST FLOOR FRAMING PLAN**
SCALE: 3/8"= 1'-0"



2 S2.0 **ELEVATED SLAB REINFORCEMENT PLAN**
SCALE: 3/8"= 1'-0"

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

REV	DATE	DESCRIPTION

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STRICKER Engineering

NEAHKAHNIE HOUSE
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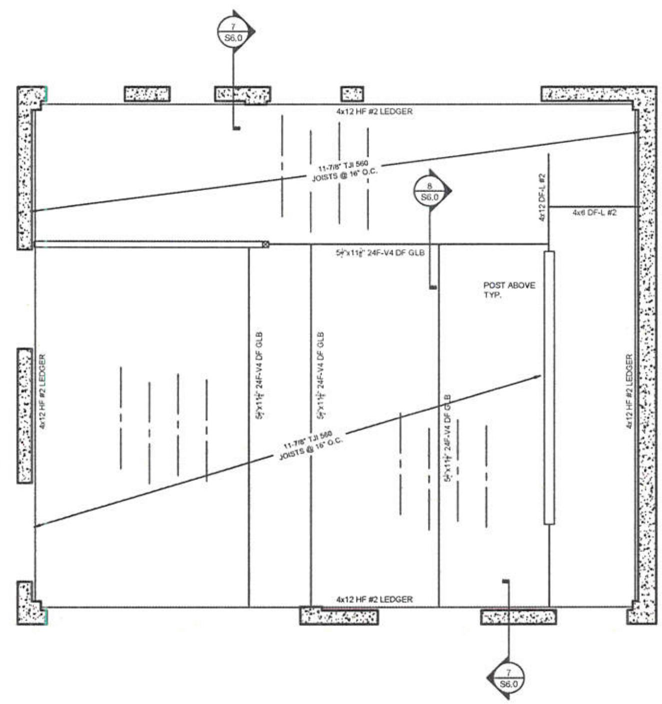
NEHALEM, OR

FIRST FLOOR FRAMING AND CARPORT REINFORCEMENT PLAN

DRAWN:	04/19/2021
ISSUED:	05/24/2021
SCALE:	AS SHOWN
JOB N.O:	201113858

Drawing N.O:

S2.0



1 S3.0 **SECOND FLOOR FRAMING PLAN**
SCALE: 3/8"= 1'-0"

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

REV	DATE	DESCRIPTION

REVISIONS

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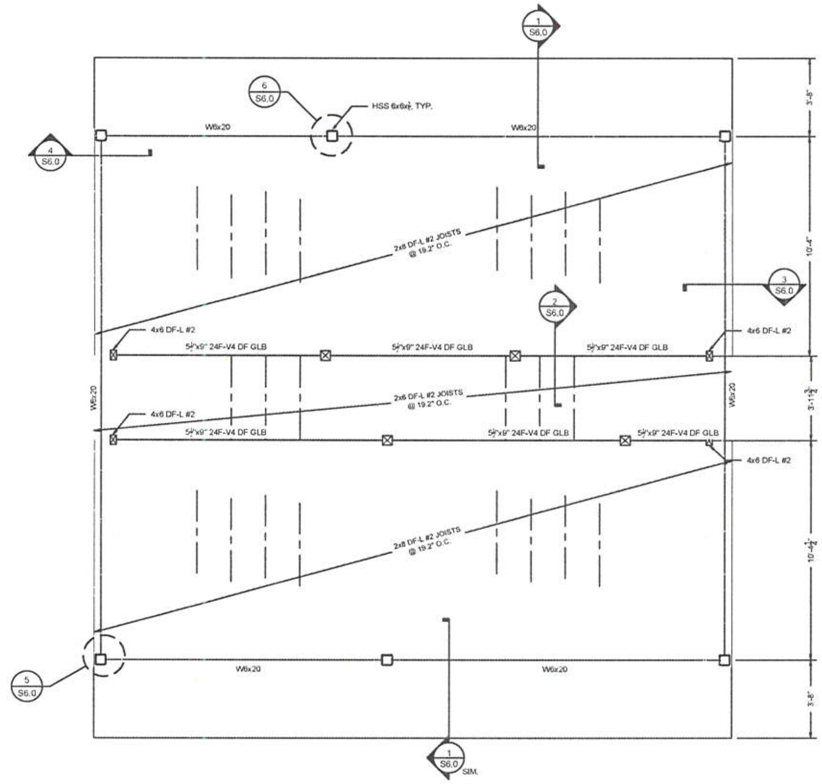
NEHALEM, OR

SECOND FLOOR FRAMING PLAN

DRAWN:	04/19/2021
ISSUED:	06/24/2021
SCALE:	AS SHOWN
JOB N.O:	201113656

Drawing N.O:

S3.0



1 S4.0 **ROOF FRAMING PLAN**
SCALE: 3/8"= 1'-0"

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

REV	DATE	DESCRIPTION

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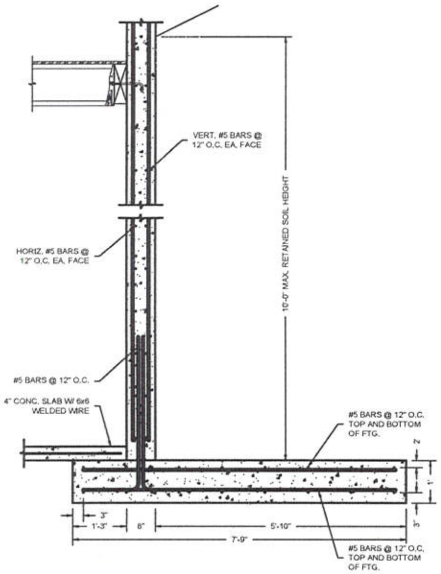
ROOF FRAMING PLAN

DRAWN: 04/19/2021
ISSUED: 05/24/2021
SCALE: AS SHOWN
JOB N.O: 201113658

Drawing N.O:

S4.0



1 S5.0 UP TO 10' RETAINING WALL
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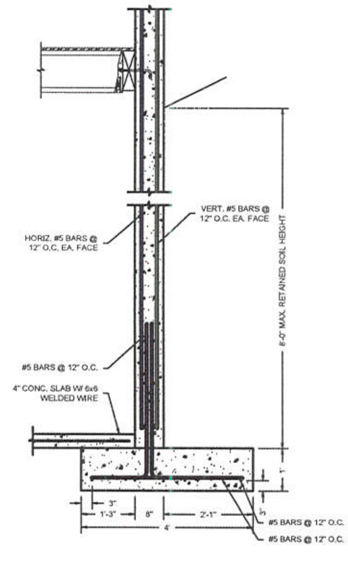

2 S5.0 UP TO 8' RETAINING WALL
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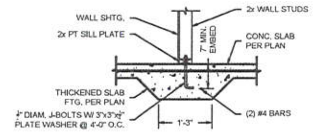

3 S5.0 THICKENED SLAB FOOTING
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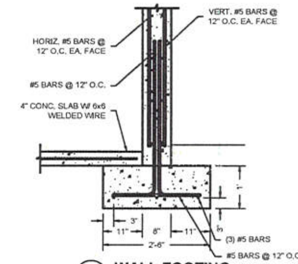

4 S5.0 WALL FOOTING
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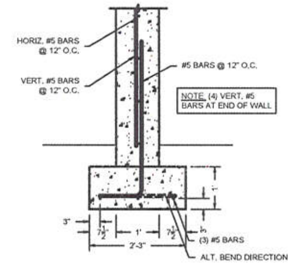

5 S5.0 CARPORT WALL FOOTING
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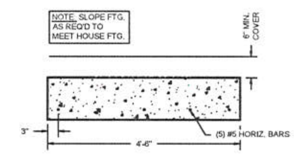

6 S5.0 SUB-GRADE BEAM FOOTING
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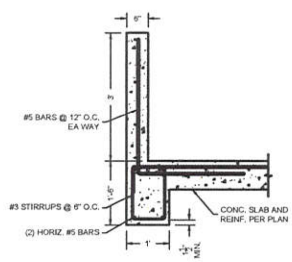
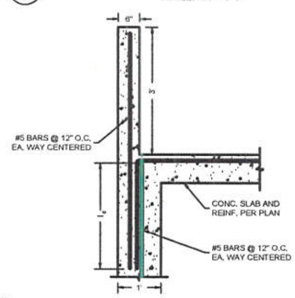


7 S5.0 CARPORT BEAM W/ CONC. PARAPET
SCALE: 3/4"= 1'-0"



8 S5.0 CARPORT WALL W/ CONC. PARAPET
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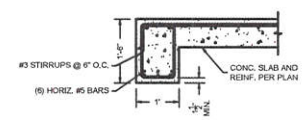

9 S5.0 CARPORT BEAM REINF.
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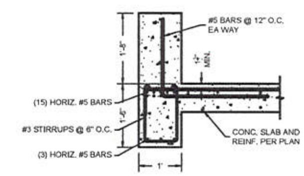

10 S5.0 CARPORT BEAM W/ CONC. SEAT
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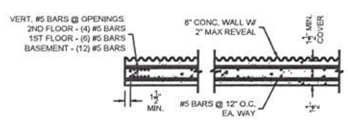

11 S5.0 TYP. CONC. WALL REINF.
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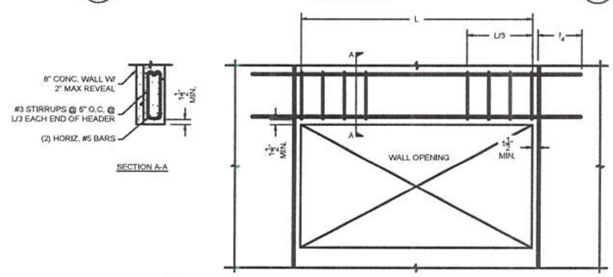

12 S5.0 TYP. CONC. HEADER REINF.
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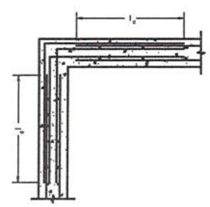

13 S5.0 TYP. CORNER REINFORCEMENT
SCALE: 3/4"= 1'-0"

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FOR REVIEW ONLY

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SE STRICKER Engineering

NEAHKAHNIE HOUSE
NEW RESIDENCE
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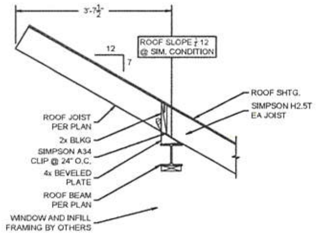
NEHALEM, OR

