Area 9 Test Fishing Proposal
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Introduction
Washington Department of Fish and Wildlife (WDFW) is proposing a 2020 Fall Chum Salmon (*Oncorhynchus keta*) test fishery for Marine Catch Area 9 (Area 9). This effort aims to bring an additional modeling option when the Non-Treaty (NT) commercial fishing is restricted or closed in the Hood Canal (HC). The HC Fall Chum Salmon fishery is presently co-managed by an in-season update model (ISU) that estimates total run-size (TRS) from fishery-dependent sampling regime. Specifically, TRS is estimated from a direct relationship between TRS and cumulative NT commercial catch-per-unit effort (CPUE) data from the NT purse seine fleet (Dufault, 2016). In 2017, the ISU was updated after an extensive model performance review to incorporate an additional "Extended Season" model run adding additional CPUE data from an expanded time window (Litz, 2017). Despite these adjustments, the present ISU model has limited use when fisheries are constrained due to conservation-based regulatory changes that support meeting escapement goals and recovery of the fishery. Thus, a fishery-independent catch data model for HC Fall Chum is warranted to give WDFW and Tribal co-managers in-season assessments of Fall Chum during years when conservation-based commercial fishing restrictions are applied pre-season.

Upon reviewing the preliminary 2020 Hood Canal Fall Chum Joint Tribal/WDFW forecast of 471,810 Chum (wild and hatchery combined), there is some caution as to the successful prosecution of a full Hood Canal purse seine season through weeks 42-46. This lends credence to the initiation of a new test fishery in Area 9 to accommodate for potential pre-season restrictions imposed on the commercial fishery. Test fisheries have proven to be a powerful fishery management tool in that they provide valuable fishery-independent data (Thorne and Thomas, 2012). Management agencies such as WDFW, Tribal governments, and the Pacific Salmon Commission, rely on accurate and timely abundance estimates of returning adult salmon to update modeled run-sizes for pre-terminal and terminal area fisheries. The simple benefit of test fishery data is that it is not dependent upon an actual fishery occurring. This independence gives fishery managers much more flexibility in that data being collected, the model used during analysis, and control over variability in time and location for updates to in-season fishery regulations. Currently WDFW and the Northwest Indian Fisheries Commission (NWIFC) operate a single test fishery used to model South Puget Sound Fall Chum runsize. Initiated in 1981, the Apple Cove Point (ACP) test fishery's catch data feeds a simple linear regression CPUE model. This test fishery also collects genetic stock identification (GSI), and other biological data (e.g., age composition) used to inform in-season management decisions and generate run stock proportions.

Current Marine Chum Test Fisheries
ACP Test Fishery:
Operated in conjunction with the NWIFC this test fishery is located on the Area 9/10 boarder, North East of Apple Cove Point, WA (Fig. 1). The current contract is issued to the purse seiner F/V *Sound Star*, a 58' Delta that fishes a Puget Sound seine net. The ACP test fishery fishes weekly from management week 41 through management week 46. Each week the seiner fishes six consecutive sets. Due to conditions such as weather, debris, and current, sets can be dispersed covering an area of .51 sq. miles. WDFW and NWIFC staff census the entire catch collecting: sex/length, scales, GSI tissue, location, time, and catch composition per set, and CWT and mark status of all non-chum salmon encountered. All fish, including bycatch, are retained (NWIFC permit ***), and are sold to a contracted buyer at the end of the day.

NWIFC Area 9 Treaty Test Fishery:

Since 2005, the NWIFC and member tribes have conducted genetic stock identification (GSI) research on Chum salmon collected from several study sites within Area 9. During the 2018 pre-season fishery planning, tribal co-managers agreed to pursue further research at additional locations within Area 9, with a focus on potential Chum fishing areas. This was to be a treaty only test fishery, with no support from WDFW. The primary objective was to collect chum tissue samples for genetic stock composition analysis for potential chum-directed commercial fisheries. These objectives stem from tribal interest in determining the feasibility of prosecuting chum-directed fisheries in Area 9 under a co-manager agreed-to management plan that is consistent with terminal escapement goals and allocation agreements (NWIFC, 2019). Unlike the APC test fishery, or the WDFW proposed Area 9 test fishery, this tribal test fishery has been defined by strata of management week and study site, and is not restricted to a single location.

