OREGON SHORES
CONSERVATION COALITION

Friday, September 21, 2018

City of Newport Planning Commission
c/o Community Development Director Derrick Tokos
Newport Community Development Department
169 SW Coast Hwy
Newport, Oregon 97365

Via Email to: D.Tokos@NewportOregon.gov

Re: File No. 1-GP-18-A, Lund Geologic Permit Application
Comments of Oregon Shores Conservation Coalition

Dear Chair Patrick and Planning Commission members:

Please accept these comments from the Oregon Shores Conservation Coalition and its members (collectively "Oregon Shores") to be included in the record on appeal of File No. 1-GP-18-A. Oregon Shores is a non-profit organization dedicated to protecting the natural communities, ecosystems, and landscapes of the Oregon coast while preserving the public's access to these priceless treasures in an ecologically responsible manner. Our mission is to assist local residents in land use matters and other regulatory processes affecting their coastal communities, and to engage Oregonians and visitors alike in a wide range of advocacy efforts and stewardship activities that serve to protect our state's celebrated public coastal heritage. For nearly half a century, Oregon Shores has been a key public interest participant in legislation, policy, and regulatory processes related to land use and shoreline management in the State of Oregon.

We previously offered comments on Mr. Bill Lund's application for a shorelands impact review (sent July 31, 2018, to be included in the record of File No. 1-SIR-18), which he submitted for the same proposed project site pursuant to Newport Municipal Code ("Code") Chapter 14.38. Please notify me of any further decisions related the geologic permit.

1. Background

This past spring, Mr. Lund sought approval for development of three homesites on a vacant plot of land located immediately north of 1245 NW Spring St., within the city of Newport, Oregon. A single-family residence is planned for the northernmost lot, and duplexes are planned for the two southern lots. The proposed site is within the "Jump-Off Joe" landslide complex and adjacent to the Jump-Off Joe outstanding natural area boundary.[1] Mr. Lund secured the services of K & A Engineering, Inc. to provide a geotechnical engineering report and geologic hazard assessment for the site, which K & A subsequently presented to Mr. Lund on June 29, 2018. Mr. Lund included K & A's Geotechnical Engineering Report and Geologic Hazard Assessment (hereinafter "K & A Report") in his land use application for a Geologic Permit for the site. The decision at issue on appeal is the Newport City Development Director's approval of Mr. Lund's Geologic Permit Application. At issue for purposes of our comment is whether the City Development Director's approval of Mr. Lund's geologic permit application was proper (i.e. appropriate, informed, and supported) on the basis of the geologic report submitted by Mr. Lund.

Oregon Shores provides these comments in order to underscore the apparent deficiencies in the applicant's geologic report and to emphasize the importance of a robust geologic review prior to development in the highly dynamic coastal environment—particularly on ocean-facing slopes with landslide histories. In doing so, we hope to lend our knowledge of and experience with coastal land use and development concerns to support an appropriate and informed decision on the pending appeal. Our comment supports the appellants' view that, at the very minimum, more information is required before Mr. Lund's geologic permit can properly be approved.

2. The Applicant's Geologic Report Fails to Demonstrate Compliance with the Minimum Preparation Criteria Required Under the Code.

Mr. Lund is proposing construction on land that is subject to numerous known chronic coastal and geologic hazards. The site is within the area of "very high" (i.e. active) coastal erosion hazard and existing land sliding identified by Oregon's Department of Geology and Mineral Industries (DOGAMI) erosion hazard and landslide mapping.[2] Hence, in preparation for submitting this comment, we began with an in-depth review of the investigations, findings, and appendices contained in the K & A Report. Next, we read two expert independent analyses of the Report. The first was a geotechnical peer review (hereinafter "Peer Review") of the Report conducted by Columbia Geotechnical, a geotechnical engineering firm whose more than two decades of experience includes foundation and slope stability investigations, logging exploratory borings and providing interpretive geological maps and cross sections, monitoring groundwater evaluations, soil testing for geotechnical design, and site-specific seismic evaluations and liquefaction analyses. Ms. Ruth Wilmoth, a licensed practicing geologist and civil engineer, conducted the technical review of the Report on behalf of Columbia Geotechnical.[3] The second evaluation we reviewed was a comment on K & A Engineering's slope stability modeling

[1] George R. Priest and Jonathan C. Allan, Or. Dept. of Geology & Mineral Indus., OFR O-04-09, *Evaluation of Coastal Erosion Hazard Zones Along Dune and Bluff Backed Shorelines in Lincoln County, Oregon: Cascade Head to Seal Rock*, 30 (2004) (hereinafter "ORF *O-04-09*").
[2] OFR *O-04-09*, App. A at 80, 104-05; *Id.,* App. B at 114-17, 154-56.
[3] Peer Review at 6.

authored by Timothy A. Cross, a neighboring homeowner and geologist/geological engineer with nearly 30 years of research experience in stratigraphy, sedimentology, and tectonics of western North America. Third, we read the testimony and evidence submitted in the record on appeal by Ms. Elaine Karnes, another neighboring homeowner who has personally observed the dynamism of the proposed project site and adjacent property for many years.[4] All of these documents have been submitted to the record of this appeal. Finally, we reviewed the K & A Report for consistency with the Geologic Hazards Overlay criteria set forth in Chapter 14.21 of the Code, the findings of both the aforementioned expert independent analyses, and the publicly available, site-specific state and federal geologic literature referenced by these documents.

Based on the above review, we found that the Community Development Director's approval of Mr. Lund's current design proposal was unjustified and inadequately supported because of significant inaccuracies and omissions in the K & A Report relating to landslide hazards, erosion hazards relating to ground and surface water, coastal erosion hazards, and slope stability.

a. The Geology of the Bluff-Backed Shores of Nye Beach

The rocks, soils, and sands of the bluff-backed shores of Nye Beach tell a torturous tale of the consequences of coastal development, and further evidence the need for meticulous geotechnical investigation in accordance with the highest industry standards.

