FINDING OF NO SIGNIFICANT IMPACT
2012 Cedar River I-Type Floodwall Vegetation Removal
King County, Washington

1. Background. The Cedar River Section 205 Flood Control Works (FCW) project included constructing earthen levees combined with steel sheet-wall pilings and concrete floodwalls along both banks of the river and dredging in the river channel. Dredging is designed to reduce flooding which results from sediment deposition in this reach of the Cedar River that is a constructed artificial channel. Levees and floodwalls were raised along both banks from its confluence with Lake Washington to Williams Avenue, 1.25 miles upstream. Dredging lowered the river channel approximately four feet deeper from the mouth of the river to the Logan Avenue Bridge at River Mile (RM) 1, gradually decreasing the slope upstream another 0.5 mile to meet the existing grade. Its goal was to reduce potential flood damage along approximately 1.5 miles of the lower Cedar River through downtown Renton, primarily protecting the Boeing aircraft manufacturing plant and the Renton Municipal Airport. An overflow section downstream of the south Boeing Bridge on the left bank insures that if the capacity of the FCW project is exceeded, flooding will occur on the less developed left bank. Boeing has added hydraulic jacks to the south Boeing Bridge to lift it clear of floodwaters. This feature is not part of the Federal project. At the time of the original construction in 1998 and 1999, much of the vegetation (including trees) was not removed. U.S. Army Corps of Engineers (Corps) guidance for I-type floodwalls, Engineering Techinical Letter (ETL) 1110-2-571, dated 10 April 2009, now requires their removal.

This Section 205 project is designed to provide protection from periodic, recurring floods up to the 100-year event level. The Section 205 project operations and maintenance plan includes a requirement to re-dredge as needed to remove sediment deposits in the project reach. Because of this sedimentation and re-dredging cycle, the level of protection can vary through the life of the project. While maintenance dredging was anticipated to occur every 3 to 10 years to maintain the flood protection benefits of the Section 205 project, it has been more than 10 years since the last dredging. Maintenance dredging is anticipated to be needed within the next 3 to 5 years, depending upon sediment deposition rates within the project area.

The proposed work would remove vegetation that is out of compliance with ETL 1110-2-571. The guidance states that a minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity. The I-type floodwall in its current state does not comply with this guidance. Based on the Seattle District's Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report, roots were found penetrating the I-wall joints and joint seals which pose a threat to the structural integrity of the I-wall.

2. Proposed Action. The proposed work involves removal of 220 trees (136 of which are 6" in diameter at breast height, DBH, or larger) and clearing of all vegetation within 15-feet of the I-type floodwall structure. To help offset impacts of vegetation removal, an area at the project site along the upstream portion of the floodwall has been identified for planting willow stakes at 12-inch spacing along 200 feet at or below ordinary high water (OHW). This area extends beyond the 15-foot vegetation free buffer and will provide on-site riparian vegetation to offset a portion

of the impacts of the proposed action. No in-water work would be required to complete the vegetation removal.

In addition, two planting areas have been identified to offset the loss of tree cover at the project site. The first planting site is within the Cedar River FCW on the right bank opposite the vegetation removal. Willows would be planted at 12-inch spacing along 1,620 feet at or below OHW. The second planting site is upstream from the project site near RM 5.0 on the Cedar River at the city of Renton's Ron Regis Park. The proposed off-site plan includes planting of 408 trees to provide a 3:1 replacement ratio for removal of trees larger than 6" DBH at the I-wall. The replacement trees will be planted at two locations at Ron Regis Park along Cedar River (195 trees) and the Elliott Spawning Channel (213 trees). See Appendix A of the Environmental Assessment (EA) for the detailed upstream planting plan and location map.

3. Impacts Summary. Pursuant to the National Environmental Policy Act, the attached EA has been prepared. The EA, which evaluates the environmental impacts associated with the emergency actions and the proposed action and whether those actions would cause significant effects to the quality of the human environment, is briefly summarized below.

The project site is in a coastal county and is, therefore, subject to the requirement of the Coastal Zone Management Act (CZMA). A CZMA Consistency Determination was sent to the Washington Department of Ecology (Ecology) on 3 October 2011. A concurrence letter was received from Ecology on 1 December 2011. The project has complied with the National Historic Preservation Act and the Corps has notified all recognized Native American Tribes in the project vicinity. The proposed work also does not violate usual and accustomed fishing rights.

The Corps has determined the proposed action *may affect, but is not likely to adversely affect* threatened Puget Sound Chinook salmon, Puget Sound steelhead, Coastal/Puget Sound bull trout and their designated critical habitat. This determination was submitted to the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) on 10 November 2010. Concurrence letters were received from NMFS and USFWS dated 10 December 2010 (Reference # 2010/05546) and 11 January 2011 (Reference # 12410-2011-I-0047) respectively. The Corps does not believe that a revised number of trees to be removed and planted would trigger re-initiation of consultation under ESA because no new information or data has become available; the project revisions do not constitute a modification that would affect an ESA listed species; and no new species has been listed or critical habitat has been designated

Potential environmental impacts of the proposed action include short-term effects to water quality, vegetation, fish, wildlife, and threatened and endangered species. The effects to these resources would be minimal and occur during vegetation removal activities; no long-term effects would occur due to the implementation of best-management practices and mitigation plantings. There will be a temporal lag during the growth and establishment of the mitigation plantings. Birds, mammals, and other wildlife would be disturbed by vegetation removal activities but would be able to re-colonize remaining habitat in the vicinity of the project area. However, noise disturbance levels are generally higher in the project vicinity due to the presence of the Renton

Municipal Airport. Due to the limited duration of proposed activities, the existing high levels of ambient disturbance in the area, and because removed vegetation will be offset through on and off-site plantings, the proposed action would have minimal effects to fish and wildlife species.

4. Conclusion. I find that the proposed action will not result in significant adverse environmental impacts and complies with all applicable laws, regulations, and agency consultations, including the Clean Water Act, Endangered Species Act, Coastal Zone Management Act, and National Environmental Policy Act, as well as Executive Orders. Based on the analysis described above and provided in more detail in the accompanying EA, this project is not a major Federal action significantly affecting the quality of human environment and, therefore, does not require preparation of an environmental impact statement.

Date 10 OCT 2012

BRUCE A. ESTOK
Colonel, Corps of Engineers
Commanding

FINAL – ENVIRONMENTAL ASSESSMENT

Cedar River I-Type Floodwall Vegetation Removal

Renton, Washington

October 2012

US Army Corps of Engineers®
Seattle District

Cedar River I-Type Floodwall Vegetation Removal

Renton, Washington

Final Environmental Assessment
October 2012

Responsible Agency: The responsible agency for this project is the Seattle District, U.S. Army Corps of Engineers (Corps).

Abstract: This Environmental Assessment (EA) evaluates the potential impacts of additional work to the Flood Control Works (FCW) on the Cedar River Section 205 Flood Control Project. This Federally authorized project, constructed between 1998 and 2000, is located upstream of the mouth of the Cedar River, from river mile (RM) 0 to approximately RM 1.5, in the City of Renton, King County, Washington and included the construction of an I-type floodwall. The proposed work consists of vegetation removal along 1620 feet of the I-type floodwall structure on the left bank of the Cedar River adjacent to the Renton Municipal Airport. This action is pursuant to and funded by PL 84-99, "Flood Control and Coastal Emergencies." The proposed work would remove vegetation that is out of compliance with Corps guidance for I-type floodwalls per Engineering Technical Letter (ETL) 1110-2-571, dated 10 April 2009. The guidance states that a minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity. The Cedar River I-type floodwall in its current state does not comply with this guidance. In addition, plantings to offset the vegetation removal would be installed on-site, on the opposite bank adjacent to the I-type floodwall and at a location upstream at RM 5.0. The work is planned to occur as early as fall 2012.

A Notice of Preparation was issued for this project with an official comment period 8 April to 9 May, 2011. Comments received and responses to those comments are attached to this Final EA as Appendix E.

This document is available online at:
http://www.nws.usace.army.mil/Missions/Environmental/EnvironmentalDocuments/2012EnvironmentalDocuments.aspx

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LIST OF ACRONYMS

CAA	Clean Air Act
cfs	cubic feet per second
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DBH	diameter at breast height
DOE	Washington State Department of Ecology
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FCW	Flood Control Works
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
LWD	large woody debris
LWSC	Lake Washington Ship Canal
MBTA	Migratory Bird Treaty Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
O_3	ozone
OHW	ordinary high water
Pb	lead
PL	Public Law
PSCAA	Puget Sound Clean Air Agency
RCRA	Resource Conservation and Recovery Act
RM	river mile
SHPO	State Historic Preservation Office
SIP	State Implementation Plans
SO_2	sulfur dioxide
TMDL	total maximum daily load
TSP	total suspended particulates
U.S.	United States
USFWS	U.S. Fish and Wildlife Service
UST	underground storage tank
WDFW	Washington Department of Fish and Wildlife

1.0 INTRODUCTION

The United States (U.S.) Army Corps of Engineers (Corps), and City of Renton as the local project sponsor, need to complete required maintenance on the Cedar River Section 205 Flood Control Project (otherwise referred to as Flood Control Works (FCW)). This Federally authorized project, constructed between 1998 and 2000, is located upstream of the mouth of the Cedar River, from river mile (RM) 0 to approximately RM 1.5, in the City of Renton, King County, Washington (Figure 1). The required maintenance consists of vegetation removal along 1620 feet of the I-type floodwall structure on the left bank of the Cedar River adjacent to the Renton Municipal Airport. Mitigation plantings would be installed on-site, adjacent to the repair on the right bank and at an upstream planting location. The proposed work is planned to occur as early as fall 2012. The Council On Environmental Quality implementing regulations for the National Environmental Policy Act (NEPA) of 1969 provide at 40 C.F.R.§ 1500.1(c): "The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." 40 C.F.R. § 1508.9(a)(1) provides that an environmental assessment is required to "provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" on actions authorized, funded, or carried out by the federal government. This assessment evaluates environmental consequences for the implementation of Corps funded and carried out maintenance actions that are necessary to comply with national vegetation standards. .

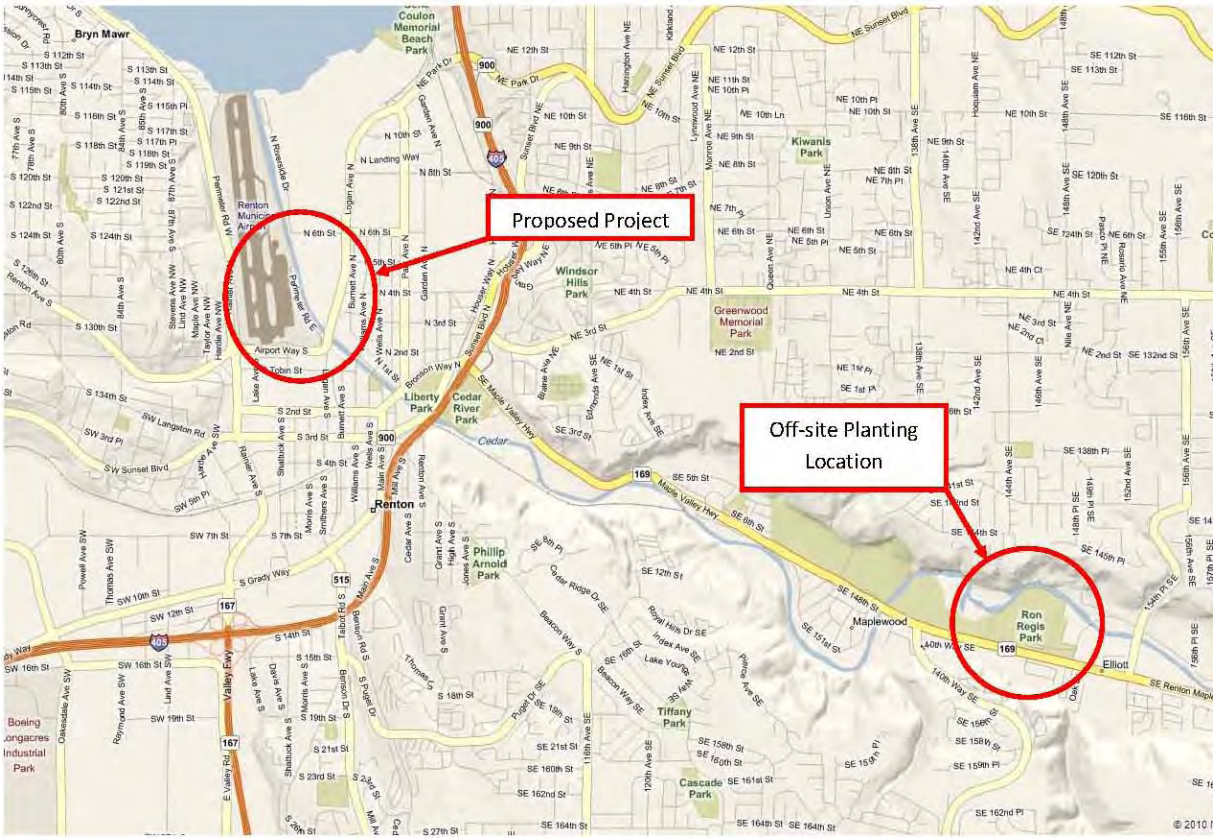

Figure 1. Location Map of Vegetation Removal and Upstream Off-site Planting Area

2.0 BACKGROUND

2.1 Project Location

The proposed project is located in the floodplain along the left bank from Logan Avenue (RM 1.07) to the south Boeing Bridge (RM 0.74) on the Cedar River in the City of Renton, King County, Washington (Figure 1).

2.2 Project History

The Cedar River Section 205 Project included constructing earthen levees combined with steel sheet-wall pilings and concrete floodwalls along both banks of the river and dredging in the river channel. Dredging is designed to reduce flooding which results from sediment deposition in this reach of the Cedar River that is a constructed artificial channel. Levees and floodwalls were raised along both banks from its confluence with Lake Washington to Williams Avenue, 1.25 miles upstream. Dredging lowered the river channel approximately four feet deeper from the mouth of the river to the Logan Avenue Bridge (at RM 1), gradually decreasing the slope upstream another 0.5 mile to meet the existing grade. Its goal was to reduce potential flood damage along approximately 1.5 miles of the lower Cedar River through downtown Renton, primarily protecting the Boeing aircraft manufacturing plant and the Renton Municipal Airport. An overflow section downstream of the south Boeing Bridge on the left bank insures that if the FCW project is exceeded, flooding will occur on the less developed left bank. Boeing has added hydraulic jacks to the south Boeing Bridge to lift it clear of floodwaters. This feature is not part of the Federal project. At the time of the original construction, much of the vegetation, including trees were not removed. Corps guidance for I-type floodwalls (Engineering Technical Letter (ETL) 1110-2-571, dated 10 April 2009) now requires their removal.

This Section 205 Project is designed to provide protection from periodic, recurring floods up to the 100-year event level. The Section 205 Project operations and maintenance plan includes a requirement to re-dredge as needed to remove sediment deposits in the project reach. Because of this sedimentation and re-dredging cycle, the level of protection can vary through the life of the project. While maintenance dredging was anticipated to occur every 3 to 10 years to maintain the flood protection benefits of the Section 205 Project, it has been more than 10 years since the last dredging. Maintenance dredging is anticipated to be needed within the next 3 to 5 years, depending upon sediment deposition rates within the project area. However, the work proposed at this time only includes removal of vegetation and mitigation plantings.

2.3 Project Authority

This maintenance action is authorized pursuant to Public Law (PL) 84-99, “Flood Control and Coastal Emergencies.”

2.4 Need and Purpose

Corps guidance for I-type floodwalls in ETL 1110-2-571 states that a minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity to the structure unless the project obtains a variance for these requirements. The I-type floodwall in its current state does not comply with this guidance. The purpose of the proposed project is to ensure both adequate access to the I-wall for inspection purposes and that the structural integrity of the I-wall is not compromised by tree roots or erosion.

3.0 DESCRIPTION OF PREFERRED ALTERNATIVE

The proposed work involves removal of 220 trees (136 of which are 6" in diameter at breast height, DBH, or larger) and clearing of all vegetation, within 15-feet of the I-type floodwall structure. Refer to Appendix B of the Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report (Appendix G in this EA) for the inventory of trees in the project area. To help offset impacts of vegetation removal, an area at the project site along the upstream portion of the floodwall has been identified for planting willow stakes at 12-inch spacing along 200 feet at or below ordinary high water (OHW). This area extends beyond the 15-foot vegetation free buffer and will provide on-site riparian vegetation to offset a portion of the impacts of the proposed action. All work would be done in the dry.

In addition, two planting areas have been identified to offset the loss of tree cover at the I-wall. The first planting site is within the Cedar River FCW on the right bank opposite the vegetation removal. Willows would be planted at 12-inch spacing along 1620 feet at or below OHW. The second planting site is upstream from the project site near RM 5.0 on the Cedar River at the City of Renton's Ron Regis Park (Figure 1). The proposed off-site plan includes planting of 408 trees to provide a 3:1 replacement ratio for removal of trees larger than 6" DBH that would be removed at the I-wall. The replacement trees would be planted at two locations at Ron Regis Park along Cedar River (195 trees) and the Elliott Spawning Channel (213 trees). See Appendix A for the detailed upstream planting plan and location map along Cedar River (195 trees).

The project consists of the following elements to meet Corps vegetation standards for floodwalls and restore native vegetation cover to the Cedar River:

- Removal of 220 trees (136 of which are 6" DBH or larger) within 15-feet of the floodwall along 1620 feet from the Logan Avenue Bridge (RM 1) downstream to the south Boeing Bridge (RM 0.74). The trees are predominantly red alder (*Alnus rubra*) with one western red cedar (*Thuja plicata*). Trees within 15-feet of the floodwall would be cut using a chainsaw and then hoisted over the floodwall. A portable stump grinder would grind all stumps to ground level. All trees beyond 15-feet from the floodwall would remain (approximately 40 trees).

- Removal of shrubs and brush within 15-feet of the floodwall along 1620 feet from the Logan Avenue Bridge downstream to the south Boeing Bridge. Dominant understory vegetation is an invasive species (Himalayan blackberry (*Rubus* spp.)). Blackberry, like other understory vegetation restrict access to and/or visibility of the I-wall for inspection purposes. Vegetation, including invasive species, would be hand-cleared and disposed of off-site.

- The 15-foot buffer area would be raked following vegetation removal and hydroseeded using a native seed mix.

- Planting of willows stakes would occur at the upstream end of the floodwall with a varying width within an area 200 feet long by 5-10 feet wide and on the right bank opposite the vegetation removal within an area 1620 feet long by 5-10 feet wide. Stakes would be inserted using rebar created pilot holes at approximately 12-inch spacing at or below OHW.

- Offsite planting along Cedar River would occur within an area approximately 1060 feet long by 30 feet wide (0.73 acres). A total of 195 trees would be planted with an equal distribution between Oregon ash (*Fraxinus latifolia*), Sitka spruce (*Picea sitchensis*) and western red cedar. Two staggered rows would be created with 10-foot spacing between each tree and 10-foot spacing between rows. Buffers would be created along the two access paths to minimize possible disturbance to the plantings. See Section 3.1 for conservation measures specific to the tree planting.

- Offsite planting along the Elliott Spawning Channel, 213 trees would be planted on both sides of the channel with an equal distribution between Sitka spruce, western red cedar, and western hemlock (*Tsuga heterophylla*). All plantings would be laid out with the City of Renton, Corps and contractor on site.

Project work is anticipated at the beginning of the fall 2012 flood season. Once started, vegetation removal and plantings are expected to take about 1 week.