Proposed Methodology

WDFW Area 9 Test Fishery:

In forming the Area 9 fall chum test fishery, WDFW will initially mirror the methodology of the APC test fishery. To determine the exact location of the Area 9 test fishery, WDFW staff will use input from Puget Sound purse seine fishers. Staff will also conduct an analysis of the bathymetry where the current ACP test occurs, and compare it to similar regions of Area 9. Like the ACP test fishery, the Area 9 test fishery will fish weekly from management weeks 41 through 46. Each day the vessel will fish 6 sets, with a potential increase to 8 sets. Data collection will include: sex/length, scales, GSI tissue, location, time, and catch composition per set, and CWT and mark status of all non-chum salmon encountered. In addition, the Area 9 test fishery may collect an increased array of physical data such as tidal state, current, diel depth, and conductivity, temperature, depth (CTD). WDFW will write and provide a copy of exact sampling methodologies to tribal co-managers. Both test fisheries would occur simultaneously, requiring the contract of second purse seine vessel. Additionally, WDFW may seek to add subsequent days to the test fishery each week to sample additional sites in Area 9. To standardize catchability and net efficiency, WDFW would ensure each vessels seine nets were similar in construction: length, depth, mesh size, and quality. This will be done in conjunction with purse seine vessel owners input and net manufactures schematics. Each week, fishing would conclude with the end of the final set. WDFW will work with contracted buyers to determine where the landed catch of chum will be sold.

Pursuant to RCW 77.12.177 (4):

> Proceeds from the sale of fish or shellfish taken in test fishing conducted by the department, to the extent that these proceeds exceed the estimates in the budget approved by the legislature, may be allocated as unanticipated receipts under RCW 43.79.270 to reimburse the department for unanticipated costs for test fishing operations in excess of the allowance in the budget approved by the legislature

The intent being the sale of landed chum, in excess of vessel and crew expense, would be allocated to further Chum fishery research and management tool development. WDFW expects that priorities would be developed in conjunction with co-managers as part of ongoing comprehensive chum management improvement.

Area 9 Test Fishery Locations:

This test fishery will only focus on the northern waters of Hood Canal, South of a line from Olele Point to Foul Weather Bluff. WDFW expects to select two locations to conduct this test fishery: A primary location and a secondary location (Fig 2). The primary location, preferably close to the Hood Canal Bridge, will coincide with the time and day of the ACP test fishery. WDFW has selected four potential

primary locations (Fig 3). Selection of the primary location will involve consolation with purse seine fishers and analysis of bathymetry. Catch data from that location will be critical in understanding the stock specific differences between Hood Canal and South Sound stocks. The secondary location will be selected further north. WDFW has identified two potential secondary locations (Fig 4). The main purpose of the second location will be to increase the dataset robustness, and spatial/temporal resolution of the data when compared to the APC test fishery.

Area 9 Test Fishery Data Analysis:
Data from this test fishery will be used to model a Hood Canal TRS for fall chum. We believe a simple linear regression will be the best suited model. To make comparisons to the ACP test fishery, this regression model will use a cumulative catch per unit effort (CCPUE) of the highest 4 sets per management week. Environmental and physical data such as depth, location, and sea surface temperature will be collected and analyzed using the appropriate covariance models, and potentially integrated into in-season TRS prediction models in subsequent years. Data from each primary and secondary test fishery locations will be run separately and cumulatively.

