Birch Bay Shoreline Enhancement

The first recommendation for beach reconstruction along Birch Bay Drive was in September 1975. Wolf Baur provided a shoreline analysis with preliminary design elements for the Whatcom County Planning Commission. The Whatcom County Public Works Department constructed a portion of the project in 1986, from the mouth of Terrell Creek to the north along Birch Bay Drive up to the southern property boundary of Jacob's Land Condominiums.

The continuation of the project has been requested repeatedly since the late 1980's. This included the Philip Williams & Associates Birch Bay Shoreline Improvement Plan and Conceptual Design completed December 10, 2002 for the Whatcom County Council of Governments.

On September 28, 2004 the Whatcom County Council adopted the Birch Bay Subarea Plan update. The Subarea plan includes the shoreline enhancement project as one of the top projects for the Subarea. It is described as the Beachfront promenade:

- "Working with the appropriate County and State agencies, retain a civil engineer for final design of a promenade and a berm along Birch Bay Drive. Seek State and Federal funding for construction of the berm. Construct the berm and promenade along Birch Bay Drive.

Prior to moving forward with construction design, Whatcom County Public Works wanted to ensure the project would not meet the same resistance from area property owners that stopped the project in 1986. An RFP was issued on May 6, 2006 for a feasibility study.

Philip Williams & Associates (PWA), together with ESA Adolfson, Coastal Geologic Services, and David Evans Associates was contracted to complete the feasibility study. The feasibility study was divided into phases. Phase I, addressed property owners along the beach at Birch Bay Drive. A charrette was held to request input and hear their concerns regarding design and construction. In addition, individual meetings were held with property owners to obtain verbal agreements to provide easements for the construction of the project. Phase I was completed on October 20, 2006.

Phase II A, Conceptual Cost Estimate was completed on December 11, 2007. The cost estimate established the general cost of the full project including beach reconstruction and road reconstruction.

December 11, 2007

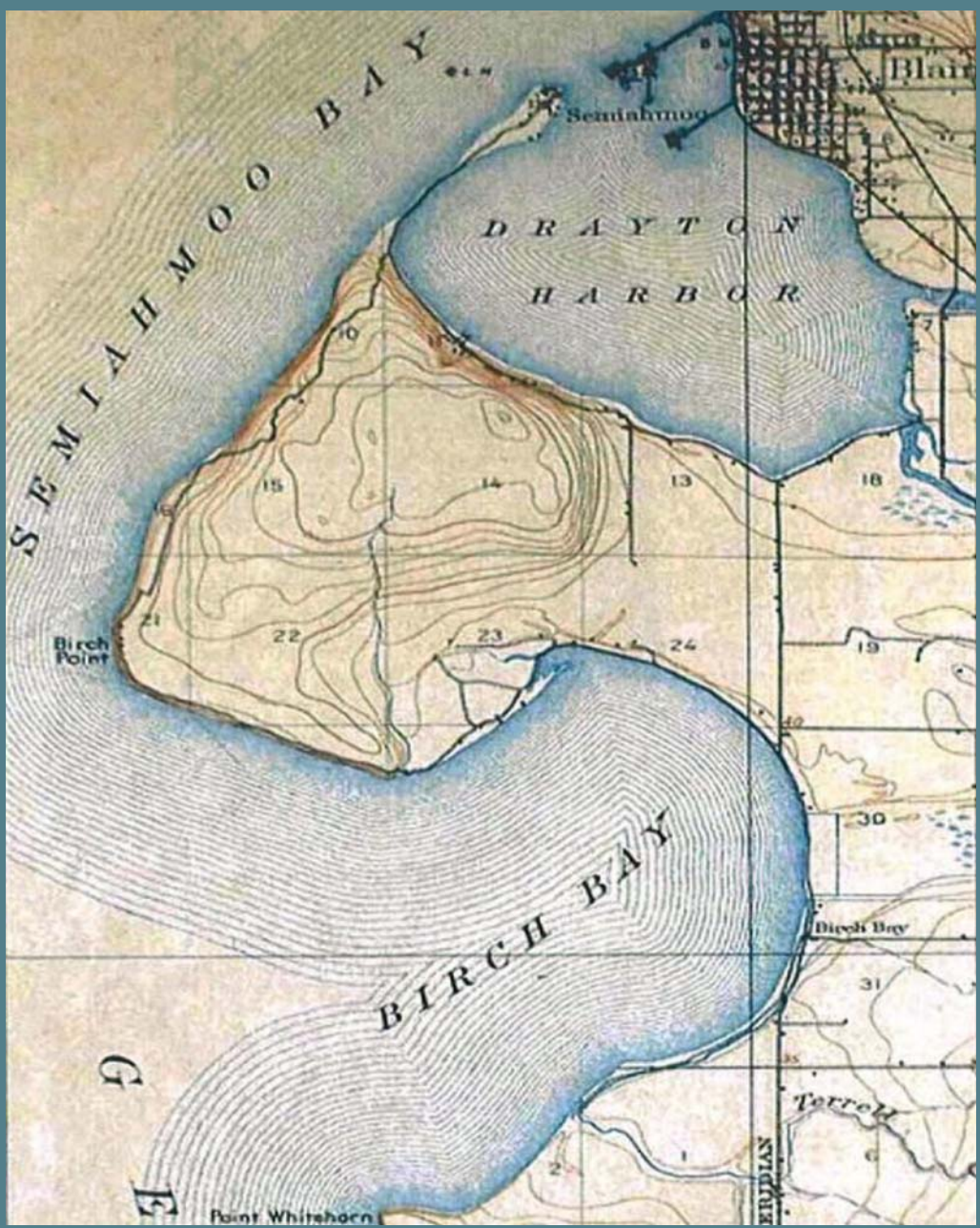
Birch Bay Shoreline Enhancement Phase 2A Conceptual Cost Estimate

Prepared for

Whatcom County Public Works Department

Prepared by

Philip Williams & Associates, Ltd., with
ESA Adolfson, Inc., Coastal Geologic Services
and David Evans & Associates, Inc.



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BIRCH BAY SHORELINE ENHANCEMENT
PHASE 2A
CONCEPTUAL COST ESTIMATE

Prepared for

Whatcom County Public Works Department

Prepared by

Philip Williams & Associates, Ltd.

with

ESA Adolfson, Inc.
&
Coastal Geologic Services
&
David Evans and Associates, Inc.

December 11, 2007

PWA REF. 1859.01

Services provided pursuant to this Agreement are intended solely for the use and benefit of Whatcom County Public Works Department.

No other person or entity shall be entitled to rely on the services, opinions, recommendations, plans or specifications provided pursuant to this agreement without the express written consent of Philip Williams & Associates, Ltd., 550 Kearny Street, Suite 900, San Francisco, CA 94108.

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LIST OF APPENDICES

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1. INTRODUCTION

1.1 BACKGROUND

Birch Bay, Washington is a small community on the northeastern coast of Puget Sound about 20 miles north of Bellingham, WA, in Whatcom County (Figure A-1). Birch Bay is a very popular recreational and tourist destination, and the surrounding community is part of a designated Urban Growth Area with substantial rural and suburban density residential development. Birch Bay is a small, shallow, crescent-shaped bay (approximately 2.5 miles wide with a maximum depth of 30 feet), between Point Whitehorn and Birch Point, which is backed by narrow to moderately wide gravel, cobble, and sand beaches. North of the Birch Bay State Park, the shore has been highly developed with single family residences, some commercial structures, condominiums, and public infrastructure (roads, power lines, etc.).

At present, the gravel and sand beaches, particularly along the central and northern reaches of the Bay, are narrow, degraded, and offer limited protection to Birch Bay Drive and limited recreational opportunities or flood protection for inland development. The narrow, armored beaches also degrade the ecology of the upper inter-tidal zone. Beach nourishment in the form of a berm comprised of sand, gravel and cobble was originally proposed in the 1970s (Bauer, 1975). A test section was constructed in 1986 by Whatcom County (CGS, 2004). A geomorphic and engineering review found the nourishment concept to be technically sound, subject to more detailed analysis and project definition (PWA, 2002).

Enhancement of the Birch Bay shore is identified as a high priority project in County planning documents and supported by the Birch Bay Steering Committee and the Shoreline Subcommittee advising the County. In addition to beach nourishment, landside improvements for pedestrian and bicycle safety, shore access, utility under-grounding, aesthetics and storm drainage have been identified as elements of the shoreline enhancement project. Consequently, the County initiated an inter-active public meeting (called the charrette) to evaluate the interest in a shoreline renovation project, and to identify its likely elements for alternatives formulation and feasibility study. The charrette was held on September 16, 2006 (PWA and others, 2006). This “Phase 1” study found substantial public support for the project. Completion of a preliminary Design (Phase 2) was recommended.

This document provides an Engineer’s estimate of construction costs, based on the conceptual project description. This study is labeled “Phase 2A” since it is the first step in Phase 2 Preliminary Design.

1.2 PURPOSE

The purpose of this Phase 2A Conceptual Cost Estimate is to provide a “ball-park” estimate of construction costs based on the conceptual project description, consistent with the Phase 1 public outreach (Charrette, PWA, 2006). The anticipated project cost is a key factor affecting whether Whatcom County will pursue the project further.

1.3 SCOPE

An approximate engineer's estimate of the likely project cost will be developed at the beginning of Phase 2 in order to facilitate planning by the County. The County will provide input regarding the assumptions used, including scale, phasing, and elements to include. A brief technical memorandum will be provided to convey and describe the estimate.

