

**Project Design Report
SRFB Project No. 09-1443N
Cottonwood Island Slough Design – Phase 2**

**Prepared for:
Washington Salmon Recovery Funding Board
Recreation and Conservation Office
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SRFB Project No. 09-1443N “Cottonwood Island Slough Design – Phase 2” Project Design Report

EXECUTIVE SUMMARY

This design report is intended to satisfy Special Condition No. 1.4. of PSAR Project Agreement, RCO #09-1443N “Cottonwood Island Slough Design – Phase 2.” Specifically, the design report identifies and explains the relevant factors upon which the project sponsor, Skagit Conservation District (SCD), based the project’s preliminary engineering design. When implemented, the project is anticipated to reactivate Cottonwood Island Slough, a relic side channel of the Skagit River, and result in about 9.4 acres of additional rearing habitat for outmigrating Chinook salmon. The restored habitat is expected to provide sufficient ecological carrying capacity to provide for between 2.1 and 4.8 percent of the numerical population goals identified in the *Skagit Chinook Recovery Plan*.

The report identifies several specific objectives for meeting the project’s general ecological, engineering and land use goals. It then develops various alternatives for meeting the specific objectives, each of which based on a preferred design scenario that was identified in a previous study, the *Cottonwood Island Feasibility Assessment* (SRFB Project No. 06-2211N). Each of the alternatives is evaluated according to its relative ability to achieve the specific objectives. Based on the evaluation, a preferred alternative, which is referred to as the “Minimum Channel” alternative, was selected as achieving the overall most favorable fit of the various evaluation criteria. Finally, the report describes the preliminary design of the preferred alternative, presents a preliminary cost estimate of \$1.4 million for implementing it, outlines a general sediment maintenance approach, and describes public and regulatory consultation activities that have been completed to date.

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1. Introduction

This design report is intended to satisfy Special Condition No. I.4. of PSAR Project Agreement, RCO #09-1443N “Cottonwood Island Slough Design – Phase 2.” Specifically, the design report identifies and explains the relevant factors upon which the project sponsor, Skagit Conservation District (SCD), based the project’s preliminary engineering design. This design report is intended as a supplement to the in-depth hydraulic engineering design study prepared for the project by Northwest Hydraulic Consultants, titled *Conceptual Design Report for Cottonwood Slough Restoration Project* (NHC, 2011). The PRISM file for project 09-1443N contains a copy of this study, as well as copies of all other technical reports prepared for the project.

1.1. Purpose of the Project

The purpose of the project was to prepare a preliminary engineering design and regulatory permit applications for a project to restore rearing habitat for ESA-listed Chinook salmon in the nearly mile-long Cottonwood Island Slough near Mount Vernon, Washington. The eventual implementation of the design is anticipated to make a significant contribution to meeting the ESA recovery goals identified in the *Skagit Chinook Recovery Plan* (SRSC, 2005).

1.2. Relation of Project to the Skagit River’s Chinook Recovery Goals

Restoration of rearing habitat in Cottonwood Island Slough is listed explicitly as element No. 10.3.8 of the *Skagit Chinook Recovery Plan*. The preliminary design described in this report is anticipated to reactivate river flow and fluvial processes into about 9.4 acres of key side-channel rearing habitat. The Skagit Chinook Recovery Plan’s fisheries carrying capacity model estimates that the additional rearing habitat can support roughly 8,370 to 19,020 additional Chinook parr migrant smolts annually.¹ These figures equate to between 2.1 and 4.8 percent of the Recovery Plan’s target recovery goal of 400,000 annual additional smolts.

1.3. Previous Work Context

The preliminary project design evolved through the course of three feasibility and design studies sponsored by Skagit Watershed Council member organizations over the course of ten years. The *Big Bend Reach Feasibility Study* (SRFB Project No. 01-1355N) identified Cottonwood Island Slough as a particularly promising site for restoring off-channel rearing habitat in the lower main stem of the Skagit. Later, the *Cottonwood Island Feasibility Assessment* (SRFB Project No. 06-2211N) modeled key sediment transport and river flow dynamics that would affect the feasibility of the restoration design at the site, and evaluated the effect of these dynamics on three alternative design scenarios. The present study developed a preliminary engineering design and initiated the regulatory permitting process for implementing the preferred alternative design scenario that was identified in the 2006 feasibility study. An evaluation of the various alternatives is presented in Section 4, below.

