EXHIBIT K-5
WILDLIFE AND WETLAND MITIGATION (REVISED)

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Introduction

The determination of wildlife (including wetland) mitigation requirements for the Columbia River Channel Improvement project takes into account the impacts to wildlife across a spectrum of habitats impacted by project disposal actions. Mitigation actions associated with the project do not focus only on jurisdictional wetlands as it does for a private party seeking a permit under Section 404 of the Clean Water Act. The mitigation analysis for the channel improvement project addressed wildlife impacts associated with upland habitats (including agricultural lands), riparian forest habitats, and wetland habitats.

The wildlife mitigation plan relied on the Habitat Evaluation Procedures (HEP), a U.S. Fish and Wildlife Service program selected as the analytical means to assess project-related wildlife impacts and mitigation attainment levels. An interagency mitigation team (Corps of Engineers, Washington Departments of Ecology and Fish and Wildlife, U.S. Fish and Wildlife Service, and the Oregon Department of Fish and Wildlife) was formed to determine mitigation levels. The wildlife mitigation plan and updated addendum were presented in the Final Integrated Feasibility Report/Environmental Impact Statement (Final IFR/EIS; August 1999, including Appendix G). Public and agency comments for the draft IFR/EIS were presented in that document.

The resource agencies that participated in the wildlife mitigation planning effort voiced a uniform concern, which centered on resolution of discrepancies, inconsistencies and/or inaccuracies in the HEP analysis for the draft wildlife mitigation plan. Two options to resolve these concerns were offered by the resource agencies. The Corps of Engineers decided to implement Option 1, which is shown below.

> Complete the HEP analysis by collecting data to represent all habitat types and reanalyze current and future conditions based on changes in individual habitat parameters. This re-analysis could be completed during the preconstruction engineering and design (PED) phase of the project.

Subsequent to the decision to implement Option 1, consultation under the Endangered Species Act was reinitiated and concluded with NOAA Fisheries and the U.S. Fish and Wildlife Service. Through this consultation process, the acreage of habitats impacted by the project was reduced further from that reported in the 1999 Final IFR/EIS, Addendum to the Wildlife Mitigation Plan. Currently, 172 acres of agricultural land, 50 acres of riparian forest and 16 acres of wetland habitat are anticipated to be impacted by project-related actions versus 200 agricultural, 67 riparian forest and 20 wetland acres reported in the1999 FIFR/EIS, Addendum to the Wildlife Mitigation Plan. In other words, the revisions made during consultation resulted in a 28 acre reduction in impact to agricultural habitat, a 17

acre reduction in impact to riparian forest habitat, and a 4 acre reduction in impact to wetland habitat.

Further discussions have been held with WDFW and WDOE to resolve their concerns pertaining to the Wildlife Mitigation Plan. To attain a more natural hydrology to the Woodland Bottoms wetland mitigation acreage, the Corps has proposed to remove the levees along Burris Creek that bisects these wetlands to allow natural flooding over the landscape to occur. To resolve Cowlitz County concerns regarding their Shoreline Master Program, it is now proposed to develop approximately 16 acres of tidal marsh habitat in the 32 acre Martin Island lagoon. An 80-acre site on Martin Island, proposed for upland disposal purposes in the 1998 DIFR/EIS would not be developed for mitigation purposes. As a result of these discussions, the Corps has refined the mitigation proposal as described above, and will not be performing the re-analysis previously contemplated.

The present mitigation proposal would see development of 132 acres of agricultural pastureland, 43 acres of riparian forest and 97 acres of wetland habitat at Woodland Bottoms, Washington; 159 acres of riparian forest and 23 acres of wetland habitat would be developed at Martin Island, Washington; and 74 acres of wetland habitat would be developed at Webb, near Westport, Oregon. Wildlife mitigation efforts to develop or enhance wildlife habitat will result in the physical alteration or improved management practices on 528 acres of the 740 acres authorized for wildlife mitigation purposes. Totals thus are 132 acres of agricultural pastureland, 202 acres of riparian forest and 194 acres of wetland habitat. The balance of the 740 acres of the real property acquired for mitigation purposes supports existing habitat, infrastructure (both existing and for mitigation features), or else is undevelopable for mitigation purposes.

Methods

Initial mitigation efforts focused on avoiding or minimizing impacts to wildlife habitat, to the extent practicable, during selection of dredged material disposal sites. Avoidance was accomplished by focusing disposal-siting efforts on existing and previously used disposal sites. Sites with wetland and riparian habitats or important wildlife resources were avoided to the extent practicable. Adjustment of disposal site boundaries to avoid riparian and wetland habitat, based upon site visits and review of aerial photography, also was used. Site boundaries were further adjusted and acreage decreased through the 2001 BA and during development of the Final SEIS.

The wildlife mitigation plan relied on a HEP analysis for evaluating project impacts and mitigation efforts. Detailed discussion of the HEP process as applied for this project is contained in the 1999 Final IFR/EIS, Appendix G. The HEP process used models of habitat variables for selected target species. These species-specific models are based upon habitat suitability indices for each habitat variable. The HEP process assessed both habitat quality and quantity for target species selected by the interagency mitigation team. Target species were selected as representative members of the habitats present in the areas of impact. Habitat variables important to each species, methods to measure these variables,

and species models that assign suitability indices (numerical scores) to habitat variables were identified. Existing HEP models were generally used in this process, modified by the interagency team where necessary, along with development of one new model.

