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Detailed Geology and Other Factors Related to the Suitability of Potential Cable Landing Sites in the Rockaway Beach Area, Northern Oregon Coast

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Geologic Assessment of Potential Cable Landing Sites Along the Oregon Coast

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Plate 2

Introduction

The six panels on this plate illustrate geologic and geomorphic data that support our analysis of suitability of potential cable landing sites in the Rockaway Beach area on the northern Oregon Coast. The larger map scale of this plate portrays details of the geospatial data that are not visible in summary figures of the accompanying report. Existing cables land at two beach manhole sites in the vicinity of the cable landing station in northern Rockaway Beach. The abrupt change in map units ~6.7 km (~4.2 mi) from the northern map boundary relates to different geologic unit naming used by original sources compiled in the OGDC v7 database (Franczyk and others, 2020; Goldfinger and others, 2014; Goldfinger and Beeson, 2023).

The bedrock units that make up this sector of the Oregon Coast are primarily sedimentary rocks deposited in a nearshore marine environment and subsequently uplifted by deformation of the North America tectonic plate over the Cascadia subduction zone (Panel 1). The underlying basement rocks of the Siletzia terrane do not crop out at the surface. There are minor exposures of Paleogene volcanic rock in the southeastern corner of the map. Neogene Columbia River Basalt crops out throughout the plate area, including both subaerial and intrusive/invasive lava flows (Panel 1). The sedimentary and volcanic rocks are deformed by a network of generally north- to west-trending fault zones and folds (Panel 1). On land, unconsolidated Quaternary sediment occurs as extensive beach and dune sand where most of the coastal towns have been constructed; forecasted rates of shoreline erosion are moderate to high (Panels 1 and 2). Other Quaternary sediment includes fine grained alluvium and estuary mud associated with the Tillamook Bay and Nehalem estuaries. Offshore, discontinuous rocky seafloor outcrops interpreted as Columbia River Basalt units occur around Cape Falcon and scattered in the near shore area, with shelf gravel, sand, and mud present in the intervening area (Panel 2). Along jet ski survey lines, many reefs correspond with previously mapped areas of rock substrate, although reefs are identified outside of previously known rocks, and other mapped areas of rocky seafloor lack the bathymetric signature used here. The existing cables are routed through mapped areas of sand, largely avoiding rock and gravel (Panel 2).

Rocky headlands capped by bluffs tens of meters (tens to hundreds of feet high) occur where resistant basalt units crop out near the shoreline, e.g., Cape Falcon (Panels 1 and 3). The thickness of Quaternary sediment is generally less than 23 m (75 ft) as shown by water wells constructed in the area (Panel 4). Extensive wetlands between dune ridges and the slopes of the Oregon Coast Range limit favorability of much of the shoreline (Panel 4). Landslides are common in steeper topography, with generally low mapped susceptibility along beach and sandbar-dominated landscapes, and higher susceptibility along more rugged sections of the coastline (Panel 5). Consideration of all the factors in our suitability analysis indicates much of the sandy coastline and nearshore sandy shelf in this map area including are generally compatible with cable landing use (Panel 6). The existing cable landing sites are in areas that score in the upper half to quarter of non-zero scores in our suitability analysis. The most negative factors that affect scores at these sites are the presence of nearshore wetlands and areas of high forecasted coastal erosion rates (Panel 6). These and other negative factors may be mitigated with site-specific cable landing analysis, design, and construction practices.

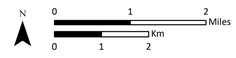
Study Extent Location Map



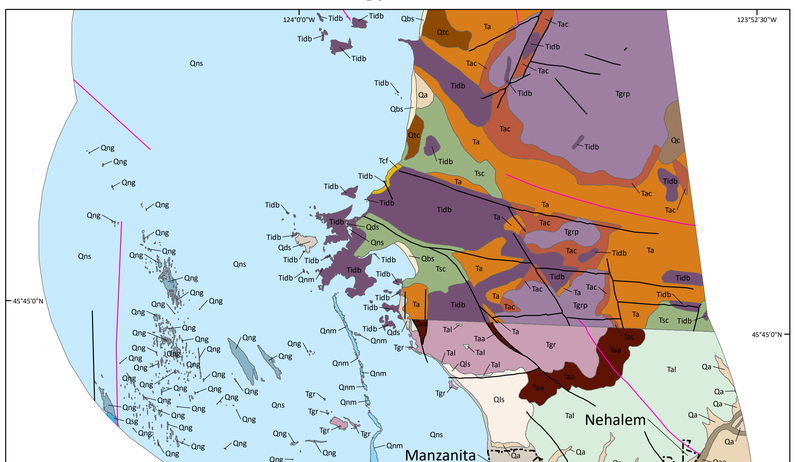
Scale and Orientation

All panels are at the same scale and orientation as scale bar and north arrow below.

