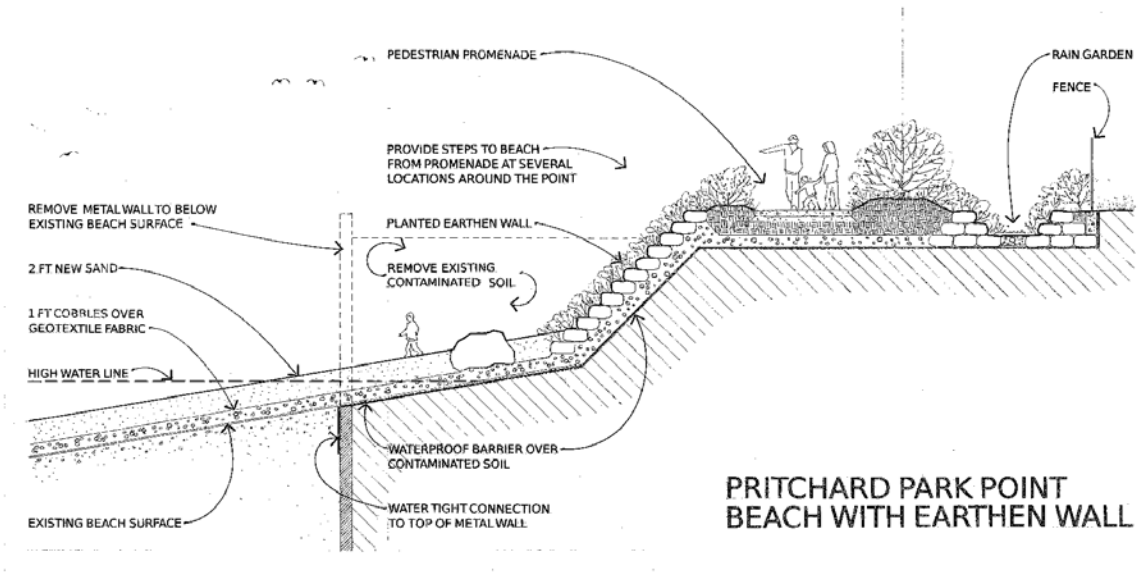
Appendix G: Point Shoreline Restoration: Preliminary Feasibility Assessment

Prepared by: Jim Brennan, Marine Habitat Specialist, Washington Sea Grant
University of Washington, October 2007

Background

This report was prepared in response to a request from Barbara Trafton, Pritchard Park Advisory Committee, and Lauren Perry, Bainbridge Metro Park and Recreation District. The Pritchard Park Advisory Committee and Bainbridge Parks are in the process of compiling a design report for Bainbridge Parks and the City of Bainbridge Island, which will consider design options for future use of Pritchard Park and Bill Point, the site of the Wyckoff creosote plant, a superfund cleanup site. There is a long history of contamination and cleanup efforts at this site, which will need to be considered in any efforts to make this site accessible to the public. The purpose of this report is to provide a simple, yet cursory evaluation of a design option **(See Attachment A, below)** that was presented for review and comment. The design and my review comments are conceptual, and are intended for discussion purposed only. A substantial amount of additional work will need to be done to properly evaluate the feasibility of options for this site due to the constraints imposed by the contaminated nature of this site, the various natural processes that influence the feasibility of various options (e.g., tides, wave energy, sediment transport, precipitation, drainage), and the long-term interests and authorities of various stakeholders.

ATTACHMENT A,
Draft design by Lauren Perry, Bainbridge Metro Park and Recreation District



Review of Conceptual Design

Current Conditions – Can Anything Be Done to Rectify the Habitat Loss Problem?

Historically, Bill Point, the southern point of land at the mouth of Eagle Harbor, was a natural spit formation, which resulted from sediments being driven along the shore from the south and settling out to create a point of land and a broad tidal flat (i.e., a depositional area). The historic human use of this point resulted in substantial fill and armoring to contain the fill. Presently, the existing sheet pile wall contains both fill and contaminants at this site. As a result, there is a loss of natural shallow water and backshore habitat, and a disruption of natural processes that would allow for the development and maintenance of habitat structure and ecological functions.