The HEP analysis initially focused on determination of impacts from disposal actions. Habitat quantity was determined by mapping habitat acreage for each new upland disposal site. Riparian and wetland habitat that occurred within the boundaries of existing or previously used disposal sites was included in the loss assessment phase of HEP. Habitat quality was determined by field sampling of species-specific habitat variables at representative locations. Field data were summarized and species suitability indices for individual habitat variables were then identified. Mathematical equations were then used to determine habitat suitability indices, a quality value, for each species. Multiplication of habitat quantity and habitat suitability indices on a species-specific basis provided the number of habitat units lost per species. Species losses were reported as average annual habitat units (AAHUs), which is an estimate of the average number of habitat units lost per year over the project life of 50 years.

The mitigation phase of the HEP analysis focused on determination of the level of recovery associated with proposed mitigation actions. Mitigation sites were generally selected on the basis of large tracts of land with potential for habitat development and their nearness to national wildlife refuges or state wildlife management areas. These potential sites were analyzed to determine their baseline value to wildlife and the incremental increase in wildlife habitat value that could be attained through implementation of wildlife mitigation measures.

Existing habitats at potential mitigation sites were identified and quantified to determine the baseline condition. Physical measures that could be employed at each site to develop riparian, wetland or agricultural habitat features were identified and quantified. Habitat quality for target species was determined for mitigation sites as described for disposal sites; projections for future habitat conditions were made for each habitat developed through implementation of mitigation actions. Future projections were based on field sampling of habitat variables in representative habitats and professional judgment. The accumulated information was then analyzed to determine the number of AAHUs generated at each site by the proposed mitigation measures. The Corps will collect additional field data for those habitat types where professional judgment was initially used to estimate habitat suitability indices and thus verify/correct the estimates.

Once information on project-related losses and mitigation gains were identified, a determination of the number of mitigation sites required to offset losses was determined. The selection of which mitigation sites to use was determined by cost efficiency and incremental cost analyses per output.

Results

The mitigation team placed an emphasis on mitigation actions directed toward the development of wetland and riparian forest habitats and not a simple replacement in-kind

for the habitat impacted. Habitat acreage impacts identified in the subsequent text reflects changes to the Proposed and Least Cost disposal plans; these changes are also identified in Tables 1 and 2. Agricultural cropland (an upland habitat) was numerically the most impacted habitat (Proposed plan - 172 acres; Least Cost plan – 257 acres), as compared to wetland habitat (Proposed plan – 16 acres; Least Cost plan – 24 acres) and riparian forest habitat (Proposed and Least Cost – 50 acres). However, mitigating for agricultural cropland impacts was minimized in the mitigation plan for the proposed plan (132 acres to be managed as pasturelands); the plan currently calls for development or substantial improvement to 194 acres of wetland habitat and 202 acres of riparian forest habitat. The 202 acres of riparian habitat refers only to early successional riparian forest that would be developed on presently agricultural lands.

The mitigation plan for the Proposed disposal plan calls for development of 159 acres of early successional riparian forest at Martin Island and 43 acres at Woodland Bottoms. Twenty-three acres of wetland habitat, including 16 acres of intertidal emergent marsh habitat would be developed at Martin Island. Ninety-seven acres of wetlands at Woodland Bottoms and an additional 74 acres of wetlands at the Webb location would be developed. Agricultural habitat development (132 acres) would occur at Woodland Bottoms.

The emphasis placed by the mitigation team on implementation of wetland and riparian mitigation actions provided for a substantial acreage ratio for wetland mitigation compared to wetland impacts. The present ratio is approximately 12:1 when including wetland mitigation acreage in both states and 8:1 for Washington wetland mitigation acreage. It is believed that the HEP approach, in conjunction with the emphasis on wetland habitat mitigation, leads to mitigation greater in scope than if jurisdictional wetlands were determined and mitigation was based upon a predetermined ratio predicated upon the nature of the wetland mitigation action.

For wetland mitigation, the HEP process differed substantially from the standard approach used for Section 404 permit applicants. No delineation of jurisdictional wetlands was made for impacted sites (disposal locations). Nor are there established ratios for wetland mitigation efforts that depend upon whether the mitigation effort is based on wetland creation, improvement or restoration. Rather, the HEP evaluation was used to provide data on the scope of the mitigation effort. Impacts, as measured in average annual habitat units (AAHUs), were substantially more than offset by mitigation measures, also evaluated in the terms of AAHUs.

Wetland mitigation siting and implementation also differ from the in-kind, on-site mitigation normally sought under the Section 404 permit process. For the project, large blocks of mitigation acreage were sought rather than to mitigate in-kind and on-site. This mitigation approach allows for the development and/or restoration of large blocks of wildlife habitat with an interspersion of wetland and riparian habitat typically proposed. These large blocks of wetland and riparian habitat offer a more secure and diverse setting for wildlife populations.

