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MEMORANDUM

To:	Scott Steltzner, Squaxin Island Tribe	**Date:**	September 30, 2013
From:	Tracy Drury, John Small, Betsy Bermingham, and Jennifer Goldsmith, Anchor QEA	**Project:**	120122-01.02
Re:	Proposed Shelton Harbor Restoration Concepts		

INTRODUCTION

The Squaxin Island Tribe (Tribe) is interested in helping develop a shared vision for the future of Shelton Harbor located in Mason County, Washington. Shelton Harbor is the industrial waterfront area of the City of Shelton, Washington. Shelton Harbor is located at the mouth of Oakland Bay and at the end of Hammersley Inlet. Shelton Harbor was historically shallow with a broad intertidal delta complex that is exposed during low tides. Hammersley Inlet connects both Shelton Harbor and Oakland Bay to the greater Puget Sound. Because of the narrow and long configuration of Hammersley Inlet, the water in Oakland Bay and Shelton Harbor has high refluxing, low flushing, and high retention rates (Ecology 2004, referenced in Herrera 2010). The harbor shoreline contains several timber processing and mill facilities and the harbor itself has been used extensively for log storage and timber products shipping.

BACKGROUND INFORMATION

Over the course of the early to mid-20th century, industrial companies gradually filled and built upon the natural tidal flats and estuary area in Shelton Harbor. These new shorelines were armored, and large boat and barge loading and unloading facilities were constructed. Hundreds of wood piles were installed throughout the harbor for use for log storage. In the 1950s, the outlet of Goldsborough Creek protruded approximately 1,500 feet east from the edge of the developed industrial area, confined between a railroad ferry dock on the north (left) bank and a railroad spur on the south (right) bank. Sediment was regularly dredged from the harbor adjacent to the north railroad ferry dock to be used as fill. In approximately 1991, the ferry dock was removed by the U.S. Army Corps of Engineers (USACE). The south bank railroad spur remains in place.

After the railroad ferry dock (north) was removed, the creek quickly migrated (likely as an avulsion) to the north into the dredged area that had been behind the dock embankment, creating an abrupt grade drop from the channel into the dredged area. This resulted in a quickly propagating a headcut up the creek channel as the creek adjusted to its new base elevation, which resulted in channel incision in Lower Goldsborough Creek. The exposure of two buried pipelines and the undercutting of infrastructure is evidence of the downcutting of the channel bed over time.

Two tributaries flow into Shelton Harbor: Goldsborough Creek and Shelton Creek. Goldsborough Creek is a productive salmonid stream that supports coho, fall chum, and winter steelhead spawning, with fall Chinook listed as having a presence in the stream (WDFW 2013). Shelton Creek supports fall chum and winter steelhead spawning, with coho listed as having a presence in the stream (WDFW 2013).

Ecology Cleanup Efforts

Chemically affected sediments in Shelton Harbor and Oakland Bay have been identified as a priority for cleanup by the Washington State Department of Ecology (Ecology) as part of the Toxics Cleanup Program's Puget Sound Initiative (Herrera 2010). Ecology identified Oakland Bar for detailed sediment investigation related to source control, sediment cleanup, and restoration (Herrera 2010).

Habitat Restoration Goals

The cleanup of Shelton Harbor presents an opportunity to substantially improve habitat conditions at the mouths of Goldsborough and Shelton creeks. Habitat in estuaries has been identified as a limiting factor for salmon recovery (Kuttel 2002). Habitat restoration in estuaries and nearshore areas is a key component of Water Resources Inventory Area (WRIA) 14 and Puget Sound salmon recovery strategies (Shared Strategy 2007). The conceptual designs developed for this effort are not intended to recreate pre-development conditions. Instead, they were developed to compliment cleanup actions and work with existing industrial, shoreline-dependent development while significantly improving habitat. Specific goals for the restoration design are:

- Restore natural stream, coastal, and estuarine processes, most importantly sediment transport and tidal hydrology, to create a self-sustaining delta environment that contains a variety of habitats and that can adapt to anticipated changes in sediment load, tidal flux, and sea level.
- Promote the establishment and development of estuarine marsh vegetation, which provide prey to out-migrating salmon and other marine species.
- Provide juvenile salmon physiologic refuge during migration to allow for more successful adaptation to changes in salinity, temperature and other water quality parameters when migrating between freshwater and saltwater environments.

