OREGON PARKS AND RECREATION DEPARTMENT
OCEAN SHORE PERMIT APPLICATION

SHORELINE PROTECTION STRUCTURES

FOR OFFICIAL USE ONLY

OPRD PERMIT #:	3046
APPLICATION DATE:	~~10/3/2023~~
DATE POSTED:	10/5/2023
COORDINATOR:	Blanchette
60 DAY DUE DATE:	11/26/23

Section 1. Proposed Project

Project type:

☒ Riprap Revetment	☐ Vegetative Stabilization
☐ Seawall	☐ Other

Provide a brief description of the project:

At 3216 Pacific Street in Cannon Beach, construct a riprap revetment at the western edge of the property with dimensions of approximately 60 feet long, 20 feet wide, and 20 feet long (including subsurface portion)

Estimated project start date 10/16/23	Estimated project completion date 11/10/23

Section 2. Applicant Information

Owner Stephen and Laurel Day	Agent Garrett Stephenson
Mailing Address 2135 S 2200 E	Mailing Address 1211 SW Fifth Ave., Suite 1900
City Salt Lake City State UT Zip 84109	City Portland State OR Zip 97124
Phone (208) 284-9019 Fax	Phone (503) 796-2893 Fax
Email stephentday33@gmail.com	Email gstephenson@schwabe.com; bmoswald@schwabe.cc

Primary Contact	☐ Owner	☒ Agent

Section 3. Property Location and Information

Situs Address	3216 Pacific Avenue				
City/Town	Cannon Beach		County	Clatsop	
Township 5N	Range 10W	Section 31	Subsection NE, SE	Tax Lot 2100	

Current Use

☒ Residential	☐ Commercial/Industrial	☐ Public
☐ Vacant (unbuilt)	☐ Other (explain)	

City/County Zoning Designation R1	Year main structure was built 1931

Lot Dimensions

Lot Size 0.12 acre	Oceanfront footage (in feet) 60
Street front footage (in feet) 60	East-West footage (in feet) 90

Setbacks

Distance from eastern (or landward) property line to nearest building (in feet)	5
Distance from seaward dune crest or bluff edge to nearest building (in feet)	25
Approximate height of oceanfront bluff, dune or escarpment (in feet)	10

List the names, situs and mailing addresses of oceanfront landowners with property boundaries common to those of the property or properties described in the application.

Name	Property situs address	Mailing address
S4 Investments LLC	3188 Pacific Street, Cannon Beach, OR 97145	5615 SE Scenic Lane #301, Vancouver,WA 98661
Isabel House LLC	3264 Pacific Street, Cannon Beach, OR 97145	4919 N Mildred Street, Tacoma,WA 98407-1329

Section 4. Project Justification and Impacts

Provide a detailed explanation of the hazards and threat to property:

See Supplemental Application Narrative, narrative attachments, and Geotechnical Investigation and Design Report by Earth Engineers, Inc.

(Include documented supporting evidence, i.e. photographs, and/or chronology of bank retreat)

Attach additional pages as necessary

Describe all potential impacts:

See Supplemental Application Narrative, narrative attachments, and Geotechnical Investigation and Design Report by Earth Engineers, Inc.

Attach additional pages as necessary

Describe measures that will be taken to minimize the impacts identified above:

See Supplemental Application Narrative, narrative attachments, and Geotechnical Investigation and Design Report by Earth Engineers, Inc.

Attach additional pages as necessary

Section 5. Project Details

Total Length along shoreline (in feet) 60	Height (in feet) Up to ~18 (including up to ~10 feet subsurface
Total width of project (in feet) Up to ~18	
Slope (ratio-horizontal to vertical) 1H:1V	Total volume of all material(s) (cubic yards) ~800

Riprap Specifications:

Armor stone type Basalt	Armor stone source Knife River Seaside Quarry or similar
Diameter of armor stone (in feet) 2-6	Amount of armor stone (cubic yards) 506
Type of filter fabric Mirafi Filterweave 700, or equivalent	Type of backing fill material 6-inch minus pit run
The amount of backing fill material (cubic yards) 300	Will toe be keyed into bedrock? ☒ Yes ☐ No
Elevation of toe trench ~6-8' (NAVD 88)	Depth of toe trench ~10-12 feet

Section 6. Analysis Of Hazard Avoidance

Please verify that the attached hazard avoidance analysis includes:

☒ A list of hazard avoidance alternatives	
☒ A description of why hazard avoidance alternatives are not feasible	☐ If an alternative was tried, explain why it did not succeed

☐ Is the relocation cost estimate included? ***(If the cost of moving the building is listed as an unfeasible factor.)***

Section 7. Geologic Report

Please provide the following information:

Date of Report 11/22/22		Company Earth Engineers, Inc.	
Geologist Name Adam Reese		Geologist Certifications RG, CEG (OR)	
Mailing Address 2411 SE 8th Avenue			
City Camas	State WA	Zip 98607	
Phone (360) 567-1806	Fax	Email address adam@earth-engineers.com	

Please verify your geologic report contains all of the following information:

☒ The potential impacts from the proposed project on the sand source, supply, and movement on the affected beach as well as within the same littoral cell.	☒ A review of potential non-structural solutions, including, but not limited to: vegetative stabilization; non-structural dynamic revetments and foredune enhancement.
☒ The known or suspected geologic and seismic hazards in the project area and how the proposed project may affect or be impacted by those geologic and seismic hazards.	☒ The bank or bluff stability and erosion rates on the subject property and adjacent properties.

Section 8. Additional Permit Requirements

List the agency and type of permit required:

No permit is required from USACE or Oregon DSL.

Conditional Use Permit CU#23-01 approved by Cannon Beach Planning Commission on March 23, 2023

☐ **No additional agency permit required**

Section 9. Signature Requirement

The application is hereby made for the ocean shore alteration described within this application. I certify that I am familiar with the information contained in this application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed alteration.

I understand that the granting of an OPRD permit does not release me from obtaining any additional permits from any/all local, state, and/or federal agencies that may be required before commencing the project.

I understand that the payment of required OPRD processing fee does not guarantee the issuance of an approved permit.

09-05-2023

Owner Signature — Date

☒ *I (Owner) authorize the Agent included in this application to act on my behalf during this application process.*

09-06-2023

Agent Signature — Date

Section 10. Required Drawings

The submitted application shall be accompanied by a plan view and a cross-section of the proposed project. Neatness and accuracy are important in order for those reviewing the application to clearly understand the proposal. Copies of county assessor's maps may not be used as site plan maps.

For consistency and quality please follow these format specifications:

- **All Drawings shall be:**
  - On 8.5 X 11 inch white paper
  - In black ink or clear legible photocopy of plan(s)
  - Printed or typed (no cursive) minimum size 10 point font
  - Drawn with a straight-edge and not freehanded.
  - Drawn accurately to scale
  - Be labeled appropriately

- **Plan view drawing shall include:**
  - Scale of drawing and north arrow
  - All lot lines with dimensions
  - Existing structures
  - Roads, driveways, etc. (existing, proposed, or temporary access roads)
  - Setback distance from nearest structure or infrastructure to upper edge of bluff or dune edge
  - Location of proposed improvements in relation to Statutory Vegetation Line and Actual Vegetation Line
  - Location of proposed project in relation to all property lines
  - Location of the proposed project in relation to the top of the bluff or dune and the existing toe of bluff or dune

- **Cross-section (side view) drawing shall include:**
  - Scale of drawing
  - Location of the existing base of bluff or dune
  - Location of top of bluff or dune
  - Location of proposed project in relation to base and top of bluff or dune
  - Approximate length, in feet, the project will occupy beyond the existing toe of bluff or dune, include buried toe of proposed shoreline protection structure.
  - Depth of toe trench or footing
  - Slope of the project (width/height ratio (i.e. 2:1))
  - Overall height of the project from bottom of buried toe to the top
  - Armor stone layer with rock size accurately depicted
  - Thickness of armor stone
  - Backing fill layer with thickness accurately depicted
  - Type of filter fabric, if applicable

Section 11. Application Fees and Calculation Worksheet (to be submitted with application)

Each application filed under ORS 390.640, for an alteration on the ocean shore shall be accompanied by a processing fee for the purpose of partial recovery to the Department of its administrative costs. The fee shall be determined according to the construction value of the project.

The application processing fee shall be:
(a) $400 for projects with a construction value less than $2,500; or
(b) $400 plus three percent of the construction value over $2,500 for projects with a construction value equal to or greater than $2,500.

Please use the formula below to determine total application fees.

Total construction value of project		$	81,859.39	
Base construction value (Subtractable allowance)	-	$	2500.00	
Subtotal (construction value minus base fee)	=	$	79,359.39	(x .03 =)
3% of subtotal		$	2,380.78	
Add Base Fee	+	$	400.00	
TOTAL APPLICATION FEE	=	$	2,780.78	

EXAMPLE

Total construction value of project		*$*	*10,000.00*	
Base construction value (Subtractable allowance)	*-*	*$*	*2,500.00*	
Subtotal (construction value minus base fee)	*=*	*$*	*7,500.00*	*(x .03 = 225.00)*
3% of subtotal		*$*	*225.00*	
Add Base Fee	*+*	*$*	*400.00*	
TOTAL APPLICATION FEE	*=*	*$*	*625.00*	

Submitted Ocean Shore Permit Application shall include this completed fee worksheet, as well as, evidence of construction value

Thoreson Excavating, LLC

PO Box 1350
Astoria, Or. 97103
503-440-1594
CBC# 216409

Estimate

Date	Estimate #
4/10/2023	151

Name / Address
Stephen Day

Project

Description	Qty	Rate	Total
LABOR,EQUIPMENT,GENERAL MATERIALS(fabric,etc.) Total: $45,195.39			
Hauled in equipment for project	1	500.00	500.00
5400 sqf of fabric	5,400	0.20	1,080.00
Dig out and place materials(rip rap, sand, construction rock)	120	140.00	16,800.00
Trucking materials to site	177	120.00	21,240.00
Set up site fencing and caution tape morning,night and place fabric fencing and related materials	80	65.00	5,200.00
	1	375.39	375.39
RIP RAP($24,794.00)			
Rip Rap for wall	506	49.00	24,794.00
CONSTRUCTION ROCK($5,750.00)			
Construction rock between fabric and rip rap	230	25.00	5,750.00
SAND($6,120.00)			
Sand to cover and plant project	300	20.40	6,120.00
" Prices Subject to Change"			
		Total	$81,859.39

CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT

Applicant

Last	First	MI
Day	Stephen & Laurel	

Property Details

Township	Range	Section	Subsection
5N	10W	31	NE, SE

Tax Lot 2100

County

☒ Clatsop	☐ Tillamook	☐ Lincoln	☐ Lane
☐ Douglas	☐ Coos	☐ Curry	

Project Type

☒ Shorefront Protection	☐ Access/Other Misc.	☐ Sand Alteration
☐ Pipeline/Cable/Conduit	☐ Natural Product Removal	

Planning Department Certification
(To be completed by local planning official)

Part I

In accordance with Statewide Planning Goal #18, Beaches and Dunes alteration permits for beachfront protective structures may be issued only where development existed on January 1, 1977, or where an exception to this Goal 18 implementation requirement has been approved by the appropriate local jurisdiction. For the purpose of this requirement, the definition of "development" means houses, commercial and industrial buildings, and vacant subdivision lots which are physically improved through the construction of streets and provisions of utilities to the lot.

Above property meets Goal 18 Eligibility? ☒ Yes ☐ No ☐ Not Applicable

Part II

I have reviewed the proposed project application and have determined that:

☐ This project is not regulated by the local comprehensive plan and zoning ordinances.

☑ This project has been reviewed and **is consistent** with the local comprehensive plan and zoning ordinance.

☐ This project has been reviewed and **is not consistent** with the local comprehensive plan and zoning ordinance.

☐ The consistency of this project with the local planning ordinance cannot be determined until the following local approvals are obtained:

☐ Conditional Use Approval ☐ Zone Change ☐ Plan Amendment
☐ Development Permit ☐ Other (Specify) _____

Comments:

Conditional Use 23-01 approved March 23, 2023

Robert St. Clair — Planner

Local Planning Official Name (Please Print) — Title

June 1, 2023

Signature — Date

The completed/signed form shall be submitted with the completed Ocean Shore Permit Application

Supplemental Application Narrative

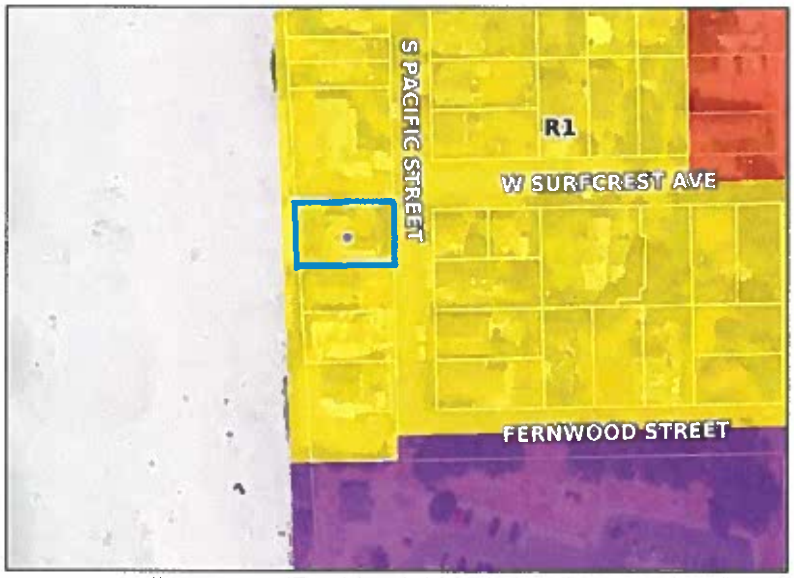
Ocean Shore Permit Application No. XX-XXXX

Day Residence - 3216 Pacific Street, Cannon Beach, Clatsop County, Oregon

August 31, 2023

This narrative supplements the above-referenced application to the Oregon Parks and Recreation Department (OPRD) for an ocean shore permit to allow the construction of a proposed Shoreline Protection Structure (SPS), a riprap revetment along the ocean bluff in order to protect the oceanfront property located at 3216 Pacific Street (TL 2100) in Cannon Beach, Clatsop County, Oregon. Erosion of the low bluff on the west side of the property has caused the undermining and destruction of a former seawall that protected the property, and the purpose of the proposed revetment is prevent ongoing erosion that poses an imminent threat to structures on the property, including a concrete wall at the top of the existing bluff, a deck, and the single family residential structure. This narrative presents that there is (1) a need for shoreline protection for this property and (2) that the type of protection proposed (riprap revetment) is the alternative with the least impact among reasonable shoreline protection alternatives that would be viable at this location.

Figure 1: Map showing the subject property (outlined in blue) and zoning of the



surrounding area. (Residential Moderate Density ("R1").

1.0 SITE DESCRIPTION

The residence is located in Clatsop County in Cannon Beach north of Tolovana Park. The Subject Property is zoned Residential Moderate Density ("R1") as shown on the excerpt from the Cannon Beach municipal map pictured above.

The Subject Property is bordered by single family residences to the north and south, South Pacific Street to the east, and the beach to the west. It is located approximately 200 feet north of the Tolovana Beach State Recreation parking lot. The subject property (TL 2100) has beach frontage that is approximately 60 feet wide and has no current bluff protection. The height of the bluff slope at this property location is up to approximately 10 feet, as measured in elevation from the beach to the backyard of the upland property. The width of the backyard from the residential structure to the top is approximately 25 feet. Based on a review of past photos of the property, the beach elevation at this location varies seasonally and annually.

2.0 PROJECT OVERVIEW

The existing single-family residence on the Subject Property was constructed in 1931. As a result, the Subject Property is eligible for shoreline stabilization consistent with Goal 18 and the "Oregon Beach Bill," which require properties to be developed prior to January 1, 1977 to be eligible for shoreline stabilization, up to and including hard structural protection such as rip-rap revetments. The adjacent beach frontage is approximately 60 feet wide and, as shown in the existing condition photograph below, has no current bluff protection.

The former concrete wall protecting the existing home on the Subject Property was destroyed due to beach erosion sometime in the last decade. As stated in the Geotechnical Investigation and Design Report, prepared by Earth Engineers, Inc. (EEI), dated November 22, 2022 and attached, in the absence of permanent shoreline protection, slumping and slope regression will continue. This poses an imminent threat to structures on the property, including a concrete wall at the top of the existing bluff, a deck, and the single family residential structure . The proposed SPS will be armored with riprap, and will be 60 feet long, up to 20 feet wide, and up to 20 feet in height at a slope of 1Horizontal:1Vertical (1H:1V). in accordance with the EEI report. The design of the revetment is meant to accomplish several objectives, including preventing further bluff erosion and landward retreat, improving stability of the bluff, minimizing risk of slope failure during an earthquake, avoiding adverse impacts on the shoreline of adjacent properties, and ensuring compliance with all applicable regulations. As outlined in the narrative detail below, this Application meets the standards and criteria for approval of a shoreline stabilization permit.

3.0 APPLICATION SECTION 4

The following narrative addresses each of the items specified in Section 4 of the Application.

3.1 Provide a detailed explanation of the hazards and threat to property:

The purpose of this section is to provide a description of the hazard and the threat it poses to the property, as justification for the request for authorization to alter the ocean shore area by constructing a Shoreline Protection Structure (SPS). A complete hazard analysis, design specifications, and considerations are provided in EEI's attached Geotechnical Investigation and Design Report. The following are the applicable hazards:

1. **Erosional Susceptibility.** Coastal erosion is the primary hazard to this property, including erosion from tidal and wave impacts during seasonal extremes. As mentioned above, the bluff at the site experiences continuous ocean wave erosion. As presented in the publication "Coastal Erosion Hazard Zones in Southern Clatsop County" (Witter et al, 2009), the estimated the rate of bluff retreat could be as high as approximately 5 feet per decade in southern Clatsop County, Oregon. On that basis, the concrete wall (as evident in visual observations of the bluff face and concrete wall) and a deck at the top of the existing bluff are at immediate risk, given their proximity to the existing top of the bluff. Regarding the existing single-family residence, to maintain lateral support of the bearing soils beneath building foundations EEI typically recommends that all foundations on or adjacent to oversteepened slopes be setback at least 1 foot horizontally from an imaginary 2H:1V plane to the horizontal, projected upward from the base of the slope. On that basis, assuming an average bluff retreat rate of 5 feet per decade, the existing single-family residence (at a distance of approximately 25 feet away from the existing edge of the near-vertical bluff that is up to approximately 10 feet in height) is at risk of being at a distance of less than the minimum recommended setback within a decade or less. Based on the observed conditions and erosion potential, there is a reasonable need for permanent shoreline protection for the subject property to stabilize the bluff base and shield the bluff from wave attack and continued undercutting. On that basis, we recommend armoring the shoreline with riprap.

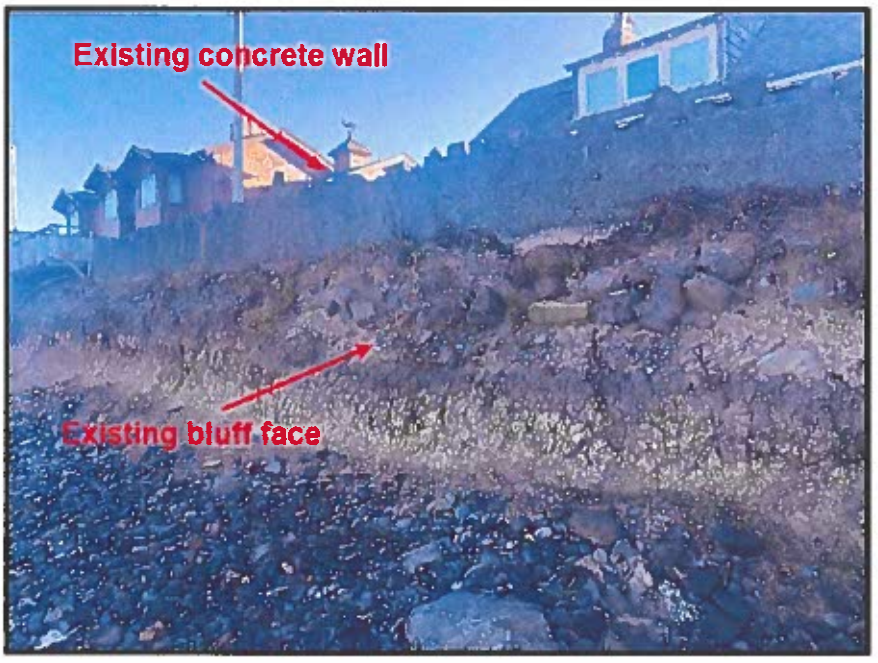


Photo 1: Existing eroded bluff face, and concrete wall at the top of the bluff.