"The Jump-Off Joe Fiasco"[5]

Mr. Lund's proposed development is situated within the notorious Jump-Off Joe landslide complex.[6] Jump-off Joe was a popular pre-WWI tourist destination, a limestone sea arch separating Nye Beach from Agate Beach State Park to the north.[7] Natural forces separated it from the mainland in the 1890s, and its large arch collapsed in 1916.[8] It crumbled between the 1920s and 1970s.[9] This once prominent headland is barely visible today.[10]

Jump-Off Joe exemplifies the highly dynamic environment in which the proposed project site is located, and bears the scars of multiple failed coastal developments. It took less than a decade for a condominium development just south of the proposed development to crumble at the foundations—before construction could even come to fruition.[11] Ms. Karnes personally witnessed "erosion and slides along a section of Coast Street (just to the south of [the] failed Jump-Off Joe development), resulting in its closure."[12]

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[4] *See* Karnes Test., Sept. 17, 2018.
[5] *See* Paul D. Komar, "The Pacific Northwest Coast: Living with the Shores of Oregon and Washington" 161 (Feb. 19, 1998)
[6] *See* OFR O-04-09.
[7] *See* Komar, *supra* note 5.
[8] U.S. Geological Survey, "Erosion of a Sea Stack," available at https://walrus.wr.usgs.gov/pubinfo/jump.html
[9] *See* Komar, *supra* note 5.
[10] Newport Comprehensive Plan, "Natural Features," Ordinance No. 1621, § 3, 23 (1991).
[11] *See* Komar, *supra* note 5 at 166-173.
[12] Karnes Test., Sept. 17, 2018.

The Surface Geology of Tax Lots 1800, 1900, and 1903

Mr. Lund's proposed development would be built on strata of soil and rock that are highly friable (i.e. prone to breaking under pressure or friction) and are as such inherently unstable. Tax lots 1800, 1900, and 1903 sit on the western face of a sea cliff composed of three main soil layers.[13] The site's surface layer consists of Quaternary Coastal Terrace deposits.[14] These deposits contain a varying mix of (1) semi-consolidated[15] uplifted[16] beach sand overlain locally by fine-grained dune deposits with occasional localized gravel lenses;[17] and (2) unconsolidated to semi-consolidated gravel, beach, and dune sand. The coastal terrace deposits overlay early Miocene Nye Mudstone on most of the site. Nye Mudstone is the "foundational" layer of the construction site, and contains thick-bedded "clayey" marine siltstone[18] embedded with sandstone interbeds that include chalky concretions.[19] At the wave zone west of the site, a layer of Middle Miocene Astoria Formation deposits is sandwiched by the Coastal Terrace deposits and the Nye Mudstone.[20]

Coastal terraces such as the proposed site location are continually receding, and are thus less suitable for development than they appear.[21] As noted in the Newport Comprehensive Plan, Nye Mudstone is particularly vulnerable to interbedding failure.[22] The slope surface at this particular site is vulnerable to slumping, which means home owners will likely be beset by chronic settlement problems, such as cracking walls, warped doors and windows, and water- and sewer-line difficulties.[23]

b. Relevant Law and Purpose of Code

Mr. Lund's proposed construction project has implications for crucial state and City of Newport planning goals related to the public safety of all Oregonians and the environmental health of a coastline that is held in trust for the public. The Code contains the implementing measures required to promulgate the mandate of both the Oregon Statewide Planning Goals ("Goals") and the objectives of the Newport Comprehensive Plan ("Plan"). Significant among these implementing measures is Chapter 14.21, which contains the City of Newport's Geologic Hazards Overlay zoning ordinance.[24] The purpose of this chapter is to 1) minimize public and

[13] *See* K&A at 6, fn. 3; DOGAMI Bulletin 81-3; OFR-O-04-09.
[14] Also known as Marine Terrace Deposits.
[15] **Unconsolidated sediments** are loose materials, ranging from clay to sand to gravel. Compare to **consolidated sediment**, which is essentially solid rock made from materials that have been metamorphosed or cemented together. **Semi-consolidated sediment** is material where the hardening process is incomplete.
[16] **Uplift** in this context mean pushed up slope by plate tectonics or coastal erosion.
[17] In geology, a **Lens** is a body of ore or rock that is thick in the middle and thin at the edges, resembling a convex lens in cross-section.
[18] **Siltstone** is a sedimentary rock composed mainly of silt-sized particles. It forms where water, wind, or ice deposit silt, and the silt is then compacted and cemented into a rock.
[19] A **concretion** is a hard, compact mass of matter formed by the precipitation of mineral cement within the spaces between particles, and is found in sedimentary rock or soil.
[20] *See* K&A at 6; DOGAMI Bulletin 81-3; OFR-O-04-09.
[21] Newport Comprehensive Plan, "Natural Features," § 3, 30 (1991).
[22] Newport Comprehensive Plan, §3 at 30.
[23] *Id*.
[24] Code Ch. 14.21.

private losses due to earth movement hazards (such as landslides and soil expansion) and 2) limit erosion and related environmental damage to protect the public health, safety and general welfare, consistent with Goals 7 and 18 and the Natural Features Section of the Plan.[25]

Goal 7 expresses Oregon's policies on land use planning in areas subject to natural hazards, with the object of protecting people and property from, amongst other things, coastal flooding, landslides, earthquakes and related hazards, tsunamis, and coastal erosion.[26] Goal 18 details land use policies related reducing danger to human life and property in coastal beach and dune areas, regardless of whether hazards in these areas arise from natural forces or human-induced actions.[27] Finally, the Natural Features Section of the Plan states that the prevention of loss of life and/or property must be a major consideration when analyzing environmental constraints to the development potential of land within the Newport area.[28] Protecting Newport's significant natural features is also an explicit point of concern. The Plan states that care must be taken when developing land on or near the sites of these natural features.[29]

Geologic hazards which fall under the City of Newport's geologic hazards regulations include (1) bluff- or dune-backed shoreline areas within high or active hazard zones identified in DOGAMI Open File Report (OFR) O-04-09 and (2) active or potential landslide areas, prehistoric landslides, or other landslide risk areas identified in OFR O-04-09.[30] Although OFR O-04-09 is not intended as a site-specific analysis tool, its hazards mapping is used by the City "to identify when a Geologic Report is needed on property prior to development."[31] Mr. Lund's unit of land sits within bluff- or dune-backed shoreline hazards zones and atop an active landslide area as identified by OFR O-04-09, triggering the requirement to prepare a Geologic Report.

In 2010, the City of Newport undertook a comprehensive update of the city code, which resulted in the geologic hazard zones requirements detailed in Code Chapter 14.21 in its present form.[32] To contend with the active landslides documented along Newport's coastline, the updated code required property owners to obtain a geologic review prior to proposed development.[33] Significantly, new construction was to be limited "to the recommendations of a geologist" and constructed with sufficient access to permit new buildings to be removed, dismantled, or relocated from the site.[34] This makes ensuring the accuracy of geologic engineering reports and hazard assessments of vital importance.