2. PROJECT DESCRIPTION

2.1 PROJECT DESCRIPTION – OVERVIEW

This description of the Birch Bay Shoreline Enhancement Project is based on the conceptual design developed in Phase 1, and is intended to respond to community input developed during several meetings (PWA and others, 2006). Further detailing of the conceptual design has been accomplished in this Phase 2A in order to develop quantitative basis for the engineer's estimate of likely costs. This Phase 2A project description has been attempted before the Phase 2 alternatives evaluation process, and hence the preferred project is not yet defined. This description is conceptual pending further engineering analysis, consideration of environmental assessments and regulatory requirements and further evaluation by the Community and County staff and officials. Similarly, estimated quantities and costs are subject to revision. Comments on this description will be documented for future use in the Phase 2 analysis, and hence there is no intent to update this memorandum.

The Shoreline Enhancement Project Area includes a portion of Birch Bay, from Terrell Creek Mouth to Rogers Creek Mouth, a distance of about 11,400 feet measured along Birch Bay Drive (Figure A-2). The project is divided into two shoreline reaches, which will receive different treatments (Figure A-2). The Phasing shown in Figure A-2 is described later. The two reaches are:

- Central Reach – Primary focus of shoreline enhancement project; (approximately 5,100 ft)
- Cottonwood Reach – Limited shoreline enhancement (approximately 6,300 ft).

The Project Goal is to enhance the shoreline in the Central and Cottonwood Reaches (central and north Birch Bay). The Project Objectives are as follows:

- Widening beach to protect Birch Bay Drive and for recreation;
- Bike / pedestrian paths promenade;
- Coastal access;
- Flood protection;
- Aesthetics;
- Ecosystem function;
- Sustainability.

It is important to note that much of the area is in the coastal flood plain and that traditional shore protection and beach stabilization approaches have not performed adequately (PWA and others, 2006). Recently obtained photographs of conditions during a storm in 1982 are in Appendix D (Loe and Larson, 1982). This project is an innovative approach to providing traditional storm damage reduction to public

works and private residences in an ecologically sensitive and sustainable manner. The test section just north of the Terrell Creek mouth has been effective with ongoing maintenance (CGS, 2007).

The dividing line of the two reaches was developed in Phase 1. The Central Reach extends northward of Harborview Drive to include the adjacent public parking lot as the northern most limit of intensive landside enhancement. The extent of the waterside enhancement is subject to further review, but is shown to extend northward in to the Cottonwood reach to include an area of critically narrow shore and high risk to Birch Bay Drive and inland development. The extents of the Shoreline Enhancement Project Area in the cross-shore direction are generally from the landward side of Birch Bay Drive out into the edge of the sand flats (nearshore intertidal) of Birch Bay. The landside limit is flexible in order to accommodate effective connections with existing facilities to remain (e.g. road pavements and utilities) and logical stopping points (e.g. storm drain junction boxes / drain inlets on the landside of Birch Bay Drive).

The Shoreline Enhancement will consist of waterside and landside treatments that vary with location. More intensive and complete enhancement (waterside and landside) is proposed for the Central Reach and the southernmost 1,500 foot section of the Cottonwood Reach where the existing shore is heavily impacted and there is limited protection for Birch Bay Drive and inland development. Enhancement in the remaining northern portion of the Cottonwood Reach is limited in order to avoid disturbing the existing vegetated back beach and its uses by adjacent residents. Improved pedestrian (bike and walking) safety and marginal storm drain function improvements are desired for the Cottonwood Reach, to the extent allowed within the available transportation corridor and as agreed upon with landowners.

The Birch Bay Shoreline Enhancement Plan will be consistent with, and coordinated with, the Birch Bay Comprehensive Stormwater Management Plan (BBCSMP)(CH2MHill, 2006). The connection is primarily in terms of the locations and configurations of storm water outfalls. The Birch Bay Shoreline Enhancement Plan will also be coordinated with plans for the Coast Millennium Trail, which will connect through the Cottonwood and Central Reaches. However, only the Central Reach segment is likely to comply with the desired geometries unless more space is obtained in the Cottonwood Reach.

2.2 CONCEPTUAL PROJECT DESCRIPTION FOR ESTIMATES

2.2.1 Typical Treatments by Reach

The Birch Bay Shoreline Enhancement Project elements are:

- Central Reach (Figure A-3 typical section, Figure A-4 typical section)
    - Restoration of beach by removal of fill and coastal structures, placement of beach nourishment sediment (gravel and sand) to restore natural coastal processes;
    - Backshore native plant installation and pockets of landscaping along landward edge of beach;
    - Pedestrian trail in upland portion of restored coastal profile;

- Bicycle lanes on one or both (preferably both) sides of Birch Bay Drive;
- Underground existing overhead utilities (electrical, telecom, cable), located as far landward as practicable;
- Reconstruct Storm Drain Outfalls consistent with the BBCSMP;
- Coordination with other utilities renovation (sewer and water);
- Renovation of public parking (maintain same number of spaces but reconfigure);
- Road re-paving, striping, signage;
- Maintenance, re-nourishment of beach with gravel and sand.

- Cottonwood Reach (Figure A-5 typical section)
  - Beach nourishment with sand and gravel as described in Figure A-3 — southern 1,500 ft only;
  - Bike / Pedestrian path (single combined lane owing to space limitations);
  - Underground existing overhead utilities (electrical, telecom, cable) located as far landward as practicable;
  - Reconstruct Storm Drain Outfalls consistent with the BBCSMP;
  - Coordination with other utilities renovation (sewer and water).

2.2.2 Waterside Elements

The waterside renovation will be limited to the Central Reach and the southernmost 1,500 feet of the Cottonwood Reach. The assumed treatment is consistent with prior work: the lower berm option proposed by Bauer (1975); the test section (CGS, 2004); and the configuration considered by PWA (2002). The typical geometry is shown in Figure A-3 in terms of a typical cross-section. This conceptual cross-section was developed for costing purposes and does not reflect detailed analysis of project area-specific conditions. In general, a sand-covered, gravel berm will be constructed to an elevation about one foot above the existing grade of Birch Bay Drive, and gravel and sand will be placed to create a 15 foot wide berm top. Local sources of sediment will be used and will match native sediments to restore the natural morphology processes and realize ecologic benefits. The berm surface will be fine graded, planted, and support a pedestrian trail. Drift wood will be salvaged and re-used as part of the fine grading of the berm. All debris and fill will be removed. Most of the existing concrete groins will be removed. Several may be buried in place, or maintained at the edges of placement sections. Placement sections will be defined by obstructions (primarily the existing concession located over the beach and existing parking lots and seawalls), and at the north end of sediment placement. No beach enhancement will occur in front of the Bluefish Restaurant and the boat launch at the end of Cedar Road. The cost estimate does not include any repairs or reconstruction to the existing boat launch at the end of Cedar Road. Transitions

from enhancement sections to areas with no enhancement will be designed. The seawall and parking will not be eliminated; beach enhancement and sediment placement will occur in front of the existing seawall. Storm water outfalls will be replaced with outfalls consistent with the widened beach. Tide gates (passive flap or duckbill types) will be considered as means to limit high tidal waters from flooding inland areas and plugging the drains.

2.2.3 Landside Elements

The landside treatments are different in the Central and Cottonwood Reaches. Electrical and telecommunications utilities are under-grounded in both reaches.

Central Reach:

- Roadway – 34 ft edge to edge. Complete reconstruction is assumed, partly due to the anticipated trucking of beach sediment for the waterside construction.
- Bike lanes – 5 ft wide on road shoulders, one way on each side of road, at road grade, separated by striping.
- Curbs – Vertical curbs on landside of road and concrete strip on waterside.
- Sidewalk – 5 ft wide separated sidewalk on landside of roadway, depending on space available.
- Pedestrian – 5 ft wide crushed limestone pavement on waterside berm. Connected through the paved parking areas as necessary.
- Stormwater – Raingarden located on waterside of roadway with stormwater collection points for overflow.

Cottonwood Reach:

- Roadway – same as existing with some relocation (reconstruction of the roadway is assumed in the estimate, although may not be necessary due to the good condition of the existing roadway and the lack of truck traffic during construction of the beach nourishment).
- Although bike lanes on both sides of the roadway are desired (as shown in Figure A-5), it is not anticipated that there is enough room to accommodate them as drawn.
- Bike/Pedestrian Trail – 10 ft +/- wide combined trail, HMA paving, same grade as roadway, on waterside shoulder. Extends north from the bike lane transition point to the proposed Coast Millennium Trail terminus from Birch Bay Drive.
- Stormwater – Raingarden located on waterside of road with stormwater collection points for overflow. The raingarden may be located on the landside of the road at the existing drainage ditch.

2.2.4 Environmental Considerations

The project objectives include improvements to ecology and hence the project is assumed to be self-mitigating. This assumption will be evaluated in Phase 2. Construction impacts will be minimized by

adhering to the requirements of resource and regulatory agencies and the advice of other qualified biologists and ecologists.

In-water construction (work waterward of the ordinary high water line) will be restricted to specific "windows" as defined by state and federal regulatory agencies. The work windows are intended to protect juvenile salmonids and forage fish species, such as herring, Pacific sand lance, and surf smelt, that spawn in the subtidal and intertidal zones. Each of these species has been documented to spawn in Birch Bay. Pacific herring spawn in intertidal and shallow subtidal areas, depositing eggs on marine vegetation at elevations between 0 and -10 feet MLLW. Surf smelt spawn on coarse sand or pea gravel ranging in size from 1 to 7 millimeters at tidal elevations between +7.0 and MHHW. Surf smelt spawning can occur year-round. Pacific sand lance spawn over a wider range of substrate sizes than surf smelt, ranging from fine sand beaches to beaches with gravel up to 30 millimeters in size.