3.1 Conservation Measures

Several measures would be employed during project work to minimize adverse project effects on protected species and their habitat:

- A Corps biologist and the City of Renton would co-supervise the off-site layout and tree planting at Ron Regis Park;

- Refueling of all equipment would occur in the staging area on the landward side of the floodwall, no equipment fueling or servicing would occur on the riverward side of the floodwall;

- At least one fuel spill kit with absorbent pads would be onsite at all times and no equipment would operate in the water;

- Soil disturbance would be minimized during vegetation removal by cutting the stems and using a portable stump grinder to grind all stumps to ground level;

- Understory vegetation would be hand cleared and all invasive species would be disposed of offsite.

- Care would be taken to ensure that vegetation inputs to the Cedar River would be minimized to the maximum extent practical (e.g. falling leaves during stem cutting).

- Native hydroseed application following vegetation removal would be applied to land only, care would be taken to ensure no hydroseed enters the river;

- Willow stakes would be planted using hand installation methods to minimize soil disturbance;

- All work would be performed in the dry;

- Work would occur during daylight hours only;

- Planting material would be healthy and disease free with a contractor guaranteed survival rate of 100% after 30 days and 80% at one year;
- Understory vegetation would be hand-cleared to an approximately 6-foot diameter circle around each planting at the upstream planting site;
- Throughout the 0.73 acre upstream planting site, knotweed would be hand cleared to ground level and disposed of off-site at the time of construction and annually during early spring for 10 years;
- 1 and 2 gallon trees would be used at both locations in Ron Regis Park along the Cedar River and the Elliott Spawning Channel to minimize disturbance and all plants would be watered-in at the time of planting;
- 6-8" of mulch would be added following planting at Ron Regis Park along the Cedar River and the Elliott Spawning Channel.

4.0 OTHER ALTERNATIVES CONSIDERED

4.1 No Action

The No-Action alternative would leave the floodwall vegetation in place. This alternative would not be in compliance with Corps I-type floodwall guidance and raises structural concerns, therefore this alternative does not meet the project need.

4.2 Vegetation Removal Only

The Vegetation Removal Only Alternative would remove 220 trees (136 of which are 6-inch DBH) and all vegetation within 15-feet of the I-type floodwall structure along 1620 feet from the Logan Avenue Bridge (RM 1) downstream to the south Boeing Bridge would be cleared. Trees within 15-feet of the floodwall would be cut using a chainsaw and then hoisted over the floodwall. A portable stump grinder would grind all stumps to ground level. All trees beyond 15-feet of the floodwall would remain. Removal of shrubs and brush within 15-feet of the floodwall along 1620 feet from the Logan Avenue Bridge (RM 1) downstream to the south Boeing Bridge. Dominant understory vegetation is Himalayan blackberry. Vegetation would be hand-cleared and disposed of off-site. The 15-foot buffer area would be raked following vegetation removal and hydroseeded using a native seed mix. No planting would be completed to offset the impacts of the vegetation removal under this alternative. Because this alternative did not address environmental concerns caused by the vegetation removal, this alternative is not considered further.

4.3 Floodwall Vegetation Variance

The Floodwall Vegetation Variance Alternative would allow some vegetation to remain within the vegetation free zone (15-feet on the riverward side) along the I-wall. Variations of this alternative could include thinning out some of the trees; leaving understory vegetation including Himalayan blackberry between the inspection and maintenance cycle; only removing trees that have roots at surface intersecting the I-wall; or creating a root-free zone adjacent to I-wall. All of the variations of this alternative would require a variance approved by the Corps Headquarters.

The Seattle District conducted a study to analyze the vegetation along the I-wall and determine if the vegetation is a significant concern to the effectiveness of the Section 205 Project and if a vegetation variance is appropriate (USACE 2012). Study methods included consultation with subject matter experts, literature searches, field investigation and analysis of findings. The field investigation was completed in July 2012. Along the landward side of the I-wall, six test holes were dug to characterize the root penetration. Roots were found to some degree in five out of the six holes below the concrete cap (see Appendix B, Photo 4). In addition, a 5 foot wide buffer of understory was cleared in order to conduct the inspection on the riverward side of the I-wall to determine if tree roots have penetrated the I-wall joints. The Seattle District determined that the Cedar River I-wall is not a candidate for a variance to the Corps national standard on levee/I-Wall vegetation standards as outlined in Corps guidance. Roots were found to have penetrated the I-wall joints and joint seals in the concrete cap (see Appendix B, Photo 5). In addition, roots up to ¾" were found along the steel sheet pile approximately 4 feet below grade. Although no penetration points by these roots were located through the I-wall itself, it is unlikely that the trees landward side of the I-wall were the source of the identified roots. Access and inspection due to the heavy growth on the riverward side of the wall was such that damages to the joint sealants were not identified in any previous inspections. Also, no access for repairs is currently possible with the vegetation in it's current state.

Based on the Seattle District's Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report (Appendix G), roots found penetrating the I-wall joints and joint seals pose a threat to the structural integrity of the I-wall and therefore, make this I-wall a poor candidate for a variance to the Corps national standard for I-walls. As mentioned in Section 3.0, understory vegetation including Himalayan blackberry restricts access to and/or visibility of the I-wall during inspection. Because this alternative does not address structural, safety, and inspection concerns caused by the presence of trees and understory vegetation within 15-feet of the floodwall and approval of a variance is unlikely, this alternative will not be considered further.

4.4 Floodwall Relocation/Setback

The Floodwall Relocation/Setback Alternative would relocate the floodwall structure further landward to allow existing vegetation to remain outside of the 15-foot vegetation free zone. The existing floodwall would be removed and a new floodwall would be constructed approximately 20-feet landward from the existing location. No riverward vegetation would be removed under this alternative. This alternative would impact the northbound lane of Perimeter Road West, which runs adjacent to the Renton Municipal Airport. A new steel sheetpile floodwall would be constructed from Logan Avenue to the South Boeing Bridge. The sheetpile floodwall would be cold formed with seals used at the joints to reduce leakage. The floodwall would need to tie-into the existing temporary closure structure on the west side of the south Boeing Bridge entrance. This alternative would have a substantial cost, transportation impacts and require a longer duration planning and construction phases.

5.0 AFFECTED ENVIRONMENT

5.1 Topography, Hydrology and Soils

The existing topography and surface geology of the Puget Sound region are largely the result of Pleistocene glacial, Holocene river, and volcanic processes. The northwest/southeast trending valleys that contain the Cedar River, lakes Sammamish and Washington, were formed by the

most recent retreat of the glaciers approximately 10,000 years ago. Glacially deposited soils predominate in the region, including till, outwash, and glaciolacustrine deposits. The Cedar River valley is composed primarily of alluvium deposited with the meanderings of the Cedar River across its floodplain.

During the last century, human activities have produced large-scale landscape modifications, such as the lowering of Lake Washington in the early 1900s and widespread topographic changes associated with urbanization.

Flows in the Cedar River include a mean low flow of 228 cubic feet per second (cfs) in September and a mean high flow of 1,100 cfs in January (USGS 2010). Currently, flows in the Cedar River are regulated by the City of Seattle under the Habitat Conservation Plan. Operating hydrographs are broken into "critical," "normal minimum" and "normal high" flows for the entire year. The low-flow months are August through mid-September. Flows are usually at least twice the low-flow amount for the rest of the year. Lake Washington is held at a high elevation from approximately March through July, and then drawn down to its winter low elevation from November through February. When the lake is at its high water elevation, the lower portion of the Cedar River is backwatered.

In the project area, the Cedar River is a confined, single-thread, low gradient artificial channel (the historic channel flowed into the Black River). The Renton Municipal Airport occupies the left bank, while the right bank is a city park that transitions to a Boeing manufacturing plant. The thalweg of the river is primarily located adjacent to the left bank.

In this reach, the river is highly modified and provides generally poor habitat for the fish and other aquatic species. The river is channelized with armored banks and there is very little pool habitat. The river at this point primarily functions as a backwater for Lake Washington during the summer high pool, but is a riffle or run during winter low water levels in Lake Washington. Spawning-sized gravel occurs in the streambed in this reach. This gravel may be used for spawning by Chinook salmon and is used for spawning by sockeye salmon.

The floodwall portion specifically identified for vegetation removal is on the left bank of the Cedar River from the Logan Avenue Bridge (RM 1.07) to the south Boeing Bridge (RM 0.74) along 1620 feet.

5.2 Water Quality

This reach of the Cedar River (Lake Washington to the Maplewood Bridge RM 4.1) has the following use designations: aquatic life uses - core summer habitat; recreation uses – primary contact recreation; water supply uses – domestic water supply, industrial water supply, agricultural water supply and stock water supply; miscellaneous uses – wildlife habitat, fish harvesting, commerce and navigation, boating and aesthetic values (WDOE 2006). Also, within the project limits the Cedar River is listed on the Washington State Department of Ecology's (WDOE) impaired water quality list, category 5 of the 303(d) list, for exceeding fecal coliform, temperature and dissolved oxygen standards (WDOE 2008). Category 5 listings are defined as polluted waters that require a total maximum daily load (TMDL). Also, it is listed as category 2, water of concern, for exceedances of pH standards (WDOE 2008).

5.3 Vegetation

The common riparian community along most of the downstream reaches of the Cedar River includes a cottonwood-alder forest, with an understory of snowberry, salmonberry (*Rubus spectabilis*), and sword fern (*Polystichum munitum*). In places, vine maple (*Acer circinatum*), Himalayan blackberry, Indian plum (*Oemleria cerasiformis*), Japanese knotweed, bleeding heart (*Dicentra spectablilis*), giant horsetail (*Equisetum telmateia*), and Pacific waterleaf (*Hydrophyllum tenupies*) occur.

In contrast to the general riparian condition along the Cedar River, the terrestrial environment at this Cedar River FCW site is highly urbanized and provides very limited wildlife habitat. Riparian vegetation here is limited to red alders a few willows (Salix sp.) and invasive species such as Japanese knotweed, reed canary grass, Scot's broom, butterfly bush (*Buddleia* sp.) and Himalayan blackberry. Due to the proximity of the Renton Municipal Airport, trees are limited in this area. The existing red alder trees at the project site are smaller than a fully mature tree. Mature red alder trees are medium-sized ranging from 50 to 100 feet tall with 14 to 18 inches DBH (USDA 2006).

5.4 Wildlife

Wildlife species likely to be present at the site and surrounding area are black-tailed deer, muskrat, coyote, raccoon, eastern gray squirrel, opossum, beaver, cottontail rabbits, striped skunk, Norway rats, various small rodents, and feral dogs and cats. Red tailed hawks and bald eagles utilize the taller cottonwoods for perching and foraging beyond the project area. However, regular operations at the Renton Municipal Airport may detract hawks and eagles due to noise and the physical presence of planes in the air. Mergansers, mallards and other waterfowl are present.

5.5 Fish

At least 22 species of fish inhabit the Cedar River, according to the Final Environmental Impact Study for the Cedar River 205 Flood Control Project prepared in August 1997 (USACE 1997). Based on its description and depending on season, the project site may include sockeye salmon (*Oncorhynchus keta*), Chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), steelhead (*O. mykiss*), rainbow trout (*O. mykiss*), cutthroat trout (*O. clarki*), mountain whitefish (*Prosopium williamsoni*), northern pikeminnow (*Ptychoceilus oregonsis*), peamouth chub (*Mylocheilus caurinus*), three-spine stickleback (*Gasterosteus aculeatus*), largescale sucker (*Catostomus macrocheilus*), longnose dace (*Rhinichthys cataractae*), and several species of sculpin. Approximately 80 percent of the sockeye salmon population of the Lake Washington system spawns in the Cedar River.

The project reach is currently used primarily as a migration corridor by anadromous fish. Sockeye salmon do spawn in the upstream portion of the project area.

5.6 Sensitive, Threatened and Endangered Species

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts

to federally listed and proposed threatened or endangered species. Three species listed as threatened are potentially found in the area of the project (Table 1).

Table 1: Listed species in project vicinity

Species	Listing Status	Critical Habitat
Coastal Puget Sound Bull Trout *Salvelinus confluentus*	Threatened	Designated (but doesn't include project area)
Puget Sound Chinook Salmon *Oncorhynchus tshawytscha*	Threatened	Designated
Puget Sound Steelhead *Oncorhynchus mykiss*	Threatened	___

5.6.1 Coastal/Puget Sound Bull Trout

The Coastal/Puget Sound bull trout distinct population segment was listed as a threatened species under the ESA in October, 1999. Bull trout populations have declined through much of the species' range; some local populations are extinct, and many other stocks are isolated and may be at risk (Rieman and McIntyre 1993). A combination of factors, including habitat degradation, expansion of exotic species, and exploitation, has contributed to the decline and fragmentation of indigenous bull trout populations.

Washington's native char are known to exhibit four life history strategies (WDFW 2000). The three freshwater forms include adfluvial, which migrate between lakes and streams; fluvial, which migrate within river systems; and resident, which are non-migratory. The fourth and least common strategy, anadromy, occurs when the fish spawn in fresh water after rearing for some portion of their life in the ocean. The least information is available on the anadromous form of bull trout, but it is assumed that they occur in a number of Puget Sound basins, possibly as far south as the Puyallup River.

Bull trout movement in response to developmental and seasonal habitat requirements makes their movements difficult to predict both temporally and spatially. A Washington Department of Fish and Wildlife (WDFW) (1999) summary paper on bull trout in Stillaguamish Basin provided some general information on bull trout distribution in Puget Sound river basins. Newly emergent fry tend to rear near spawning areas, while foraging juvenile and sub-adults may migrate through river basins looking for feeding opportunities. Based on research in the Skagit Basin (Kraemer 1994), anadromous bull trout juveniles migrate to the ocean in April-May, then re-enter the river from August through November. Bull trout typically spawn from August to November during periods of decreasing water temperatures. Preferred spawning habitat consists of low gradient stream reaches with loose, clean gravel, with redds often constructed in stream reaches fed by springs or near other sources of cold groundwater (USFWS 2004). Post-spawn adults of the non-resident life form quickly vacate the spawning areas and move downstream to forage, some returning to their "home" pool for additional rearing. Anadromous sub-adults and non-spawning adults are thought to migrate from marine waters to freshwater areas to spend the winter.

5.6.1.1 Utilization of the Project Area

A resident/adfluvial population of bull trout resides in Chester Morse Lake. This lake is a core management area for bull trout, located within the Cedar River Municipal Watershed in the upper reaches of the Cedar River drainage, upstream of a natural migration barrier at Lower Cedar Falls (RM 34.4). Chester Morse Lake (originally Cedar Lake) was naturally formed by glaciers. The water elevation of the lake was raised 32 feet by the construction of the Masonry Dam to provide storage for the City of Seattle's municipal water supply and hydroelectric power generation. Bull trout from Chester Morse Lake may pass over the Masonry Dam during high flows, but there are no fish passage facilities for them to pass back upstream again.

A couple of native char (most likely bull trout) have been captured in the lower Cedar River, but it is not known whether these fish are from the resident/adfluvial population in Chester Morse Lake or the Masonry Pool or anadromous strays from other systems (USACE 2002).

The Lake Washington foraging, migration and overwintering habitat consists of the lower Cedar River, the Sammamish River, Lakes Washington, Sammamish and Union, the Lake Washington Ship Canal, and all accessible tributaries and lakes. These waters contain important foraging, migration and overwintering habitat necessary for bull trout recovery. Adult and sub-adult sized individuals have been observed infrequently in the lower Cedar River (below Cedar Falls), Lake Washington, and at a few other locations in the Lake Washington watershed. However, no spawning activity or juvenile rearing has been observed and no distinct spawning populations are known to exist in Lake Washington watershed, outside of the upper Cedar River in Chester Morse Lake (USFWS 2004).

5.6.2 Puget Sound Chinook Salmon

The Puget Sound Evolutionary Significant Unit (ESU) of Chinook salmon was listed as a threatened species under the ESA in March 1999. Chinook are anadromous and semelparous. Within this general life history strategy, Chinook display a wide range of variation in life histories including variation in age at seaward migration, variation in length of freshwater, estuarine and oceanic residence, variation in ocean distribution and ocean migratory patterns, and variation in age of spawning migrations. There are two predominant life history patterns in the eastern north Pacific populations: stream-type and ocean-type (Healy 1991). Stream type populations may rear as juveniles in streams for up to a year or more prior to migrating out to marine waters. Ocean-type populations have a wide range of rearing strategies, with some fish immediately migrating downstream after emerging from the gravel and rear in estuaries and others rearing for 1-6 months in freshwater prior to migrating to estuaries. Summer/fall run populations are typically considered to be ocean-type fish.

In the Lake Washington basin, all Chinook stocks are summer/fall run, and presumably ocean-type fish. The Cedar stock is considered depressed and escapement estimates have ranged from 419-1745 from 1967-1991 (WDFW 1992, as cited in USACE 2002, Myers et al. 1998, Good et al. 2005). Chinook salmon are typically mainstem spawners preferring higher velocity areas than the smaller salmon species.

Juvenile Chinook have been captured and counted in inclined plane and screw traps in Bear Creek and the Cedar River and show a long period of outmigration from the spawning grounds. In the Cedar River, small Chinook fry (~40 mm) migrate from January through April. Then, larger Chinook (80-150 mm) migrate from May through at least the end of July. Due to the Lake Washington Ship Canal (LWSC) and other shoreline development below the Locks, there is very

limited estuary habitat for juvenile Chinook to rear in (NMFS 1998). There is some evidence that Chinook fry and smolts may rear in nearshore areas of Lake Washington.

5.6.2.1 Utilization of the Project Area

Adult and juvenile Chinook use the entire mainstem of the Cedar River for migration, spawning, and rearing. In general, Chinook spawn from about RM 2 to RM 19 (USACE 2002). No Chinook spawning was observed below RM 1.5 in 1998. Due to very few side channels in the Cedar River, there is limited off-channel rearing habitat available to juvenile Chinook. This lack of side channel rearing habitat is likely a limiting factor to Chinook production.

5.6.3 Puget Sound Steelhead

The Puget Sound Distinct Population Segment (DPS) of steelhead was listed as threatened effective June 11, 2007 (NMFS 2007). Critical Habitat for this DPS is under development. The DPS includes all naturally spawned anadromous winter-run and summer-run *O. mykiss* (steelhead) populations, in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington.

O. mykiss exhibit the most complex life history of any species of Pacific salmonid. *O. mykiss* can be anadromous (steelhead) or freshwater residents (rainbow or redband trout), and under some circumstances, they can yield offspring of an alternate life history form (Hard et al. 2007). Anadromous *O. mykiss* can spend up to 7 years in fresh water prior to smoltification (the physiological and behavioral changes required for the transition to salt water), and then spend up to 3 years in salt water prior to migrating back to their natal streams to spawn. *O. mykiss* may spawn more than once during their life span (iteroparous), whereas the Pacific salmon species generally spawn once and die (semelparous).

Steelhead can be divided into two basic reproductive ecotypes, based on the state of sexual maturity at the time of river entry and duration of spawning migration (Burgner et al. 1992). The summer or stream-maturing type enters fresh water in a sexually immature condition between May and October, and requires several months to mature before spawning. The winter or ocean maturing type enters fresh water between November and April, with well-developed gonads and spawns shortly thereafter. In basins with both summer and winter steelhead runs, the summer run generally occurs where habitat is not fully utilized by the winter run, or where an ephemeral hydrologic barrier separates them, such as a seasonal velocity barrier at a waterfall.

5.6.3.1 Utilization of the Project Area

Winter steelhead in the Cedar River are of the Lake Washington stock and were identified as a stock based on their distinct spawning distribution. The Lake Washington stock is a native stock with wild production (WDFW 2010). Stock status was rated as depressed in 1992 and was changed to critical in 2002 due to chronically low escapements and a short-term severe decline in escapement in 2000 and 2001 (WDFW 2010). Spawning takes place throughout the Lake Washington Basin. In the Cedar River, spawning occurs in the lower reaches. Spawning occurs from mid-December through early June (WDFW 2010).