The low oceanfront bluff at this location is composed of weakly consolidated marine terrace deposits. The low beachfront bluff on the west side of the properties in this area to the north of Tolovana Beach State Recreation Area parking lot have historically undergone episodic sloughing and erosion. The erosion resulted in undercutting and destruction of a former concrete seawall (Photo 2 and Photo 3). The material at the base of the bluff slope at TL 2100 has been eroded away leaving the bluff in a near-vertical condition. The existing top of the bluff (Photo 1) currently is approximately 16 feet east of the statutory vegetation line (Figure 1, Tax Map) established by the Oregon Beach Bill.

Photo 2: Undated historical photo provided by the property owner, looking east at the subject property and seawall (note that the beach elevation at the time of the photo is substantially higher than the current beach elevation.)

2. **Regional Seismic Hazard.** Peripheral to the coastal erosion hazard, the change in conditions that would result from a regional seismic event would likely exacerbate coastal erosion impacts. Abundant evidence indicates that a series of large earthquake related to the Cascadia Subduction Zone have occurred along the coastline of the Pacific Northwest over thousands of years. The calculated possibility of a Cascadia earthquake will occur in the next 50 years ranges from 7-15 percent for a great earthquake affecting

the entire Pacific Northwest, to about 37 percent for a major earthquake influencing the southern end of the Cascadia Subduction zone. In general, settlement, liquefaction, and landsliding of earth material (e.g., bluff slopes) are anticipated to occur in conjunction with this type of major seismic event.

3. **Climate Change.** Also peripheral to the coastal erosion hazard, climate change will likely contribute to increased coastal erosion and impacts to the property. Despite offsetting effects of tectonic uplift, sea levels are rising on the northern Oregon coast and global climate models are project increasing rates of rise in the future (Guidebook on Erosion Control Practices on the Oregon Coast, State of Oregon Department of Land Conservation and Development [DLCD], 2021). The potential impacts of sea level rise on the subject property include flooding, increased wave heights, and erosion of the beach and bluff. As with seismic considerations, climate change is a factor that will only exacerbate the current state of erosional susceptibility of the subject property. This is additional justification for installing the more robust structural shoreline protection solution (riprap) for this property.

Photo 3: Undated photo of site beachfront and former seawall, presented in Witter et al (2009) as an "example of a seawall in Cannon Beach that has been undermined by wave erosion".

To address these hazards and threats, the property owner requests OPRD authorization to construct a 60-foot long SPS to protect the property against anticipated ocean processes and from ongoing coastal erosion impacts. In the absence of permanent shoreline protection, slumping and slope regression will continue; and unless the bluff base is stabilized and shielded from wave attack, this property will be subject to continued undercutting and eventual loss.

Photo 4: Photos of site beachfront in January 2022 showing ocean runup at high tide, facing north (provided by Stephen Day, property owner).

3.2 Describe all potential impacts:

The purpose of this section is to describe all potential impacts this project may have in the short and long-term to neighboring properties, to recreation, scenic, safety, and natural resources of the ocean shore. Possible adverse impacts are specifically addressed in Section 3.3 of EEI's attached Geotechnical Investigation and Design Report. The potential impacts, including impacts from the SPS and impacts from the construction activities, are as follows:

1. **Impacts from the SPS and measures to minimize the impacts.** In terms of impacts, the inherent purpose of the revetment is to stop the occurrence of bluff erosion at this location. By reducing the supply of erodible material (in this case, the fine-grained bluff soils), there is also inherently a reduction of material supply within the littoral cell. However, based on the relative width of property ocean frontage, that the quantity of material that would have been transported from the subject property is a de minimis volume relative to the scale of the littoral cell. The sand will be imported, and will therefore represent a net addition of erodible material within the littoral cell. In addition, the revetment design specifies a surficial vegetated sand blanket, required by the City of Cannon Beach Conditional Approval to be maintained and monitored for a period of 5 years after revetment construction. The monitoring will include monthly inspection (including checklist and photo documentation) by the homeowner (or representative) to assess the vegetative cover and sand blanket. An annual engineering inspection will be conducted in the month of September by the geotechnical engineer of record to assess the overall condition of the structure. Following engineering inspection, repairs (if needed; e.g., replanting or limited sand management) to the SPS will be conducted on an annual basis, prior to the wet season. The annual engineers report will include the monthly inspection documentation

(provided by the property owner) as an attachment. The annual report will be retained by the engineer for a minimum of 5 years, and can be provided to OPRD or the City of Cannon Beach upon request.

Impacts of shoreline protection can also include changes in aesthetic value, public use of the beach, and impacts to natural resources. The proposed design will give the revetment a surficial appearance of a vegetated dune, so the appearance will be an improvement over the existing condition of exposed seawall and riprap. The revetment is located on private property, so public access will not be inhibited.

The structure will not obstruct views of the ocean or beach from adjacent properties and will be consistent with other revetments immediately adjacent and slightly further to the north and south of the property. Lastly, there are no substantive natural resource impacts that will result from the revetment construction. The riprap structure is designed to avoid negatively affecting other properties, the surrounding environment, and shoreline appearance.

2. **Impacts from the construction activities and measures to minimize the impacts.** Impacts to the beach in the project vicinity can result from SPS construction. These may include impacts to public access, public recreation opportunities, public safety, and surrounding ecosystems. Among these, the primary applicable impacts are construction-related safety hazards and limitations of public access due to construction work. The construction work will need to be performed from the beach (as opposed to constructing the revetment from the upland property) because there is not sufficient on the property for construction equipment access/egress from Pacific Avenue to the west side of the property. Aside from the revetment itself, no substantial or permanent physical alterations to the beach are required for access, staging, or construction activities.

   Regarding the potential for temporary limitations to public access or recreation, and safety risks that could result from the construction work (if unmitigated), the attached supplemental Construction, Staging, and Safety Plan addresses those potential impacts and how they will be mitigated. Key concepts presented in the plan are as follows:

   - Because the beach is flat and unvegetated between the property and the Tolovana Park access point (the ramp at the west end of West Warren Way) no alterations will be necessary for use of the beach as a haul route or staging area. As indicated in the Construction Plan, material will generally be trucked to the site on the day that it will be placed, and there will be no substantial quantity of material stored on the beach throughout the period of construction.
   - To ensure that the public does not inadvertently enter active construction areas, warning signs will be placed along the haul route, in the staging area, and in the work area. These areas will be well delineated with high visibility signage.

- Extreme caution will be used while equipment is being operated. The public will always be given the right of way in any situation where areas accessible to the public intersect the work area, staging area, or haul route.
- When the beach access is constricted at high tide, equipment will be moved and/or operated so that public access to the beach is preserved.
- All construction work will be conducted on weekdays when public beach use is lowest, and work will not be performed on weekends or holidays.
- Daily "cut and cover" excavation practices will be used, so that excavations are not left open outside of active work hours.

4.0 APPLICATION SECTION 6

Alternatives to the recommended hazard avoidance measure (rip-rap revetment construction) are presented on EEI's attached Geotechnical Investigation and Design Report. Alternatives considered include each of the nonstructural and structural shoreline protection described in Guidebook on Erosion Control Practices on the Oregon Coast (Oregon DLCD, 2021), including vegetative stabilization, sand alteration, sand burrito, and dynamic cobble berms. As described in the EEI report, none of these alternatives are recommended as effective solutions for mitigation of the coastal erosion conditions affecting the subject property. These protection measures would not be sufficient to resist wave attack in order to substantially slow or halt erosion, or to stabilize the bluff slope.

Addressing "reasonable alternatives" for protection/mitigation (OAR 736-020-0010), the performance of non-structural solutions in the vicinity of the subject property. Non-structural shoreline protection in the vicinity of the subject property includes several examples of attempts at vegetative stabilization. Vegetative stabilization can be an alternative to the more sturdy structural solutions in some areas of the Oregon Coast; however, it is not suited to areas where the erosion conditions are too severe to allow establishment of vegetation, or to prevent erosion of the underlying terraced soil structure.

As the closest analog to the subject property in terms of both the localized conditions and time period of construction (i.e. factoring in both the erosive forces at the location and present-day conditions when vegetation would become established), the recently constructed vegetated soil burrito structure at the adjacent property to the south (3188 Pacific Avenue) offers a case study of the limited effectiveness of a non-structural solution for the subject property. The shoreline protection at 3188 Pacific Avenue (constructed in 2021) consists of an embankment constructed of terraces created by wrapping fine-grained soil (presumably borrowed at the SPS location) in a synthetic geotextile (geogrid) material, then vegetated with willow plants. At the time of our initial preliminary reconnaissance site visit to the subject property on September 8, 2022 (see Photo 5 below) the lower portion of the structure (i.e. the lower 2-4 feet above the beach) was observed to be damaged, including washout of the fine-grained soil within the open-matrix geogrid and oversteepened (i.e. steeper than the design slope) embankment denuded of vegetation.

Based on the observed condition of the soil terraces and vegetation, we recommend that the embankment at 3188 Pacific Street will require reconstruction, including removal and replacement of the geotextile-wrapped terraces. This reconstruction (after only 1-2 years) will require substantial construction effort and cost. Correspondingly, we recommend that this was not a "reasonable" alternative for the erosive conditions at this location, and experimentation with similar non-structural solutions for the subject property is not warranted based on the limited chance of success and high cost of maintenance.

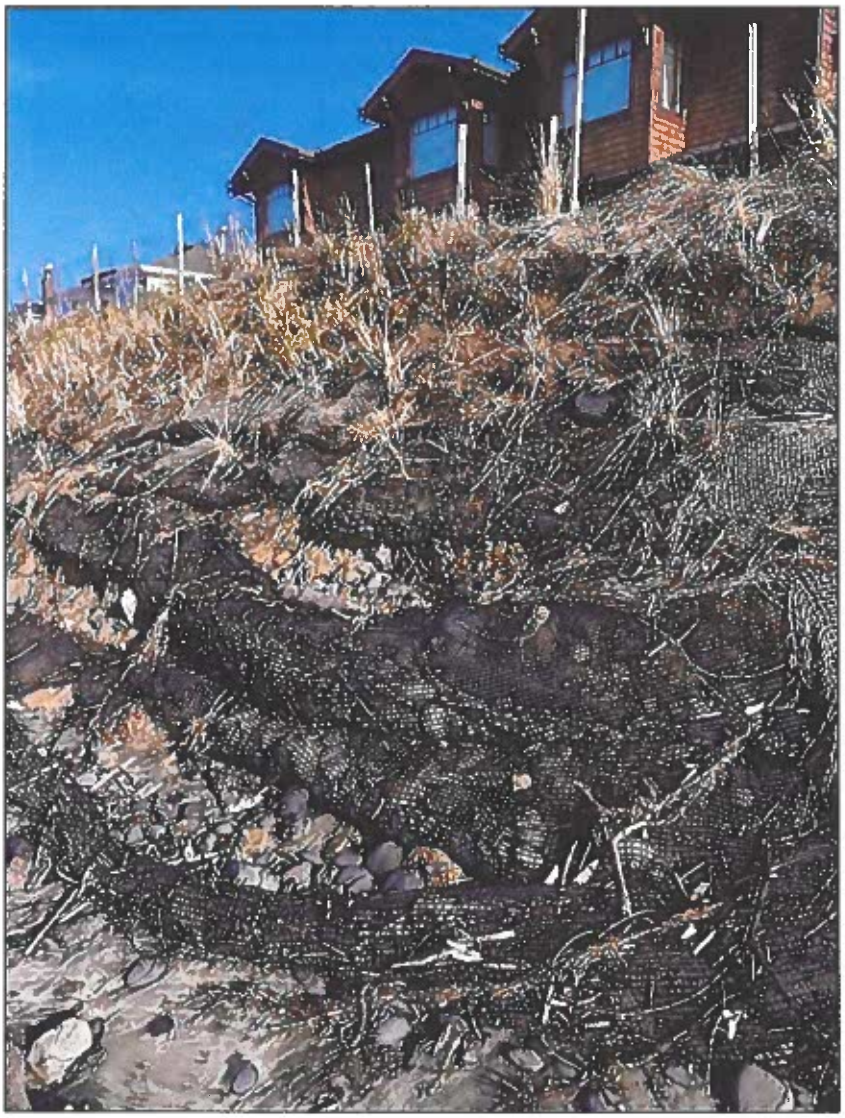


Photo 5: Damaged vegetated soil burritos at the adjacent property (3188 Pacific Street; September 2022).

Another example of vegetative stabilization is present at 3276 Pacific Street. Unlike the subject property, this property was developed in 2004 and was therefore ineligible for a structural SPS

(i.e. whether or not the structural SPS was the best alternative for this property, it could not have been considered as an alternative for shoreline protection at 3276 Pacific Street). Notably, in 1999, a rip-rap revetment was proposed for property after receiving a conditional use permit from the City of Cannon Beach; however, OPRD did not issue a construction permit for the revetment, presumably because the property had been developed after 1978. Based on the review of the 2004 OPRD permit (BA 580-04), the vegetative stabilization shoreline protection was designed as a 1.5H:1V sloped bank made of clay-filled geotextile pillows, then planted with native willow. The permit also allowed a 2-foot-wide gravel beach access pathway to be installed at the north end of the property.

Based on a visual reconnaissance of the 3276 Pacific Street vegetated bank in August 2023, it was observed that the existing slope is currently vegetated. However, it appears that the vegetated slopes have eroded and are steeper than the design slope of 1.5H:1V (locally 1:H:1V or steeper), with plastic geotextile and vegetation roots exposed at the surface across the structure, indicating failure of the structure in the current climate conditions. The history of maintenance, supplementing, and/or rebuilding of this structure is unknown within the time period since construction in 2004; however, there is visual evidence that the erosion resistance of the slope is enhanced by angular basalt boulders present on and in front (west) of the existing bank. We anticipate that permitting authorities (City of Cannon Beach and OPRD) would consider the vegetative stabilization design.

Based on the conditions observed at 3276 Pacific Street bank indicating erosion under the vegetation, as well as the ineligibility of this property for a structural solution, and the limited understanding of maintenance and/or reconstruction of that bank, this was not an example of a "reasonable" alternative for properties that are eligible for a more robust structural SPS. Further, we recommend that the conditions at the failing, recently constructed structure 3188 Pacific Street are a more reliable indicator of the potential performance of vegetative stabilization at the subject property at this location and in present-day conditions. Experimentation with non-structural solutions (similar to 3188 and 3276) for the subject property is not warranted based on the limited chance of success and high cost of maintenance.

Regarding the alternative of moving the structures on the property, based on the limited lot size (i.e. the house is already at a very limited setback from the Pacific Avenue right-of-way), relocation of the house is not considered a viable option.

5.0 FULFILLMENT OF OREGON BEACH CONSTRUCTION/ALTERATION STANDARDS

The proposed rip-rap revetment construction at this property fulfills each of the OAR Chapter 736, Division 20 "Beach Construction/Alteration Standards", including the General Standards (OAR 736-020-0010), Scenic Standards (OAR 736-020-0015), Recreation Use Standards (OAR 736-020-0020), Safety Standards (OAR 736-020-0030), and Natural and Cultural Resource Standards (OAR 736-020-0030). The following sections address each of the applicable standards:

5.1 General Standards OAR 736-020-0010

1. **Project Need - There shall be adequate justification for the project to occur on and alter the ocean shore area.**

   The proposed SPS (riprap revetment) will prevent further erosion of the oceanfront property bluff. As described in EEI's attached Geotechnical Investigation and Design Report and in Section 2 and 3 of this narrative, in the absence of permanent shoreline protection, slumping and slope regression will continue. This poses a threat to structures on the property, including the single-family residential structure, concrete wall at the top of the existing bluff and a deck. These are at imminent risk (i.e. have already been undermined) in the case of the wall and deck, and (as described in Section 3.1) the house foundations are at risk of being at a distance of less than the minimum recommended setback within a decade based on the anticipated erosion rates.

   Regarding the need for the construction work, the work will need to be performed from the beach (as opposed to constructing the revetment from the upland property) because there is not sufficient on the property for construction equipment access/egress from Pacific Avenue to the west side of the property. A need for shoreline exists for this property that would be fulfilled by construction of the SPS, and it is necessary that the construction occurs from the beach. Therefore, in both cases, this criterion is met.

2. **Protection of Public Rights - Public ownership of or use-easement rights on the ocean shore shall be adequately protected.**

   The proposed SPS will be constructed on private property and no public beach access will be obstructed or lost as part of the revetment installation. At present, the concrete wall at the crest of the eroded, oversteepened bluff is at risk of being undermined and therefore presents a potential safety hazard to the public – as such, the revetment will serve to mitigate that hazard. As discussed above and in the attached Construction, Staging, and Safety Plan, the revetment construction has been planned to limit impacts to the public beach access and recreation. The work area will be clearly delineated with access to the Oregon Coast Trail to be maintained during construction (e.g., a minimum 10-feet-wide delineated easement will be maintained between the ocean and the work area at high tide) and OPRD will be notified of the construction activities on the beach. For these reasons, the project is protective of public rights and this criterion is met.

3. **Public Laws - The applicant shall comply with federal, state, and local laws and regulations affecting the project.**

   The project meets Statewide Planning Goal 18 criteria allowing beachfront protective structures to be permitted only where development existed on January 1, 1977. A

Conditional Use Permit (CU#23-01) was approved by Cannon Beach Planning Commission on March 23, 2023. The City of Cannon Beach Planning Department has executed the affidavit required for this application and is included herewith. Regarding compliance with other federal and state law, a permit from the U.S. Army Corps of Engineers (USACE) or the Oregon Department of State Lands (DSL) is not required for this project. As such, the project is in compliance with applicable federal, state, and local laws, and therefore this criterion is met.

4. **Alterations and Project Modifications - There are no reasonable alternatives to the proposed activity or project modifications that would better protect the public rights, reduce or eliminate the detrimental affects on the ocean shore, or avoid long-term cost to the public.**

   As described in Section 4.0 above, and as presented in the EEI's attached Geotechnical Investigation and Design Report, alternative protective measures were considered and none of these alternatives are recommended as effective solutions for mitigation of the coastal erosion conditions affecting the subject property. As previously described in this narrative, there is a need for shoreline protection at this location, the subject property is eligible for a structural solution, and the proposed solution (rip-rap revetment) is the lowest impact "reasonable" alternative. In terms of the structural solution proposed, the structure is designed to stay within the subject tax lot property boundaries. Based on the alternatives analysis and findings, this criterion is met.

5. **Public Costs - There are no reasonable special measures which might reduce or eliminate significant public costs. Prior to submission of the application, the applicant shall consider alternatives such as nonstructural solutions, provision for ultimate removal responsibility for structures when no longer needed, reclamation of excavation pits, mitigation of project damages to public interests, or a time limit on project life to allow for changes in public interest.**

   The proposed SPS will be constructed on private property and maintained by the Applicant. Therefore there are no substantive public costs associated with this project. Further, the property owner will bear all costs for the revetment construction, and for any construction restoration activities performed after the revetment has been completed (e.g. ruts in the sand on the haul route will be regraded, and West Warren Way will be swept of sand tracked onto the roadway from the beach. Nonstructural alternatives have been considered and are not recommended, as previously described. There will be no direct indirect cost to the public as a result of the SPS construction, and therefore this criterion is met.

6. **Compliance with LCDC Goals - The proposed project shall be evaluated against the applicable criteria included within Statewide Planning Goals administered by the Department of Land Conservation and Development.**

As described above, the project meets Statewide Planning Goal 18 criteria allowing beachfront protective structures to be permitted only where development existed on January 1, 1977. The house on the subject property was constructed in 1931, so this criterion is met.

5.2. Scenic Standards (OAR 736-020-0015): Projects on the ocean shore shall be designed to minimize damage to the scenic attraction of the ocean shore area.

1. **Natural Features - The project shall retain the scenic attraction of key natural features, for example, beaches, headlands cliffs, sea stacks, streams, tide pools, bedrock formations, fossil beds and ancient forest remains.**

   In general, based on the experience and observations of EEI engineering geologists and geotechnical engineers, it is the opinion of EEI that the oceanfront properties in the City of Cannon Beach represent one of the most densely armored stretches of shoreline on the Oregon Coast. Where shoreline protection is present, the majority of the properties are protected by riprap revetments. The majority of lots in the Tolovana Park area have riprap revetments, therefore this vegetated structure (resembling a vegetated dune) will be an aesthetic improvement over the uncovered riprap, exposed seawalls, and degrading sand burrito structures nearby and as they currently exist at the subject property. The project will closely follow existing revetments and bluff profile in the area and will not substantively alter any other landforms. The project may enhance (and will not harm) the scenic attraction in the vicinity of the property, and therefore this criterion is met.

2. **Shoreline Vegetation - The project shall retain or restore existing vegetation on the ocean shore when vital to scenic values.**

   Although no significant vegetation presently exists at beach level to the west of the property, the proposed SPS design includes vegetating the revetment face with native plantings. The sand-covered SPS will be vegetated with native plants (e.g., willow) and will be monitored and maintained as described above. In addition, the planned construction activities will not be conducted in areas of vegetation. As a result of these conditions, and proposed SPS design and construction measures, this criterion is met.