If the mitigation approach were restricted to in-kind, on-site requirements, wetland mitigation would occur on small acreage parcels adjacent to lands subject to industrial development or intensive agricultural practices in addition to the disposal operations. Juxtaposition of other habitats such as riparian forest could not be assured. Essentially, we would form islands of habitat within an overall developed area that would lead to local extirpation of some species and reduced populations of other wetland species. Large mitigation areas with an interspersion of wetland and riparian habitats are expected to support a more diverse species assemblage and more stable population of species, including wetland-associated species.

Comments received regarding disposal sites in the 1998 Draft IFR/EIS prompted the Corps and project sponsors to remove several of them from further consideration and add alternate disposal sites for the mitigation plan presented in the 1999 Final IFR/EIS. The 2001 Biological Assessment resulted in additional modifications to disposal sites resulting in reduced impacts to wildlife habitats, particularly riparian forest. Table 1 shows the Proposed disposal plan, as currently configured (i.e., including changes made during the 2001 Biological Assessment process), and the habitat acreage by category for each disposal site. For comparative purposes, the revised least cost disposal plan, as currently configured, is shown in Table 2.

Changes made between the Draft and Final IFR/EIS are as follows. The Morse Brother's Pit (O-80.0) and Peavey Oval (W-73.5) disposal sites were dropped from the plan. The Washington Departments of Fish and Wildlife and Ecology raised concerns that mitigation actions would be required for disposal at Peavy Oval. Disposal sites added to the Proposed plan include W-71.9, W-67.5 and W-33.4. Site W-71.9 (27 acres) and a 12-acre addition to the Cottonwood Island site (for 62 total acres) are proposed to offset the loss of Peavy Oval for disposal purposes.

Changes made during the 2001 Biological Assessment process are as follows. The Mt. Solo disposal site (W-62.0) has been changed in configuration and reduced in acreage (50 to 46.6 acres) in order to avoid more wetland habitat and to meet 2001 BA requirements for a 300-foot setback from ordinary high water. The Gateway 3 (W-101.0) site has been reduced from 69 to 40 acres. The Lord Island disposal site (O-63.5) was reduced from 46 acres to 25 acres, thus avoiding impacts to 17 acres of riparian forest habitat.

As currently configured, the Proposed disposal plan substantially reduces the mitigation requirements compared to the least cost plan because the Proposed disposal plan impacts substantially fewer habitat acres, e.g., 172 acres (Proposed) versus 257 acres (least cost) of agricultural cropland impacts; 50 acres (Proposed) versus 67 acres (least cost) of riparian forest impacts; and 16 acres (Proposed) versus 24 acres (least cost) of wetland habitat impacts. As shown in Table 3, the estimated loss of average annual habitat units (AAHUs) for the Proposed plan (as configured in the 1999 Final IFR/EIS) is 445 AAHUs; losses for the least cost plan (as configured in the 1999 Final IFR/EIS) are estimated at 659 AAHUs. While here loss estimates do not reflect the changes to the Proposed and least cost plans developed as a result of the 2001 Biological Assessment process, all of these changes resulted in reductions in habitat impacts. Specifically, the proposed and least cost plans as

currently configured result in a 28-acre reduction in impacts to agricultural habitat, a 17-acre reduction in impact to riparian forest habitat, and a 4-acre reduction in impact to wetland habitat.

The mitigation package for the Proposed disposal plan would be a "balanced" mitigation plan to the extent practicable, with an effort to distribute mitigation actions equitably between Oregon and Washington based upon project-associated losses for each state. Currently, the balanced mitigation plan consists of Martin Island and Woodland Bottoms in Washington and the Webb location in Oregon. This balanced mitigation plan would produce an estimated 608 AAHUs versus a projected loss of 445 AAHUs (Table 3).

The final mitigation plan for the least cost disposal plan would also be comparable to the "balanced" mitigation plan presented for the Proposed plan, except that the mitigation acreage would be increased at the Webb location to 146.5 acres. This mitigation plan would produce an estimated 758 AAHUs versus a projected loss of 659 AAHUs (Table 3).

As noted above, to resolve Cowlitz County concerns regarding their Shoreline Master Program, and after consulting with other members of the interagency team, it is now proposed to develop approximately 16 acres of tidal marsh habitat in the 32 acre Martin Island lagoon rather than the 32 acres initially proposed and evaluated in the 1999 HEP analysis. However, given the substantial reduction in habitat impacts since the 1999 analysis (discussed above) and the already large surplus in AAHUs provided by the mitigation proposal, this change does not alter the conclusion that the mitigation proposed more than compensates for the projected impacts.