5.7 Cultural Resources

A cultural resources assessment was performed by a professional archaeologist in order to determine if a potential exists to cause effects to Historic Properties if they should exist within

the project area. A search of the archaeological and historic site records at the Washington State Department of Archaeology and Historic Preservation (DAHP) indicated that no properties listed in the National Register of Historic Places (NRHP) or the Washington State Historic Site Register are recorded in the project area. Historic aerial photos and General Land Office (GLO) survey maps were reviewed in order to identify any potential areas where cultural resources could be present.

The Corps has determined that the project has No Potential to cause effects to Historic Properties under the NHPA, as the area has been highly disturbed by modern construction and there are no historic structures adjacent to the undertaking, or within immediate viewsheds that are eligible for the National Register. This determination completes the NHPA process.

5.8 Land Use

Land use in the lower Cedar River basin is highly urbanized and dominated by industrial and commercial land uses near the river. The Cedar River FCW protects the Boeing aircraft manufacturing plant on the right bank and the Renton Municipal Airport on the left bank.

5.9 Air Quality, Noise and Transportation

5.9.1 Air Quality

In accordance with the Clean Air Act (CAA) and its amendments, National Ambient Air Quality Standards (NAAQS) have been established by the Environmental Protection Agency (EPA) for several criteria pollutants including lead (Pb), ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), total suspended particulates (TSP), and particulates with aerodynamic diameters of less than 10 microns (PM_{10} and PM2.5). Three agencies have jurisdiction over air quality in the project area: the EPA, Ecology, and the Puget Sound Clean Air Agency (PSCAA). These agencies establish regulations that govern both the concentrations of pollutants in the outdoor air and contaminant emissions from air pollution sources. Although their regulations are similar in stringency, each agency has established its own standards. Unless the state or local jurisdiction has adopted more stringent standards, the EPA standards apply. The project area is classified as an attainment area for all criteria pollutants except CO, O_3, and PM_{10}. For CO and O_3, the region is classified as a maintenance area, which is a provisional attainment status that must be maintained for several years before being reclassified as full attainment. There are three pockets of PM_{10} non-attainment areas in the region, including industrial areas in Seattle, Kent, and the Tacoma Tideflats. The project site is located outside of these areas.

5.9.2 Noise

State, county, and local noise regulations specify standards that restrict both the level and duration of noise measured at any given point within a receiving property. The maximum permissible environmental noise levels depend on the land use of the property that contains the noise source (e.g., industrial, commercial, or residential) and the land use of the property receiving that noise. Sound levels throughout the Cedar River are variable and depending on location, ranging from relatively loud noises associated with urban and industrial activities near the project area to very quiet rural environments in the upper basin.

5.9.3 Transportation

The project area is located in the City of Renton which is approximately 25 minutes south of downtown Seattle to the northwest and the City of Bellevue to the north and is situated in the center of a regional transportation network that connects State Highways 167, 169, 515 and 900 to Interstate Highways 5, 405 and 90. The Renton Municipal Airport is adjacent to the project area and provides "regional aviation services for air charter, air taxi, corporate, business and recreational flyers. It is also an FAA-designated "'Reliever' airport, diverting general aviation aircraft traffic from Sea-Tac International Airport" (Renton 2011).

5.10 Recreation

The proposed project area is located within the Cedar River FCW and contains public walking on the right bank only within the City of Renton's Cedar River Trail Park. The Cedar River Trail is 4.5 miles long within the city limits and connects to the east to Maple Valley. The trail extends on the right bank opposite the project area. It is a 24-acre park which contains picnic areas, play equipment as well as a non-motorized boat launch. The park provides views of Lake Washington and aircraft taking-off from Renton Municipal Airport (Renton 2011). Public access to the river along the floodwall is not available. Recreational aviation occurs landward of the floodwall at the Renton Municipal Airport.

5.11 Aesthetics

The visual quality of the lower Cedar River basin varies with its diverse land use and development. Visual quality decreases downstream as development increases. The proposed project area is located in an urban/industrial dominated landscape, including the Renton Municipal Airport and the Boeing Company manufacturing facility. The existing floodwall on the left bank restricts views of the Cedar River, although the river can be viewed from both the Logan Avenue and south Boeing bridges. The right bank of the Cedar River FCW offers views of the river from the City of Renton maintained open space.

6.0 ENVIRONMENTAL CONSEQUENCES

6.1 Topography, Hydrology, and Soils

6.1.1 No Action

Under the No Action Alternative, the floodwall would remain out of compliance with Corps I-type floodwall guidance. In the event of a floodwall failure during a flood event, the river channel could migrate into developed areas, changing the hydrology in the immediate area of the failure and throughout the affected reach of the river. It is unlikely that topography or soils would be affected in the project area, since prior development along the lower Cedar River has already altered the native soils and topography. No impacts to topography, hydrology and soils would result from this alternative.

6.1.2 Preferred Alternative – Vegetation Removal with Mitigation

Removing the existing vegetation would result in a net increase in hydraulic conveyance due to lower bank roughness values. This will result in very slightly lower water surface elevations through the reach. Lower stage flood events (below the vegetation line) would not result in any changes to velocity or water surface elevation. Larger events could produce lower water surface elevations due to higher channel velocities, which may cause additional toe scour and potential levee damage, if not controlled by backwater from a downstream structure and/or feature. However, if the bridge abutments for the South Boeing Bridge create backwater, then the vegetation removal would have no impact other than adding a few cubic feet of volume in the channel. Minor changes to hydrology would be expected, however no changes to the topography and soils would occur.

6.1.3 Floodwall Setback/Relocation

Relocating the floodwall landward of its present location would increase conveyance by increasing the cross sectional area of the river channel. Velocities will decrease as compared to identical flows with the existing geometry, and the water surface elevation should decrease if not controlled by backwater from a downstream structure and/or feature. Minor changes to hydrology would be expected, however no changes to the topography and soils would occur as a result of this alternative.

6.2 Water Quality

6.2.1 No Action

No effects to water quality would result from the no-action alternative.

6.2.2 Preferred Alternative – Vegetation Removal with Mitigation

This alternative would utilize best management practices, such as working completely in the dry as well as soil disturbance minimization measures as described in Section 3.1, to ensure no sediment enters the river during project work, and all cleared areas would be mulched, seeded and planted with appropriate native grass species to prevent storm water runoff after completion. No turbidity is expected to occur, however a Corps biologist would be onsite during the vegetation removal to visually monitor. Short-term impacts to water quality are expected to be insignificant. A reduction in shading associated with the removal of overstory canopy cover could increase localized temperature, although water depth rather than shade is typically more

significant because the presence of shade this close to the mouth of the river would have little influence on water temperature. Willow stakes installed at the upstream portion of the project site as well as willow stakes installed on the right bank opposite the project site would offset localized shade reduction. A temporal lag would occur from the removal of vegetation to establishment of willows and upstream tree plantings. This will result in temporary minor impacts to water quality due to the temporal lag of plantings as a result of this alternative.

6.2.3 Floodwall Setback/Relocation

This alternative would utilize best management practices during the construction of a floodwall landward of the existing floodwall and removal of the existing floodwall from Logan Avenue to the south Boeing Bridge. Existing vegetation would remain in place and be allowed to mature in perpetuity. A minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet would be maintained for access and structural integrity. No impacts to water quality would result from this alternative.

6.3 Vegetation

6.3.1 No Action

Under the no-action alternative, the floodwall would remain out of compliance with vegetation present on the riverward side of the floodwall. It is assumed that the current vegetation, including invasive species would remain in place and be allowed to mature and undergo natural processes (i.e. maturation, erosion, snag forming). No effects to vegetation would result from the no-action alternative.

6.3.2 Preferred Alternative – Vegetation Removal with Mitigation

Following vegetation removal, there would be an alteration in stream shading and reduction in leaf fall, cover and woody debris recruitment. Forty trees are located beyond the 15 foot vegetation-free zone of the I-wall and would not be removed (Appendix G). The project area would be hydroseeded to minimize erosion following tree and vegetation removal. Both the off-site planting location and on-site willow stakes would offset the loss of cover and organic material inputs formerly contributed to the river by the removed trees. There would be a temporal lag of 3-10 years while vegetation is established. All necessary measures, including monitoring would be taken to ensure planting success. Invasive species will be removed from the project site and also removed surrounding each planting at the upstream planting area. Impacts from vegetation removal will be offset in the long-term from benefits of invasive species removal and plantings. However, minor impacts will result during the temporal lag of establishment of plantings as a result of this alternative.

6.3.3 Floodwall Setback/Relocation

This alternative would utilize best management practices during the construction of a floodwall landward of the existing floodwall and removal of the existing floodwall from Logan Avenue to the south Boeing Bridge. Removal of the existing floodwall would likely result in disturbance and damage to the existing vegetation for equipment access. Vegetation could be disturbed and some trees would likely need to be removed for construction access to remove the existing floodwall. Remaining vegetation would remain in place and allowed to mature in perpetuity. A minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet would be maintained for access and structural integrity. The new vegetation-free zone is currently devoid of woody vegetation because that area is currently airport infrastructure for the

Renton Municipal Airport. Temporary construction related impacts to vegetation would result from this alternative.

6.4 Wildlife

6.4.1 No Action

Under the no-action alternative, no changes to wildlife habitat and use are anticipated. Wildlife activity in the lower Cedar River is limited by development and roads. Human land use patterns have virtually eliminated the riparian corridor along the lower Cedar River and what is left is highly fragmented. The small patch of native vegetation at the project site, creates wildlife habitat that is fragmented and, at best, poor quality. No impacts to wildlife would result from this alternative.

6.4.2 Preferred Alternative – Vegetation Removal with Mitigation

Removal of vegetation, including invasive species and adding native willow stakes at the upstream end of the project site and on the right bank opposite the project site as well as native tree plantings upstream at RM 5.0 should provide the addition of riparian vegetation to offset the vegetation removal. The willows and tree plantings should also provide habitat to support small, native mammal and bird species, thereby not reducing biodiversity in the lower Cedar River corridor over the long-term. A short-term but immediate impact to wildlife is expected during vegetation removal activities. Cutting, stump grinding and transportation would require the use of construction equipment whose presence and noise may temporarily displace some species at the site. The site is in a highly developed area with an adjacent airport, so wildlife species present would be relatively tolerant of humans and their activities. The removal work would be done in the fall which would avoid the nesting season. Impacts to wildlife are expected occur during the vegetation removal from equipment noise and in the short-term as mitigation plantings mature.

6.4.3 Floodwall Setback/Relocation

Vegetation could be disturbed and some trees would likely need to be removed for construction access to remove the existing floodwall. Remaining vegetation would remain in place and allowed to mature in perpetuity. A minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet would be maintained for access and structural integrity. The duration of construction would be expected to last 8-12 weeks. Due to the lack of woody vegetation, the new vegetation-free zone of the relocated floodwall would remain unsuitable wildlife habitat. Temporary construction related impacts to wildlife would result from this alternative.

6.5 Fish

6.5.1 No Action

Current habitat conditions are limited by the existing levees and extensive deterioration of the riparian corridor caused by development in the floodplain. Levees and floodwalls constrain the river to the single, fixed channel and lead to a reduction in shade, organic/nutrient input and large woody debris (LWD) recruitment; elements which are essential in the formation of high-quality fish habitat. No effects to fish would result from the No Action Alternative.

6.5.2 Preferred Alternative – Vegetation Removal with Mitigation

Removal of 1620 LF of vegetation within 15-feet of the floodwall would result in a decrease to localized shade within the project footprint. With the vegetation removal, there is expected to be only a slight increase above the existing condition in night time lighting from near by buildings and roads reaching the river when the majority of fry and juveniles are moving through this reach of the river. This is because almost all the trees in the area are deciduous and would not have leaves, therefore much of this artificial light already reaches the river. The outmigration period for sockeye fry (late January – early June, peak migration late March and early April) and Chinook fry and juveniles (February - April). It is assumed that fish use would not change over the long-term. Short term disturbance may occur with the operation of heavy construction equipment adjacent to the river channel from noise and/or vibration. Tabor et al. (1998) report that light intensity levels through the project reach normally range between 0.10 and 0.20 lumens/ft^2, but that most of the river stretch is higher velocity habitat whereas most predation of sockeye fry appears to occur in lower-velocity habitat.

Tree removal along the I-wall would result in effects to shading and water temperature, supply food, overhead cover, and refuge and cover habitat. Planting willows along the upstream portion of the project area and planting along Ron Regis Park upstream from the project area will offset some of the effects the project would have on fish. Because public safety and the structural integrity of the floodwall precludes significant riparian growth along the riverward side of the structure, two off-site planting have been developed, as described in Section 3.0. The proposed plantings plan adds 195 trees to floodplain forest at Ron Regis Park along the Cedar River and would improve refugia available to fish during flood events. In addition, the second planting area at the Elliott Spawning Channel currently has little amount of vegetation cover and the proposed planting of 213 trees along the channel would greatly enhance the habitat along the channel by providing shade cover, detritus inputs, and refugia. Willow plantings along the upstream portion of the floodwall, beyond the vegetation-free buffer, would offset the long-term effects of vegetation removal on detritus inputs and refugia. Impacts to the existing habitat would be more quickly offset by the willow placement; however, a temporal lag is anticipated for impacts of tree removal and associated off-site planting. Because outmigration timing, higher velocity habitat in project reach, temperature, and shading impacts are considered minimal and adequately addressed with the off-site plantings and minimal impacts to fish are expected to occur from this alternative.

6.5.3 Floodwall Setback/Relocation

Similar to the No Action Alternative, current habitat conditions are limited by the existing levees and extensive deterioration of the riparian corridor caused by development in the floodplain. Levees and floodwalls constrain the river to the single, fixed channel and lead to a reduction in shade, organic/nutrient input and LWD recruitment; elements which are essential in the formation of high-quality fish habitat. Additional channel width associated with a setback/relocation of the floodwall landward of its existing location would increase the bank complexity within the lower Cedar River. Existing vegetation would remain in place and be allowed to mature in perpetuity. During high water events, vegetation would provide lower velocity areas for refuge. No impacts to fish are expected to occur from this alternative.

6.6 Sensitive, Threatened and Endangered Species

Puget Sound Chinook salmon, Puget Sound steelhead and Coastal/Puget Sound bull trout are the focus of the biological evaluation that was prepared by the Corps and transmitted to both the

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). The proposed project is expected to have no effect on marbled murrelet, northern spotted owl, grizzly bear and Canada lynx.

6.6.1 No Action

Under the No Action Alternative, no impacts to listed species would occur beyond those already having taken place by the construction of the existing Cedar River FCW. These impacts include degradation of riparian habitat with consequent impacts to temperature, cover, organic input and food production for fish, and loss of some benthic habitat. No additional changes to sensitive, threatened and endangered species in the lower Cedar River are anticipated if vegetation removal activities are not conducted.

6.6.2 Preferred Alternative – Vegetation Removal with Mitigation

Construction could cause temporary disturbances to Chinook salmon, steelhead and bull trout due to increased noise and/or vibration, if fish are present during construction. Adult fish are expected to avoid the construction area and still be able to access upstream spawning areas. Removal of vegetation would decrease the amount of existing shade and refuge within the project reach. Planted trees and willow stakes would, with time provide salmonid habitat in the lower Cedar River by helping to offset any adverse impacts from vegetation removal along the floodwall such as elevated water temperatures. A biological evaluation (BE) was submitted to both UWFWS and NMFS on 10 November 2010 with a determination that the proposed action *may affect, but is not likely to adversely affect* threatened Puget Sound Chinook salmon, Puget Sound steelhead, Coastal/Puget Sound bull trout and their designated critical habitat. Impacts to sensitive, threatened and endangered species are expected to be minor related to noise and/or vibration from equipment and reduced cover impacts would be offset as plantings mature. The number of trees to be removed has increased since November 2010. However, the Corps does not believe that a revised number of trees to be affected would trigger reinitiation of consultation under ESA because no new information or data has become available; the project revisions do not constitute a modification that would affect an ESA listed species; and no new species has been listed or critical habitat has been designated (Appendix C). See paragraph 10.2.

6.6.3 Floodwall Setback/Relocation

A setback/relocation of the floodwall landward would create bank complexity that is currently limited by the existing levees and deterioration of the riparian corridor through the project reach. Additional landmass riverward of the floodwall would allow natural processes of continued vegetation growth and potential woody debris recruitment. These processes coupled with lower velocity areas at higher water events would slightly increase quality of available fish habitat through the project reach in the Lower Cedar River. Possible minor beneficial impacts to sensitive, threatened and endangered species could result from this alternative.

6.7 Cultural Resources

6.7.1 No Action

No effects to cultural resources would result from the No Action Alternative.

6.7.2 Preferred Alternative – Vegetation Removal with Mitigation

No effects to cultural resources would result from the Preferred Alternative – Vegetation Removal with Mitigation.

6.7.3 Floodwall Setback/Relocation

A Corps archaeologist would be required to conduct an additional cultural resources survey to determine whether there is a potential for the proposed repairs to cause effects to historic properties, if they exist within the project area. If a potential exists, a Section 106 investigation report with the Corps' determination of effects to historic properties would be prepared and reviewed by the Washington State Historic Preservation Officer (SHPO) and the appropriate tribes prior to construction.

6.8 Land Use

6.8.1 No Action

Under the no-action alternative, the floodwall would remain out of compliance with Corps I-type floodwall guidance and continue to have increased risk of structural failure as well as complicating the operations of the wall. If corrective action is not taken, the flood control structure would be rated unacceptable and removed from the Corps Rehabilitation and Inspection Program. This action can lead to FEMA decertification and affect land use and flood insurance to the protected facilities. If the floodwall failed during a flood event, a highly urbanized area would be impacted by flood water. This would affect property values, and hence future land use. This alternative has potential to permanently impact land use.

6.8.2 Preferred Alternative – Vegetation Removal with Mitigation

No changes to land use are expected to occur as a result of this alternative.

6.8.3 Floodwall Setback/Relocation

Relocation of the floodwall landward of its present location would require the acquisition of the northbound lane of Perimeter Road West. The road would be permanently altered into a single lane road that could have impacts to businesses at the Renton Municipal Airport as well as impacts to the Boeing Company facility which owns and maintains the south Boeing Bridge. This alternative would have impacts on access to commerce and existing industry within the vicinity of the project area.

6.9 Air Quality, Noise and Transportation

6.9.1 No Action

No effects to air quality, noise or transportation would result from the no-action alternative.

6.9.2 Preferred Alternative – Vegetation Removal with Mitigation

Proposed activities would be conducted in an area that has attainment for all priority pollutants. The proposed activities would not exceed *de minimus* levels of direct emissions of a criteria pollutant or its precursors (100 tons/year for carbon monoxide and PM-10; 50 tons/year for ozone) and are exempted by 40 CFR Section 93.153(c)(2)(iv) from the conformity determination requirements. Emissions generated by the construction activity are expected to be minor, short-term and well below the *de minimus* threshold. Noise would be generated by vegetation removal equipment such as chainsaws, trucks, and portable stump grinder. All noise levels would return to background levels, including those of the adjacent Renton Municipal Airport, following the 1-week project duration. Vegetation removal activity would have minor, short-term impacts to transportation in the form of additional vehicles and equipment present at the project site. No roads would be closed but traffic would be controlled as needed during daylight hours only.

