AGENDA
BAINBRIDGE ISLAND ROAD END ADVISORY COMMITTEE
SPECIAL MEETING

MONDAY, SEPTEMBER 22, 2014
CITY HALL 4PM

Order: 4pm

1. Report of consultants regarding details of the three existing plans to restore Fletcher Road #30, to a natural beach.

2. No other items of business.

Adjourn: 5:30

City of Bainbridge Island

Fletcher Landing Proposed Road End Improvements Assessment

Prepared by:

AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104

Project Number:

60329035

Date:

September, 2014

AECOM Signatures

Report Prepared By:				
		William Gerken Project Manager		

Prepared by:

AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104

Project Number:

60329035

Date:

September, 2014

Table of Contents

page

List of Figures

List of Tables

1.0 Introduction and Purpose

The City of Bainbridge Island 2014 Road Ends Work Plan identified the Fletcher Landing Road End for improvement. The Department of Planning and Community Development held a series of public meetings to gather public input for the redevelopment process. These public meetings resulted in development of the primary issues the public would like to see addressed and three conceptual improvement options. The purpose of this report is to provide basic assessment of the three proposed design options. The assessment takes into account technical and engineering considerations, permitting requirements, and identified feasibility issues related to permitting, design and implementation of the alternatives. Review included known points of concern such as seawall removal, beach stability, stormwater, impact to adjacent property owners, and concept level cost. Review is based primarily on documentation of the three developed alternatives and a site visit conducted on July 30, 2014. This basic assessment indicates that a road end improvement project could be designed that would result in no anticipated negative impact to adjacent shorelines.

2.0 Project Site Description and Geomorphology

The project site is located on the western shore of Bainbridge Island approximately 300 feet south of the entrance to Fletcher Bay (Figure 1). The area is relatively protected from wave action by the Kitsap Peninsula to the north, west, and south.

Figure 1. Overview of Bainbridge Island (left panel) with the project site shown in white on the western shore. View of the project site (right panel) immediately south of the entrance to Fletcher Bay.

The beach fronting the project site consists of a relatively steep beach composed of a surface layer of primarily small to large gravel with underlying material grading from coarse sand to large gravel (Figure 2). In the upper beach area the surface materials average size/gradation decreases with elevation to coarse sand. This is typical of a naturally sorted, naturally armored steeper gradient beach profile. The backshore, in pockets where observable, consists of sands with areas of vegetation and is generally somewhat flatter. Most of the adjacent shoreline is developed with private residences. Much of the upper shoreline/backshore adjacent to the site is armored with sections of stone rockery/rip-rap and timber bulkheads of various size and quality. Based on observations made during the site visit (additional information provided latter in this section), littoral drift at the site (i.e., wave-induced sand transport) is small, directed to the north, and is evidenced by the small sand spit extending north at the entrance to Fletcher Bay.

The proposed construction area consists of a relatively level paved road with a right-of-way that terminates in a concrete bulkhead 40 feet long and approximately 5 feet in height (Figure 3). The bulkhead is in poor condition, fractured in five places and tilting seaward; with previous repairs in place to stop the spread of three fractures. High water mark on the bulkhead and adjacent timber bulkhead indicates that the highest tides/water levels inundate nearly 2 feet of the bulkhead. Mean higher high water (MHHW) is approximately 11.8 feet Mean Lower Low Water (MLLW) (Table 1) which suggests that the toe is at about 10 feet MLLW. This corresponds to the approximate toe elevations on conceptual design drawings for the site.

Figure 2. Photo of the project site looking north. The water is on the left and the seawall on the right. The top layer of the beach generally consists of very coarse to coarse gravel.

Figure 3. Visible high water line indicates highest tides/water levels approximately two feet above toe of wall.

Review of aerial photographs and observations made during a site visit indicate that the beach and backshore are likely stable and experience little net erosion. Significant storm/wave events may cause some modification to the beach profile. Aside from various coastal protection structures that might indicate erosion issues, there are no distinct erosion pockets, scarps, beach cusps, or other beach markings to indicate significant shoreline retreat. Where littoral drift is strong and induces erosion, areas in lee of each structure can be depleted of sediment. This does not appear to be the case at this site. Vegetation, including grasses, looks undisturbed which also indicates that backshore overtopping is not a significant issue. The area is relatively protected and not exposed to significant swell or waves. All this indicates that shoreline erosion at the project site is most likely small.

The upland portion of the project site consists of a level paved road with a right-of-way to the concrete bulkhead (Figure 4Figure 4.). The City of Bainbridge Island right–of-way is 40 feet wide with a private property owner fence on either side on the property line. The 20± foot wide road terminates at four concrete bollards approximately 85 feet from the concrete bulkhead, from that point the remains of an asphalt path extend approximately 75 feet to three more concrete bollards. Beach access is via a narrow steep path between the south end of the concrete bulkhead and the adjacent timber bulkhead/fence. The south edge of the project site has a row of mid-size fir trees extending from the approximate road edge to close to the beach access path.

Figure 4. Project site looking west towards bulkhead.

Storm water is conveyed across the majority of the site through an open vegetated ditch along the south side of the property which discharges through broken 4 inch polyvinyl chloride (PVC) pipe at the top of the beach access path (Figure 5.), where system transitions from open ditch to PVC pipe could not be determined due to heavy vegetation. It is unknown how large of an area is drained and discharged at this location.

Two power poles and a telephone riser box are located within the potential project area, these will remain unchanged. Other utilities have not been noted but research and locates should be performed to verify absence of utilities in project impact area.

As-built drawings for the bulk head were not available so its buried configuration, original shoreline contours, and nature of backfill material are unknown.

Figure 5. Broken stormwater outfall.