Table 1. Habitat Composition and Acreage for the Proposed Disposal Plan as Currently Configured (Final SEIS)

Disposal Site*	Site Acres	Agriculture Cropland (acres)	Wetland (acres)	Riparian (acres)	Existing Dredged Material (acres)	Other Houses, Roads, etc. (acres)
Reach 1 – Columbia River miles 98 to 105						
O-105 W. Hayden Is.	102	0	0	0	102	0
W-101 Gateway 3	40	40	0	0	0	0
Reach 2 – Columbia River miles 84 to 98						
W-97.1 Fazio S&G	27	0	0	0	27	0
W-96.9 Adjacent Fazio	17	8.2	0	0	8.8	0
O-91.5 Lonestar	45	0	0	0	0	45
O-87.8 RR Corridor	12	0	0	0	12	0
W-86.5 Austin Point	26	0	0	3.4	22.6	0
O-86.2 Sand Island	28	0	0	0	28	0
Reach 3 – Columbia River miles 70 to 84						
O-82.6 Reichold	49	0	0	0	49	0
W-82.0 Martin Bar	32	0	0	2.9	29.1	0
W-80.0 Martin Mitig.	16	0	0	0	0	16
O-77.0 Deer Island	28.8	0	0	0	28.8	0
O-75.8 Sandy Is.	30	0	0	0	30	0
W-71.9	27	0	0	0	27	0
W-70.1 Cottonwood Is.	62	0	0	6.2	55.8	0
Reach 4 – Columbia River miles 56 to 70						
W-68.7 Howard Is.	200	0	0	20	180	0
W-67.5 International	29	0	0	0	29	0
O-67.0 Rainier Beach	52	0	0	0	52	0
O-64.8 Rainier Indus.	53	0	0	8.2	44.8	0
O-63.5 Lord Is. Upstrm	24.8	0	0	0	24.8	0
W-63.5 Reynolds Alum	13	0	0	0	13	0
W-62.0 Mt. Solo	46.6	35.8	10.8	0	0	0
W-59.7 Hump Is.	69	0	0	7	62	0
O-57.0 Crims Is.	46	0	0	0	46	0
Reach 5 – Columbia River miles 41 to 56						
O-54.0 Port Westward 1	50	0	0	0	50	0
W-46.3 & W-46.0 Brown Island	72	0	0	0	72	0
W-44.0 Puget Island	100	88.2	5.4	2.6	0	3.8
O-42.9 James River	53	0	0	0	53	0
Reach 6 – Columbia River miles 29 to 41						
O-38.3 Tenasillahe Is.	42	0	0	0	42	0
W-33.4 Skamokawa Pk	11	0	0	0	11	0
O-34.0 Welch Island	42	0	0	0	42	0
Reach 7 – Columbia River miles 3 to 29						
O-27.2 Pillar Rock Is.	55.6	0	0	0	55.6	0
O-23.5 Miller Sands Spt	151	0	0	0	151	0
W-21.0 Rice Island	228	0	0	0	228	0
Totals	**1879.8**	**172.2**	**16.2**	**50.3**	**1576.3**	**64.8**

* "W" and "O" refer to Washington or Oregon shoreline. The number refers to the approximate river mile in the navigation channel.

Table 2. Habitat Composition and Acreage for the Least Cost Disposal Plan as Currently Configured (Final SEIS)

Disposal Site*	Site Acres	Agriculture Cropland (acres)	Wetland (acres)	Riparian (acres)	Existing Dredged Material (acres)	Other Houses, Roads, etc. (acres)
Reach 1 – Columbia River miles 98 to 105						
O-105 W. Hayden Is.	102	0	0	0	102	0
Reach 2 – Columbia River miles 84 to 98						
W-97.1 Fazio S&G	27	0	0	0	27	0
W-96.9 Adjacent Fazio	17	8.2	0	0	8.8	0
W-95.7	25	25	0	0	0	0
O-90.6 Scappoose Dairy	107	99.3	7.7	0	0	0
O-87.8 RR Corridor	12	0	0	0	12	0
W-86.5 Austin Point	26	0	0	3.4	22.6	0
O-86.2 Sand Island	28	0	0	0	28	0
Reach 3 – Columbia River miles 70 to 84						
O-82.6 Reichold	49	0	0	0	49	0
W-82.0 Martin Bar	32	0	0	2.9	29.1	0
W-80.0 Martin Mitig.	16	0	0	0	0	16
O-77.0 Deer Island	28.8	0	0	0	28.8	0
O-75.8 Sandy Is.	30	0	0	0	30	0
W-71.9	27	0	0	0	27	0
W-70.1 Cottonwood Is.	62	0	0	6.2	55.8	0
Reach 4 – Columbia River miles 56 to 70						
W-68.7 Howard Is.	200	0	0	20	180	0
W-67.5 International	29	0	0	0	29	0
O-67.0 Rainier Beach	52	0	0	0	52	0
O-64.8 Rainier Indus.	53	0	0	8.2	44.8	0
O-63.5 Lord Is. Upstrm	24.8	0	0	0	24.8	0
W-63.5 Reynolds Alum	13	0	0	0	13	0
W-62.0 Mt. Solo	46.6	35.8	10.8	0	0	0
W-59.7 Hump Is.	69	0	0	7	62	0
O-57.0 Crims Is.	46	0	0	0	46	0
Reach 5 – Columbia River miles 41 to 56						
O-54.0 Port Westward 1	50	0	0	0	50	0
W-46.3 & W-46.0 Brown Island	72	0	0	0	72	0
W-44.0 Puget Island	100	88.2	5.4	2.6	0	3.8
O-42.9 James River	53	0	0	0	53	0
Reach 6 – Columbia River miles 29 to 41						
O-38.3 Tenasillahe Is.	42	0	0	0	42	0
O-34.0 Welch Island	42	0	0	0	42	0
Reach 7 – Columbia River miles 3 to 29						
O-27.2 Pillar Rock Is.	55.6	0	0	0	55.6	0
O-23.5 Miller Sands Spit	151	0	0	0	151	0
W-21.0 Rice Island	228	0	0	0	228	0
Totals	**1915.8**	**256.5**	**23.9**	**50.3**	**1565.3**	**19.8**