3. **View Obstruction - The project shall avoid or minimize obstruction of existing views of the ocean and beaches from adjacent properties.**

   The proposed SPS will not obstruct views of the ocean or beach from adjacent properties and will be consistent with the profile of the other revetments immediately adjacent and slightly further to the north and south of the property. As such, this criterion is met.

4. **Compatibility with Surroundings - The project shall blend in with the existing**

shoreline scenery (type of construction, color, etc.).

As noted above, EEI has observed that the City of Cannon Beach has a densely armored oceanfront, with the majority of the properties in the project vicinity protected by riprap revetments. The proposed vegetated SPS will closely follow existing revetments and bluff profile in the area and will be an aesthetic improvement over other nearby protection structures. The project is compatible with the surrounding properties, and on that basis this criterion is met.

5.3 Recreation Use Standards (OAR 736-020-0020): The following recreation use standards shall be applied, where applicable, to each application for an ocean shore permit.

1. **Recreation Use - The project shall not be a detriment to public recreation use opportunities within the ocean shore area except in those cases where it is determined necessary to protect sensitive biological resources such as state or federally listed species.**

   The proposed SPS will be constructed on private property, and the future existence of this structure would correspondingly not be a detriment to public recreation use opportunities. Construction activities will be conducted on weekdays and will not occur during peak summer months (June, July, or August) to facilitate minimal impact to public beach users. In addition, the project will require a relatively limited staging area during active construction based on the small overall size of the SPS and strategy of only importing the volume of material that will be used on a daily basis. Equipment will not be stored overnight on the beach. The work area will be clearly delineated and access to the Oregon Coast Trail will be maintained during construction (e.g., a minimum 10-feet-wide delineated easement will be maintained between the ocean and the work area at high tide).

2. **Recreation Access - The project shall avoid blocking off or obstructing public access routes within the ocean shore area except in those cases where it is determined necessary to protect sensitive biological resources such as state or federally listed species.**

   During the worst of conditions, high tides and storm waves cover the beach up to the base of the existing revetments and beachfront slopes. During normal and summer conditions, the beach may be as much as 300 yards wide at low tide. This structure will not alter or worsen the existing conditions. During normal seasonal weather patterns, the usage of the beach in this area will not change because of this structure. As described in the attached Construction, Staging, and Safety Plan, construction activities are being sequenced and timed to minimize impacts to public beach access. Access to the Oregon Coast Trail will be maintained as described above, and o additional public access routes within the ocean shore area will be blocked, and therefore this criterion is met.

5.4 Safety Standards (OAR 736-020-0030): The project shall be designed to avoid or minimize safety hazards to the public and shoreline properties. The following safety standards shall be applied, where applicable, to each application for an ocean shore permit.

1. **Structural Safety - The project shall not be a safety hazard to the public due to inadequate structural foundations, lack of bank stability, or the use of weak materials subject to rapid ocean damage.**

   The proposed SPS was designed by a Certified Engineering Geologist and licensed geotechnical engineers in accordance with current engineering standards. The design is for a robust structure with heavy armor rock that is intended to withstand extreme conditions of coastal erosion. Periodic inspection will be conducted by the engineer of record (EEI) during construction to confirm that the structure is constructed in accordance with the design, with inspections documented in daily field reports and a Final Summary Report at the end of construction. The design is structurally safe and proper implementation will be verified by the engineer of record during construction, therefore this criterion is met.

2. **Obstructional Hazards - the project shall minimize obstructions to pedestrians or vehicles going onto or along the ocean shore area.**

   As described in the sections above, the SPS will be constructed on private property and will therefore not obstruct public access. In accordance with the attached Construction, Staging, and Safety Plan, construction activities are being sequenced and timed to minimize temporary obstructions to public beach access and public movement on the adjacent beach. Based on the conditions presented, this criterion is met.

3. **Neighboring Properties - The project shall be designed to avoid or minimize ocean erosion or safety problems for neighboring properties.**

   As observed by EEI during September 2022 reconnaissance, the majority of lots in this area of Cannon Beach (i.e. Tolovana Park to the Ocean Lodge property [2864 Pacific Avenue]) to the north of Tolovana Park already have anSPS in place. Based on the principles of sand source, supply, and movement within a littoral cell, the presence of these other revetments have increased the potential for future wave erosion and continued rapid bluff retreat on the subject property. Left unchecked, resulting erosion and bluff recession may later compromise the stability of the SPS and bluff slope of the adjacent properties to the north and south. The proposed revetment will protect the properties and provide a smooth line of shoreline protection along the beachfront in this area, graded to match the current embankment slope of the neighboring properties to the north and south. Constructing an SPS to protect the subject property is unlikely to have a measurable negative effect on the neighboring properties, and therefore this criterion is met.

4. **Property Protection - Beachfront property protection projects shall be designed to accomplish a reasonable degree of increased safety for the on-shore property to be protected.**

   As presented above and in EEI's attached Geotechnical Investigation and Design Report, the proposed SPS will improve the safety of the property by preventing prevent future erosion and recession of the bluff. Ancillary benefits of the riprap revetment will be improved bluff slope stability and related protection during seismic events. The project improves the protection of the property, and on that basis this criterion is met.

5.5 Natural and Cultural Resource Standards (OAR 736-020-0030): Projects on the ocean shore shall avoid or minimize damage to the following natural resources, habitat, or ocean shore conditions, and where applicable, shall not violate state standards.

1. **Fish and wildlife resources including rare, threatened or endangered species and fish and wildlife habitats.**

   It is anticipated that the proposed project for a relatively small residential lot, including the permanent SPS and the construction activities, will not substantively alter the habitat of any fish and wildlife resources (including that of rare, threatened or endangered species). The Oregon Department of Fish and Wildlife (ODFW) will be informed of this application during the review process to verify the presumed absence of rare, threatened, or endangered fish or wildlife species at the project site to ensure that this criterion is met.

2. **Estuarine values and navigation interests.**

   The subject property is not in an estuary, and will not affect navigational interests, therefore this criterion is met.

3. **Historic, cultural and archeological sites.**

   It is anticipated that the implementation of the proposed project, including installation of the permanent SPS and the construction activities, will not encounter or impact historic, cultural or archaeological resources. Beyond the presumption of the absence of these resources, the applicants acknowledge the requirement that these resources must not be impacted as a result of this project. If historic, cultural, or archeological artifacts are inadvertently discovered during construction, the project will cease, and the Oregon State Historic Preservation Office will be contacted. During the application review, notice and opportunity for comment will be provided to the Oregon State Historic Preservation Office, as well as the indigenous tribes that included the northern Oregon coast within their homelands (the Confederated Tribes of Grand Ronde and Confederated Tribes of Siletz Indians), in order to ensure that this criterion is met.

4. **Natural areas (vegetation or aquatic features).**

   There is no vegetation on the project site, nor in the proposed construction area, staging area, and haul road. No aquatic areas or features will be impacted by the proposed structure. As such, this criterion is met.

5. **Air and water quality of the ocean shore area.**

   The proposed SPS, as well as the construction activities, will not impact the air and water quality of the ocean shore. Measures to ensure this will include verifying that construction materials are brought to the site free of debris, and equipment will not be fueled or maintained on the beach. Based on the planned adherence to these measures, this criterion is met.

6. **Areas of geologic interest, fossil beds, ancient forest remnants.**

   The subject property is not in a known area of geologic interest, fossil bed, or ancient forest remnant. If evidence of such features are identified by construction workers or EEI geologists onsite during construction inspections, the project will cease, and the Oregon Department of Geology and Mineral Industries (DOGAMI) will be contacted. Based on these conditions, this criterion is met.

7. **When necessary to protect native plant communities or fish and wildlife habitat on the subject or adjacent properties, only native, non-invasive, plant species shall be used for revegetation.**

   In EEI's attached Geotechnical Investigation and Design Report, the proposed SPS design specifies planting the vegetated revetment surface with native species, therefore this criterion is met.

6.0 CONCLUSION

For the reasons stated above, Oregon Parks and Recreation Department can find that all applicable criteria are met and approve the Application.

CONSTRUCTION, STAGING, AND SAFETY PLAN

Shoreline Erosion Protection Project

3216 S Pacific Street (TL 2100)

Cannon Beach, Clatsop County, Oregon

Below is the construction, staging, and safety plan for construction of the proposed revetment structure to protect the Laurel and Stephen Day home (the "Home"), as described in detail in the plans, narrative, and other supporting materials for Ocean Shore Permit Application XXXX-XX. The responds to each item in the Oregon Parks and Recreation Department (OPRD) construction plan guidelines (the "Guidelines").

The written plan includes:

A) Beach Access Plan,
B) Proposed Haul Routes,
C) Staging Plan,
D) Beach Impact Plan,
E) Safety Plan, and
F) Detailed Project Timeline

Also enclosed with this plan is the Project Schedule and list of construction vehicles and equipment that could be used on site. Together, these documents demonstrate that all potential impacts from the proposed construction and staging activities have been considered and mitigated and that public safety will not be compromised.

A. Beach Access Plan

Construction vehicles and equipment will access the worksite and material staging area via the public access ramp on West Warren Way adjacent the Tolovana Beach State Recreational Site as shown below.

The only alternate access point is the ramp at the west end of Ecola Ct. near The Wayfarer restaurant more than a mile north of the construction site as shown below.

Access at West Warren Way adjacent Tolovana Beach State Recreation Site is a safer option given the distance to the site and a lower density of building. Less distance and less time on the beach of heavy equipment reduces the impact on recreational use of the beach. Further, reduced time and distance on the beach reduces the risk of a safety event occurring.

The access will be used for periodic delivery of rock and other construction materials to the staging area, daily movement of construction equipment from the equipment staging area to the worksite and back, as well as occasional vehicle access for management personnel and professionals visiting the site. As noted below, the haul routes and beach access will be minimal given the proximity of the access point to the job site.

B. Proposed Haul Routes

Although the Tolovana Beach State Recreation Site will remain open to the public, there will be periodic interruption to public use of the designated access point. Each truck will carry approximately 14 tons of material per load. A total of 40 to 60 loads will be required to complete the project, which will be achieved in two stages over a period of 2 to 3 weeks. Each stage will take approximately 4-5 days on the beach. Accordingly, the interruptions for the public at the beach access point will occur for approximately 15-20 min 4 to 6 times per day on those days that loads are being delivered to the material staging area.

Two haul trucks ("10-yard" dump trucks) and one excavator (SK140) will be used in the construct of the revetment. On those days when materials are being hauled to the staging area, between 4 and 6 hauls will occur. Throughout the 2-3 week period of the project, there will be a total of 40 to 60 loads brought onto the beach. Accordingly, the dump trucks will only be on the beach on 8 to 10 of the days of the construction period.

To reduce the impact on the public and to achieve the highest degree of safety for all, each time a truck is approaching the beach access point, the truck will be "walked" by a construction worker with bright colored safety flag/vest from west end of Warren Way, through the access point itself, and on the beach to the job site which is located approximately 460 feet north of the access point.

Use of the vehicle ramp at the beach access point will not hinder public beach access at the stairway leading from the parking lot to the beach as the stairway will always be unobstructed and available for public use. Additionally, the path for the public will always be free of debris.

Several strategies will be employed to minimize conflicts between pedestrians and construction activities (i.e., equipment operation, hauling of materials, vehicle access, etc.).

- Construction work will occur only during weekdays when public use of the beach is lowest; work will not be done on weekends or holidays.
- During work times, material transportation will be scheduled to minimize the usage of the haul routes.
- Multiple highly visible signs will be placed to clearly define the construction and staging areas. At the site, additional warning signs will be placed, stating "Caution Moving Equipment" or something similar.
- Equipment operators have extensive experience in operating heavy machinery on and around the Oregon Coast, including areas used heavily by the public, and will exercise extreme caution and always defer to the public's absolute right-of-way.
- Because the project will take place after Labor Day, recreational use of the beach will be much lower than during the summer months. However, it is necessary to complete the work as early as possible after permits are approved so that haul route and worksite locations are less likely to be impacted by high tides.
- Finally, if the work timeline needs to be temporarily adjusted due to unusually high tides, the areas will be secured and will include relocation of signs and notices accordingly. Tides will be closely monitored, and any temporary changes will prioritize the preservation of public access over construction work.

C. Staging Plan

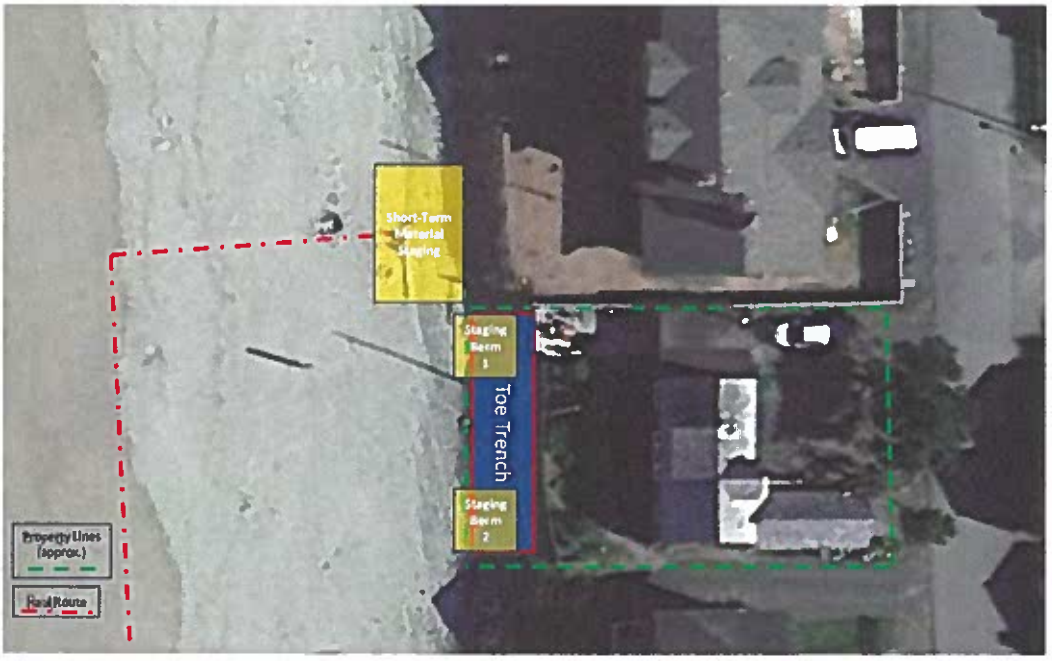
The construction plan anticipates a section-by-section approach to minimize the need for staging. The project will be split into two sections of approximately 30 feet each given the residential lot width of 60 feet total.

In order of activity, equipment and material will work first on the 30-foot stretch of the property line on the south side of the lot and will follow this sequence of activity:

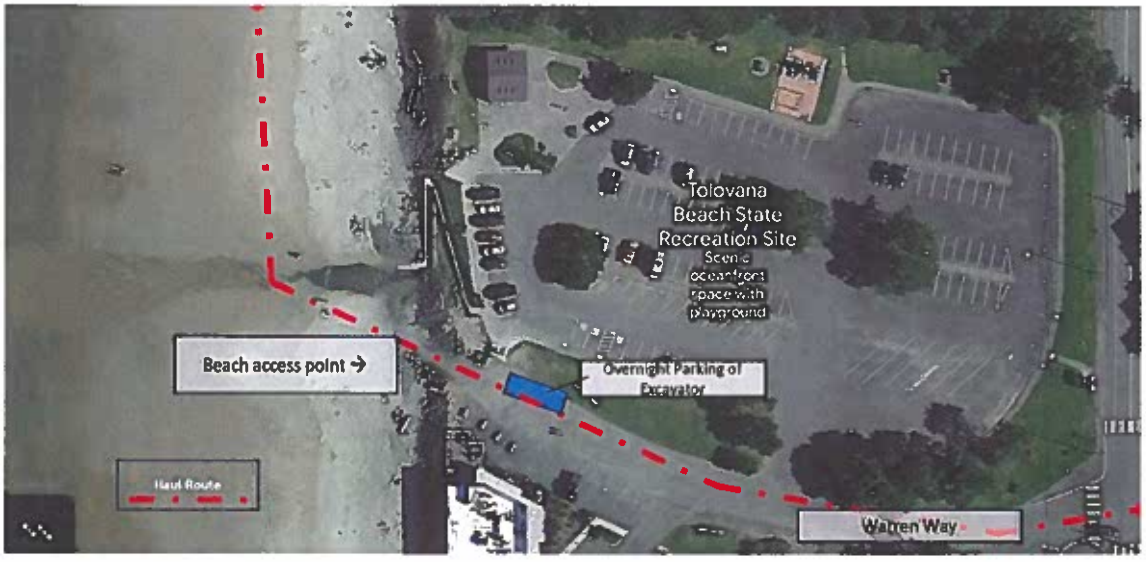
1. Excavate the 30-foot stretch of land within the property line to the east and bounded at the south by the legal property line. Sand that is excavated to create the revetment toe trench will be stored within the work area because it will shortly be placed back on the revetment structure. Because the revetment is being constructed in sections, however, the sand stockpile will be kept to a limited size, which is also necessary to avoid interference with construction work. The south side of the toe trench will be excavated first with the removed material being placed on "Staging Berm 1" as shown below.
2. A small number of truck loads of "access rock" will also be staged in "Staging Berm 1" on top of the sand extracted from the toe trench until it is used in the construction process.
3. The rock materials for this project are planned to be sourced from the Drake Quarry, which is in Astoria, Oregon, approximately 40 miles from the Tolovana Beach State Recreation Site. However, because of the relative size of the project, minimal staging of material is necessary. Staging will occur primarily during those days when construction is occurring and no more than two days material will be stored at any time. When materials are staged, they will be stockpiled on the east side of the beach just north of the construction site adjacent to the residential lot immediately north of the construction site. The staging area is naturally flat and has no vegetation so that no excavation, sand movement, or other alteration is necessary to make the area useable. Although permission to stage the material from the homeowners of the lot to the north (Address: 3188 Pacific Street) is not necessary because the material will be staged to the west of their property line, the owners have expressed their support of the project and comfortable with the area being used for staging in this

manner. The State representatives have been notified of this support and the written support is attached.

4. The staging process will be reversed and repeated for the northern portion of the site and structure.



5. Finally, the equipment will be staged to the south of the Tolovana State Park parking lot shoulder of Warren Way. No other equipment will be staged on or near the construction site. (See graphic below showing "Overnight Parking of Excavator".) The only equipment that will be staged is the KOBELCO SK140 excavator. The excavator will be parked overnight on the shoulder on the north side of the far west end of Warren Way. This overnight staging area will be approved as part of the final permit obtained from the City of Cannon Beach. Dump trucks and other equipment will not be staged at the site overnight. If the written approval from the City of Cannon Beach is not obtained, the excavator will be removed from the site each night and staged in a private location as near the construction site as possible.



D. Beach Impact Considerations

The worksite, staging area, and haul route between them are located along the eastern edge of the beach, adjacent to the bluffs and existing riprap. In this area there is no vegetation and no significant change in grade slope. Also, the equipment and vehicles used to construct the revetment and haul materials are designed to run in sand. Accordingly, no construction, excavation, or other alteration is necessary to operate equipment or vehicles on these sites or the haul route between them. Any ruts formed from hauling materials on the beach will be smoothed by "blading" them periodically through the project but at a minimum at the end of each work week.

The specific location of the haul route is shown in the Revetment Staging Plan. The haul route will be used for eight hours on non-holiday weekdays in the ten-hour window between 7:30 a.m. and 5:30 p.m., with the specific start and stop times dependent on that day's tide schedule. As set out above and in the Revetment Staging Plan, the public will be directed out of the haul route with each load in addition to the signage that will be placed along the haul route.

Because alterations are not necessary to establish the haul route, little work will be necessary to restore the area to its original condition upon completion of the revetment construction. The area, however, will be graded to a slope and contour that closely matches the surroundings so that no visual cues of the prior construction activities remain.

In preparing this application narrative, we sought guidance from Chris Parkins and Jenna Maromon of OPRD regarding potential impact and interruption along the Oregon Coast Trail. Chris Parkin responded with the following on August 3,2023:

> *"Thank you for your diligence in reaching out with regard to potential project impacts to the Oregon Coast Trail (OCT). Tyler Blanchette provided me with your pre-application packet. The screen shot below indicates the OCT alignment (pink line) in reference to your property location.*
>
> *If the project is approved and permitted using the Tolovana access option you propose, it should be possible to minimize impacts to trail users. Keeping the Staging Area, Construction Site and Haul Routes as narrow and lightly trafficked as possible will be key.*
>
> *There is less and less of a distinct recreation season on the Oregon coast these days, but your commitment to time after Labor Day is a good move. Generally, OCT through-hikers may hike in the shoulder months of May and September, but the peak activity occurs in June, July and August. Also beach visitation in general will be leaning towards lighter and more local use.*
>
> *Again, I think this project could be conducted without adversely impacting trail use during construction and the project result shouldn't have any impact to the OCT. Once Tyler receives your application, I will stay in contact with him in case I have any more specific recommendations. If available, I am also willing to participate if a site visit is set. Thanks again for the contact. Take care, Chris"*

Accordingly, the plan outlines the efforts to keep the staging areas as narrow as possible to minimize the impacts on trail users.