Under state law (WAC 220-110-271), construction work in salt water in Whatcom County is prohibited during the following times:

- salmon rearing areas - March 15 to June 14
- herring spawning areas - February 1 to June 14
- surf smelt spawning areas - Potentially year-round

Project-specific work windows can be negotiated based on site-specific information. The Washington Department of Fish and Wildlife, U.S. Army Corps of Engineers, and/or the National Oceanic and Atmospheric Administration (NOAA) can modify the standard windows based on a case-by-case assessment of the actual presence of the species of concern in the work area. Normal variations in spawning and rearing activity due to weather and other factors, and ability to mitigate adverse effects on the species, which is function of the project design and construction techniques, can also be considered. The likelihood that a year-round prohibition on in-water work would be imposed for the Birch Bay Shore Enhancement Project is low, especially considering that documented surf smelt spawning has been limited to the northwest corner of the Bay, outside the Shoreline Enhancement Area. It is likely that regulatory agencies will require beach surveys prior to the construction work to identify species of concern in the project area and then determine work windows based in part on that site-specific information.

Construction timing outside (landward of) the Bay will be determined based on traffic considerations, effects on business and tourism, and other health and safety issues.

2.2.5 Environmental Review and Regulatory Approvals

The project will require environmental permits and approvals from state and federal agencies as well as from Whatcom County. The County likely would be the lead agency for the State Environmental Policy Act (SEPA) review. The County will review the project as specified in Whatcom County Code (WCC)

16.08 for compliance with the state law. The project would likely qualify for a Mitigated Determination on Non-significance (MDNS) assuming that the design includes adequate mitigation to offset environmental impacts. Traffic impacts, effects on threatened salmonids and other fish and wildlife habitat conservation areas, effects on shellfish harvesting, and effects on water quality will be key concerns. The SEPA review process is likely to take 12 to 18 months.

The project will also require a Shoreline Substantial Development Permit from Whatcom County since the work will involve regulated activities within shoreline jurisdiction. According to the County's locally adopted Shoreline Management Program (SMP, 2007)[1], the shoreline in the vicinity of the study reaches is a mixture environment designations: Shoreline Residential, Urban Resort, and Urban, landward of ordinary high water, and Aquatic, waterward of ordinary high water. The project, which is considered to be an ecological restoration project, is an allowed use in all of these designations.

Required federal permits/approvals will include a Clean Water Act Section 404 permit, a Coastal Zone Consistency determination, and a Clean Water Act water quality certification (issued by the state Department of Ecology). The federal permit agency for Clean Water Act approval, the U.S. Army Corps of Engineers, will also need to consult with NOAA and the U.S. Fish and Wildlife service regarding effects on threatened and endangered species, as required by Section 7 of the Endangered Species Act (ESA). The project may qualify of a Corps nationwide permit (NWP 27) if it is considered an Aquatic Habitat Restoration, Establishment, and Enhancement project, but similar project involving intertidal fill have required an Individual Permit.

Approvals from state agencies will be required under the State Hydraulic Code and the National Pollution Discharge Elimination System (NPDES) general permit (a federal permit administered by the State Department of Ecology). Key federal and state permits and approval are summarized in Appendix C.

Compliance with environmental regulations is expected to influence project costs in several ways:

- By requiring ecological studies and beach surveys prior to applying for required permits,
- By limiting in-water work to certain work windows as described above,
- By requiring the best management practices be implemented during construction to prevent adverse impacts,
- By limiting staging and stockpiling of construction equipment to designated non-sensitive areas,
- By requiring the use of specific substrate materials on the water side that provide suitable spawning habitat for forage fish, and
- By requiring monitoring during and following construction to ensure that mitigation performance standards are met.

[1] The locally adopted SMP had not been approved by the Dept. of Ecology and is not yet in effect. Dept. of Ecology is expected to approve the program by the end of 2007.

No additional compensatory mitigation is expected to be required assuming that the project is designed to be self-mitigating, meaning that the improvements are:

1. located, designed, and constructed to prevent adverse effects on ESA-listed species, critical habitats, and critical areas,
2. restore natural beach processes, and
3. maintain or improve habitat for spawning forage fish species.

Approximate costs for permitting and environmental compliance related services are expected to be as follows:

- Preliminary environmental studies, surveys and documentation (including a preliminary beach sampling and a more detailed follow–up survey for forage fish and a BA) – $28,000
- Permit applications and agency coordination (assumes Individual Corps Permit) – $35,000
- Construction monitoring (mainly Phases 1 and 2, but some in Phases 3 and 4) – $20,000
- Post construction monitoring (annually for 5 years) – $28,000

These costs are estimates based on professional experience with similar projects in Washington state and Whatcom County. The estimates assume that the project will not directly impact Terrell Creek or require any in-water work in freshwater. The estimates include permits for the landside improvements. The level of effort to obtain permits can be quite variable and difficult to predict, so these estimates are preliminary. Also, there is no guarantee that permits will be obtained.

2.2.6 Phasing

It is assumed that the project will be phased over several years. This assumption is based on the scale of construction, the need to limit impacts on businesses and residences, and environmental restrictions on construction timing. Pending a better understanding of these factors, we estimate the project to be phased as described in the following table:

PHASE	LOCATION	ACTIVITY	TIMEFRAME
1	Central Reach- South	Beach Restoration	Year 1
2	Central Reach- North	Beach Restoration	Year 2
3	Central Reach	Landside Improvements	Year 3
4	Cottonwood Reach	Landside Improvements	Year 4

Description of the four project phases is as follows:

- Phase 1 Waterside, from north of Terrell Creek Mouth (specifically, north of the existing "test section") to the southernmost edge of existing parking near the intersection of Harborview Drive and Birch Bay Drive (approximately 580 feet).
- Phase 2 Waterside, from southernmost edge of existing parking near the intersection of Harborview Drive and Birch Bay Drive to approximately 800 ft southeast of the intersection of Beach Way Drive and Birch Bay Drive, where Birch Bay Drive turns inland and is protected by a wider shore.
- Phase 3 Landside, from the mouth of Terrell Creek to approximately 340 feet north-northwest of the intersection of Birch Bay Drive and Harborview Drive.
- Phase 4 Landside, from approximately 340 feet north-northwest of the intersection of Birch Bay Drive and Harborview Drive to the mouth of Rogers Creek.

2.3 ENGINEERS' ESTIMATES OF CONSTRUCTION COSTS – CONCEPTUAL LEVEL

The Engineer's Estimate of Likely Construction Costs is based on the conceptual project description and will be updated after completion of a preliminary design. The actual project description (and construction costs) may differ substantially from what is provided herein. It is recommended that financial feasibility not be assessed until the preliminary design is accomplished, based on a more thorough consideration of coastal processes, regulatory and environmental opportunities and constraints, and engineering. The preliminary design process will also facilitate a maturation of the project description in terms of County and Community desires and funding.

The cost estimates are intended to provide an approximation of total project costs appropriate for the conceptual level of design. These cost estimates are considered to be approximately -30% to +50% accurate, and include a 30% contingency to account for project uncertainties (including final design, permitting restrictions and bidding climate). These estimates are subject to refinement and revisions as the design is developed in future stages of the project.

Please note that in providing opinions of probable construction costs, PWA has no control over the actual costs at the time of construction. The actual cost of construction may be impacted by the availability of construction equipment and crews and fluctuation of supply prices at the time the work is bid. PWA makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bids or actual costs. Construction costs for each phase of construction and allowance for non-construction items are summarized in the following table. Detailed cost estimates and descriptions are in Appendix B.

Key cost factors not included are:

- Property and easement costs;
- Funding opportunities and requirements;
- Environmental mitigation (project is generally assumed to be self-mitigating as described herein);
- Optimized dimensions;

- Detailed quantity calculations;
- Cost escalation (all costs are in 2007 dollars), which may vary substantially for gravel and sand, among other items;
- Maintenance costs, including monitoring and re-nourishment of waterside.