1.4. Overall Design Theme

The preliminary design draws from two general themes for restoring salmon habitat in Western Washington. To the extent feasible, the design attempts to restore the natural habitat-forming

¹ This estimate is based on a low carrying capacity range of 0.22 smolts per square meter of side-channel floodplain habitat (*Skagit Chinook Recovery Plan*, p. 128) to a high range of 0.5 smolts per square meter of off-channel floodplain habitat in the Riverine Tidal Delta reach of the Skagit (E. Connor, Seattle City Light, personal communication to SCD). The anticipated restored area totals 9.4 acres, which equates to 38,040 m².

landscape processes of flooding, sediment deposition, channel migration and large wood debris (LWD) recruitment that historically formed side channel habitat along the lower Skagit. At the same time, however, the design approach utilizes engineering components to manage unnaturally high sediment deposition patterns that otherwise would necessitate excessive maintenance dredging of the channel inlet area. SCD believes that this blending of natural process and engineered structures is necessary to respond to the impacts of human manipulation of the Skagit main stem over a much larger scale than can be addressed by any single habitat restoration project. Extensive bank armoring and levee construction for miles upstream along the Skagit have constricted the floodplain and locked the river thalweg against the opposite bank in the project site vicinity, resulting in an unnaturally-high sediment deposition regime along Cottonwood Island. The integration of natural process-based and engineered structural elements that underlies the preliminary project design is described in Section 4 and in the accompanying engineering design study (NHC, 2011).

2. Site Description

2.1. Characterization of Site Conditions

Several studies have been completed to characterize the historical evolution and the physical and ecological characteristics of the Cottonwood Island Slough project site. Reports of these studies are included as attachments in the PRISM file for SRFB Project 09-1443N or the preceding Feasibility Analysis, SRFB Project 06-2211N. These studies cover the following topics:

Historical evolution of channel morphology:

Conceptual Design Report for Cottonwood Slough Restoration Project (Northwest Hydraulics Consultants, 2011)

Cottonwood Island Restoration Feasibility Study – Hydrodynamic and Sediment Transport Analysis (Battelle Memorial Institute PNW Lab, 2007)

Bathymetry and Topography survey

SCD and staff from the Nooksack Salmon Enhancement Association (NSEA) and Skagit Fisheries Enhancement Group (SFEG), 2010 (raw topographical survey data)

Northwest Hydraulic Consultants, 2010 (raw bathymetric survey data)

Hydrology and Geohydrology

Conceptual Design Report for Cottonwood Slough Restoration Project (Northwest Hydraulics Consultants, 2011)

Skagit Conservation District, 2010 (raw monitoring data)

Sediment Transport Dynamics

Conceptual Design Report for Cottonwood Slough Restoration Project (Northwest Hydraulics Consultants, 2011)

Cottonwood Island Restoration Feasibility Study – Hydrodynamic and Sediment Transport Analysis (Battelle Memorial Institute PNW Lab, 2007)

Soils and Geotechnical Evaluation

Geotechnical Engineering Consulting Services, Cottonwood Island Slough Habitat Restoration Design Project (Geoengineers, Inc. 2011)

Wetlands and Critical Areas

Cottonwood Island Slough Wetland and Habitat Conservation Area Reconnaissance Report (Pacific Ecological Consultants, LLC, 2010)

Cultural Resources

Cultural Resources Assessment for the Cottonwood Island Slough Habitat Restoration Project, Skagit County, Washington (Cultural Resources Consultants, Inc., 2011)

Biological Resources and Impact Analysis

Informal ESA Consultation for Impacts to Listed Species and Critical Habitat from Cottonwood Island Slough Restoration Project (Marine View Fisheries Consulting, 2011)

2.2. Summary of Key Conditions

Of the extensive information developed by the studies listed in Section 2.1, the following site characteristics are most pertinent to the development and evaluation of habitat restoration alternatives for the site.