To further reduce potential impact to the beach, any vehicle maintenance or fueling will occur upland, off the beach. To protect against spills during operation of the equipment, spill kits will be staged near the work area so that cleanup of an unexpected spill can begin within two minutes of the beginning of the event.

Upon completion of the revetment construction, all excess materials will be removed from the staging area. The area should not need restoration work, other than potential light grading to eliminate any minor sand disruption (ruts) from the construction vehicle traffic or rock storage. Excavated sand that is not placed on the revetment structure will be spread out across the haul route, which will not cause any noticeable change in grade.

E. **Safety Plan**

Signage and barriers will be used to alert the public as follows:

- Haul Routes – On those days materials are being hauled to the construction site, the following will occur along the haul route (note the haul route is pictured above):
    - Workers will "walk" each truck and load from the west end of Warren Way, through the access point at the vehicle ramp, on to the beach and to the construction site approximately 460 feet north of the access point.
    - Signage will be placed every 50 feet along the haul route but only during those days when hauling is taking place. The signage will resemble the following:

- Material Staging Area – The Material Staging area will rarely hold material overnight. However, to the extent materials are left overnight the following will occur:
    - Barriers will be placed around the material, sealing off access from the beach to any materials.

    - Signage will be placed on the barriers which will be visible from all directions. Signs will state:

- Trench – Because construction of the revetment will proceed in individual sections of approximately 10 to 20 feet per workday, trenches will not typically be left overnight. If a trench cannot be filled by the end of the day, the following will occur:
    - Barriers will be placed around the trench, sealing off access from trench

    - Signage will be placed on the barriers will be visible from all directions. Signs will state:

- Trench will be covered with sturdy material with sand and fill rock (not rip rap) to secure the covering to mitigate falling hazard.

F. Detailed Project Schedule and Description of Daily Construction Activities

The project will begin upon receipt of the necessary permits. Once construction begins, the project will have a duration of between 20 and 30 days. Within this time period, there will be between 10 and 15 days of on-beach construction work. Work will not occur on weekends or on/around official state holidays. Note that given the location of the construction site and the proximity of existing houses to each other, there is no opportunity to get equipment into position that would allow completing any part of the construction activity from upland.

Construction activities will occur for eight hours on non-holiday weekdays in the ten-hour window between 7:30 a.m. and 5:30 p.m., with the specific start and stop times dependent on that day's tide schedule. A typical workday is as follows:

1. Survey the site to confirm that all warning signs are in place, there is no obstruction in the temporary public pathway, and no other hazards exist. Remediate any issues.
2. Fuel and perform maintenance on equipment/vehicles in upland area as necessary.
3. Drive equipment from upland parking to that day's work area (construction of the revetment will start at the south end of the resort and be built in daily sections, working north).
4. Excavate sand at base of revetment and place to the west of the work area, which helps divide the public pathway from that day's worksite.
5. Dig trench for construction of the revetment toe.
6. Drive to/from staging area with riprap rock.
7. Install riprap material and rock.
8. Cover newly constructed revetment section with sand. Any excess sand is stockpiled on the western half of the revetment construction area, to the north of the section currently being built.
9. Survey the site to confirm that all warning signs are in place, there is no obstruction in the temporary public pathway, and no other hazards exist. Remediate any issues.
10. Drive equipment/vehicles back to upland parking area.

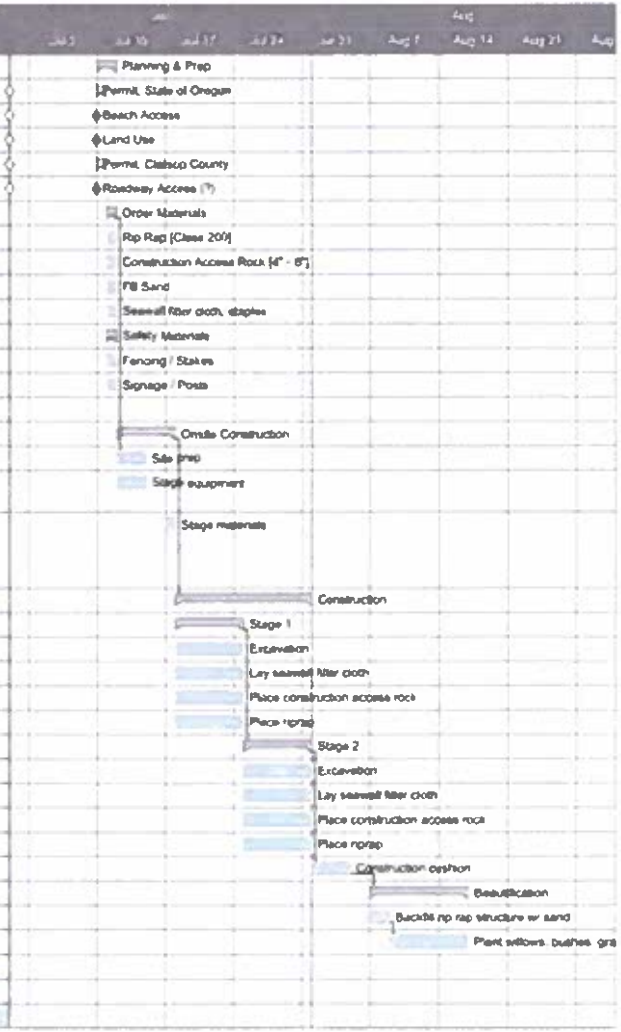
At the end of the project, a licensed surveyor has been retained to visit the work site, reset the property line pins and file the necessary survey documents with Clatsop County to ensure legal property lines are maintained. (Please contact Angela Bouchard at angela@ckiinc.net as needed.)

As described above, the work and staging areas will be made safe for the public prior to any break in work by fencing of any hazards (e.g., open trenches, staged material, etc.), warning signs, and removal of equipment and vehicles from the beach.

A detailed construction timeline is attached to this plan. Note, the timeline shows a 3-week work period. The start date as soon as possible following permit acceptance. (Please ignore dates showing on the image. Durations are valid.)

Day-CB-Armament Plan (Vegetated Rip Rap)

Task Name	Duration	Start	Finish	Comments
Planning & Prep	2d	07/10/23	07/11/23	Permits, materials, planning, safety
Permit, State of Oregon	0	07/10/23	07/10/23	
Beach Access	0	07/10/23	07/10/23	
Land Use	0	07/10/23	07/10/23	
Permit, Clatsop County	0	07/10/23	07/10/23	
Roadway Access (?)	0	07/10/23	07/10/23	
Order Materials	1d	07/11/23	07/11/23	
Rip Rap [Class 200]	1d	07/11/23	07/11/23	Source from Drake Quarry, Astoria, OR
Construction Access Rock [4" - 8"]	1d	07/11/23	07/11/23	Source from Drake Quarry, Astoria, OR
Fill Sand	1d	07/11/23	07/11/23	Source from pit in Clatskanie, OR
Seawall filter cloth, staples	1d	07/11/23	07/11/23	12' wide, steel staples
Safety Materials	1d	07/11/23	07/11/23	
Fencing / Stakes	1d	07/11/23	07/11/23	
Signage / Posts	1d	07/11/23	07/11/23	
Onsite Construction	4d	07/12/23	07/17/23	
Site prep	3d	07/12/23	07/14/23	Access, Safety, Property Lines, etc
Stage equipment	3d	07/12/23	07/14/23	KOBELCO SK140 will be staged in the Tolovana Beach State Recreation Site parking lot. Other equipment such as dump trucks, etc. will not be staged at the jobsite
Stage materials	1d	07/17/23	07/17/23	Limited staging, "just in time" delivery. Stage Construction Access Rock and riprap for 1-3 days use. Staged on east side of beach, north of construction site. Two "ten yard" dump trucks will haul materials to the site throughout the project and will not be staged overnight at the jobsite.
Construction	10d	07/18/23	07/31/23	
Stage 1	5d	07/18/23	07/24/23	Stage 1-South half of property
Excavation	5d	07/18/23	07/24/23	Stage 1-South half of property
Lay seawall filter cloth	5d	07/18/23	07/24/23	12' wide, placed w/ 18" overlap, steel staples
Place construction access rock	5d	07/18/23	07/24/23	Supports riprap placement
Place riprap	5d	07/18/23	07/24/23	Rip rap laid at 1:1 grade beginning at west property line up to current lot elevation
Stage 2	5d	07/25/23	07/31/23	Stage 2-North half of property
Excavation	5d	07/25/23	07/31/23	Stage 2-North half of property
Lay seawall filter cloth	5d	07/25/23	07/31/23	12' wide, placed w/ 18" overlap, steel staples
Place construction access rock	5d	07/25/23	07/31/23	Supports rip rap placement
Place riprap	5d	07/25/23	07/31/23	Rip rap laid at 1:1 grade beginning at west property line up to current lot elevation
Construction cushion	4d	08/01/23	08/04/23	In case of weather or other delays
Beautification	8d	08/07/23	08/16/23	
Backfill rip rap structure w sand	2d	08/07/23	08/08/23	
Plant willows, bushes, grasses	6d	08/09/23	08/16/23	
				Estimated project cost



Earth Engineers, Inc.

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

November 22, 2022

Stephen and Laurel Day
2135 S 2200 E
Salt Lake City, Utah 84109

Phone: 208-284-9019
E-mail: stephentday33@gmail.com
E-mail: laurel.christensen@gmail.com

Subject: **Geotechnical Investigation and Design Report**
Proposed Shoreline Protection Structure
3216 Pacific Avenue
Cannon Beach, Clatsop County, Oregon
EEI Report No. 22-232-1

Dear Mr. and Mrs. Day:

Earth Engineers, Inc. (EEI) is pleased to transmit our Geotechnical Investigation and Design Report for the above referenced project. The attached report includes the results of the field investigation and laboratory testing, an evaluation of geotechnical and geologic factors that may influence the proposed construction, recommendations for shoreline protection structure design, as well as recommendations for revetment construction.

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.

Yonggui Xie, PhD, P.E.
Geotechnical Engineer

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

Adam Reese, R.G., C.E.G.
Principal Engineering Geologist

Attachment: Geotechnical Investigation and Design Report

Distribution (electronic copy only): Addressees

GEOTECHNICAL INVESTIGATION AND DESIGN REPORT

for the

Proposed Shoreline Protection Structure
3216 Pacific Avenue
Cannon Beach, Clatsop County, Oregon

Prepared for

Stephen and Laurel Day
2135 S 2200 E
Salt Lake City, Utah 84109

Prepared by

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

EEI Report No. 22-232-1

November 22, 2022

Earth Engineers, Inc.

EXPIRES: 6/30 23

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

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Adam Reese, R.G., C.E.G.
Principal Engineering Geologist

Yonggui Xie, P.E.
Geotechnical Engineer

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1.0 PROJECT INFORMATION

1.1 Project Authorization

Earth Engineers, Inc. (EEI) has completed a Geotechnical Investigation and Design Report for the proposed shoreline protection structure construction located at 3216 Pacific Avenue (Tax Lot [TL] 2100, Map 5 10 31DA), in Cannon Beach, Clatsop County, Oregon. The property is located approximately 200 feet to the north of the Tolovana Beach State Recreation Area parking lot. Our services were authorized by Stephen & Laurel Day on September 27, 2022 by signing EEI Proposal No. 22-P368-R1 dated September 22, 2022.

1.2 Project Description

Our current understanding of the project is based on the information provided via e-mail to EEI Principal Engineering Geologist Adam Reese. We further understand you wish to construct a Shoreline Protection Structure (SPS) to mitigate impacts from anticipated future coastal erosion. Among SPS alternatives, we understand that your preference is to construct a riprap revetment. This report addresses the engineering geology and geotechnical conditions at the site, and provides recommendations for an oceanfront shoreline protective structure (SPS). For the purposes of this report, the terms "rip rap", "revetment", and "SPS" are interchangeable.

The subject property (TL 2100) has beach frontage that is approximately 60 feet wide and has no current bluff protection. The height of the bluff slope at this property location is approximately 8 feet, as measured in elevation from the beach to the backyard of the upland property. The width of the backyard from the residential structure to the top is approximately 25 feet. Based on a review of past photos of the property, the beach elevation at this location varies seasonally and annually. At the time of our site visits, the upper edge of the beach stood approximately at 19 feet NAVD.

The low oceanfront bluff at this location is composed of weakly consolidated marine terrace deposits (see Photo 1). The low beachfront bluff on the west side of the properties in this area to the north of Tolovana Beach State Recreation Area parking lot have historically undergone episodic sloughing and erosion. Over the past few years, the erosion has increased, resulting in undercutting and destruction of a former concrete seawall (Photo 2 and Photo 3). The material at the base of the bluff slope at TL 2100 has been eroded away leaving the bluff in a near-vertical condition. The existing top of the bluff (Photo 1) currently is approximately 16 feet east of the statutory vegetation line (Figure 1, Tax Map) established by the Oregon Beach Bill.

Photo 1: Looking at the current condition of the oceanfront bluff.

Photo 2: Undated photo of site beachfront and former seawall, presented in Witter et al (2009) as an "example of a seawall in Cannon Beach that has been undermined by wave erosion".

Photo 3: Undated historical photo provided by the property owner, looking east at the subject property and seawall (note that that the beach elevation at the time of the photo is substantially higher than the current beach elevation.)

We noted that the adjacent property at 3188 Pacific Avenue has a beach frontage that is approximately 110 feet wide with an existing SPS, a sandbag-type structure constructed of sand tubes or sand burritos. The structure at 3188 Pacific Avenue appears to have been constructed by wrapping fine-grained soil (presumably borrowed at the SPS location) in a synthetic geotextile (geogrid) material, then planted with dune grass. We understand that this existing SPS was constructed in 2021. At the time of our preliminary reconnaissance site visit on September 8, 2022, the lower portion of the sand tubes (i.e. the lower 2-4 feet above the beach) was observed to be damaged, including washout of the fine-grained soil within the open-matrix geogrid and denuding of vegetation. We understand that there are no as-built drawings for the existing SPS at 3188 Pacific Avenue.

We have been provided with the following document (related to the neighboring SPS):

- **Geologic Shoreline Erosion Study; Map 5 10 31DA, Tax Lot 2200; 3188 S. Pacific Street, Cannon Beach/Tolovana Park, Clatsop County, Oregon by Horning Geosciences (April 12, 2020).** This document provides a summary of a reconnaissance-level investigation (i.e. visual assessment- and research-based, with no subsurface investigation) of the shoreline at the 3188 Pacific Avenue property. The report offers several suggested solutions including: no action (i.e. allowing "graceful retreat" of the bluff), regrading/revegetating the eroding bluff (with or without the component of wrapping the clay-rich soil in a geotextile; i.e. "sand burrito" armoring), or armoring the bluff with rip-rap (if the other options should fail). The report also includes a site plan and cross-section diagram as a design for the sand burrito mitigation option.

Briefly, we understand that the plan at the Day property is to construct a 60 foot long SPS to

protect the property against anticipated ocean processes and from ongoing coastal erosion impacts. It is our opinion that in the absence of permanent shoreline protection, slumping and slope regression will continue; and unless the bluff base is stabilized and shielded from wave attack, this property will be subject to continued undercutting and eventual loss. EEI recommends that a rip-rap revetment structure will provide the most protective, durable, and cost-effective solution feasible under current regulatory constraints. Although a solid seawall might be more protective, such structures are generally not approved in Oregon for protecting residential properties. In addition to its purpose of presenting the geotechnical investigation and design information for the SPS, this report is also presented as supporting information for an Ocean Shore Improvement Permit Application for the State of Oregon Parks and Recreation District (OPRD), and the local permit applications for the City of Cannon Beach.

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 existing soil, rock, and groundwater properties in order to provide geotechnical related recommendations for the proposed SPS. Our site investigation consisted of advancing 2 test pits (TP-1 and TP-2) with 2 drive probe tests (DP-1 and DP-2) within the subject property.

Grab samples were obtained from each stratum encountered in the test pits for laboratory testing. Laboratory testing was accomplished in general accordance with ASTM 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, if encountered).
- Geotechnical related recommendations and design for the proposed SPS (riprap revetment).
- Qualitative (visual) assessment of bluff slope stability.
- 2019 Oregon Structural Specialty Code seismic design criteria.
- Recommendations for the overall suitability of the in-situ soils for use as backfill and structural fill.
- Structural fill requirements, including gradation and compaction.
- Recommendations for riprap revetment foundation subgrade preparation.
- Wet and dry weather construction recommendations.
- Discussions on geotechnical issues that may impact the project

Our scope of services did not include a global slope stability analysis or a site-specific seismic site hazard analysis.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 Site Location and Description

The site for the proposed shoreline protection structures is located at 3216 Pacific Avenue, Cannon Beach, Oregon. The property is bordered by residences to the north and south, Pacific Avenue to the east and the beach and the Pacific Ocean to the west. The property is currently occupied by an existing single family residential structure. The existing structure was built in 1931, qualifying the property owners for construction of an SPS under the Oregon Beach Bill requirement that the properties be developed prior to January 1, 1977. Locations of existing Beachfront Protective Structures (also known as SPS) and eligibility for constructing future SPS are depicted on Figure 2.

The area of the site east of the bluff is generally flat. An existing short concrete wall (less than 4 feet tall) is present at the top of the bluff and the horizontal distance from the top of bluff slope to the back of existing house is approximately 25 feet. To the west of the existing concrete wall, the oversteepened bluff slope stands at approximately 1 Horizontal: 1 Vertical (1H:1V) to near-vertical. As shown in the photos above, the current bluff was historically retained and protected by a concrete seawall. However, based on a review of aerial images available on Google Earth, the seawall was visible in a June 2017 image, but was no longer present (removed or destroyed) sometime prior to October 2019.

The approximately 8 feet tall bluff face is composed of light brown decomposed sandstone with silt, which has become over steepened and experienced continuous ocean wave erosion. The materials and condition of the bluff at the time of our field investigation is shown on Photo 1.

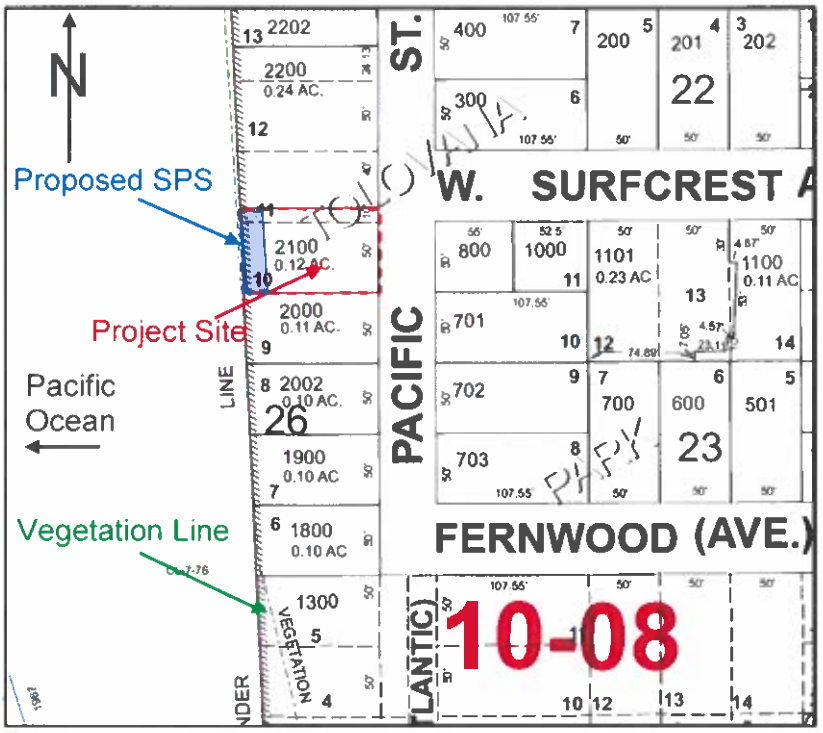

Figure 1: Project site and vicinity (base map source: Clatsop County Taxlot Map).

Photo 3: Looking east at the current bluff slopes from the beach.

Photo 4: Looking northwest at the existing bluff slopes from the top of bluff.