Sampling Protocol:
Data collection goals for test fishery day per management week will be: 6 complete sets, and 200 chum sampled for sex/length/scales/GSI. To ensure random sampling, WDFW staff will use a spatially random sampling frame, as proposed in the *GSI Sampling Protocol Brief for Onboard Observers in the Non-Treaty Purse Seine Fishery, 2019* (Addae, 2019)*.* The following modification will be made to this protocol: a maximum of 35 GSI/Sex/Length/Age fish will be collected from each set. If the set is less than 35 chum, all fish will be sampled. All sampled fish from sets > 35 fish will be randomly selected using the spatially random sampling frame provided in the 2019 document. Prior to any biological sampling, a complete catch composition, and release of all non-target species would be conducted by WDFW staff. Non-chum salmon will be counted and recorded for marked status fishing effort data including latitude/longitude, net haul times, will be collected on each set while the vessel is fishing. Physical data will be collected prior to the start of each set if using a CTD/sensor array lowered from the fishing vessel, or data will be continuously collected if using a CTD/sensor attached to the net.

Catch and Incidental Impacts:
All non-target (non-chum) salmon will be released, with the exception of CWT coho and Chinook.[1] With Chinook encounters being rare in Hood Canal during this period (weeks 41 -46) (0.051 Chinook/observed set, n = 345), WDFW may require use of a recovery box to better mitigate the assumed chinook impacts in Area 9. During this same time series coho are annually retained in the Hood Canal NT net fisheries (WDFW, and NWIFC, 2019) however this test fishery would require the release of all non-chum and non-CWT salmon. Release mortality rates of 26%, 45%, 33%, and for encountered coho, Sub-Adult Chinook, Adult Chinook, would be applied to the total weekly encounters, respectively. Preliminary estimates of incidental mortality using 5-year averaged Hood Canal observer data show very low chinook and Coho mortality (Table 1); nonetheless, a non-fishery based in-season CPUE assessment of salmon by-catch will be useful in future years as most salmonids are experiencing population-level declines due to a myriad of factors including recent climate variability

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[1] WDFW may require the release of all non-chum salmon, regardless of CWT presence.

Table 1:
Preliminary non-target mortality estimates during the proposed Area 9 Chum Test Fishery. Observer data from the Hood Canal Non-Treaty purse seine fishery in Areas 12,12B, 12C, to be used as a preliminary estimate. No adjustments for annual fishing schedule were made.

