Snohomish County

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PROJECT TITLE: Northwest Straits Project: Snohomish County Marine Shore Inventory

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PROGRESS REPORT () FINAL REPORT (X)

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Final Report
Northwest Straits Project: Snohomish County Marine Shore Inventory
CZM Agreement No. G0300026
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A. Description of Work Completed

Task 1: Scoping

Snohomish County completed a review of existing shoreline inventory methodologies and sought input from experts from state and local agencies. The draft methodology was also reviewed by consulting firms, and the final version was incorporated into the Quality Assurance plan for this project.

Task 2: Shoreline Inventory

Snohomish County staff identified marine shore property owners and sent letters and educational brochures requesting access for the inventory field work. Maps were produced showing the access status of each shoreline property. These maps were provided to Landau Associates, the consulting firm hired for the inventory field work and data processing. Landau Associates completed the inventory field work for the entire Snohomish County marine shoreline, except for areas where this methodology could not be applied, which included the heavily developed Everett waterfront, major estuaries, mudflats, and properties for which access was denied by the owners. Landau Associates also provided the inventory data in Geographic Information System (GIS) format along with supporting metadata in accordance with Washington State Department of Ecology standards.

Task 3: Analysis

Snohomish County staff assessed the quality of the marine shore inventory data, integrated the data into the County's GIS, and completed a preliminary analysis of possible candidate sites for protection and restoration activities. These accomplishments are summarized below.

Data Quality Assessment

Background. The Snohomish County Marine Shore Inventory Quality Assurance Project Plan (QAPP) describes the data quality objectives and the quality assurance procedures used for this project. To assess the quality of the data, approximately 3% of the total length of the survey was surveyed a second time. The two replicate sets of data were compared and the differences between them were used to determine how well the measurement quality objectives were met.

Scope. The following covers were checked in accordance to the Snohomish County Marine Shore Inventory Quality Assurance Project Plan: armoring, banks/bluffs, invasive species, piers/docks, pipes, ramps/launches, and riparian vegetation. The remaining covers – streams, seeps, and wetlands – could not be checked because those features were not recorded by both surveys in the sample areas.

Methods. Up to three kinds of results are reported for each cover. First, any differences in the amount of data collected are described. This occurs when one survey records a feature that the other survey does not record. For line covers, lengths are also reported. Second, for point covers, the accuracy of the locations are analyzed as described in the QAPP. This was not done for line covers because the locations are not single points. Third, for point and line covers, the accuracy of significant non-location attributes that are expected to be constant between the surveys is analyzed and reported as described in the QAPP. For line covers, adjacent line segments with the same attributes are considered one feature, so the number of features is different from the number of data records in the GIS. Results for line covers are also presented as lengths and percentages of total length. This gives a more accurate picture of the data quality since segment lengths vary.

Armoring. The first survey recorded 19 similarly classified lengths of armoring. The second survey recorded these 19 and three more that were not recorded in the first survey. Analysis of the 19 replicate segments shows that 93% of the individual attributes matched in the two surveys. A total of 6,709 feet (89%) of armoring was recorded with all of the same attributes in both surveys. Inconsistent classification among at least one attribute (face, material or condition) occurred along 825 feet (11%) of the replicates.

Banks/bluffs. The banks/bluffs dataset is continuous so there are no missing segments in either survey. Changes in the basic classification (none, low, moderate or steep) were used to group the line segments into 23 replicates. The basic classification matched for 17 (74%) of these segments and did not match for six. Overall, 9,180 feet (92%) of blanks/bluffs were consistently classified in both surveys. Inconsistent classification among at least one attribute occurred along 787 feet (8%) of the sample.

Invasive species. The first survey recorded one 54-foot line of invasive species. The second survey recorded that line as 59 feet long, and found an additional 23-foot segment. The first survey identified four point locations. The second survey recorded two of the four points, plus three additional points. This suggests that the data on invasive species is not likely to be consistently comprehensive. Analysis of the two replicate points finds significant differences (standard deviations of 22 and 48 feet) in location. This is because survey crews recorded nearby locations when they could not reach the actual location of the invasive species due to physical constraints. The QA-checked attributes of the replicate point and line records matched 100% of the time.

Piers/docks. The first survey recorded two piers/docks with a total length (along the shoreline) of 26 feet. The second survey recorded those two with a total length of 18, plus one additional 211-foot pier/dock. Upon review of aerial photos, it was determined that the 211-foot dock in the second survey is the Washington State ferry dock at Edmonds. Further review found that the ferry dock and two other docks near Mukilteo were also not recorded in the survey, so the piers/docks coverage does not appear to be comprehensive. The QA-checked attributes of the two replicate pier/dock records matched 100% of the time.

Pipes. The first survey found 11 pipes. The second survey found those 11, plus 19 more. This discrepancy is primarily due to the different tidal heights at the times of the two surveys. Some pipes remain underwater even at extreme low tides, so it is impossible to determine how many pipes might be missed by this survey method. Analysis of the 11 replicates shows that the locations of 8 out of 11 (73%) have standard deviations less than 5 feet. All 11 (100%) have standard deviations less than 10 feet. The QA-checked attributes of replicate pipe records matched 100% of the time.