- The 1889 USC&GS T-Sheet depicts Cottonwood Island Slough as being a major channel of the Skagit River, with a width 1.5 to 2 times greater than the eastern channel (which is now the main channel).
- By the 1980s, the slough had filled in to a state where it only entrained flow from the Skagit River at a frequency of only a few days each year.² Several circumstances are believed to have contributed to the isolation of the slough, including disruption of sediment deposition patterns on the Skagit River's floodplain by the levee system, which results in unnaturally high rates of deposition as the River emerges from the long, constricted leveed reach at the upstream end of Cottonwood Island; construction of road fill across the upstream and downstream end of the slough to facilitate sand quarrying on Cottonwood Island in the 1960s; and evidence that the inlet was shifted a few hundred feet downstream, further into the sediment deposition zone, during construction of WDFW's fishing access parking lot in the early 1970s³.
- The hydraulic gradient of the Skagit River between the upstream (inlet) end of the slough and the downstream (outlet) end typically drops about 1.5 feet in elevation. Tidal backwatering of the outlet does occur at high tide, but the effect is slight. The tidal influence is negligible at high river flow conditions.

² As of January 2010, river flow entered the existing slough inlet at flows above approx. 33,000 cfs (measured at the USGS Mount Vernon gage)

³ Although it is speculative whether the slough inlet was shifted to its current, downstream location during parking lot construction, the following sources support this speculation:

- Personal testimony by Mr. Ray DeVries, a life-long resident and owner of land adjacent to the project area, that the slough inlet formerly was located where the parking lot and boat ramp are now located;
- Comparison of the inlet location in pre-parking lot photos with post-construction photos, showing that the even up to 1956, the northern bank of the inlet was about 200 feet upstream of the current inlet location;
- The presence of extensive dredge spoils, knotweed infestation and relatively young alder trees immediately south of the parking lot and boat ramp, indicating land disturbance and filling in the recent past.

- Sediment conditions in the majority of the existing slough are fairly uniform fine sand, with D_{50} typically measured in the range of 0.1 to 0.2 mm. Modeling of sediment transport dynamics in the Skagit River show an exponential relation between flow rate and sediment load, with maximum November sediment loads exceeding the monthly average by a factor of 10 (NHC, 2011). Key implications of the sediment transport regime on the design of the slough reactivation are addressed in detail in Section 9 of the NHC report.
- Approximately 4.1 acres of the downstream half of the slough channel are characterized as Category 3 Palustrian Shrub-scrub (PSSC) open water wetland. Cottonwood Island in general is covered with a mature cottonwood and alder forest, interspersed with occasional spruce and cedar, and provides high quality wildlife habitat.

3. Specific Design Objectives

SCD and staff from various stakeholder organizations identified the following specific design objectives to guide the development of the preliminary design.

3.1. Ecological

- Provide juvenile salmonid access into the reactivated slough during at least the duration of the Chinook outmigration period of March through June.
- Ensure water depth and velocity conditions in the slough that represent the ecological niche occupied by Chinook juveniles, specifically a depth range of 0.5 to 5.0 feet and a velocity range of 0.5 to 1 feet per second.⁴
- Conserve the site's high-quality existing forest habitat, in particular nesting habitat for bald eagles.
- Preserve and enhance the diverse, mature forest and wetland conditions along the slough.

3.2. Engineering and Operational

- Keep the deposition of flood-born river sediment into the slough to a manageable level in order to minimize long-term maintenance costs of keeping the slough open.

3.3. Land Use

- Maintain (and ideally, improve) the existing local flood hazard management situation
- Provide continued public fishing access at the site
- Protect existing infrastructure in the vicinity of the site, particularly Skagit County Dike District No. 1's flood control levee and the Olympic Pipeline Company's gas pipeline.

⁴ These figures are based on guidance by Mr. Ed Connor, a fisheries biologist employed by Skagit City Light.