* "W" and "O" refer to Washington or Oregon shoreline. The number refers to the approximate river mile in the navigation channel.

Table 3. Site-specific Wildlife Habitat Losses for the Least Cost and Proposed Disposal Plans as Configured in 1999 Final IFR/EIS

Disposal Site	Least Cost Disposal Plan AAHU Losses	Proposed Disposal Plan AAHU Losses
Reach 1 – Columbia River miles 98 to 105		
W-101 Gateway 3		-28.7
Reach 2 – Columbia River miles 84 to 98		
W-96.9 Adjacent Fazio	-15.6	-15.6
W-95.7	-44	
O-90.6 Scappoose Dairy	-210.1	
W-86.5 Austin Point	-1.8	-1.8
Lonestar Gravel Pit		-9.6
Reach 3 – Columbia River miles 70 to 84		
W-82.0 Martin Bar	-2.1	-2.1
O-77.0 Deer Island*	-26.7	-26.7
W-70.1 Cottonwood Island	-23.6	-23.6
Reach 4 – Columbia River miles 56 to 70		
W-68.7 - Howard Is.	-22.9	-22.9
O-64.8*	-16.1	-16.1
O-63.5*	Correct-40	Correct-40
W-62.0 - Mt. Solo	-82.7	-82.7
W-59.7 - Hump Island	-49.3	-49.3
Reach 5 – Columbia River miles 41 to 56		
W-44.0 - Puget Island	-173.4	-173.4
Total Losses	**Correct-659.3**	**Correct-445.3**
Oregon Losses	Correct-292.9	Correct-92.4
Washington Losses	-366.4	-352.9

Wildlife Mitigation Locations by Site and State	AAHUs	AAHUs
Washington		
Woodland Bottoms	291.9	291.9
Martin Island	223.8	223.8
Oregon		
Webb (74 acres)		92.4
Webb (194 acres)	242	
Mitigation Total	**757.7**	**608.1**

* AAHUs = average annual habitat units
Losses in AAHUs were mathematically adjusted and a 5% contingency factor was added.

Physical Habitat Development at Wildlife Mitigation Sites

Woodland Bottoms: Agricultural, riparian forest and wetland habitat would be developed at this mitigation location. Agricultural habitat development would entail tillage of existing cropland acreage and establishment via seeding and fertilization of permanent pasture on 132 acres. Riparian forest habitat would be established on 43 acres in Woodland Bottoms. Development would occur along the Burris Creek levees, overbuilt areas of the perimeter levees and the perimeter of the mitigation site. Establishment of riparian forest would be accomplished by planting a mix of native trees, principally black cottonwood, willow species, and Oregon white ash. Wetland habitat development would be accomplished by construction of perimeter levees to contain interior drainage and overflow waters from Burris Creek. The levees along Burris Creek would be removed to the extent that soil volume removed matches material requirements for the wetland perimeter levees that would contain waters for the wetlands and maintain the existing level of flood protection as the current Burris Creek levees. The Burris Creek levees would be excavated to an elevation approximately one foot higher than the ground surface such that Burris Creek waters would be maintained in a low flow channel but would overflow the wetland habitat during freshets. This allows for a more natural hydrologic regime in the wetland habitat. An overflow structure and control structure would be incorporated into the perimeter levee at the present pump station to outlet waters during major flood events or to allow dewatering of the wetland for habitat management purposes.

Martin Island: Riparian forest development at Martin Island would occur on the lands currently in unused pastureland and in areas overtaken by blackberry. Pasturelands would be subjected to mowing, herbicide and/or tillage actions to result in bare mineral soil conditions by mid-May in the construction years. Natural seeding by established stands of riparian forest would be relied upon to establish riparian forest species on these lands. Establishment of riparian forest would be supplemented by planting a mix of native trees, principally black cottonwood, willow species, and Oregon white ash, if necessary, to achieve a viable stand. Acreage currently in blackberry thickets would be scarified of blackberries and tilled, again relying upon natural seeding and supplemental planting to establish riparian forest.

Sixteen acres of tidal marsh habitat would be developed in the Martin Island embayment or roughly 50 percent of the lagoon area. Dredged material would be placed via pipeline dredge in this area to bring the bottom elevation to within two feet of the survey elevation at which tidal marsh habitat would develop. Adjacent tidal marsh habitat would be surveyed prior to construction to establish this elevation. Topsoil, obtained during scarification of blackberry thickets on adjacent uplands, would be placed atop the sandy dredged material to complete the construction to design elevation and form a better soil substrate for tidal marsh plant establishment.