3.0 Water Levels

TIDES

Tidal datum is critical in establishing design water levels for coastal structures. Current tidal datum for the NOAA tide station located at Brownsville, Washington (Station #9445832) are listed in Table 1. This station is located approximately 4 miles northwest of the project site. As indicated previously, the existing base of the seawall appears to be near 10 feet MLLW.

Table 1. Tidal Datum for NOAA Tide Station #9445832 at Brownsville, Washington.

Reference Plane	Elevation in feet (MLLW Datum)
Mean Higher High Water (MHHW)	11.8
Mean High Water (MHW)	11.0
Mean Sea Level (MSL)	6.9
Mean Low Water (MLW)	2.9
Mean Lower Low Water (MLLW)	0.0

Source: http://tidesandcurrents.noaa.gov/benchmarks/

SEA LEVEL RISE

Future Sea Level Rise (SLR) is an important factor to consider when designing and constructing any coastal infrastructure. The proposed designs may be adequate for current water levels but may not be adequate for future SLR scenarios. The National Research Council (NRC 2012) has published projected SLR scenarios for the Seattle area for the years 2030, 2050, and 2100 (Table 2). The projections indicate that the water levels are expected to increase by 0.2, 0.5, and 2.0 feet for 2030, 2050, and 2100 respectively. Although these increases may not seem significantly large, they may be expected to induce shoreline retreat. It is critical to consider the expected lifetime of the project when factoring in the importance of SLR. For example, a structure designed to last until 2100, when 2.0 feet of SLR is expected, may require designs to higher elevation or may require maintenance and retrofits at regular intervals. For the Fletcher Landing Road End Improvements project, long term sea level rise should be taken into account for design of material sizing and gradation, rockery design and slope stability, and potential wave run-up, and overtopping of shoreline rockery protection.

Table 2. NRC (2012) Projections of Sea Level Rise for the Seattle, Washington Region

Year	Projected SLR (feet)	SLR Range (feet)
2030	0.2	-0.1 – 0.7
2050	0.5	-0.1 – 1.6
2100	2.0	0.3 – 4.7

NOTES: “Projected SLR” refers to the current NRC projection for each year. “SLR Range” refers to the range of predicted SLR scenarios for several global scenarios. Please refer to NRC (2012) for more details.

4.0 Wind and Wave Conditions

As no documented detailed wave conditions for this project site were available, preliminary wave conditions were estimated following the guidance in the US Army Corps of Engineers (USACE) Shore Protection Manual (SPM) (USACE 1984). Due to the island configuration and site location, winds can only generate relevant waves from the northwest thru west to southwest directions. To evaluate the site alternatives, two extreme scenarios of wind-generated waves were considered. The first scenario considers the longest applicable wind fetch which extends approximately 5.8 miles to the southwest from the site. This fetch is relatively long, which facilitates greater wave generation, but it is oblique to the site, which inhibits actual wave impacts to the site. The second scenario considers a wind fetch which extends approximately 1.7 miles to the northwest from the site. This fetch is shorter but is more perpendicular to the site. Extreme extrapolated wind conditions for the area indicate an approximate 50 mph design wind lasting for 1 hour. Following the USACE (1984) procedure, the calculated deep water significant wave height and period for the southwest fetch are approximately 5.2 feet and 4.1 seconds (Table 3). Due to the orientation of the site shoreline relative to the deep water wave direction, this wave height will be significantly reduced due to wave refraction and shoaling prior to impacting the beach in front of the site. The actual depth limited breaking wave height that impacts the site is approximately 1.7 feet. The calculated deep water significant wave height and period for the northwest fetch are approximately 2.8 feet and 2.8 seconds (Table 3). Due to the relatively small angle between the site shoreline and the deep water wave direction, this wave height is not as significantly reduced due to wave refraction and shoaling prior to impacting the beach at the site. The depth limited breaking wave height that impacts the site from the northwest fetch is approximately 2.3 feet. Even with an extreme wind event, the resulting wave heights that would impact the site during higher tide levels are relatively small and not expected to pose significant design issues for the proposed project, which is at or above the upper intertidal zone.

Table 3. Wind and Wind-Generated Wave Conditions for the Project Site

Southwest Fetch	
Wind	
Wind Speed	50 mph
Wind Duration	1 hour
Wind Fetch Length	5.8 miles
Waves	
Deep Water Wave Height	5.2 feet
Wave Period	4.1 seconds
Depth Limited Breaking Wave Height	1.7 feet
Wave Runup	0.9 feet
Northwest Fetch	
Wind	
Wind Speed	50 mph
Wind Duration	1 hour
Wind Fetch Length	1.7 miles
Waves	
Deep Water Wave Height	2.8 feet
Wave Period	2.8 seconds
Depth Limited Breaking Wave Height	2.3 feet
Wave Runup	0.4 feet

Wave runup on the beach was also estimated using the wave conditions, an observed beach slope of 1:12 (V:H), and the Stockdon et al. (2006) empirical equation for wave runup (Table 3). The estimated wave runup heights of 0.9 feet and 0.4 feet for both wind fetches are also relatively small. As this level of runup is expected during an extreme storm event (i.e., a "worst-case" scenario), wave runup is not expected to pose significant design issues for the proposed layouts and structures. Wave overtopping, which could create drainage and settlement issues, will also not be an issue under current sea level conditions.

5.0 Development Options Engineering and Construction

All three of the developed options for the road end project represent constructible alternatives that address the project goals in somewhat different ways with different emphasis. They all provide a sloping beach/path to the existing beach (difference is in width) suitable for public and kayak launch use. Concepts in their constructed form do not directly impact adjacent owner's property. Construction can be conducted within the City right-of-way but will require coordination with adjacent property owners because the existing bulkhead extends onto the adjacent properties. Each concept removes all or the majority of the existing concrete bulkhead. All concepts provide varying degrees of landscape enhancement, with two of the alternatives providing some upland park amenities and a bench from which to view the shore. Although not shown, each design provides the potential to enhance stormwater discharge to an acceptable level. They all present the opportunity for parking a minimum of two to three cars and all alternatives present the need for limited maintenance.