Action	Cost	Notes
Phase 1	$790,400	
Phase 2	$636,400	
Phase 3	$2,124,200	
Phase 4	$1,993,200	
Subtotal	**$5,540,000**	Includes 30% contingency
Environmental Review and Permitting	$63,000	Surveys, studies, permits
Survey and Final Design	$430,000	10% of Subtotal (w/o contingency)
Construction Administration/Monitoring	$430,000	10% of Subtotal (w/o contingency)
Post-Construction Monitoring	$140,000	$28,000 annually for 5 years
Total	**$6,600,000**	

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This report was prepared by the following PWA staff:

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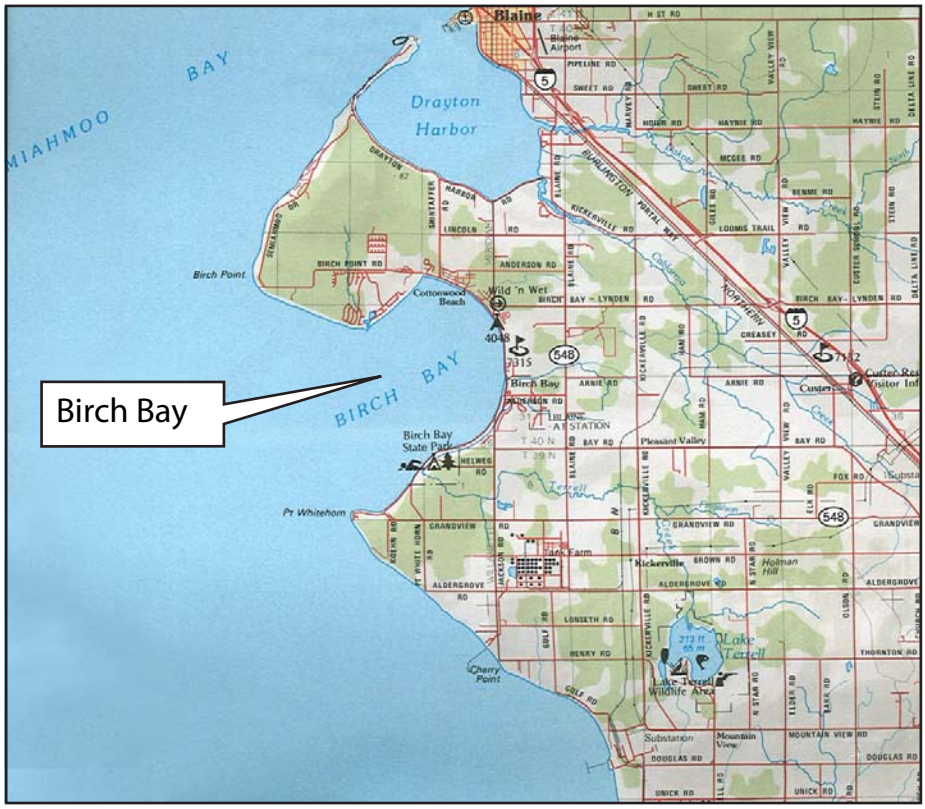
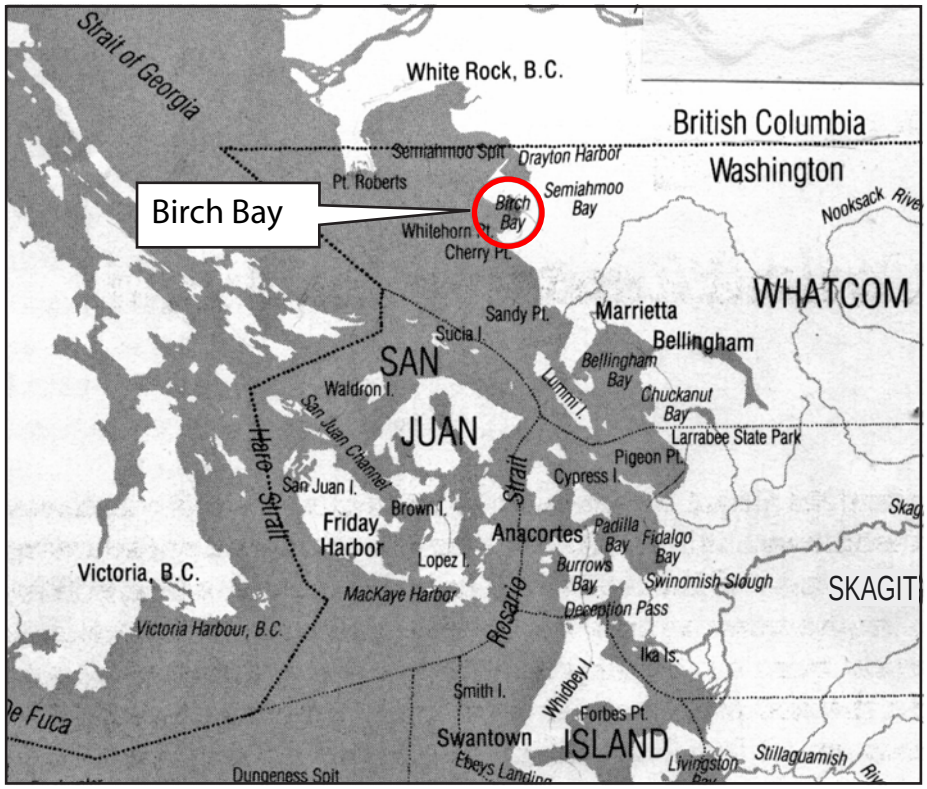
APPENDIX A
FIGURES