EXISTING CONDITIONS

On August 22, 2013, a site reconnaissance was conducted of the lower extent of the Goldsborough Creek, delta, and estuary area in support of developing habitat restoration concepts. During the site visit, the weather was sunny and dry. A -0.2-foot low tide occurred at 2:24 pm. During the reconnaissance, most of the delta at the mouth was above this exiting tide level. Current conditions of the restoration area were documented with digital photographs.

Upon entry to Shelton Harbor, the low-flow channel veers to the north away from the railway loading area along the south (riprap embankment). Sediment deposition is occurring in the form of large bars throughout the delta. A north-south channel is located along the base of the rock retaining wall that defines the eastern extent of the timber operations north of the mouth of Goldsborough Creek. This channel conveys outfall drainage (via culverts) from the timber mill during low tides and is inundated during high tides.

CONCEPTUAL RESTORATION DESIGN

The project proposes to develop areas of high marsh, low marsh, and limited riparian habitat throughout the harbor north of the existing Simpson Timber unloading facility and the Goldsborough Creek confluence. In addition to the restoration goals listed above, the marsh and riparian habitat creation will provide a native vegetation community that contributes organic matter and terrestrial origin insects to the aquatic system. These inputs provide insect prey items for juvenile salmon migrating and rearing along the shoreline, as well as

organic matter to support the lower trophic levels at the base of the food web (Brennan 2007; Brennan et al. 2009).

The habitat types proposed for all of the Project alternatives include intertidal mudflat, low and high marsh, and riparian. The elevation ranges (in mean lower low water [MLLW] datum) of these habitat types and typical plant species were preliminarily determined based on a reference site at John's Creek. Further design criteria details are discussed below.

Intertidal mudflat: Intertidal mudflat occurs within elevations between about +5 feet and +13.4 feet MLLW. Mudflats are characterized by unvegetated silt/clay to fine sand substrate and have a relatively flat grade of less than 2%. For all alternatives, a grade this flat was not possible to tie into the existing MLLW elevation; therefore, coarser sand and some pea gravel substrate may also be required. Channels in the intertidal mudflat would be created or formed naturally to convey the flow of streams and tidal waters on ebb tides.

Marsh: Marsh habitats include both low marsh between +13.4 feet and +14.5 feet MLLW and high marsh between +14.5 feet and +16 feet MLLW. Both low and high marsh habitats would experience regular tidal inundation and be vegetated with vascular plants. Slopes of these habitat areas should not exceed 20:1 or 5%. Tidal channels would exist in both areas, but would be wider, deeper, and denser in the low marsh. The high marsh would not necessarily be inundated daily by high tides.

A bioretention topsoil mix will be used for marsh habitat areas and consist of approximately 60% sand, 35% leaf compost, and a maximum of 5% clay with a slightly acidic to neutral pH of 5.5 to 7. To minimize erosion until vegetation is established within the high and low marsh areas, placement of coir fabric and coir logs are assumed in the concept design. Coir fabric consists of coconut fiber matting for use in areas subjected to inundation, currents, and waves. This fabric provides temporary erosion protection during vegetation establishment. It should be noted that extensive cuts in the coir fabric for plant installation will significantly reduce its effectiveness.

As the site is tidally influenced and saline, careful plant selection is necessary. Emergent and herbaceous perennials for the high marsh habitat areas may include tufted hairgrass

(*Deschampsia cespitosa*), Puget Sound gumweed (*Grindelia integrifolia*), Pacific silverweed (*Potentilla pacifica*), and potentially others. Low marsh species may include Lyngby sedge (*Carex lyngbyei*), pickleweed (*Salicornia virginica*), fleshy jaumea (*Jaumea camosa*), and potentially others. Further reference site research is recommended before finalizing the plant species list in the marsh areas. Ideally, plants used for restoration would be propagated from specimens in Oakland Bay and the elevations of existing vegetation compared to those at the restoration site to determine the proper planting location.