6.9.3 Floodwall Setback/Relocation

Proposed activities would be conducted in an area that has attainment for all priority pollutants, as discussed in Section 6.9.2. Heavy equipment would be required to drive sheet piles and pour the concrete casing for the relocated floodwall and haul away the existing floodwall. Perimeter Road would be closed for the duration of construction. Traffic and transportation would be permanently impacted by the reduction of Perimeter Road to a single lane following construction. In some places only 45-50 feet of space exist between the floodwall in its current position and existing buildings leaving very little space for a setback/relocation. Impacts to air quality and noise would occur during construction and return to normal levels following completion. Transportation would be permanently impacted as a result of this alternative.

6.10 Recreation

6.10.1 No Action

No effects would result from the no-action alternative.

6.10.2 Preferred Alternative – Vegetation Removal with Mitigation

Recreational activities at the project area are not expected to change after completion of vegetation removal. Any impacts to traffic and/or public access at the project site or off-site planting locations would be limited to the duration of vegetation removal activities, which is anticipated to last 1 week.

6.10.3 Floodwall Setback/Relocation

Construction of a floodwall landward of its present location would result in the elimination of one lane of Perimeter Road West. The road would be single lane and would impact the existing recreational aviation companies accessed only by Perimeter Road West or through the entrance of Renton Municipal Airport. This alternative would permanently impact recreation access.

6.11 Aesthetics

6.11.1 No Action

Under the No Action Alternative, no impact to aesthetics or visual quality is expected.

6.11.2 Preferred Alternative – Vegetation Removal with Mitigation

The Vegetation Removal Alternative, including tree removal and understory vegetation clearing (including invasive species) combined with willow stake installation and upstream tree planting is expected to create a more natural landscape in the project vicinity. However, at the project site, there would be a change in visual quality following vegetation removal with exposure of the floodwall to the public accessing the Cedar River Trail Park on the right bank.

6.11.3 Floodwall Setback/Relocation

Relocation of the floodwall landward of its present location would maintain the existing visual quality of the landscape by retaining all vegetation currently on-site. Under the Floodwall Setback/Relocation Alternative, no impact to aesthetics or visual quality is expected.

8.0 Cumulative Impacts

Cumulative effects include the effects of other past, present, and reasonably foreseeable future Federal, State, tribal, local or private actions in the action area considered in this evaluation.

The City of Renton proposes to conduct maintenance dredging within the next 3-5 years of the Cedar River FCW. The dredging would involve the removal of sediment from the channel bottom and disposal either through a beneficial use site or open water disposal area. The long-term cumulative environmental effects of the Cedar River FCW – including a recently completed repair along the right bank downstream of the project site (completed summer 2011) and mitigation Cedar Spawning Channel Replacement Project between RM 3.4 and 3.6 (completed summer 2009) have been fully evaluated in the Environmental Impact Statement (EIS) and project specific EAs.

As mitigation for the Section 205 Project, the existing trees were planted to preserve the riparian habitat and have increased relative ecological importance due to lack of similar habitat in this project reach. The proposed on- and off-site plantings would compensate for the loss of riparian vegetation due to the proposed action.

The proposed action is not anticipated to generate incremental adverse effect on the quality of the human environment, when considered in conjunction with other past and present actions and future proposals. Cumulative impacts from local, short-term disturbances caused by the proposed action (noise, emissions, traffic disruptions, etc.) would be minor and temporary.

9.0 Coordination

The following agencies and entities have been involved with the environmental coordination of this project:

- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- Washington Department of Fish and Wildlife
- Washington Department of Ecology
- Washington State Office of Archaeology and Historic Preservation
- Muckleshoot Indian Tribe
- City of Renton

10.0 Environmental Compliance

10.1 National Environmental Policy Act (42 USC 4321 et seq.)

In accordance with the NEPA, federal projects are required to evaluate potential environmental impacts. The Council On Environmental Quality implementing regulations for the National Environmental Policy Act (NEPA) of 1969 provide at 40 C.F.R.§ 1500.1(c): "The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." 40 C.F.R. § 1508.9(a)(1) provides that an environmental assessment is required to "provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact" on actions authorized, funded, or carried out by the federal government. Per NEPA requirements, this assessment evaluates environmental consequences from the proposed federal action involving vegetation removal along the Cedar River in King County, Washington. A Notice of Preparation (NOP) was issued from 8 April to 9 May 2011 to solicit comments from interested agencies and members of the public. Comments received and responses to those comments are attached to this EA as

Appendix E. A Finding of No Significant Impact (FONSI) is being prepared for the proposed federal action.

10.2 Endangered Species Act of 1973, as Amended (16 USC 1531-1544)

The Corps initiated informal consultation for the proposed action with the USFWS and the NMFS concerning anticipated effects on threatened and endangered species and their critical habitat, pursuant to Section 7(a)(2) of the ESA. The BE was sent on 10 November 2010, based on the determination that the project is not likely to adversely affect threatened Puget Sound Chinook salmon, Puget Sound steelhead, Coastal/Puget Sound bull trout and their designated critical habitat. Concurrence letters were received from NMFS and USFWS dated 10 December 2010 (Reference # 2010/05546) and 11 January 2011 (Reference # 12410-2011-I-0047) respectively (Appendix C).

In August 2012, after the Corps received concurrence from NMFS and USFWS, a more recent survey of the trees along the I-wall was conducted for the Corps' Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report, August 2012. As mentioned in Section 3.0, that survey identified 220 trees (136 of which are 6" in DBH or larger) for removal to meet the Corps guidance requirement of a 15 foot vegetation-free zone for I-type floodwalls. Therefore, the offsite planting plan has been updated from 195 trees to 408 trees to maintain the 3:1 replacement ratio for the trees larger than 6" in DBH that would be removed. The plantings would still occur within Ron Regis Park.

The Corps does not believe that a revised number of trees to be affected would trigger reinitiation of consultation under ESA because no new information or data has become available; the project revisions do not constitute a modification that would affect an ESA listed species; and no new species has been listed or critical habitat has been designated (Appendix C).

10.3 Clean Water Act, as Amended (33 USC 1251 et seq.)

The Clean Water Act (CWA) is the primary legislative vehicle for federal water pollution control program and the basic structure for regulating discharges of pollutants into waters of the United States. The proposed action would not involve a discharge of fill material into waters of the United States, therefore Section 404 of the CWA is not applicable.

10.4 Coastal Zone Management Act (16 USC 1451-1465)

The Coastal Zone Management Act (CZMA) of 1972 as amended, requires Federal agencies to carry out their activities in a manner, which is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. A review of the City of Renton Shoreline Master Program was conducted for the proposed project. A detailed analysis of consistency with the CZMA was submitted to the Washington Department of Ecology on 3 October 2011. A concurrence letter was received from the Washington Department of Ecology on 1 December 2011.

10.5 National Historic Preservation Act (16 USC 470 et seq., 110)

The National Historic Preservation Act (NHPA) (16 U.S.C. 470) requires that the effects of proposed federal undertakings on sites, buildings structures, or objects included or eligible for

the National Register of Historic Places must be identified and evaluated. The Cedar Floodwall project is a Federal undertaking of the type which has No Potential to cause effects to Historic Properties as the area has been highly disturbed by modern construction and there are no historic structures adjacent to the undertaking, or within immediate view sheds that are eligible for the National Register (Appendix F). This determination completes the NHPA process.

10.6 Clean Air Act, as Amended (42 USC 7401 et seq.)

The Clean Air Act requires states to develop plans, called State Implementation Plans (SIP), for eliminating or reducing the severity and number of violations of NAAQS while achieving expeditious attainment of the NAAQS. The Act also required Federal actions to conform to the appropriate SIP. An action that conforms with a SIP is defined as any action that would not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard required interim emission reductions or other milestones in any area.

The Corps has determined that emissions associated with the proposed action would not exceed EPA's *de minimus* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone).

10.7 Wild and Scenic Rivers Act (16 USC 1271-1287)

No portions of the Cedar River have been designated as a Wild and Scenic River and this act is therefore not applicable to the proposed action.

10.8 Migratory Bird Treaty Act and Migratory Bird Conservation Act (16 USC 701-715)

The Migratory Bird Treaty Act (MBTA), establishes a Federal prohibition, unless permitted by regulations to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, … or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." This prohibition applies to birds included in the respective international conventions between the United States and Great Britain, the United States and Mexico, the United States and Japan, and the United States and the former Union of Soviet Socialist Republics.

The alternatives considered in this EA are evaluated with regard to effects on birds and their habitat in wetlands and riparian areas. The site is in a highly developed area with an adjacent airport, so birds present would be relatively tolerant of humans and their activities. The removal work would be done in the fall which would avoid the nesting season.

10.9 Magnuson-Stevens Fishery Conservation and Management Act (16 USC 1801 et seq.)

The Magnuson Stevens Fishery Conservation and Management Act requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. The objective of an EFH assessment is to determine whether or not the proposed action(s) "may adversely affect" designated EFH for relevant commercial, federally-managed fisheries species within the proposed action area. The assessment also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

The BE included a determination that the project would not reduce the quality and/or quality of Essential Fish Habitat (EFH) for Pacific salmon under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The Corps has determined that the proposed action would not reduce the quality and/or quantity of EFH for Pacific salmon or federally managed fisheries in Washington waters. This determination is based on the limited scope and duration of the vegetation removal, on and off-site planting plan and no in-water work. Concurrence letter were received from NMFS dated 10 December 2010 (Reference # 2010/05546). NMFS recommended the Corps seek conservation bank or in-lieu fee bank opportunities to further compensate for the loss of riparian habitat. The Corps believes that the proposed planting plan at Ron Regis Park and at the upstream end of the I-wall offsets any potential effects to EFH from the proposed tree removal at the I-wall.

As described in Section 10.2, the amount of trees identified for removal and planted as mitigation has been revised since the Corps received concurrence. The Corps does not believe that a revised number of trees to be affected would trigger reinitiation of consultation under MSA because no new information or data has become available and the project revisions do not constitute a modification that would affect EFH (Appendix C).

10.10 Federal Water Project Recreation Act, as Amended (16 USC 4612 et seq.)

In the planning of any Federal navigation, flood control, reclamation, or water resources project, the Federal Water Project Recreation Act, requires that full consideration be given to the opportunities that the project affords for outdoor recreation and fish and wildlife enhancement. The Act requires planning with respect to development of recreation potential. Projects must be constructed, maintained and operated in such a manner if recreational opportunities are consistent with the purpose of the project.

This EA assesses impacts of alternative actions on recreation, but the proposed action is not intended to provide recreational benefits.

10.11 Fish and Wildlife Coordination Act (16 USC 661)

The Fish and Wildlife Coordination Act (FWCA) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. This goal is accomplished through Corps funding of USFWS habitat surveys evaluating the likely impacts of proposed actions, which provide the basis for recommendations for avoiding or minimizing such impacts. A FWCA Report was completed for the 1997 Final EIS for the Cedar River Section 205 Flood Control Project and the current project is consistent with that report. No FWCA Report is required for the proposed action.

10.12 Resource Conservation and Recovery Act (42 USC 6901 et seq.)

The Resource Conservation and Recovery Act (RCRA) was enacted to address the issue of how to safely manage and dispose of municipal and industrial waste, regulate underground storage tanks (USTs) that store petroleum or hazardous substances, establish a system for managing solid (primarily non-hazardous) waste, including household waste, and set forth the framework for EPA's comprehensive waste management program. No abandoned waste has been observed during project site visits. If abandoned or buried hazardous waste or pesticides were discovered during construction, it would be managed in accordance with RCRA or the Comprehensive

Environmental Response, Compensation, and Liability Act requirements, as applicable. Contractor hazardous materials and waste would be managed in accordance with RCRA requirements. The proposed action is in compliance with this act.

10.13 Treaty Rights

In the mid-1850s, the United States entered into treaties with nearly all of the Native American tribes in the territory that would become Washington State. These treaties guaranteed the signatory tribes the right to "take fish at usual and accustomed grounds and stations... in common with all citizens of the territory" [U.S. v. Washington, 384 F. Supp. 312 at 332 (WDWA 1974)]. In U.S. v. Washington, 384 F. Supp. 312 at 343 - 344, the court resolved that the Treaty tribes had the right to take up to 50 percent of the harvestable anadromous fish runs passing through those grounds, as needed to provide them with a moderate standard of living (Fair Share). Over the years, the courts have held that this right comprehends certain subsidiary rights, such as access to their "usual and accustomed" fishing grounds. More than de minimis effects to access to usual and accustomed fishing areas may violate this treaty right [Northwest Sea Farms v. Wynn, F. Supp. 931 F. Supp. 1515 at 1522 (WDWA1996)]. In U.S. v. Washington, 759 F.2d 1353 (9th Cir 1985) the court indicated that the obligation to prevent degradation of the fish habitat would be determined on a case-by-case basis. The Ninth Circuit has held that this right encompasses the right to take shellfish [U.S. v. Washington, 135 F.3d 618 (9th Cir 1998)].

No in water work is involved and the project timing was developed so that it would not affect tribal fishing seasons and areas. To address impacts of the proposed work on fisheries habitat, the Corps supplemented the mitigation proposed in the project's Notice of Preparation to also include 1620 linear feet of willow plantings on the right bank opposite the project area. This additional planting effort, combined with 200 linear feet of willow planting on the left bank at the project site will provide long-term benefits within the project reach including water temperature. In addition, planting to enhance riparian habitat will be completed at the off-site planting area at Ron Regis Park (RM 5.0). The Corps believes that the plantings adequately compensate for project impacts identified in comments by the Muckleshoot Indian Tribe Fisheries Division.

Coordination occurred with the Muckleshoot Indian Tribe. The Tribe has attended site visits to both the vegetation removal site as well as the mitigation planting site. Multiple meetings have occurred including Government to Government meetings. The last several of these Government to Government meetings were 2 March, 12 June, and 10 September 2012. Staff level communication both in-person, over the phone, and via-email have been exchanged. In response to the Tribe's concerns in response to the NOP, the Corps incorporated additional willow plantings on the right bank opposite the floodwall. Additionally, the Corps conducted analysis of the floodwall during August 2012 to investigate the interaction of vegetation with the floodwall structure. Resulting from this analysis, the Corps found that roots have penetrated the I-wall joints and joint seals in the concrete cap (see Appendix B, Photo 5) and observed roots up to ¾-inches diameter along the steel sheet pile approximately 4 feet below grade. Although no penetration points by these roots were located through the I-wall itself, it is unlikely that the trees landward side of the I-wall were the source of the identified roots (i.e. the roots likely originate from trees on the waterward side of the wall). Therefore, the Corps determined that the Cedar River I-wall is a poor candidate for a variance to the Corps national standard on levee/I-Wall

vegetation standards as outlined in draft Corps guidance and communicated this conclusion in the 10 September Government to Government meeting.

During the 10 September meeting, the Tribe proposed other possible solutions such as leaving some trees in the 15 foot zone; thinning out some of the trees; leaving understory vegetation including Himalayan blackberry between the inspection and maintenance cycle; planting trees with an above ground type root structure or in containment structures; only removing trees that have roots at surface intersecting the I-wall; and creating a root-free zone adjacent to I-wall. The Corps considered these potential options and concluded that they are not viable solutions because fundamental concerns about structural integrity of the I-wall and public safety would remain. Even though these options would preserve more vegetation along the I-wall in comparison to the preferred alternative, they still would permit circumstances where roots could impact the I-wall and preclude adequate inspections, and would require variance approval by Corps Headquarters which is highly unlikely.

Though the Muckleshoot Indian Tribe continues to have concerns with the removal of vegetation, the Corps has analyzed the proposed project with respect to its effects on the treaty rights described above. The Corps believes its actions are consistent with our Tribal Treaty and Trust responsibilities and concludes the following:

(1) The work would not interfere with access to usual and accustomed fishing and gathering areas;
(2) The work would not cause the degradation of fish runs in usual and accustomed fishing grounds or with fishing activities or shellfish harvesting and habitat; and
(3) The work would not impair the Treaty tribes' ability to meet moderate living needs.

10.14 Executive Order 11988, Floodplain Management (24 May 1977)

Executive Order 11988 requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy of the floodplain, and to avoid direct and indirect support of floodplain development where there is a practicable alternative. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by flood plains.” Section 8 of the order notes that it does not apply to assistance provided for emergency work essential to save lives or protect public property, health, and safety. The proposed action would not create a change that would affect occupancy of the floodplain. By removing vegetation, the proposed action would be consistent with the executive order by bringing the floodwall into compliance with Corps guidance and minimize structural integrity concerns, while not changing floodplain occupancy conditions.

10.15 Executive Order 12898, Environmental Justice

Executive Order 12898 directs every Federal agency to identify and address disproportionately high and adverse human health or environmental effects of agency programs and activities on minority and low-income populations. The proposed action does not involve the siting of a facility that would discharge pollutants or contaminants, so no human health effects would occur. Therefore, the proposed action is in compliance with this order.

10.16 Executive Order 11990, Protection of Wetlands

Executive Order 11990 encourages federal agencies to take actions to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking federal activities and programs. The proposed action would not impact wetlands.