4. Identification and Evaluation of Restoration Alternatives

Identification and evaluation of restoration alternatives was completed at three distinct phases and levels of conceptual analysis during the 2006 feasibility analysis and subsequent 2009 preliminary design study. These evaluation phases are summarized as follows.

4.1. Phase 1 Alternative Analysis: Conceptual Design Scenarios (Project No. 06-2211N)

Battelle Memorial Institute's Pacific Northwest Lab identified three general design scenarios for restoring Chinook rearing habitat conditions in Cottonwood Island Slough. The Battelle study, which focused on a broader, reach level analysis than the subsequent No. 09-1443N study, modeled coarse-scale hydraulic and sediment transport dynamics to evaluate the effectiveness of the following alternatives compared to the existing condition:

- Setting back the right bank levee southward from the "spud house" potato processing plant at the intersection of Penn and Calhoun Roads and leaving the slough in its existing condition;
- Setting back the right bank levee and constructing a 30-meter wide trapezoidal channel along the slough alignment, with an invert elevation approximately 1 meter deeper than the existing condition;
- Keeping the levee in place and constructing a 15-meter wide trapezoidal channel along the slough alignment, with an invert elevation approximately 3 meters deeper than the existing condition, resulting in an elevation about the same of that of the Skagit River main stem.

Battelle's 3-D hydrodynamic modeling effort evaluated flow velocity, bed shear-stress and resulting sediment deposition characteristics for each design scenario and concluded the following:

Alternative 1

Alternative 1 did not significantly alter the hydrodynamics and sedimentation in the slough compared to the existing condition.

Alternative 2

Alternative 2 would achieve the Chinook rearing habitat design parameters of 0.1 m/sec flow velocity and 0.2 to 2.0 meter flow depth during average river flow conditions (16,500 cfs), but did not significantly alter the hydrodynamics and sedimentation conditions during high flow conditions.

Alternative 3

Alternative 3 would achieve the desired rearing habitat design parameters during average flow conditions. It also would reduce sedimentation at the inlet of the slough compared with the other alternatives under high-flow conditions. In low flow conditions, no significant sedimentation was predicted near the inlet.

Based on its improved hydraulic and sediment deposition characteristics and the fact that because it did not require setting back the right bank levee, the Battelle study identified Alternative 3 as the most cost-

effective design scenario. Subsequently, construction costs for implementing the Alternative 3 scenario were estimated at approximately \$3,000,000.⁵

4.2 Phase 2 Alternative Analysis: Preliminary Design Modeling (Project No. 09-1443N)

Drawing on the previous analysis and conclusions of the 2007 Battelle study, SCD and NHC subjected Battelle’s preferred design scenario (Alternative 3) to a finer-scale and more detailed modeling study. Additional alternatives were identified to test the effectiveness of various designs in meeting the project’s specific ecological and engineering objectives. Although each of these alternatives was consistent with the basic design scenario of Battelle’s Alternative 3, they differed by key design details. The alternatives and their analysis are described in detail in Section 7 of the NHC report. A summary of the evaluation of each alternative is presented in the following table:

Summary of Evaluation of Design Alternatives

Evaluation Criteria	Design Alternative			
	Existing Condition (“No action”)	Backwater Channel	Minimum Channel	Large Channel
Chinook rearing habitat restoration	No Chinook rearing habitat	No additional Chinook rearing habitat, but will add about 5 acres of marginal habitat for coho and chum	Will restore 9.4 acres of high quality Chinook rearing habitat	Will restore 15+ acres of Chinook rearing habitat, but less shallow/edge habitat than the “Minimum Channel” alternative
Forest and wetland conservation	High quality forest and wetland habitat conserved	Will impact 3.5 ac. of wetland and 1.4 ac. of forest. (Impacts would be mitigated)	Will impact 3.5 ac. of wetland and 2.8 ac. of forest. (Impacts would be mitigated)	Will impact 3.5 ac. of wetland and about 5 ac. of forest (Impacts would be mitigated)
Engineering (sediment management)	Not addressed. Sediment will continue to fill relic slough.	Sediment will continue to fill slough inlet but not significantly impact the new backwater channel.	Channel self-clearing during typical conditions. Up to 2.5 feet of sediment may accumulate in the upstream end during over-bank floods. Frequency of sediment events can be reduced by design.	Channel self-clearing during typical conditions. Deeper thalweg will entrain coarser sediment, with higher sedimentation during floods. Channel sides below the water table will be prone to sloughing.
Cost – capital	None	Low	Moderate	High
Cost – O&M	None for slough.	None for slough.	Maintenance	Maintenance dredging

