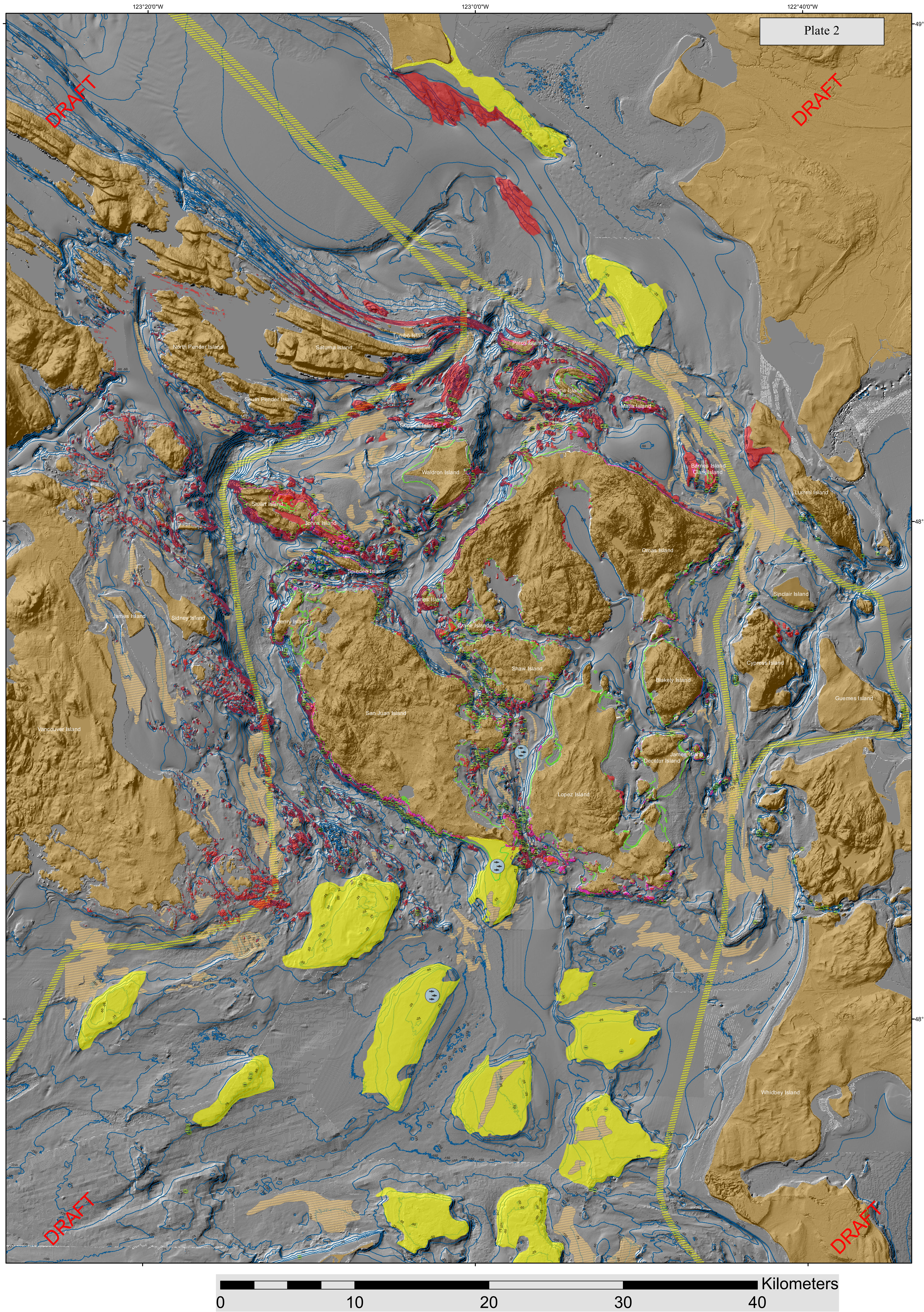