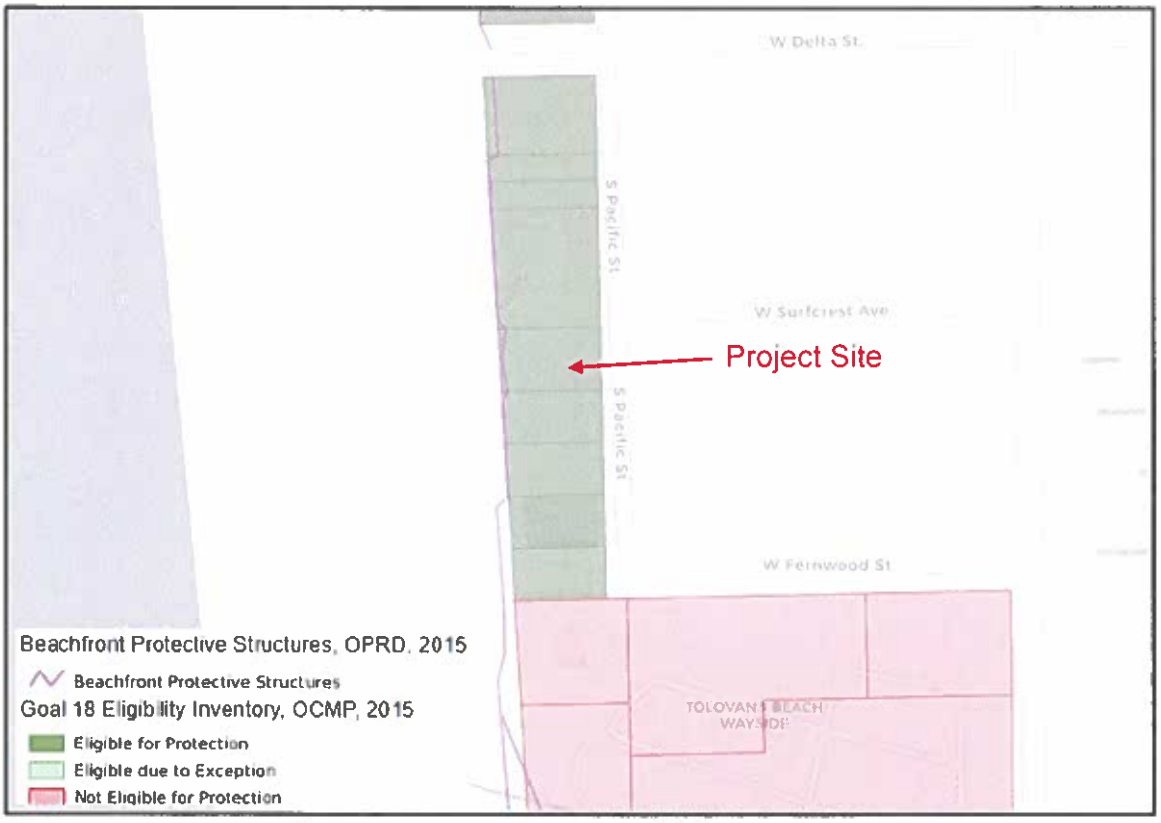

Figure 2: Existing Shoreline Armoring and Goal 18 Eligibility (base map source: Ocean Shores Viewer, Oregon Coastal Atlas; https://www.coastalatlas.net/oceanshores/).

2.2 Mapped Soils and Geology

The project site is located on the lower west foothills of the Oregon Coast Range, specifically above Canon Beach and about 1 mile southeast of the iconic Haystack Rock. The Oregon coast range is defined by a 30- to 40-mile-wide swath of moderately high mountains that span approximately 200 miles along the Pacific Coast. In general, the region has been uplifted as a result of plate convergence from the Cascadia subduction zone located about 150 to 200 km west of the coast range[1]. The region is underlain by a framework of Miocene aged (23 to 5 million years ago) volcanic rocks and Oligocene (33 to 23 million years ago) to Miocene aged marine sedimentary deposits that have been deposited over a basement rock of Eocene-aged (60 to 33 million years ago) volcanic arc deposits. Overlying this framework are Quaternary–aged (1.8 million years ago to present) marine terrace deposits, beach and dune deposits and landslide deposits.

The project area was mapped by Alan R. Niem and Wendy A. Niem, of the U.S. Geological Survey from 1972 to 1984. Within the project vicinity the underlying geologic unit is mapped as the Cannon Beach member of the Astoria formation (Tac). This unit consists of well-bedded, fine-grained marine sandstone, siltstone, and mudstone from the middle to lower Miocene. Haystack Rock is mapped as Wanapum Basalt and specially Frenchman Springs Member of pillow palagonite complexes (Tfsp). This unit is from the middle Miocene and is composed of isolated pillow breccia associated with autointrusive sills and dikes (igneous intrusions). Quaternary alluvium (unconsolidated flood plain deposits) and beach sand from the Holocene (the past 11,000 years) have also been mapped within the vicinity of the project site[2].

The United States Department of Agriculture (USDA) Soil Survey provides geographical information of the soils in Clatsop County as well as summarizing various properties of the soils. The USDA shows the native soils on the site mostly mapped as 28 – humitropepts - tropaquepts complex, 0 to 20 percent slopes.[3] The humitropepts - tropaquepts silt loam is moderately poorly-drained, forms stream terraces and consists of alluvium deposits derived sedimentary rock.

2.3 Geologic Hazards

The Oregon Department of Geology and Mineral Resources (DOGAMI) maps various geologic hazards such as 100-year flooding, earthquake ground shaking, coastal erosion, tsunamis, and landslides. DOGAMI presents hazard levels derived from this mapping in an interactive geographic information system (GIS), generally referred to as Oregon HazVu.[4] Hazvu presents

[1] Kelsey, H.M., and J.G. Bockheim, Coastal landscape evolution as a function of eustasy and surface uplift rate, Cascadia margin, southern Oregon, Geol. Soc. Am. Bull., 106, 840-854, 1994.
[2] Niem, A.R., and Niem, W., 1985, Geologic map of the Astoria Basin, Clatsop and northernmost Tillamook Counties, northwest Oregon: Portland, Oreg., Oregon Dept. of Geology and Mineral Industries Oil and Gas Investigation Map OGI-14, Plate 1, scale 1:100,0
[3] Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/ accessed March 3, 2020.
4 Oregon HazVu: Statewide Geohazards Viewer, available online at: http://www.oregongeology.org/sub/hazvu/ accessed 11/2/2022.

the primary geologic hazard levels associated with the subject property as follows:

- Low to very high (active) coastal erosion hazard zones
- Tsunami inundation hazard area
- Low to moderate landslide hazard area
- Severe Cascadia earthquake expected shaking
- Severe crustal earthquake expected shaking
- High liquefaction (soft soil) hazard area

Pertinent to this study, we describe the coastal erosion hazard in more detail below, as well as discussion of tsunami and landslide hazard risk levels for this property.

Coastal Erosion. Because the primary purpose of this study is to address coastal erosion, we assessed the site location relative to Coastal Erosion Hazard Zones. From east to west, the Oregon HazVu mapping (Figure 3) shows that portions of the site falls within the low, moderate, high, and very high (active) coastal erosion hazard zones.

Erosion Cycles and Current Site Condition. During the past quarter century, there has been a general increase in ocean wave erosion observed along much of the Oregon coast. These conditions have been attributed to an increased frequency of relatively severe global climatic episodes, such as El Niño and La Niña periods. The severe storms along the northern Oregon coast during these extremes have resulted increased wave heights and more substantial beachfront erosion than what has been seen in prior recorded history. The severity and frequency of these episodes is expected to increase in the future, and there is near certainty that the rate of sea-level rise will also increase as a result of global warming.

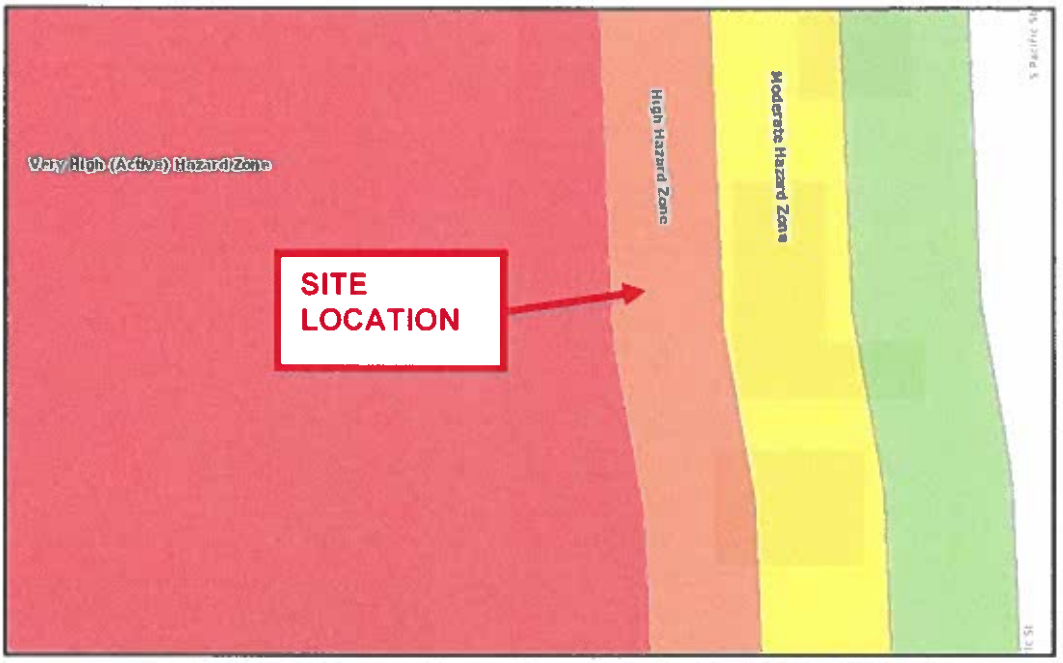

Figure 3: Coastal Erosion Hazard Zone provided by DOGAMI HazVU.

Offsetting recent historical sea level rise, the regional tectonic processes on the northern Oregon coast result in emergence (gradual uplift). This negates the short-term effects of sea-level rise in areas like Cannon Beach. However, the expected accelerated rate of sea level rise is likely to result in a general submergence of the coastline, exacerbating the coastal erosion impacts compared to what has been seen historically.

In addition to the climate changes, the configuration of offshore reefs and currents can direct ocean waves to particular stretches of the beach in the form of rip embayments. Rip embayments can be particularly destructive in that they create deep troughs in the near-shore sand deposits, allowing waves to reach the bluffs and dunes backing the beaches with full energy. Rip embayments can set up at random locations and cause extensive destruction in short periods of time.

Potential shoreline flooding associated with coastal recession and earthquake-generated tsunamis may also affect the site. On a geologic time scale (thousands of years), much of the Oregon coast is in the process of receding eastward, and it should be expected that continued erosion and recession of the coastline will occur in the future. Dune-back beaches, such as the Cannon Beach area including this site location, fluctuate seaward and landward over time, but the net result is a loss of ground to the ocean. Bluff-backed beaches undergo the same erosion cycles but regress more slowly without the seaward fluctuations of dune-backed beaches.

The subject property (TL 2100) has been exposed to the erosion cycles noted above, and in the absence of adequate shoreline protection, the erosion has occurred in the form of episodic bluff undercutting. As shown in Figure 2, nearly all properties in this area of Cannon Beach are protected by an SPS. The erosion at his location has become more severe in recent years, and the destruction of the former seawall has left a near-vertical bluff face. The fine-grained soils will temporarily stand in this configuration; however, without protection, the soils will soon collapse at their natural angle of repose (approximately 2H:1V to 3H:1V) and more substantial recession of the bluff crest (i.e. 5 to 10 feet) will immediately be observed.

As described above, the bluff located at the subject property was historically protected by a low beach-level concrete wall (Photos 2 and 3); however, within the past decade, the concrete wall was undermined by bluff erosion (undercutting) and destroyed due to exposure to ocean waves. The adjacent property to the north (TL 2200) is protected by a sand burrito-type SPS. We understand this adjacent SPS was constructed in 2021. At the time of our site reconnaissance and fieldwork, we observed that the adjacent SPS has already been substantially impacted by erosion. As shown in Photo 5, this includes denuding of the majority of vegetation on the lower half of the structure, and washout of the fine-grained soil within the open-matrix geogrid.

It is our opinion that in the absence of permanent shoreline protection, slumping and slope regression will continue; and unless the bluff base is stabilized and shielded from wave attack, the subject property will be subject to continued undercutting and eventual property loss. The recent impacts to the former seawall on the subject property (TL 2100) and impacts to the recently-installed SPS on the adjacent property (TL 2200) indicate erosion patterns in this location

are at the base of the bluff showed that the While we understand that "softer" SPS structures (such as sand bag/burrito structures) may be preferred by regulating agencies, it is our opinion that the rapid deterioration of the adjacent sand burrito SPS is evidence that a more robust solution is warranted at this location.

Tsunami Hazard. In addition, we reviewed the Tsunami Inundation Map for Cannon Beach, Oregon (reference: https://www.oregongeology.org/pubs/tim/Clat09_CannonBeach_Plate1_print.pdf, 2013 Local Source [Cascadia Subduction Zone]). The map shows that this property, along with nearly all of the other beachfront properties in this part of Cannon Beach, is mapped within the tsunami inundation zone (dark purple, light purple, and yellow shaded area in Figure 4 below) and could be impacted by tsunami waves in the event of even a small (magnitude 8.7 or greater) Cascadia Subduction Zone earthquake.

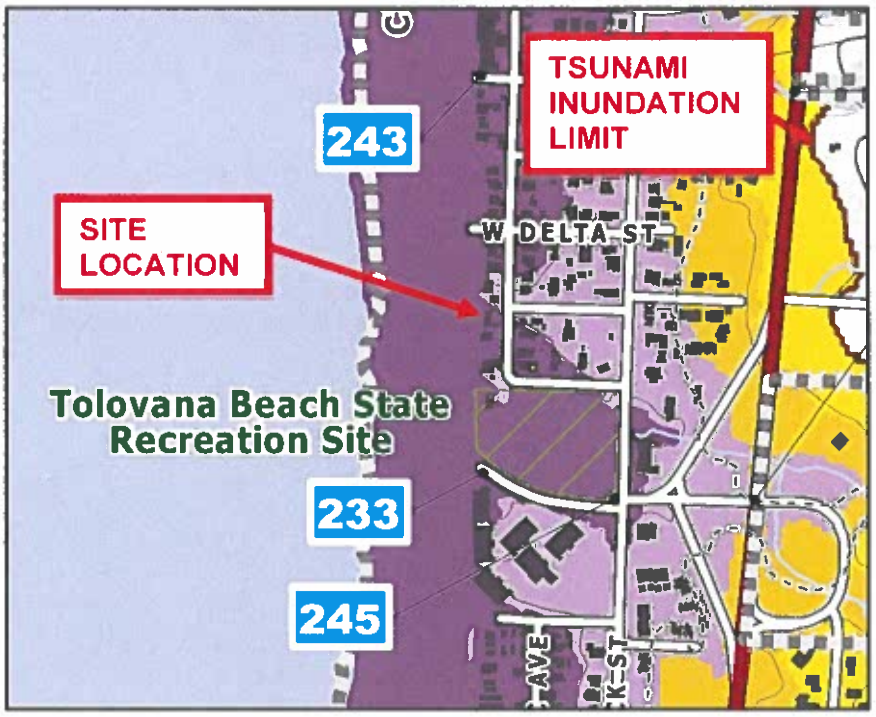

Figure 4: Tsunami hazard map for Cannon Beach provided by DOGAMI. The dark purple shading indicates the area expected to be generated by a "small-sized" Cascadia Subduction Zone Earthquake (earthquake magnitude ~8.7).

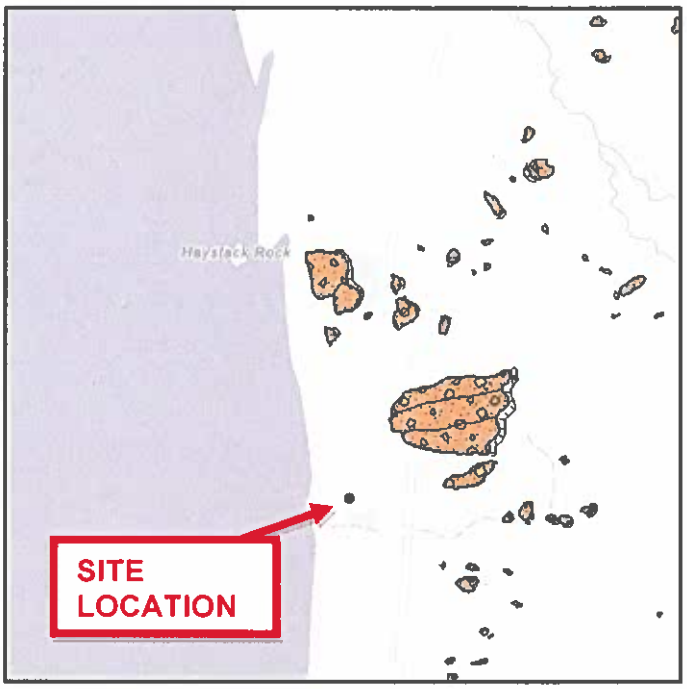

Figure 5: Mapped landslides from DOGAMI's SLIDO (landslides shown as brown notations).

Landslide Hazard. To assess landslide hazard risk for the site, we reviewed the DOGAMI Statewide Landslide Information Database for Oregon (SLIDO) (https://www.oregongeology.org/slido/). The SLIDO may shows mapped landslides throughout the state of Oregon, including the Cannon Beach area (Figure 3). The mapping shows that there are mapped landslides to the north, northeast, east, and southeast of the site; however, all of the mapped slides are located at a distance of greater than approximately 700 feet from the site. Given the observed soil and rock units on the property and our visual observations of site conditions, we recommend that landslide risk for this property is relatively low (with the exception of the localized slumping of the bluff due to wave attack and coastal erosion).

2.4 Subsurface Materials

The site was explored with 2 test pits (TP-1 and TP-2). For the approximate exploration locations, see Appendix B. The two test pits were advanced using a CAT 360 excavator from Thoreson Excavation. TP-1 was advanced to a depth of 9.5 feet below existing ground surface (bgs) and accompanied by supplemental drive probe testing. TP-2 was advanced to depth of 7.5 feet bgs. Both test pits were terminated by refusal. In addition, we conducted another drive probe test (DP-2) in the backyard on the east side of the concrete wall, see Table 1 below.

The drive probe test is based on a "relative density" exploration device used to determine the distribution and to estimate strength of the subsurface soil and decomposed rock units. The resistance to penetration is measured in blows-per-foot of an 11-pound hammer, freely falling roughly 39-inches, striking a coupling, and driving a 1-inch diameter solid end area (i.e. pipe cap) into the ground. This measure of resistance to penetration can be used to estimate relative density of soils. For a more detailed description of this geotechnical exploration method, please refer to the Slope Stability Reference Guide for National Forests in the United States, Volume I, United States Department of Agriculture, EM-7170-13, August 1994, P 317-321.

Table 1: Drive Probe Test Results

DEPTH (inches)	DEPTH (feet)	DP-1 Blows per 6 inches	DEPTH (inches)	DEPTH (feet)	DP-2 Blows per 6 inches
0-6	0-1	7	96-102	8-9	21
6-12		13	102-108		23
12-18	1-2	19	108-114	9-10	24
18-24		9	114-120		24
24-30	2-3	20	120-126	10-11	23
30-36		12	126-132		20
36-42	3-4	11	132-138	11-12	16
42-48		13	138-144		21
48-54	4-5	15	144-150	12-13	24
54-60		13	150-156		28
60-66	5-6	10	156-162	13-14	26
66-72		12	162-168		27
72-78	6-7	12	168-174	14-15	40
78-84		12	174-180		44
84-90	7-8	15	180-186	15-16	47
90-96		19	186-192		50/5.5"

Select soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished in general accordance with ASTM procedures. The testing performed included moisture content tests (ASTM D2216), the amount of material in the soils finer than the #200 sieve (ASTM D1140), and Atterberg limits tests (ASTM D4318). The test results have been included on the Exploration Logs in Appendix C.

In general, we encountered a thin layer of dark grey cobbles, underlain by brown to reddish clayey silt with few sand, brown to grey silty sand, and then siltstone. Each of the strata we encountered in our explorations are described below:

FILL

In the beach level near the toe of bluff slope, we encountered a layer of dark grey cobbles. This layer, interpreted to be fill, was approximately 6 inches thick. Presumably this material was placed for limited temporary erosion control, or has been transported and redeposited by wave action from nearby properties.

CLAYEY SILT (MH)

Beneath the fill described above, we encountered native fine-grained soils in both test pits, it consists of brown to reddish clayey silt with few sands (MH), wet, soft to very stiff. This stratum

extended to a depth ranging from 6 to 9 feet bgs. Laboratory moisture content testing on samples obtained within this stratum ranged from 34 to 55 percent, indicating a wet condition. Fines content laboratory testing for samples obtained within this stratum ranged from 59 to 83 percent passing the #200 sieve. An Atterberg limits test was conducted on the most cohesive appearing sample and had a liquid limit of 54, a plastic limit of 36, and a calculated plasticity index of 18.

SILTY SAND (SM)

We encountered native silty sand beneath clayey silt in TP-2. It consists of brown to grey silty sand, wet. This stratum extended to a depth of 7 to 9 feet bgs in our test pits. Laboratory moisture content testing on samples obtained within this stratum was 35 percent, indicating a wet condition. Fines content laboratory testing for samples obtained within this stratum was 48 percent passing the #200 sieve.

SILTSTONE

Beneath the native soils described above, we encountered marine sedimentary bedrock (siltstone) at a depth of 9 feet bgs in TP-1 and 7 feet bgs in TP-2. This rock stratum consisted of grey decomposed siltstone. The measured moisture contents in this stratum ranged from 36 to 53 percent.