Existing conditions are shown in Figure 6 for reference and comparison.

OPTION A:

This option (Figure 7) provides the widest beach access with limited new upland landscape areas. The bulkhead is removed from the northern property line to its southern end. Existing grade is excavated to provide beach access by

carrying the existing beach up slope to tie into the existing upland elevation, creating additional beach area. Concept drawings show this beach extension at an approximate 10H:1V slope (final stable slope determined in design). It is assumed that material for the new extension of beach will be sized appropriately to blend with fronting beach and remain stable. Thickness of the new beach material layer is assumed to be 18 inches. New stone rockeries will protect the cut slopes along the north and south margins of excavation and tie into existing rockery to the south and bulkhead to the north.

This concept basically creates a well-protected pocket beach. Considering elevation range of new access beach and level of protection, erosion/stability of beach profile is not anticipated to present a significant design issue (for any of the options). Demolishing the seawall removes a vertical structure from the upper intertidal zone; this should provide some limited improvement in erosional conditions during the higher water levels by eliminating a reflecting surface for wave energy. No negative impact to adjacent shorelines would currently be anticipated (for any of the options).

Stormwater management for this option includes transitioning from the current open ditch to an 8 inch buried line at the 10 inch driveway culvert. The new pipe would enter a new catch basin with insert and then a buried discharge line extends west down the new access ramp and out to a beach discharge point at approximately elevation 8 feet within the intertidal zone. Additional more detailed design analysis is necessary to determine the area drained and amount of water to be conveyed during a design storm, and to determine the feasibility of an open vegetated bio-swale type system. Discharge at the rockery with an energy diffuser should also be explored as an alternative to the beach discharge.

This option provides two parking spaces as part of the street end redevelopment and, as with other options, there is room to park up to 4 vehicles along the south side of the road east of the gravel driveway.

Option A maximizes beach access and has the lowest level of park like amenities and landscape features. Maintenance for this alternative is anticipated to be minimal.

As with all options, the site is constrained by adjacent properties. All construction must be conducted within this 40 foot wide corridor with no physical disturbance to adjacent properties.

For all options, as much construction work as practical should be done prior to bulkhead removal, including excavation/grading, portions of rockery placement, and placement of material for the beach access/extension. If possible removal of the bulkhead and completion of work should be timed to avoid exceptionally high tides and easily allow all construction to be done in the “dry”. Considering the existing base of bulkhead location in the upper intertidal elevations, and the unknown design/construction of the bulkhead, it is likely unnecessary to remove any large bulkhead footing if one exists. Bulkhead would be removed down to the footing, and if necessary beach grade adjusted to cover. This approach potentially reduces both cost and disturbance in the upper intertidal zone during construction.

There is a large monolithic concrete remnant at beach grade in front of the existing bulkhead, with a rebar stub protruding in at least one location. The full extent and depth of this concrete is unknown, as it is partially and intermittently covered. It is recommended for all options that this be left in place (with any protruding steel cut off) and design provided such that it is covered with 12 inches of material similar to the existing beach.

This alternative (as depicted) brings excavation and rockery construction right up to, or very close to, the adjacent property lines and property owners’ fences. Lacking information on fill/sub-grade material appropriate measure should be taken in design and construction to insure the integrity of fences and adjacent properties is maintained.

OPTION B:

Option B (Figure 8.) follows the same basic concept as Option A but reduces the width of the beach access and provides a narrow landscaped area with a path and viewing bench at an upland grade along the northern edge of the site. A concrete bulkhead is constructed at the shoreside end of the viewing area.

Based on the concept sketch, it appears that Option B transitions the open stormwater ditch into an artificial gravel stream bed integrated into the rockery close to its base and discharges to receiving water. This is an interesting feature, but as with the other options, additional more detailed design analysis is necessary to determine the area drained and amount of water to be conveyed during a design storm, and the feasibility and compliance of the concept.

The concept sketch showed no parking spaces being created at the new street end but as with other options there is room to park up to four vehicles along the south side of the road east of the gravel driveway.

Option B reduces beach access width in order to provide a minimal level of park-like amenities, a viewing bench and landscape features. Maintenance for this alternative is anticipated to be minimal, limited to the care of landscaping.

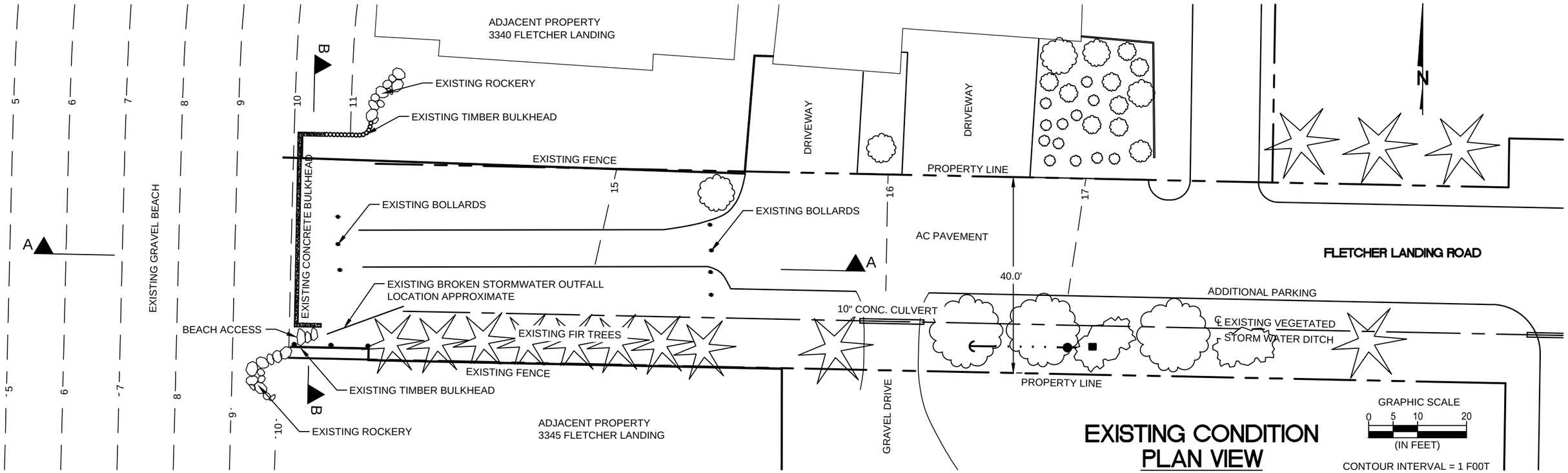
OPTION C:

Option C (Figure 9.) follows the same basic concept as Option B but further reduces/minimizes the width of the beach access and provides a greater landscaped area, along the northern and southern edges of the site. The northern landscape area includes a path and viewing bench at upland grade.

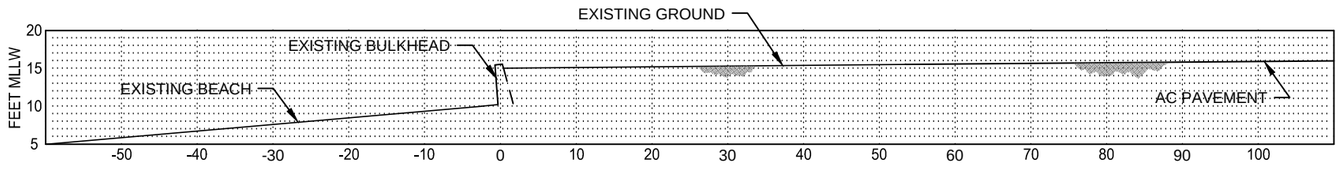
Based on the concept sketch the intended stormwater system could not be determined, it appears that the storm water conveyance may be a buried pipe system but there is no notation or catch basin structures shown so this was not assumed. Stormwater discharge is at the rockery.

The concept sketch showed no parking spaces being created at the new street end but designated three vehicle spaces along the south side of the road east of the gravel driveway. In this concept the spaces are shown as developed with the road edge offset about 4 feet. The existing drainage ditch would have to be shifted or buried conveyance piping with catch basin(s) installed to safely accommodate this configuration.

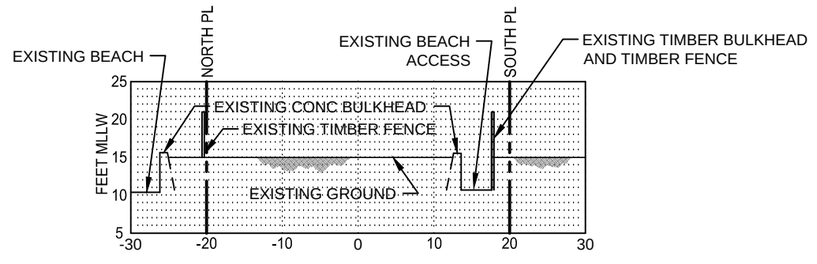
Option C minimizes beach access width in order to maximize the level of park-like amenities and landscape features. Maintenance for this alternative is anticipated to be minimal, limited to care of native vegetation landscaping.