Approximately 7 acres of wetland habitat on Martin Island will be enhanced. The present design calls for excavation of approximately one foot of topsoil, to include reed canarygrass above ground vegetation plus roots and rhizomes. This excavation would

allow native wetland plants in the soil seed bank to germinate and populate the improved wetland.

Webb Property: Wetland habitat development at this location would primarily consist of construction of a perimeter levee to contain interior drainage and removal of cattle grazing in order to allow wetland plant growth to occur unimpeded. Borrow material for the perimeter levee would come from lands interior to the levee to remove pasture grasses and reed canarygrass, thus providing for a wetland with variable substrate height. An overflow and water control structure would be incorporated into the perimeter levee for water level management. A pump station would also be an element of the infrastructure to assure adequate water can be provided to the wetland during low precipitation periods.

Potential Impacts

Direct

The Proposed disposal plan uses a total of 29 upland disposal sites (i.e., exclusive of shoreline disposal sites and the Lonestar gravel pit), with a total land area of 1630 acres. Material placement would range from 15 to 40 feet high over a 20-year period. The Proposed disposal plan would result in the direct loss of 172 acres of agricultural lands, 50 acres of riparian habitat, and 16 acres of wetland habitat. Wildlife mitigation actions would offset these direct habitat losses. The mitigation plan currently calls for development or substantial improvement to 194 acres of wetland habitat, 132 acres of permanent agricultural lands and 202 acres of riparian forest habitat.

Agricultural lands impacted are principally pasturelands and cereal grain/row crop fields. This habitat is probably most important to wintering waterfowl, but also provides habitat for other species depending upon crop grown, grazing pressure by cattle, management practices, and other factors. Thirty-two acres of riparian habitat losses are early successional stage riparian forest representing cottonwood trees pioneering onto dredged material disposal sites that have been idle for 10 years or more. Eight acres of riparian forest at O-64.8 are represented by cottonwood-dominated forests 25 to 50 plus years in age would be impacted by disposal. The balance of riparian habitat impacted is small inclusions of trees degraded by cattle grazing and located in otherwise agricultural settings. Wetland habitat losses occur at two locations and include wetland habitat associated with drainage ditches, land subject to row crop agriculture, and/or land grazed by livestock.

Using more upland disposal sites rather than the historic shoreline disposal practice would modify aesthetic values from primarily a rural condition to mounds of bare sand. Recreation impacts may result from increased upland disposal and may affect activities such as wildlife viewing although upland disposal sites are often isolated from development and are small in comparison to the overall landscape. Land use at new disposal sites would change land use from agricultural/open space to dredged material disposal. No cultural resources would be impacted by disposal actions.

Indirect

Indirect impacts were assessed for: a) disturbance to wildlife; and b) loss of habitat arising from port and industrial development that are project related. Regarding port and industrial development, the six sponsoring ports, in correspondence attached to the clarification letter for the 2001 BA for NOAA Fisheries, have stated on record that no port/industrial development depending upon channel deepening is foreseen. For ESA listed species, disturbance potential has been described in the original terrestrial BA, and for the 2001 BA plus the associated NOAA Fisheries and US Fish and Wildlife Service Biological Opinions (2002) and is incorporated herein by reference.

For non-ESA species, disturbance is related to location and timing of the specific project associated action. Dredging and shipping actions in the main channel or immediately adjacent open water habitat occur in an environment typically not frequented by large aggregations of wildlife. A notable exception is gull concentrations during the winter smelt run. The response of gull concentrations in open water habitat to dredging and shipping actions in the main channel is minor, brief avoidance or attraction to the ship's wake. Seals and sea lions, western grebes and other diving birds, typically dive and move short distances to avoid the vessel, and then return to their normal activities.

Upland disposal actions are site specific in nature. Only a few upland sites are anticipated to be used concurrently. Further, with disposal occurring primarily on existing or former disposal sites, few wildlife species occur at these locations and these generally at low population levels. Thus disturbance to wildlife at these locations would typically be low. Those few new upland disposal sites proposed for use are typically subject to agricultural operations and thus they generally support few wildlife species and at low population levels. An exception would be wintering waterfowl, particularly Canada geese, which may periodically congregate on these locations.

Disturbance offsite at upland dredged material disposal sites, to wildlife present in adjacent habitats, is projected to be minimal. Disposal related activities, with the potential exception of pipeline placement and removal, are restricted to the site footprint. Associated activities are repetitive in nature and consistent in manner and location, thus wildlife becomes habituated to the actions. Further, upland disposal actions are slated to occur behind berms, which once their construction is completed, will serve as a visual and to a lesser extent, a sound barrier.