The classifications noted above were made in accordance with the Unified Soil Classification System (USCS) as shown in Appendix D. The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The exploration logs included in Appendix C should be reviewed for specific information at specific locations. These records include soil descriptions, stratifications, and locations of the samples. The stratifications shown on the logs represent the conditions only at the actual exploration 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 these logs. 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.

2.5 Groundwater Information

Groundwater was encountered at depth of approximately 8 feet in test pit TP-1 at the time of our explorations, and we did not encounter groundwater in TP-2. The nearest well log (obtained from the State of Oregon Water Resources Department website http://apps.wrd.state.or.us/apps/gw/well_log/) that had a groundwater table reported was drilled 0.2 mile to the north of the site. The depth to groundwater at that location was reported as 9 feet bgs, as shown on the well log presented in Appendix E.

It should be noted that groundwater conditions can fluctuate based on changes in land use, seasonally changing climatic conditions, and/or ocean tidal conditions.

2.6 Seismicity

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 SPT blow counts, as well as our local knowledge of the area geology. Inputting our recommended Site Class as well as the site latitude and longitude into the 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 2 below. Note that the values for F_a and F_v in Table 2 were obtained from ASCE's Supplement 3 dated November 5, 2021 and issued for ASCE 7-16 to correct some seismic design issues in the original publication.

Table 2: Seismic Design Parameter Recommendations (ASCE 7-16, including Supplement 3 dated November 5, 2021)

PARAMETER	RECOMMENDATION
Site Class	D
S_s	1.315g
S_1	0.690g
F_a	1.000
F_v	1.700
S_{MS} (=S_s x F_a)	1.315g
S_{M1} (=S_1 x F_v)	1.173g
S_{DS} (=2/3 x S_s x F_a)	0.877g
S_{D1} (=2/3 x S_1 x F_v)	0.782g
Design PGA (=S_{DS} / 2.5)	0.351g
MCE_G PGA	0.663g
F_{PGA}	1.100
PGA_M (=MCE_G PGA x F_{PGA})	0.729g

Note: Site latitude = 45.87377, longitude = -123.96169

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 ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following conditions:

1. Structures on Site Class D sites with S_1 greater than or equal to 0.2g.

   Exception: ASCE 7-16 does not require a site-specific ground motion hazard analysis when the value of S_{M1} is elected to be increased by 50% for all applications of S_{M1} by the Structural Engineer. If S_{M1} is increased by 50% to avoid having to perform the seismic response analysis, then the resulting value of S_{D1} shall be equal to 2/3 * [1.5*S_{M1}]).

2. Structures on Site Class E sites with values of S_s greater than or equal to 1.0, or values of S_1 greater than or equal to 0.2.

   Exception: ASCE 7-16 does not require a site-specific ground motion hazard analysis when:
   1. The Structural Engineer uses the equivalent lateral force design procedure and the value of Cs is determined by Eq. 12.8-2 for all values of T, or
   2. Where (i) the value of S_{ai} is determined by Eq. 15.7-7 for all values of T_i, and (ii) the value of the parameter S_{D1} is replaced with $1.5*S_{D1}$ in Eq. 15.7-10 and 15.7-11.

We classified this site as Site Class D. Because the S_1 value is greater than 0.2g as shown in Table 1 above, a ground motion hazard analysis is required unless the Structural Engineer elects to increase the S_{M1} value by 50 percent (which results in also increasing the S_{D1} value by 50 percent). **If the Structural Engineer elects not to utilize the 50 percent increase on S_{M1} and S_{D1}, then EEI should be retained to perform a site-specific ground motion hazard analysis in accordance with Section 21.2 of ASCE 7-16. Note that for a revetment project to protect a landscape area, we do not expect that a site-specific ground motion hazard analysis will be necessary.**

Photo 5. Looking north at the sand burrito-type SPS, installed in 2021 on the western edge of TL 2200. Note the substantial observed vegetation denuding and erosion that has occurred in the course of one winter season.

3.0 SHORELINE PROTECTION STRUCTURE RECOMMENDATIONS

3.1 Bluff Slope Erosion Factors of Influence

Based on the information provided to us, as well as our subsurface investigation and literature review, it is our professional opinion that the primary factors influencing the stability of the bluff slope, as well as future impacts to the property and existing structures, include the following:

1. **Erosional Retreat.** As mentioned above, the bluff at the site experiences continuous ocean wave erosion. Witter and others[5] estimated the rate of bluff retreat could be as high as approximately 5 feet per decade in southern Clatsop County, Oregon. Given that the existing house is approximately 25 feet away from the bluff slope and assuming an average bluff retreat rate of 5 feet per year, it would take about 25 years for the bluff to retreat to within 10 feet of the house. Based on the observed conditions and this potential future retreat rate, we recommend armoring the shoreline with riprap.

2. **Regional Seismic Hazard.** Abundant evidence indicates that a series of large earthquake related to the Cascadia Subduction Zone have occurred along the coastline of the Pacific Northwest over thousands of years. The calculated possibility of a Cascadia earthquake will occur in the next 50 years ranges from 7-15 percent for a great earthquake affecting the entire Pacific Northwest, to about a 37 percent for a major earthquake influencing the southern end of the Cascadia Subduction zone. In general, settlement, liquefaction, and landsliding of earth material (e.g., bluff slopes) are anticipated to occur in conjunction with this type of major seismic event.

3. **Climate Change.** According to most of the recent scientific studies, the earth's climate is changing as the result of human activities, which is altering the chemical composition of the atmosphere through the buildup of greenhouse gases. Global sea-level rise caused by melting polar ice caps and ocean thermal expansion could lead to flooding of low-lying coastal property, loss of coastal wetlands, increased wave heights, erosion of beaches and bluffs, and saltwater contamination of fresh groundwater. Climate change and the resultant sea-level rise are likely to impact the subject site (as well as numerous other developed similar ocean-front properties in Cannon Beach) through accelerated coastal erosion.

With structures on the property dating back to 1931, the property qualifies for such protection under Statewide Planning Goal 18 rules. In the area north of Tolovana Beach State Recreation Area, most of the properties are protected by engineered structures (many with riprap). The subject property has historically been protected by a concrete seawall; however, the former seawall was of insufficient size for permanent protection and was undercut and destroyed by wave erosion. In addition, the recently installed sand burrito structure on TL 2200 to the north appears to be insufficient as constructed for long-term property protection. Finally, with a

[5] Witter, R.C., Horning, T., and Allan, J.C., 2009, Coastal Erosion Hazard in Southern Clatsop County, Oregon Seaside to Cape Falcon; Open File Report O 09-06; Oregon Department of Geology and Mineral Industries; 61 p.

projected increase in both seasonal climatic events and sea level rise, the erosive forces impacting the property are generally expected to be more significant than the conditions experienced in the past. When considering these lines of evidence and the above influence factors, it is our professional opinion that the existing bluff slope should be protected by a robust SPS, such as a riprap revetment.

3.2 Riprap Revetment Recommendation

To mitigate future ocean wave erosion and the resulting bluff recession, support the over steepened bluff, and protect the subject house from damage, we recommend that a riprap revetement be constructed. We recommend constructing a rip rap revetment in the area shown in Appendix F as the Proposed Revetment Plan. A typical cross-section and recommended specifications for the proposed revetment are shown in Appendix G as the Typical Cross Section: Revetment and Fill. The elevations used on Appendix G are based upon the nearby elevation points provided by Google Earth and USGS Maps, and should be considered approximate.

The intent of the SPS is to protect only the house and property of TL 2100. The proposed revetment will be approximately 60 feet long (i.e. the width of the property beach frontage), and will be sloped westward at 1 Horizontal to 1 Vertical (1H:1V). The final geometry of the revetment will be shaped to match the existing slopes to the north (TL 2200) and south (TL2002) in order to avoid leaving gaps that could act as funnels to erode the adjacent banks. If there are future modifications to adjacent banks, we recommend that (for the sake of continuity, and for the future safety of the existing structures) the gaps be filled in to act as one continuous SPS covering all the lots.

The proposed revetment will generally be constructed of armor rock (riprap), underlain by filter rock (quarry-run bedding), and filter fabric (a woven geotextile). For the sole purpose of creating aesthetic similarity to undeveloped fore-dune areas, we are recommending that the revetment above the elevation of the beach should be covered with a 1- to 2-foot-thick blanket of sand, then be vegetated with dune grass (or other native plants that are common in Oregon Coast dune environments).

Following removal of existing loose fill soil, excavating to the dense bedrock elevation, and excavating a key trench into the bedrock at the toe of the slope, a woven filter fabric (Mirafi Filterweave® 700 or equivalent) should be installed from the top of the slope to the bottom of the toe trench and wrap the lowermost armor stones placed in the trench. An approximately 6-inch-thick layer of quarry-run bedding rock, consisting of 4-inch minus rock, should be placed on the filter fabric and lightly compacted (with the bucket of a backhoe/excavator or a jumping jack) to prevent the more angular filter rock from puncturing the filter fabric.

Riprap armor rock should consist of hard, durable, non-weathered basaltic rock, approximately 1.5 to 4 feet in diameter, placed in an interlocking state. The armor rock should be embedded into dense bedrock at the approximate elevations shown on the Appendix G cross sections, keyed into the native siltstone at a minimum of 2 feet. Toe trench embedment depths must be approved

by a representative of EEI at the time of construction. When installing the armor rock, we recommend that the largest diameter rocks be placed on the face of the structure, with placement sequenced from the bottom to the top of the revetment. The riprap should not be placed at slopes steeper than 1H:1V. The riprap should be moderately compacted with the bucket of the backhoe/excavator (often referred to as "knuckling" the rock into place) to ensure that good particle to particle contact is made

Following placement of the armor rock, the revetment above the beach elevation should be covered with a 1- to 2-foot-thick blanket of sand. The purpose of this layer is entirely aesthetic (i.e. to give the rip-rap revetment the appearance of a vegetated dune). The sand should then be planted with native beach grass, fertilized, and watered as necessary to establish vegetation growth.

Since the excavation may result in excess sand, we recommend that the leftover sand be added to the beach budget by spreading it uniformly over the beach above the Mean High Water (MHW) Level, not in excess of 1 foot in thickness.

While the proposed riprap revetment is intended to be durable, coastal processes are dynamic and it should be anticipated that revetment will need to be maintained and repaired as necessary. In particular, we anticipate that future wave attack will cause surface erosion of the vegetation and sand blanket material. This surficial layer will periodically need to be regraded (or sand replenished) and replanted when erosion occurs.

3.3 Possible Adverse Impacts

Sand supplies along the Oregon coast are derived primarily from two sources: from erosion of bluffs, headlands and dunes; to a lesser extent from sediments carried by streams and rivers that discharges to coastal areas.

The proposed revetment would prevent erosion along approximately 60 feet of bluff length in subject property. The loss of sand to the beach in the littoral cell at the site during the life of the SPS would be minimal as a result of the construction of a new riprap revetment.

Assuming an average annual erosion rate of 0.5 feet per year, based on nearby unprotected portions of the beach, and an anticipated life of the revetment of 60 years, we estimate that the maximum total loss of sediment supply as a result of the revetment will be approximately 534 cubic yards in 60 years or an annual average loss of 9 cubic yards of material. 60% of this material is sand sized, and 40% is silt and clay.

The revetment has been designed to reduce obstructions to sand movement along the beach. We do not anticipate that sand movement along this dynamic beach will be adversely impacted by the riprap revetment.

The riprap revetment will increase the stability of the bluff slope and will reduce the risk of

continued ocean wave erosion. We anticipate that there could potentially be no erosion below the elevation of the top of the revetment if the revetment is well maintained. However, any exposed bluff above the revetment may continue to recede due to wind and rain erosion and severe wave attack.

3.4 Recommended Geotechnical Inspections of Riprap Construction

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

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

1. Subgrade preparation beneath the riprap revetment.
2. Verify filter fabric placement.
3. Verify filter rock (quarry-run bedding) placement
4. Verify armor rock placement (verify proper rock, verify proper toe embedment, verify riprap inclination).
5. Final revetment inspection.

Note that the construction team and/or governing jurisdiction may require additional inspections.

3.5 Other Considerations

The following discusses the general concerns that OPRD and the reviewing agencies and groups generally consider when evaluating an SPS Permit Application.

Project Need. Although the bluff has suffered normal ongoing erosion since development of the property, this property has clearly been more severely threatened in recent years. In this area of Tolovana Park, it is apparent that the properties have historically been affected by major storms based on the prevalence of riprap revetments, concrete seawalls, and wooden bulkheads. As a result of recent seasonal storm episodes, the bluff is currently standing at a near-vertical slope (Photo 1). Without a permanent solution, there will be near-term property loss (i.e. the existing concrete wall at the crest of the slope and portions of the small backyard) as the bluff soil reverts to the normal angle of repose and wave action quickly erodes the loose, disturbed soil. Eventually, these conditions will threaten the house on TL 2100 (as well as potentially the adjacent properties to the north and south). Without shoreline protection, the existing home on TL 2100 would be in jeopardy.

Public Rights. The proposed revetment will extend approximately +/-20 feet beyond the face of the existing bluff (Appendix F and G), but in terms of beach loss based on existing conditions, the

SPS footprint will stay within the property boundary and will match the slopes to the north and south of the site. No public beach access will be lost.

Alternatives to Revetment Construction. The presence of numerous existing seawalls and revetments on the beachfront in this part of Cannon Beach has undoubtably helped to exacerbate the erosion conditions affecting this property and has increased the erosion potential for non-hardened surfaces. Nevertheless, we needed to consider non-structural solutions that in some areas help stabilize bluff slopes. These included vegetative stabilization, sand alteration, and cobble berms. Vegetation on this slope and adjacent properties has been systematically removed by storm events. Due to the high wave energy and relatively steep beach slopes, vegetation has not been effective in this area.

Sand alteration is fairly common on the east coast where the wave climate is significantly milder; however, this has only been attempted in a few areas of the west coast such as San Diego, California. The process involves moving hundreds of thousands of cubic yards of sand within littoral cells or bringing sand from other sources in attempts to encourage dune building and to shore-up erosion-damaged areas. Typically, this involves large amounts of government spending and long-term commitments. The reality is that intense climatic events such as El Niño and La Niña, or in recent cases, an unusually severe storm or rip embayment, can remove hundreds of thousands of cubic yards of material in a few days' time, again exposing the shorelines to intense erosion. The practice of sand alteration usually requires vast areas of beach to be even moderately effective, so this would not be a viable solution for the small subject property.

Cobble berms are similar to sand alteration in that they involve moving material around on the beaches from areas of low potential damage to areas of high potential damage. Normally these require an extensive source of cobbles on the beach, or very close by (not readily available at this site). Cobble berms are constructed at a low slope angle (e.g., on the order of 11 degrees), and therefore require a larger footprint for placement. In this case, the proposed riprap revetment will need to be installed at a 1H:1V (45 degree) slope in order to have a footprint within the site property boundary. The limited amount of property, lack of cobble sources, and high-energy waves in this area combine to eliminate a cobble berm solution. Wave attack could remove the stabilizing effects of the cobbles in a short period of time.

Vegetative stabilization, sand alteration, and cobble berms would not be sufficient to resist wave attack in order to substantially slow or halt erosion, or to stabilize the bluff slope. In addition, the height of the bluff, presence of adjacent revetments, and the close proximity of adjacent structures to the slope crests do not make them conducive to experimentation with solutions having marginal chances of success.

We do not believe dynamic revetments such as sand bags, gravel mounds, logs, or composite revetments would prove effective. Sand tubes have been used on the Atlantic coast with some success by placement offshore, which causes waves to break early and lose energy before reaching the shorelines. However, because of the extremely high wave energy, these structures have not been shown to have acceptable performance during severe storm events and over

longer periods of time along the west coast. We do not believe dynamic revetments have been satisfactorily proven to work in the type of coastal environment found at the site.

Public Costs. In terms of public cost, the structure will not result in any significant loss of public beach. Since maintenance costs and repairs will be borne by the property owner, there is no public cost in dollars.

Scenic Concerns. The project will closely follow existing revetments and bluff profiles in the area and will not alter any major landforms. Although no significant vegetation presently exists at beach level, we are recommending to the property owner that they vegetate the revetment face with naturally occurring plantings. The majority of lots to the north of Tolovana Park already have an SPS in place, therefore this structure will be an aesthetic improvement over the exposed seawalls and exposed riprip structures already existing. The structure will not obstruct views of the ocean or beach from adjacent properties and will be consistent with other revetments immediately adjacent and slightly further to the north and south of the property.

Recreational Usage. During the worst of conditions, high tides and storm waves cover the beach up to the base of the existing revetments and beachfront slopes. During normal and summer conditions, the beach may be as much as 300 yards wide at low tide. This structure will not alter or worsen the existing conditions. During normal seasonal weather patterns, the usage of the beach in this area will not change because of this structure. No important public access routes within the ocean shore area will be blocked.

Neighboring Properties. The majority of lots to the north of Tolovana Park already have an SPS in place. The presence of these revetments have increased the potential for future wave erosion and continued rapid bluff retreat in this zone. Left unchecked, the erosion will continue to erode the bluff below TL 2100. The resulting erosion and bluff recession may later compromise the stability of the SPS and bluff slope of the adjacent properties to the north and south. The proposed revetment will protect the properties and provide a smooth line along the beach front in this area. The composition of the adjacent bluff slope to the south is unknown, so there is potential that this property could be adversely affected by this structure in a similar manner that TL 2100 has likely been affected by the other existing SPS structures in this vicinity.

Sand Source, Supply, and Movement. Sand supplies along the Oregon coast are derived primarily from two sources: (1) from sediments carved by streams and rivers that discharge to coastal areas; and (2) from erosion of bluffs, headlands, and dunes. Due to their relative hardness, the bluff and headland sand supplies are minor compared to those derived from dunes and streams.

During El Niño events, the entire sand supply may be removed from portions of a littoral cell and deposited elsewhere, usually at the northern end, exposing the bluffs and dunes to rapid erosion. The bluff material and talus eroded during the storm events will also disappear, generally by moving offshore, then gradually returning during summer months. When conditions return to normal, it may be several years before the beaches and dunes recover their pre-El Niño configurations. The areal distribution of the bluff and talus material removed during an El Niño

event is nearly impossible to determine, and estimating the amount of sand supply loss to the coastal system by this particular structure is very difficult. Like other areas of the northern coast, the beaches in the Clatsop County area have historically gone through periods of severe erosion and minor dune construction, and the historical record is not sufficient to infer the overall trend. The variability in erosion and deposition of sands is influenced by general ocean currents, waves, rip currents, jetties, spits, and other structures and phenomena, but is ultimately controlled by global climate conditions and the relative elevation of the sea level.

Ultimately, the proposed SPS will reduce the risk of erosion for only 60 feet of property line, and in our estimation the resulting additional loss of sand to the beach will be minimal during the life of the revetment.

Bank or Bluff Stability and Erosion Rates. The State of Oregon DOGAMI has numerous fairly detailed reports and accompanying maps regarding shoreline and bluff retreat in this area. Witter and others (2009) estimated approximately 30 feet of bluff retreat over the next 60 years, or approximately 5 feet per decade, which is much higher than has been observed to date. Retreat rates are not consistent from year to year and are considered long-term averages because erosion occurs in cycles. Generally speaking, a particular bluff may not move for 20 years, and then suddenly lose 15 feet of frontage in one storm event.

In this area, the extensive presence of engineered structures indicates that there has been historical erosion impacts from storms. Within the past half century, much of this shoreline in this part of Cannon Beach has remained relatively stable, with minimal overall erosion or accretion having occurred since the 1960's. However, as pertaining to TL 2100 and adjacent properties, a series of storms in recent winter seasons have resulted in bluff retreat of several feet, likely in excess of all projected annual erosion rates.

The published erosion rates are approximate, and in given areas, the error bar can be vastly inaccurate. Therefore, on a small lot in an area tightly constrained by property boundaries and adjacent SPS, moving a building site a few feet further back than the projected erosion rate dictates (in lieu of providing SPS protection) is not a reasonable alternative. As noted previously, if no SPS is provided, the ongoing process of toe erosion and slope layback to the natural angle of repose of the fine-grained soil (approximately 2H:1V to 3H:1V) may eventually remove the upland backyard on the property and threaten the residential structure.

The published erosion rates do not take into account the presence of existing SPS and their effect on adjacent properties. In our opinion, construction of the revetments to the north and south of this property has helped to accelerate the erosion of the bluff. An SPS at this site will increase the stability of the bluff slope east of the revetment and will help to protect it from continued ocean wave erosion. The structure will be tied into the existing revetment to the south and will be extended on the north side to help mitigate the effects of wave refraction around the end of the structure.

4.0 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.

The subject property is located on a bluff fronting the Pacific Ocean. This property is subject to very dynamic forces (i.e. powerful winter storms, ocean currents, and earthquakes). The conditions of the subject property could change drastically in the future due to these forces and cannot be entirely predicted, nor can they be fully mitigated. These risks are common to other similar properties in the area, which have already been developed with similar residential homes.