Riparian: Riparian habitats are located above elevation +16 feet MLLW and contain a mixture of native shrubs and trees. Topsoil for riparian habitat areas shall consist of 60% sand and 40% composted organic amendment with a pH range similar to the marsh topsoil mix. To minimize erosion of soil around plants that are not fully established, steeper sloped riparian areas, particularly along the west edge of the harbor, will use jute matting for temporary erosion control. The jute erosion control fabrics will be staked in to the soil and degrade naturally over time as the plant roots establish and take over this soil-holding function.

Within the lower riparian areas, at the west edge of the harbor, a mix of live stake species including Hooker, Pacific, and Sitka willow (*Salix hookeriana*, *S. ladiandra, and S. sitchensis*) would be appropriate. The higher riparian areas could include a greater mix of groundcover, shrub, and trees species. If the restoration plan could be phased, the Tribe may like to consider a staggered planting of deciduous and coniferous trees based on forest succession dynamics (early succession deciduous and some coniferous trees with a few species cut out a few years later to make room for late succession coniferous species). Early planting could include a mix of Sitka spruce (*Picea sitchensis*), shore pine (*Pinus contorta var. contorta*), quaking aspen (*Populus tremuloides*), and red alder (*Alnus rubra*). Later plantings could include coniferous species that prefer more shade, including western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Sitka spruce (*Picea sitchensis*).

ALTERNATIVES SUMMARY

The conceptual alternatives developed are shown in Figures 1 through 3. All of the alternatives include low and high marsh habitat within the harbor and riparian planting along the north edge of the harbor, along the railroad berm feature, and along the west side

of the harbor. All alternatives for this project assume that Alternative 2 (moderate-sized restoration concept) of the Lower Goldsborough Creek Confluence restoration project will be implemented, raising the Goldsborough Creek channel 3 feet above existing grades and making the Old Navy site (north harbor) available for upland restoration. The concept drawings also illustrate post-cleanup conditions through removing creosote piling and likely raising grades in many areas of the harbor.

The following is a summary of the conceptual alternatives:

- Alternative 1 (Figures 1 and 4) has approximately 25 acres of marsh habitat and 1.5 acres of riparian habitat. This alternative provides the maximum amount of new habitat while feasibly meeting existing grades at the MLLW elevation break (0 feet).
- Alternative 2 (Figures 2 and 5) has approximately 17 acres of marsh habitat and 1.5 acres of riparian habitat. This alternative has a moderate amount of marsh habitat and greater areas of mudflat.
- Alternative 3 (Figures 3 and 6) has approximately 17 acres of marsh habitat and 1.5 acres of riparian habitat. This alternative has a slightly different marsh configuration, which allows for a shallow brackish pool that can provide a larger refugia area for juvenile salmon.

REFERENCES

Brennan, J.S., 2007. Marine Riparian Vegetation Communities of Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-02. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at: www.pugetsoundnearshore.org.

Brennan, J., H. Culverwell, R. Gregg, and P. Granger, 2009. Protection of marine riparian functions in Puget Sound, Washington. Washington Sea Grant. Prepared for Washington Department of Fish and Wildlife.

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Kuttel, M., 2002. Salmonid Habitat Limiting Factors Water Resource Inventory Areas 14, Kennedy – Goldsborough Basin. Washington State Conservation Commission. November 2002.

Shared Strategy (Shared Strategy Development Committee), 2007. Puget Sound salmon recovery plan. Adopted by the National Marine Fisheries Service January, 19, 2007.

WDFW (Washington State Department of Fish and Wildlife), 2013. SalmonScape. Available at: http://fortress.wa.gov/dfw/gispublic/apps/salmonscape/default.htm. Accessed on: September 24, 2013.