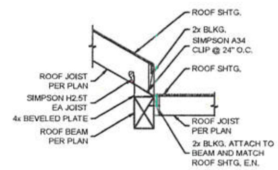
FOUNDATION AND CONCRETE DETAILS

DRAWN: 04/19/2021
ISSUED: 06/24/2021
SCALE: AS SHOWN
JOB NO.: 201113656

Drawing N.O.:
S5.0



1/S6.0 **ROOF JOIST @ STEEL BEAM**
SCALE: 3/4"= 1'-0"



2/S6.0 **ROOF JOIST @ CENTER**
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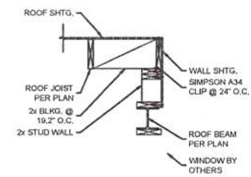
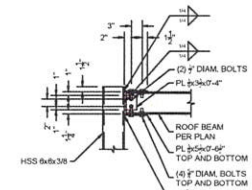
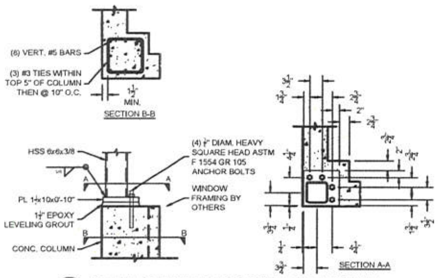


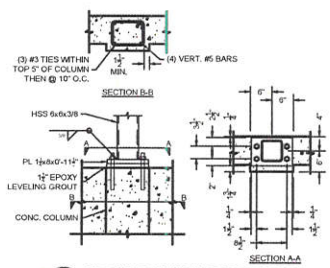
3/S6.0 **ROOF JOIST @ PARALLEL WALL**
SCALE: 3/4"= 1'-0"



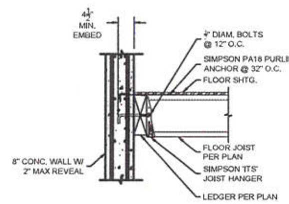
4/S6.0 **STEEL BEAM TO COLUMN**
SCALE: 3/4"= 1'-0"



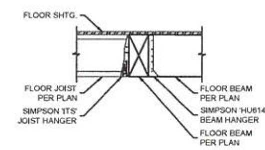
5/S6.0 **STEEL CORNER COLUMN BASE PLATE**
SCALE: 3/4"= 1'-0"



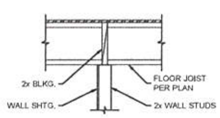
6/S6.0 **STEEL COLUMN BASE PLATE**
SCALE: 3/4"= 1'-0"



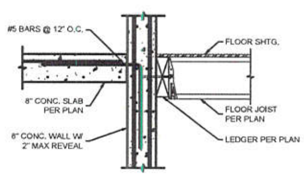
7/S6.0 **FLOOR JOIST AND LEDGER**
SCALE: 3/4"= 1'-0"



8/S6.0 **FLOOR JOIST TO BEAM**
SCALE: 3/4"= 1'-0"



9/S6.0 **FLOOR JOIST @ INTERIOR BEARING WALL**
SCALE: 3/4"= 1'-0"



10/S6.0 **CARPORT DECK @ CONC. WALL**
SCALE: 3/4"= 1'-0"

NOT FOR CONSTRUCTION
FOR REVIEW ONLY

REV	DATE	DESCRIPTION

REVISIONS

105 East Cypress
Garibaldi, OR 97118
503-322-2442
strickerengineering.com
John@strickerengineering.com

STRICKER Engineering

NEAHKAHNIE HOUSE
NEW RESIDENCE
7780 TWANA TERRACE
NEHALEM, OR

FRAMING DETAILS

DRAWN	04/19/2021
ISSUED	05/24/2021
SCALE	AS SHOWN
JOB N.O.	201113656

Drawing N.O:

S6.0

Earth Engineers, Inc.

2 11 Southeast 8th Avenue • Camas • WA 98607
Phone: 3 0-567-180
www.earth-engineers.com

June 7, 2021

Wolves Above, LL
1 22 Northeast North Valley Road
Newberg, Oregon 97132
Attention: James Anderson

phone: (503 572-8907
E-mail: jim@patriciagreencellars.com

Subject: **Geotechnical Investigation and Geologic Hazard Report**
Proposed Anderson Single Family Residence – "Neahkahnie House"
7780 Twana Trace
Nehalem, Tillamook County, Oregon
EEI Report No. 21-074-1

Dear Mr. Anderson:

Earth Engineers, Inc. (EEI) is pleased to transmit our report for the above referenced pro ect. The attached report includes the results of field and laboratory testing, an evaluation of geologic ha ards that may influence the proposed development, recommendations for foundation 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.

Laura Haigh
Geotechnical Engineering Associate

Ken Andrieu, R.G.
Senior Geologist

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

Attachment: Geotechnical Investigation and Geologic Ha ard Report

Distribution (electronic copy only):
Addressee
Peter Ballman, Ballman Khapalova (ballman ballkhap.com)

GEOTECHNICAL INVESTIGATION AND GEOLOGIC HAZARD REPORT

for the

Proposed Anderson Single Family Residence
"Neahkahnie House"
7780 Twana Trace
Nehalem, Tillamook County, Oregon

Prepared for

Wolves Above, LLC
15225 Northeast North Valley Road
Newberg, Oregon 97132
Attention: James Anderson

Prepared by

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

EEI Report No. 21-074-1

June 7, 2021

Earth Engineers, Inc.

REGISTERED PROFESSIONAL OREGON KENNETH DAVID ANDRIEU #G1988 GEOLOGIST

EXP: 12/1/2021

Ken Andrieu, R.G.
Senior Geologist

REGISTERED PROFESSIONAL ENGINEER 19206PE OREGON JULY 15, 1997 TROY M. HULL

EXPIRES: 6/30 23

Troy Hull, PE, GE (Oregon)
Principal Geotechnical Engineer

Laura Haigh
Geotechnical Engineering Associate

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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 7780 Twana Trace in Nehalem, Tillamook County, Oregon. Our services were authorized by James Anderson on April 19, 2021 by signing EEI proposal No. 21-P219 issued on April 17, 2021

1.2 Project Description

Our current understanding of the project is based on the information provided to EEI Principal Geotechnical Engineer Troy Hull by Peter Ballman of Ballman Khapalova (project architect). We have received the following documents:

- **February 15, 2008 report by Chinook GeoServices, Inc. titled "Engineering Geologic Hazard Reconnaissance Report, Proposed Roman Residence, Tax Lot 1700, Map 3N 10 20 BB, Fire Mountain Estates, Tillamook County, Oregon."**

- **November 30, 2020 topographic lot drawing by S&F Land Services titled "Topographic Survey for Jim Anderson, Located in the Northwest ¼ of the Northwest ¼ of Section 20, Township 3 North, Range 10 West, of the Willamette Meridian, Tillamook County, Oregon."**

- **December 20, 2020 engineering report by Morgan Civil Engineering, Inc. titled "Addendum No. 1 to Engineering Geologic Hazard Report for Tax Lot 1704, Map 3N 10W 20BB, Parcel 2, Partition Plat 1992-23, Neah-Kah-Nie, Tillamook County, Oregon (7780 Twana Trace)."**

- **April 12, 2021 schematic drawing set titled "Neahkahnie House, 7780 Twana Terrace, Nehalem, OR 97131," by Ballman Khapalova.** The 10-sheet drawing set includes: A100, A200 – A202, A300 – A303, A350, and A500. The site plan from Sheet A100 can be seen below in Figure 1. Note that the street referred to as Twana Terrace on the architectural drawings is referred to as Twana Trace in our report.

- **Undated 3-D renderings of the overall view and overall view close-up, by Ballman Khapalova.** See Figure 2 below for the overall view.

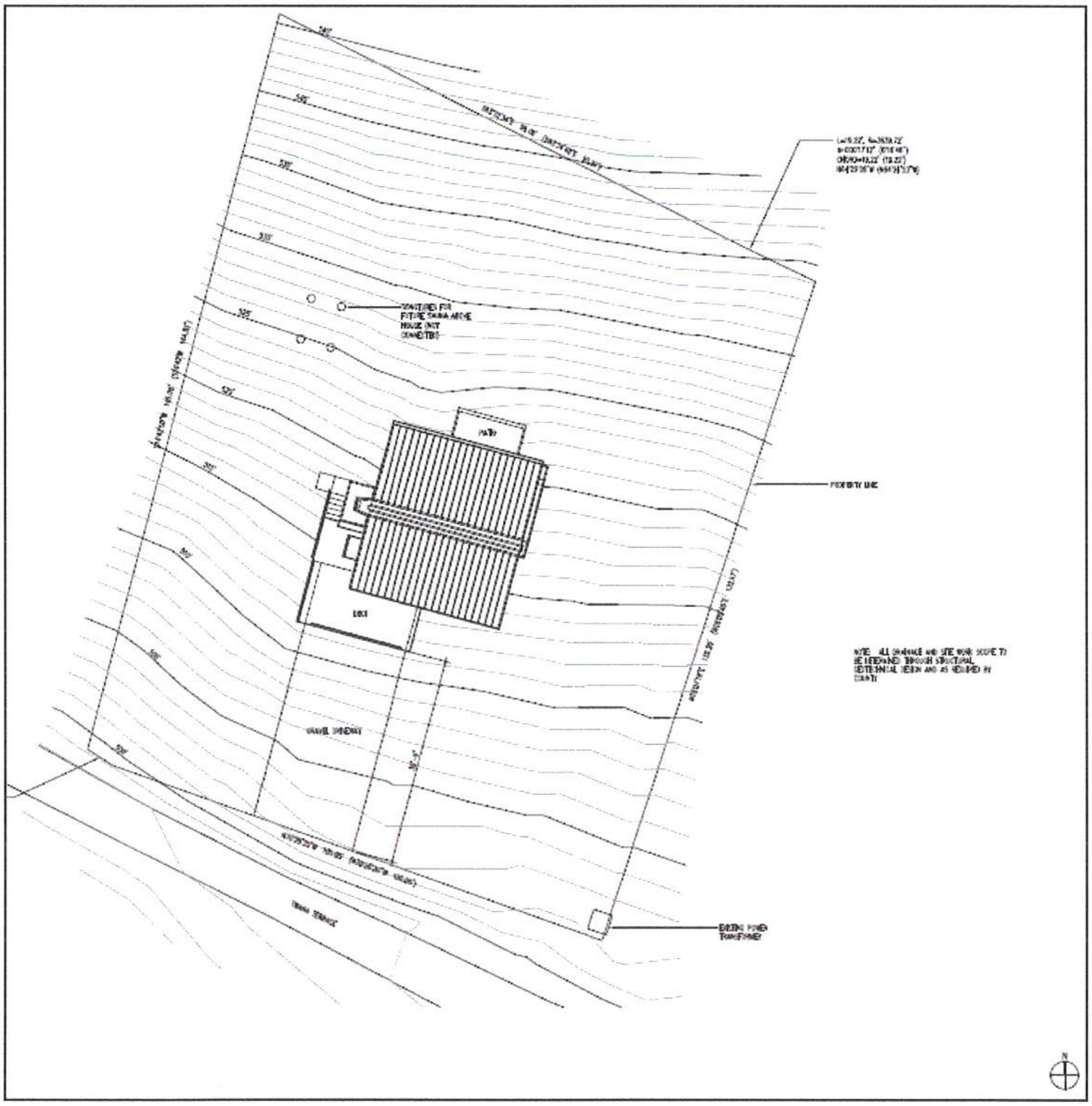

Figure 1: Proposed site plan (source: Sheet A100 by Ballman Khapalova, dated April 12, 2021).