Scale = 1 : 63,360



Panel 1: Onshore / Offshore Geology



Ocean Disposal Site

Geologic Structures

Fault

Fold

List of Map Units

Quaternary Surficial Deposits

Qf	fill deposits - fill and construction material including jetty boulders (Modern)
Qbs	beach sand - active ocean beach deposits of sand, gravel, and shells (upper Holocene)
Qa	alluvial deposits - stream channel and flood plain deposits of gravel, sand, and silt (Holocene and upper Pleistocene[?])
Qds	dune sand - upland coastal dune deposits of well-sorted sand (Holocene[?] and upper Pleistocene[?])
Qaa	estuary deposits - unconsolidated clay, silt, sand, and peat deposits associated with streams and bays (Holocene)
Qmtm	fluvial terrace deposits - alluvial silt, silt, sand, and gravel in deposits elevated above modern streams (Holocene and Pleistocene)
Qc	colluvium - poorly sorted angular structureless deposits beneath steep basalt slopes (Holocene)
Qls	landslide deposits - landslide deposits of rock and soil (Holocene and upper Pleistocene[?])
Qtc	coastal marine-terrace deposits - beach sand and crudely stratified rounded basalt gravel (Pleistocene)

Quaternary Offshore Surficial Deposits

Qnm	nearshore mud deposits (Quaternary)
Qnms	nearshore muddy sand deposits (Quaternary)
Qns	nearshore deposits of sand and mud (Quaternary)
Qng	nearshore gravel deposits (Quaternary)
Qsg	shelf gravel deposits (Quaternary)
Qnsh	nearshore shelll deposits (Quaternary)

Columbia River Basalt Group

Tgr	Grande Ronde Basalt - dark gray basalt flows and associated breccias and pillow lavas (middle Miocene)
Tgrp	Grande Ronde Basalt subaerial basalt flows - columnar jointed, dark gray basalt with rare interbeds (middle Miocene)
Tidb	Intrusive Grande Ronde Basalt - invasive sills, dikes, and irregular intrusive bodies of basalt (middle Miocene)

Paleogene to Neogene Sedimentary Rocks

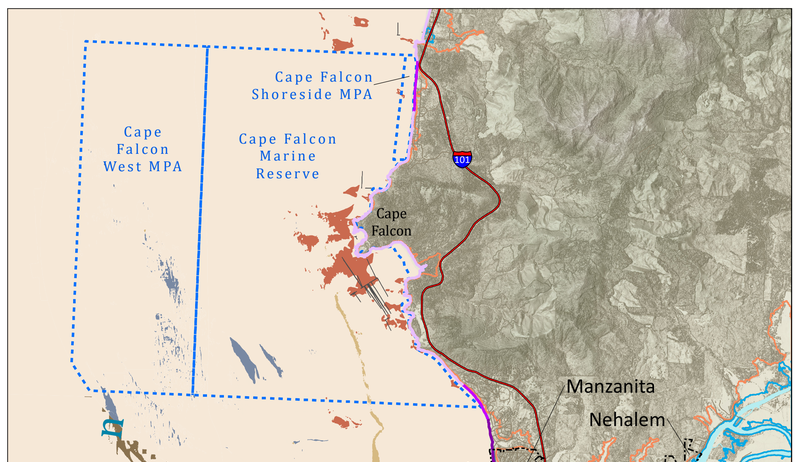
Tcf	Cape Falcon Conglomerate - poorly sorted, coarse grained, locally derived conglomerate (middle Miocene)
Ta	Astoria Formation - mudstone and sandstone (middle to lower Miocene)
Tac	Astoria Formation, Cannon Beach member - mudstone with subordinate sandstone (middle to lower Miocene)
Taa	Astoria Formation, Angora Peak member - arkosic and volcanic sandstone (middle to lower Miocene)
Tal	Alsea Formation - tuffaceous silstone and tuff (lower Miocene and Oligocene)
Tsg	Sandstone of Garibaldi - arkosic and volcanic sandstone (lower Miocene or Oligocene)
Tsc	Smuggler Cove Formation - tuffaceous mudstone and volcanic sandstone (lower Miocene to upper Eocene)
Tn	Nestucca Formation - tuffaceous mudstone and volcanic sandstone (upper Eocene)
Tbs	Basaltic sandstone at Roy Creek - volcanic conglomerate, sandstone, and siltstone (upper to middle Eocene)