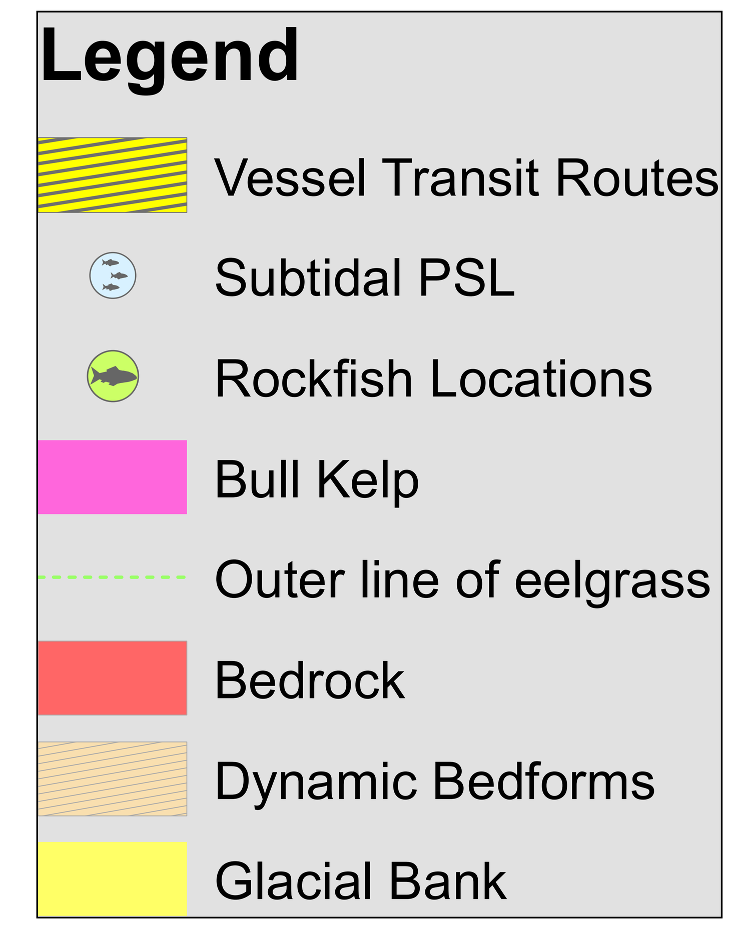
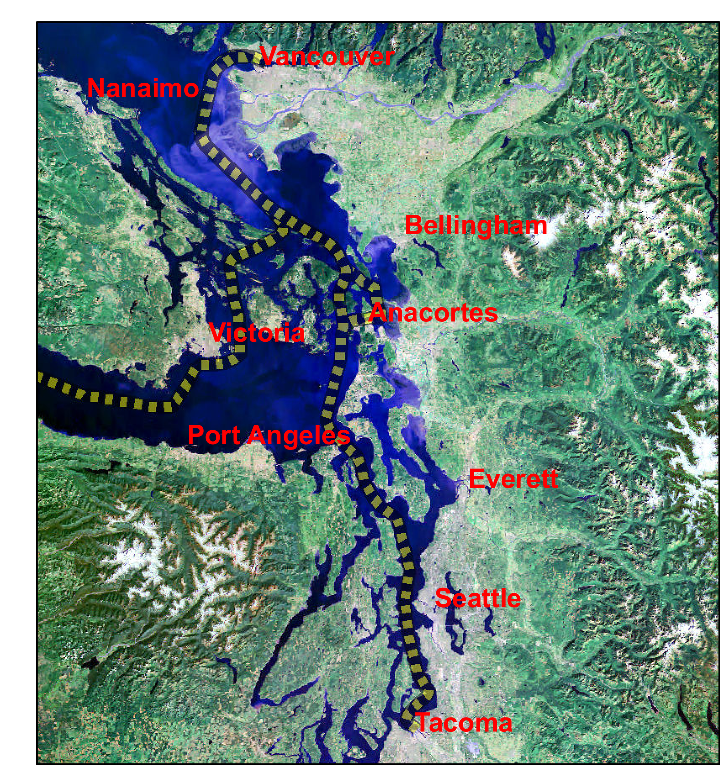