Briefly, we understand the plan is to construct a 3-story home that will be benched into the hillside (see Figure 2 and 3 below). We have not been provided detailed foundation loading or grading plans for the proposed home construction. For the purposes of this proposal, we are assuming typical, relatively lightly loaded residential foundation loads of 3 kips per linear foot for wall footings, 40 kips per column footing, and 1 0 psf for floor slabs. With regard to design grades, we are assuming cuts and fills will generally be limited to about 8 feet. We assume the house will be designed in accordance with the 2021 Oregon Residential Specialty Code (ORSC), an amendment to the 2018 International Residential Code (IRC).

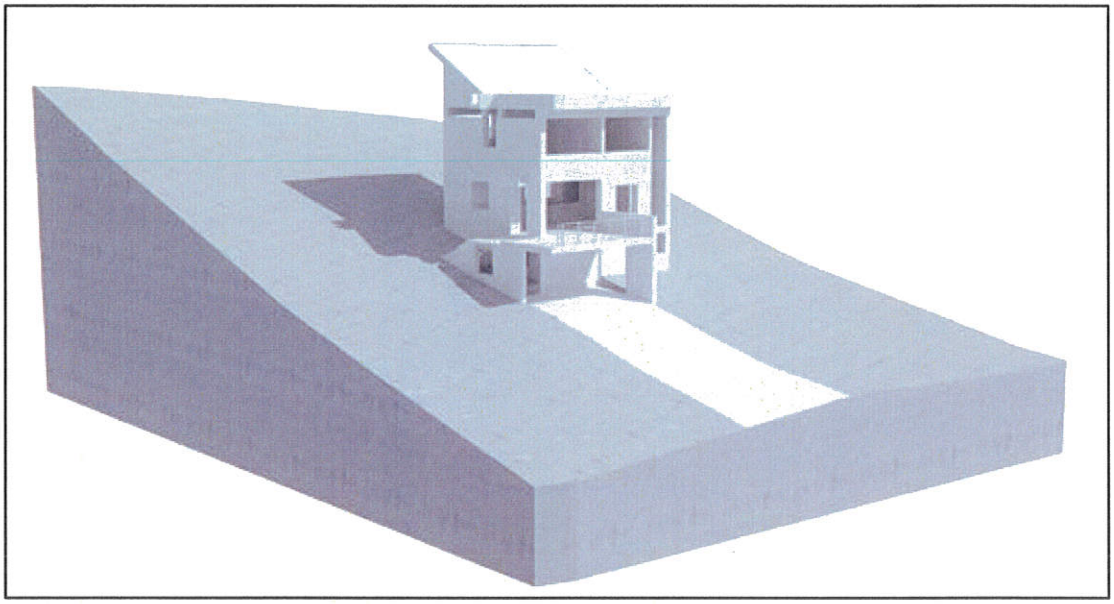

Figure 2: Overall view of proposed project (source: Undated 3-D renderings of the overall view, by Ballman Khapalova .

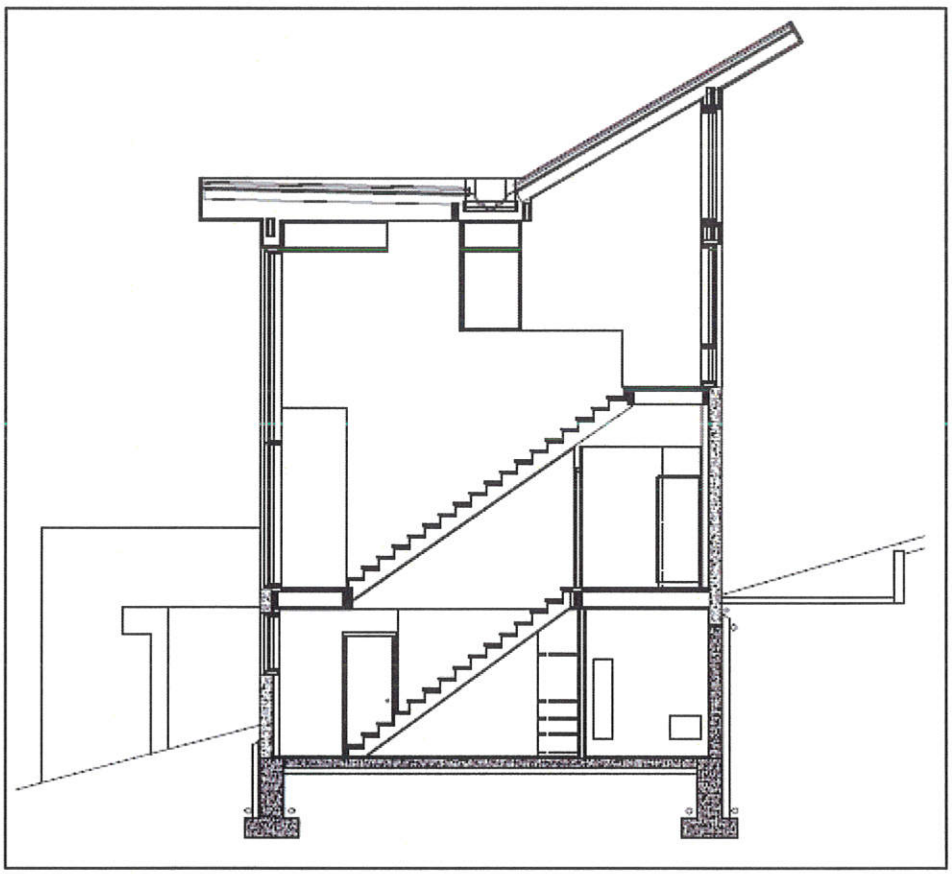

Figure 3: Section view of proposed house (base drawing source: Detail 2 on drawing A3 0, by Ballman Khapalova, dated April 12, 2021).

The subject property, is mapped within an ancient landslide area by the Oregon Department of Geology and Mineral Industries (DOGAMI). As such, it is very probable that the proposed development is subject to the Tillamook County code section 4.130 Development Requirements for Geologic Hazard areas, which has been included in our scope and is a part of this report.

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 one Standard Penetration Test (SPT) boring (B-1) to a depth of 81.5 feet below grade onsite. SPT samples were taken at regular intervals, 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.
- Slope stability evaluation.
- Seismic design parameters in accordance with ASCE 7-16.
- Geotechnical related recommendations for foundation design including allowable bearing capacity, minimum footing dimensions, and estimated settlements.
- 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.

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the noted information is incorrect, please inform EEI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. EEI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Our scope of services did not include a detailed evaluation of deep-seated global slope stability. Given that the property is located within an ancient landslide area that covers several square miles, it would not be practical to evaluate the entire global stability of the entire mapped landslide.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 Site Location and Description

The project site is located at 7780 Twana Trace (Tax Lot 1700, Map 3N 10 20BB) in Nehalem, Tillamook County, Oregon. The property sits on the south facing slope of Neahkahnie Mountain and is approximately ½ mile north of Man anita Beach, and approximately 1.5 miles north of the central business district of the City of Man anita. The property location relative to surrounding features is provided in Appendix A Site Location Plan.

The 0.3 -acre property is generally rectangular in shape and is bordered by the Oregon Coast Highway to the north, Twana Trace to the south, a developed single-family residence to the east, and a vacant lot to the west, as shown below in Figure 3.

Figure 4: Property location, outlined in blue (base image source: http://tillamookcountymaps.co.tillamook.or.us/).

The subject lot is sloping downward to the south towards Twana Trace, generally at about 2.4H:1V (Hori ontal:Vertical . The slope is a relatively even grade, becoming slightly steeper in the upper portion of the site where it approaches Highway 101, and along Twana Trace where the slope on the uphill side of the road was cut to form the road. Partially buried basalt boulders are spread across the face of the slope, indicating rockfall ha ard from Neahkahnie Mountain at some time in the past. The highway appears to provide a catchment for more recent rockfalls, as we did not observe any recently placed boulders on the slope surface.

The lot has been mostly cleared of trees, vegetated mainly with grasses, ferns and shrubs, with some mature evergreen trees along the north and west property lines. The evergreens are generally straight trunked indicating relatively stable slope conditions. See Photo 1 and 2 below for the existing site conditions.

Photo 1: Subject property viewed from the southeast property corner along Twana Trace.

Photo 2: Current subject property conditions as viewed from Twana Trace.

2.2 Subsurface Materials

The site was explored with one SPT boring (B-1) near the southeast corner of the property. For the approximate exploration location, see the Exploration Location Plan, Appendix B. The SPT boring was advanced with a subcontracted Mobile B-58 drill rig from PLi Systems of Hillsboro, Oregon. Using mud rotary drilling techniques, B-1 was advanced to a depth of 81.5-feet with SPT samples taken every 2.5-feet in the upper 15-feet, then every 5-feet thereafter to the terminal depth. Note that due to the sloping topography of the lot, the proposed house footprint area was not accessible to the drill rig. Instead, the boring had to be located in Twana Trace.

Select soil samples were tested in the laboratory to determine material properties for our evaluation. Results of the drilled borings are reported in the Exploration Logs in Appendix C. 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 gravel underlain by silty gravel, silt, and an ancient landslide/colluvial deposit. Each individual stratum encountered is discussed in further detail below.

Road Gravel (Fill): The surficial layer encountered consisted of 8-inches of grey basaltic gravel fill.

Silty Gravel (GM): Below the road gravel was a layer of wet dense dark brown to brown silty gravel with sand and few organics. Below a depth of 4 feet bgs, no organics were encountered and the soil transitioned to very dense. Laboratory testing conducted on samples obtained in this stratum resulted in moisture contents of 15 to 31 percent and a fines content of 14 percent. This stratum extended to a depth of 12 feet bgs.

Silt (ML): Beneath the silty gravel was a layer of wet dark brown silt with some sand in a medium stiff condition. Laboratory testing conducted on samples obtained in this stratum resulted in moisture contents of 37 to 52 percent. The thickness of the stratum was approximately 3.5 feet, extending to a depth of 15.5 feet bgs.