Paleogene Igneous Rocks

Teib	Basalt Sills - intrusive columnar gray-green basalt and diabase (late Eocene)
Tbl	Tillamook Volcanics, lower porphyritic basalt flow - sequence of porphyritic basalt flows (upper middle Eocene)

Data Sources:
Geology: Franczyk and others, 2020; Goldfinger and others, 2014; Goldfinger and Beeson, 2023
Ocean disposal sites: OCM, 2023a

Panel 2: Coastal Erosion Susceptibility and Seafloor Substrate



Beach Cable Manholes

Cable Landing Station

City Limits

Road

US Highway 101

Ocean Disposal Site

Marine Reserve and Protected Area

Offshore Cable

River

Reef

Coastal Erosion Score

Low

Medium

High

Tsunami Evacuation Zones

Distant Tsunami

Local Tsunami

Offshore Surficial Lithology

Shell

Cobble

Gravel Mix

Gravel

Sand

Muddy Sand

Gravelly Sand

Rock

Boulder

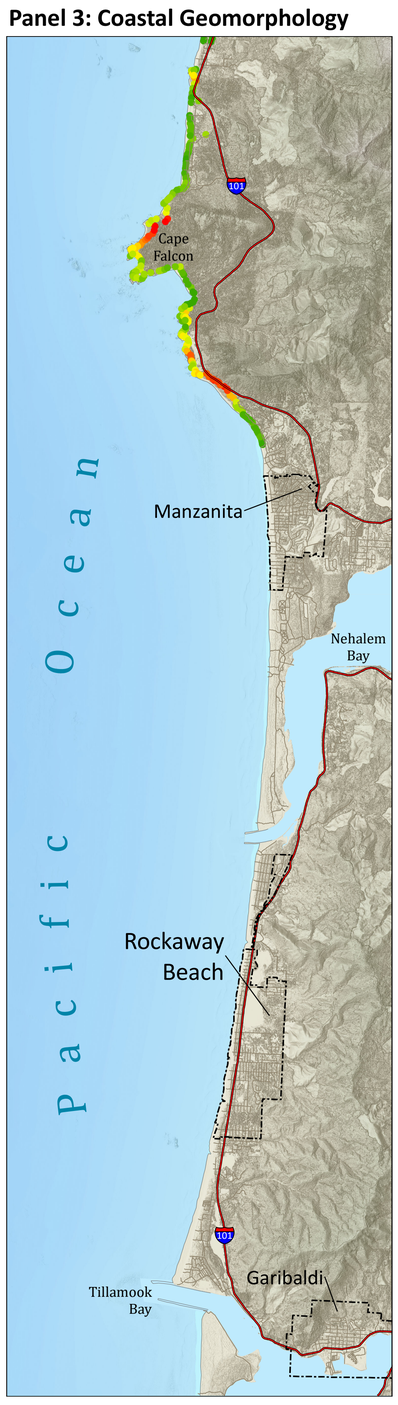
Mud

Sand Mud

Sandy Mud

Data Sources:
Coastal erosion: This report
Offshore surficial geology: Goldfinger and others, 2014
Rocky reefs: This report
Tsunami zones: DOGAMI, 2022
Marine reserves: ODFW, 2022
Offshore cables: OCM, 2023b
Disposal sites: OCM, 2023a