Construction actions related to ecosystem restoration features will occur in a number of habitats throughout the project area. Dependent upon the feature to be implemented, these features will take from a few days to 4-plus months to complete with some features taking a number of work seasons scattered over a number of years to complete. The long-term benefits of these features far outweigh any disturbance indirectly incurred by wildlife species. For comparative purposes, such indirect disturbance would be significantly less than that incurred by wildlife resources from human intrusion throughout the project area during waterfowl hunting season or by salmon fisherman during spring and fall fishing seasons. Implementation of ecosystem monitoring and evaluation actions would result in

less indirect disturbance to wildlife resources as they are less intrusive into wildlife habitats and do not entail construction activities.

Wildlife mitigation development actions will typically be of short to moderate duration (e.g. approximately 1-4 months per site) and will occur only at three locations. They will occur on lands presently subject to agricultural operations. The benefits of their implementation to wildlife resources far outweigh any short-term disturbance to wildlife associated

Cumulative

Habitat losses from past actions along the lower Columbia and Willamette Rivers have been considerable. The vast majority of these habitat losses are attributed to actions not related to the navigation channel such as diking for agricultural development or filling for urban developments. Studies conducted by Graves et. al. (1995) indicate a total loss of 51,997 acres of wetland/marsh habitat and 27,004 acres of forested wetland habitat since the 1880s. Much of the wetland loss can be attributed to the nearly 84,000 acres encompassed by diking districts and/or a 20,000 acre increase in urban development that has occurred since that time. The combination of diking, urban developments and dredged material disposal practices have essentially contributed to the narrowing of the river and reduced floodplain and floodplain habitats. Port developments and related infrastructure development such as roads and railroads have further contributed to habitat degradation.

Habitat impacts over the past 20 years have been estimated through a review of 1974, 1989 and 1996 aerial photography. This review addressed the 82 upland and/or shoreline disposal sites used for disposal during that time period. Estimates for riparian and/or wetland habitat, shallow water habitat, agricultural lands, industrial sites, existing disposal sites and areas unaffected by disposal were estimated for these 82 sites. Existing disposal sites accounted for an estimated 2,696 acres of the total. Impacts to riparian/wetland habitat were estimated at 898 acres. Port of Kalama industrial development actions, which used dredged material for, fill accounted for 420 acres of the riparian/wetland impacts; mitigation plans were implemented for Port of Kalama development actions. Emergency dredging actions associated with the Mt. St. Helens eruption accounted for an estimated 325 acres of the total riparian/wetland impacts and 220 acres of the total shallow water habitat impact. Impacts to shallow water were estimated at 749 acres. Miller Sands Spit accounted for about 76 acres of shallow water loss post-1975. Otherwise, shallow water impacts were scattered throughout the length of the project and involved relatively small acreage. Agricultural impacts were estimated at 50 acres of pastureland on Hayden Island. Industrial sites accounted for an estimated 114 acres and 88 acres were not impacted.

Future wetland/riparian habitat losses are expected to be reduced because of current state and federal requirements under the Clean Water Act and Endangered Species Act. New programs now in place such as habitat restoration programs by the States of Oregon and Washington, the National Estuary Program, Lower Columbia River Estuary Program and actions implemented under the Corps of Engineers Ecosystem Restoration authorities

would potentially lead to restoration of large areas currently diked or filled to wetland/riparian habitat.

Agricultural lands along the lower Columbia River are incurring losses from urban and industrial development plus mining for gravel resources. Either disposal plan would contribute to the cumulative loss that is occurring presently. Clark, Cowlitz, and Wahkiakum Counties in Washington incurred an 11 percent loss (15,618 acres) in all croplands from 1987 to 1992 (U.S. Department of Commerce, 1994). The 172 acres of croplands impacted by the Proposed disposal plan would represent a minor percentage loss of cropland in those three Washington counties. The least cost disposal plan figures are 257 acres of croplands impacted and a similar minor percentage loss. Obviously, urban/industrial development has resulted in additional cropland losses since the *1992 Census of Agriculture* in those Washington counties.

Multnomah and Columbia counties in Oregon experienced a four percent decline in cropland (4,197 acres) from 1987 to 1992 (U.S. Department of Commerce, 1993). No use of new upland (farmland) disposal sites is projected if the Proposed disposal plan is implemented. The 99 acres of Oregon farmland that would be impacted under the least cost plan represent a minor incremental loss. Similar to Washington, urban/industrial development would have resulted in additional losses to croplands since the *1992 Census of Agriculture*.

Riparian forest habitat losses along the lower Columbia River have been estimated by Graves et al. (1995) and the Corps of Engineers (1996) for the period from the 1880s to 1991. An estimated 13,800 acres of riparian forest were lost during that period, principally to agricultural and urban/industrial land development. The loss of 50 acres of riparian forest associated with the Proposed or least cost disposal plan represents an increase of about one-half of one percent to the estimated cumulative loss. The remaining amount of riparian forest downstream of CRM 105.5 along the lower Columbia River is estimated at 2,240 acres. It should be noted that the riparian habitat, e.g., early successional stage riparian forest developing on old dredged material disposal sites, that mitigation is proposed for in this plan would not be currently counted in the cumulative total of riparian habitat present along the lower Columbia River.