⁵ Skagit Watershed Council Cottonwood Island Restoration Preliminary Engineering Report (Leonard Budinot and Skodje, Inc. 2008).

	WDFW parking lot maintenance costs will continue at existing level	WDFW parking lot maintenance costs will continue at existing level	dredging of channel may be needed above 2-year flood events. Parking lot O&M can be reduced by design. Dike District 1 can utilize the sediment.	of channel may be needed above 2-year flood event. Quantity and cost higher than minimum channel. Parking lot O&M costs not addressed.
Protect Existing Infrastructure)	Neutral	Neutral	No impact on levees, may impact fishing access depending on inlet design	Sloughing of deep channel sides could impact levees depending on design.

Based on this first level screening, NHC’s “Minimum Channel” Alternative was identified as the most promising in that it performed best overall in meeting the specific objectives. In order to improve its performance at meeting the engineering objective, a range of sub-alternatives related to the location and design of the channel inlet were then tested. These sub alternatives included:

- Keeping the existing channel inlet location,
- Moving the inlet to approximate the historic (pre-1970s) location in the vicinity of the existing WDFW boat ramp and parking lot,
- Various combinations of engineered elements to manipulate the local flow field at the inlet and to reduce the frequency of flood-born sediment intake. These sub-alternatives are described and evaluated in detail in Section 7 of the NHC report.

Based on this second level screening, it was determined that locating the channel inlet near to its historic, pre-1970s location and constructing several engineering components to induce inlet scour and reduce the frequency of flood-born sediment intake provided the best overall performance for meeting the engineering objective for “Minimum Channel” design alternative. None of the sub-alternatives differed significantly in their impact on nearby major infrastructure (i.e. flood control levee and gas pipeline). The inlet structure would likely have a very small local effect on flood elevation rise for the Skagit River, but a Skagit County Dept. of Public Works floodplain management staff does not believe that the effect would be significant.⁶ Depending on the final design, the effect of changing the inlet location on public fishing access could be considerable, as discussed in Section 4.3.

4.3. Phase 3 Alternative Analysis: New Inlet Configuration Evaluation (Project No. 09-1443N)

Finally, the study considered the land use impact of three alternative inlet configurations for the “Minimum Channel” alternative. In particular, WDFW staff and staff from SRSC’s and the Upper Skagit Indian Tribe’s natural resources departments considered the effect that three alternative inlet

⁶ Personal communication with Skagit Co. DPW Floodplain management official Tim DeVries, Nov. 2010.

configurations would have on public fishing access.⁷ Three alternative configurations were identified. The capital (construction) cost of the three options was assumed to be roughly equivalent.

Option A

Construct the new slough inlet in the existing parking lot and construct a bridge over the slough and a new parking lot to access the existing boat ramp;

Option B

Construct the new slough inlet at the south edge of the existing parking lot and construct a new, deeper water boat ramp immediately upstream of the inlet;

Option C

Construct the inlet and a new boat ramp in the existing parking lot and construct a new parking area on the landside of DD1's levee, in the area currently occupied by a seepage berm.

The following table summarizes the WDFW and tribal staff's comments on the three options.