Ramps/launches. The first survey found one 15-foot (along the shoreline) ramp. The second survey recorded that ramp as 19 feet long. There were no other ramps/launches found in the sample area. The QA-checked attributes matched 50% of the time.

Riparian vegetation. The riparian vegetation cover is continuous so there are no missing segments in either survey. Changes in the primary vegetation were used to group the line segments into 19 replicates. The QA-checked attributes matched 92% of the time. Overall, 8,070 feet (81%) of riparian features were consistently classified in both surveys. Inconsistent classification among at least one attribute occurred along 1,878 feet (19%) of the sample.

Summary. Streams, seeps, and wetland features were not found in the sample area where the survey was repeated, so the accuracy of data on those features cannot be estimated. The recording of invasive species and docks in the sample area was inconsistent and did not meet the measurement quality objective. Analysis of location data for the pipes shows that 73% of the recorded locations are likely within 5 feet of the actual locations, and the remaining 27% are generally within 10 feet of the actual locations. The measurement quality objective was to have 90% within 5 feet. Only 50% of the QA-checked attributes matched for ramps, but with only one ramp in the sample, this is not statistically significant. All other attributes that were tested satisfied the measurement quality objective of matching 90% of the time or more.

Integration with Snohomish County GIS

The inventory data was stored on the County's computer network and incorporated with the marine resources GIS project. Packaging the data for distribution and use, both internally within the Snohomish County organization and externally with local cities and tribes, was initiated. Opportunities to improve the usefulness of the data have been identified. For example, it would be useful to know the total over water area of docks and piers. This could be done by digitizing polygons for piers and docks using aerial photos. In addition, it would be useful to know where armoring is located relative to the mean higher high tide line. This could be determined by comparing the height of the toe of the armoring above the water level with the tidal elevation at that time. Alternatively, when LIDAR data for the Snohomish County shorelines becomes available analysis of these data sets together would provide the answer.

Preliminary Analysis

A preliminary analysis of possible candidate sites for protection and restoration was completed using the marine shore inventory data in conjunction with other existing

marine resource data sets compiled and maintained by the County. In developing the approach for this preliminary analysis the following existing data sets were reviewed:

- Washington Department of Natural Resources' ShoreZone Inventory,
- Washington Department of Fish Wildlife's Priority Habitats and Species Database,
- Anchor Environmental's Northwest Straits Nearshore Inventory,
- King County's Marine Outfall Siting Study (MOSS), and
- Pentec Environmental's Snohomish Estuary Wetland Integration Program (SEWIP) Tidal Habitat Model.

Areas along the marine shore that are not armored and that have relatively high potential habitat value were identified as candidate sites for protection. Potential habitat values were generated based on riparian conditions and proximity to freshwater features. These were also correlated with intertidal and subtidal marine vegetation data and known forage fish spawning areas.

The following candidate sites were identified for restoration:

- Failing bulkheads – determine whether they could be removed or replaced with alternative methods of shoreline protection.
- All bulkheads, ramps, and launches along known forage fish spawning beaches – determine ownership, condition, and impact of these bulkheads and assess need and feasibility of removing or replacing them with softer alternatives.
- Pipes at the mouths of Puget Sound tributary streams – determine whether they are blocking the flow of water, sediment, and organic materials to the marine shore.
- Marine shore areas affected by invasive plants – forward this information to the Snohomish County Noxious Weed Control Board for inclusion in their work program.
- Publicly owned shorelines where potential habitat value is low – determine whether the habitat value of these areas could be enhanced by planting native vegetation.

Additional analysis could include the following:

- Investigate the condition of ramps and launches and whether they are actively used.
- Digitize polygons for piers and docks using aerial photos and determine the degree of shading from these over water structures.
- Determine where armoring is located relative to the mean higher high tide line. This could be done by comparing the height of the toe of the armoring above the water level with the tidal elevation at that time. Alternatively, when LIDAR data for the Snohomish County shorelines becomes available, analysis of these data sets together would provide the answer.

B. Status of Project Schedule

The project was completed on time.

C. Financial Status and Personnel Changes

There were no changes in MRC staff personnel during the contract period.

D. Difficulties Encountered

- The amount of time and the financial cost of securing property owner permission to access the shoreline was greater than anticipated.
- Making arrangements with the Burlington Northern Santa Fe railroad company for safety flaggers on the railroad tracks along the southern half of the County's marine shoreline was an unanticipated expense and caused some delays for the fieldwork.
- Oversampling for QA/QC of the data did not produce a sufficiently large sample size to check the accuracy of measurements and/or estimates for some of the geographic features that were included in the inventory.
- The inventory field work proceeded more slowly than expected. As a result it took the consultant more time to complete the inventory for the entire Snohomish County marine shoreline than originally estimated.

E. Anticipated Benefits of the Project

- The process of contacting shoreline property owners for permission to access their properties for the inventory helped to increase their awareness about the Snohomish County Marine Resources Advisory Committee and the County's efforts to conserve marine resources.
- The data collected for this inventory will improve the MRC's ability to produce more precise and accurate recommendations for protection and restoration of local marine resources.
- This inventory will be of use to other local jurisdictions for improved management of marine resources. The City of Mukilteo and the Tulalip Tribes have requested the inventory to support their current shoreline management activities.
- This data will help improve public awareness about marine shoreline conditions and opportunities for protection and restoration in Snohomish County.