Riparian mitigation under the Proposed disposal plan would develop and restore 202 acres of riparian habitat or 4 times the amount impacted. The wildlife mitigation actions proposed to offset disposal impacts for the least cost plan would develop 375 acres of riparian habitat. This is a nearly a seven-fold increase over projected losses from disposal actions. The net result of project-related mitigation under either disposal plan would increase the riparian habitat acreage from existing levels along the lower Columbia River.

Wetland habitat loss is estimated at 16 and 24acres for the Proposed plan and least cost plan, respectively. Historical wetland losses along the lower Columbia River have been estimated by Graves et al. (1995) and the Corps of Engineers (1996) for the period from the 1880s to 1991. An estimated 52,000 acres of wetland/marsh and 27,000 acres of forested wetlands were lost during that period. Mitigation actions for the project would

restore and or develop 194 acres (Proposed plan) or 236 (least cost plan) acres of wetland habitat.

These wetland mitigation acreages represent about a 12-fold increase over projected losses and would result in a net gain of wetland habitat, plus securing these sites in the public ownership, along the lower Columbia River.
Cumulative losses of wildlife along the lower Columbia River are directly related to the losses in wetland/marsh, forested wetland, and riparian habitat acres that have occurred over time.

Assessment of Impacts

Disposal of dredged material under the Proposed disposal plan would adversely affect additional upland areas, including 172 acres of agricultural lands, 50 acres of riparian woodlands, and 16 acres of wetlands. These habitat losses would be offset through mitigation actions. The mitigation plan currently calls for development or substantial improvement to 194 acres of wetland habitat and 202 acres of riparian forest habitat plus provision of 132 acres of agricultural pastureland.

Action Plan

The final mitigation plan will be refined in the PED phase. The specific location of structural features and their design detail will be completed. Material quantity requirements for setback levees at Woodland Bottoms will be balanced with borrow requirements from the levees currently encompassing Burris Creek at the Woodland Bottoms mitigation site.

Wetland and riparian habitat development will be the emphasis of mitigation actions as recommended by the interagency team. The Corps' goal will be to develop wetland, riparian, or agricultural (pastureland) habitat acreage to the extent identified at the individual mitigation sites. The Corps' objective will be to replace, overall, the amount of average annual habitat units identified as lost due to project implementation, recognizing that tradeoffs among target species will occur. Focusing mitigation actions on wetland and riparian habitat will lead to tradeoffs among target species. Riparian and wetland oriented target species would be favored over other target species, such as Canada geese, that are more agricultural oriented.

Surveys, design, and construction scenarios including vegetation plantings will be further developed during the PED phase. Engineering analyses will take into account site topography and hydrology; project features will be designed to account for or take advantage of these features. Property boundaries and established infrastructure, such as roads and utilities, will influence individual site development. Mitigation plans and specifications will be prepared and will be suitable for construction bidding and implementation.

Contingency factors have been built in to Corps cost estimates. No specific contingency plans will be developed for individual mitigation sites. Adjustments in the overall mitigation plan will occur if individual sites are not available. It is anticipated that these adjustments will reflect selection of the next incrementally justified site(s) on the basis of cost per wildlife habitat unit that meets the mitigation requirement and provides for a balanced mitigation effort between the states.

In the event Martin Island is acquired in its entirety, the Corps would be agreeable to discussing additional actions on the 80-acre parcel currently not included in the HEP analysis. If the entire balance of the island is not available and additional mitigation is required the Corps would intend to develop additional mitigation acreage on the Webb Site.

Means to establish vegetation on mitigation sites will rely on natural establishment to the extent practicable. Where seeding and/or planting of cuttings, plugs, trees, shrubs or other propagules are necessary, that methodology will be employed. Monitoring and operation and maintenance plans for mitigation habitats were presented in the draft plan (1999 Final IFR/EIS, Appendix G). These plans will be reviewed with the interagency team during the PED phase and revised as necessary.

Operation and maintenance plans identify those actions necessary to maintain developed habitats and site infrastructure at individual mitigation sites. Non-native and invasive plants such as blackberry and reed canarygrass can be expected to occur on mitigation sites. Their presence will be managed to the extent practicable, but as on national wildlife refuges and state wildlife management areas, there will be a presence of these plants on the landscape. Monitoring efforts to assess attainment of HEP objectives will be conducted periodically over the first 10 years of the mitigation sites. Thereafter, such assessments will be solely the responsibility of the land manager.

Implementation of mitigation actions will occur concurrently with construction of channel improvements. The Corps will seek to complete mitigation site construction in 2 years, which matches the project construction schedule.

References

Graves, J.K., J.A. Christy, and P.J. Clinton. 1995. Historic Habitats of the Lower Columbia River. Columbia River Estuary Study Task Force, Astoria, Oregon. 10 pp.

U.S. Army Corps of Engineers. 1996. Lower Columbia River Bi-State Water Quality Program - Fish, Wildlife and Wetlands GIS Habitat Mapping. Prepared for the Oregon Department of Environmental Quality. Portland District, Portland, Oregon.

U.S. Department of Commerce. 1993. 1992 Census of Agriculture. Part 37, Oregon State and County Data.

U.S. Department of Commerce. 1994. 1992 Census of Agriculture. Part 47, Washington State and County Data.