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.

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.

The subsurface explorations performed for this geotechnical study represent the subsurface conditions at discrete locations on the project site. The number of explorations were sufficient to provide geotechnical engineering recommendations for the proposed retaining wall project, but may not be sufficient to eliminate all risk of differing or unanticipated subsurface conditions elsewhere along the proposed retaining wall alignment. When developing the construction schedule and budget, it should be assumed that the subsurface could conditions may vary across the site. To reduce the risk of encountering differing or unanticipated conditions during construction, we are available to perform additional subsurface explorations upon request.

This report has been prepared for the exclusive use of Stephen and Laurel Day for the specific application to the proposed riprap revetment within the property located at 3216 Pacific Avenue in Cannon Beach, 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.

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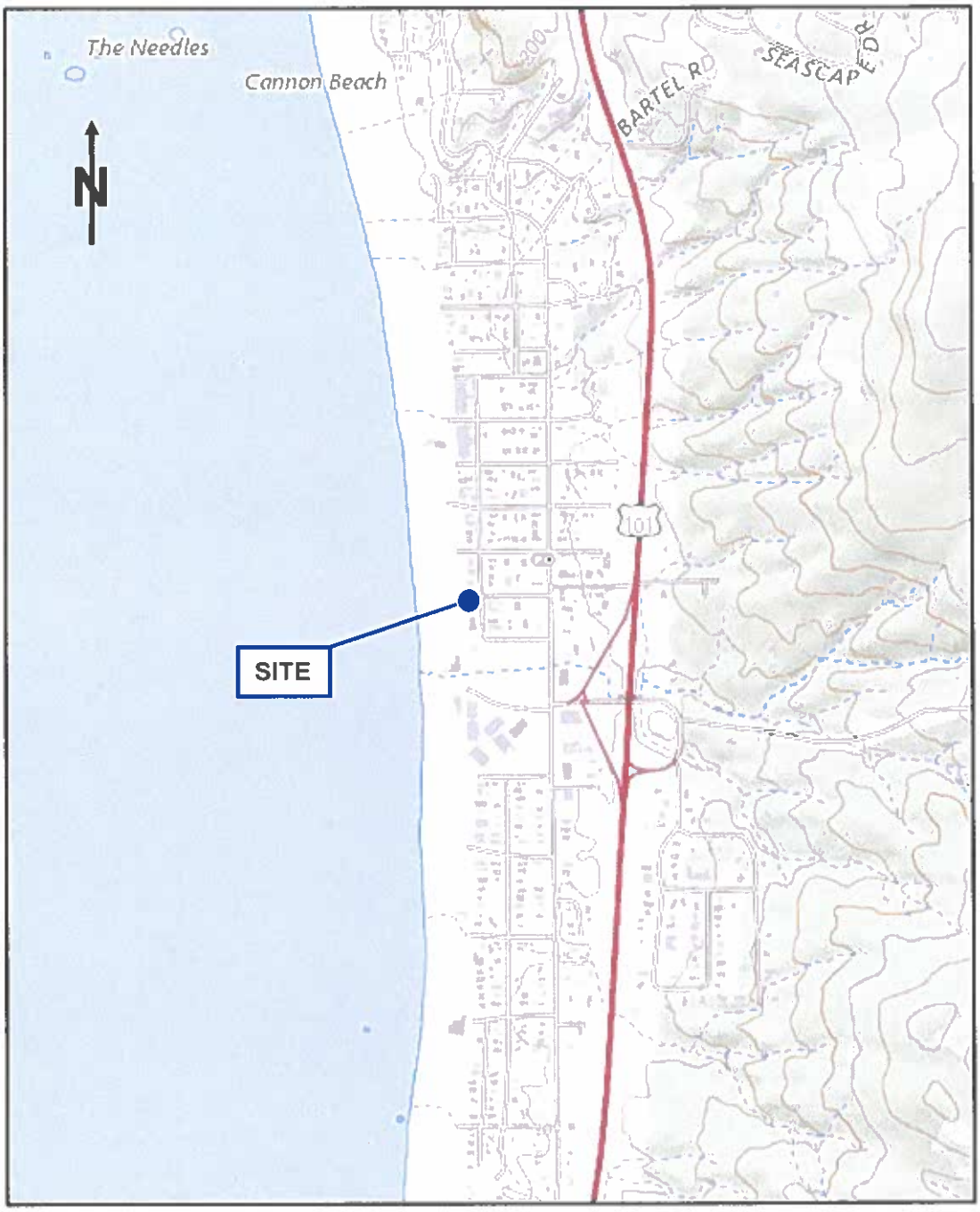
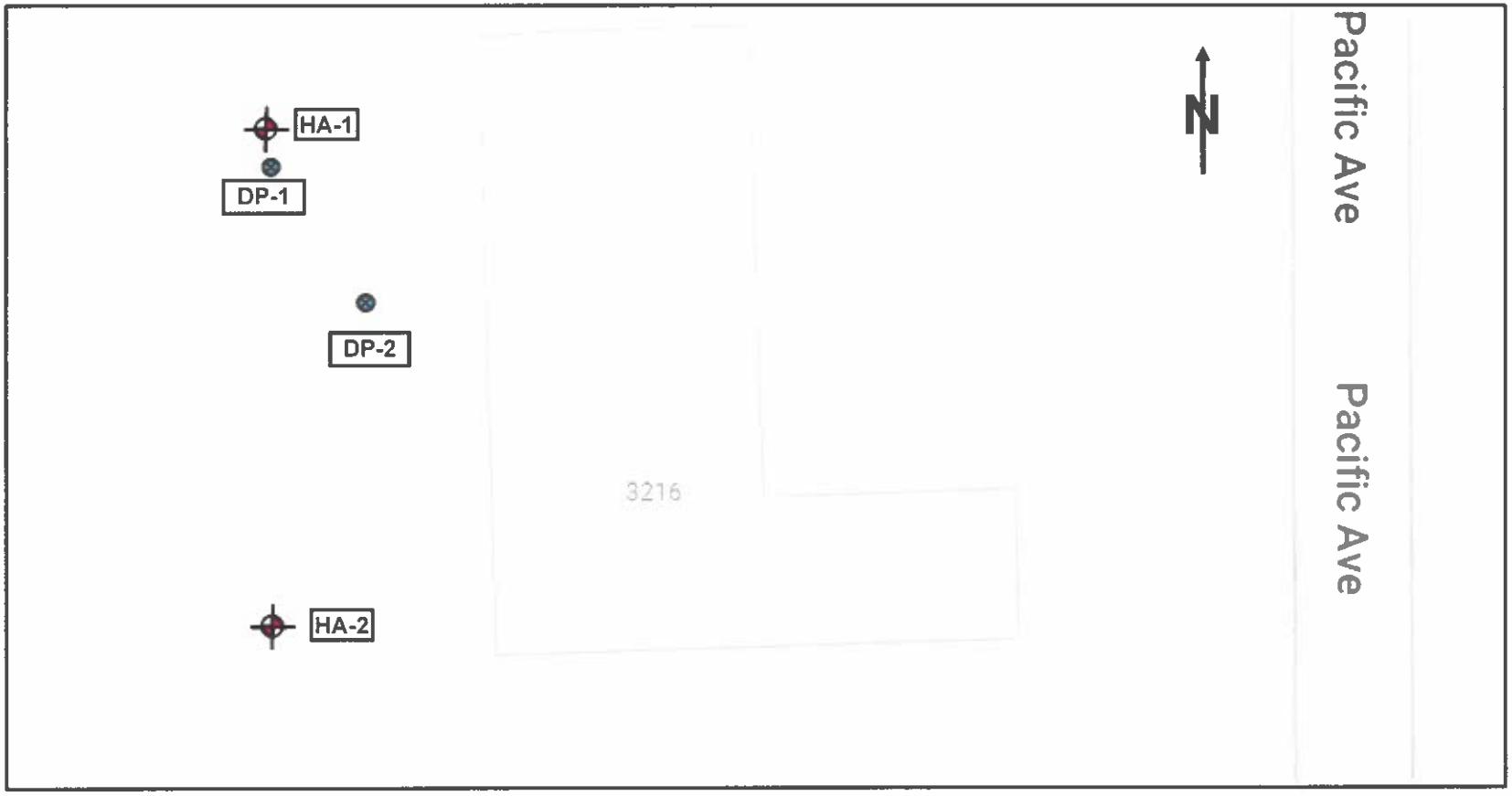
APPENDICES

APPENDIX A – SITE LOCATION MAP



Earth Engineers, Inc.	Proposed Shoreline Protection Structure 3216 Pacific Avenue Cannon Beach, Clatsop County, Oregon	Report No. 22-232-1 November 22, 2022

APPENDIX B – EXPLORATION PLAN



Legend:

= Approximate Hand Auger Boring Location

= Approximate Drive Probe Test Location

Base Drawing from Google Earth

Earth Engineers, Inc.	**Proposed Shoreline Protection Structure** **3216 Pacific Avenue** **Cannon Beach, Clatsop County, Oregon**	**Report No. 22-232-1**	**November 22, 2022**

Earth Engineers, Inc.

Appendix C: Test Pit TP-1

Client: Stephen and Laurel Day
Project: Proposed Shoreline Protection Structure Construction
Site Address: 3216 Pacific Avenue
Cannon Beach, OR
Location of Exploration: See Exploration Location Plan
Logged By: Yonggui Xie, P.E./ Adam Reese C.E.G.

Report Number: 22-232-1
Excavation Contractor: Thoreson Excavation
Excavation Method: Excavator with 24-inch toothed bucket
Excavation Equipment: CAT 360
Approximate Ground Surface Elevation (ft msl): 16
Date of Exploration: October 13, 2022

Depth (ft)	Water Level	Lithology: Lithologic Symbol	Lithology: Geologic Description of Soil and Rock Strata	Sampling Data: Sample Number	Digging Effort	Drive Probe Blows Per 6 Inches	Pocket Pen. (tsf)	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Remarks
0			Fill - Dark grey cobbles with few sand, dry			9, 17						
1			MH - Brown to reddish clayey silt with few sand, wet, soft to very stiff			3						
2				GRAB 1		4, 4		54				
3						4, 4, 3						
4				GRAB 2		12		48	83			
5						6, 6						
6			more grey	GRAB 3		8, 7		55	72	54	36	
7						9, 15						
8				GRAB 4		23		55	59			
9			Siltstone - Grey decomposed siltstone	GRAB 5				53				
10												
11												
12												
13												
14												
15												

Notes: Test pit terminated at a depth of approximately 9.5 feet bgs. Groundwater was encountered at depth of 8 feet at the time of our exploration. Test pit loosely backfilled with excavated soil on 10/13/2022. Approximate elevation based on Google Earth.

Earth Engineers, Inc.

Appendix C: Test Pit TP-2

Client: Stephen and Laurel Day
Project: Proposed Shoreline Protection Structure Construction
Site Address: 3216 Pacific Avenue
Cannon Beach, OR
Location of Exploration: See Exploration Location Plan
Logged By: Yonggui Xie, P.E./ Adam Reese C.E.G.

Report Number: 22-232-1
Excavation Contractor: Thoreson Excavation
Excavation Method: Excavator with 24-inch toothed bucket
Excavation Equipment: CAT 360
Approximate Ground Surface Elevation (ft msl): 16
Date of Exploration: October 13, 2022

Depth (ft)	Water Level	Lithology: Lithologic Symbol	Lithology: Geologic Description of Soil and Rock Strata	Sampling Data: Sample Number	Digging Effort	Drive Probe Blows Per 6 Inches (0 20 40 60)	Pocket Pen. (tsf)	Moisture Content (%)	% Passing #200 Sieve	Liquid Limit	Plastic Limit	Remarks
0			Fill - Dark grey cobbles with few sand, dry									
1			MH - Brown to reddish clayey silt with few sand, wet, soft to very stiff									
2				GRAB 1				34	64			
3												
4				GRAB 2				48	71			
5												
6			SM - Brown to grey silty sand, wet.	GRAB 3				35	48			
7			Siltstone - Grey decomposed siltstone	GRAB 4				36				
8												
9												
10												
11												
12												
13												
14												
15												

Notes: Test pit terminated at a depth of approximately 7.5 feet bgs. Groundwater was not encountered at the time of our exploration. Test pit loosely backfilled with excavated soil on 10/13/2022. Approximate elevation based on Google Earth.

APPENDIX D: SOIL CLASSIFICATION LEGEND

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

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

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

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

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

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

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

Earth Engineers, Inc.

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

APPENDIX E

CLAT 51189

STATE OF OREGON
GEOTECHNICAL HOLE REPORT
(as required by OAR 690-240-035)

(1) OWNER/PROJECT: Hole Number B1
Name STATE MARTIN MAG CO
Address PO BOX 219
City CANNON BEACH State OR Zip 97110

(2) TYPE OF WORK
[X] New [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) CONSTRUCTION:
[ ] Rotary Air [ ] Hand Auger [ ] Hollow Stem Auger
[X] Rotary Mud [ ] Cable Tool [ ] Push Probe [ ] Other

(4) TYPE OF HOLE:
[X] Uncased Temporary [ ] Cased Permanent
[ ] Uncased Permanent [ ] Slope Stability [ ] Other

(5) USE OF HOLE: GEOTECH

(6) BORE HOLE CONSTRUCTION:
Special Construction approval [ ] Yes [X] No Depth of Completed Hole 30 ft.

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
5"	0	30	BENCHIPS	30	0	6

Backfill placed from ____ ft. to ____ ft. Material ____
Filter Pack placed from ____ ft. to ____ ft. Size of pack ____

(7) CASING/SCREEN:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing					[ ]	[ ]	[ ]	[ ]
			NA		[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Screen					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Slot size ____

(8) WELL TEST:
[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian
Permeability ____ Yield ____ GPM ____
Conductivity ____ PH ____
Temperature of water 58 °F Depth artesian flow found ____ ft
Was water analysis done? [ ] Yes [X] No
By whom? ____
Depth of strata analyzed. From ____ ft. to ____ ft.
Remarks: ____

(9) LOCATION OF HOLE by legal description:
County CLATSOP Latitude ____ Longitude ____
Township 5 N or S Range 10 E or W WM
Section 31 SE 1/4 SW 1/4
Tax Lot 200 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) INTERSECT. OF PACIFIC ST & MELCHERS AVE

Map with location identified must be attached

(10) STATIC WATER LEVEL:
9 ft. below land surface. Date 7/25/01
Artesian pressure ____ lb. per square inch. Date ____

(11) SUBSURFACE LOG:
Ground Elevation ____

Material Description	From	To	SWL
BR SILTS	0	18	9
BR SD	18	30	

Date Started 7/25/01 Date Completed 7/25/01

(12) ABANDONMENT LOG:

Material Description	From	To	Sacks or Pounds
BEN-CHIPS	30	0	6

RECEIVED
AUG 22 2001
WATER RESOURCES DEPT
SALEM, OREGON

Date started 7/25/01 Date Completed 7/25/01

Professional Certification
(to be signed by a licensed water supply or monitoring well constructor, or Oregon registered geologist or civil engineer)

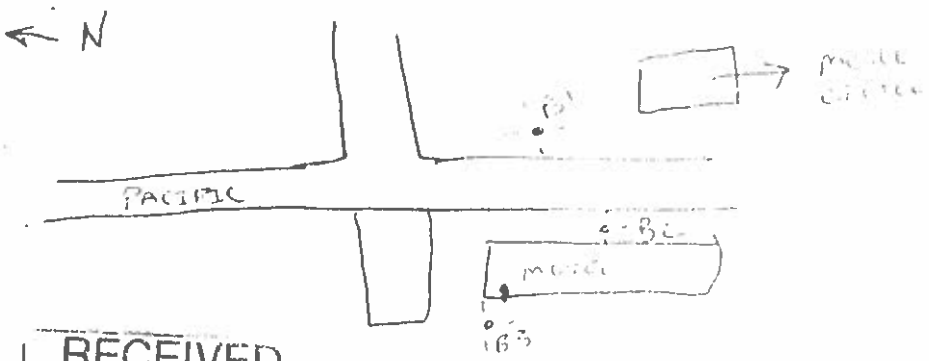
I accept responsibility for the construction, alteration, or abandonment work performed during the construction dates reported above. All work performed during this time is in compliance with Oregon's geotechnical hole construction standards. This report is true to the best of my knowledge and belief.

License or Registration Number 10306
Signed ____ Date 8-10-01
Affiliation SUBSURFACE TECH.

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

ORIGINAL - WATER RESOURCES DEPARTMENT FIRST COPY - CONSTRUCTOR SECOND COPY - CUSTOMER

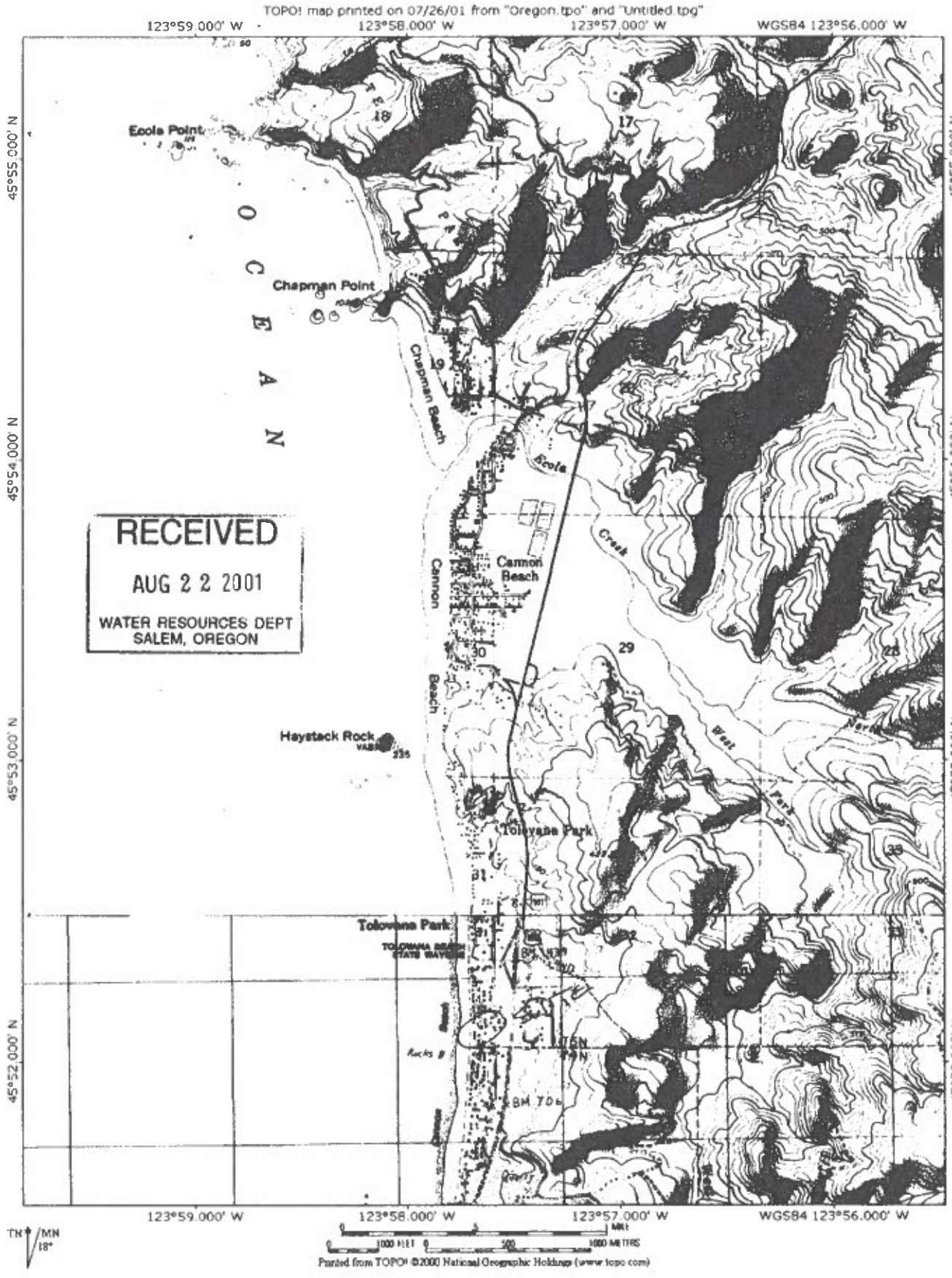
CLAT 51189



OCEAN BEACH

1" = 50'