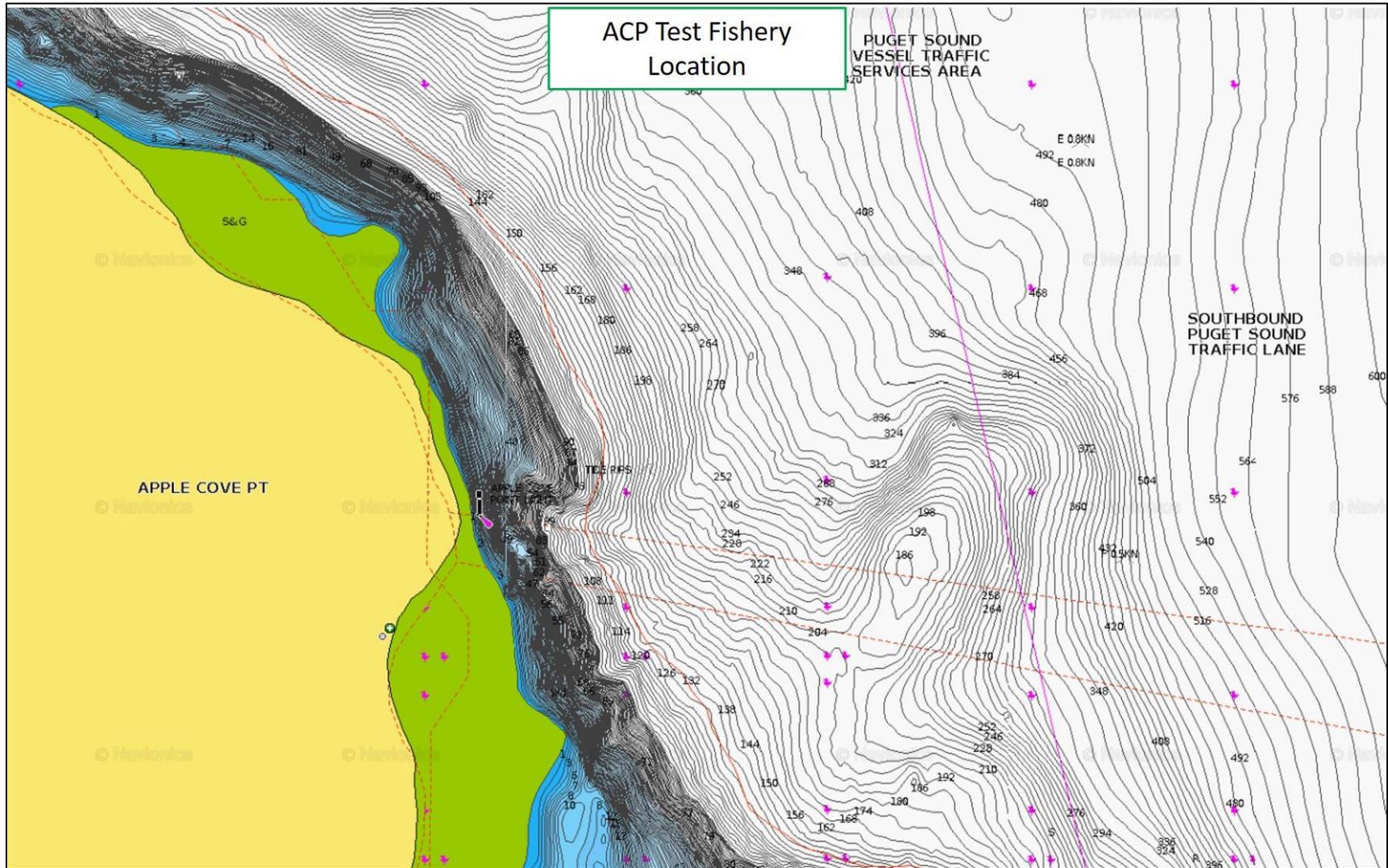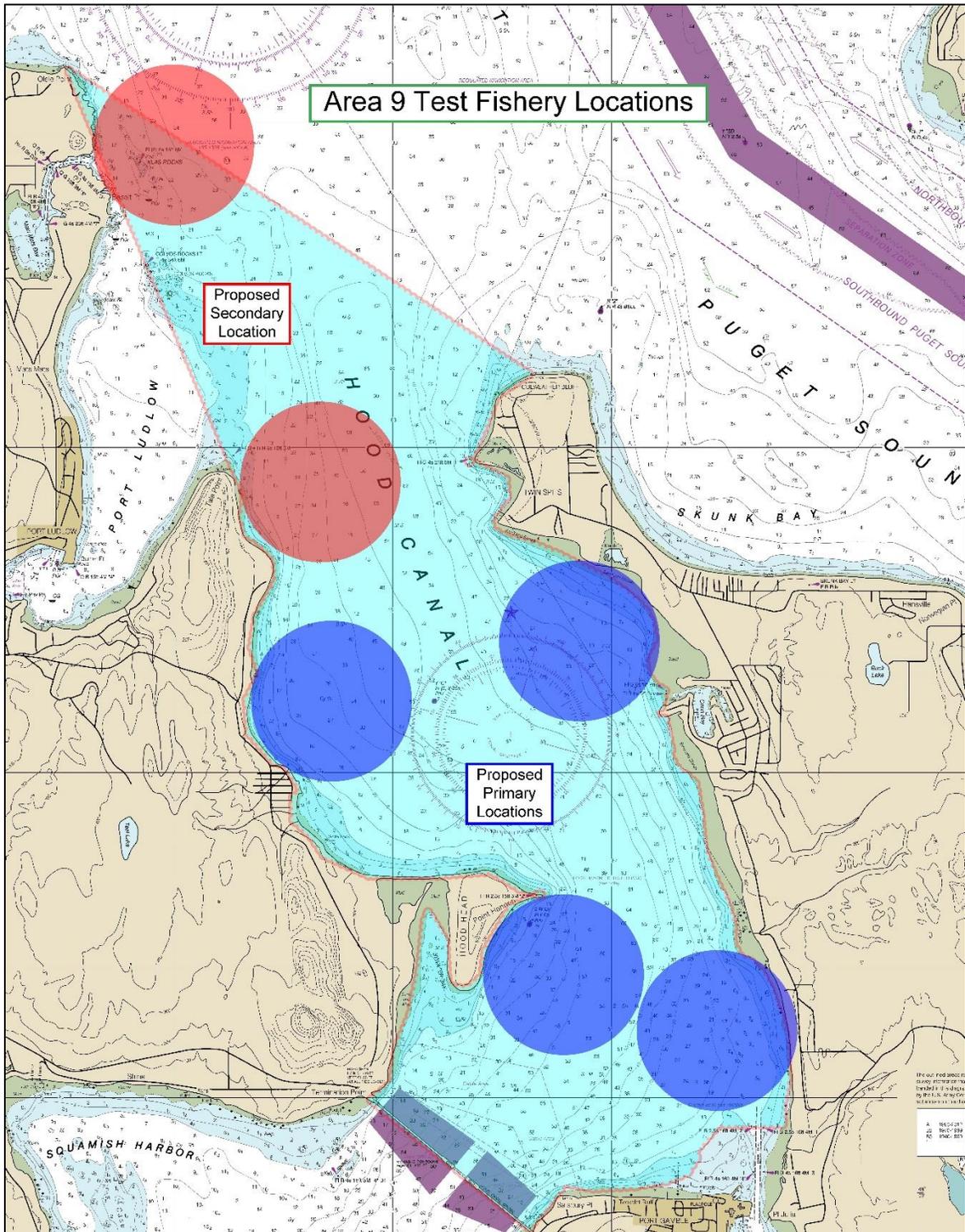| Year	Coho	Chinook < 22"	Chinook	Combined Chinook
2015	16	0	3	3
2016	115	1	10	11
2017	183	3	1	4
2018	112	0	0	0
2019	115	2	0	2
Total	541	6	14	20
5-year Avg.	180.3	2.0	4.7	6.7
Expected Mortality	46.9	0.9	1.5	2.4