11.0 List of Preparers

The following people contributed directly to preparation of this document:

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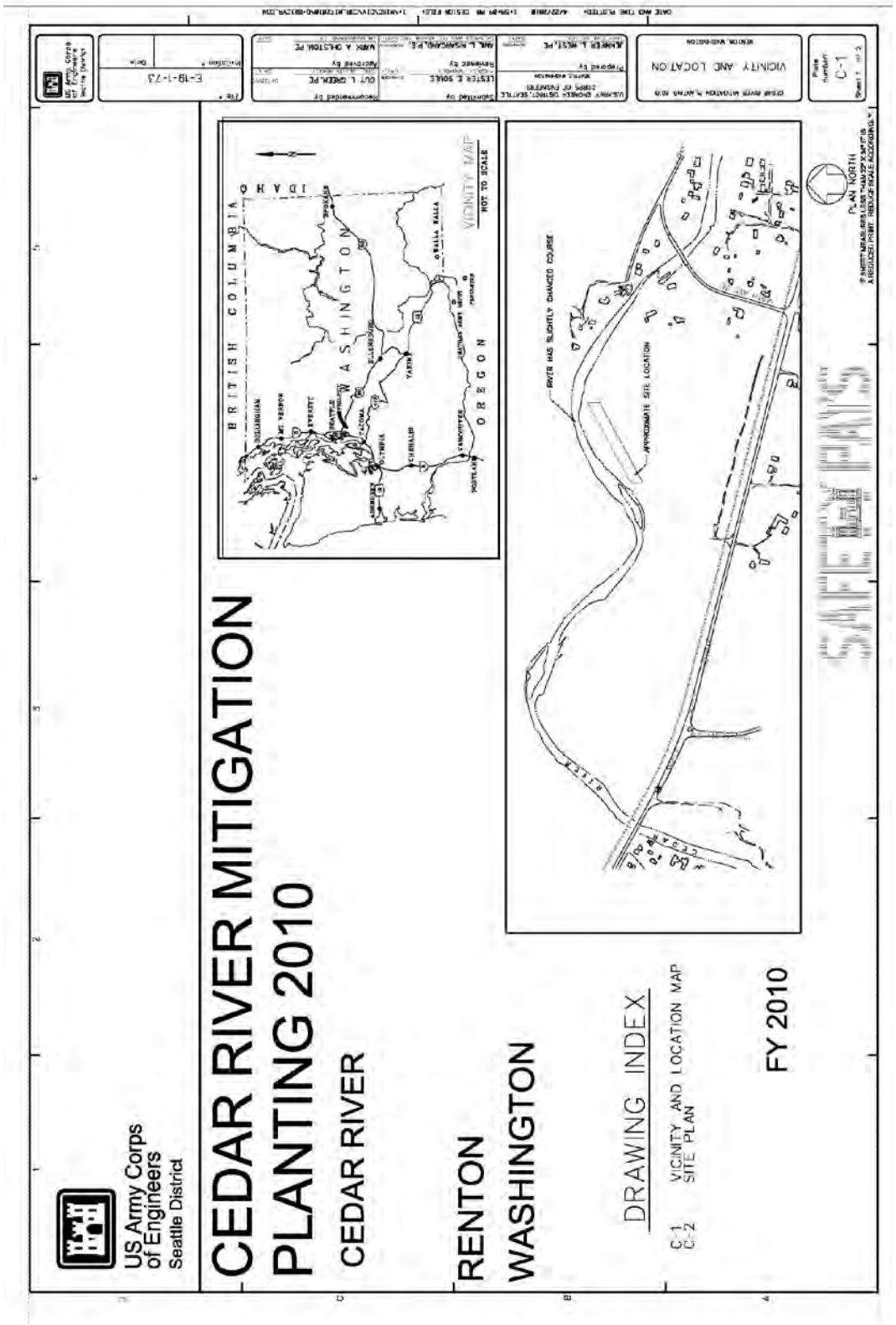
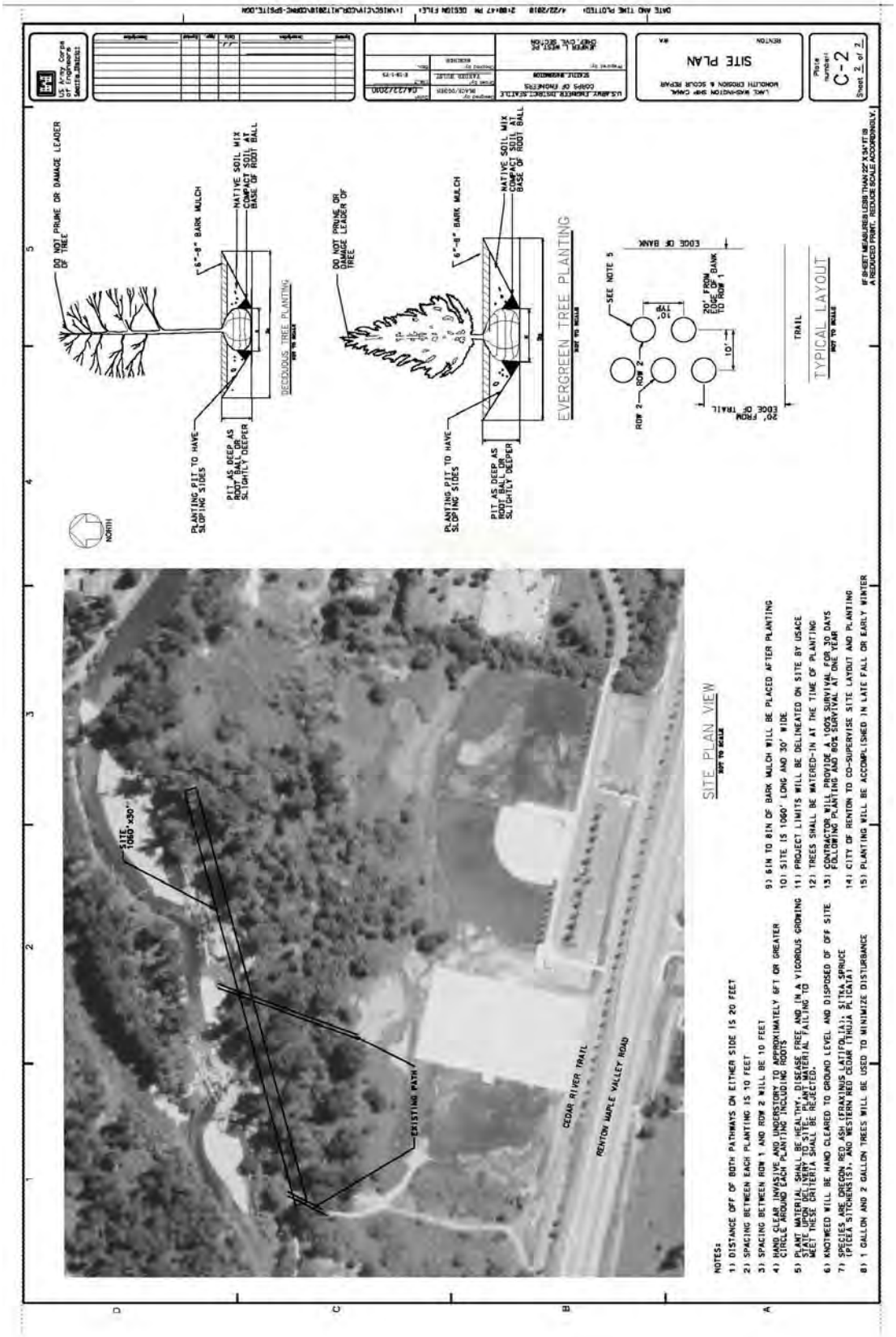
13.0 Appendices

Appendix A: Offsite Mitigation Planting Plan along the Cedar River for the 195 Trees




US Army Corps of Engineers Seattle District
SITE PLAN
LAKE WASHINGTON SHIP CANAL MONOLITH CROSSING & SCOUR REPAIR
RENTON
WA
Plate number: C-2
Sheet 2 of 2
DO NOT PRUNE OR DAMAGE LEADER OF TREE
6"-8" BARK MULCH
NATIVE SOIL MIX COMPACT SOIL AT BASE OF ROOT BALL
PLANTING PIT TO HAVE SLOPING SIDES
PIT AS DEEP AS ROOT BALL OR SLIGHTLY DEEPER
DECIDUOUS TREE PLANTING
NOT TO SCALE
EVERGREEN TREE PLANTING
NOT TO SCALE
SEE NOTE 5
EDGE OF BANK
20' FROM EDGE OF BANK TO ROW 1
10'
ROW 2
20' FROM EDGE OF TRAIL
TRAIL
TYPICAL LAYOUT
NOT TO SCALE
IF SHEET MEASURES LESS THAN 22" X 34" IT IS A REDUCED PRINT. REDUCE SCALE ACCORDINGLY.
NORTH
SITE 1060' x 30'
EXISTING PATH
CEDAR RIVER TRAIL
RENTON MAPLE VALLEY ROAD
SITE PLAN VIEW
NOT TO SCALE
NOTES:
1) DISTANCE OFF OF BOTH PATHWAYS ON EITHER SIDE IS 20 FEET
2) SPACING BETWEEN EACH PLANTING IS 10 FEET
3) SPACING BETWEEN ROW 1 AND ROW 2 WILL BE 10 FEET
4) HAND CLEAR INVASIVE AND UNDERSTORY TO APPROXIMATELY 6FT OR GREATER CIRCLE AROUND EACH PLANTING INCLUDING ROOTS
5) PLANT MATERIAL SHALL BE HEALTHY, DISEASE FREE AND IN A VIGOROUS GROWING STATE UPON DELIVERY TO SITE. PLANT MATERIAL FAILING TO MEET THESE CRITERIA SHALL BE REJECTED.
6) KNOTWEED WILL BE HAND CLEARED TO GROUND LEVEL AND DISPOSED OF OFF SITE
7) SPECIES ARE OREGON RED ASH (FRAXINUS LATIFOLIA); SITKA SPRUCE (PICEA SITCHENSIS), AND WESTERN RED CEDAR (THUJA PLICATA)
8) 1 GALLON AND 2 GALLON TREES WILL BE USED TO MINIMIZE DISTURBANCE
9) 6IN TO 8IN OF BARK MULCH WILL BE PLACED AFTER PLANTING
10) SITE IS 1060' LONG AND 30' WIDE
11) PROJECT LIMITS WILL BE DELINEATED ON SITE BY USACE
12) TREES SHALL BE WATERED-IN AT THE TIME OF PLANTING
13) CONTRACTOR WILL PROVIDE A 100% SURVIVAL FOR 30 DAYS FOLLOWING PLANTING AND 80% SURVIVAL AT ONE YEAR
14) CITY OF RENTON TO CO-SUPERVISE SITE LAYOUT AND PLANTING
15) PLANTING WILL BE ACCOMPLISHED IN LATE FALL OR EARLY WINTER

Appendix B: Project Photos

Photo 1. View looking downstream towards the South Boeing Bridge, the southern extent of the proposed vegetation removal.

Photo 2. View looking upstream towards Logan Avenue of the I-type Floodwall on the left bank of the Cedar River with Renton Airport to the right (West).

Photo 3. View looking downstream near the upstream extent of the project area, note mostly small diameter red alder with invasive understory.

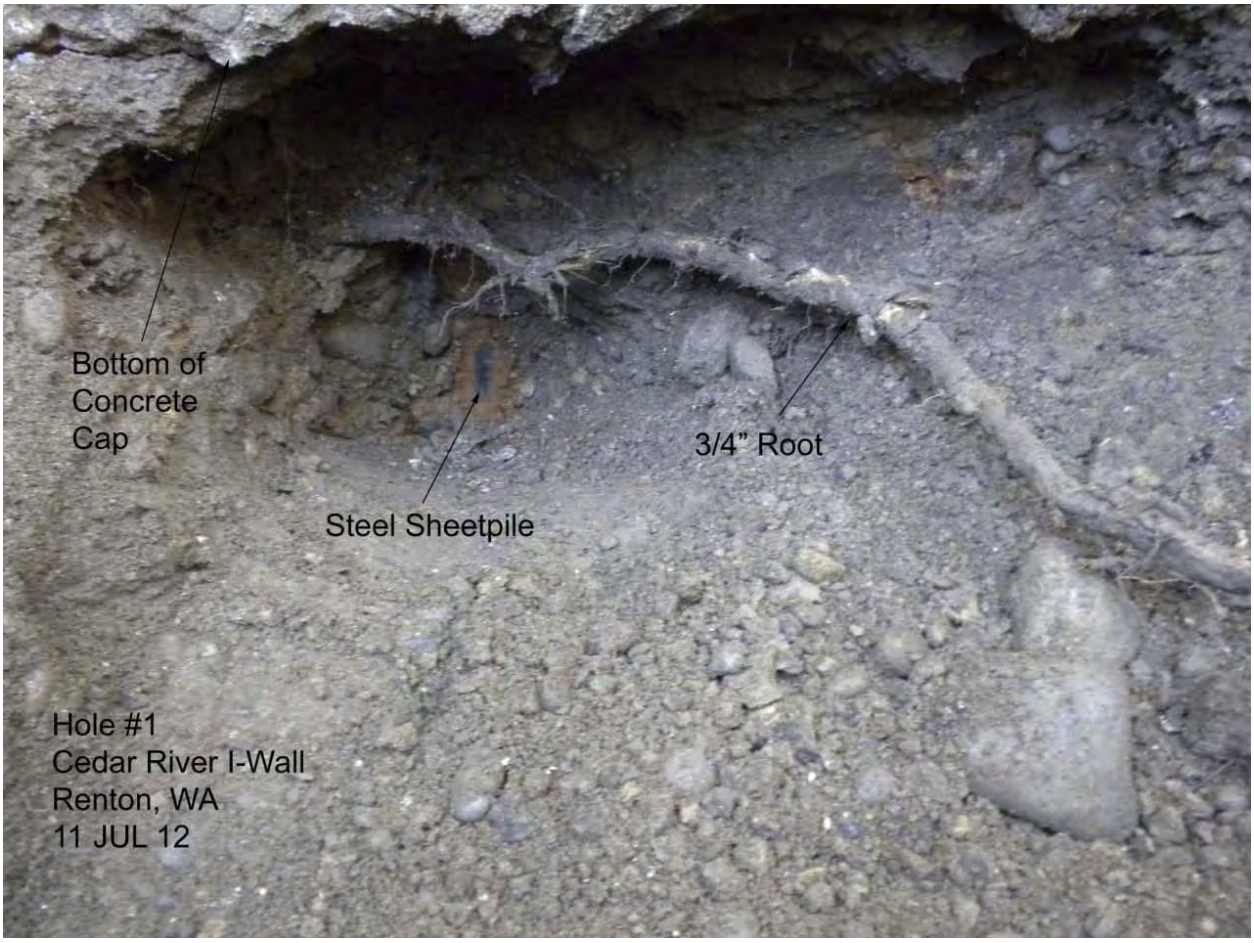


Photo 4. Hole #1 root along sheet pile.

Photo 5. Riverward side of I-wall with alder root penetrating the expansion joint.

Appendix C: ESA Concurrence Letters

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, Washington 98115

NMFS Tracking No.:
2010/05546

December 10, 2010

Evan Lewis, Chief
Environmental Resources Section
Department of the Army
Seattle District, Corps of Engineers
P.O. Box 3755
Seattle, WA 98124-3755

RE: Endangered Species Act Section 7 and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Floodwall Maintenance Vegetation Removal, Cedar River at Renton, King County, WA. HUC 171100120106 (Lower Cedar River) COE Reference No.: PL-10-13

Dear Mr. Lewis:

This correspondence is in response to your request for consultation under the Endangered Species Act (ESA) of 1973, as amended, 16 U.S.C. 1531. Additionally, this letter serves to meet the requirements for consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSA, 16 U.S.C. 1855).

Endangered Species Act

The National Marine Fisheries Service (NMFS) has reviewed the Biological Evaluation (BE) for the Floodwall Maintenance Vegetation Removal, Cedar River at Renton received on November 10, 2010. The Corps of Engineers (COE) requests concurrence with its determination that the proposed action *"may affect, but is not likely to adversely affect"* threatened Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*), threatened PS steelhead (*O. mykiss*) and designated PS Chinook salmon critical habitat. This consultation with the COE is conducted under section 7(a)(2) of the ESA, and its implementing regulations, 50 CFR Part 402.

The COE is proposing to complete required maintenance to the Flood Control Works (FCW) on the Cedar River Section 205 Flood Control Project located from river mile (RM) 0.0 to approximately RM 1.5 on the Cedar River. The required maintenance consists of vegetation removal along 1620 feet of the left bank of the Cedar River adjacent to the Renton Municipal Airport from Logan Avenue (RM 1.07) to the south Boeing Bridge (RM 0.74) in King County. The action area is riverine and riparian habitats of the Cedar River within the described 1620 feet along the left bank of the river and downstream 300 feet.

The Cedar River Section 205 FCW project, constructed between 1998 and 2000, included the building of earthen levees combined with steel and concrete floodwalls along both banks of the river and dredging in the river channel. Levees and floodwalls were raised along both banks from the confluence of the Cedar River with Lake Washington to Williams Avenue, 1.25 miles upstream. Dredging lowered the river channel approximately four feet from the mouth to the Logan Avenue Bridge (RM 1), gradually decreasing the slope upstream another 0.5 mile to meet the existing grade. The goal was to reduce potential flood damage along approximately 1.5 miles of the lower Cedar River through downtown Renton, primarily protecting the Boeing aircraft manufacturing plant and the Renton Municipal Airport. An overflow section downstream of the south Boeing Bridge on the left bank insures that if river flows within the FCW project are exceeded, flooding will occur on the less developed left bank.

The floodwall in its current state does not comply with vegetation maintenance requirements, which state that a minimum vegetation-free zone (with the exception of grasses for erosion control) of 15 feet must be maintained for access and structural integrity.

The proposed project includes the following actions: (1) Remove 180 trees (65 of which are larger than or equal to 6 inch diameter at breast height (DBH)); (2) Clear all vegetation within 15 feet of the I-type floodwall structure; (3) Plant willow stakes at the river's edge along 200 feet at the upstream portion of the floodwall; and (4) Plant an off-site area at approximately RM 5.0 on the Cedar River with 195 native site-appropriate trees, providing a 3:1 replacement ratio for trees larger than 6 inch DBH. All work will be done in the dry.

Additional project detail can be found in the BE and in the informal consultation request letter from the COE. This project has the potential to affect listed fish in the Cedar through construction activities that may (1) disturb riparian vegetation, (2) increase the possibility for contamination from petroleum-based products, (3) perpetuate degraded conditions of the streambank, and (4) increase stream temperatures due to lack of shading from canopy. The project will be completed in the late spring when Cedar River flows are low. In addition to typical best management practices (BMPs) to minimize potential adverse effects on Chinook and steelhead, new riparian plantings will be monitored, and replanted as necessary, for a minimum of 3 years following project completion.

Species Determination

Puget Sound Chinook Salmon
Puget Sound Steelhead

Puget Sound Chinook salmon are distributed throughout the Cedar River, potentially utilizing the project area for adult migration, spawning and juvenile rearing. Chinook are known to spawn primarily above RM 2.0, and emigrating juvenile Chinook generally move quickly through this stretch of river to the lake. Since all work is being conducted in the dry, following all BMPs and technical guidance will minimize potential effects to this species to the point of being discountable.

Puget Sound steelhead may be present year-round in the action area. Since all work will be conducted in the dry, temporary potential impacts from sediment and temperature will be localized and easily avoided by any steelhead present in the area. Additionally, juvenile steelhead are found mostly in faster water and not the slower unprotected waters adjacent to the floodwall. Appropriate use of BMPs as listed above will ensure that project effects are insignificant for this species. NMFS has determined that this project *"may affect, but is not likely to adversely affect"* PS Chinook salmon and PS steelhead.

Critical Habitat Determination

Puget Sound Chinook salmon

The final rule designating critical habitat for PS Chinook salmon was published on September 2, 2005 (70 FR 52630) and became effective on January 2, 2006. The Cedar River is designated as critical habitat for PS Chinook salmon. Primary constituent elements (PCEs) essential for the conservation of this ESU that support one or more life stages include: (1) Freshwater spawning sites with water quantity and water quality conditions and substrate supporting spawning, incubation and larval development; (2) Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks, and: (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.

Public safety and the structural integrity of the floodwall preclude large riparian trees along the riverward side of the structure. There are also tree height restrictions in place due to adjacency to the airport. Therefore, this site can, at best, provide only a low measure of function for the PCEs in the action area because of repeated disturbance when the COE considers the trees are larger than about 4 inch DBH. The temporal loss of riparian trees that provide shade and overhanging large wood will affect rearing and perhaps spawning PCEs.

Mitigation at the site and further upstream is expected to partially offset effects at the floodwall. The upstream mitigation site near RM 5.0 is at the City of Renton's Ron Regis Park. Conditions at this site allow for natural riparian and instream habitat conditions to persist and conservation value for both spawning and rearing of listed species will be improved. Additionally, higher value and larger trees such as Sitka spruce and Western red cedar will be planted at the upstream mitigation site. Because NMFS agrees that streambanks and instream habitat at the project site are in a degraded condition, proposed off-site plantings will partially compensate for removal of riparian trees at the floodwall. NMFS concurs that this project *"may affect, not likely to adversely affect"* PS Chinook salmon critical habitat.

This concludes informal consultation on these actions in accordance with 50 CFR 402.14(b)(1). The COE must reinitiate ESA consultation if: (1) new information reveals effects on the actions that may affect listed species in a way not previously considered; (2) the actions are modified in

a manner that causes an effect on listed species that was not previously considered; or (3) a new species is listed, or critical habitat is designated, that may be affected by the proposed actions.

Magnuson-Stevens Fishery Conservation and Management Act

Federal agencies are required, under section 305(b)(2) of the MSA and its implementing regulations (50 CFR 600 Subpart K), to consult with NOAA Fisheries regarding actions that are authorized, funded, or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH). The MSA section 3 defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity". If an action would adversely affect EFH, the Federal action agency is required to provide EFH conservation recommendations (MSA section 305(b)(4)(A)). This consultation is based, in part, on information provided by the Federal action agency and descriptions of EFH for Pacific salmon contained in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (August 1999) developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (September 27, 2000).

The proposed action and action area are described in this letter and in the BE and other supporting documentation. The action area includes habitat which has been designated as EFH for various life stages of coho salmon (*O. kisutch*) and Chinook salmon.