Summary of Effect of the Inlet Configuration on Public Fishing Access

Option	Staff Comments
A: Construct a bridge to the existing boat ramp	Being located in a quiet backwater area prone to high sedimentation, the existing boat ramp is too shallow to launch boats during much of the fishing season. Building a bridge over the new slough inlet to access the boat ramp would not improve the fishing access. The long driveway and turn-around at the boat ramp increases WDFW's annual maintenance costs and attracts trash dumping and partying. Raising the parking lot grade would make it harder to fish from the bank during low water conditions.
B: Relocate the boat ramp	A new boat ramp in the faster flowing, less sediment prone area along the existing parking lot would improve boat access, but it would reduce the area available for the public to park along the bank and fish from their vehicles. Raising the parking lot grade would make it harder to fish from the bank during low water conditions.
C: Construct a new parking lot west of the levee	Relocating the parking lot across the dike would eliminate the popular practice of parking along the bank and fishing and socializing from vehicles. WDFW's existing easement across Dike District 1's levee does not include parking, so the easement would have to be renegotiated. Raising the parking lot grade would make it harder to fish from the bank during low water conditions.

Based on the input from WDFW and tribal staff, it was determined that Option B represented the least impact on public fishing access.

⁷ No funding was available in the project grant to perform a survey of members of the public who use the "Spud House" fishing access. Instead, the opinions of WDFW and tribal fisheries staff members were considered to be reasonably representative of the public's opinion on this issue.

5. Preferred Alternative

5.1. Description of the Preferred Alternative

Based on the evaluation of the various criteria described above, SCD determined that the “Minimum Channel” alternative, as modified with the following design elements, presents the best overall match for the various ecological, engineering, and land use specific objectives.

- Locating the inlet at the south edge of the existing parking lot (close to its historic location)
- Engineering the inlet structure to optimize flow fields for reducing sediment intake
- Raising the grade of the parking lot and installing closable floodgates to eliminate sediment deposition in the channel at water levels below a 5-year flood stage
- Widening and deepening the first few hundred feet of the channel to allow for sediment storage
- Negotiating with Dike District 1 to take responsibility for operating the inlet flood gate and removing sediment from the parking lot, boat ramp and channel inlet
- Enhancement of instream and riparian habitat quality, including placement of large wood material structures, inter-planting of conifers within a riparian buffer along each side of the slough, eradicating about 1.1 acres of invasive knotweed in the vicinity of the exiting slough inlet/parking lot dredge spoils area and replanting this area with native forest plants.

The preferred alternative is shown in the preliminary project plans.

5.2. Construction Cost Estimate

SCD contracted with Interwest Construction, Inc. (ICI) to provide recommendations on construction techniques and to prepare a construction cost estimate for implementing the preferred preliminary project design. Using ICI’s input and our own experience with implementing habitat restoration projects of this type, SCD developed the project cost estimate shown in Appendix 1. A summary of the estimated costs is shown below:

Summary of Project Implementation Costs

Item	Cost Estimate
Administration and Engineering (Including final design, permitting, construction management, etc.)	\$94,000
Construction (all costs, including tax)	\$1,293,000
Three years maintenance and adaptive management (Maintaining plantings and sediment removal, as needed)	\$40,000
Total	\$1,427,000

5.3. Sediment Management Approach

Hydraulic engineering modeling has identified management of sediment deposition in the upstream end of the channel as the most important operational issue associated with the preferred design alternative. As described in Section 5.1, the design includes various features to prevent entrainment of large quantities of sediment into the channel at river flow rates below the 5-year flood level of approximately 94,000 cfs. A key operational factor for supporting the design is the closure of the inlet floodgates during the typical high flow season of late autumn to late winter. Skagit County Dike District No 1 (DD1) commissioners have expressed interest in taking responsibility for operating the floodgates⁸, and a formalization of this arrangement would likely be included as a condition of the project's construction permits and final approval by WDFW.

Preliminary modeling indicates that a significant quantity of sediment would accumulate in the upstream several hundred feet of the channel in the event of an over-bank flood event. While most of this material would eventually be transported out of the channel when flow rates return to normal, it may become necessary to dredge the first few hundred feet of channel in order to remove a sediment "wedge" that might block normal flows. The widened channel immediately downstream of the inlet is designed to allow for construction vehicle access in the event that dredging is necessary. DD1 commissioners have expressed interests in taking responsibility for periodic maintenance dredging. Formalization of this arrangement would likely be included as a condition of the project's construction permits and final approval by WDFW.