Poorly-Graded Gravel with Silt and Sand (Ancient Landslide / Colluvial Deposit) (GP-GM): The terminal stratum in our borings was a wet gray angular, fine to coarse grained fractured basalt gravel with bluish gray, medium to coarse grained silty sand. We interpret this stratum to be an ancient landslide / colluvial deposit. SPT blow counts indicated a medium dense to very dense apparent density. Laboratory testing conducted on samples obtained in this stratum resulted in moisture contents of 8 to 25 percent, a fines content of 7 to 24 percent. This stratum extended to the terminal depth of B-1 at 81.5 feet bgs.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The exploration log 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 log represent the conditions only at the actual exploration location. 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 log. The samples that were not altered by laboratory testing will be retained for 90 days from the date of this report and then will be discarded.

2.3 Groundwater Information

Groundwater was not encountered in our explorations. During our research, we found one publically available historical water well log for the area as published by Oregon Water Resources Department; which also did not find a static water level within the 92 feet drilled. According to mapping by Google Earth, this well log is located about 700 feet southwest of the property and about 100 feet lower in elevation than the subject 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 site mapped as Klootchie-Necanium complex with 30 to 60 percent slopes [1]. This well drained complex is formed on mountain slopes from a parent material of colluvium and residuum derived from igneous rock and tuff sources.

3.2 Geology

The 1994 U.S. Geological Survey (USGS) geologic map of the project area indicates the site is generally located on the south facing slope of Neahkahnie Mountain, a coastal headland underlain by Grande Ronde basalt flows (Tgr) and intrusive bodies of Columbia River Basalt Group (Tgri), and buttressed on the south by sedimentary deposits of the Astoria Formation (Taa) and Alsea Formations (Tal). A Quaternary aged (within the past 1.8 million years) landslide deposit (Qls?) also lies on the south flank of Neahkahnie Mountain.[2]

The project area was mapped as possible landslide deposits from the Holocene and Pleistocene (Qls?) by Wells and others (1994) of the USGS who described the deposit as "poorly sorted angular to subrounded bedrock clasts in weathered muddy matrix, forming hummocky topography with closed depressions and poor drainage; also, includes coherent bedrock glide blocks and colluvial aprons of angular cobbles and boulder at the base of steep slopes."

Previously, Schlicker and others (1972)[3] mapped the project area as an inactive landslide area, "characterized by erosion modified head scarps and hummocky, poorly drained topography, but shows no evidence of recent movement such as tilted trees, cracks, back-tilted blocks and sag-ponds". The underlying bedrock unit according to this 1972 report is Oligocene to Miocene Sedimentary Rocks (Toms), which are medium gray to dark gray siltstone, claystone and varying amounts of local sandstone and claystone. This unit is reported to be over 5,000 feet thick and underlain by basaltic sandstone and conglomerates. See Figure 5 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 May 19, 2021.

[2] Wells and others, 1994. Geologic Map of the Tillamook Highlands Northwest Oregon Coast Range Nehalem 15 Minute Quadrangle, United States Geologic Survey (U.S.G.S.) Open File Report 94-21.

[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.

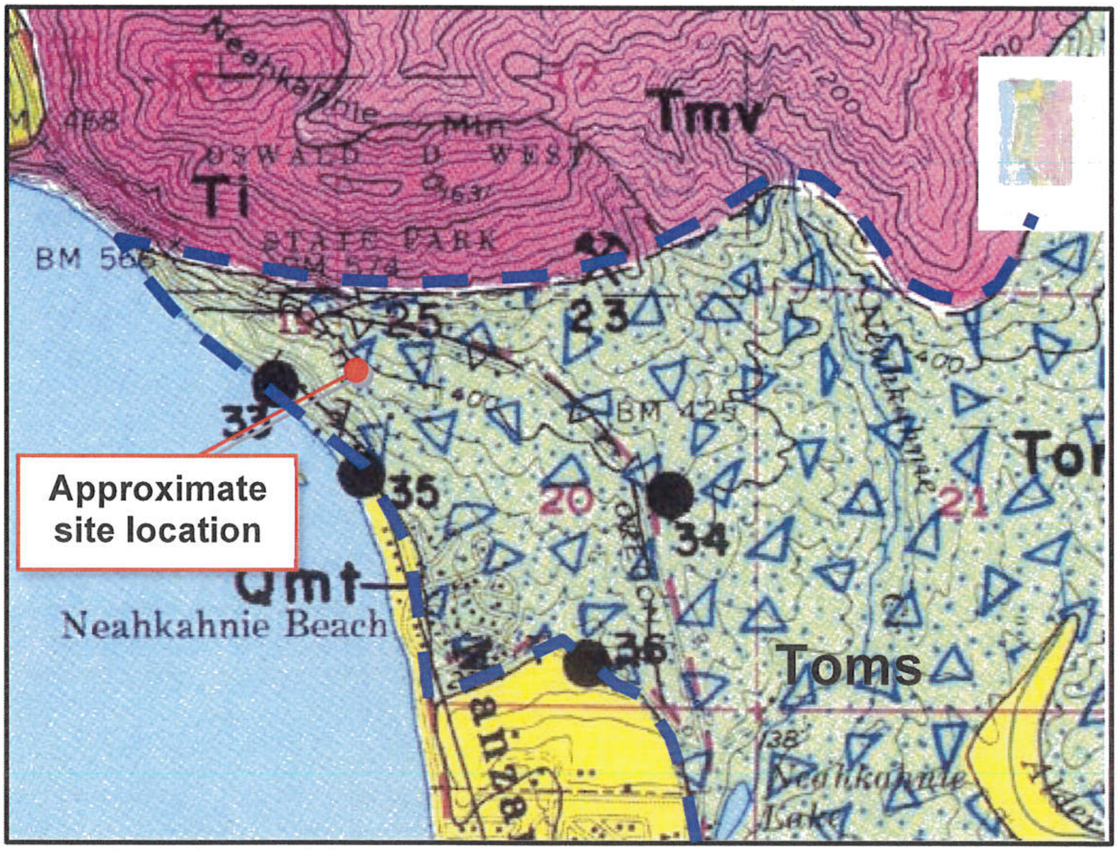


Figure 5: Geologic map of the area; the large green area with triangles outlined with a dashed blue line is ancient landslide material (source: Schlicker and others, 1972

Although we did not observe signs of recent landslides from our reconnaissance of the immediate area, based on our observations of exposed and subsurface soils, we concur that the site is likely located on a very large, stabilized, ancient landslide. While the landslide mass appears stable (likely for at least the past hundreds of years), it is possible for the landslide mass to become unstable in the future. Based on the US S mapping of the landslide, the risk to this property of being impacted by a landslide in the future is similar to numerous other properties that have already been developed in the area.

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 ma or 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, but there is an inferred fault running east to west approximately ¼ mile to the north of the property as shown in Figure 3 above.

In accordance with ASCE 7-16 we recommend a Site Class D (stiff soil 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 drive probe 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 Structural Engineers Association of California (SEAOC) – OSHPD Seismic Design Maps website (http://seismicmaps.org) which is based on the United States Geological Survey, we obtained the seismic design parameters shown in Table 1 below.

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

PARAMETER	RECOMMENDATION
Site Class	D
S_s	1.292
S_1	0.678g
F_a	1.000
F_v	Null – See Section 11.4.8
S_{MS} (=S_s x F_a)	1.292g
S_{M1} (=S_1 x F_v)	Null – See Section 11.4.8
S_{DS} (=2/3 x S_s x F_a)	0.861g
Design PGA (=S_{DS} / 2.5)	0.344g
MCE_G PGA	0.648g
F_{PGA}	1.100
PGA_M (MCE_G PGA * F_{PGA})	0.713g

Note: Site latitude = 45.739053, longitude = -123.946731

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

Per Section 11.4.8 of ASCE 7-16 a site-specific seismic site response is required for structures on Site Class D and E sites with S_1 greater than or equal to 0.2g. The S_1 value for this site is greater than 0.2g as shown in Table 1 above. Therefore, a site response analysis is required as part of the design phase. However, Section 11.4.8 does provide an exception for not requiring a site response analysis (reference Sections 11.4.8.1, 11.4.8.2 and 11.4.8.3). The project Structural Engineer should determine if the proposed building will meet any of the exceptions—if the building does not meet the exception requirements, then EEI should be retained to perform a site-specific site response analysis.

We understand a Supplement 1 dated December 12, 2018 has been issued for ASCE 7-16 to correct some issues in the original publication. One of the corrections in the Supplement pertains to Table 11.4-2 (see table below) for determining the value of the Long-Period Site Coefficient, F_V, which is then used to calculate the value of T_S. The T_S value is needed for one of the exceptions in Section 11.4.8. Without the correction in Supplement 1, it would not be possible to determine F_V and calculate T_s. Based on Supplement 1, the F_V value may be determined from the following corrected table.

Table 2: Long-Period Site Coefficient, F_V (corrected Table 11.4-2 in ASCE 7-16).

	Mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameter at 1-s Period					
Site Class	S_1<=0.1	S_1<=0.2	S_1<=0.3	S_1<=0.4	S_1<=0.5	S_1>=0.6
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.8	0.8	0.8	0.8	0.8	0.8
C	1.5	1.5	1.5	1.5	1.5	1.4
D	2.4	**2.2**[a]	**2.0**[a]	**1.9**[a]	**1.8**[a]	**1.7**[a]
E	4.2	**3.3**[a]	**2.8**[a]	**2.4**[a]	**2.2**[a]	**2.0**[a]
F	See Section 11.4.8	See Section 11.4.8	See Section 11.4.8	See Section 11.4.8	See Section 11.4.8	See Section 11.4.8

Note: use linear interpolation for intermediate values of S_1.

[a] **See requirements for site-specific ground motions in Section 11.4.8. These values of F_V shall be used only for calculation of T_S.**

3.4 Site Reconnaissance

EEI Senior Geologist Ken Andrieu 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. Because the site is on an ancient, very large landslide mass that extends from the ocean up to near the top of Neahkahnie Mountain, it should be assumed that if a major earthquake occurs, it could reactivate the ancient landslide mass. This risk is not only true for this property, but all of the other previously developed lots in the area. It is our opinion that it is not practical to engineer a solution that would totally mitigate this risk.

Based on the provided topographic map ("Topographic Survey for Jim Anderson, located in the Northwest ¼ of the Northwest ¼ of Section 20, Township 3 North, Range 10 West, of the Willamette Meridian, Tillamook County, Oregon," prepared by S&F Land Services dated November 30, 2020), the site lies between elevations of approximately 999 and 1,045 feet above an assumed elevation of 1,000 feet at B.M. #1 (40d nail in graveled Twana Trace). The 46 feet of elevation change slopes down to the southwest towards Twana Trace. This slope is approximately 2.4H:1V, which we do not consider to be oversteepened. Based on Google Earth, the site elevation is approximately 460 to 505 feet above mean sea level.

