# Appendix B. Examples of Duwamish Restoration Projects Completed from Earlier NRDA Settlements

## Herring's House

This restoration project is located at River Mile two of the Duwamish Waterway at the site of the former Seaboard Lumber Mill, which operated from around 1929 until the early 1980s. The site is in the vicinity of Kellogg Island and on the last remaining oxbow of the Duwamish River system. The site contains 5.7 acres of upland and 10 acres of tidelands. Historically, the upland site was a marsh/channel of the Duwamish River. Developed as an industrial site, the area was filled with waste-bearing fill material consisting of silt, sand, and gravel mixtures with broken asphalt, rock, concrete, brick, wood, and metal debris. Investigations revealed soils with concentrations of Total Petroleum Hydrocarbons (TPH), lead, mercury, and polycyclic aromatic hydrocarbons (PAHs) that exceeded Washington State Model Toxics Control Act cleanup criteria.

*Design Objectives*

- Restore intertidal habitat from areas that have been filled for use by juvenile salmonids.
- Create a protective low-energy environment with backwater pools to provide refuge and food sources.
- Establish areas of high intertidal salt marsh vegetation with a protective perimeter buffer of upland riparian vegetation.
- Remove and contain contaminated upland soils and industrial debris.
- Protect the site for natural resources in perpetuity.
- Provide opportunities for passive public access and environmental education.

*Restoration Activities*

In 1999, a protective outer berm was constructed, armoring and modifying the shoreline. The armor layer consists of 8 to 9 inches of quarry stone with voids filled with fish rock (fine/medium gravel and course sand to three-eighths of an inch). Parts of the berm serve to contain low-level industrial contaminants which has been monitored. Project construction was completed in 2000 and consisted of several primary activities:

- Structures associated with the mill operation were demolished; a 9,200 square foot shoreline dock structure was removed, including 248 creosoted wooden supporting piles, concrete foundations, areas of paving, and partially buried railroad spurs.
- Highly contaminated upland soil was removed.
- Low level TPH-contaminated soil was contained by covering with a minimum of two feet of clean soil with erosion control features to ensure containment.
- A 1.8-acre intertidal bay was excavated with a curvilinear edge to elevations between +6 to +12 feet MLLW, protected by two armored spits forming a mouth opening to the Duwamish River.
- On-site soil was amended with a mixture of silts and clays with a high organic content distributed to a depth of 18 inches over the basin.
- Slopes of the intertidal area were planted with emergent marsh plants at various elevations, and transitional scrub/shrub habitat between the intertidal marsh, upland meadow, and forested habitat.
- Intertidal habitat was monitored for a ten-year period.

## Turning Basin no. 3

This project is located on the former Kenco Marine Services property at the western upstream boundary of the maintained navigation channel (Turning Basin No. 3) where the Duwamish Waterway is formed from the Duwamish River. The upland portion of the site was composed of fill material and was covered with asphalt and concrete pads, in addition to an office/warehouse structure, small storage sheds, and a house. A commercial pier extended 125 feet into the Turning Basin. Barges and other vessels moored in the intertidal and subtidal area.

Other portions of the Turning Basin have been restored to natural wetlands by federal agencies, including NOAA, the U.S. Fish and Wildlife Service, and the Port of Seattle, under various programs. The Panel partially funded the purchase of additional land to increase estuarine habitat, to be held under the trusteeship of the Muckleshoot Tribe. Over one acre of mudflats were “daylighted” by the removal of derelict vessels at the site. The commercial pier and shoreside structures were removed and the area was recontoured and revegetated to provide an enhanced intertidal wetland area.

## Design Objectives

- "Daylight" intertidal and subtidal areas by removing vessels.
- Reduce pollution potential by curtailing commercial activity.
- Remove existing commercial upland and in-water structures.
- Recontour bank to create three intertidal and riparian habitat benches.
- Reestablish native intertidal and riparian vegetation.
- Increase food sources for trust resources.
- Protect the site in perpetuity for natural resources.

## Restoration Activities

- Vessels and commercial activities were removed from the pier.
- Former commercial structures, concrete foundations and paved areas were removed, including the dock structure and creosoted wooden supporting piles.
- The area was recontoured and planted to create an enhanced intertidal wetland area consisting of three habitat benches at various elevations:
    - A "lower bench" at +2 to +6 feet at a 10:1 slope of sand over 3/4 inch gravel substrate to create 6,500 square feet of habitat. Bank stabilization will be accomplished by using "soft" substrates (wood) in lieu of riprap at the transition to the emergent zone bench.
    - An "emergent zone bench" at +9.5 to +11 feet at 20:1 slope planted with native intertidal vegetation and random rock placement will create 6,050 square feet of habitat.
    - A "groundcover and shrub zone bench" at elevation +14 to +17 feet at a 3:1 slope planted with native riparian vegetation to create 1,850 square feet of habitat.
- Future moorage of barges and other vessels was prohibited at the site, allowing 18,000 square feet of intertidal and subtidal mudflats to become permanently exposed.
- Intertidal habitat was monitored for success over a ten-year period under the Elliott Bay/Duwamish Restoration Program's monitoring plan

## North Wind's Weir

The North Wind's Weir project is on a 3.1-acre parcel of King County's Cecil B. Moses Park on the free-flowing Duwamish River about a mile upstream of Turning Basin #3. The Elliott Bay/Duwamish Restoration Program purchased 1.03 acres of the park to construct an intertidal basin. The site was developed in the 1930s and 1940s for single-family residential housing. All dwellings were removed. A steep bank along the river right-of-way sloped downward (almost vertical) approximately 20 feet to the riverbed where the shoreline was poorly protected by riprap and debris in the lower intertidal to subtidal areas.

## Design Objectives

- Create an intertidal basin for use by juvenile salmon.
- Shoreline protection improvements.
- Provide native intertidal and riparian vegetation.
- Improve habitat for out-migrating salmonid acclimation to salt water at a critical location in the Duwamish River.
- Provide refuge and food sources for trust resources.
- Protect the site in perpetuity for natural resources.

## Restoration Activities

A 0.3-acre intertidal basin was constructed by excavating from an elevation of +6 to +15 feet MLLW. A curvilinear edge creates a more natural appearance and maximizes habitat diversity at the zone edge. The northeast end of the property connects to the Duwamish River via natural bank slopes stabilized with vegetation. Upland edges were revegetated with native trees and shrubs to form a riparian buffer designed to incorporate as many mature trees and native shrubs present on the site as possible and to restrict human access from the surrounding park. Monitoring for intertidal habitat success was conducted for a period of ten years under the Elliott Bay/Duwamish Restoration Program's restoration monitoring plan.