SHORELINE PROTECTION ALTERNATIVES GUIDANCE IN LAKE WASHINGTON

Introduction

The shoreline protection alternatives guidance (SPAG) is designed to streamline the federal permit process to replace existing rip rap and concrete bulkhead projects in Lake Washington. The SPAG also provides for a more environmentally appropriate erosion control method and enables direct beach and water access for land owners. In many situations the erosion control methods described in the SPAG may be more cost effective than traditional rip rap bulkhead replacements.

The applicant will fulfill the United States Army Corps of Engineers (COE) permit requirements under the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA) for bulkhead replacement or repair by meeting the design elements in this SPAG. Issuance of a federal permit in Lake Washington includes consultation with the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) for Puget Sound Chinook (*Oncorhynchus tshawytscha*) and its critical habitat, Puget Sound Steelhead (*O. mykiss*), and Bull Trout (*Salvelinus confluentus*) and its critical habitat. Proposed actions that comply with SPAG and only involve bulkhead replacement will not require additional minimization measures for aquatic species under the ESA, Magnuson Stevens Act (MSA), RHA or CWA.

The three alternative methods for bulkhead replacement described below in this document will fulfill the federal permit process including consultation with NMFS and United States Fish and Wildlife Service (USFWS). All projects that meet the elements of this programmatic will receive a letter and a Nationwide Permit (s) from the COE. If bulkhead replacement projects do not meet this guidance then individual ESA consultation with the COE and the services will be necessary. For projects that involve both pier and bulkhead replacement or remodels, the use of both the SPAG and Regional General Permit (RGP) #3 is encouraged for expedited permitting and for more environmentally functional projects.

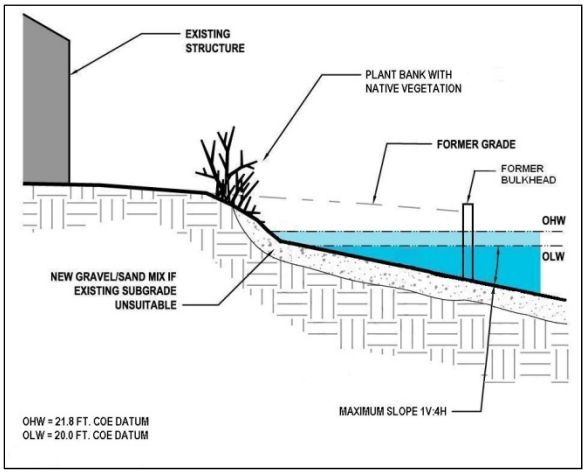
Erosion control methods that use ecological principles and techniques to achieve stabilization of the shoreline while enhancing habitat, improving aesthetics and reducing costs should be considered first before any other bank protection method. Where appropriate, rounded gravel, vegetation, wood and other natural materials should be used to protect shorelines and maintain shallow water and shallow gradients to re-establish the integrity of the shoreline. The range of gravel gradation is determined based on site specific conditions such as exposure, wave fetch and slope. Larger gravel is more resistant to higher wave action and will remain more stable on a steeper slope than smaller sized gravel. Because the functional effectiveness of gravel fill increases (and the cost of gravel decreases) as the extent of coverage increases, multiple lot projects are encouraged.

Gravel fill acts like other shore protection structures to prevent erosion of the backshore. At the same time gravel fill provides a shallow slope and substrate that is better for native juvenile salmonids by creating shallow water conditions. A shallow gravel beach is also a safe way for humans to access the water. Depending on site conditions, coarse sand may be retained on the beach, too. We recommend adding gravel fill to attain the shallowest grade possible at the site. We also recommend the addition of beach wood and native plants along the shoreline.

The City of Seattle Park Department has added gravel fill to the shorelines of two public beaches in Lake Washington, Seward Park and Magnuson Park, to improve habitat conditions along the shoreline, to protect the shoreline from erosion, and for the greater enjoyment of the public.

Seward Park Beach (north facing beach) Magnuson Park Beach (southeast facing beach)

Cut Beach, Place Gravel Fill and Re-vegetate



Remove existing rip rap or concrete bulkhead and cut into the existing bank across the maximum width of the property to attain a shallow shoreline grade and further reduce the effects of scouring wave action. Plant native riparian vegetation ten feet deep across at least 50% of the width of the shoreline. Plant emergents in areas where wave action is suitable for growth. Place gravel beach fill grading slope to range of 1Vertical (V):4 Horizontal (H) or less steep. The design target for the slope is 1V:7H. More than 2 cubic yards of gravel fill per lineal foot at or below the 21.85 foot elevation will need additional review and consent by COE. Typically, gravel size should range from 1/8 inch to 2 inches. Add emergent plants in areas where wave action is suitable for growth. For higher energy areas shoreline logs may be partially buried within the new substrate at the water's edge. The area behind the logs will be planted with willows and/or emergent vegetation. Section F gives the COE web site for work windows at various locations around the lake. Best management practices including installation of silt fences for water quality control must be used. This method may be most appropriate for shallow-sloped shorelines with lawns. Site specific engineering may be needed depending on location and scale of project.