The site is covered with grasses and shrubs. We did not observe severely leaning or deformed trees in the vicinity that may indicate downslope shallow soil creep. 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, or sheet flows down to the south.

3.5 Geologic Ha ards

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

- Low coastal erosion ha ard
- Severe expected shaking from a Cascadia earthquake (estimated magnitude 9.0+/-)
- Very strong to severe expected earth uake shaking
- Moderate earth uake liquefaction hazard
- Very high landslide ha ard due to being mapped within a landslide deposit.

Figures 6 through 11 below show mapping of the geologic ha ards presented by Oregon s Ha Vu.

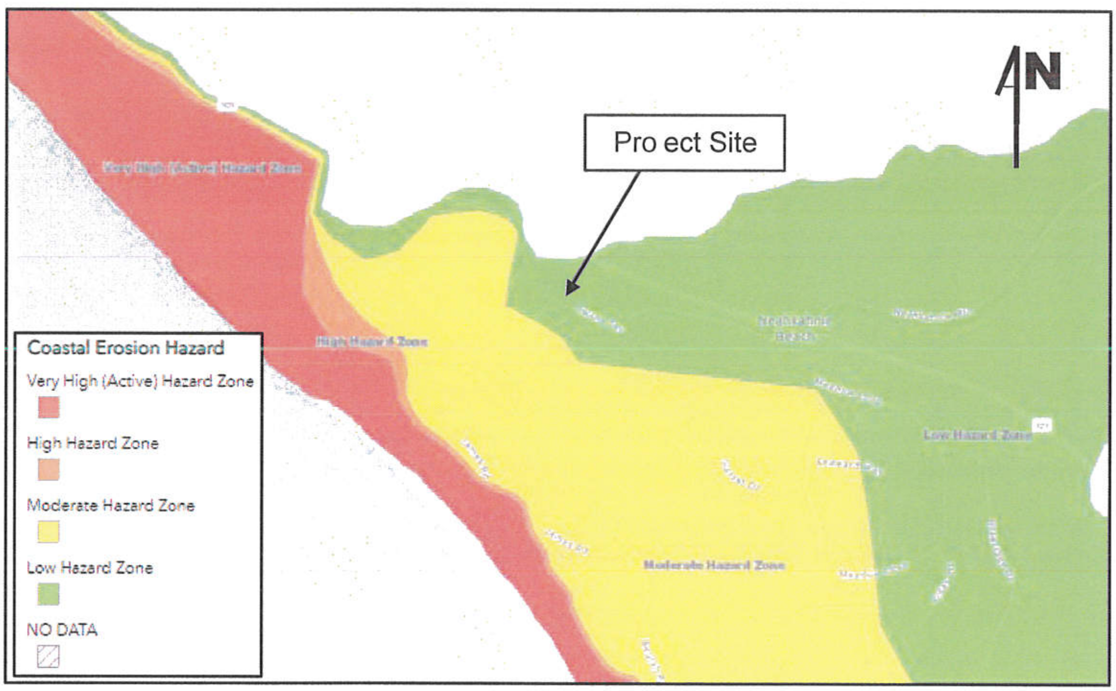


Figure 6: Ha Vu map showing extent and degree of coastal erosion ha ard areas.

[4] Oregon HazVu: Statewide Geoha ards Viewer, available online at: http://www.oregongeology.org sub hazvu accessed 5/19/2021

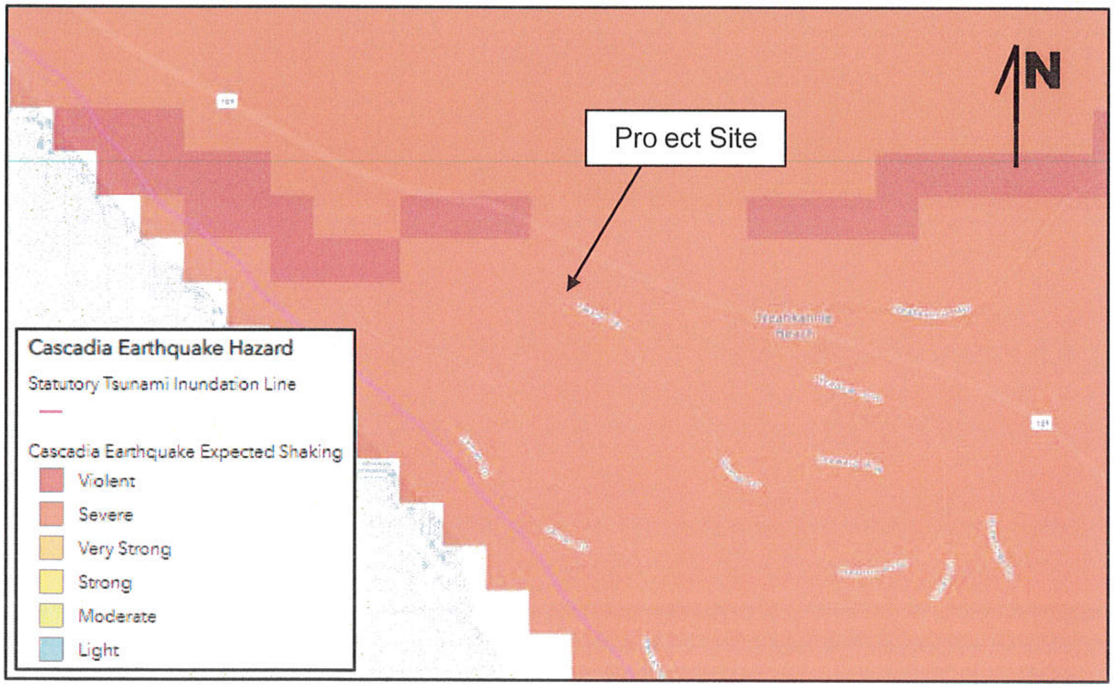


Figure 7: Ha Vu map showing extent and degree of Cascadia earth uake ha ards.

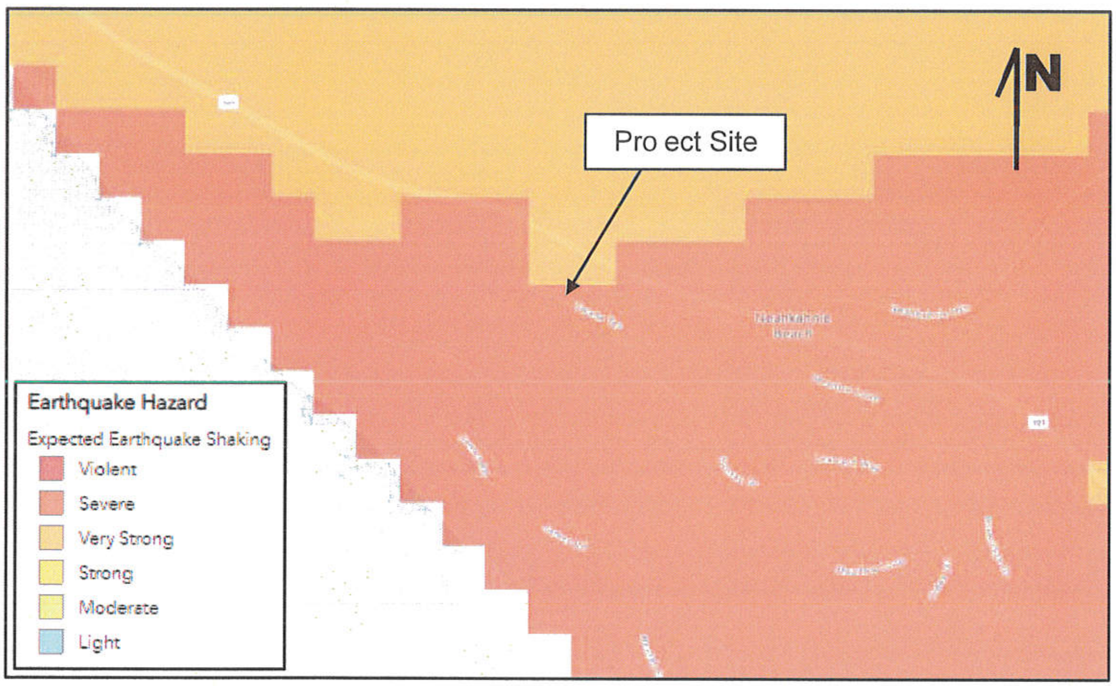


Figure 8: Ha Vu map showing extent and degree of expected earth uake shaking ha ard.

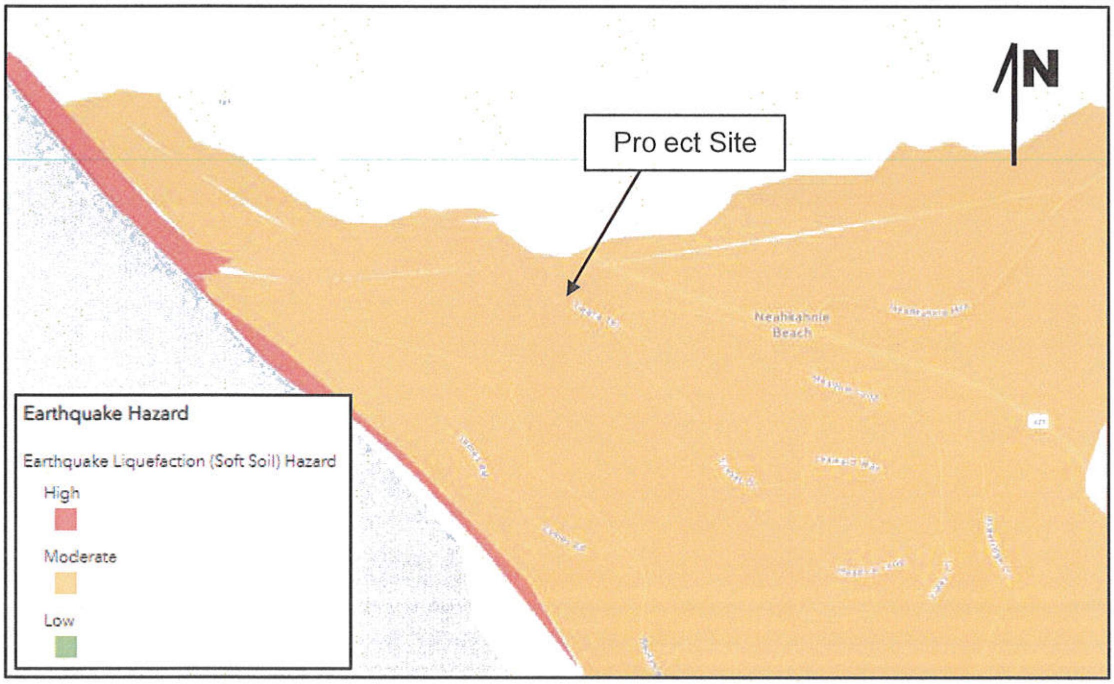


Figure 9: Ha Vu map showing extent and degree of earth uake hazards due to liquefaction.