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[25] Code § 14.21.010.
[26] OAR 660-015-0000(7).
[27] OAR 660-015-0010(3).
[28] Newport Comprehensive Plan, § 3, 27.
[29] *Id.*
[30] Code § 14.21.020(A)(1)-(2).
[31] Code § 14.21.020(B).
[32] Lori Tobias, *Newport plan on geologic hazard zones outrages property owners*, The Oregonian (March 27, 2010) https://www.oregonlive.com/news/index.ssf/2010/03/newport_plan_on_hazard_areas_o.html.
[33] *Id.*
[34] *Id.*; *See also* Code § 14.21.070(A)(2).

Under the Code, Geologic Reports shall be prepared "consistent with standard geologic practices employing generally accepted scientific and engineering principles."[35] Significantly, such reports "shall, at a minimum, contain the items outlined in the Oregon State Board of Geologist Examiners 'Guidelines for Preparing Engineering Geologic Reports in Oregon,' in use on the effective date of this section."[36] Geologic reports must also address the requirements of Code subsections relating to construction limitations within geologic hazard areas and erosion control measures.[37]

c. The K & A Report's hazard inventory omits relevant consideration of the mapped "Spring Street Landslide," a Holocene Active Landslide with boundaries that encompass the proposed project site.

Per the Oregon State Board of Geologist Examiners' "Guidelines for Preparing Engineering Geologic Reports in Oregon" ("Preparation Guidelines"), an engineering geologic report should disclose "known or suspected geologic hazards affecting the area, including a statement regarding past performance of existing facilities (such as buildings or utilities) in the immediate vicinity."[38] In accordance with the Preparation Guidelines, delineating "pertinent hazard zones" is an explicit element of the Report's scope of work.[39] Geologic literature focusing on Jump-Off Joe Landslide Complex and vicinity, much of which is referenced in the Report, demonstrates that one of most pertinent known hazards on this site is the very high risk of landslides and slope movement.[40]

The Peer Review notes that the K & A Report failed to weigh "the mapped Spring Street Landslide" in its consideration of landslide hazard risk to the proposed development.[41] The Spring Street Landslide is a Holocene Active Landslide.[42] Curiously, K & A's Geologic Assessment discloses the presence of an active slide "mapped extending generally along the west side of NW Spring Street between NW 14th Street and NW 11th Street" and corresponding "to the scarp observed on the eastern margin of the subject site."[43] However, the only disclosure the K & A Report makes of this active landslide is a reference to "landslide debris extending to depths as much as approximately 16-feet below the ground surface" of Zone 2.[44] Apart from the acknowledgement of the active landslide, the Report does not disclose evidence of recent slope movement in site investigations.[45]

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[35] Code § 14.21.060.
[36] *Id.*
[37] *Id*; s*ee also* 14.21.070, 14.21.090.
[38] "Guidelines for Preparing Engineering Geologic Reports in Oregon," adopted by The Oregon State Board of Geologist Examiners, I.H.1 at 1 (hereinafter "Preparation Guidelines").
[39] K & A at 2.
[40] OFR O-04-09.
[41] Peer Review at 1-2.
[42] OFR O-04-09.
[43] K & A, App. D, §5 at 3.
[44] K & A, § 2.3.3, 5. Zone 2 is an area that K & A Engineering defined in its survey of the proposed project site as the "[a] rolling mid-slope area extending from the toe of the steep embankment along the west edge of the roadway to a terminal siltstone ridge bordering the east edge of the beach." K & A, §2.2 at 4. Slope gradients in Zone 2 range from "approximately 0 to 35-percent." *Id.*
[45] K & A Report §2.2 at 4; App. D, §9.0, 5-6.

An active landslide is defined as one that appears to be currently moving or has moved within the past 150 years.[46] Fresh cracks, disrupted vegetation, or displaced/damaged manmade features indicate recent activity, and should serve to heighten suspicion of active landslide hazard in the area observed.[47] In contrast to the K & A Report, the Peer Review found substantial evidence supporting active landslide mapping on the proposed site, including:

> [D]isturbed terrain within the fallen landslide blocks indicative of recent slope movement; high contrast of lidar images that suggest landslide blocks that have had little time to erode since they last moved; tilted shore pine within the area of the planned new development; and historical distress to the two closest homes (roughly 15 ft north and 75 ft south of the project) on either side of the property caused by ground movement in the past 30 years or so.[48]

Ms. Karnes' testimony corroborates the Peer Review's finding with regards to how ground movement in the area has significantly damaged the foundations of the homes immediately to the north and south of the proposed project site. Since each of the homes' construction in 1981, both have required extensive post-development repairs to maintain habitability. According to Ms. Karnes, the home located "roughly 15 ft north" of the subject site at 1409 NW Spring Street "required major work by 'Ram Jack' [a foundation repair contractor] during the summer of 2017."[49] Specifically, "[a] large section of the driveway was removed and a concrete pour was done to support anchors attached to the house."[50] Per the issued permit, these foundation repairs were valued at nearly $30,000.[51] In the photos appended by Ms. Karnes, the repaired driveway of 1409 NW Spring Street displays visible cracks.[52] The nearest neighbor located to the south of the proposed project site at 1245 NW Spring St "required [replacement of] much of its foundation with a cantilever support construction" and the addition of a retaining wall to its west side.[53]

K & A completed much of its site work in November of 2017, and it seems unlikely that such extreme indicators of landslides and slope movement suddenly appeared between K & A's site work and the Peer Review in August 2018. Furthermore, beyond reference to "some shallow subsidence of utility boxes on the east side of the road," K & A omitted any substantive discussion of the past performance of the homes neighboring the project site. The extensive repairs required to the structural foundations of those homes in the immediate vicinity of the proposed project site tend to show that the subject site may be far less stable than K & A's findings indicate. Given its obligations to disclose known or suspected geologic hazards under

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[46] *See* DOGAMI Fact Sheet, "Understanding Landslide Deposit Maps" *available at* *https://www.oregongeology.org/pubs/fs/landslide-inv-factsheet.pdf*
[47] *Id*.
[48] Peer Review at 1.
[49] Karnes Test., Sept. 17, 2018. *See also* Newport Community Development Department, "Permits Issued: 8/1/2017-8/31/2017," 4, http://www.newportoregon.gov/dept/cdd/documents/August_2017_Building_Permits.pdf (last visited Sept. 18, 2018) (showing a building permit issued on Aug. 1, 2017 for "repair to exiting foundation" on parcel 11-11-05-BC-01802-00 at site address 1409 Spring St, Newport, OR).
[50] Karnes Test., Sept. 17, 2018, citing appended photos #4 and #5.
[51] *See* Newport, OR, Community Development Department, "Permits Issued: 8/1/2017 – 8/31/2017," *supra* note 49.
[52] *See* Karnes Test., Sept. 17, 2018, Photo #5.
[53] *Id*. citing Photos #1, #2, #3.

the Preparation Guidelines, K & A should have weighed the explicit on-the-ground markers of the active "Spring Street Landslide" in their conclusions concerning the slope's stability.

d. The Report fails to address evidence of substantial erosion related to active springs flowing on the subject property.