FIGURES

Existing Conditions

Restoration Proposal

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Figure 1
Alternative 1
Shelton Harbor Nearshore Restoration
Squaxin Tribe

Existing Conditions

Restoration Proposal

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Figure 2
Alternative 2: Moderate Restoration
Shelton Harbor Nearshore Restoration
Squaxin Tribe

Existing Conditions

Restoration Proposal

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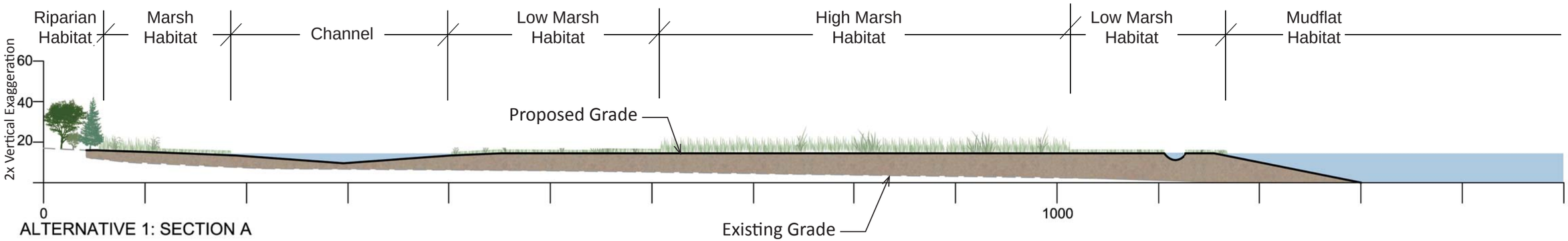
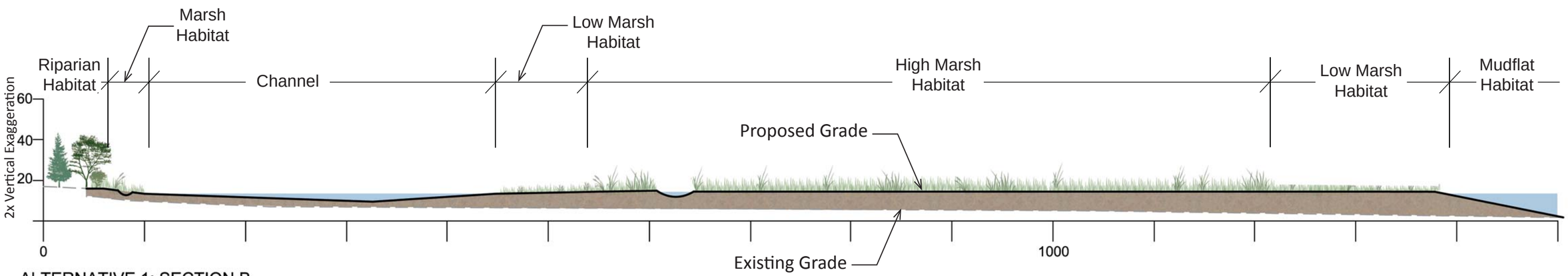
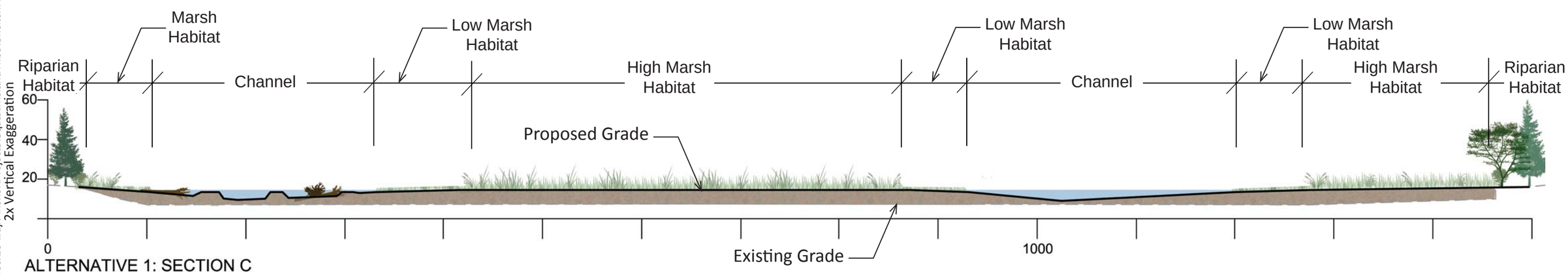
Figure 3
Alternative 3
Shelton Harbor Nearshore Restoration
Squaxin Tribe