Birch Bay

figure 1

Birch Bay Shoreline Enhancement

Location and Vicinity Map

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PWA

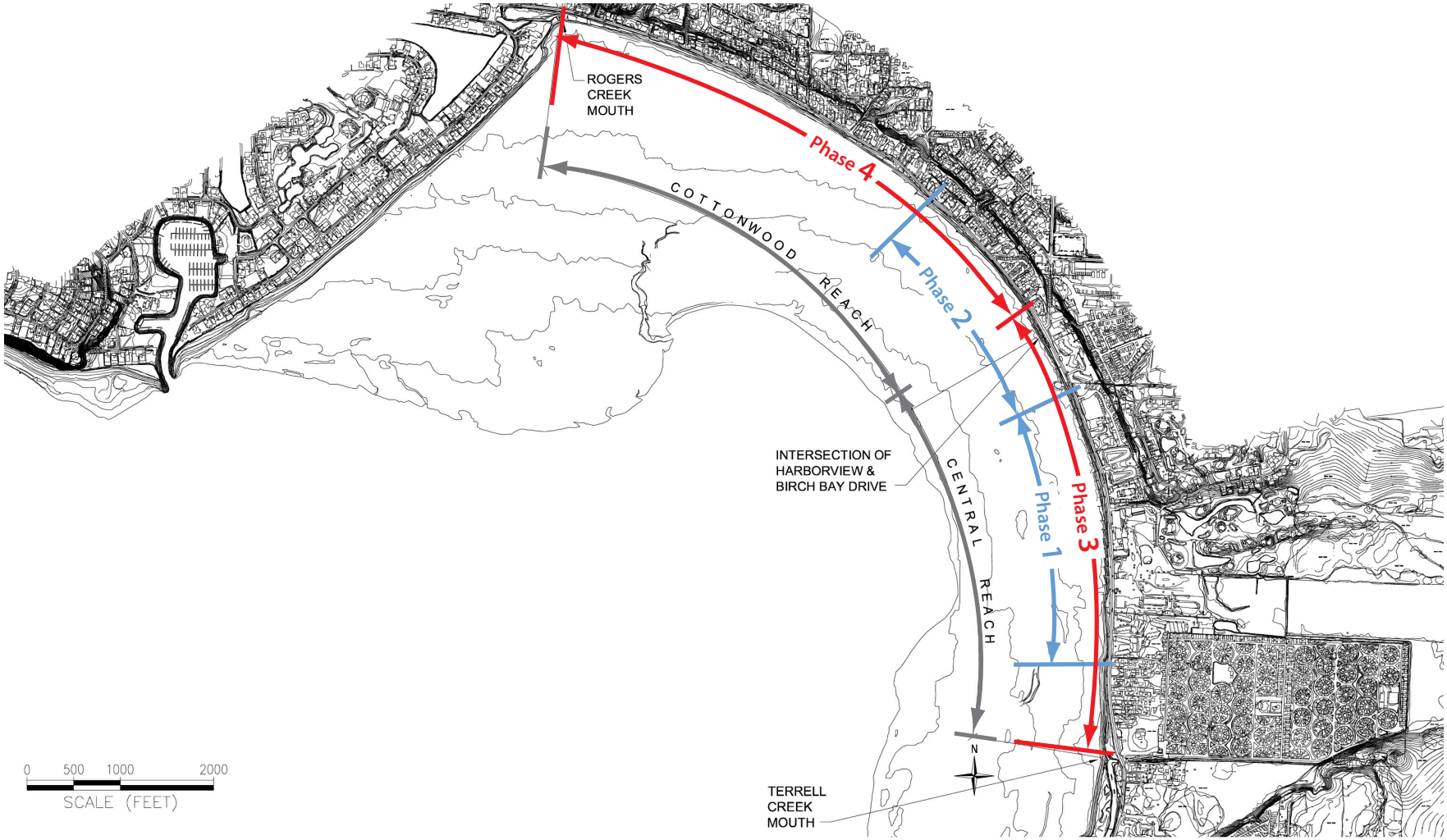

figure 2

Birch Bay Shoreline Enhancement

Project Reaches and Conceptual Phasing

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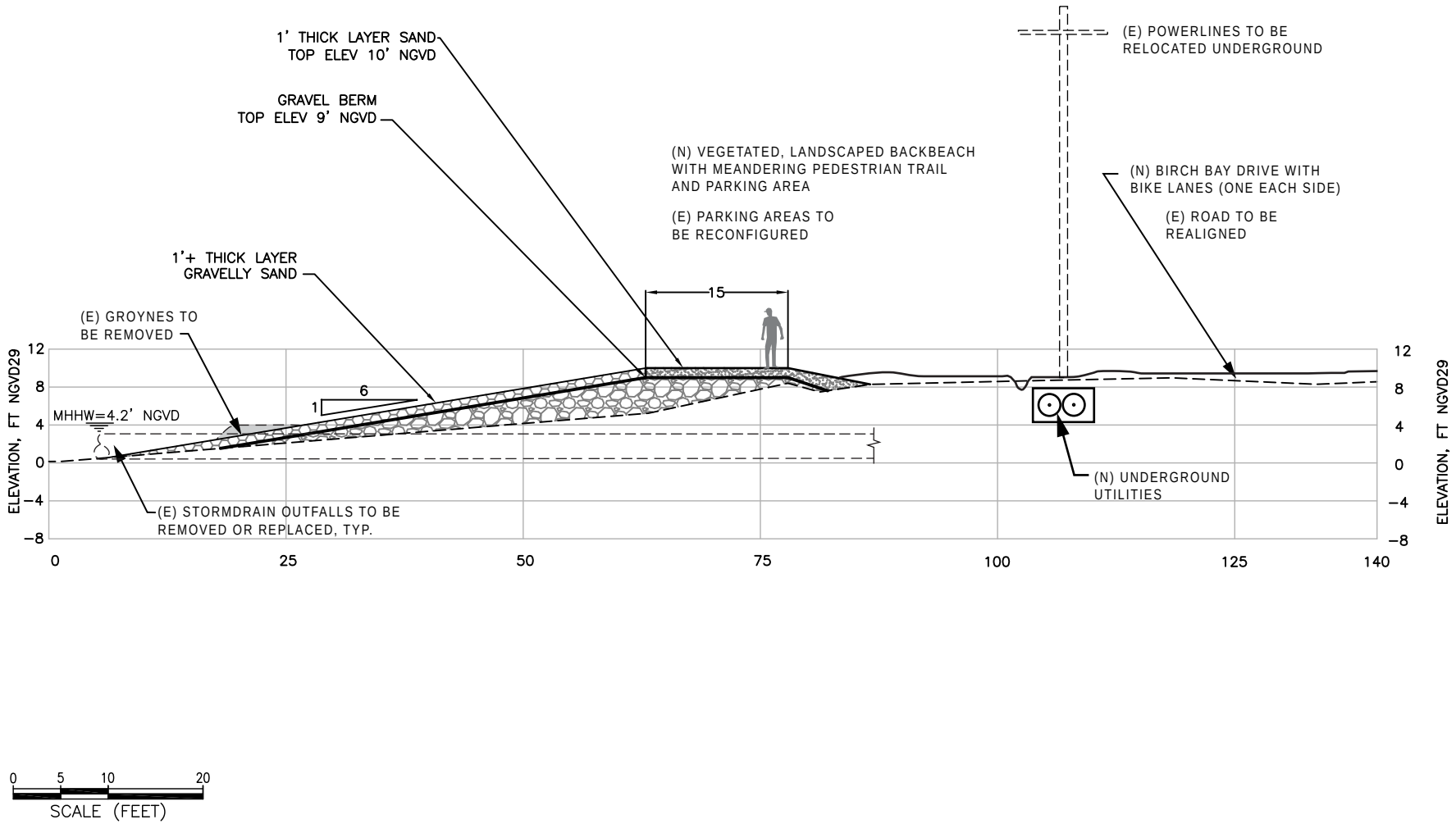

figure 3

Birch Bay Shoreline Enhancement
Typical Conceptual Cross-Section: Shore and Landside Renovation

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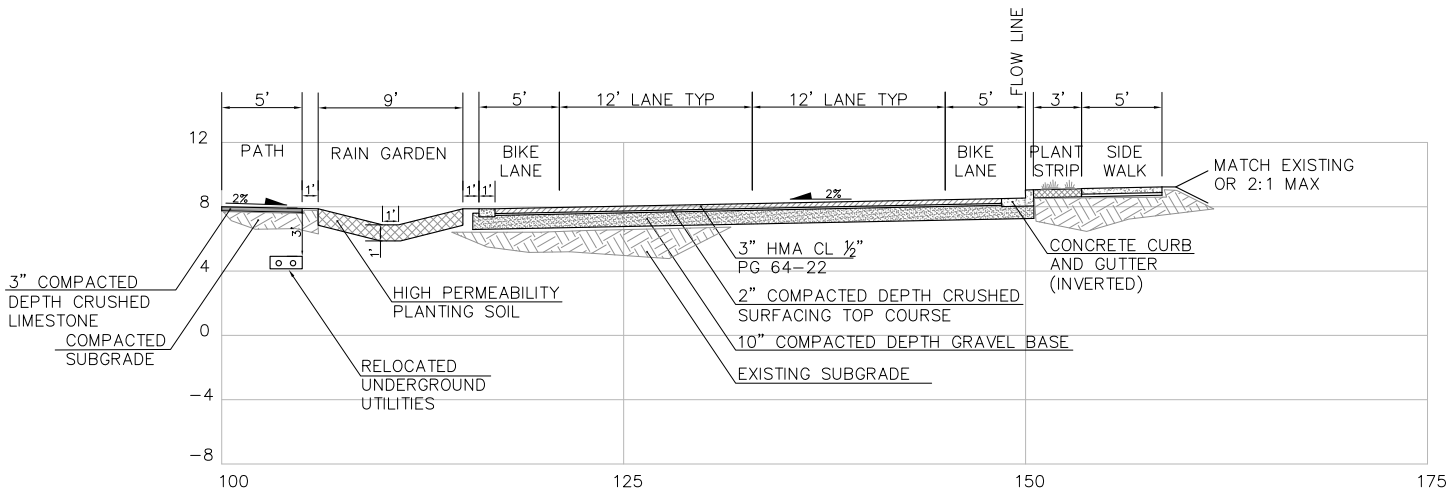
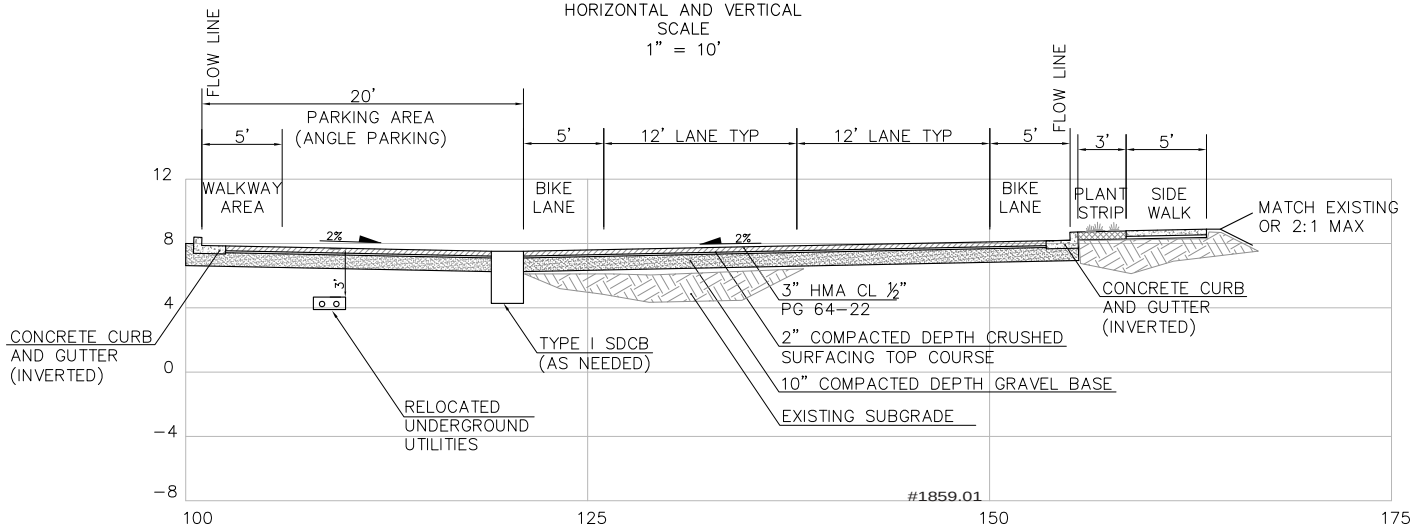
1. Gravel berm must match native material.

PWA



SECTION I

HORIZONTAL AND VERTICAL SCALE
1" = 10'



SECTION II

figure 4

Birch Bay Shoreline Enhancement

Typical Sections - Landside Central Reach

Source: David Evans and Associates Inc.