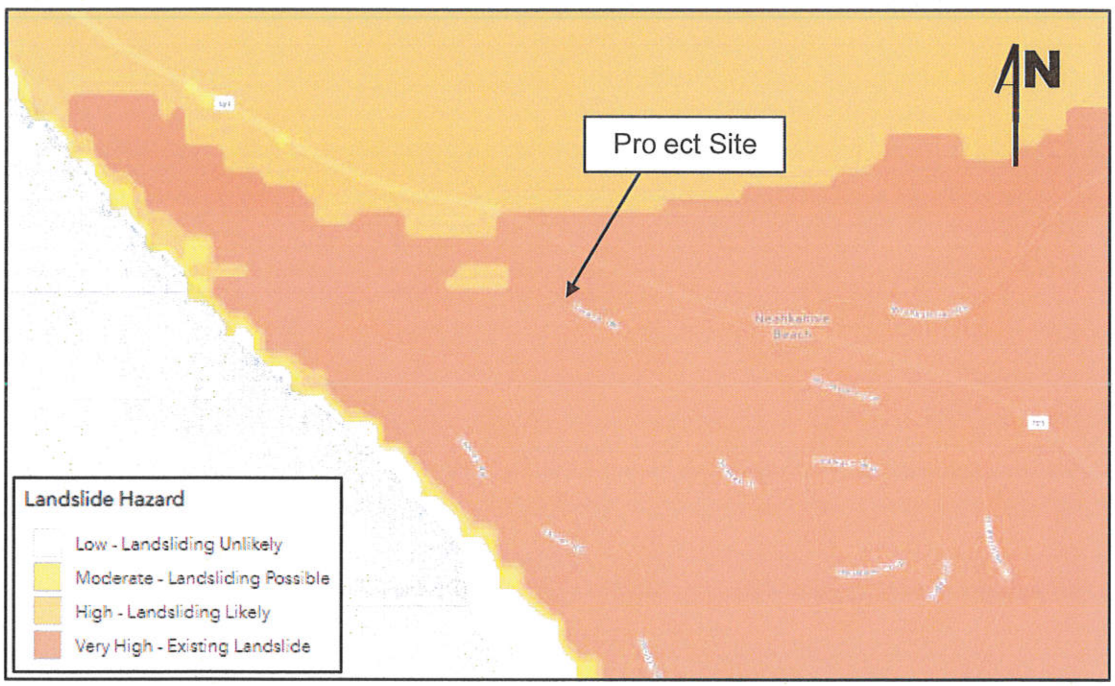


Figure 10: Ha Vu map showing extent and degree of landslide ha ards.

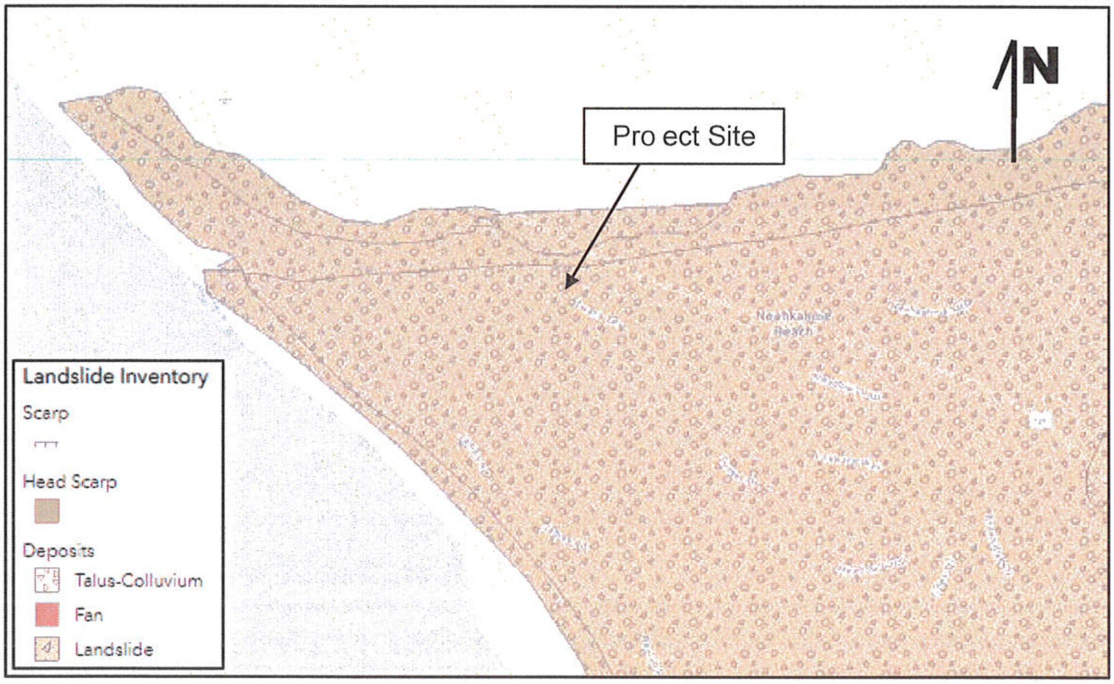


Figure 11: Ha Vu map showing extent and degree of mapped landslide deposits.

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

- Reactivation of the ancient landslide debris;
- Minor shallow soil creep
- Potential local slope instability associated with loose, organic, near surface soils;
- Possible slope instability concerns resulting from regional seismic activity.

Although the site is located in an area mapped as an ancient landslide, which we concur with based on our explorations, we believe that this landslide is currently inactive. Although a ma or seismic event could reactivate the slide mass, to what degree is not known. We do not believe this property is at any greater risk from this ha ard than other existing structures in the area.

Given the apparent density of the encountered subsurface soils and the absence of groundwater, we consider the risk of earth uake-induced liquefaction to be low.

We do not consider the site to be in a coastal erosion ha ard area since it is located at an elevation of over 460 feet and about ¼-mile from the coastline. Similarly, we do not consider tsunamis, flooding, and storm surges as ha ards for this site.

It is our opinion that the proposed residential development on this property is feasible subject to the geologic ha ard 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, owning a home in this area of Neahkahnie means there is an acceptance of risk by the homeowner that the property is located within a very large ancient landslide area (hundreds of acres) that could reactivate at some time in the future. We should caution that the Oregon coast 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 drawings topographic site plan provided to us, the site slope is not steeper than about 2.4H:1V. We do not consider the property to be oversteepened. As discussed above, the property appears currently stable when considering global, deep-seated landsliding, but the stabilized landslide mass could become unstable in the future—especially during a major earthquake.

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 property is located in a mapped landslide area on a coastal bluff. Several well documented landslide reactivations have occurred in this geologic unit during modern times. While the property did not appear to have experienced recent or ongoing slope movement, there is future risk of slope instability that could impact all or part of the property. Simply owning a property in this area of Neahkahnie brings with it a risk that cannot be entirely mitigated. The risk appears similar to other properties in the same area.

   To reduce the risk of reactivating the ancient slide, we recommend that site drainage be carefully controlled. Preferably, all stormwater should be collected and hard piped to an approved stormwater disposal area off the property. Specific geotechnical recommendations regarding the disposal of site stormwater are provided in Section 5.2.

   We also recommend that the building footprint be limited so that the new construction is not as disruptive to the native soils and vegetation. Based on our review of the proposed building footprint, it appears that the design has complied with our recommendation to limit the building footprint.

   We also recommend that minimal additional weight be placed on the lot to reduce the potential for landslide reactivation. In other words, the weight of the house and any imported fill to be placed should not be greater than the weight of the soil permanently removed from the property (i.e., from the house excavation). Based on the drawings provided to us, the house will be benched into the hillside and it does not appear that any significant fills to raise site grades (i.e. more than about 1 foot) will be necessary. If this is not the case, we should be notified so that we can consider modifying our recommendations.

   Because of the risk of the ancient landslide debris reactivating, we recommend all footings be tied together (i.e. integrated system of grade beams) so that the structure moves as a unit. We recommend isolated pad footings not be used.

   Finally, once construction is completed for the project, we recommend landscaping undeveloped surfaces. This will reduce erosion, inhibit transpiration of surface water, and provide anchorage of the near surface soils. The site should be reseeded or landscaped as soon as possible following the completion of the development. General maintenance, such as placement of much or straw, should be expected to promote young plant growth.

2. **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. Should this earthquake strike, there is high risk that it could reactivate part of the global landslide mass on the south side of Neahkahnie Mountain. It could also cause a localized slide to 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 Neahkahnie area are at a similar risk. We do recommend that the house foundation consist of an integrated system of grade beams (i.e. no isolated pad footings).

3. **Uncertainties in characterizing the site subsurface conditions.** As with all subsurface investigations, the boring logs only represent the conditions at the actual exploration location; variations occur and should be expected. For this project, we had to locate the drilled boring in Twana Trace because the sloping proposed building pad area was not accessible to our subcontracted drill rig. Additionally, the grading history of the site and the quality and extent of any potential manmade fill is difficult to characterize and uncertain. As shown in the upper 4 feet in B-1, and from our experience in the Neahkahnie area, some organic soil or decomposed woody debris is present in both the manmade fill and likely native colluvium soil as a result of past grading or pre-historic landslides.

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 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.

Any existing 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 below.

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.

Final landscaping should be put in place where the soil is exposed as soon as practicable once final site grades are established. Ground covers and creeping shrubs should be used to help protect from soil erosion. Jute, burlap, or similar geotextile (or loosely placed stray) may be used to protect the soil while the vegetation is being established, especially during the much wetter winter months. The landscape architect or contractor should assist in the selection of the specific plants that are suitable for this climate and use.

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

As stated above in Section 4.1, we recommend that minimal additional weight be placed on the lot to raise site grades. The added weight of any structural fill should not be substantially greater that the weight of soil removed from the property during excavation.

Where structural fill is required, it should be free of organic or other deleterious materials, have a maximum particle size less than about 6 inches, be relatively well graded, and have a liquid limit less than 45 and plasticity index less than 25. In our professional opinion, the on-site soils free of organics can be appropriate for use as structural fill. However, based on the moisture content at the time of our subsurface investigation, these soils may need to dry to achieve optimum moisture prior to compacting. As an alternative to using the native soils for structural fill, imported well-graded crushed rock gravel may be used.

We recommend any fill soils be moisture conditioned to within 3 percentage points below and 2 percentage points above optimum moisture as determined by ASTM D1557 (Modified Proctor). If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. The topsoil is not appropriate for structural fill but could be used as topsoil in landscaping areas.