6. Stakeholder Consultation and Regulatory Permitting

6.1. Stakeholder Consultation Activities

As part of the process for evaluating alternatives and developing the preliminary design, SCD consulted with several organizations, individuals and regulatory agencies that have an interest in the outcome of the project. These consultations took the form of both informal meetings and communications and written correspondence with regulatory agencies.

Stakeholder Meetings and Communications

SCD conducted the following informal communications:

- Maintained a page on our organization's website <http://www.skagitcd.org>, which contains a project description and key technical information such as consultants' reports,
- Maintained an email list serve of interested individuals and sent them periodic project status updates,
- Met with neighboring landowners Ray and John DeVries and Dean and Rachel Youngquist to explain the project and learn their views and their knowledge of the slough's history,
- Met with WDFW staff members from the LaConner and Mill Creek offices to discuss ongoing project plans and strategies,
- Met with the commissioners of Skagit Dike District No. 1 to update them on project plans and get their input,
- Convened a general meeting of list serve members at which NHC presented its technical findings and attendees gave input on their priorities for the various design alternatives,

⁸ Personal communication with SCD, April 2011.

- Corresponded with staff from Skagit River System Cooperative's and the Upper Skagit Indian Tribe's fisheries departments to get input on design alternatives,
- Corresponded with US Army Corps of Engineers staff regarding opportunities to link project plans with levee mitigation obligations of several Skagit County dike districts, and
- Presented a project status update at a meeting of the Skagit Watershed Council.

6.2. Correspondence with Regulatory Permitting Agencies

SCD initiated preliminary permitting correspondence with the US Army Corps of Engineers Regulatory Branch and Skagit County Department of Planning and Development Services to identify relevant permitting issues related to the preferred project design. Staff from both agencies reviewed the preliminary design and provided detailed comments and recommendations for how to ensure that the final design will be consistent with their regulatory programs.

References

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Cultural Resources Consultants, Inc., 2011. *Cultural Resources Assessment for the Cottonwood Island Slough Habitat Restoration Project, Skagit County, Washington.*

Geoengineers, Inc. 2011. *Geotechnical Engineering Consulting Services, Cottonwood Island Slough Habitat Restoration Design Project.*

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Marine View Fisheries Consulting, 2011. *Informal ESA Consultation for Impacts to Listed Species and Critical Habitat from Cottonwood Island Slough Restoration Project.*

Northwest Hydraulics Consultants, 2011. *Conceptual Design Report for Cottonwood Slough Restoration Project.*

Pacific Ecological Consultants, LLC, 2010. *Cottonwood Island Slough Wetland and Habitat Conservation Area Reconnaissance Report.*

Skagit System River Cooperative and Washington Department of Fish and Wildlife, 2005. *Skagit Chinook Recovery Plan.*