Per the Preparation Guidelines, a geologic report "should contain brief but complete descriptions of all natural materials and structural features recognized…within the subject area."[54] Geologic reports should, at a minimum, describe all "[s]urface and shallow subsurface hydrologic conditions, including groundwater, springs, and streams and their possible effect on the site."[55] K & A's Geologic Assessment recognizes that "a spring is mapped (USGS 2014 Newport North Topographic Quadrangle Map) in Lot 1903," and further notes as of June 13, 2018, it was "observed on the access road during the reconnaissance."[56] Without explicitly referencing what impacts, if any, the spring's presence has on the property, the K & A Report's description of surface conditions on the proposed development site concludes that "[a]side from erosion due to disturbance on the few foot-trails that exist on the site, there is little evidence of on-going severe surface erosion or mass slope movement."[57] The K & A Report further states that no indications of "slope movement in the roadway such as cracks with differential[58] movement" were observed.[59]

Columbia Geotechnical conducted a site visit as a part of its independent professional review of K & A's Report.[60] Although this reconnaissance did not include additional soil explorations or testing, it presented a starkly different picture of the mapped spring's effects on the steep slide scarp contained in the lots proposed for the two duplexes (tax lots 1900 and 1903). In contrast to the K & A Report, the Peer Review notes that Columbia Geotechnical's site visit found "deep erosion on and just downslope of the steep slide scarp (the steep slope immediately west of NW Spring Street)" and "in areas associated with both of the significant springs still flowing in August [2018] (roughly uphill of each of the planned new duplexes)."[61] Again, it seems unlikely that such deep erosion on the steep slide scarp appeared in the two-month period that elapsed between the K & A Report's geologic reconnaissance and the Peer Review's site visit. Under the requirements of the Code and the Preparation Guidelines, the K & A Report should have more thoroughly and explicitly disclosed the present or possible future effects of this mapped spring on Mr. Lund's proposed project site.

[54] Preparation Guidelines, III, at 2.
[55] *Id*. III.D., at 3.
[56] K & A Report, App. D §8.0, 5.
[57] Peer Review at 2.
[58] **Differential settlement** occurs when one portion of the soil beneath a structure expands, contracts or shifts away at a greater rate than the soil underlying the rest of the structure. It can be caused by factors such as poor drainage, frost, broken water lines, vibrations from nearby construction, or poorly compacted fill soil.
[59] Peer Review at 2.
[60] *Id*. at 1
[61] *Id*. at 2.

e. The K&A Report fails to use standard practices to monitor the effects of average and high rainfall seasons and groundwater pressure on slope stability.

In addition to accurately describing the effects of surface and shallow subsurface hydrologic conditions on a proposed site, the Preparation Guidelines require that a geologic report indicate how site conditions "may be affected by variations in precipitation, temperature, etc."[62] With respect to the effect of the mapped spring on the proposed site's slope stability, the Peer Review provides the rationale for this requirement as follows: "Old landslide scarps and displaced material cannot effectively be judged to be stable based on isolated site observations alone, which represent just a snapshot in time even over the course of several months."[63] To measure how site conditions may be affected by variations in weather conditions over time, the Peer Review states that the common practice is to "set up a comprehensive monitoring system that can provide data over the course of one or more wet seasons [on which] to base the opinion of current slope stability."[64] For this type of development project, the Peer Review recommends a monitoring system that would include:

> [A]t least two slope movement sensors (in-place inclinometers or other in-ground methods that extend at least 20 ft below the suspected slide interface to continuously measure changes in slope at several locations relative to NW Spring Street and other stationary points east of NW Spring Street), numerous surface monitoring points that are routinely surveyed, vibrating wire piezometers to continuously measure shallow and deep groundwater pressures, and a continuous rain gauge (if continuous local rainfall is not available). Since landslides are most active during high rainfall years, the goal would be to install the geotechnical instrumentation as soon as possible and monitor over a duration that includes at least one high-rainfall season, (which may take more than one year). [65]

The Peer Review states that "[p]remature conclusions on stability can only be avoided by monitoring through a season that exceeds normal rainfall," ideally "monitoring over a season of record rainfall."[66] Ongoing monitoring to describe how variations in "precipitation, temperature, etc." affect the site is especially important given that "[g]lobal climate change may provide record rainfall as soon as this year or next year."[67] Given the Code's requirement to prepare geologic reports consistent with "standard geologic practices" and the Preparation Guidelines' requirement to indicate how variable weather conditions affect a site, K & A Engineering should have conducted some form of ongoing monitoring of weather conditions on the site and discussed their effects in the "Surface Conditions" sections of its Report and Assessment.

[62] Preparation Guidelines, III.D., at 3.
[63] Peer Review at 2.
[64] *Id*.
[65] *Id.*
[66] *Id.*
[67] *Id.*

f. The K & A Report's Field Developed Cross Section and Slope Stability Analysis data each omit key pieces of general data and details that would allow technical reviewers to make comprehensive independent assessments regarding the reliability and interpretation of said items.

The Preparation Guidelines state that an "engineering geologic report should include sufficient facts and interpretation regarding geologic materials, processes, and history to allow evaluation of the suitability of the site for the proposed use."[68] The Guidelines go on to detail a number of general information items that should be addressed and requires that the "[l]ocations of test holes and excavations (drill holes, test pits, and trenches) [be] shown on maps and sections and described in the text of the report."[69] Furthermore, the Preparation Guidelines state that the "actual data, or processed data upon which interpretations are base[d], should be included in the report to permit technical reviewers to make their own assessments regarding reliability and interpretation."[70] The K & A Report includes the location of the probes and borings K & A Engineering made to estimate 1) subsurface boundaries and material properties and 2) groundwater levels, as well as a textual description of the slope stability modeling done based on those estimates derived from said probes and borings.[71] However, the Peer Review found that K & A Engineering failed to include any of the "calculation sheets and assumptions" used in the final slope stability models in the relevant Report Appendix.[72] Because the Preparation Guidelines require that both the actual and processed data on which interpretations like slope stability analyses are based be included in an engineering geologic report to permit proper independent technical review, the applicant should supplement the submitted K & A Report with the calculation sheets and assumptions underlying their final slope stability analysis.