Figures

Figure 1. Bathymetry of Apple Cove Point (ACP). This region shows the current location of the ACP Test Fishery. North is up. Each contour line is 5 feet.

Figure 2. Proposed Area 9 Test Fishery Locations. Primary locations and the secondary locations (red circles) are representative of the area covered by 6 purse seine sets. Calculations were made using set position data from the 2019 ACP Test Fishery.
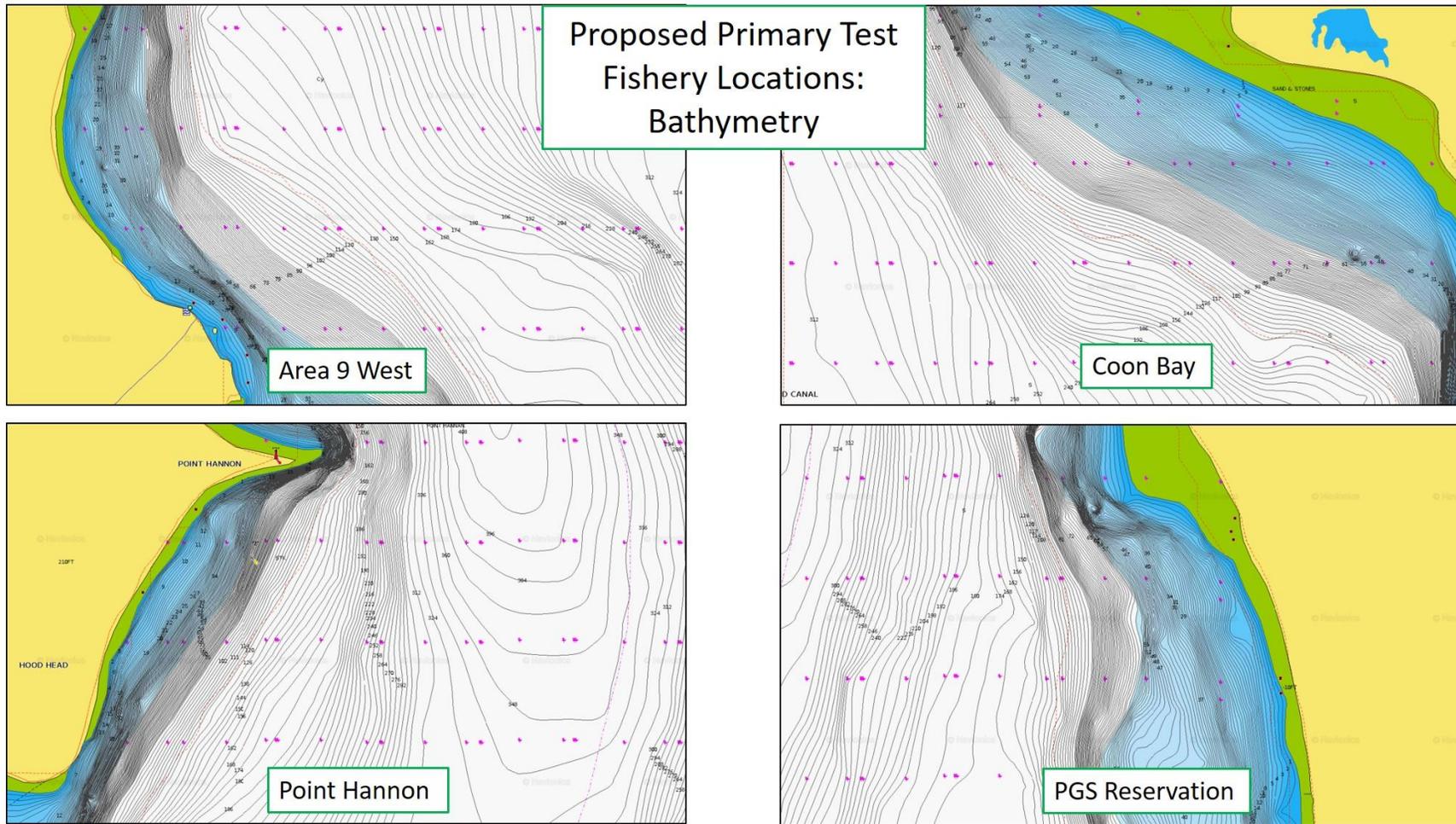
Figure 3. Four potential Primary location bathymetries. North is up. Each contour line is 5 feet.
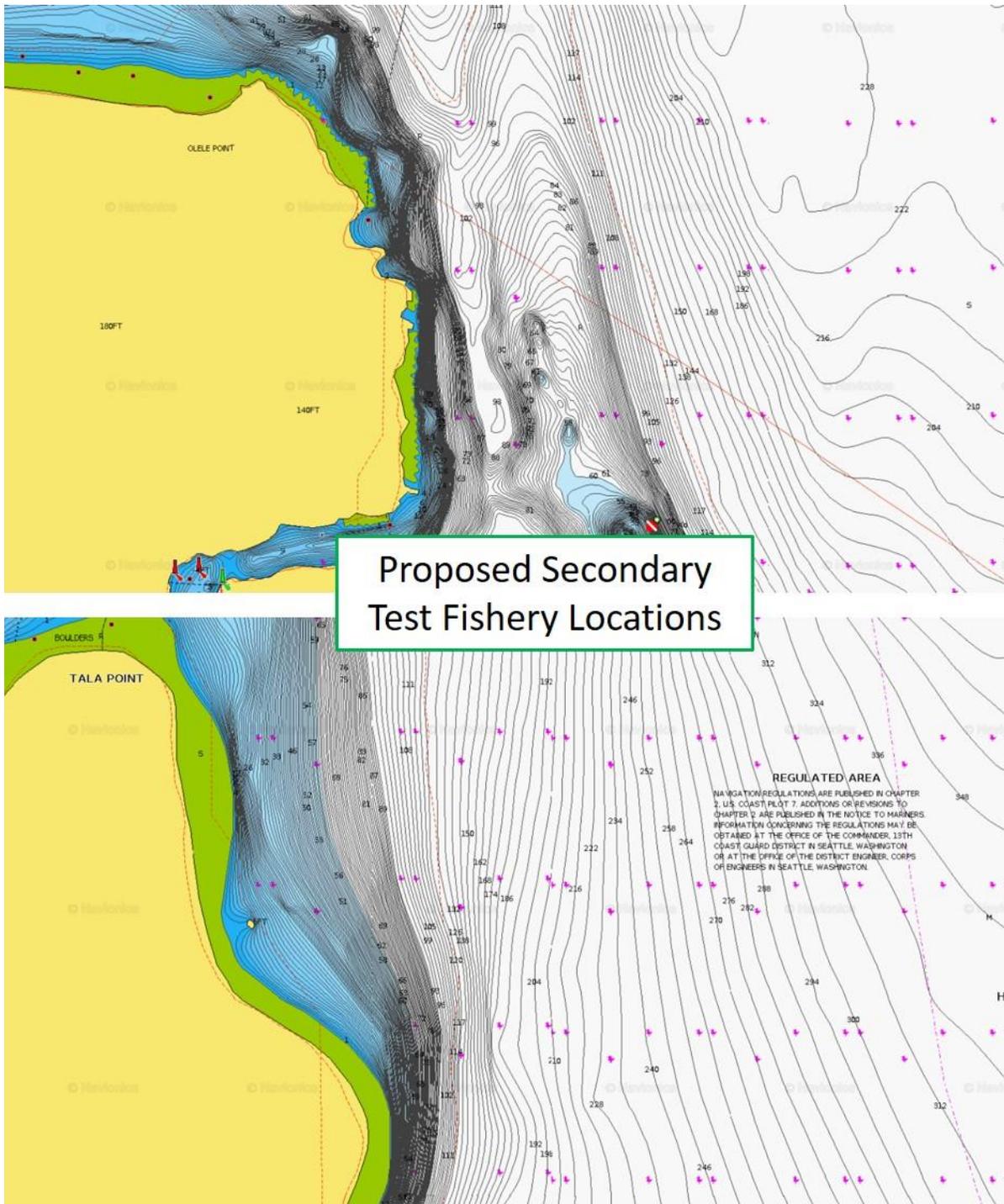
Figure 4. Two potential Secondary Location bathymetries. North is up. Each contour line is 5 feet.

Reference

Addae, K. (2019). GSI Sampling Protocol Brief for Onboard Observers in the Non-Treaty Purse Seine Fishery for Areas 10 and 11. Washington Department of Fish & Wildlife, 600 Capitol Way N, Olympia, WA.

Dufault, A. (2016). Hood Canal Escapement and Runsize; Fall Chum Salmon. Washington Department of Fish & Wildlife, 600 Capitol Way N, Olympia, WA.

Litz, M. (2017). In-Season update (ISU) Model for Hood Canal Fall Chum Salmon. Washington Department of Fish & Wildlife, 600 Capitol Way N, Olympia, WA.

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Thorne, R. E., & Thomas, G. (2012). The role of fishery-independent data. In Fishery Management (pp. 121-137). Nova Science Publishers, Inc.

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