EXISTING CONDITION PLAN VIEW



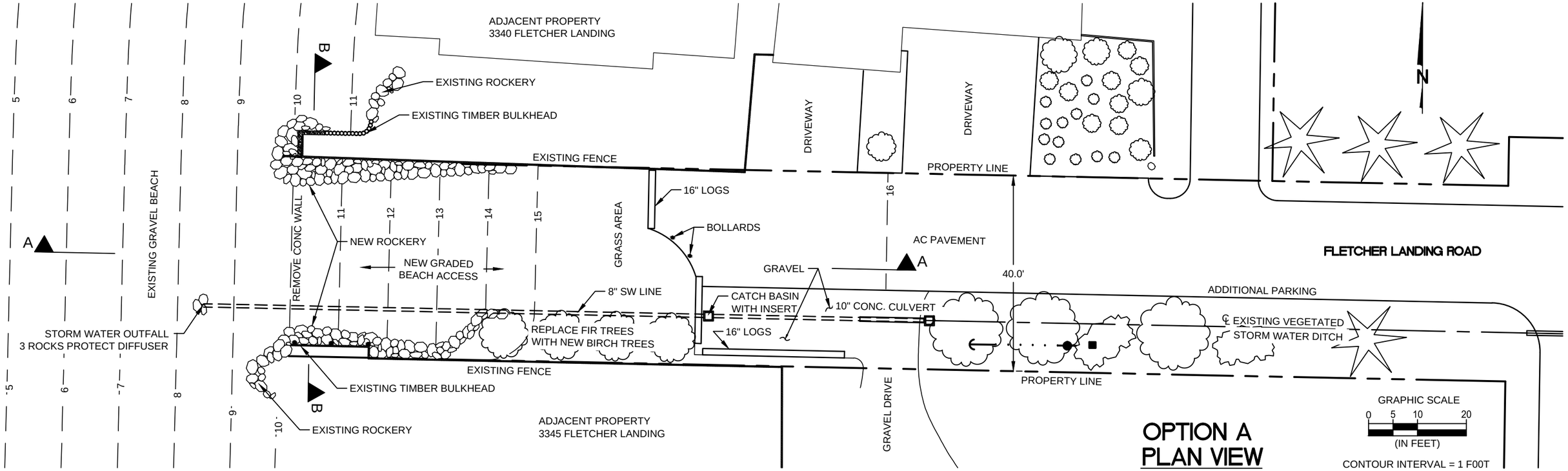
SECTION A-A



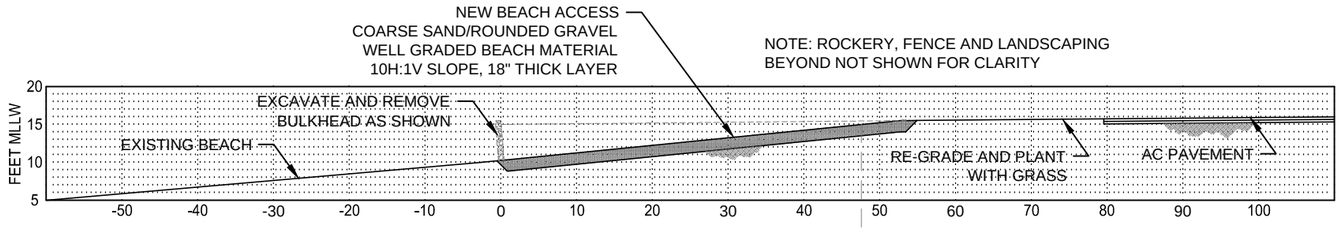
SECTION B-B

CONCEPT ONLY

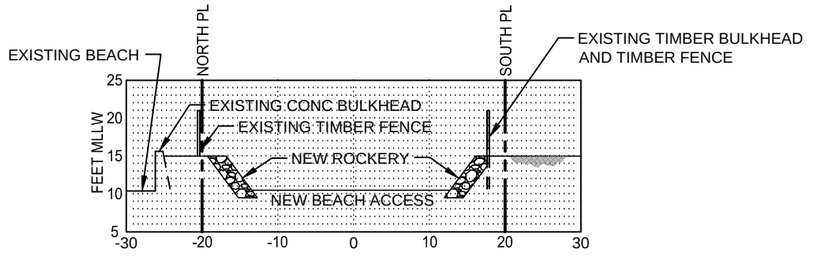
AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104
T: 206-624-9349
F: 206-624-2839