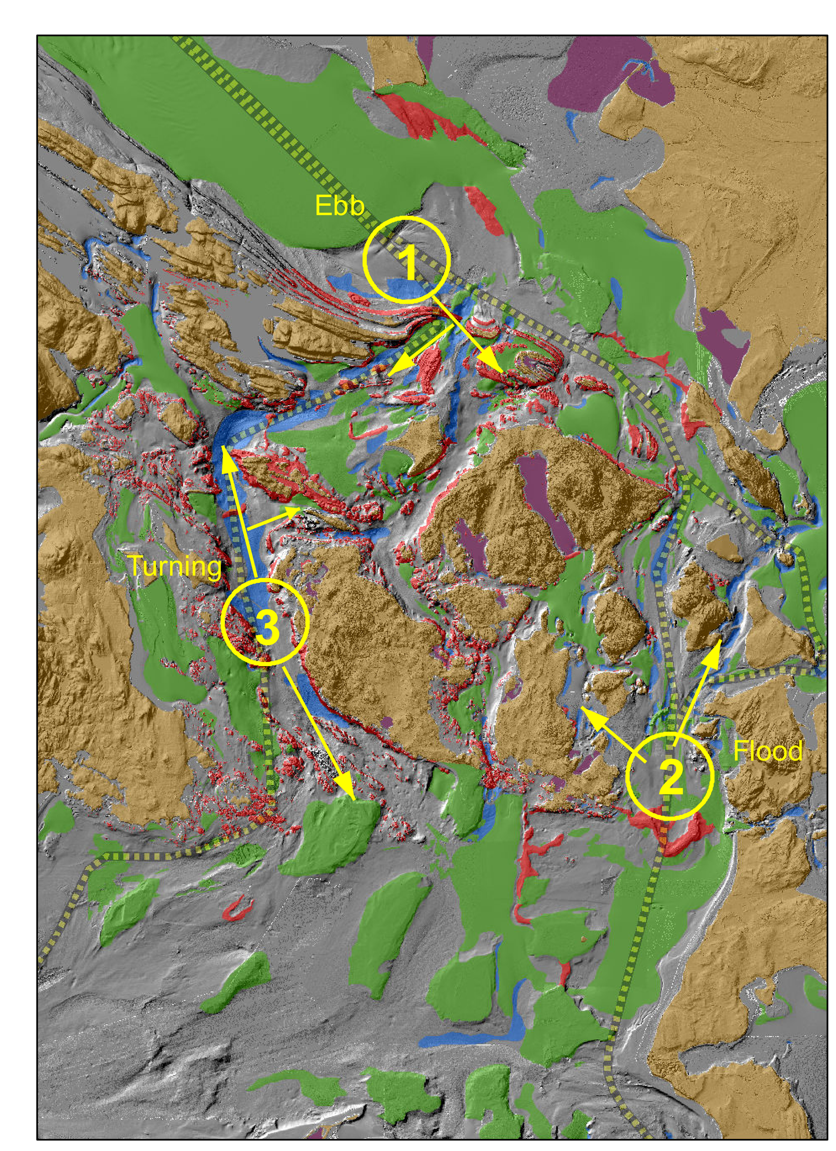