The K & A Report includes a Field Developed Cross Section ("Original Cross Section") as required by the Preparation Guidelines to show subsurface relationships significant to the stability of the slope on the project site.[73] However, the Peer Review, the Cross Comment, and our own inspection of the K & A Report's Original Cross Section all highlight significant omissions that make the K & A Report incomplete per the Preparation Guidelines' criteria. The Preparation Guidelines require that the "geologist doing the investigation and preparing the map should report the nature of bedrock and surficial materials, the structural features and relationships, and the three- dimensional distribution of earth materials exposed and inferred within the area."[74] The Peer Review found that the Original Cross Section did not include estimates of "the contact between the disturbed and undisturbed siltstone" underlying the slope.[75] Further, the Peer Review, the Cross Comment, and our own visual inspection found that the Original Cross Section fails to properly illustrate the plotted structural dip of the slope.[76] Specifically, the Peer Review states that "the 15º dip of the underlying undisturbed siltstone and the estimated slide plane of the past land-sliding should be illustrated" in the Original Cross

[68] Preparation Guidelines, 1.
[69] *Id*. I.H.1., 1.
[70] *Id*. I.H.1., 1.
[71] *See* K & A Report, App. C; K & A Report, §3.1.2, 9.
[72] Peer Review at 5.
[73] K & A Report, App. A, Drawing 3; *See* Preparation Guidelines, II(C)-(D), 2.
[74] Preparation Guidelines, II.C., 2.
[75] Peer Review at 5 citing K&A App. A.
[76] *Id*.; *see also* Cross Comment.

Section.[77] Per the Preparation Guidelines' requirements, K & A Engineering should amend their Original Cross Section with the aforementioned data on the contact between disturbed and undisturbed siltstone and the illustration of structural dip to enable a full independent technical review.

g. The slope on Mr. Lund's property is less stable than represented by K&A's slope stability modeling, which restricts the City of Newport's ability to rely on K&A's engineering recommendations to remediate slope stability issues.

The "assessment of existing geologic conditions and processes with respect to intended use of [a proposed project] site constitutes the principal contribution" of a geologic report.[78] This assessment involves "1) the effects of the geologic features upon the proposed grading, construction and land use, and 2) the effects of these proposed modifications upon future geologic conditions and processes in the area."[79] The Preparation Guidelines require that an assessment of "topography and slope" be included in a "[geologic report's] discussion, conclusions, and recommendations" with respect to "general suitability of proposed land use to geologic conditions."[80] The Preparation Guidelines reiterate that geologic reports must contain the "[i]dentification and extent of known or probable geologic conditions which may result in risk to the proposed land use," including land slides, subsidence, erosion, and deposition.[81] The K & A Report does not contain discussions, conclusions, and recommendations to that effect.[82] Mr. Cross' expert independent analysis of this information reveals that K & A's conclusion that the slope on subject property is "stable" and in a condition that is "generally acceptable for development" is based on erroneous ground surface boundary assumptions.[83] He discovered this error after conducting a review of K & A Engineering's Original Cross Section of the study site shown in Appendix A and the graphic summaries of said slope stability analyses contained in Appendix C. Per our interpretation of Mr. Cross' comment, this seriously constrains the extent to which the City of Newport should rely on K & A Engineering's presented modeling of the slope's stability.

The Nye Formation's Structural Dip: As plotted in the K & A's Field Developed Cross Section (FDCS) versus as modeled in the Report's Slope Stability Analysis.

Structural dip refers to the acute angle that a rock surface—in this case, the Nye Formation—makes with a horizontal plane. Correctly determining the angle of a bedrock's structural dip and accurately inputting that number into design models is crucial to determining the likelihood of whether any overlying structures or soil layers are at risk of mass movement. Mr. Cross recognized that K & A Engineering's Original Cross Section plots the surface elevation of the top of the Nye Formation in borings B-1 and B-3, and establishes the structural dip of the top of the Nye Formation at an acute angle range of 13° to 15° (the K&A Report states 11º to 15º) to

[77] Peer Review at 5.
[78] Preparation Guidelines, IV, 4.
[79] *Id*.
[80] *Id*., IV.A.2., 4.
[81] *Id*., IV.B., 4.
[82] K & A Report §2.4.1, 6-7; K & A Report, App. D, §4.0, 3.
[83] Cross Comment; K & A Report §2.4.1, 7; K & A Report, §3.1.2, 7-9; K & A Report, App. C.

the west.[84] Per Mr. Cross review of available geologic literature, this determination accords with all other structural dip values and directions published on the 1976 geological map of the Newport region.[85] Our reading of the same geologic literature confirms Mr. Cross' review.

In assigning the boundary conditions for the computer model runs in their slope stability analysis, however, Mr. Cross found that K & A Engineering assumed that the structural dip of the Nye Formation was approximately 0° instead of 13° to 15° to the west.[86] This inaccurate assumption is represented in the Original Cross Section as the dashed line labeled "Assumed Surface of Siltstone," beginning at FC-1/B-1 and stretching westward to the extension of the siltstone ridge.[87] At borehole B-1, the dashed line indicating the location Nye Formation suddenly becomes sub-horizontal[88] (i.e. slightly angled instead of acutely angled).[89] Mr. Cross states that in his professional opinion, there is "absolutely no justification for this change in dip, and it seems unlikely that the dip would so drastically change exactly at the position of the B-1 borehole."[90]

Effect of the discrepancy between the Structural Dip as plotted in the Report versus as presented in final slope stability model.