Conceptually, the ability to restore some of the structure and functions at this site is likely possible, although there are a number of serious constraints that must be overcome to make this happen. In addition, due to the highly developed nature of the entire drift cell (i.e., residential development/armoring along Rockaway Beach), true restoration (i.e., reestablishment of geological processes - sediment inputs, transport, deposition) will not be possible and will require artificial inputs of sediments to recreate/enhance habitat structure.

Design Options – Identification of Goals and Objectives

When considering design options for a restoration or enhancement project, the goals and objectives need to be clearly stated. The opportunities and constraints also need to be weighed in the decision-making process. Generally, there are usually social, ecological, and economic considerations. Moral and ethical considerations may also be considered, such as a responsibility to clean up a contaminated site for current and future generations.

Although the goals and objectives for this project were not included as a part of the request for review of the conceptual design, it is assumed that they include both ecological and social considerations. For example, it is assumed that partial removal of the sheet pile wall and beach recreation would provide ecological benefits, such as juvenile salmon migration, feeding, and refuge habitat, forage fish spawning habitat, wildlife habitat, public access, and aesthetic improvements. It will be critically important to have clear goals and objectives and a rationale for design options, including constraints, when presenting this information to stakeholders and for developing a final design.

Design Elements – What looks feasible?

In general, the conceptual design provided for review contains most of the elements that would make such a project feasible, at least in concept and with limited consideration of the many factors that need to be incorporated for further consideration. For example, tidal elevation, potential wave energy, and the ability to provide an impermeable membrane that would prevent further seepage of contaminants through the recreated beach and bank need to be evaluated. However, since this is clearly a concept for discussion, it is a good first step. Wall removal, beach and backshore recreation, beach nourishment, reestablishing shoreline vegetation and the use of alternative methods for bank stability (other than conventional armoring) are all methods that have been used in

the Puget Sound region and elsewhere for restoring shorelines. These methods have also been used at heavily contaminated sites to contain contaminants and provide natural elements in the design.

In the last decade, a substantial amount of effort has focused on creating alternatives to conventional shoreline armoring due to the adverse impacts associated with shoreline fill and armoring. Examples of these alternatives are now fairly common; a number of them exist on Bainbridge Island and can be found throughout the region (see Zelo et al. 2000; and other examples found at Coastal Geologic Services web site http://www.coastalgeo.com/). While most "soft shore protection" projects occur at single family residential properties, many have been done at contaminated sites. The old Navy Dump at Manchester, Floral Point at Naval Base Bangor, and Naval Ordinance Center on Indian Island are three examples. Descriptions of these projects can be found in Zelo et al. 2000 and on the USEPA web site. Therefore, I believe that we have the knowledge, technology, and creativity available to make such a project work, but it will depend on the level of commitment and money available to make the project work at this site. However, there may be some constraints that would reduce the feasibility of recreating a beach and backshore, or result in too much risk to human health or the integrity of the project at this site. These unknowns will likely surface as this analysis moves forward and receives additional review and discussion with the stakeholders and by those qualified to make such assessments.

Regarding the conceptual design that was submitted for review, it is difficult to say "will work" or "won't work" to various parts of the design because there is no scale provided. Tidal elevation is also a critical element needed for considering tidal inundation (at normal and extraordinary tidal/storm events). Beach and bank materials are also critical. The conceptual design specifies 2 feet of new sand. I would not recommend a uniform beach material, but rather a mix of sand and gravel, with size determined by the slope of the beach and wave energy that will act on those sediments. Biological considerations are also important. For example, if one of the goals is to provide spawning habitat for surf smelt and sand lance (beach spawning forage fishes), the beach material specified should be in the range of grain sizes suitable for forage fish spawning. I would not recommend the specified geotextile fabric as underlayment on the beach. This material would likely serve no purpose and would interfere with the natural colonization and survival of benthic infauna (e.g., clams, worms, etc). It is also possible that it may reduce the stability of the sediments and/or become mobile and end up as litter on the beach. The "waterproof barrier" over the contaminated sediments will be a critical element for the success of the project for containing contaminants. I do not know enough about potential impermeable materials that are available, but think that something similar to the materials that are used for liners at toxic waste sites might be suitable, if it can be sealed to the wall.