ALTERNATIVE 1: SECTION A



ALTERNATIVE 1: SECTION B



ALTERNATIVE 1: SECTION C

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Figure 4
Alternative 1: Sections
Shelton Harbor Nearshore Restoration
Squaxin Tribe

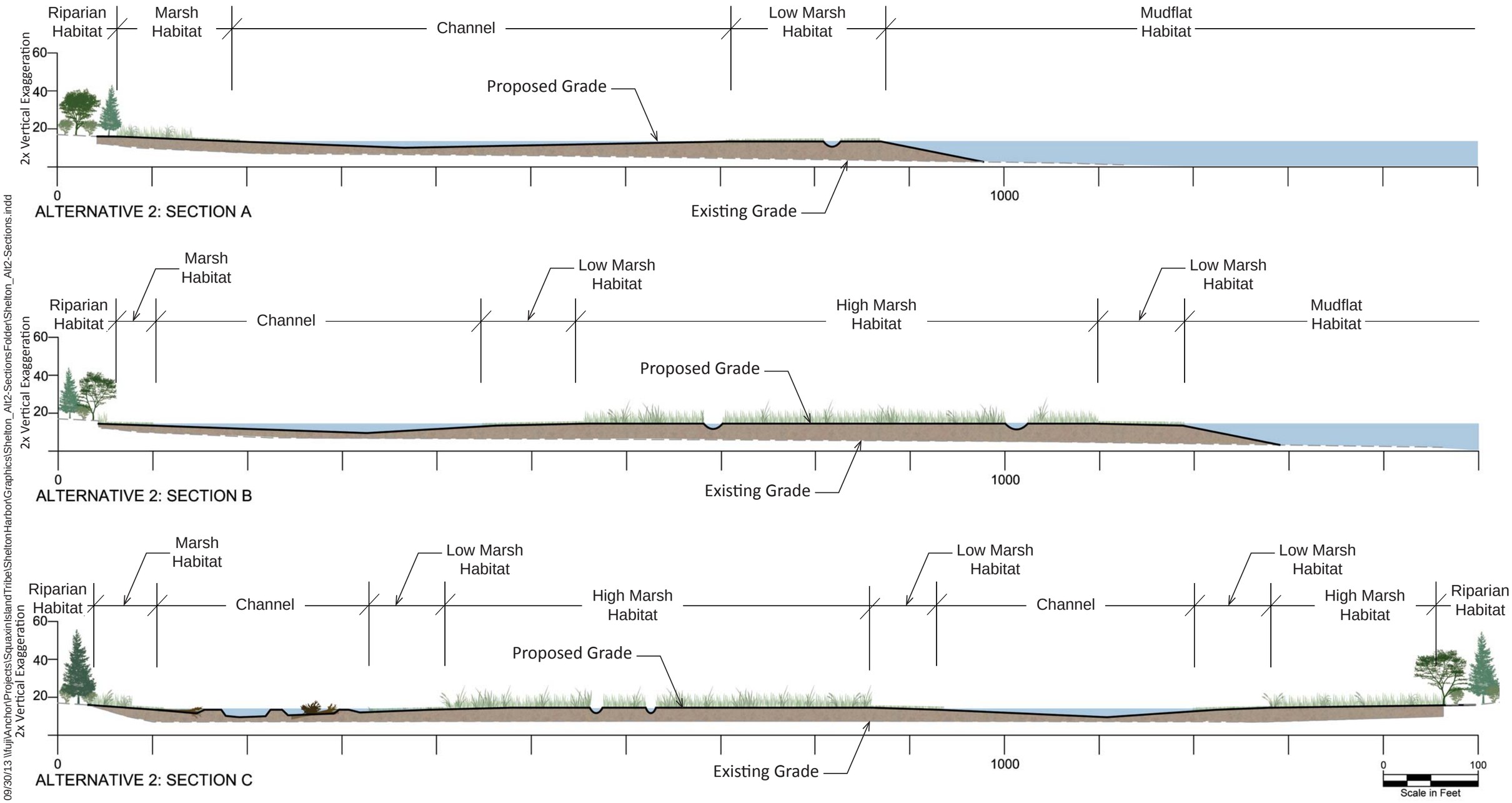

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Figure 5