Fill should be placed in a relatively uniform horizontal lift 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 the Modified Proctor maximum dry density as determined by ASTM D1557.

Each lift of compacted structural fill should be tested by a representative of the Geotechnical Engineer prior to placement of subsequent lifts. The fill should extend horizontally outward beyond the exterior perimeter of the building and pavements at least 5 and 3 feet, respectively, prior to sloping.

Fills that are constructed on slopes steeper than 5H:1V, such as the current site slope, should be benched into the hillside. Level benches should be a minimum of 4 feet wide laterally, and should be cut into the slope for every five feet of vertical rise. The placement of fill should begin at the base of the slope. All benches should be inspected by a representative of the Geotechnical Engineer and approved prior to placement of structural fill lifts. If evidence of seepage is observed in the bench excavations, a supplemental drainage system may need to be designed and installed to prevent hydrostatic pressure buildup behind the fill. Fill and cut slopes and disturbed natural soil slopes should be graded no steeper than 2H:1V.

4.4 Foundation Recommendations

Due to the deep stabilized ancient landslide deposit, we recommend the project Structural Engineer design the shallow foundations to be more rigid (i.e., additional concrete thickness and rebar) and tie all the footings together with an integrated gridded system of grade beams (i.e., no isolated pad footings). This approach does not mitigate movement due to a future landslide reactivation, but attempts to prevent the building foundation elements from moving differentially while also protecting life-safety. If the grade beam approach does not provide enough rigidity in the opinion of the Structural Engineer to mitigate total and differential settlement between columns, then a mat foundation could be used instead.

Footings can be designed for an allowable soil bearing pressure of up to 2,000 psf based on dead load plus design live load when bearing on the firm native soils or properly compacted granular structural fill placed upon the firm native soils, and can be increased by one-third when including short-term wind or seismic loads.

Lateral frictional resistance between the base of footings and the subgrade can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.35 for concrete foundations bearing directly on firm native soils or properly compacted granular structural fill placed upon the firm native soils. In addition, lateral loads may be resisted by passive earth pressures based on an equivalent fluid pressure of 250 pounds per cubic foot (pcf) for footings poured "neat" against the above-mentioned soil strata. These are ultimate values—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. To be clear, no safety factor has been applied to the friction factor recommended above either.

The bottom of the building foundation should be located at a depth of at least 12 inches below the final exterior grade to provide adequate frost protection. If the building is to be constructed during the winter months or if the foundation soils will likely be subjected to freezing temperatures after foundation construction, then the foundation soils should be adequately protected from freezing.

The foundation excavations should be observed by a representative of the Geotechnical Engineer prior to steel or concrete placement to assess that the foundation materials are capable of supporting the design loads and are consistent with the materials discussed in this report. Unsuitable soil zones encountered at the bottom of the foundation excavations should be removed and replaced with properly compacted structural fill as directed by the Geotechnical Engineer.

After opening, foundation excavations should be observed and concrete placed as quickly as possible to avoid exposure of the excavation bottoms to wetting and drying. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, the foundation concrete should be placed during the same day the excavation is made. If the soils will be exposed for more than 2 days, consideration should be given to placing a thin layer of rock atop the exposed subgrade to protect it from the elements.

4.5 Floor Slab Recommendations

Reinforced concrete floor slabs can be grade supported on 6-inches of property compacted, well-graded, granular structural fill (i.e., crushed rock gravel) placed upon approved subgrade. Based on the existing soil conditions, the design of slabs-on-grade can be based on a subgrade modulus (k) of 150 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

According to the providing documents, the basement wall along the northern side of the residence is expected to be up to about 9 feet tall. Retaining wall footings should be designed in general accordance with the recommendations contained in Section 4.4 above (i.e. rigid grade beam designed for an allowable bearing capacity of up to 2,000 psf).

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 60 pcf for sloping backfill with a maximum 2H: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 90 pcf for sloping backfill with a maximum 2H: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.

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.

For seismic loading on retaining walls, 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 8 psf * H^2 be applied at 1/3 H up from the base of the wall, where H is the height of the wall measured in feet. This applies for a backslope angle up to 10 degrees.

5.0 CONSTRUCTION CONSIDERATIONS

EEI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. EEI cannot accept any responsibility for any conditions that deviate from those described in this report, nor for the performance of the foundations if not engaged to also provide construction observation for this project.

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 moderately steep and the subsurface soils consist of ancient landslide debris, 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. If stormwater cannot be hard piped to a public system, then we recommend the use of stormwater planters, where the overflow is piped to the bottom of the property and then outlet onto the ground surface using a level spreader system so that it sheet flows. We recommend the level spreader pipe be at least 20 feet long to achieve sufficient sheet flow and avoid concentration of the water.

5.3 Excavations

Based on our past experience in the Neahkahnie area, vertical cut slopes in the ancient slide debris may at first appear to be stable. However, over time (typically a few days), the soils may "relax" and slough. As such, the contractor should take care when excavating into these soils and we strongly recommend that they either use temporary shoring, or lay the excavated slopes back. Once the site soils are exposed, we can consult with the contractor to determine a safe layback slope angle.

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.

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).

(7) The GEOLOGIC HAZARDS report shall recommend development standards that will protect development on the property and surrounding properties. These should include standards for:

(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 for grading are followed.

(b) Locations for structures and roads: The location of the proposed residence as shown in Figure 1 above is acceptable when considering the impact of geologic hazards.

(c) Land grading practices, including standards for cuts and fills: Based on the project drawings, the proposed house footprint has been intentionally designed to be compact so that it will comply with our recommendation to limit the area of ground and vegetation disturbance. Our recommended standards for cuts and fills are outlined in Section 4.3.

(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 on an integrated system of grade beams (i.e. no isolated pad footings) in order to protect life-safety.

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

(g) Management of storm water runoff during and after construction: As discussed in Section 4.1 and 5.2, we recommend that stormwater be solid piped to an approved off-site system If it cannot be piped off the property, we recommend it be disposed of at the base of the slope (adjacent to Twana Trace) using a level spreader system.

(8) The GEOLOGIC HAZARD report shall include the following 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. Undercutting, 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. These hazards cannot be completely mitigated (due to the very large size of the existing, stabilized landslide mass that impacts numerous previously developed properties in the area), however our recommendation to support the house on an integrated system of grade beams will protect life-safety (the minimum code requirement).

(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 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. If 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, the 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 James Anderson for the specific application to the proposed home development to be located at 7780 Twana Trace in Nehalem, 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.

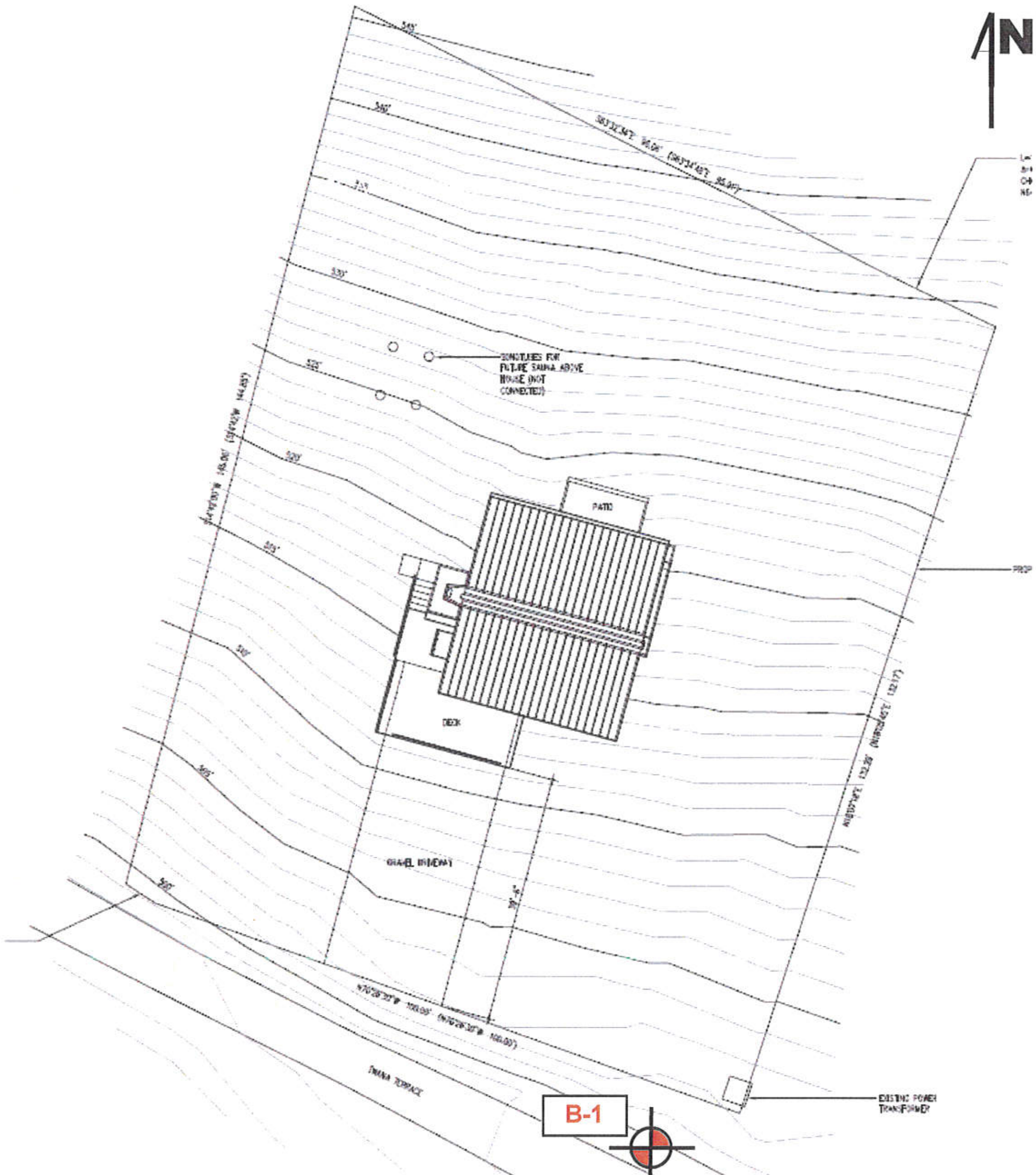
APPENDICES

APPENDIX A – SITE LOCATION PLAN

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

Earth Engineers, Inc.	**Proposed Anderson Single Family Residence "Neahkahnie House" 7780 Twana Trace Nehalem, Tillamook County, Oregon**	**Report No. 21-074-1**
		June 7, 2021

APPENDIX B – SITE EXPLORATION PLAN



LEGEND

Approximate Boring Location

Source: Detail 1 on Sheet A100 of drawing set "Neahkahnie House, 7780 Twana Terrace, Nehalem, OR 97131" prepared by Ballman Khapalova, dated April 12, 2021.