Panel 3: Coastal Geomorphology



City Limits

Road

US Highway 101

Shoreline

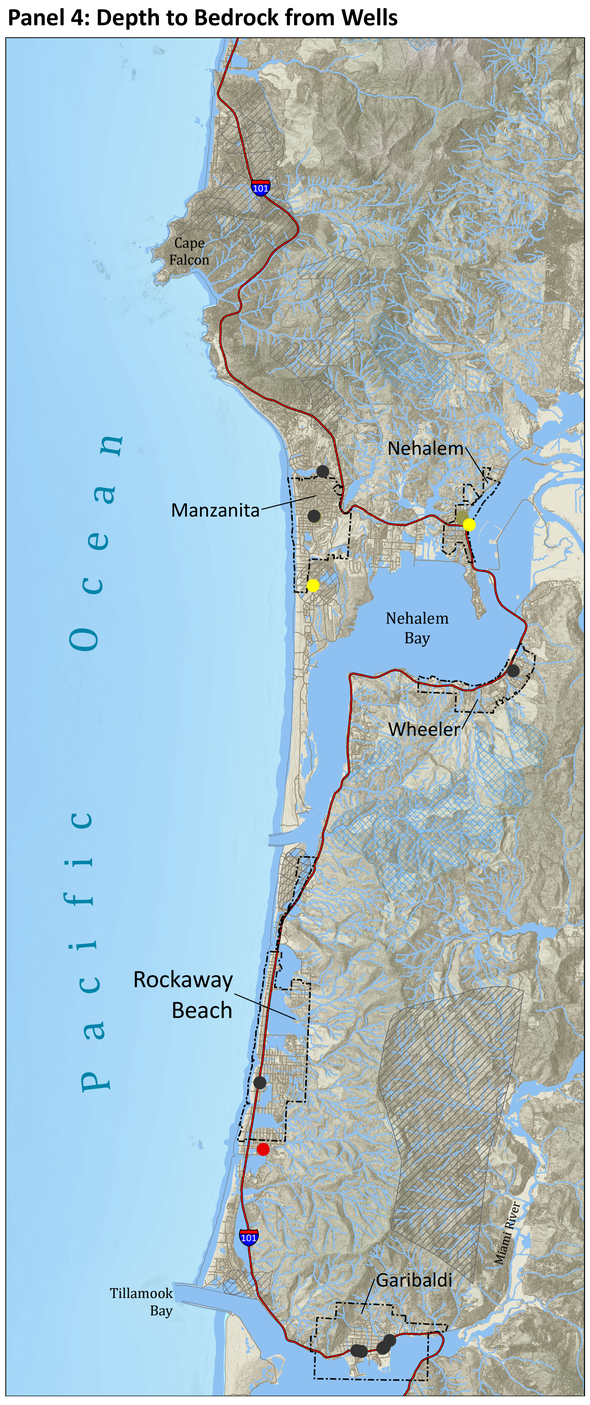
Water

Data Sources:
Bluff elevations: This report

Bluff Elevations (meters, rounded to 10s)

10	70	130
20	80	140
30	90	150
40	100	160
50	110	170
60	120	180

Panel 4: Depth to Bedrock from Wells



City Limits

Road

US Highway 101

Shoreline

Water

Wetland

Drinking Water Source Areas

Ground Water

Surface Water

Sediment Depth (in ft)