Appendix 1: Detailed Project Implementation Cost Estimate

**Cottonwood Island Slough Reactivation
Preliminary Construction Cost Estimate - May1 2011**

Item	Units	Unit Cost	No.	Cost	Comment
<u>Final Design, Contracting and Construction Management</u>					
Final Design and Specs (SCD)	hours	\$60	120	\$7,200	SCD staff
Consultant design support	l.s.	\$50,000	1	\$50,000	Structural, geotech, dewatering, etc
Cultural resources monitoring	l.s.	\$10,000	1	\$10,000	consultant contract
Permit and agency negotiation	hours	\$60	100	\$6,000	SCD staff
Bid and contract process	hours	\$60	80	\$4,800	SCD staff
Construction oversight-WICD	hours	\$60	80	\$4,800	SCD staff
Travel and materials	l.s.	\$1,000	1	\$1,000	
Project administration	hours	\$45	200	\$9,000	SCD staff
Supplies	l.s.	\$1,000	1	\$1,000	copying, bid publication, etc.
A&E Subtotal				\$93,800	A&E total = 6.9% of total budget
<u>Construction</u>					
<u>Group 1: Construction Initiation and Site Prep</u>					
1.1. Contractor permits	l.s.	\$20,000	1	\$20,000	WDOE stormwater, county ROW
1.2. Mobilization and demobilization	l.s.	\$45,000	1	\$45,000	Includes contractor's proj. Mgmt
1.3. Tree and brush clearing	ac.	\$4,500	5	\$22,500	Includes knotweed area
1.4. Grade haul roads	LF	\$0.75	5820	\$4,365	North side only (Note 1)
1.5. Ballast haul road with quarry spal	ton	\$38	150	\$5,700	cut from pasture, fill into lagoon
1.6. Temp contractor facilities	l.s.	\$25,000	1	\$25,000	Trailer, power hookup, etc.
1.7. TESC BMPs	LF	\$3	500	\$1,250	
1.8. CESCL	day	\$150	20	\$3,000	
<u>Group 2: Construction Dewatering</u>					
2.1 Upstream area - Portadam	LF	\$200	350	\$70,000	1 mo. Rental and installation
2.2 Downstream area - Portadam	LF	\$200	75	\$15,000	1 mo. Rental and installation
2.3 Dewater pumping	l.s.	\$32,000	1	\$32,000	
<u>Group 3: Channel excavation and Levee Supplementation</u>					
3.1 Channel excavation	cy	\$5.00	70,060	\$350,300	
3.2 Levee supplementation	cy	\$2.00	66,000	\$132,000	soil seepage berm (Note 2)
<u>Group 4: Inlet Area Grading and Armoring</u>					
4.1 Parking lot grading	cy	\$1.10	3000	\$3,300	
4.2 Miscellaneous grading	cy	\$3.50	1060	\$3,710	
4.3 Bank armoring	ton	\$24.50	1200	\$29,400	WSDOT light loose riprap
4.4 Stabilized soil embankment	cy	\$25.00	420	\$10,500	assumed unit cost
<u>Group 5: Concrete work at Inlet</u>					
<u>5.1 Structural sheet piling</u>	sf	\$25	5,250	\$131,250	estimate to be verified
5.1 Boat ramp	cy	\$500	27	\$13,500	Precast estimate (Note 3)
5.2 Inlet culvert	cy	\$1,800	54	\$97,200	Precast estimate
5.3 Inlet headwalls	cy	\$900	26	\$23,400	Cast in place - bckside only
<u>Group 6: Parking Lot Construction and Misc. Inlet Work</u>					
6.1 Flood gates	l.s.	\$60,000	1	\$10,000	Rough estimate
6.2 Fencing around inlet	LF	\$55	50	\$2,750	
6.3 Crushed rock parking surface	ton	\$25	1370	\$34,250	includes grading
6.4 Boat ramp foundation rock	ton	\$45	43	\$1,935	includes grading
<u>Group 7: Large Wood Material</u>					
7.1 LWM in channel	each	\$900	25	\$22,500	installed
7.2 LWM along inlet	each	\$1,500	7	\$10,500	installed

Cottonwood Slough
Prelim. Construction Cost Estimate

Group 8: Restoration planting

8.1 Hydroseeding - channel	ac	\$2,700	3.7	\$9,990	
8.2 Hydroseeding - levee berm	ac	\$2,700	7.3	\$19,710	
8.3 Interplanting riparian buffer	ac	\$7,500	5.0	\$37,500	(Note 4)
8.4 Knotweed eradication	l.s.	\$10,000	1	\$10,000	spraying
Construction subtotal				\$1,197,510	includes contingency (Note 5)
Sales tax				\$95,801	
Construction Total				\$1,293,311	
Maintenance and Adaptive Management					
Planting maintenance (3 years)	ac	\$2,000	5	\$10,000	contract-replanting/invasive control
Channel and inlet maintenance	year	\$10,000	3	\$30,000	
Maintenance subtotal				\$40,000	
Total Project Budget				\$1,427,111	

Notes

1. Add 2000 LF if need to construct another haul road on the south side of the slough
2. Seepage berm construction using excavated soil only. Any gravel dressing to be done at DD1's expense.
3. Price includes foundation work and crane for placing structure
4. Includes replanting 1.1 acre where knotweed was removed
5. ICI's estimates include a 10% contingency markup