OPTION A
PLAN VIEW



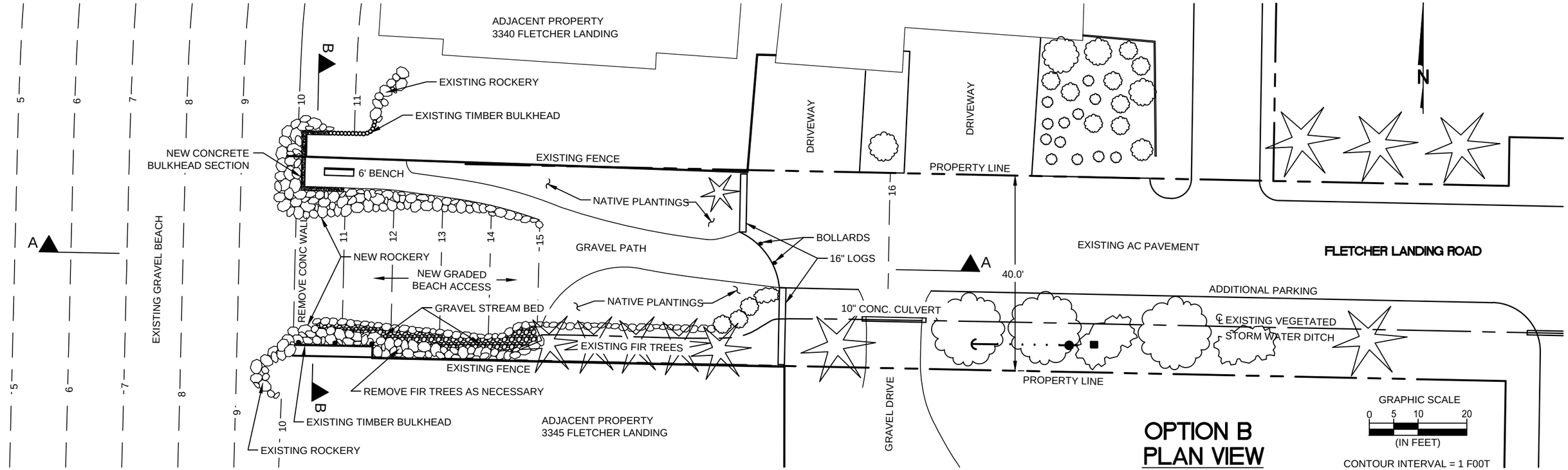
SECTION A-A



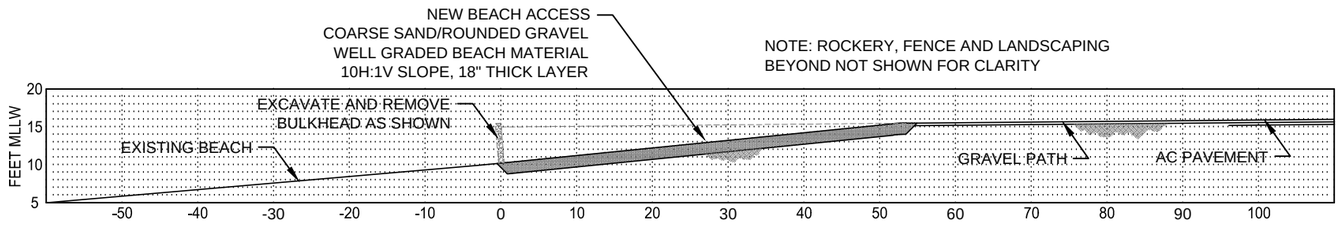
SECTION B-B

CONCEPT ONLY

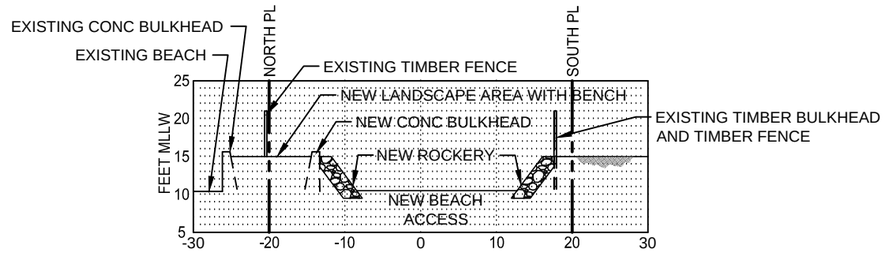
AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104
T: 206-624-9349
F: 206-624-2839



OPTION B
PLAN VIEW



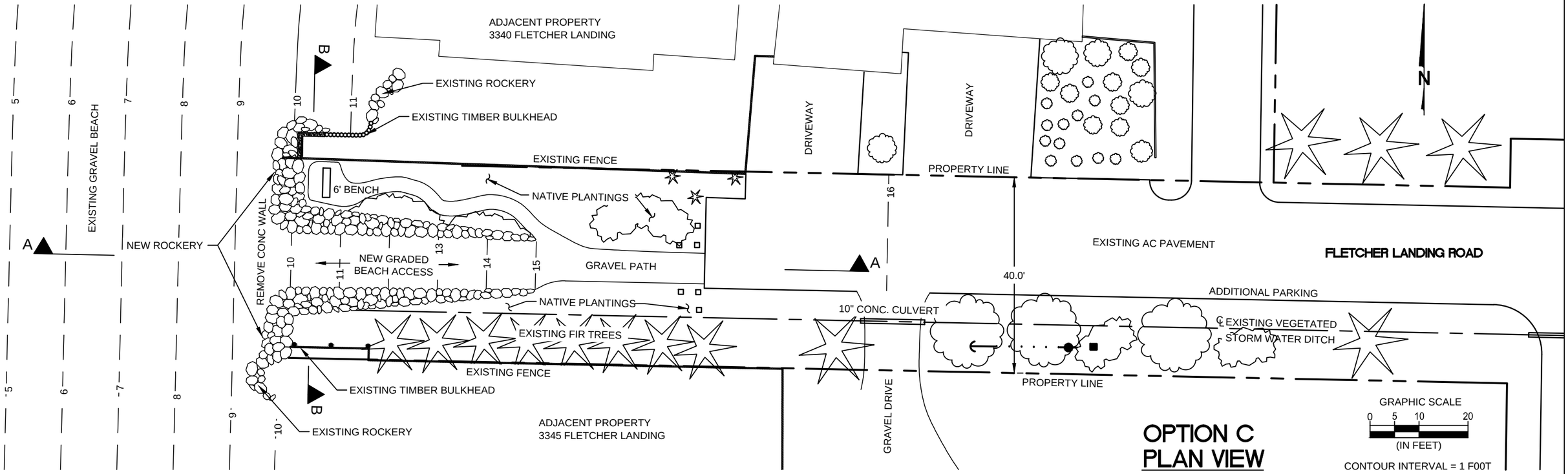
SECTION A-A



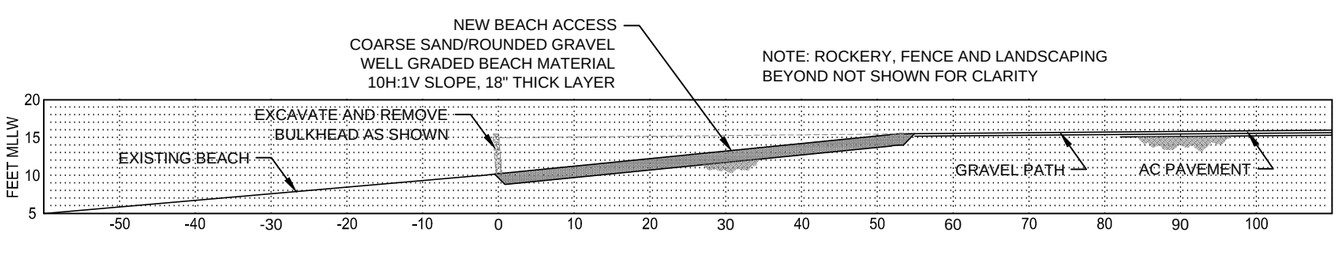
SECTION B-B

CONCEPT ONLY

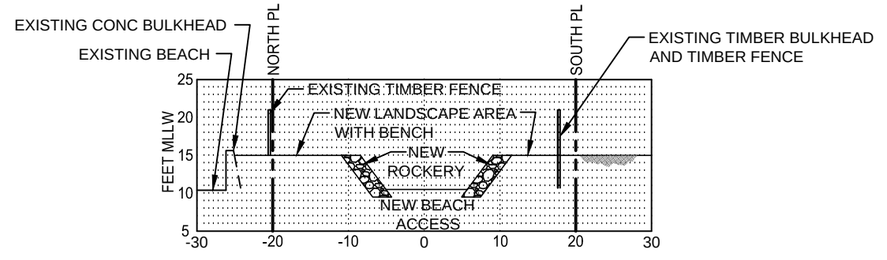
AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104
T: 206-624-9349
F: 206-624-2839