EFH Conservation Recommendations: Despite the off-site planting, NMFS is concerned about long-term adverse effects on salmon EFH from the loss of riparian ecological function at the floodwall, e.g., shade, insect-drop, and litterfall. The NMFS recommends that the COE seek opportunities to use a conservation bank or in-lieu fee bank within the lower Cedar River watershed to compensate for local loss of riparian ecological function that affect salmon EFH.

Implementation of this conservation recommendation would enhance the habitat value of the 0.6 acres of EFH within the action area.

Federal agencies are required to provide a detailed written response to EFH conservation recommendations made by NMFS within 30 calendar days of receipt of these recommendations (MSA (section 305(b)(4)(B)) and 50CFR 600.920(k)). The response must include a description of the measures proposed to avoid, mitigate, or offset the adverse effects of the activity on EFH. In the case of response that is inconsistent with EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

This concludes consultation under the MSA. If the proposed action is modified in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations, EFH consultation will be reinitiated in accordance with implementing regulations for EFH at 50 CFR 600.920(k). If you have any questions, please contact Randy McIntosh at 360-534-9309 or randy.mcintosh@noaa.gov.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

cc: Karen Walter, Muckleshoot Indian Tribe
Deborah Needham, City of Renton
Amanda Ogden, COE
Larry Fisher, WDFW

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
510 Desmond Dr. SE, Suite 102
Lacey, Washington 98503

JAN 11 2011

In Reply Refer To:
13410-2011-I-0047

Evan R. Lewis, Chief Environmental Resources Section
Seattle District, Corps of Engineers
ATTN: Environmental Resources Section (Ogden)
P.O. Box 3755
Seattle, Washington 98124-3755

Dear Mr. Lewis:

Subject: Floodwall Maintenance Vegetation Removal Cedar River at Renton, Washington

Your November 10, 2010, letter requested our concurrence with your determination of "may affect, not likely to adversely affect" bull trout (*Salvelinus confluentus*) and bull trout critical habitat for the United States Army Corps of Engineers (Corps), and City of Renton's proposed floodwall vegetation removal on the Cedar River in the City of Renton, King County, Washington. Your letter, Memorandum for the Services, and Biological Evaluation were received in our office on November 12, 2010. We are responding to your request for informal consultation in accordance with section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*)(Act).

The City of Renton proposes to perform floodwall maintenance on the west bank of the Cedar River, adjacent to the Renton Municipal Airport, from Logan Avenue to the South Boeing Bridge in accordance with Corps regulations. The maintenance consists of hand-clearing all vegetation within 15 ft of the top for a distance of 1,620 linear ft of the levee. Approximately 180 trees will be removed, including 65 trees over 6-inches diameter at breast height. All shrubs and brush will also be removed and all vegetation will be disposed of offsite. Predominant species in the project area include red alder (*Alnus rubra*) and Himalayan blackberry *(Rubus* spp.). Following the vegetation removal, the area will be hydroseeded with a native seed mix.

TAKE PRIDE IN AMERICA

In order to offset the effects on protected species and their habitat, the applicants propose to plant willow stakes along a 200 ft upstream section of the floodwall. An off-site planting at Ron Regis Park is also proposed, which will consist of planting 0.73 acre (approximately 195 trees) with an equal distribution of Oregon ash (*Fraxinus latifolia*), Sitka spruce (*Picea sitchensis*) and western red cedar (*Thuja plicata*) at a 3:1 replacement ratio to compensate for the removal of the larger diameter trees . All Japanese knotweed (*Fallopia japonica*) within the planting area will also be removed and will continue to be cleared annually for 10 years.

Based on the information provided in your letter and Biological Evaluation, the U.S. Fish and Wildlife Service (Service) concurs with your "may affect, not likely to adversely affect" determination for bull trout. Bull trout critical habitat is not designated in the action area.

Bull Trout

The proposed project is located in the lower Cedar River. The action area is used by infrequently by bull trout for foraging, overwintering and migration. The bull trout population in the Cedar River watershed is isolated upstream of Landsburg and Masonry Dams in Chester Morse Reservoir. Because the only means for bull trout to emigrate to the lower river is during infrequent spills at the dams, their occurrence in the lower river is extremely limited. Potential effects to bull trout, their prey species, and/or their foraging habitat from the proposed activities include disturbance associated with vegetation removal activities, exposure to elevated levels of turbidity, and indirect effects. However, direct effects of the proposed project to bull trout and/or their prey resources are expected to be insignificant or discountable because of the following:

- The expected duration of the vegetation removal and plantings is one week. No in-water work is proposed and the amount of sediment discharged into the water would be minimal or none. Best Management Practices will be employed to during vegetation removal to minimize impacts to water quality. Therefore, exposure of bull trout to the effects of the proposed action is extremely unlikely due to the temporary and minor impacts of the project.

- The proposed project may result in the suspension of a relatively minor amount of sediment. Although bull trout may be exposed to the sediment and increased turbidity, the concentration and duration of this exposure are not at levels that would result in a measurable effect to bull trout.

- After implementation of the project, indirect effects to bull trout may occur as a result of the proposed action. Individual bull trout that may be present within the reach may experience a short-term reduction in shading, availability of refuge and cover, and invertebrate prey abundance. Conservation measures included in the proposed action (tree plantings) are expected to partially offset these impacts. These impacts may result in behavioral responses such as displacement or avoidance. However, because of the low use of the action area by bull trout and the fact that long-term impacts to water temperature (shade) and food base (insect and litterfall) are not expected to be measurable, indirect effects of the proposed action on bull trout are considered insignificant.

Long-Term Effects of Vegetation Removal on Riparian Habitats

Although the project site is not designated critical habitat and significant bull trout use of the action area was not anticipated, a few bull trout may use the Cedar River for foraging, overwintering and migration. While the Service appreciates the inclusion of tree planting as part of this action, it will take some time for the plantings to provide the same benefits to the riparian area as the large trees that will be removed.

The Service is concerned with the long-term adverse effects of levee vegetation maintenance that does not include planting of trees that will be allowed to grow to maturity. Removal of mature riparian vegetation results in a direct loss of complex stream habitat at the project site as well as downstream. Although replacing large trees with willows will provide some shade and food web support, willows do not have the same size potential as trees and thus cannot provide the same function or long-term habitat complexity as conifer or hardwood trees.

Riparian vegetation links terrestrial and aquatic ecosystems, influences channel processes, contributes organic debris to streams, stabilizes banks, and modifies water temperatures (Gregory et al. 1991, pp 547-548). The continued loss of large trees prevents material inputs and reduces the structural component of instream habitat that creates pools, refugia, and cover from predators. Larger trees also provide more shade and enhance invertebrate production and abundance due to the complex range of habitats available for colonization and the retention of fine organic debris (Gurnell et al. 2002, p.603).

Future levee vegetation maintenance projects that are conducted to meet Corps regulations will continue to preclude the establishment of large hardwood and conifer trees along the river corridor, prolonging or limiting recovery of listed salmonids. Preventing larger hardwoods and conifers from becoming established along the river precludes the potential for the riparian areas to function adequately to provide shade, habitat-forming processes, insect fallout for prey contribution and food web support, and nutrient contributions. The Seattle District of the Corps is currently working with resource agencies, local sponsors, and stakeholders to develop a framework for levee vegetation maintenance that will meet both public safety and fish needs. The Service urges the Corps to address the potential adverse effects of levee maintenance regulations at both the watershed and regional scale. We also encourage levee setbacks and/or mitigation planting of trees and woody shrubs in areas where they will be allowed to provide habitat functions to prevent further degradation of riparian areas that are vital for the recovery of bull trout and other listed salmonids.

This concludes informal consultation pursuant to the regulations implementing the Act (50 CFR 402.13). This project should be re-analyzed if new information reveals effects of the action that may affect listed species or critical habitat in a manner, or to an extent, not considered in this consultation. The project should also be re-analyzed if the action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this consultation, and/or a new species is listed or critical habitat is designated that may be affected by this project.

If you have any questions about this letter or the Act, please contact Tiffany Nabors at (360) 753-4371 or Martha Jensen at (360) 753-9000, of this office.

Sincerely,

Martha L. Jensen

for Ken S. Berg, Manager
Washington Fish and Wildlife Office

cc:
WDFW Region 4, Mill Creek, WA
WDOE, Bellevue, WA (R. Padgett)

LITERATURE CITED

Beamer, E.M., and R.A. Henderson. 1998. Juvenile salmonid use of natural and hydromodified stream bank habitat in the mainstem Skagit River, northwest Washington. Prepared for: United States Army Corps of Engineers, Seattle District, Environmental Resource Section, Seattle, Washington. 51 pp.

Gregory, S.V., F.J. Swanson, W.A. McKee, and K.W. Cummins. 1991. An ecosystem perspective of riparian zones. Bioscience 41(8):540-551.

Gurnell, A.M., H.P. Gay, F.J. Swanson, and S.V. Gregory. 2002. Large wood and fluvial processes. Freshwater Biology 47:601–619.

CENWS-PM-ER 4 October 2012

MEMORANDUM FOR RECORD

SUBJECT: Cedar River I-Type Floodwall Vegetation Removal Project

This memorandum is to capture the Corps determination that reconsultation under Section 7 of the Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) with National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) is not warranted for an updated project description (dated October 2012) regarding the amount of trees being removed at the location of the subject project. The project description for the Cedar River I-Type Floodwall Vegetation Removal Project in the Biological Evaluation (BE) stated that 180 trees (65 of which are 6" diameter at breast height (DBH) or larger) would be removed within 15 feet of the I-type floodwall structure. To help offset impacts of vegetation removal, an area at the project site along the upstream portion of the floodwall has been identified for planting willow stakes along 200 feet at the river's edge. In addition, an off-site planting area has been identified to offset the loss of tree cover at the project site. The planting site is upstream from the project site near RM 5.0 on the Cedar River at the City of Renton's Ron Regis Park. The proposed off-site plan includes planting of 195 trees which will provide a 3:1 replacement ratio for the trees larger than 6" DBH that will be removed. The BE was sent on 10 November 2010, based on the determination that the project is not likely to adversely affect threatened Puget Sound Chinook salmon, Puget Sound steelhead, Coastal/Puget Sound bull trout, or designated critical habitat for Chinook or bull trout. Concurrence letters were received from NMFS and USFWS dated 10 December 2010 (Reference # 2010/05546) and 11 January 2011 (Reference # 12410-2011-I-0047) respectively.

Since then, a more recent survey of the trees along the I-wall was conducted for the Corps' Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report, August 2012. That survey identified 220 trees (136 of which are 6" in DBH or larger) for removal to meet the Corps guidance requirement a 15 foot vegetation-free zone for I-type floodwalls (Engineering Technical Letter (ETL) 1110-2-571, dated 10 April 2009). Therefore, the offsite planting plan has been updated from 195 trees to 408 trees to maintain the 3:1 replacement ratio for the trees larger than 6" in DBH that would be removed. The plantings would still occur within Ron Regis Park. However, those 408 trees would be planted at two locations at Ron Regis Park: the original planting site (195 trees) and along the Elliott Spawning Channel (213 trees). The offsite planting plan at the original site would remain the same. For the Elliott Spawning Channel, 213 trees would be planted on both sides of the channel with an equal distribution between Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*). All plantings would be laid out with the City of Renton, Corps and contractor on site.

In accordance with the NMFS letter of concurrence, the Corps must reinitate ESA consultation if: "(l) new information reveals effects on the actions that may affect listed species in a way not previously considered; (2) the actions are modified in a manner that causes an effect on listed species that was not previously considered; or (3) a new species is listed, or critical habitat is designated, that may be affected by the proposed actions." USFWS concurrence letter reinitation triggers are substantially the same. Per 50 CFR 920(l) "A Federal agency must reinitiate

consultation with NMFS if the agency substantially revises its plans for an action in a manner that may adversely affect EFH or if new information becomes available that affects the basis for NMFS EFH Conservation Recommendations." The Corps does not believe that a revised number of trees to be affected would trigger reinitiation of consultation under ESA or MSA for the following reasons:

1) No new information or data has become available since consultation was completed.

2) The project revisions do not constitute a modification that would affect an ESA listed species and/or EFH in a manner or to an extent that was not considered in the consultation. The project's components are the same, but with a more accurate number of trees removed and mitigated for in the planting plan. The tree replacement ratio remains 3:1. The loss of the riparian habitat at the I-wall and mitigation were evaluated in the BE. Further details on project impacts are found in the EA.

3) No new species has been listed or critical habitat has been designated that would be affected by the project.

Appendix D: Coastal Zone Management Act Consistency Determination and Concurrence Letter

Coastal Zone Management Act Consistency Determination
Floodwall Maintenance Vegetation Removal, 2011

The vegetation removal actions are activities undertaken by a Federal agency; the following constitutes a federal consistency determination with the enforceable provisions of the Washington Coastal Zone Management Program.

Introduction

As described below, the proposed Federal action applicable to this consistency determination is the vegetation removal along the lower left bank of the Cedar River from river mile 1.07 to 0.74. The vegetation removal is on the riverward side of the existing floodwall constructed as part of a Federally authorized Flood Reduction Project. This determination of consistency with the Coastal Zone Management Act is based on review of applicable sections of the State of Washington Shoreline Management Program and policies and standards of the Renton, Washington Shoreline Master Plan.

The proposed project would remove vegetation that is out of compliance with Corps regulations (ETL 110-2-571). In respect to floodwalls, ETL 110-2-571 states that a minimum vegetation free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity. The floodwall in its current state does not comply with the vegetation maintenance requirements.

Project Description

The proposed project involves removal of 180 trees (65 of which are 6" diameter at breast height (DBH) or larger) and clearing of all vegetation, within 15-feet of the I-type floodwall structure along a 1,620 foot reach. To help offset impacts of vegetation removal, both onsite and offsite vegetation planting is being proposed. All work will be done in the dry.

- Onsite planting will occur at an area upstream of where the removal will occur along the same side of the river. Approximately 200 feet of willow stakes will be place along the river's edge. This area extends beyond the 15-foot vegetation free buffer and will provide on-site riparian vegetation to offset a portion of the impacts of the proposed action.
- Offsite planting will occur on the right bank opposite and extending upstream of the proposed project. Willows stakes will be planted at OHW along 1,620 feet at 12" spacing.
- Offsite planting will also occur upstream of the project site near RM 5.0 on the Cedar River at the City of Renton's Ron Regis Park. This site includes planting of 195 Oregon ash, Sitka spruce, western red cedar trees which will provide a 3:1 replacement ratio for the trees larger than 6" DBH.

State Of Washington Shoreline Management Program

The Coastal Zone Management Act of 1972, as amended, requires Federal agencies to carry out their activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved state Coastal Zone Management (CZM) Programs. The Shoreline Management Act (SMA) of 1972 (RCW 90.58) is the primary authority for Washington's CZM Program. Primary responsibility for the implementation of the SMA is assigned to local governments. The City of Renton, in which the proposed levee rehabilitation project is located, fulfilled this requirement by publishing their own Shoreline Master Program (SMP).

Renton Shoreline Master Program

The Renton Shoreline Master Program Shoreline Designation Map was used to determine project consistency. The proposed vegetation removal is located along the Cedar River from RM 1.07 to RM 0.74. Renton's Shoreline Management Program designation for the project area is 'Urban.'

Applicable portions of the Renton SMP are presented below with the Corps consistency indicated in ***bold italics.***

Per the Renton SMP, "The objective of the Urban environment is to ensure optimum utilization of shorelines within urbanized areas by providing for public use, especially access to and along the water's edge and by managing development so that it enhances and maintains shorelines for a multiplicity of viable and necessary urban uses."
The project will not change public accessibility of the river at the project site or at the planting locations. The riverward side of the floodwall is not accessible by the public nor will it be after project completion. The planting locations includes public lands, Ron Regis Park and the Cedar River Trail Park, which will maintain their level of public access after project completion, though the immediate vicinity of ongoing work may be cordoned off during planting for safety reasons.

090-K.2.(a) The potential effects on water quality, water and land vegetation, water life and other wildlife (including, for example, spawning areas, migration and circulation habits, natural habitats, and feeding), soil quality and all other environmental aspects must be considered in the design plans for any activity or facility which may have detrimental effects on the environment.
Effects of the proposed project on the environment have been considered. The vegetation removal area will be hydroseeded with a native seed mix that will limit erosion but maintain inspectability and safety standards. Removed vegetation will be replaced by planting at the project area and at two offsite locations. Willows will be planted along 200 feet of the river's edge at the upstream end of the floodwall. Willows will also be placed along 1620 feet on the opposite bank in the vicinity of the tree removal efforts to further offset impacts locally in a way that does not compromise the safety of the flood control structures. Overstory plantings will be completed upstream of the project site at RM 5.0 at Regis Park. At this location, 195 overstory trees will be planted to provide a 3:1 replacement ratio for trees larger than 6 inches DBH.

090-K.2.(b) Applicants for permits must explain the methods that will be used to abate, avoid or otherwise control the harmful effects.
All work will be performed in the dry. The replanting site will provide a 3:1 replacement ratio for the removed trees of 6" DBH and larger. The willow plantings will create shade, nutrient

input, and bank diversity within the vicinity of the tree removal impacts without compromising the inspectability and safety of the flood control structures.

090-K.2.(c) Erosion is to be controlled through the use of vegetation rather than structural means where feasible.
The location of the removed trees and shrubs will be replanted with native grass and willows to attenuate erosion.

090-K.3.a The potential impact of any of the following on adjacent, nearby, and possibly distant land and shoreline users shall be considered in the design plans and efforts made to avoid or minimize detrimental aspects:

(ii) Noise, odors, night lighting, water and land traffic, and other structures and activities.
Construction and traffic will only occur on-site during daylight hours. The limited scope and timeframe of the proposed project will minimize impacts. If necessary, walking trails at the site of construction or planting efforts will be rerouted to maintain public safety. Flaggers or signs will be used as needed and appropriate.

(iii) Architectural styles, exterior designs, landscaping patterns and other aspects of the overall design of a site shall be a uniform or coordinated design, planned for the purpose of visual enhancement as well as for serving a useful purpose.
A planting plan consistent with the Renton Park Department's previous plan was produced. Only native vegetation will be used. Post construction conditions substantively comply with relevant sections of the City of Renton's SMP code.

(iv) Landscaped screening shall be used to hide from public view any area that may impinge upon the visual quality of a site, for example, disposal bins, storage yards, and outdoor work areas.
Vegetation removal is to occur on the riverside of the floodwall, and will therefore be obscured from public view. The construction and staging areas are temporary, and will be restored upon completion of the project.

(v) Work areas, storage, and other activities on a site in a residential area shall be in enclosed buildings, as is reasonably possible, to reduce distractions and other effects on surrounding areas. Outdoor activities of commercial and industrial operations shall be limited to those necessary for the operation of the enterprise. Outdoor areas shall not be used for storage of more than minimal amounts of equipment, parts, materials, products, or other objects.
Equipment and staging area locations on-site were approved by the City of Renton. Renton has a map of staging areas and the area to be fenced off during construction. All vegetation debris will be hauled off-site and disposed of properly. Construction and staging areas are temporary and will be restored upon completion of the project.

090-K.4.(a) Where possible, space and right-of-way shall be left available on the immediate shoreline so that trails, non-motorized bike paths, and/or other means of public use may be developed providing greater shoreline utilization.
No public access exists on proposed tree removal project site. Public access at the planting locations site will be unaffected.

090-L.4.d.(iv) In cases where bulkheading is permitted, scientific information suggests a rock riprap design is preferred. The cracks and openings in such a structure afford suitable habitats for certain forms of aquatic life. If there is determined to be a severe rate population, consideration must be given to construction of a solid bulkhead to eliminate cracks and openings typical to a riprap structure.
The existing shoreline structures, including the floodwall will not be changed by this project. The floodwall is a flood control device previously permitted to protect critical infrastructure.