PWA

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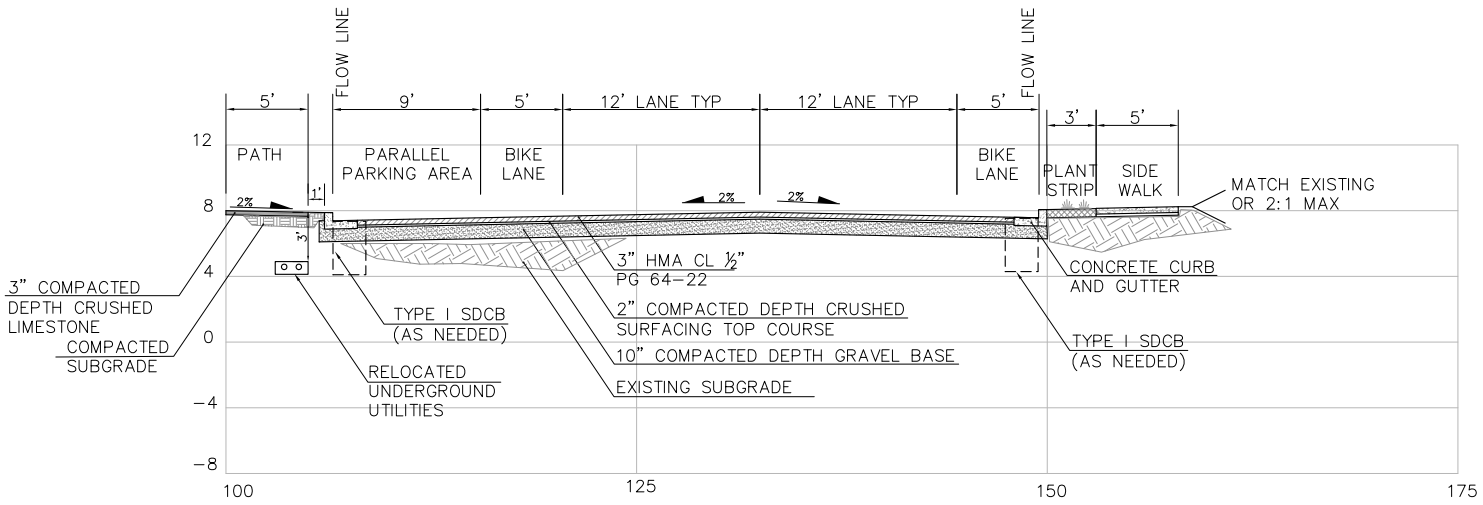
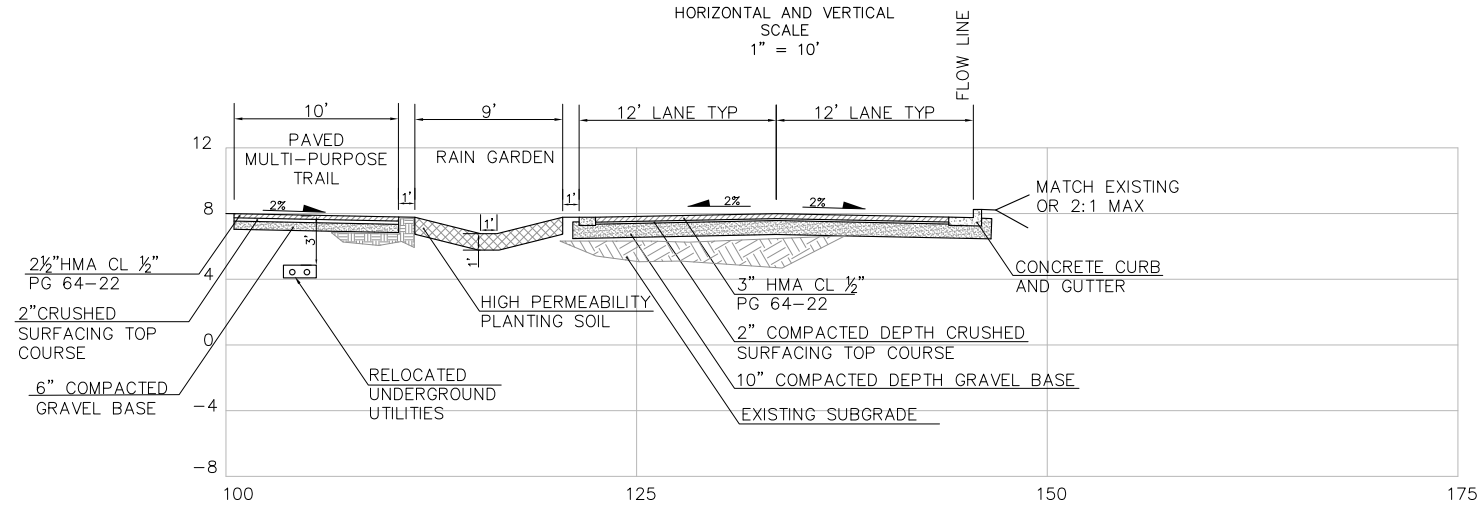
1. Utilities to be located under bike lane(s) and on landside of road, not under pedestrian trail, if practicable.



SECTION III



SECTION IV

figure 5

Birch Bay Shoreline Enhancement

Typical Sections - Landside Cotton Reach

Source: David Evans and Associates Inc.

PWA

#1859.01

1. Rev: Bike lanes and pedestrian path in Section III combined to single multi-purpose trail located on road shoulder with utilities beneath.
2. Rev: Locate raingarden on landside where existing drainage ditch is.

APPENDIX - B
COST ESTIMATE WORKSHEETS

APPENDIX - B
COST ESTIMATE DESCRIPTION AND WORKSHEETS

The cost estimate was conducted in a spreadsheet format with a summary worksheet linked to multiple worksheets for primary construction elements. Each worksheet is printed on a single page. The worksheet can be readily updated to assess alternative quantities and costs. The basis for the quantities and costs are described below.

Typical Cross-Section – Waterside

The typical cross-section was approximated based on designs developed by CGS for North Beach, Samish Island and Seahurst Park in Burien, as well as prior work by Bauer (1975) and PWA (2002), and PWA and others (2006), and observations of the test section constructed near Terrell Creek mouth (CGS, 2004). The typical cross-section was based on a surveyed cross-section from the water to across the existing Birch Bay Drive. The transect (transect 10) was located approximately 450 feet north of "The Beach House Restaurant" (formerly Stephanie's). Geometry of the new gravel berm is shown in the attached figure, and will extend approximately 75 feet seaward from the road. Gravel (up to approximately 2.5" max) will be first spread across the beach and built into a berm with crest width of 15 feet and elevation of 9 feet NGVD, sloping seaward at 6:1 (H:V). An approximately 1 foot thick layer of gravelly-sand mix (tentatively, select pit-run) will be spread on the waterward face of the gravel berm, also with a slope of 6:1. Coarse sand will be spread on the berm top up to elevation 10 feet NGVD, extending landward to the edge of pavement. Unit volumes were estimated to be:

- Gravel: 4.4 cy/lf (cubic yards per lineal foot)
- Gravelly sand: 1.9 cy/lf
- Sand: 0.9 cy/lf

Material unit costs were determined based on preliminary cost estimates provided by Ferndale Ready Mix to Jim Johannessen of Coastal Geologic Services in October 2007, along with previous experience costing beach nourishment projects in the region. The cost estimates provided by Ferndale Ready Mix were based on the approximate volumes of material provided in the spreadsheet, and based on the continued availability and anticipated near-term availability of a suitable source of high quality gravel (sound, durable, and rounded) not too far from the project site. Sand sources are not as critical as gravel. Costs for needed sediment delivered to the site provided were:

- Gravel: \$12/ton × 1.4 ton/cy = \$16.80/cy (cubic yard),
- Gravelly sand pit-run: \$9/ton × 1.35 ton/cy = \$12.15/cy, and
- Utility sand: \$11/ton × 1.35 ton/cy = \$14.85/cy, or
- Coarse sand pit-run: \$9/ton × 1.35 ton/cy = \$12.15/cy

These unit costs reflect the cost associated with delivery of the material to Birch Bay Drive, as opposed to in-place cost.

The width of site preparation was determined using a weighted average of work done without parking (30 feet wide) and with parking (10 feet wide). This resulted in a strip 23.6 feet wide to be prepped – including demo, clear and grub, and selective grading. Unit cost estimated to be about $2/sy.

Grading of materials include beach grading – gravel and gravelly sand – to be spread to certain elevations and extent as indicated in the typical cross-section, and fine grading in the back beach to establish the sandy berm top platform. Unit cost estimated to be about $3/sy, although CGS indicated that this price could probably be lowered to $1.50/sy to $2/sy.

A 10 foot wide strip is assumed to be representative of potential planting along the shoreline at Birch Bay, and is estimated to be about $2/sy.

The preceding items were compiled for Phases 1 and 2, and converted into a beach restoration cost per linear foot of shoreline. Added to the cost of beach restoration are removal of existing coastal structures (primarily failing concrete groins), relocation of a terminal groin, and renovation of an existing boat launch.

It is anticipated that gravel and sand will be delivered by truck entering Birch Bay Drive along Harborview or along Grandview-Blaine-Alderson Roads. Truck traffic will use Birch Bay Drive to access the shore renovation area to dump the imported gravels and sands at the roadside. Traditional land-based equipment will rough grade the dumped sediment, and fine grade the berm crest for planting and trail construction.

Landside Activities

Cost estimate for landside activities was prepared by David Evans and Associates, Inc. based upon the following criteria for the reaches:

Central Reach (per Sections I, II & III)

- Demolition of existing asphalt where it conflicts with proposed construction
- Construction of new roadway section consisting of two 12’ travel lanes; two 5’ bike lanes; curb, gutter, and sidewalk on the landside; and concrete edge on the waterside.
- Reconstruction of the existing parking areas.
- 5’ wide crushed limestone pedestrian path.
- Raingarden where no parking exists and closed storm system adjacent to parking
- Underground utilities (electrical, telephone, and cable television
- Landscaping in landside planter strip

Cottonwood Reach (per Sections I, II, III, & IV)

- Demolition of existing asphalt where it conflicts with proposed construction
- Construction of new roadway section conforming to the Central Reach section where existing parking is located.
- Reconstruction of the existing parking areas.
- Construction of new roadway section consisting of two 12’ travel lanes; curb, gutter, and sidewalk on the landside; and concrete edge on the waterside.
- Raingarden where no parking exists and closed storm system adjacent to parking
- Underground utilities (electrical, telephone, and cable television)
- Bike lanes extending northward to the Coast Millennium Trail transition point 10’ wide Coast Millennium Trail where no existing parking is located.