Alternative 2: Sections
Shelton Harbor Nearshore Restoration
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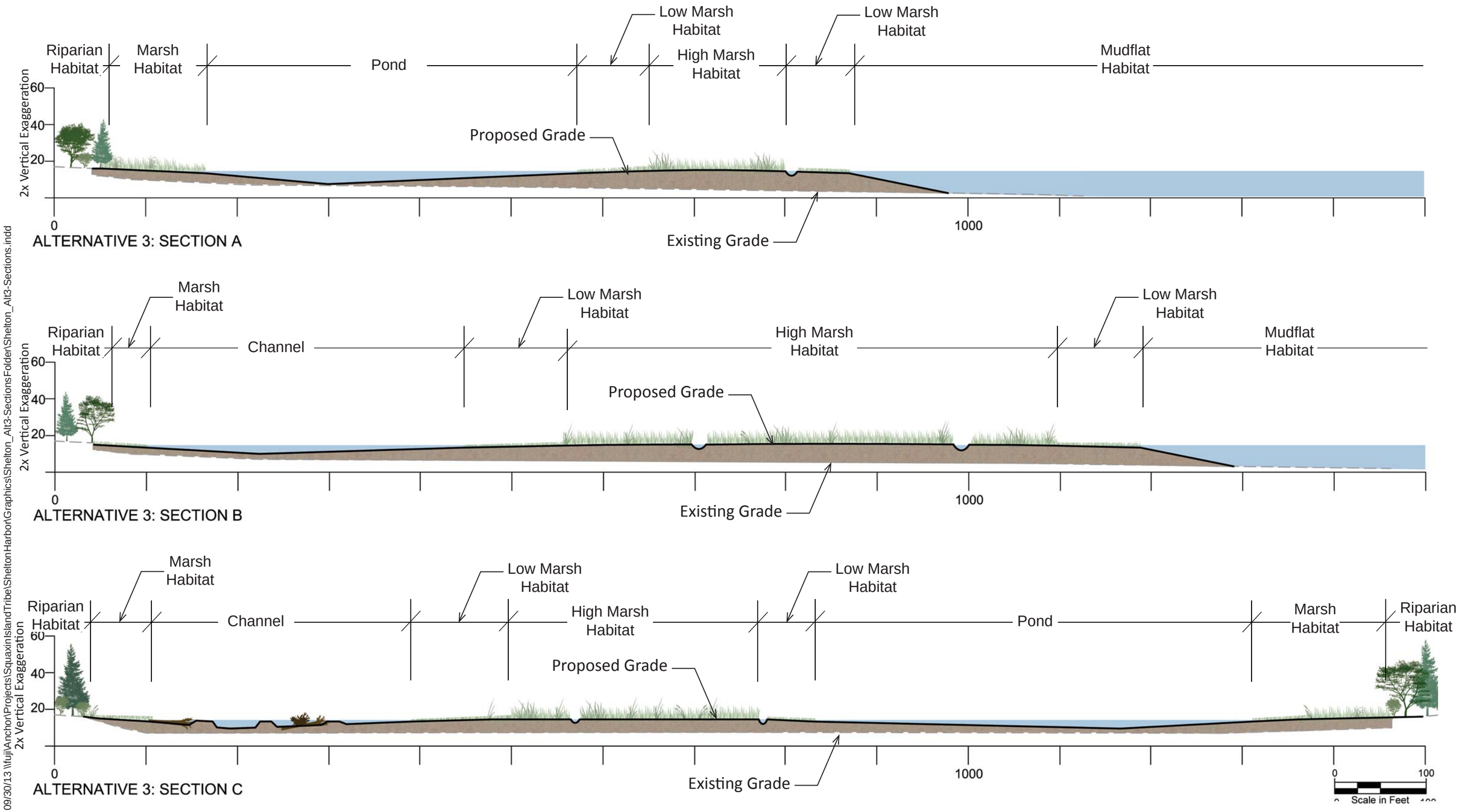

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Figure 6
Alternative 3: Sections
Shelton Harbor Nearshore Restoration
Squaxin Tribe