Earth Engineers, Inc.	**Proposed Anderson Single Family Residence "Neahkahnie House" 7780 Twana Trace Nehalem, Tillamook County, Oregon**	**Report No. 21-074-1**
		June 7, 2021

Earth Engineers, Inc.

Appendix C: Boring B-1

Client: Wolves Above, LLC
Project: Proposed Neahkahnie House
Site Address: 7780 Twana Trace, Neahkahnie, Oregon
Location of Exploration: See Appendix B
Logged By: Ken Andrieu, R.G.

Report Number: 21-074-1
Drilling Contractor: PLi Systems
Drilling Method: Mud Rotary
Drilling Equipment: Mobile B-58
Approximate Ground Surface Elevation (ft msl): 460'
Date of Exploration: 3/29/2021

Depth (ft)	Water Level	Lithology: Geologic Description of Soil and Rock Strata	Sample Number	Blows per 6 Inches	N_{60} value	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Pocket Pen (tsf)	Remarks
0		Road Gravel - 8 inches thick	SPT-1	6, 5, 2	9	15					
		SILTY GRAVEL (GM) - dark brown, silty gravel with sand and few organics, wet, dense									
2			SPT-2	4, 9, 26	45	31					
4		SILTY GRAVEL (GM) - brown, silty gravel with sand, moist, very dense									
6			SPT-3	9, 15, 20	45	20					
8			SPT-4	10, 6, 15	27	17	14				
10			SPT-5	11, 9, 6	19						No Recovery
12		SILT (ML) - dark brown to brown, silt with some sand, wet, medium stiff	SPT-6	2, 2, 2	5	37				0.5	
14						52					
			SPT-7	2, 31, 11	54	19				1	
16		POORLY-GRADED GRAVEL with SILT and SAND (GP-GM) - gray, angular, fine to coarse grained fractured basalt gravel with bluish gray, medium to coarse grained silty sand, wet, very dense. (Ancient landslide / colluvial deposit)									
20		Silty sand matrix becomes brown, transitions to medium dense	SPT-8	10, 8, 10	23	25					Mud loss below 20 feet.
26			SPT-9	11, 8, 9	22	16	9				
30											

Notes : Boring terminated at a depth of approximately 81.5 feet below ground surface (bgs). Groundwater was not determined due to use of mud rotary drilling method.Boring backfilled with bentonite chips on 4/30/2021. N60 values reported are based on a SPT hammer energy correction factor of 1.295 (i.e. 77.7/60), reference "Report of SPT Hammer Energies" prepared by GeoDesign Inc. dated 1/15/2020. Approximate elevation estimated from Google Earth.

Appendix C: Boring B-1

Earth Engineers, Inc.

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Approximate Ground Surface Elevation (ft msl): 460'
Date of Exploration: 3/29/2021

Depth (ft)	Water Level	Lithologic Symbol	Geologic Description of Soil and Rock Strata	Sample Number	Blows per 6 Inches	N_{60} value	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Pocket Pen (tsf)	Remarks
30			POORLY-GRADED GRAVEL with SILT and SAND (GP-GM) - gray, angular, fine to coarse grained fractured basalt gravel with brown, medium to coarse grained silty sand, wet, very dense. (Ancient landslide / colluvial deposit)	SPT-10	8 14 8	28	8					
35			transitions to dense	SPT-11	12 11 17	36	13	10				
40				SPT-12	23 14 11	32	13					
45				SPT-13	14 12 13	32	25					
50				SPT-14	15 12 16	36	11					
55			transitions to very dense	SPT-15	20 15 25	52	15	7				
60												

Notes : Boring terminated at a depth of approximately 81.5 feet below ground surface (bgs). Groundwater was not determined due to use of mud rotary drilling method.Boring backfilled with bentonite chips on 4/30/2021. N60 values reported are based on a SPT hammer energy correction factor of 1.295 (i.e. 77.7/60), reference "Report of SPT Hammer Energies" prepared by GeoDesign Inc. dated 1/15/2020. Approximate elevation estimated from Google Earth.

Appendix C: Boring B-1

Earth Engineers, Inc.

Client: Wolves Above, LLC
Project: Proposed Neahkahnie House
Site Address: 7780 Twana Trace, Neahkahnie, Oregon
Location of Exploration: See Appendix B
Logged By: Ken Andrieu, R.G.

Report Number: 21-074-1
Drilling Contractor: PLi Systems
Drilling Method: Mud Rotary
Drilling Equipment: Mobile B-58
Approximate Ground Surface Elevation (ft msl): 460'
Date of Exploration: 3/29/2021

Depth (ft)	Water Level	Lithologic Symbol	Geologic Description of Soil and Rock Strata	Sample Number	Blows per 6 Inches	N_{60} value	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Pocket Pen (tsf)	Remarks
60			POORLY-GRADED GRAVEL with SILT and SAND (GP-GM) - gray, angular, fine to coarse grained fractured basalt gravel with brown, medium to coarse grained silty sand, wet, very dense. (Ancient landslide / colluvial deposit)	SPT-16	50 /5"	100	9					
65				SPT-17	17 30 50/5"	100	14					
70				SPT-18	16 19 16	45	11					
75				SPT-19	16 50/3"	100	20	24				Lost mud circulation below 75 feet.
80				SPT-20	16 33 22	71	15					

Notes : Boring terminated at a depth of approximately 81.5 feet below ground surface (bgs). Groundwater was not determined due to use of mud rotary drilling method.Boring backfilled with bentonite chips on 4/30/2021. N60 values reported are based on a SPT hammer energy correction factor of 1.295 (i.e. 77.7/60), reference "Report of SPT Hammer Energies" prepared by GeoDesign Inc. dated 1/15/2020. Approximate elevation estimated 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	¾ inch to 3 inches
Gravel - Fine	No. 4 sieve to ¾ inch
Sand - Coarse	No. 10 to No. 4 sieve (4.75mm)
Sand - Medium	No. 40 to No. 10 sieve (2mm)
Sand - Fine	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

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

TILL 361

State Well No. 3N/10W-19aa

State Permit No.

(1) OWNER:

Name: Benjamin Reed (M)

Address: Rte. 1 Box 183H Nehalem, Ore.

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☒

6 " Diam. from 0 ft. to 44 ft. Gage 19#
5 7/16 " Diam. from 7 ft. to 92 ft. Gage 10 liner
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☒ Yes ☐ No.

Type of perforator used: Torch

Size of perforations 1/8 in. by 4 in.

1/8x4 perforations from ft. to ft.
50 perforations from 7 ft. to 20 feet from bottom ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.

Static level none ft. below land surface Date Nov. 2

Artesian pressure lbs. per square inch Date

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Bailer test no gal./min. with no ft. drawdown after no hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(10) CONSTRUCTION:

Well seal—Material used: Sand and cement

Depth of seal 44 feet casing 92 ft. liner ft.

Diameter of well bore to bottom of seal 9 in.

Were any loose strata cemented off? ☐ Yes ☒ No Depth

Was a drive shoe used? ☐ Yes ☒ No

Did any strata contain unusable water? ☐ Yes ☒ No

Type of water? depth of strata

Method of sealing strata off

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

(11) LOCATION OF WELL:

County Tillamook Driller's well number

¼ ¼ Section 19AA T. 3N R. 10W W.M.

Bearing and distance from section or subdivision corner

(12) WELL LOG: Diameter of well below casing 6 inch

Depth drilled 92 ft. Depth of completed well 92 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
Broken rock and lava	0	92	

Work started Sept 5 1967 Completed Sept 8 1967

Date well drilling machine moved off of well Sept 8 1967

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Ralph Turner (Drilling Machine Operator) Date Sept 8, 1967

Drilling Machine Operator's License No. 254

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Ralph Turner Drilling Co. (Person, firm or corporation) (Type or print)

Address Rte. 1 Box 141, Hillsboro, Ore.

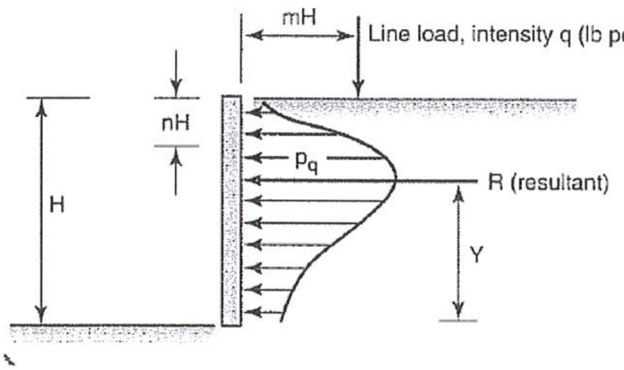
[Signed] Ralph Turner (Water Well Contractor)

Contractor's License No. 247 Date Sept 8, 1967

(USE ADDITIONAL SHEETS IF NECESSARY)

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

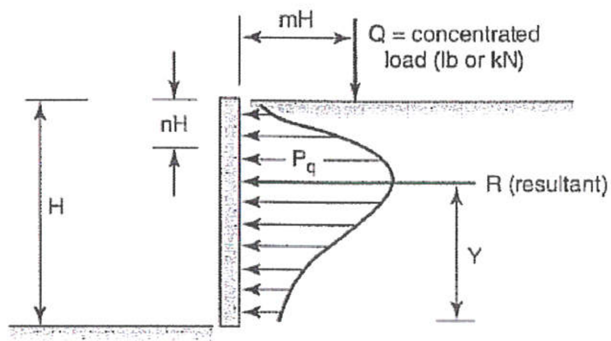
LINE LOAD (applicable for retaining walls not exceeding 20 feet in height):



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:

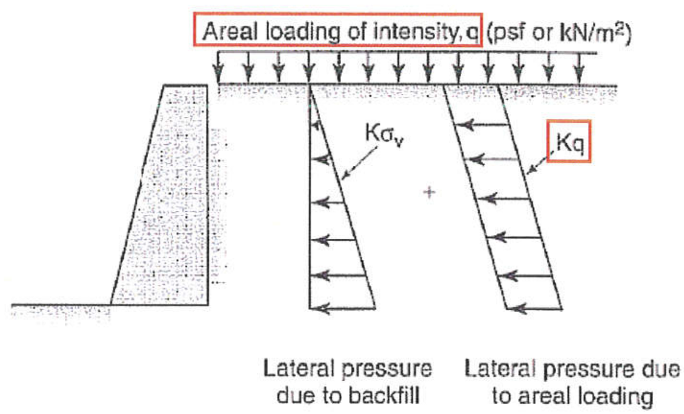
Figure 16-26 Influence of areal loading on wall pressures.

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."