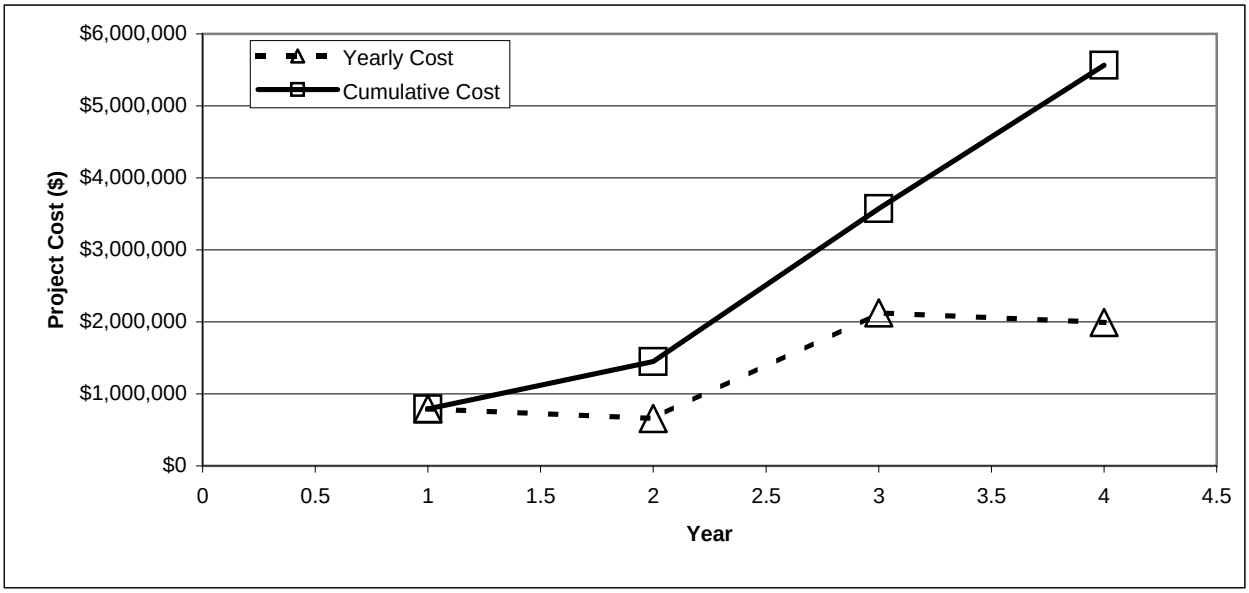
Phase	Year	Cost	Cum Cost	Description
PHASE 1	1	$790,359	$790,359	Waterside
PHASE 2	2	$657,764	$1,448,123	Waterside
PHASE 3	3	$2,124,143	$3,572,266	Landside
PHASE 4	4	$1,993,174	$5,565,440	Landside
Total		**$5,565,440**		

Item	Quantity	Unit	Unit Price	Cost
PHASE 1 - CENTRAL REACH - SOUTH - WATERSIDE				
Mobilization				**$48,500**
Mobilization	1	ls	$48,500	$48,500
Waterside Actions				**$559,468**
Remove Coastal Structures	23	ea	$5,000	$115,000
Beach Restoration	3,070	lf	$140.22	$430,468
Relocate (E) Terminal Groin	1	ls	$5,000	$5,000
New Outfalls	3	ea	$3,000	$9,000
Subtotal				**$607,968**
Contingency (30%)				**$182,390**
Total				**$790,359**

Item	Quantity	Unit	Unit Price	Cost
PHASE 2 - CENTRAL REACH - NORTH - WATERSIDE				
Mobilization				**$40,500**
Mobilization	1	ls	$40,500	$40,500
Waterside Actions				**$465,473**
Remove Coastal Structures	10	ea	$5,000	$50,000
Beach Restoration	2,790	lf	$139.60	$389,473
Transitions at (E) Boat Launch	1	ls	$20,000	$20,000
New Outfalls	2	ea	$3,000	$6,000
Subtotal				**$505,973**
Contingency (30%)				**$151,792**
Total				**$657,764**

Item	Quantity	Unit	Unit Price	Cost
PHASE 3 - CENTRAL REACH - SOUTH - LANDSIDE				
Mobilization				**$81,000**
Mobilization	1	ls	$81,000	$81,000
Landside Actions				**$1,552,956**
New Road	5,130	lf	$124.51	$638,756
Pedestrian Trail	5,130	lf	$3.87	$19,833
New Bike Path	5,130	lf	$26.97	$138,357
Utilities	5,130	lf	$68.83	$353,115
Renovation of Parking	3,250	sy	$49.36	$160,415
Stormwater - Collection & Treatment	5,130	lf	$32.65	$167,480
New Crossings at Outfalls	5	ea	$15,000	$75,000
Subtotal				**$1,633,956**
Contingency (30%)				**$490,187**
Total				**$2,124,143**

Item	Quantity	Unit	Unit Price	Cost
PHASE 4 - COTTONWOOD REACH - NORTH - LANDSIDE				
Mobilization				**$76,000**
Mobilization	1	ls	$76,000	$76,000
Landside Actions				**$1,457,211**
New Road	6,290	lf	$105.60	$664,197
New Combined Bike Path/Ped. Trail	6,290	lf	$23.04	$144,929
Utilities	6,290	lf	$68.83	$432,962
Renovation of Parking	1,780	sy	$48.83	$86,923
Stormwater - Collection & Treatment	6,290	lf	$20.38	$128,200
Subtotal				**$1,533,211**
Contingency (30%)				**$459,963**
Total				**$1,993,174**



PHASE 1

lineal feet of rest 3,070 lf

Beach Restoration	Quantity	Unit	Unit Price	Cost
Site Preparation	8,033	sy	$2.00	$16,067
Gravel	13,631	cy	$16.80	$228,997
Gravelly Sand	5,833	cy	$12.15	$70,871
Sand	2,763	cy	$14.85	$41,031
Grading - Beach	19,464	cy	$3.00	$58,391
Fine Grading - Backbeach	2,763	cy	$3.00	$8,289
Planting	3,411	sy	$2.00	$6,822
Sub-total				**$430,468**

unit cost (per lineal ft) **$140.22 per lf**

PHASE 2

lineal feet of rest 2,790 lf

Beach Restoration	Quantity	Unit	Unit Price	Cost
Site Preparation	6,433	sy	$2.00	$12,867
Gravel	12,388	cy	$16.80	$208,112
Gravelly Sand	5,301	cy	$12.15	$64,407
Sand	2,511	cy	$14.85	$37,288
Grading - Beach	17,689	cy	$3.00	$53,066
Fine Grading - Backbeach	2,511	cy	$3.00	$7,533
Planting	3,100	sy	$2.00	$6,200
Sub-total				**$389,473**

unit cost (per lineal ft) **$139.60 per lf**

PHASE 3

Reach length 5,130 lf

Road Renovation	Quantity	Unit	Unit Price	Cost
Demo	15,105	sy	$5.00	$75,525
Excavation & Haul	6,105	cy	$13.50	$82,413
Gravel Base	7,079	ton	$10.20	$72,210
CSTC	1,283	ton	$26.00	$33,345
HMA Paving	2,155	ton	$70.00	$150,822
Curb & Gutter	5,130	lf	$14.00	$71,820
Conc. Transition	3,290	lf	$10.00	$32,900
Cement Conc. Sidewalk	2,850	sy	$33.00	$94,050
Planter Strip	1,710	sy	$8.00	$13,680
Crosswalks	5	ea	$500.00	$2,500
Signage	21	ea	$200.00	$4,104
Channelization	7,695	lf	$0.70	$5,387
Sub-total				**$638,756**

unit cost (per lineal ft) **$124.51 per lf**

PHASE 4

Reach length 6,290 lf

Road Renovation	Quantity	Unit	Unit Price	Cost
Demo	18,521	sy	$5.00	$92,603
Excavation & Haul	7,485	cy	$13.50	$101,049
Gravel Base	8,680	ton	$10.20	$88,538
CSTC	1,573	ton	$26.00	$40,885
HMA Paving	2,642	ton	$70.00	$184,926
Curb & Gutter	6,290	lf	$14.00	$88,060
Conc. Transition	5,350	lf	$10.00	$53,500
Crosswalks	6	ea	$500.00	$3,000
Signage	25	ea	$200.00	$5,032
Channelization	9,435	lf	$0.70	$6,605
Sub-total				**$664,197**

unit cost (per lineal ft) **$105.60 per lf**

PHASE 3

Reach length 5,130 lf

Pedestrian Trail	Quantity	Unit	Unit Price	Cost
Clearing & Grubbing	2,400	sy	$2.00	$4,800
Excavation & Haul	216	cy	$13.50	$2,916
Crushed Limestone	346	ton	$26.00	$8,986
Sub-total				**$16,702**

unit cost (per lineal ft) **$3.87 per lf**

PHASE 3

Reach length 5,130 lf

Bike Lane	Quantity	Unit	Unit Price	Cost
Demo	4,560	sy	$5.00	$22,800
Excavation & Haul	1,898	cy	$13.50	$25,624
Gravel Base	2,155	ton	$10.20	$21,977
CSTC	410	ton	$26.00	$10,670
HMA Paving	667	ton	$70.00	$46,683
Striping	10,260	lf	$0.70	$7,182
Lane Markings	34	ea	$100.00	$3,420
Sub-total				**$138,357**