0 - 25

25 - 50

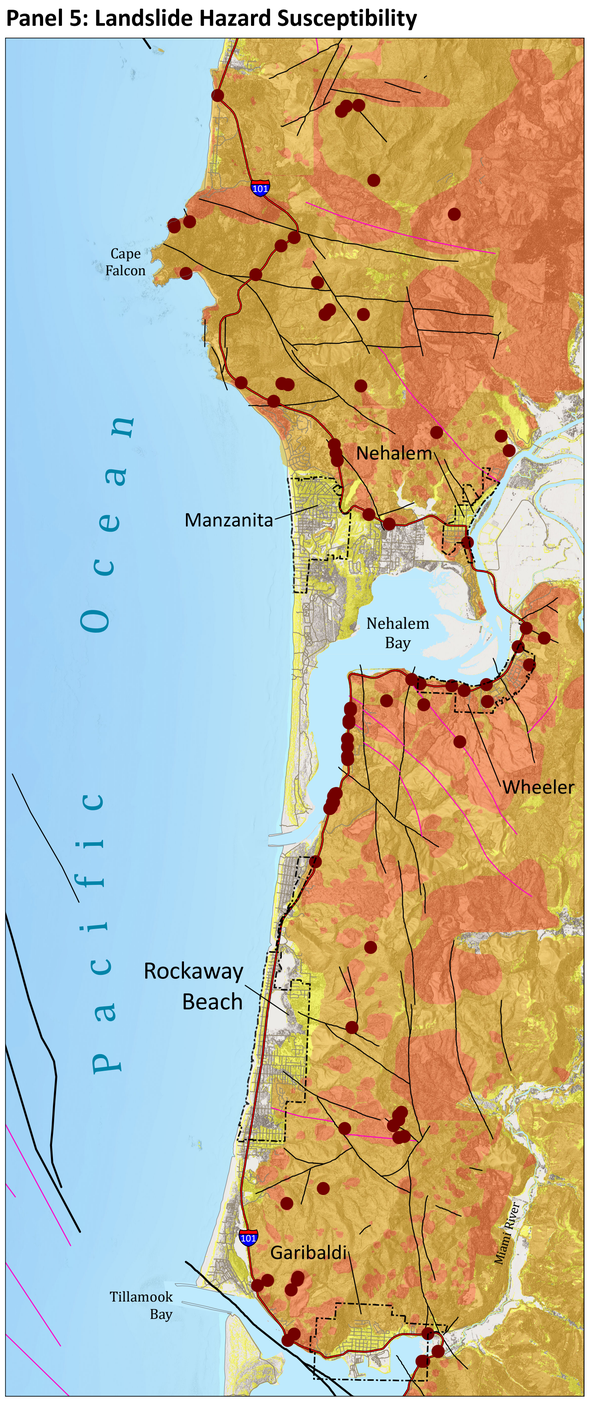
50 - 75

75 - 100

100 - 125

Data Sources:
Bluff elevations: This report
Sediment depth: This report, modified from OWRD, 2023; McClaughry and others, 2013
Groundwater: ODHS, 2011
Surface Water: DEQ, 2019

Panel 5: Landslide Hazard Susceptibility



Historic Landslide

City Limits

Road

US Highway 101

Shoreline

Water

Geologic Structures

Fault

Fold

Landslide Susceptibility

Low

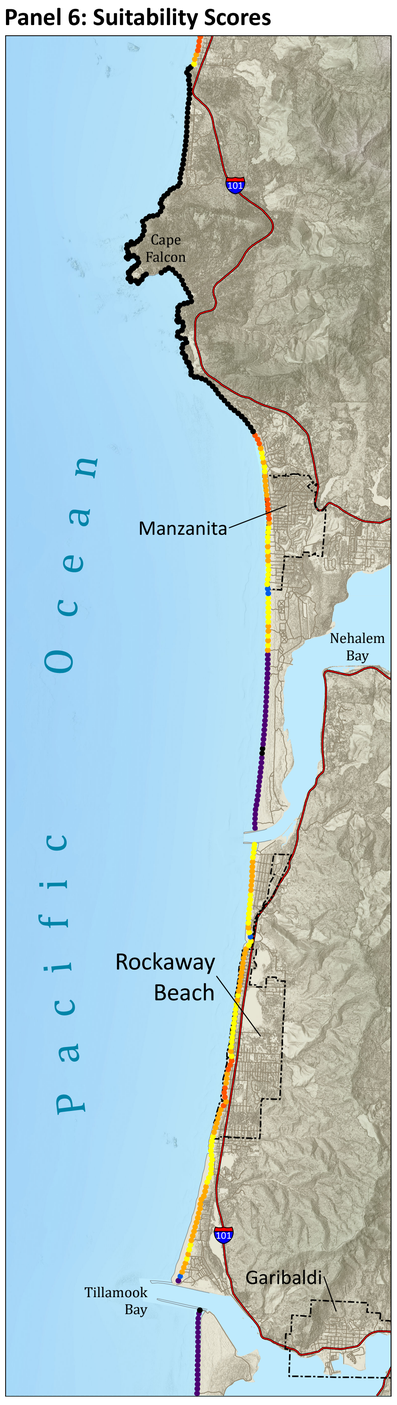
Moderate

High

Very High

Data Sources:
Landslide Susceptibility: This report, modified from Burns and others, 2016; Calhoun and others, 2020; Franczyk and others, 2021
Geologic structures: Franczyk and others, 2020

Panel 6: Suitability Scores



City Limits

Road

US Highway 101

Shoreline

Water

Data Sources:
Suitability scores: This report

Suitability Scores

91% - 100%

81% - 90%

71% - 80%

61% - 70%

51% - 60%

11% - 50%

0% - 10%

Most Suitable

Unsuitable

Source Data:
U.S. Geological Survey (USGS) National Elevation Dataset (NED) 10-meter digital elevation model. Water features from USGS National Hydrography Dataset (NHD) (2017). Road features from Oregon Department of Transportation (ODOT) (2018). City limits are from ODOT (2019).

Projection:
Oregon Statewide Lambert Conformal Conic, Unit: International Feet, Horizontal Datum: NAD 1983 HARN.

Software:
Esri® ArcMap® 10.7.1

Cartography:
Jon J. Franczyk

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ODHS, Oregon Department of Human Services, 2011, Groundwater Water Drinking Water Source Areas, https://spatialdata.oregonexplorer.info/geoportal/details;id=35221dd3e941439fa58a91357f4aa95d.

OWRD, Oregon Water Resources Department, 2023, Well Reports, https://apps.wrd.state.or.us/apps/gw/well_log/.

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