OPTION C
PLAN VIEW



SECTION A-A



SECTION B-B

CONCEPT ONLY

AECOM
710 Second Avenue, Suite 1000
Seattle, WA 98104
T: 206-624-9349
F: 206-624-2839

6.0 Permitting and Environmental Review Analysis

The purpose of the project is to provide public beach access for launching of small boats (i.e., kayaks, canoes, etc.). Project construction involves removing all or a portion of the bulkhead located at a high intertidal location and to excavate soils behind the bulkhead and back into existing uplands to extend (and match) natural beach contours. Once excavated, appropriately sized stone will armor the adjacent bulkheads, and the upper newly created beach area will be augmented with sand gravel mix as approved by agency reviewers. Because the project creates new waters of the United States, increases beach area, and removes a bulkhead, it is assumed to be self-mitigating; no new compensatory mitigation measures are expected. A likely time frame for the permitting process is six to nine months with diligent orchestration and coordination; adequate information to support the permitting process should be developed prior to initiation. All options represent the same basic level of permitting effort/feasibility. Some options provide for creation of more upper intertidal area than others, but none of the options are currently perceived to have negative impacts or impacts requiring mitigation.

Permits likely required and associated possible issues of concern are identified and discussed below:

- City of Bainbridge Island
    - SEPA Checklist and Determination of Non-significance (DNS)

      Because of public use benefit and net habitat enhancement by the project, formal environmental assessment (or Environmental Impact Statement) or expanded checklist are not anticipated. The Checklist will need to cover environmental impacts associated with the project, and the DNS will document that project impacts are minor.

    - Substantial Development Permit

      It is assumed that the proposed work is not exempt from the City's Shoreline Substantial Development permit process. However, this should be confirmed prior to implementing procedures to secure the substantial development permit.

      The substantial development permit application requires detailed project description of the project prism including excavation and material placement volumes and areas. Information data collection, formatting and drawings are similar for the USACE application materials. Common drawings are likely possible. Joint Aquatic Permit Application (JARPA) may be possible for both processes.

    - Other Potential City Permits and Regulatory Concerns:
        - Clearing permits; including associated erosion control and spill prevention plans – This will likely be required for upland soils removal and grading processes located upland of the existing bulkhead.
        - Critical area ordinance (CAO) compliance including work in beach areas. It is assumed that extension of the beach upland will comply with City CAO ordinances.
        - Zoning - It is assumed that the project complies with the City zoning requirements.
        - Coastal Zone Management Consistency is a component of the substantial development permit unless the USACE nationwide permit(s) applies, and then the USACE process applies.
        - Other City Permits.

- USACE construction permit (Section 10 of the Rivers and Harbors Act and Section 404(b)(1) of the Clean Water Act)

  Three potential permitting processes may be applied; nationwide permit, letter of permission, or individual permit. Consultation with the USACE Regulatory Function Branch will be required to determine appropriate action.

  - Nationwide Permits

    It appears that combining the nationwide permits 18 (Minor Discharges) and 19 (Minor Dredging) may be adequate to allow for appropriate coverage. As envisioned the permits would be applied as follows:

    - Nationwide permit 19 would be used for removal of the bulkhead and the soil located behind the bulkhead that is located below the MHHW mark. The soil volume would need to be less than 25 cubic yards. [Note: If the soil behind the bulkhead is excavated prior to bulkhead removal, this may be determined by the USACE as not under their jurisdiction; thereby, assuring full coverage of nationwide 19 (for removal of the bulkhead only) or determination that nationwide 19 permit is not required.

    - Nationwide 18 would be used for placement of the rock riprap to protect adjacent bulkhead structures and placement of the fish mix material in the area between the existing bulkhead and the new MHHW mark and to cover remnant concrete in front of the existing bulkhead. Volume of material would need to be 25 cubic yards or less [Note: If as much rock as possible is placed prior to bulkhead removal, this may be determined by the USACE as not under their jurisdiction; thereby helping to assure compliance under nationwide 19 (for rock placed outside bulkhead or after removal of the bulkhead).

    - The Washington Department of Ecology 401 Water Quality Certification is certified as part of these nationwide permits.

    - Coastal Zone Management Consistency is certified as part of these USACE nationwide permits

  - Letter of Permission (LOP)

    Based on the USACE Guidebook, a LOP "may be issued in cases where proposed work would be minor, would not have significant individual or cumulative impacts on environmental values, and should encounter no appreciable opposition. The types of projects often considered minimally impacting include minor dredging and construction, maintenance, or replacement of piers, mooring buoys, piles, or floats."

  - Individual Permit

    If the above simplified processes are not feasible, an individual permit process would need to be followed.

  It is reasonable to be optimistic that a nationwide permit(s) or letter of approval process would be applicable, but that determination would be made by the USACE regulatory branch.

- Endangered Species Act informal consultation – A Biological Evaluation (BE) will likely need to be prepared. It is expected that the Services (NOAA Fisheries and US Fish and Wildlife Service) will determine that the action is "not likely to adversely affect (NLAA)" and the project will result in overall habitat enhancement based on the following:

- All construction undertaken in the dry.
- Increase in area of waters of the US.
- Establishment of new beach habitat in the high intertidal area being created.

Assuming that the NLAA determination is made, then informal consultation between the USACE and Services would apply. Based on the nature of this project an abbreviated BE form may be applicable; it requires the same basic information as a BE but in an abbreviated format intended to simplify the process. If for some unforeseen reason a more restrictive determination is made, review processes may be more formal. The informal consultation process, particularly with the abbreviated form, is significantly timelier than the formal consultation process.

- Washington Department of Ecology (Ecology) Water Quality Certification (Section 401 of the Clean Water Act)

  Ecology must certify that the action will not adversely affect water quality standards. Expected permit requirements include: 1) All work be undertaken in the dry to prevent water contamination, and 2) appropriate pollution controls be implemented. These are similar requirements to the City of Bainbridge Island erosion control and spill prevention procedures.

- Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA)

  The WDFW HPA will address fishery impacts. Removal of the bulkhead is usually a desired action by WDFW to improve fishery habitat. Additionally, it is expected that the WDFW will react positively to the placement of coarse sand gravel mix (similar to fish habitat mix) and extending the beach naturally upland beyond the existing bulkhead location. WDWF will identify timing constraints as to when the construction work can be implemented.

7.0 Costs

Following are concept-level costs for the three options evaluated, provided for comparative purposes. These costs are based on the limited information provided in concept sketches. Cost analyses did not involve contacting local contractors or suppliers. Cost were based on estimates for work with similar components and available cost data for Seattle/Puget Sound area.

The site is restricted in nature with access via residential roads. It is anticipated that the project can be executed by local contractors without highly specialized equipment. Required materials are assumed to be locally available.

All options fall within a relatively small range of variation. Option C provides the lowest cost, driven primarily by the smallest amount of excavation/disposal and back fill/coarse sand-gravel material. Option B exhibits the highest cost driven by construction of a new section of concrete bulkhead. Option A provides a mid-range cost.

Option #A

	Item	Units	Quantity	Unit Price	Item Price
1	Project Mobilization/Demobilization (10% Other Base Construction Cost)	%	10		$5,551
2	SPCC Plan	LS	1	$1,000	$1,000
3	Temporary Traffic Control	LS	1	$500	$500
2	Site Prep, Clearing & Grubbing, Disposal	LS	1	$2,500	$2,500
4	Demolition & Disposal	Ton	20	$130	$2,600
5	Excavation/Disposal & Grading	CY	260	$35	$9,100
6	Coarse Sand-Gravel (In Place)	CY	110	$50	$5,500
7	Rockery (In Place)	Ton	130	$110	$14,300
8	Crushed Surfacing Top Coarse	Ton	16	$35	$560
9	Landscape Allowance	LS	1	$2,000	$2,000
10	Roadside Improvements/Restoration	LS	1	$2,000	$2,000
11	Stormwater/Drainage	LS	1	$13,500	$13,500
12	Erosion Control	LS	1	$1,950	$1,950
	Sub-Total 1: Estimated Base Construction Cost:				**$61,061**
	Sales Tax @ 8.7% of Base Construction Cost				$5,312
	Sub-Total 2: Estimated Base Bid:				**$66,373**
	Permitting and Design (20% Construction Cost)	%	20		$12,212
	Bidding/Contract Admin/Construction Oversight (15% Construction Cost)	%	15		$9,159
	Concept Level Contingency (20% of Base Bid)	%	25		$13,275
	Total Estimated Project Cost:				**$101,019**

Option #B

	Item	Units	Quantity	Unit Price	Item Price
1	Project Mobilization/Demobilization (10% Other Base Construction Cost)	%	10		$5,880
2	SPCC Plan	LS	1	$1,000	$1,000
3	Temporary Traffic Control	LS	1	$500	$500
4	Site Prep, Clearing & Grubbing, Disposal	LS	1	$2,500	$2,500
5	Demolition & Disposal	Ton	20	$130	$2,600
6	Excavation/Disposal & Grading	CY	190	$35	$6,650
7	Coarse Sand-Gravel (In Place)	CY	80	$50	$4,000
8	Concrete bulkhead	SF	90	$85	$7,650
9	Rockery (In Place)	Ton	145	$110	$15,950
10	Landscape Allowance	LS	1	$5,000	$5,000
11	Roadside Improvements/Restoration	LS	1	$2,000	$2,000
12	Stormwater/Drainage	LS	1	$9,000	$9,000
13	Erosion Control	LS	1	$1,950	$1,950
	Sub-Total 1: Estimated Base Construction Cost:				**$64,680**
	Sales Tax @ 8.7% of Base Construction Cost				$5,627
	Sub-Total 2: Estimated Base Bid:				**$70,307**
	Permitting and Design (20% Construction Cost)	%	20		$12,936
	Bidding/Contract Admin/Construction Oversight (15% Construction Cost)	%	15		$9,702
	Concept Level Contingency (20% of Base Bid)	%	25		$14,061
	Total Estimated Project Cost:				**$107,007**

Option #C

	Item	Units	Quantity	Unit Price	Item Price
1	Project Mobilization/Demobilization (10% Other Base Construction Cost)	%	10		$5,120
2	SPCC Plan	LS	1	$1,000	$1,000
3	Temporary Traffic Control	LS	1	$500	$500
4	Site Prep, Clearing & Grubbing, Disposal	LS	1	$2,500	$2,500
5	Demolition & Disposal	Ton	20	$130	$2,600
6	Excavation/Disposal & Grading	CY	100	$35	$3,500
7	Coarse Sand-Gravel (In Place)	CY	45	$50	$2,250
8	Rockery (In Place)	Ton	140	$110	$15,400
9	Landscape Allowance	LS	1	$6,000	$6,000
10	Roadside Improvements/Restoration	LS	1	$2,000	$2,000
11	Stormwater/Drainage	LS	1	$13,500	$13,500
12	Erosion Control	LS	1	$1,950	$1,950
	Sub-Total 1: Estimated Base Construction Cost:				**$56,320**
	Sales Tax @ 8.7% of Base Construction Cost				$4,900
	Sub-Total 2: Estimated Base Bid:				**$61,220**
	Permitting and Design (20% Construction Cost)	%	20		$11,264
	Bidding/Contract Admin/Construction Oversight (15% Construction Cost)	%	15		$8,448
	Concept Level Contingency (20% of Base Bid)	%	25		$12,244
	Total Estimated Project Cost:				**$93,176**