Inputting a 0° dip into the SLIDE modeling software instead of the 13°-15° dip plotted on top of the Nye formation results in a "huge change in the overburden (i.e. unconsolidated to semi-consolidated "marine terrace" plus dune sand) thickness"[91] on the slope.[92] As Mr. Cross explains, this essentially means that K & A Engineering's model significantly underestimates "the volume of material susceptible to mass movement" overlying the Nye Formation on the project site.[93]

In the Original Cross Section, thin marine terrace sediments sit on a stable, solid, sub-horizontal platform of Nye Formation siltstone. Mr. Cross submitted a modified Field Developed Cross Section ("Modified Cross Section") that displays the Nye Formation's 13º structural dip. In the Modified Cross Section, Mr. Cross illustrates "a thick, westward-facing wedge of unconsolidated sediment"[94] sitting "on a westward-inclined surface formed by the top of the Nye Formation."[95] The Modified Cross Section shows a riskier picture of slip surfaces within the Nye Formation than the Original: "[a]lternations of more muddy and less muddy sand/silt layers within the Nye formation provide potential slip surfaces within the westward-dipping strata."[96]

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[84] Cross Testimony, ¶2.
[85] *Id*.
[86] *Id*., ¶4.
[87] K & A Report, App. A, Drawing 3.
[88] **Sub-horizontal (geology):** Not quite horizontal in position or orientation.
[89] Cross Testimony, ¶4.
[90] Cross Testimony, ¶2.
[91] **Overburden Thickness** as used in reference to the geology of slopes references the entire thickness of soil or sedimentary rock material overlying rock or overlying a specific bearing stratum.
[92] Cross Testimony, ¶4.
[93] [T.C. Testimony, ¶4 referencing K & A Report, App. A, Drawing 3]
[94] **Unconsolidated sediments** are loose materials, ranging from clay to sand to gravel. Compare to **consolidated sediments**, which is essentially solid rock made from materials that have been metamorphosed or cemented together.
[95] Cross Testimony, ¶4.
[96] *Id*.

In Mr. Cross' expert opinion, "[s]lip along such surfaces could easily provoke instability and mass movement of overlying 'marine terrace' sediment."[97]

The impact of groundwater on slope stability calculations.

This discrepancy in structural dip is especially significant given the presence of springs on the proposed project site. Mr. Cross points out that "the westward-dipping top of the Nye Formation is another potential surface for slippage and consequent mass movement of the overlying 'marine terrace' sediment."[98] In the Modified Cross Section, a thick, westward-facing wedge of unconsolidated sediment sits on a westward-inclined surface formed by the top of the Nye Formation. According to Mr. Cross, water bubbling through that "unconsolidated sediment will pond on top of the significantly less porous and permeable Nye Formation, and lubricate that surface."[99] In contrast to the calculations of the Original Cross Section, "the increased volume of unconsolidated sediment above the Nye Formation" will increase "the likelihood of mass slope failure should the toe-of-slope dune sand be removed or reduced by erosion.[100]

K&A concluded that the slope is stable in its current static condition.[101] However, the ability of data analysis to predict a realistic outcome is dependent on correct modeling assumptions and the input of accurate data. Any distortion of either parameter can lead to faulty predictions and unreliable models. Because K & A used incorrect ground surface boundary assumptions in their slope stability models, their recommendation that the Mr. Lund's property was stable enough for the proposed development is likely inaccurate.

h. The K & A Report does not substantiate the findings of available site-specific geologic reports.

The Preparation Guidelines require that engineering geologic reports address the "[n]ature and source of *available* subsurface information and geologic reports or maps."[102] The Preparation Guidelines define "[s]uitable explanations of the available data" as those that "provide a technical reviewer with the means of evaluating the reliability."[103] Furthermore, "reference to cited works or field observations should be made, to substantiate opinions and conclusions."[104]

A four-page summary of a geologic reconnaissance site visit conducted in 1991 by H.G. Schlicker (Schlicker Summary) is the only existing site-specific document relating to subsurface information and geology referenced and cited in the K & A Report.[105] As the Peer Review notes, "references to slope stability and recommendations for potential development in other published

[97] *Id.*
[98] *Id.*
[99] *Id.*
[100] *Id.*
[101] K&A Report at 9.
[102] Preparation Guidelines, I.G., 1.
[103] *Id.*
[104] Preparation Guidelines, I.G., 1 (emphasis added).
[105] Peer Review at 2-3.

geologic reports were not provided" in the Report or Assessment.[106] Schlicker's 1991 investigation involved no drilling or excavation work to assess subsurface conditions.[107] One of the Schlicker Summary's primary recommendations, "given the sensitive nature" of the existing landslides and debris deposits on the site, was that a "geotechnical study be performed to determine the thickness and engineering characteristics of the material" on the slope.[108] In fact, the Schlicker Summary's introduction section stresses that a "geotechnical report will be necessary" to establish the "geologic conditions [on the site] are reasonably favorable and mitigation costs will not exceed the final land value."[109] The Schlicker Summary makes several observations in regards to existing active and historic landslides on and within the vicinity of the proposed project site. Regarding land sliding in the vicinity of the subject site, it notes that a "bowl-shaped area present *just east* of Spring Street is an older landslide that has apparently been stable for many years."[110] As for land sliding on the site itself, the Schlicker Summary goes on to state that "[t]he area west of Spring Street probably moved initially prior to the Jump Off Joe landslide that began about 1942 and continued until recently.'"[111] While observations were made as to the likelihood of mass movement, the Schlicker Summary made *no concrete conclusions* with regards to slope stability.[112] Yet, the K & A Report states that Schlicker Summary "recommended" that the "old landslide area on the site is relatively stable" following the 1991 geologic reconnaissance the firm conducted on the site.[113] K & A further claims that its geotechnical investigation "verifies Schlicker's conclusions."[114]

When examining the K & A Report's citations to the 1991 Schlicker report, the Peer Review could not substantiate K & A's statement that their 2018 geotechnical investigation "verified" the slope stability conclusions in the Schlicker Summary.[115] First, the Peer Review points out that the Schlicker Summary does not state that the "'old landslide area *on the site* is relatively stable,'" as contended in the K & A Report.[116] The Schlicker Summary, as mentioned above, made this reference in regards to an existing landslide *east* of the subject property.[117] While the K & A Report accurately presents the Schlicker Summary's findings, it nevertheless recommends, "continued translational movement of the landslide is relatively unlikely."[118] In Columbia Geotechnical's expert independent opinion, nothing in the K & A Report itself supports such a recommendation.[119] In fact, the Peer Review points out that most of the details, literature research, and site observations provided in the K & A Report tend to evidence the fact that the slope is not stable.[120] Second, the Peer Review discovered two of the Schlicker Summary's recommendations—namely, that "at least two borings [be] drilled to at least 50 ft in