090-L.16.b.(i) Unless otherwise prohibited by subsection L16c of this Section, stream alteration may be allowed subject to the regulations in subsection L16d of this Section.
090-L.16.b.(ii) Stream alteration may be permitted if it is part of a public flood hazard reduction/habitat enhancement project approved by appropriate State and/or Federal agencies.
090-L.16.d(i) All proposed stream alterations shall be designed by an appropriately State licensed professional engineer. The design shall be submitted to the Development Services Division as part of the application.
This project is part of a public flood hazard reduction project, this is an acceptable action approved by the City of Renton. The existing shoreline structures will not be altered, as such no alteration in the flow of the Cedar River will occur. All designs were completed by the Corps of Engineers project team, which includes licensed professional engineers, and reviewed by the City of Renton.

090-L.16.d(ii) The responsibility rests solely with the applicant to demonstrate the necessity of the proposal.
The proposed project would remove vegetation that is out of compliance with Corps regulations (ETL 1110-2-571). In respect to floodwalls, ETL 1110-2-571 states that a minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity. The floodwall in its current state does not comply with vegetation maintenance requirements because of vegetation within 15-feet along the length of the structure.

090-L.16.d(iii) The timing and the methods employed will have minimal adverse effects on aquatic life.
Work will occur out of the water and using best management practices to minimize impacts to the river and wildlife. Conservation measures will include, but are not limited to, installing willows by hand and hand clearing of understory vegetation to minimize disturbance, refueling equipment in the staging area landward of the floodwall, planting materials will be healthy and disease free with a survival guarantee of 100% after 30 days and 80% after the first year, and hand clearing with proper offsite disposal of any invasive species found at the project and planting locations.

090-L.16.d(iv) Pollution is to be minimized during and after construction.
Refueling or servicing of all equipment will occur in the staging area on the landward side of the floodwall.

090-L.16.d(v) The project must be designed so that the low flow is maintained and the escape of fish at low water is possible.
The Cedar River conveyance will not be affected nor changed by the project.

090-L.16.d(v) No permanent over-water cover or structure shall be allowed unless it is in the public interest.
It is in the public interest to provide channel habitat at the site. Willows will be planted along the upstream portion of the project site and on the opposite bank to increase riparian shading for salmonids. No other over water cover is anticipated at the site.

The project complies with the following enforceable policies of the Coastal Zone Management Program:
1. Shoreline Management Act: As per RCW 90.58.030 and WAC 173-37-040, maintenance of existing levees is exempt.
2. State Water Quality Requirements: The proposed project is exempt as it does not include any work below ordinary high water.
3. State Air Quality Requirements: This project does not require air quality permits.
4. State Environmental Policy Act: Corps Civil Works projects comply with NEPA and are not subject to SEPA.
5. Energy Facility Site Evaluation Council: Not applicable as no work involves energy facility construction.
6. Ocean Resource Management Act: Not applicable as this law relates to oil and gas drilling off Washington's coast.

4. STATEMENT OF CONSISTENCY

Based on the above evaluation, the Corps has determined that the proposed vegetation removal activities comply with the policies, general conditions, and activities as specified in the Renton Shoreline Master Program adopted in 1983. The proposed action is thus considered to be consistent to the maximum extent practicable with the State of Washington Shoreline Management Program and policies and standards of the Renton Shoreline Master Program. Post-construction conditions substantively comply with the relevant sections of the Renton Shoreline Master Program.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600 • Olympia, WA 98504-7600 • 360-407-6000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

December 1, 2011

Mr. Evan Lewis
Department of the Army
Seattle District, Corps of Engineers
PO Box 3755
Seattle, Washington 98124-3755

Re: Federal Consistency – Cedar River Section 205 Flood Control

Dear Mr. Lewis:

The Department of Ecology, Shorelands and Environmental Assistance Program received your letter regarding the required maintenance to the Flood Control Work (FCW) on the Cedar River Section 205 and CZMA Consistency Determination.

Upon review of the letter and CZMA Consistency Determination provided, Ecology agrees with your determination that the proposed revisions are consistent to the maximum extent practicable with the applicable enforceable policies of Washington's Coastal Zone Management Program and will not result in any significant impacts to the State's coastal resources.

If you have any questions regarding this letter please contact Abbey LaBarre at (360) 407-6932.

Sincerely,

Brenden McFarland
Section Manager
Environmental Review and Transportation Section
Shorelands and Environmental Assistance Program

cc: Amanda Ogden, Corps
cc: Abbey LaBarre, Ecology

Appendix E: Comments Received and the Corps Responses

MUCKLESHOOT INDIAN TRIBE
Fisheries Division
39015 - 172nd Avenue SE • Auburn, Washington 98092-9763
Phone: (253) 939-3311 • Fax: (253) 931-0752 DRAFT

May 9, 2011

Amanda Ogden
Environmental Resources Branch
US Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

RE: Notice of Preparation, Cedar River I-Type Floodwall Vegetation Removal - PL-10-13

Dear Ms. Ogden:

This letter provides comments regarding the environmental impacts of the proposed action to remove trees and other riparian vegetation along 1,620 feet of floodwall along the left bank of the Cedar River adjacent to the Renton Municipal Airport between the Logan Street and South Boeing bridges. Maintenance dredging is anticipated within the next 3-5 years, however, at this time the proposed work is limited to vegetation removal.

The Muckleshoot Indian Tribe holds federally reserved treaty fishing rights in the Cedar River and Lake Washington drainage system. The Cedar River supports sockeye, Chinook, and coho salmon and steelhead trout. Chinook and steelhead are listed as ESA Threatened Species. The Cedar River is designated by NMFS as Critical Habitat for Chinook salmon. The lower Cedar River in the project reach is also listed by the State of Washington as impaired for temperature on the Clean Water Act Section 303(d) list.

We have serious concerns about the fisheries impacts of the Corps' vegetation management policies for floodwalls and levees and the proposed vegetation removal project, and believe that insuring public safety and property protection can be accomplished using alternative practices that do not jeopardize natural resources including listed species. We believe that neither the Corps nor the federal resource agencies have properly implemented the consultation provisions of the ESA for these actions. As indicated in the Tribe's February 23, 2011 letter to the Corps and NMFS, we disagree with the ESA determination of "not likely to adversely affect" for the proposed work, and consider the use of informal consultation to be inappropriate given the project's indisputable adverse impacts on designated Critical Habitat for Puget Sound Chinook. Our preference for the Lower Cedar River Floodwall is that no riparian vegetation be removed, other than perhaps the removal of any individual tree specifically identified as a threat to the stability of the structure. In this regard, as discussed further below, we note that vegetation along both river banks was considered by the Corps to be an important part of the original mitigation for the Section 205 flood control project at the time of construction.

Adequate riparian vegetation is essential to aquatic habitat for salmonids. Trees, shrubs, and other plants provide shade, help control water temperatures, supply food via the input of insects, leaves, and other organic matter to aquatic food webs, provide overhead cover and complex hydraulic and physical habitat offering protection from predators and spaces for fish rearing and adult fish holding, and other functions. In the lower Cedar River, trees serve to help block artificial light known to impede sockeye fry migration and elevate predation mortality rates[1]. Sockeye fry have evolved to migrate during darkness. Artificial light levels in the lower Cedar River and in the project reach are high. As a result, predation losses of sockeye fry and likely Chinook fry are believed to be excessively high compared to other river systems in Alaska and the Pacific Northwest in large part due to artificial lighting. Improving sockeye production and survival in the Cedar River is an important tribal objective, in addition to the rebuilding of listed species. Significant fisheries and habitat investments are ongoing through the Seattle Public Utilities' replacement sockeye hatchery and Habitat Conservation Plan, and various other local government efforts. The success of these efforts will likely be affected by the proposed work, as will sockeye production from the spawning channels intended to help mitigate some of the original dredging impacts for the Section 205 project. The impacts of vegetation removal on these investments, functions, and on Cedar River fish populations should be addressed in forthcoming project environmental documentation in addition to the issues discussed below.

The Cedar River floodwall was constructed in1998-2000 as part of a federal Flood Control Works project that included mitigation for short-term and permanent project impacts to fish life and fish habitat resulting from river channel dredging, and floodwall and levee construction. Mitigation originally included willow and other native plant installations along the extent of the project on both banks, and the retention of some existing trees and plants. Project records indicate that the trees and shrubs along the floodwall were intended to grow to maturity, and were viewed as entirely compatible with the floodwall, which is constructed with steel sheet pile that extends below the root zone and is capped with concrete. Moreover, it appears that some of the larger trees now slated for removal predate the project and were left in place during construction because they were deemed compatible with the floodwall by the Corps at the time.

The proposed work would remove this vegetation, as it is out of compliance with new Corps guidance for I-type floodwalls stating that a minimum vegetation-free buffer of 15-feet be maintained for access and structural integrity. The proposed work is scheduled for spring 2011 and would clear all vegetation within 15-feet of the floodwall including removal of 180 trees, 65 of which are 6" diameter or larger, and up to approximately 40 feet tall. To offset impacts of vegetation removal, the Corps identified a single 200 foot long area along the floodwall for planting willow stakes at the river's edge that extends beyond the 15-foot buffer. An additional planting area upstream from the project site near RM 5.0 on the Cedar River at Ron Regis Park

[1] Tabor, R. and G. Brown, A. Hird and S. Hager. 2001. The effect of light intensity on predation of sockeye salmon fry by cottids in the Cedar River. U.S. Fish and Wildlife Service Western Washington Office and US Geological Survey. April 2001

was identified to offset the loss of tree cover at the project site. The proposed off-site plan includes planting of 195 trees to provide a 3:1 replacement ratio for the trees larger than 6".

The characterization of anticipated impacts to biological resources in the Notice of Preparation for this project is incomplete and inaccurate and should be revised. While clearly the river is highly modified in this reach, salmon spawning and incubation habitat is currently good to excellent at the project site and is heavily used by sockeye and on occasion by Chinook spawners. This reach of the Cedar River serves as a critical migration corridor for tens of millions of juvenile and up to hundreds of thousands of adult salmonids. All Cedar River adults and juveniles must pass through this reach given its lower river location close to Lake Washington. While the understory plants proposed for removal are dominated by blackberry, these plants provide some important fish habitat functions including complex root and stem structure and overhead cover, and supply insects and leaf litter for the food chain. The structure and cover provided by these plants also benefit adult fish during spawning and upstream migration. The alder trees proposed for removal are beginning to provide substantial shade, shade cover, and help block artificial light at night. Despite its urban location and important adjacent land uses (The Boeing Company and Renton Municipal Airport), habitat protection and compatible restoration actions are not dispensable for this reach of the Cedar River.

The Corps' environmental documentation should be revised to adequately describe cumulative effects. Other structures and areas within the Cedar River 205 Flood Control Works project appear to be subject to vegetation removal in the foreseeable future, either to comply with Corps policies and related guidance, or to accommodate periodic repairs due to erosion. For example, our April 5, 2011 field visit included a Cedar River 205 levee rehabilitation project located on the opposite bank downstream of the proposed work. That project will result in the removal of dozens more trees and shrubs. Corps staff suggested that the 205 project left bank segment immediately downstream of the proposed work will require vegetation removal when the plants reach 6 feet in height. It is even possible that trees will be removed elsewhere from the right bank levee within the project. Additionally, it can be expected that the proposed vegetation removal will lead to increased erosion of the remaining bench adjacent to the floodwall, as erosion seems to have occurred in those parts of the project where vegetation is absent. Any such erosion resulting from the proposed work will result in additional requests for maintenance actions such as bank armoring. In any case, further mitigation and ultimately a more durable mitigation approach such as a floodwall setback should be considered to offset cumulative effects.

Environmental documentation for this project should also be revised to address compliance with the Clean Water Act with regard to Section 303(d) listings in the project reach for temperature and dissolved oxygen. Removing shade will increase solar radiation and raise summer water temperatures. Restoring natural system potential shade is a key strategy for compliance with State water quality standards, and for moderating the effects of urban land use and climate trends on river temperature.

Finally, we believe that the proposed mitigation is not sufficient to address the full impacts of the proposed tree and vegetation removal on salmonid growth, rearing and migration survival, and reproductive success. The proposed upstream planting site is relatively well shaded, and given ongoing channel migration processes, the plantings may not persist over time. More importantly, the upstream plantings will not even partially offset the impacts in the project reach due to losses in shade, artificial light reduction, insect and leaf litter input, or overhead cover and complex in-water habitat structure on site and within the project reach.

Further mitigation opportunities were discussed at the April 5, 2011 field visit with the Corps, Washington Department of Fish and Wildlife, and the City of Renton. In lieu of our preferred alternative to avoid vegetation removals in the first place, we recommend the following mitigation measures to help offset project impacts in the project reach and nearer the project site:

1. In the near term, willow stakes should be densely planted at the toe along the right bank of the Flood Control Works as partial mitigation from Logan Street downstream to the boat ramp. These willows should be maintained as long as necessary to insure long term survival. Maintenance likely should include herbicide injection of knotweed stems and hand removal of other invasive plants as needed.

2. Also in the near term, a lighting reduction study should be implemented as partial mitigation and lighting reduction measures implemented. The study should identify all feasible opportunities to modify or eliminate lighting from the I-405 area downstream to the Cedar River mouth. The area of most intensive light reportedly is between the Renton Library and I-405, however, additional needs and opportunities from I-405 through the Cedar River 205 Flood Control Project reach should be evaluated.

3. In the longer term, a continuous vegetated riparian corridor should be restored along the Cedar River 205 Flood Control Project on the left bank consistent with public safety and property protection needs. The Corps had identified Floodwall Relocation/Setback as an alternative to vegetation removal in the Notice of Preparation. This alternative would have relocated the floodwall structure landward to allow existing vegetation to remain outside of the required 15-foot vegetation free zone. It was not further considered at this time due to cost, transportation impacts, and the project timeline. A Floodwall Relocation/Setback alternative should be reconsidered and implemented as a requirement before any further channel dredging in order to provide the original required mitigation and to maintain a continuous mature riparian corridor along the Cedar River.

Thank you for this opportunity to provide comments and for organizing the April 5 interagency site visit. Please contact Holly Coccoli at 253-876-3360 if you have any questions.

Sincerely

Glen R. St. Amant
Habitat Program Manager

cc: Steve Landino, Matt Longenbaugh, and Randy MacIntosh, NMFS
Martha Jensen, USFWS
Steven Lee, City of Renton
Larry Fischer, WDFW

Response to MITFD letter dated 22 November 2011

The comment letter from the Muckleshoot Indian Tribe describes concerns regarding the proposed action. The letter indicates concerns that the Corps and federal resource agencies have not properly implemented consultation provisions of the ESA for the proposed action. The Corps has completed consultation in accordance with section 7(a)(2) of the ESA pursuant to the provisions of 50 CFR 402.13. As stated in the letter, only vegetation that presents a threat to the stability of the structure will be removed. All vegetation beyond the 15-foot vegetation free zone will remain in place.

Tabor et al. (1998) investigated artificial lighting impacts to sculpin predation of sockeye salmon fry in the lower Cedar River. The study found that both species of sculpin studied are effective predators in near darkness and increased lighting did not necessarily increase the ability of the sculpin to prey on sockeye fry. They also found that light intensity did appear to inhibit migratory movement of sockeye fry. The authors concluded that the effect of increased artificial lighting on fry survival in the lower Cedar River is "unclear." The study noted that the shoreline area is where predators are most abundant; however, the lower 3 km (project area included) have gravel substrate which "appears to support few sculpin that are large enough to consume sockeye salmon fry." The project area is mainly higher velocity with few pool areas and the study noted that most predation "appears to occur in low-velocity areas" which are found further upstream. (Tabor et al. 1998)

The Environmental Assessment (EA) provides an expanded range of analysis and alternatives than presented in the Notice of Preparation. As a result of the specific recommendation in the comment letter, the Corps has supplemented the mitigation proposed in the Notice of Preparation to also include 1620 linear feet of willow plantings on the right bank opposite the project area. This additional planting effort, combined with 200 linear feet of willow planting on the left bank at the project site will provide long-term benefits within the project reach including water temperature. Planting will still be completed at the off-site planting area at Ron Regis Park (RM 5.0). A lighting reduction study could be implemented by a non-Federal entity partnered with the Corps. Several authorities would be available to undertake this type of study for the lower Cedar River. The final recommended mitigation measure involves a setback of the floodwall which was evaluated through Section 6.0 in the EA.

Reference:

Tabor, R.A., G. Brown, and V.T. Luiting. 1998. The Effect of Light Intensity on Predation of Sockeye Salmon Fry by Prickly Sculpin and Torrent Sculpin. US Fish and Wildlife Service, Lacey Washington. 16pp.

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Region 4 Office: 16018 Mill Creek Boulevard - Mill Creek, Washington 98012 - (425) 775-1311

April 26, 2011

US Army Corps of Engineers
Environmental Resources Branch
ATTENTION: Amanda Ogden (PM-PL-ER)
Post Office Box 3755
Seattle, Washington 98124-3755

Dear Ms. Ogden:

SUBJECT: Notice of Preparation Public Notice, Reference: PL-10-13, Cedar River I-Type Floodwall Vegetation Removal, Cedar River, King County, WRIA 08.0299

The Washington Department of Fish and Wildlife (WDFW) has reviewed the above-referenced public notice and offers the following comments at this time.

WDFW supports the efforts of the US Army Corps of Engineers (Corps) to provide flood protection on the lower Cedar River. WDFW also appreciates the opportunity to work collaboratively with the Corps and other involved agencies and local and tribal governments to ensure that flood protection projects are constructed and maintained in a manner which fulfills the objectives of flood protection while meeting other objectives, particularly preservation and restoration of fish and wildlife habitat.

The floodwall on the left bank lower Cedar River downstream of the Logan Avenue Bridge is a component of the Lower Cedar River Flood Control Mitigation Project conducted starting in 1998. Figure 13 of the plans for this project is the mitigation planting plan; it clearly shows the planting on both sides of the floodwall extending from downstream of the South Boeing Bridge upstream to the Logan Avenue Bridge. However, these mitigation plantings were not properly maintained, as required by the Hydraulic Project Approval (HPA) for the project. Project monitoring showed better survival of red alder and other volunteer species, and those were accepted as a substitute for the poorly surviving plantings.

US Army Corps of Engineers

As the existence of this vegetation is mitigation for the construction of the floodwall, it is inconsistent for the Corps to now propose removal of the vegetation. WDFW mitigation policy requires this mitigation to be protected for the life of the project. The proposed action would also place an onerous burden upon the City of Renton, which as the local sponsor of the project must obtain an HPA for it and provide proper mitigation. It may not be possible for WDFW to issue an HPA to impact this mitigation site without incurring a high probability of a third party appeal. I would expect at least doubling of normal mitigation ratios if an HPA is issued.

WDFW also does not believe there is any need to remove the vegetation, which is waterward of a floodwall consisting of a steel sheetpiles that have been driven well below the riverbed and capped with concrete. Removal of the vegetation would do nothing to preserve or enhance the integrity of the floodwall, but would rather hasten the erosion of the riverbank up to the floodwall and threaten its integrity. I have spoken with an engineer who was involved in the design of the floodwall for the Corps. He is of the opinion the removal of the vegetation would be unneeded and counterproductive, due to the depth of the sheetpiles and the erosion which would be likely to result.

The proposed project would impact the habitat of several priority fish species, including Chinook, coho, and sockeye salmon and steelhead trout. This proposed impact is easily avoidable by not taking an unnecessary action. WDFW does not consider the planting of willow stakes along 200 feet of the river upstream of where the vegetation is proposed for removal to constitute mitigation, as willows at that location were a component of the mitigation for the original flood control project. The mitigation proposed for the currently avoidable impact is offsite and would not replace the habitat value that would be lost on the lower river (partially because the mitigation site is already forested), which is contrary to WDFW policy. It is a higher priority to have as much vegetation as possible on the lower river; that is why this location was selected to be planted as part of the flood control project. WDFW agrees with the Muckleshoot Indian Tribe that the National Marine Fisheries Service erred in the issuance of a concurrence letter for the project.