CLAT 51189


TOPO! map printed on 07/26/01 from "Oregon.tpo" and "Untitled.tpg"
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123°58.000' W
123°57.000' W
WGS84 123°56.000' W
45°55.000' N
45°54.000' N
45°53.000' N
45°52.000' N
Ecola Point
OCEAN
Chapman Point
Chapman Beach
Ecola Creek
Cannon Beach
Cannon Beach
Haystack Rock
235
Tolovana Park
Tolovana Park
TOLOVANA BEACH STATE WAYSIDE
West Fork
North Fork
BM 70
Rocks
18
17
19
30
29
28
31
32
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RECEIVED
AUG 2 2 2001
WATER RESOURCES DEPT
SALEM, OREGON
TN
MN
18°
1000 FEET
500
1000 METERS
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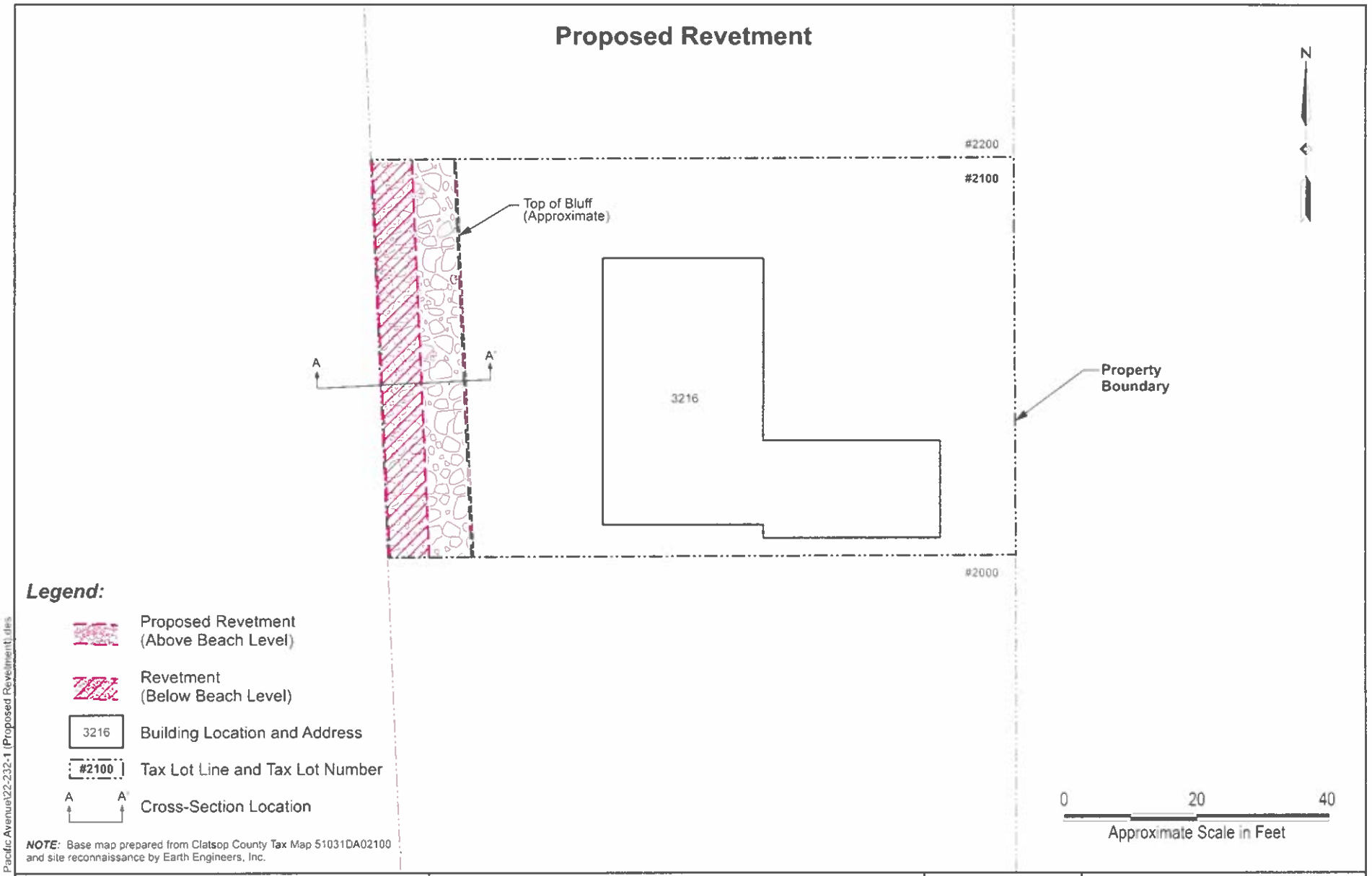
APPENDIX F

Proposed Revetment

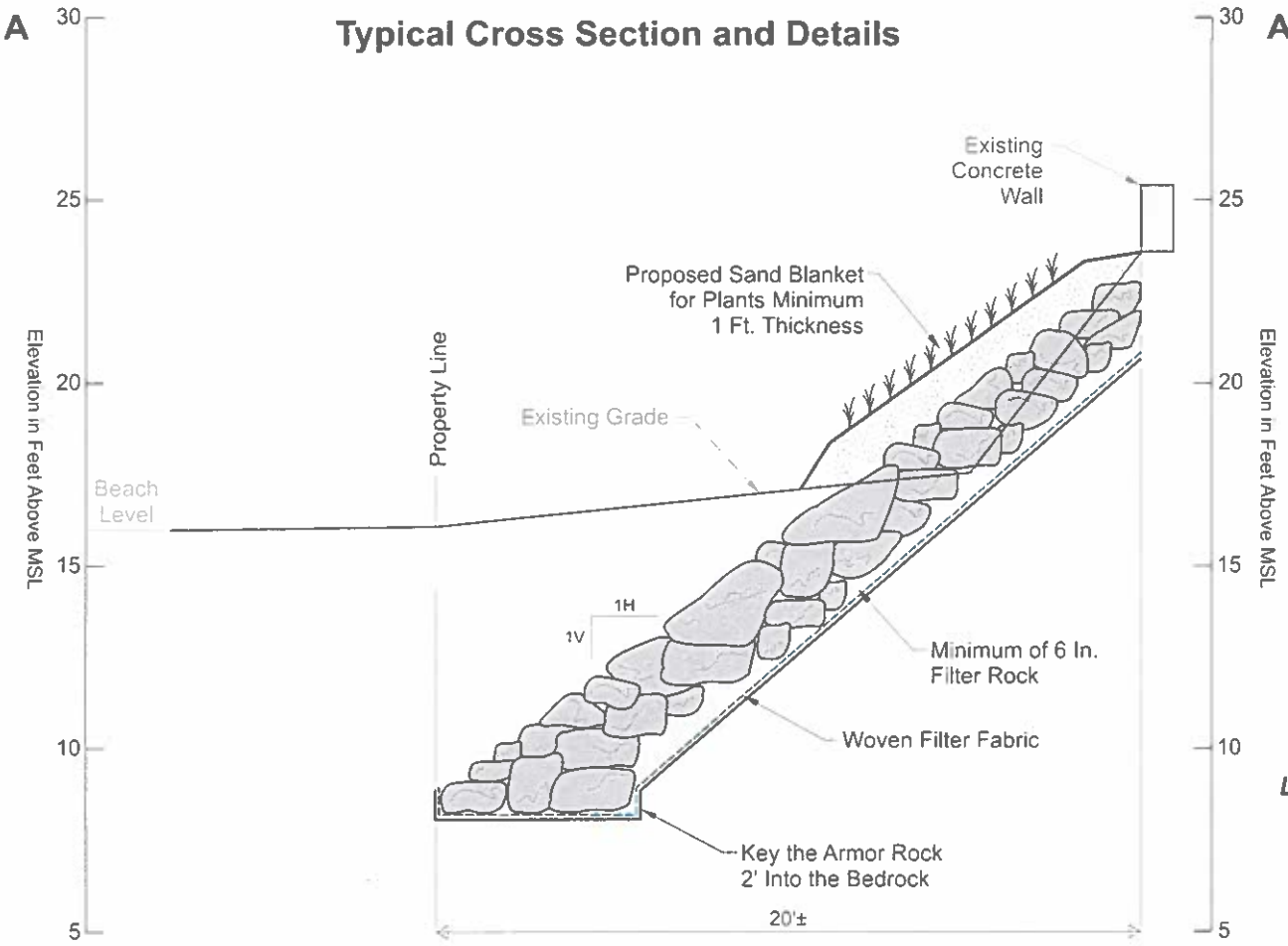


Earth Engineers, Inc.	**Proposed Shoreline Protection Structure** **3216 Pacific Avenue** **Cannon Beach, Clatsop County, Oregon**	**Report No.** **22-232-1**	**November 22, 2022**

f:\Client\Earth Engineers\3216 Pacific Avenue\22-232-1 (Proposed Revetment).dgn

APPENDIX G

Typical Cross Section and Details



ARMOR ROCK GRADATIONS
Minimum Thickness of Armor Rock - 4.0 feet

% Less than by Wt.	Wt. (Lbs.)	Dia. (Ft.)
0	417	1.40
15	1,333	2.01
50	3,334	2.72
80	6,534	3.41
100	13,335	4.32

FILTER ROCK GRADATIONS
Minimum Thickness of Filter Blanket - 0.5 Feet

% Less than by Wt.	Wt. (Lbs.)	Dia. (Ft.)
0	1	0.19
15	2	0.22
50	6	0.33
81	21	0.34
100	35	0.60

NOTES:

- The revetment should be tied into existing sand burrito to shoreline protection structure (SPS) to the north and to the existing bank to the south.
- The base of the riprap should be at least 2 feet into bedrock.
- If minimum embedment cannot be achieved due to heaving or flowing sands, then dewatering will be necessary.
- Riprap should consist of hard, durable, non-weathered basalt rock, interlocked with a minimum of three points of contact.
- The filter blanket should consist of 6-inch minus pitrun or similar, placed at a slope angle of approximately 1H:1V.
- Woven filter fabric (Mirafi Filterweave 700, or equivalent) should be placed between the filter rock and the native soils.
- Riprap slopes exposed to wave action should be on the order of 1 horizontal to 1 vertical (1H:1V).
- Following construction, the revetment should be covered with a minimum of one foot of sand and planted with native dune grass.

Legend:

Armor Rock

Filter Rock

Sand

0 5 10

Approximate Scale in Feet

Earth Engineers, Inc.

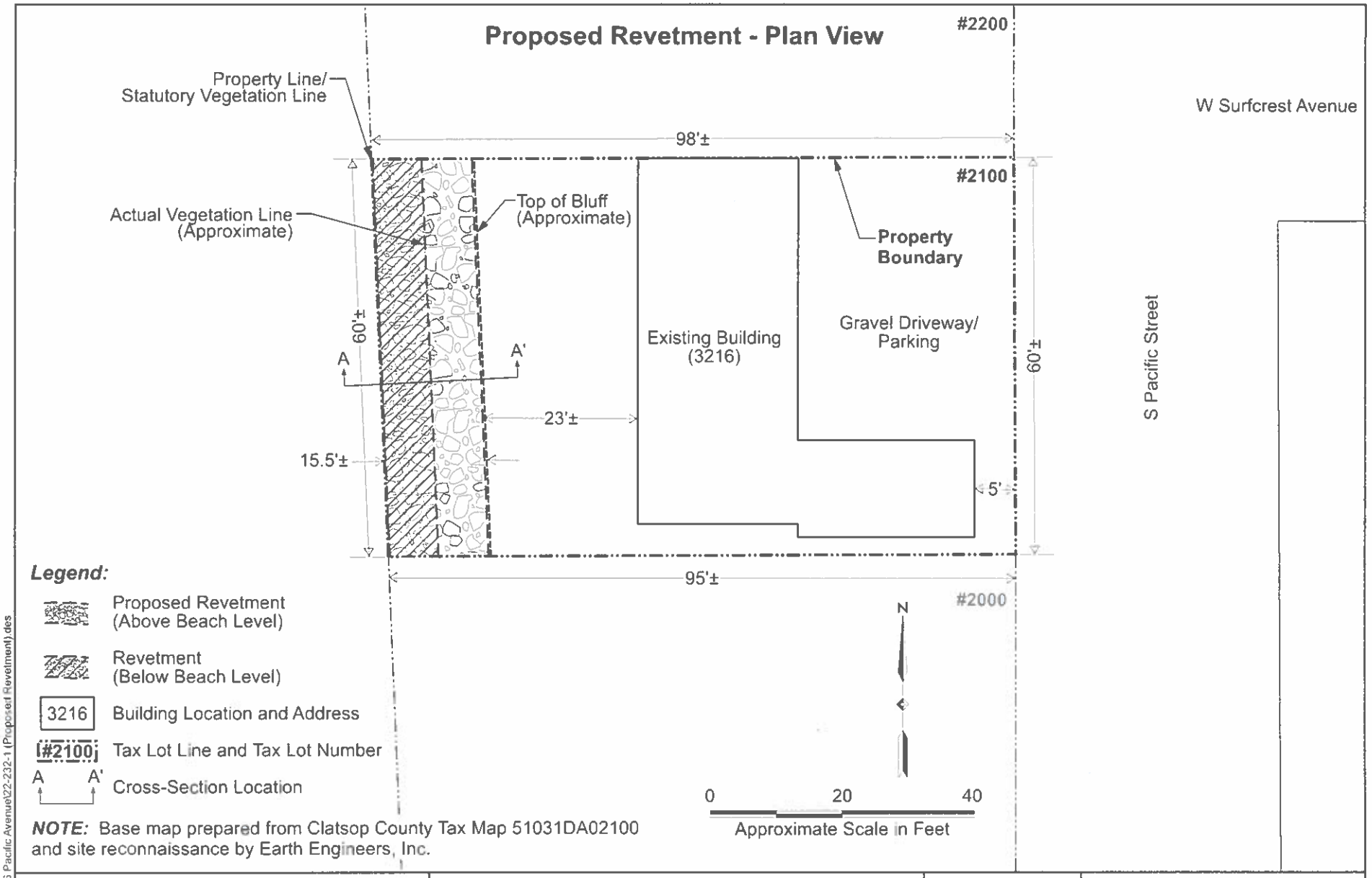
Proposed Shoreline Protection Structure
3216 Pacific Avenue
Cannon Beach, Clatsop County, Oregon

Report No. 22-232-1

November 22, 2022

I:\Client\Earth Engineers\3216 Pacific Avenue\22-232-1 (A-A' Revetment and Fill).dgn

Proposed Revetment - Plan View



Legend:

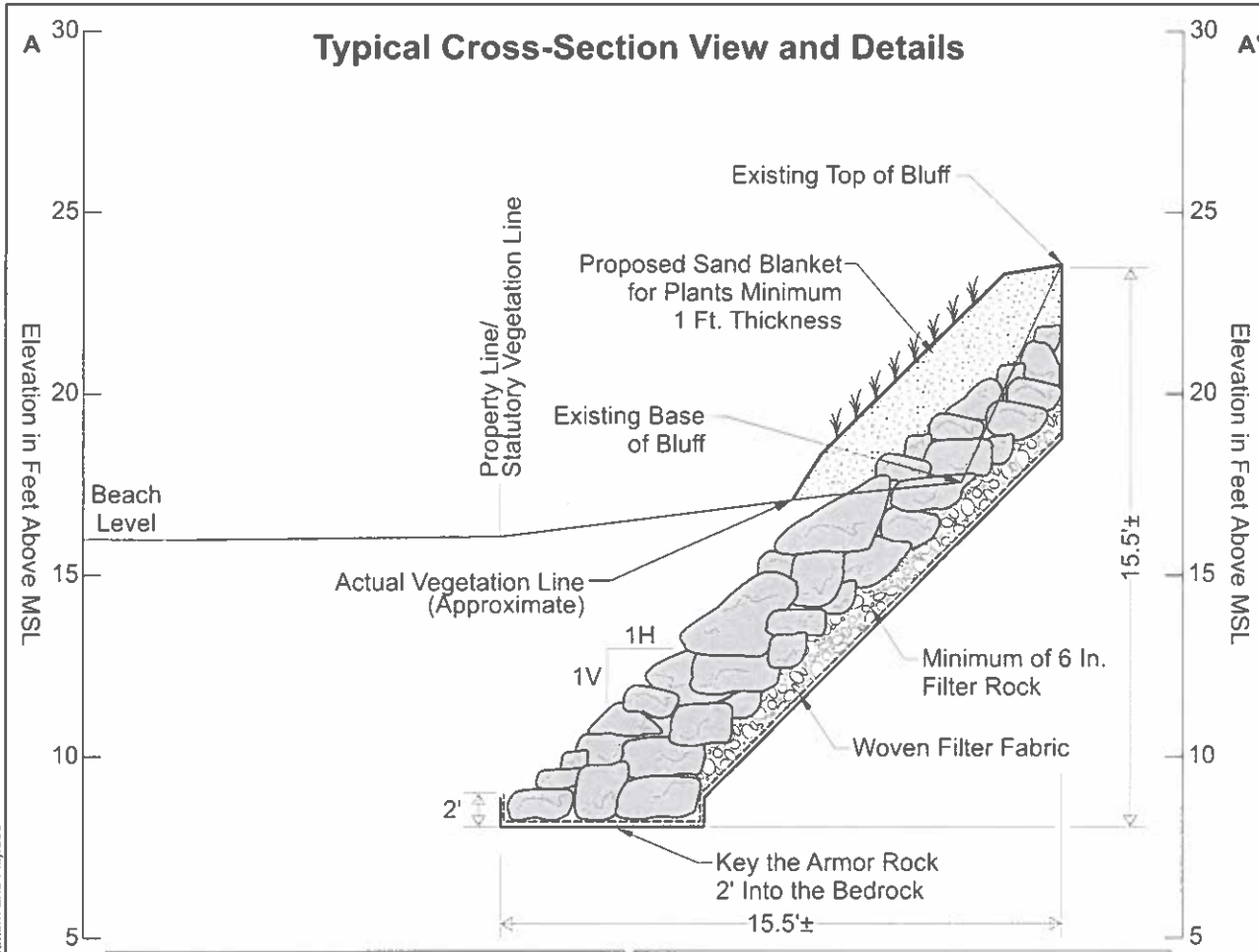
- Proposed Revetment (Above Beach Level)
- Revetment (Below Beach Level)
- 3216 — Building Location and Address
- #2100 — Tax Lot Line and Tax Lot Number
- A — A' — Cross-Section Location

NOTE: Base map prepared from Clatsop County Tax Map 51031DA02100 and site reconnaissance by Earth Engineers, Inc.

Earth Engineers, Inc.	**Proposed Shoreline Protection Structure** **3216 S Pacific Street** **Cannon Beach, Clatsop County, Oregon**	**Report No. 22-232-1**	**June 2, 2023**

I:\Client\Earth Engineers\3216 Pacific Avenue\22-232-1 (Proposed Revetment).des

Typical Cross-Section View and Details



ARMOR ROCK GRADATIONS
Minimum Thickness of Armor Rock - 4.0 feet

% Less than by Wt.	Wt. (Lbs.)	Dia. (Ft.)
0	417	1.40
15	1,333	2.01
50	3,334	2.72
80	6,534	3.41
100	13,335	4.32

FILTER ROCK GRADATIONS
Minimum Thickness of Filter Blanket - 0.5 Feet

% Less than by Wt.	Wt. (Lbs.)	Dia. (Ft.)
0	1	0.19
15	2	0.22
50	6	0.33
81	21	0.34
100	35	0.60

NOTES:

- The revetment should be tied into existing sand burrito to shoreline protection structure (SPS) to the north and to the existing bank to the south.
- The base of the riprap should be at least 2 feet into bedrock.
- If minimum embedment cannot be achieved due to heaving or flowing sands, then dewatering will be necessary.
- Riprap should consist of hard, durable, non-weathered basalt rock, interlocked with a minimum of three points of contact.
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- Riprap slopes exposed to wave action should be on the order of 1 horizontal to 1 vertical (1H:1V).
- Following construction, the revetment should be covered with a minimum of one foot of sand and planted with native dune grass.

Legend:

Armor Rock

Filter Rock

Sand

0 5 10

Approximate Scale in Feet

I:\Client\Earth Engineers\3216 Pacific Avenue\22-232-1 (A-A' Revetment and Fill).des

Earth Engineers, Inc.

Proposed Shoreline Protection Structure
3216 S Pacific Street
Cannon Beach, Clatsop County, Oregon

Report No. 22-232-1

June 2, 2023

From: steve michaelis
To: stephentday33@gmail.com
Cc: BLANCHETTE Tyler * OPRD
Subject: Ocean shore revetment and stabilization at 3216 Pacific St.
Date: Friday, August 18, 2023 7:29:58 PM

To whom it may concern,

I, Steve Michaelis, along with my spouse Sally Michaelis own the property located at 3188 Pacific St.,
Cannon Beach, OR 97110.

Following the Cannon Beach Planning Commission's approval to the ocean-shore revetment and
stabilization proposed by the owners of the property immediately to the South of our property
at 3216 Pacific St., we became aware that the project would require staging of material adjacent to
our property to the West.

We understand that as part of the OPRD's review of the draft permit application, a suggestion was
made to consult with us about the proposed staging of materials to the West of our property.
Stephen Day, the owner of 3216 Pacific St., did discuss the plan with us several weeks ago.

Although the staging area is not on our property, we have no concerns about the plan and support the Day's in proceeding with the plan as outlined.

We would be happy to answer any questions you may have.

Thank You,
Steve and Sally Michaelis
503-481-8375