The location, height, and slope of the bank will also be very important considerations in future designs. The conceptual design suggests that a normal high tide would not touch the bank, but may during a storm. This is a very important consideration. Beach slope and material are important for dissipating wave energy and the bank should be

constructed to account for some sea level rise and wave interaction. Incorporating large wood, vegetation, geotextile lifts, and having the appropriate slope and materials composition to be resistant to erosion will be important. In addition, providing an adequate buffer at the top of bank and providing designated pathways to the beach will help maintain the integrity of the bank. In other words, there should be certain "rules" for recreation/access on this beach, similar to other ecologically sensitive areas such as Dungeness Spit.

The incorporation of vegetation and large woody debris will be important habitat components to the beach, bank, and backshore of the project. These elements will also add to the structural integrity of the restoration project. Wood may be positioned at angles to the shoreline to help with the deposition and retention of sediments. Anchoring logs may be necessary to assure their long-term stability, but the use of large wood with root wads attached may eliminate the need to anchor logs. Root structure will be important for the structural integrity of the bank and backshore, so I would recommend plants that are both adapted to a beach/backshore environment and that provide good root structure. Trees should also be considered in the design to increase wildlife habitat and for long-term development of root structure. I would also recommend looking into the possibility of using vegetation for phytoremediation (plants that take up/break down contaminants). The Naval Undersea Station in Keyport used plants for this purpose in a restoration project.

A large volume of soil will need to be removed to recreate the appropriate beach slope and area. The contaminated soils may be "treated" (e.g., "cooked" to remove contaminants), then reused in the landscaping on the upland portion of the park. I am only aware that such technology exists, so the possibility of treating and reusing the soils remains a question. The use of rain gardens and other low impact development techniques, such as pervious pavers or sand/gravel trails, bioswales, etc., should be incorporated in the design and could serve as an educational opportunity for visitors to the park. Signage will also be an important element.

Design Elements – Additional Considerations

In addition to the comments above, some consideration may be given to cutting the sheet pile wall slightly higher than depicted in the conceptual drawing; leaving a sill that either matches post-construction beach grade, or is slightly higher than post-construction grade (i.e., after the beach sediments are added). This would help retain some of the beach sediments and might help assure retention of contaminants. It may also serve as an anchor for logs to be installed, but may be located too far waterward. Some thought needs to go into this option because there would also be the risk of having an exposed structure that could be a hazard to beach walkers.

One element of a beach restoration design that is not included in the conceptual drawing is the incorporation of a beach berm. If the elevations are appropriate, the creation of a berm could help reduce the steepness of the bank and serve to protect the bank. It could also serve as a sediment source for the beach in the event of a severe storm. The berm would be composed of large wood, sand/gravel mix, and vegetation. Berms are a natural

part of most beaches, especially in depositional areas, and would structural, ecological, and aesthetic benefits. The berm location would be at an elevation where only the highest tides and storm events would interact with it.

Given that there are a number of considerations and constraints for developing a restoration design at this site, future planning must consider some important limitations as far in advance as possible. Some of these limitations include the following:

- cannot disturb contaminated areas outside of project area
- must preserve integrity of cap and create an impermeable barrier to prevent further seepage of creosote
- must preserve the structural integrity of the beach, bank, and berm
- project may require addition of sediments and other maintenance over time to assure success
- must be able to acquire federal, state, and local permits
- must include a monitoring program to assure integrity (and should monitor to illustrate achievement of restoration goals, which could include both social and ecological)

It is also very important to include the various stakeholders in design discussions. At a minimum, the project team needs to make sure that all stakeholders are a part of the process. At a minimum, the following agencies should be consulted and be made part of the decision-making process for any design: USEPA, WDFW, WDOE, Suquamish Tribe, City of Bainbridge Island Planning Department.

NOTE: This report is not intended to be a complete analysis, or set of recommendations for design options or potential alternatives, which will require more in depth analysis of site conditions and constraints and the input of many other stakeholders. For further elaboration on these conceptual plans, please contact the author of this report: Jim Brennan jbren@u.washington.edu