unit cost (per lineal ft) **$26.97 per lf**

PHASE 4

Reach length 6,290 lf

Combined Bike/Ped Path	Quantity	Unit	Unit Price	Cost
Clearing & Grubbing	6,989	sy	$2.00	$13,978
Excavation & Haul	2,076	cy	$13.50	$28,022
Gravel Base	2,013	ton	$10.20	$20,531
CTSC	629	ton	$26.00	$16,354
HMA Paving	944	ton	$70.00	$66,045
Sub-total				**$144,929**

unit cost (per lineal ft) **$23.04 per lf**

PHASE 3

Reach length 5,130 lf

Underground Utilities	Quantity	Unit	Unit Price	Cost
Earthwork	4,750	cy	$22.50	$106,875.00
Electric	5,130	lf	$20.00	$102,600.00
Telecommunications	5,130	lf	$14.00	$71,820.00
Cable TV	5,130	lf	$14.00	$71,820.00
Sub-total				**$353,115**

unit cost (per lineal ft) **$68.83 per lf**

PHASE 4

Reach length 6,290 lf

Underground Utilities	Quantity	Unit	Unit Price	Cost
Earthwork	5,824	cy	$22.50	$131,041.67
Electric	6,290	lf	$20.00	$125,800.00
Telecommunications	6,290	lf	$14.00	$88,060.00
Cable TV	6,290	lf	$14.00	$88,060.00
Sub-total				**$432,962**

unit cost (per lineal ft) **$68.83 per lf**

PHASE 3

area of parking in reach 3,250 sy length = 1,840 ft

Renovation of Parking	Quantity	Unit	Unit Price	Cost
Demolition	3,250	sy	$5.00	$16,250
Excavation & Haul	4,063	cy	$13.50	$54,844
Gravel Base	1,528	ton	$10.20	$15,581
CSTC	293	ton	$26.00	$7,605
HMA Paving	520	ton	$70.00	$36,400
Curb & Gutter	2,024	lf	$14.00	$28,336
Striping	2,000	lf	$0.70	$1,400
Sub-total				**$160,415**

unit cost (per square yd) **$49.36 per sy**

PHASE 4

area of parking in reach 1,780 sy length = 940 ft

Renovation of Parking	Quantity	Unit	Unit Price	Cost
Demolition	1,780	sy	$5.00	$8,900
Excavation & Haul	2,225	cy	$13.50	$30,038
Gravel Base	837	ton	$10.20	$8,533
CSTC	160	ton	$26.00	$4,165
HMA Paving	285	ton	$70.00	$19,936
Curb & Gutter	1,034	lf	$14.00	$14,476
Striping	1,250	lf	$0.70	$875
Sub-total				**$86,923**

unit cost (per square yd) **$48.83 per sy**

PHASE 3

Number Storm Drain Crossings 5 ea

Storm Drainage Improvements	**Quantity**	**Unit**	**Unit Price**	**Cost**
New Laterals	5	ea	$15,000	$75,000
Sub-total				**$75,000**

unit cost (per storm drain crossing) **$15,000.00 ea**

PHASE 3

Reach length 5,130 lf

Stormwater Collection and Treatment	**Quantity**	**Unit**	**Unit Price**	**Cost**
Type 1 SDCB	8	ea	$1,000.00	$8,000
Storm Drain Pipe	1600	lf	$75.00	$120,000
New Bioswale	3,290	lf	$12.00	$39,480
Sub-total				**$167,480**

unit cost (per lineal ft) **$32.65 per lf**

PHASE 4

Reach length 6,290 lf

Stormwater Collection and Treatment	**Quantity**	**Unit**	**Unit Price**	**Cost**
Type 1 SDCB	4	ea	$1,000.00	$4,000
Storm Drain Pipe	800	lf	$75.00	$60,000
New Bioswale	5,350	lf	$12.00	$64,200
Sub-total				**$128,200**

unit cost (per lineal ft) **$20.38 per lf**

APPENDIX - C
REGULATORY REQUIREMENTS – SUMMARY TABLE

APPENDIX - C
REGULATORY REQUIREMENTS – SUMMARY TABLE

PERMITS/APPROVALS AGENCY	Regulated Activity / Project Trigger	SUBMITTAL REQUIREMENTS / DESIGN DETAIL AND SEQUENCING	PERMIT REVIEW TIMELINE
Endangered Species Act (ESA) Section 7 Consultation NOAA Fisheries, National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS) Initial review via: US Army Corps of Engineers	Necessary if project has federal nexus. Section 7 of the ESA requires all federal agencies to ensure that any actions they authorize are not likely to jeopardize a listed species or adversely modify its critical habitat. Project Trigger: Fill in waters of the U.S. /critical habitat triggers federal nexus.	Submittal form: ESA Section 7 Biological Assessment Design detail and sequencing: Typically prepared at >30% design level.	Varies, 1-2 months, assuming "no effect" determination. May also include additional time for review by federal funding agency.
National Historic Preservation Act – Section 106 consultation Washington Department of Archaeology and Historic Preservation (WDAHP) and potentially affected tribes.	Necessary if project has federal nexus and potential for ground disturbing activity or effects on historic properties. Consultation with WDAHP and potentially affected tribes is required. This is a consultation process, not a permit. Project Trigger: Proposed impacts to regulated waters triggers federal nexus.	Submittal form: Letter from County initiating consultation with WDAHP and tribes and requesting confirmation of "Area of Potential Effect" (APE). Design detail and sequencing: Project description sufficient to determine APE boundaries. If Cultural Resource Survey is required, need horizontal alignment and limits of disturbance.	The timing may vary depending on whether a Cultural Resource Survey is required.
Clean Water Act Section 404 Permit (Nationwide Permit 27- Aquatic Habitat Restoration, Establishment, and Enhancement Activities or possibly an Individual Permit) US Army Corps of Engineers	Section 404 of the Clean Water Act, prohibits the discharge of dredge or fill material into waters of the United States, including special aquatic sites such as wetlands, without a permit from the Corps of Engineers. Project Trigger: Intertidal fill.	Submittal form: Joint Aquatic Resources Permit Application (JARPA). Design detail and sequencing: • Project description, wetland impact amount, site plans at 30-60% design.	12-18 months
Clean Water Act Section 401 Water Quality Certification Washington Department of Ecology (Ecology)	Triggered by a federal permit (COE 404 permit) or license to conduct any activity that might result in a discharge of dredge or fill material into water or jurisdictional wetlands. Required if construction occurs in or over water, including wetlands. Project Trigger: Section 404 Permit	Submittal form: JARPA application. Design detail and sequencing: • Project description, wetland impact amount, site plans at 30-60% design.	Up to one year to approve, condition, or deny.

PERMITS/APPROVALS AGENCY	Regulated Activity / Project Trigger	SUBMITTAL REQUIREMENTS / DESIGN DETAIL AND SEQUENCING	PERMIT REVIEW TIMELINE
Coastal Zone Management (CZM) Act Consistency Determination Washington Department of Ecology	Triggered by COE 404 Permit for jurisdictional wetlands. Required if construction occurs in or over water, including wetlands in coastal counties (includes Whatcom County). Project Trigger: Section 404 Individual Permit	Submittal form: JARPA and CZM Certification form. Design detail and sequencing: Detailed project description, associated facilities, and their coastal zone effects. Typically prepared at 30-60% design level.	Certification is submitted to the Corps along with the JARPA. The Corps forwards the Certification to Ecology. Ecology has 180 days for licenses, permits or funding projects to render a decision.
Construction Stormwater General Permit (NPDES) Washington Department of Ecology	Required for soil disturbing activities such as clearing, grading, excavation, and/or demolition that will disturb 1 acre or more of land and have a discharge of stormwater into surface waters. Likely required for discharge of dewatering water. Project Trigger: Disturbance of over 1 acre during construction.	Submittal form: Notice of Intent (NOI) form submitted at least 60 days prior to start of construction. Design detail and sequencing: Detailed project description (disturbance area, staging and access areas); Stormwater Pollution Prevention Plan Temporary Erosion and Sedimentation Control Plan (TESC) Plan - typically 90% design level.	Permit coverage cannot be granted sooner than 31 days from date of public notice. Approval process typically between 45 and 180 days depending on the complexity of the project.
State Hydraulic Code - Hydraulic Project Approval (HPA) Washington Department of Fish and Wildlife (WDFW)	Permit applies to work that uses, diverts, obstructs, or changes the natural flow or bed of waters of the state. Project Trigger: Work waterward of ordinary high water.	Submittal form: JARPA application. Design detail and sequencing: Project description, wetland impact amount, plans for work within the OHWM at 90% design. Plans for proper protection of fish including maintenenance or enhancement of forage fish spawning habitat forage fish.	Maximum 45-days after application and SEPA compliance are complete.

APPENDIX - D
PICTURES OF 1982 STORM CONDITIONS

APPENDIX - D
PICTURES OF 1982 STORM CONDITIONS

The following 10 photographs of storm conditions in 1982 at Birch Bay Drive were taken by Edith Loe. Jerry Larson provided the photos to Jim Johannessen and provided a brief description as follows:

"I finally was able to make contact with the lady that had the pictures. The pictures were taken by Edith Loe who has since move to Montana and is living in an assisted living place. The pictures were given with no restriction.

Most of the pictures are of Cedar to Beach Way area.

She had written on some of the pictures saying that the damage was from the State Park to the Village. She lived in Cottonwood so most of the pictures are of that area." - Jerry Larson in e-mail to Jim Johannessen

Figure D-1

Figure D-2

Figure D-3

Figure D-4

Figure D-5

Figure D-6

Figure D-7

Figure D-8

Figure D-9

Figure D-10