[106] *Id*.
[107] K & A Report, App. E at 1.
[108] *Id*., App. E at 3
[109] *Id*., App. E at 1.
[110] *See id*. App. E at 3 (emphasis added)
[111] Peer Review at 2-3.
[112] K & A Report, Appendix E at 2-3.
[113] Peer Review at 2-3.
[114] K & A Report, §2.4.1, at 8; K & A Report, App. D, §6, 4.
[115] Peer Review at 2-3.
[116] Peer Review at 2-3 (emphasis added).
[117] [*See* K & A Report, App. E at 3 (emphasis added)]
[118] *See* K & A Report, App. D, §6, 4; Peer Review at 5.
[119] Peer Review at 5.
[120] *Id*.

depth" and that "laboratory tests [be conducted] to include direct shear on carefully obtained samples"—were not conducted as a part of K & A Engineering's investigation. Finally, the Peer Review notes that the K & A Report excluded any consideration of a number of more recent geological reports.[121] Specifically, the Peer Review found "[a] more recent report (i.e. 2016) on the adjacent property to the north by Schlicker that points out recent slope movements were not mentioned in the [Report]."[122] As recognized by the Peer Review, "[r]eferencing a l99l report when there are more recent and more thorough reports available does not provide enough basis to claim the slope is stable."[123]

As required by the Preparation Guidelines, the Report and Assessment both referred to the 1991 Schlicker Summary to address the nature and source of existing site-specific subsurface information. From our initial reading of the Report and Assessment, both seemed to imply that H.G. Schlicker's reconnaissance found the slope stable in 1991, and that K & A' Engineering's investigation somehow merely confirmed that static state of stability in 2017. However, for the aforementioned reasons, Columbia Geotechnical's expert independent review could not substantiate the Report's assertion that it "verified" the Schlicker Summary's "recommendation" that the project site's slope was stable. This again restricts the City's ability to rely on K & A Engineering's recommendations to address slope stability issues.

i. Conclusion: The applicant has not demonstrated compliance with the Code.

Licensed practicing geologist and civil engineer Ruth Wilmoth summarized the grave concerns of building on this site without first properly and accurately demonstrating its stability:

> Unless the ground can be proven to be stable and not at risk of causing or being affected by renewed land-sliding and/or episodic coastal erosion, with current, accurate, and defendable data … areas of old landslides that are highly suspected of historic movement and areas with historic ocean erosion as severe as at this site should be avoided for future development.[124]

Given the remote and more recent history of the visible impact of chronic coastal hazards on the proposed project site, Ms. Karnes expresses reasonable concern that "additional development could jeopardize the stability of Spring Street, the infrastructure (water lines, sewer lines, storm drain, and the buried utilities such as gas and electric), as well as existing homes in the area."[125] From our own comparative review of the K & A Report against the expert, independent findings of Columbia Geotechnical and Mr. Cross as well as the ground-truth presented by Ms. Karnes, we concur with Ms. Wilmoth's aforementioned professional opinion. Given the well-founded doubts about the K & A Report's substantive compliance with the minimum criteria required by the existing Code § 14.21.060, the Planning Commission should reverse the Community Development Director's decision to approve the applicant's geologic permit at this time.

[121] Peer Review at 2-3, 5.
[122] *Id*.
[123] Peer Review at 5.
[124] *See id*.
[125] Karnes Test., Sept. 17, 2018.

3. The City of Newport should improve its geologic hazards overlay zoning ordinance to provide the comprehensive, evidence-based compliance measures required to properly manage development in areas subject to risk from chronic coastal hazards.

The development pressure posed by proposed projects such as Mr. Lund's demonstrates the City of Newport's pressing need for a clearer and more robust Geologic Hazards Overlay framework with respect to 1) the minimum guidelines required for the preparation of geologic permits as the relate to sensitive coastal areas such as bluff-backed shorelines and 2) the process through which the City reviews land use applications for Geologic Permits for completeness and compliance. To enable the City to more effectively protect life, public safety, property, and key natural assets in the future, and strengthen its ability to reject applications for development in inappropriate hazard zones, we recommend that the City consider changes to its existing plan and ordinances.

In 2010, recognizing the critical threat chronic coastal hazards like landslides and erosion presented to the health and safety of residents and to the environment, the City of Newport undertook a comprehensive update to its municipal code. This resulted in the adoption of Newport's current coastal hazard maps indicating landslide-prone areas and the requirement that a geologic report be submitted to establish that a proposed site is suitable for development. Before this update, the City of Newport relied on 1970s geologic hazards maps to identify landslide, erosion, and earthquake risks pertinent to proposed development properties. The code in use before the 2010 update did not require land use applicants to obtain a geologic report prior to developing coastal properties. Given the threat of chronic coastal hazards and the ever-increasing impacts of climate change, we recognize the adoption of these geologic hazards overlay standards in 2010 as an important first step forward by the City of Newport to effectively manage the risks to life, property, and the environment inherent to coastal development.

Neskowin, an unincorporated community in Tillamook County located approximately 40 miles north of Newport, faces similar threats from landsliding and erosion associated with known chronic coastal hazards. Around the same time Newport began updating its geologic hazards zoning, Neskowin undertook a multi-year, grassroots effort, supported by a grant from the Department of Land Conservation and Development (DLCD), to improve their coastal hazards overlay zoning framework's ability to manage development in areas facing challenges presented by shoreline erosion, land sliding, and sea level rise. As a result of this coordinated effort, Tillamook County adopted the Neskowin Coastal Hazards Overlay Zone ("NESK-CH").

The purpose of the NESK-CH zone and applicable criteria is to manage development in areas subject to chronic coastal hazards:

> "in a manner that reduces long term risks to life, property and the community by
>
> (a) Identifying areas that are subject to chronic coastal natural hazards including ocean flooding, beach and dune erosion, dune accretion, bluff recession, landslides, and inlet migration;

(b) Assessing the potential risks to life and property posed by chronic coastal natural hazards; and

(c) Applying standards to the site selection and design of new development which minimize public and private risks to life and property from these chronic hazards; such measures may include hazard avoidance and other development limitations consistent with Statewide Planning Goals 7 and 18 as well as the Hazards Element and Beaches and Dunes Element of the Tillamook County Comprehensive Plan."[126]

In considering the challenges the City of Newport continues to face in determining how best to regulate development in these geologic hazard areas, we urge that the City consider the NESK-CH as an example of an effective land use code that has withstood legal challenges and produced an effective regulatory land use regime to manage the risks presented from chronic coastal hazards.