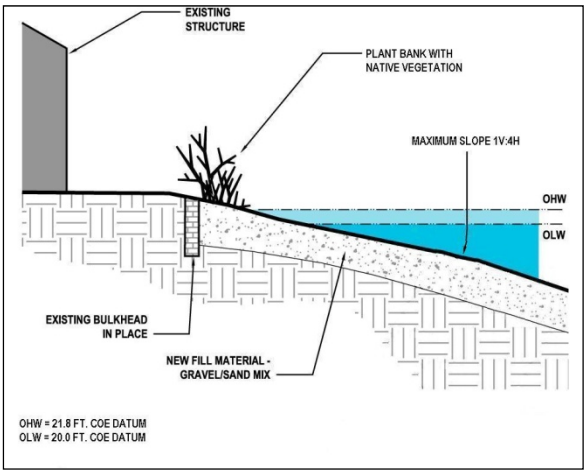
Below is an example of a residential shoreline on Lake Washington that formerly had a bulkhead at the water line across the front of the property. The owners removed the bulkhead, cut back the grass and built a gradual-sloped beach with small sized substrate placed several feet above the 21.85 foot elevation (ordinary high water (OHW)) to absorb wave action. The beach extends across the width of the property and includes emergent and riparian shoreline vegetation.

Shallow-sloped upland site on Lake Washington

Below is an example of a residential shoreline on Lake Washington that formerly had a bulkhead lower than 21.85 feet elevation (OHW) across the front of the property. The owners removed the bulkhead, cut back the grass and built a gradual-sloped beach with small sized substrate that extends above the 21.85 foot elevation (OHW) several feet to absorb wave action. The beach extends across the width of the property. The rockery functions as a retaining wall to allow a shallow- sloped beach at a steep-sloped site.

Steeper-sloped upland site on Lake Washington

Gravel Fill Beach and Re-vegetate



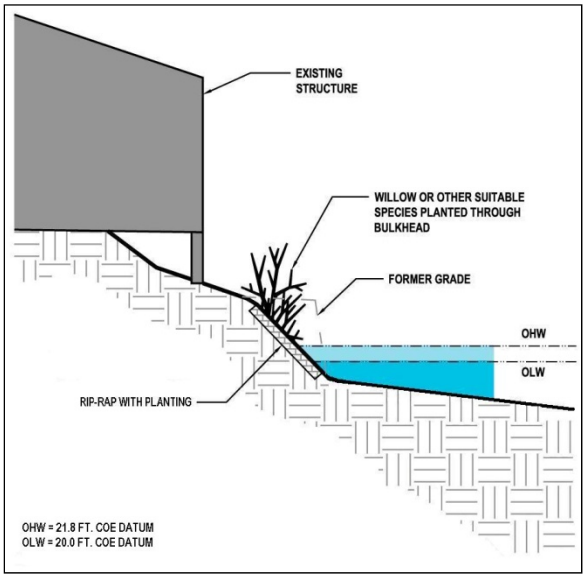
Where option #1 cannot be done, because of site conditions, place gravel beach fill in front of existing bulkhead (covering the rip rap) or remove rip rap across the maximum width of the property and replace with gravel beach fill. Plant native riparian vegetation ten feet deep across more than 50% of the width of the shoreline. Place gravel beach fill grading slope to range of 1V:4H or flatter. Design target for the slope is 1V:7H. Typically gravel size should range from 1/8 inch to 2 inches. More than 2 cubic yards of gravel fill per lineal foot at or below the 21.85 foot elevation will need additional review by COE. Add emergent plants in areas where wave action is suitable for growth. For higher energy areas shoreline logs may be partially buried within the new substrate at the water's edge. The area behind the logs will be planted with willows and/or emergent vegetation. Section F gives the COE web site for work windows at various locations around the lake. Best management practices including installation of silt fences for water quality control must be used. This method may be suited for those properties with a structure close to the shoreline and/or on a steep-sloped shoreline. Site specific engineering may be needed depending on location and scale of project.

A site where this technique has been used is the former seawall at Lincoln Park in west Seattle. Gravel fill was placed seaward of the wall to form a beach and protect a sewer main during the 1980s. Minimal gravel replenishment has been necessary over the past twenty years. See Appendix 1 for more details.

Photo courtesy of COE
Lincoln Park before construction

Photo courtesy of COE
Lincoln Park after construction

Re-vegetated Armored Banks (only for bulkheads within 25 feet of residence)



Where existing rip rap cannot be removed because of very close proximity to an existing residential or commercial structure (25 feet or less from 21.85 foot elevation), vegetation can be added to restore some functions. Willow stakes must be planted into replacement rip rap (or other material) with soil amendment or provide design with similar functional vegetation benefit in front of bulkhead. Gravel beach fill may be added in front of the bulkhead to provide some shallow water. More than 2 cubic yards of gravel fill per lineal foot at or below the 21.85 foot elevation will need additional review by COE. Section F gives the COE web site for work windows at various locations around the lake. Overhanging riparian plantings must be added along the entire length of the rip rap bulkhead. Best management practices including installation of silt fences for water quality control must be used. Limited use of this shoreline treatment may only be allowed by COE depending on site specific constraints making alternatives #1 or #2 impossible.