How to Use This Map

This map is the second of two maps within a two-map series constructed to illustrate the geology, geomorphology, substrate types, and marine benthic habitats that may lie in the path of a dilbit spill and need to be assessed to protect and/or mitigate critical habitats within the San Juan Archipelago. This map exhibits the following: selected benthic (seafloor) habitats that consist of soft sediment waves that may harbor Pacific sand lance (PSL); hard rock outcrops that are attractive to rockfish; locations of eelgrass (green outlines); positions of bull kelp (in pink); and known surveyed locations for rockfish species (green filled circles) and PSL (blue filled circles). Also shown are marine transport corridors along which tankers and barges transport dilbit. If a spill occurs, the known position can be plotted on this map so that high concentrations of the critical habitats in close proximity to the spill can be identified for protection and mitigation (see example map).





Oil Spill Assessment Map
Selected Potential Critical Benthic Habitats in the Central Salish Sea

Data Sources

Map components and sources include: a) bathymetric imagery and derivative data from multibeam echosounder (MBES) surveys undertaken cooperatively by the Center for Habitat Studies, Moss Landing Marine Labs with the Geologic Survey Canada, which are archived at the Tombolo Mapping Lab/SeaDoc Society, supplemented with NOAA bathymetric survey data (NOAA, 2018b) and University of Washington Digital Archives (Finlayson, 2019); b) terrestrial imagery developed from bare earth LiDAR (Puget Sound Lidar Consortium, 2019) supplemented with Esri Basemaps (Esri Basemaps | Digital Maps for Apps. https://www.esri.com/en-us/arcgis/products/arcgis-platform/services/basemaps) and the USGS (USGS, The National Map - Advanced Viewer. Portal to access DEMs, https://apps.nationalmaps.gov/viewer/), and; c) benthic habitat classifications and polygons (Greene and Barrie, 2011); d) rockfish survey data, spreadsheets obtained from Washington Department of Fish and Wildlife and NOAA during rockfish project 2016; e) sand lance survey data, obtained from Greene et al. (2011, 2017), Dr. Matthew Baker and students from Friday Harbor Labs; f) vessel traffic routes identified from Washington State Department of Ecology (WDOE, 2015, 2019) mapped onto AIS vessel traffic density data (NOAA Vessel Traffic Data. https://marinecadastre.gov/ais/); g) eelgrass and kelp coverage data obtained from the Friends of San Juans (Slocomb et al., 2004, Friends of San Juan Research and Maps. https://sanjuans.org/nearshorestudies-htm/); h) current direction and maximum strength modeled (NOAA, 2018a) and Acoustic Doppler Profiler measurements (NOAA, 2019).

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Coordinate System:WGS 1984
Projection: Transverse Mercator
Datum: WGS1984

Data sources and methodology used in developing this map are identified in accompanying report –"Oil Spill Assessment Map of Central Salish Sea – Marine Seafloor & Coastal Habitats of Concern - A Tool for Oil Spill Mitigation within the San Juan Archipelago"

Oil Spill Scenarios

Three speculated scenarios are presented to provide guidance on how to use this map (see inset above). The three yellow numbers represent a site of an oil spill. The yellow arrows indicate direction that oil would move during a flood, ebb, or turning tide. The rate of weathering of the oil will dictate the time the oil will begin to sink and then real-time tidal information on water column and seabed currents will be needed to estimate vectoring.

Scenario 1: A dilbit oil spill in the southern Georgia Strait area during ebb tide would vector oil southward and westward where it could be mixed by turbulence at Boundary Pass. If this occurred during a Fraser River freshet or during a phytoplankton bloom oil-particle aggregates (OPAs) could form causing the oil to sink. This oil could then be directed toward the critical rockfish habitats of Sucia Island and toward Turn Point where embedment could occur on Skipjack Island Bank.

Scenario 2: A dilbit oil spill in southern Rosario Strait during flood tide would vector oil northward and eastward toward Bellingham Bay or westward toward Lopez Sound where sunken oil could settle and be incorporated into the soft sediments on the seabed. Few embedment sites are available in this area so mitigation actions would be directed toward recovering oil from unconsolidated sand and silt substrates.

Scenario 3: A dilbit oil spill in central Haro Strait during the end of a rising (flood) tide turning to a falling (ebb) would initially vector oil northward along the tidal strait and then return it and to the south. Once the oil sinks the strong seabed tidal flow would keep the oil mobilized within the distribution corridor with a possible eventual accumulation on the glacial banks near within the eastern Strait of Juan de Fuca.