Clearer regulatory mandates and greater discretion to ensure compliance with the purpose of Code Chapter 14.21 will benefit the community. Residents need a more explicit understanding of the approval process for geologic permits to effectively participate in the land use decision-making process. Code Chapter 14.21, which contains the City of Newport's Geologic Hazards Overlay, should be updated in order for the City of Newport to better meet its Statewide Planning and Comprehensive Plan obligations in both of those regards.

The City should adopt a defined standard of "acceptable level of risk" upon which to assess a geologic report.

Risk is ever-present in identified coastal hazard areas such as the Jump-Off Joe landslide complex and the bluff-backed shores of Nye Beach. Given that entirely eliminating such risk to life, property, and the environment in these types of settings is impracticable, coastal communities must define the maximum "acceptable level of risk" a property owner is required to bear for any proposed development (keeping in mind obligations to prevent substantial harm to life, property, and the environment).[127] According to FEMA, a geologic hazards overlay zoning ordinance should explicitly outline an evidence-based acceptable level of risk standard to ensure that any geologic report recommendation design or engineering remediation effectively protects life and property to the greatest practicable extent.[128] For the Oregon Coast, an evidence-based maximum acceptable level of risk standard for proposed developments subject to chronic coastal hazards is an assurance that life, safety and proposed structures will not be exposed to identified hazards, excluding a tsunami resulting from a Cascadia megathrust earthquake, for a period of 50-70 years considering site conditions and specified mitigation.[129]

The absence of a defined minimum standard for "acceptable level of risk" (and, of course, a requirement that a geologic report subsequently meet that standard) essentially leaves residual

[126] NESK-CH §3.570(1)(a)-(c).
[127] NESK CH §3.570(1); FEMA Coast Construction Indep. Study III-19, III-20 (2013).
[128] FEMA Coast Construction Indep. Study III-19, III-20 (2013).
[129] NESK CH § 3.570(5)(d)(A)-(B). *See* "Model Coastal Hazards Overlay Zone" created by the Oregon Coastal Hazards Management Program.

risk management determinations to the geologic engineer or similar professional engaged by the project applicant to prepare the required geologic report. This creates a likelihood that certain development proposals may fall short of being reasonably able to ensure that neither life and public safety nor proposed structures will be threatened by damage from natural hazards for the recommended period of 50-70 years while demonstrating compliance with the Code's Geologic Report Guidelines.

The City should adopt a moveable structure requirement and a safest site requirement for proposed developments in areas subject to chronic coastal hazards.

Erosion is a natural part of a coastal environment that should always be considered in making development decisions. The impacts of climate change are unfortunately increasing erosion rates that therefore changing how we can live on the shores of the Pacific Northwest. These types of risks to life, property, and ecology in a designated coastal hazards zone are primarily managed by protections provided by scientifically sound siting, design, construction, and maintenance.[130] It is vital that a coastal hazards regulatory framework explicitly incorporate best practices to effectively protect life, property, and the environment. A growing number of experts have come to the conclusion that moveable structures are the only true way to minimize the risk posed to life, property, and the environment by development in areas subject to the forces of coastal erosion.

The absence of explicit mandates relating to moveable structural design and safest site requirements in the Code allows for new development on Newport's coastline to comply with the geologic hazards overlay as currently written, while simultaneously failing to meet scientifically evidenced best practices for combating the risks posed by chronic coastal hazards in the near- and long-term.

The City should adopt code provisions that would enable the Community Development Director to seek additional review by an appropriately qualified professional or otherwise impose measures that would ensure compliance with the stated goals of the Natural Features Section of the NCP.

Given that assessment of the risks of proposed construction in coastal areas is limited to the recommendations of a geologist or similar professional procured by the applicant, the Community Development Director must be empowered to require additional review of a geologic report the he or she deems inconsistent with the purpose of the geologic hazards overlay NESK CH 3.570(f) gives the planning department such discretion to require additional review at the applicant's expense. This approach effectively gives meaning to the geologic report requirement by allowing a local planning department to review and verify analysis even where that technical expertise may not exist within local planning staff members. In addition, this kind of provision has the potential to streamline Type I decision-making and reducing the likelihood of appeal of geologic permits by providing community members additional assurance that these important issues of life and safety have been independently evaluated by their local government.

[130] FEMA Coast Construction Indep. Study III-19, III-20 (2013).

Improving Informed Public Engagement Subsequent to the Approval of a Geologic Permit

Approval of a City of Newport land use application for a Geologic Permit requires that property owners within 200 feet of the subject property be notified of the decision and their right to appeal.[131] This notice requirement generally implements Goal 1's community involvement elements. However, the Code does not include a discrete section specifying the standards upon with which a Geologic Permit must comply to be granted. "Average" residents (i.e., those without professional backgrounds in this field) are left to take on faith that any decision to approve a geologic permit by the Community Development Director would mean that an applicant demonstrated compliance with construction limitations within geologic hazards areas (Code 14.21.070) and prohibitions on development on beaches and foredunes (Code 14.21.080). Adding a section that sets out the findings of compliance the Development Director must make before approving a geologic permit would greatly improve subsequent public participation in land use decision-making related to geologic hazards, better implementing Goal 1 and increasing community understanding of how these decisions are made.

4. It is the best interest of the City of Newport and its residents to address climate today.

Most fundamentally, Oregon Shores believes that our communities, especially those along the Oregon coast, must begin to plan for climate change impacts immediately. Advance planning is critically important given two opposing forces likely to result from climate change. On the one hand, increased storm frequency and intensity, along with sea level rise and decreased summertime precipitation, will put coastal properties, infrastructure, natural areas, and water sources at risk. As storm surge increases and sea levels rise with climate change, we can expect to see more problems along the coast with homes being undercut by erosion along bluffs or dunes. On the other hand, Oregon's coastal climate is likely to remain mild, with longer, warmer summers and more temperate winters. As a result, Oregon's coastal communities may attract "climate refugees" and experience greater in-migration and associated pressures on land use and water resources. At the convergence of these two forces, Oregon's coastal communities will likely see property disappearing, as beaches migrate inland, while human population growth increases the demand for land and resources. Given these increasing pressures, the need for climate change adaptive planning is critical. A concerted and systematic approach to the issue will require garnering public and political support for changes to raise the bar for construction and encourage property owners to pursue alternative methods of locating and protecting structures on coastal lands.

[131] Code 14.21; 14.52.020.

Sincerely,

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