If there are any questions regarding these comments, I may be contacted at 425-313-5683 or larry.fisher@dfw.wa.gov.

WDFW appreciates the opportunity to collaborate with the US Army Corps of Engineers in our efforts to preserve, protect, perpetuate, and manage the fish and wildlife resources of the state of Washington.

Sincerely for the resource,

Larry Fisher

Larry Fisher
Area Habitat Biologist
Habitat Program

LF:lf:ACECedarVegRemoval.doc

cc: WDFW, Reinbold, Brock, Lakey, Price
WDOE, Federal Permit Coordinator, Padgett
MIT Fisheries, Coccoli, Walter
NOAA Fisheries
City of Renton, Lee

Response to WDFW letter dated 22 November 2011

The existing vegetation is not in compliance with Corps guidance for I-type floodwalls and needs to be removed. The red alder trees were present prior to construction of the Cedar River Section 205 Flood Control Project. Mitigation plantings were installed on both the right and left banks of the project. The City of Renton acquired the Hydraulic Permit Approval (HPA) for the original construction, and the Federal Government is not subject to any conditions therein. However, removal of vegetation will be offset through mitigation. As a result of this feedback, the Corps has supplemented the mitigation proposed in the Notice of Preparation to also include 1620 linear feet of willow plantings on the right bank opposite the project area. This additional planting effort, combined with 200 linear feet of willow planting on the left bank at the project site will provide long-term benefits within the project reach. Planting proposed for the upstream off-site planting area will still be completed. The comment letter states that WDFW believes that the National Marine Fisheries Service "erred" by issuing concurrence to the Corps for the proposed action. The Corps has completed consultation in accordance with section 7(a)(2) of the ESA pursuant to the provisions of 50 CFR 402.13.

Appendix F: NHPA Documentation

12/6/2011

MEMORANDUM FOR RECORD

SUBJECT: Cedar River I-Type Floodwall Vegetation Removal Project NHPA Review

BY: Ashley Dailide, Archaeologist, Seattle District US Army Corps of Engineers

1. **Purpose:** Review Proposed Vegetation Removal Project for Compliance with NHPA.

2. **Location:** The proposed project is located in the floodplain along the left bank from Logan Avenue (RM 1.07) to the south Boeing Bridge (RM 0.74) on the Cedar River in the City of Renton, King County, Washington.

3. **Proposed Work:** The proposed work would remove vegetation that is out of compliance with Corps guidance for I-type floodwalls. The guidance states that a minimum vegetation-free zone (with the exception of grass species for erosion control) of 15-feet must be maintained for access and structural integrity.

4. **Background Research and Site Visit:** Corps archaeologist Ashley Dailide visited the site with the environmental coordinator in November of 2011. The project area is in an industrial area, with no evidence of native soil. A search of the archaeological and historic site records at the Washington State Department of Archaeology and Historic Preservation (DAHP) indicated that no properties listed in the National Register of Historic Places (NRHP) or the Washington State Historic Site Register are recorded in the project area. Historic aerial photos, General Land Office (GLO) survey maps through 1867 were reviewed in order to identify any potential areas where deeply deposited cultural resources could be present. No Historic Properties were found.

5. **Results and Recommendations:** Based on the background research and preliminary site visit the Corps has determined that the project has No Potential to cause effects to Historic Properties under the NHPA, as the area has been highly disturbed by modern development and there are no historic structures adjacent to the undertaking, or within immediate view sheds that are eligible for the National Register. As no further work is recommended, the NHPA process is completed.

1

Appendix G: Lower Cedar River Flood Control Project I-Wall Vegetation Pre-Variance Report

LOWER CEDAR RIVER FLOOD CONTROL PROJECT
I-WALL VEGETATION PRE-VARIANCE REPORT

AUGUST 2012

US ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

VEGETATION PRE-VARIANCE REPORT
INVESTIGATION OF FEASIBIITY FOR CONDUCTING A VARIANCE REQUEST FOR CEDAR RIVER FLOOD CONTROL WORKS
Renton Washington Left Bank Cedar River

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VEGETATION PRE-VARIANCE REPORT
INVESTIGATION OF FEASIBIITY FOR CONDUCTING A VARIANCE REQUEST FOR CEDAR RIVER FLOOD CONTROL WORKS (LB)
Renton Washington Left Bank Cedar River

EXECUTIVE SUMMARY

BLUF: The result of this pre-variance investigation is that the project is not a candidate for a variance request and the existing vegetation should be managed to the current USACE vegetation standards as outlined in ETL 1110-2-571, which specifically addresses vegetation management adjacent to I-Walls.

PROJECT NAME: Lower Cedar River at Renton

PROJECT CWIS NUMBER: 094283

PUBLIC SPONSOR: City of Renton

PROJECT LOCATION AND DESCRIPTION: The Federally Authorized Cedar River project is located on the Cedar River from approximately river mile (RM) 0 to RM 1.5, in the city of Renton, in King County, Washington. The project includes earthen levees combined with steel and concrete floodwalls, along both banks of the river. The project also includes dredging in the river channel. The project was designed to provide protection to the 100-year event level and a flow of 12,000 cfs.

PURPOSE AND SCOPE OF INVESTIGATION: The Federally authorized project was designed and constructed by the US Army Corps of Engineers, Seattle District. The design incorporated vegetation along the riverward side of the I-Wall. Under the vegetation variance process outlined in the PGL published in the Federal Register in Feb of 2012, the District was given the opportunity to evaluate projects such as this one to determine if a variance request was in the best interest of the Sponsor, the Government, and the public.

The original design included a landscape plan to plant vegetation in front of the wall within the current mandated 15 feet vegetation free zone and/or leave existing trees that could be preserved during wall construction. EC 1110-2-6066, Design of I-Walls, 1 April 2011 states that vegetation shall be in accordance with ETL 1110-2-571, Guidelines for landscape Plantings and Vegetation Management at levees, Floodwalls, Embankment Dams and Appurtenant Structures, 10 April 2009 which requires a Vegetation Free Zone 15 feet from both sides of the wall. The ETL 1110-2-575, Appendix B states that assessing vegetation growth, especially trees adjacent to I-Walls and its potential with respect with stability and seepage is a very complex issue. Each situation is unique, and there is no prescriptive process on how to conduct such an assessment. The remaining appendix B goes into the various types of geotechnical and structural analyses that would need to be performed.

The O&M manual for this project is silent on vegetation near the I-Wall but it does refer to EM 1110-2-301 which has been superceeded by ETl 1110-2-571, current vegetation guidelines.

PRE-VARIANCE INVESTIGATION REPORT

1. Project Identification

a. Project Name: Lower Cedar River at Renton, LB
b. Project CWIS Number: 094283

2. Project Authority

a. Classification: Federal
b. Authority: CAP, Section 205
c. Estimated original cost of project: $7,900,000
d. Construction completion date of the original project: 2000

3. Non-Federal Sponsor

a. Sponsor Identification: City of Renton
POC: Steven Lee, 425-430-7205
City of Renton, Surface Water Utility Engineering
1055 S. Grady Way
Renton, WA 98055

4. Project Location

City:	Renton, WA
County:	King
State:	Washington
Basin:	Cedar
River:	Cedar
River Bank:	Left

5. Project Design

The Cedar River at Renton Section 205 project is located in downtown Renton. The lower stretch of river is a channel dredged for flood control and commerce in the early 1900's. The Renton Airport is located on the left bank, and a Boeing assembly plant and Renton park are located on the right bank. Prior to construction of the project, zero damage for the left bank began at a 3-4 year recurrence interval flood event, and for the right bank damage began at an 8-10 year recurrence interval flood event. In the November 1990 flood (50-year recurrence interval event), the project area experienced approximately $8 million in damages.

6. Background Information

The original design included a landscape plan to plant vegetation in front of the I-wall within the current mandated 15 feet vegetation free zone and/or leave existing trees that could be preserved during wall construction. EC 1110-2-6066, Design of I-Walls, 1 April 2011 states that vegetation shall be in accordance with ETL 1110-2-571, Guidelines for landscape Plantings and Vegetation Management at levees, Floodwalls, Embankment Dames and Appurtenant Structures, 10 April 2009 which requires a Vegetation Free Zone 15 feet from both sides of the wall. The ETL 1110-2-575, Appendix B states that assessing vegetation growth, especially trees adjacent to I-Walls and its potential with respect with stability and seepage is a very complex issue. Each situation is unique, and there is no prescriptive process on how to conduct such an assessment. The remaining appendix B goes into the various types of geotechnical and structural analyses that would need to be performed.

7. Project Performance Data

CEI Inspection Results:

- The Corps conducts routine inspections of this Cedar River Left Bank Project with the local sponsor.
- The levee screening was performed by the Corps in October 2009 (LSAC 4).
- The Periodic Inspection conducted 2010 found the project in a minimally acceptable condition overall.
- The Cedar River Left Bank Levee system was rated acceptable on 26 March 2008.
- The vegetation was found to be acceptable based on the 1995 Seattle District Vegetation Variance.

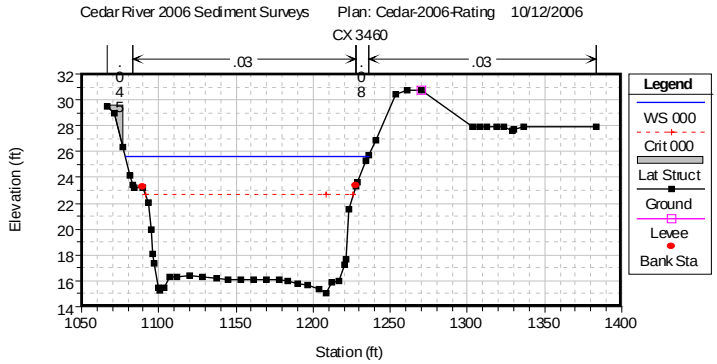
8. Hydrology and Hydraulics

Current Level of Protection and Inundation Depths

- The flood damage reduction system was designed to contain12,000 cfs (0.01 % flood). The project was designed to allow accumulation and storage of sediment. Yearly surveys of the channel are taken to determine if the channel storage capacity is within tolerable limits.
- The floodwall is a concrete capped sheet pile wall (I-wall). The minimum depth of embedment of the sheet pile is 21' below the ground surface.
- Sediment, scour and woody debris are the damaging forces typically found in this reach. Large woody debris can damage a levee in a 2-year event equally as in a 100-year event and cannot be predicted.
- The two largest events since the floodwall/levee system was completed in 1999 were:
  2009 – 9500 cfs (68% of design capacity)
  2006 – 7800 cfs

  The project is designed to allow for the storage of sediment and when this limit is reached the project no longer provides 100-year protection. Based on the 2006 study, the limit has not yet been reached. If no levee/floodwall repair is made it would be reasonable to expect that in the future, based on the above estimate and assumptions, that inundation depths would go up and effective level of protection for the left overbank would go down as a result of sediment storage in the channel.

  The hydraulic inputs to levee/floodwall repair are based on the 2006 Northwest Hydraulic Consultants HEC-RAS hydraulic model. Every year NHC provides the city with a report on the lower Cedar which serves to monitor the amount of sediment stored in the river and indicate how close the aggraded bed is getting to the dredge limit. The hydraulic model results show velocities at cross sections in the vicinity of the damaged locations on the order of 10 to 12 feet per second. The figures below show representative cross sections in the damage location and the computed water surface elevations using the 0.01 annual chance exceedence (100-year) flow of 12,000 cfs. Elevations on these plots are referenced to the NAVD1988 datum.



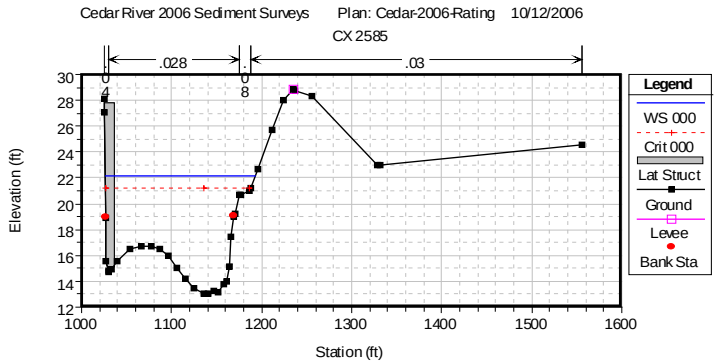


Figure 1 – Channel capacity section

Toe Scour

The chart in EM 1110-2-1601 indicates a scour depth of about 5 feet below the channel bottom at the toe location. The pier scour equation developed by Liu, et al, 1961 yields about 3-feet. Based on uncertainties in this calculation the specified scour depth (referenced from the toe location on the river bed) is 8-feet or down to about elevation 6-feet NAVD88.

9. Background Environmental Information

In the project area, the Cedar River is a confined, single channel, low gradient system. The left bank is occupied by the Renton Airport, while the right bank contains a city park and a Boeing manufacturing plant. The thalweg of the river is primarily located adjacent to the left bank. In this reach, the river is highly modified and provides poor fish and invertebrate habitat. The river is channelized with armored banks and there is very little pool habitat. The river at this point primarily functions as a backwater for Lake Washington during the summer high pool.

According to the Final Environmental Impact Study for the Cedar River 205 Flood Control Project prepared in August of 1997, there are at least 22 species of fish present in the Cedar River. In the vicinity of the project site there are sockeye salmon, Chinook salmon, coho salmon, steelhead trout, rainbow trout, cutthroat trout, mountain whitefish, northern pikeminnow, peamouth chub, three-spine stickleback, largescale sucker, longnose dace, brook lamprey, Pacific lamprey, and several species of sculpin. Bull trout have not been observed in the vicinity of the proposed project, but may occur. Approximately 80% of the sockeye salmon population of the Lake Washington system spawns in the Cedar River.

Three species listed as threatened under the Endangered Species Act are likely to occur in the project area including Bald Eagle, Puget Sound Chinook salmon, and Coastal/Puget Sound bull trout. In addition, Puget Sound Steelhead is proposed for listing. The project area has been designated as critical habitat for Chinook salmon and bull trout. Potential effects of the proposed work on threatened or endangered species and designated critical habitat will be addressed per section 7 of the Endangered Species Act.

a. The terrestrial environment is highly urbanized and provides limited wildlife habitat. Riparian vegetation in this reach is limited to a few overhanging willows and invasive species such as knotweed, reed canary grass, Scot's broom, and Himalayan blackberry. However, there are two known bald eagle nests located within one mile of the project. It is unlikely that construction activities will have any impact on eagle activity as the area is heavily urbanized. Noise, activity, and exhaust levels are generally high and wildlife that utilize the area (including eagles) are acclimated to these conditions. While it is possible that the presence and use of heavy construction equipment may temporarily displace some species at both the borrow pit and construction sites, adverse impacts to wildlife are expected to be minor.

b. Wetlands. The project area does not contain wetlands as defined by the Corps of Engineers. The project will have no adverse impacts to wetlands.

c. Recreation. The presence of the airport restricts the recreational use of the left bank of the levee. The right bank levee across the river from the repair sites is part of a city park, so it is heavily used for recreation.

d. Cultural Resources. A search of the Department of Archaeology and Historic Preservation (DAHP) electronic site database did not produce evidence for the presence of an historic property listed on the National Register of Historic Places (NRHP) or the Washington State Historic Sites Register at either of the two Cedar River flood damaged locations. The presence of archaeological materials is not anticipated in this area because the immediate area was underwater prior to lowering of the historic water level of Lake Washington in 1916 when the Mountlake Cut of the Lake Washington Ship Canal was opened. Excavation for the cut connected Lake Washington to Puget Sound and lowered the lake's elevation by about 9 feet.

10. Engineering Evaluation of Fingings

Description and quantification of the threat

The riverward side of the I-wall is a thick tangle of brush and trees consisting mostly of blackberries, knotweed, red alder, cottonwood and willow.

Although no construction records can be located to indicate the condition of the riverward side of the i-wall immediately following construction, it is assumed that the existing trees were either planted as part of the project or grew up post construction. The trees existing here today are consistent with growth rates, ages and health of other trees in the region that would indicate approximately 13-15 year old trees (see Figure 2)

Figure 2 – Similar species and age of tree cut in same region to Cedar river LB trees. This tree was in a grove of trees such as the ones along the i-wall.

Red Alder is the predominant species along the I-wall and the characteristics of the tree are as follows:

Growth and Yield- Red alder has rapid juvenile growth; of its associates, only black cottonwood grows as much or more during the juvenile phase. On good sites, trees may be 30 ft at age 5, 52 ft at age 10, and 79 ft height at age 20. One tree was 32.1 ft tall and 6.4 in DBH 5 years from seed.

Growth slows after the juvenile stage, the decrease beginning much sooner on poor sites. Site index as determined at base age 20 years ranges from 33 to 82 ft; at base age 50, it ranges from 60 to 120 ft. Associated conifers have much slower juvenile growth, but they sustain height growth years longer than alder. On an average site, both

Douglas-fir and red alder can attain the same height at about age 45. Beyond that age, Douglas-fir surpasses red alder in height.

Red alder is a relatively short-lived species, maturing at about 60 to 70 years; maximum age is usually about 100 years. On favorable sites, trees can be 100 to 130 ft tall and 22 to 30 in. in diameter. A record-size tree measured 78 in. in d.b.h., but trees over 35 in. in diameter are rare. Maximum cubic volume is attained at age 50 to 70 (7,150 ft^3/acre). In pure stands on good sites, it has been estimated that red alder can achieve annual cubic volume growth rates of 300 ft^3/acre in pulpwood rotations of 10 to 12 years, and 200 ft^3/acre in saw-log rotations of 30 to 32 years. Most of the existing alder volume is in mixed stands where growth and yield are variable.

Rooting Habit- Red alder forms extensive, fibrous root systems. Root growth of seedlings is rapid; 2-year-old nursery-grown seedlings have to be planted using a shovel because of their wide-spreading, large, woody roots.

Red alder also has root nodules that fix atmospheric nitrogen. The nodules are a symbiotic association between the tree and an actinomycete *(Frankia* spp.). Nodulation occurs soon after seed germination; root systems of seedlings a few months old commonly have dozens of visible nodules, ranging from the size of a pinhead up to 1 in. in diameter. Mature trees have nodules on both the large woody roots and the smaller new roots. Nodules found on large trees can be as large as 3.1 or 3.5 in. in diameter.

Reaction to Competition- Red alder requires more light than any of its tree associates except black cottonwood and is classed as intolerant of shade. Young seedlings can withstand partial shade for a few years but will grow very little; if not released, the seedlings will die. The only trees that survive are those that maintain dominant or codominant crown positions. Self-thinning or mortality caused by competition is rapid, and mean densities in natural stands decrease from 50,000 seedlings per acre at age 5 to 675 seedlings per acre at age 20. Red alder also selfprunes extremely well. Shaded lower branches rapidly die and fall off; alder holes are typically clear and slightly tapered. Live crown ratios in crowded, pure stands are very low, and narrow, domelike crowns are characteristic.

SITE CHARACTERIZATION

See Appendix B for a description of the number of trees, species and locations along the i-wall. There are a total of 260 distinct trees along this section of i-wall and the numbers of trees based on distance from the face of the concrete cap are as follows:

a. 110 trees within 5 feet of the i-wall,
b. 110 trees from 5-15 feet of the i-wall
c. 40 trees beyond 15 feet from the i-wall.

Based on research comparing root spread of alders to DBH, the diameter of the influence of the root mass can extend up to 40 feet in diameter.

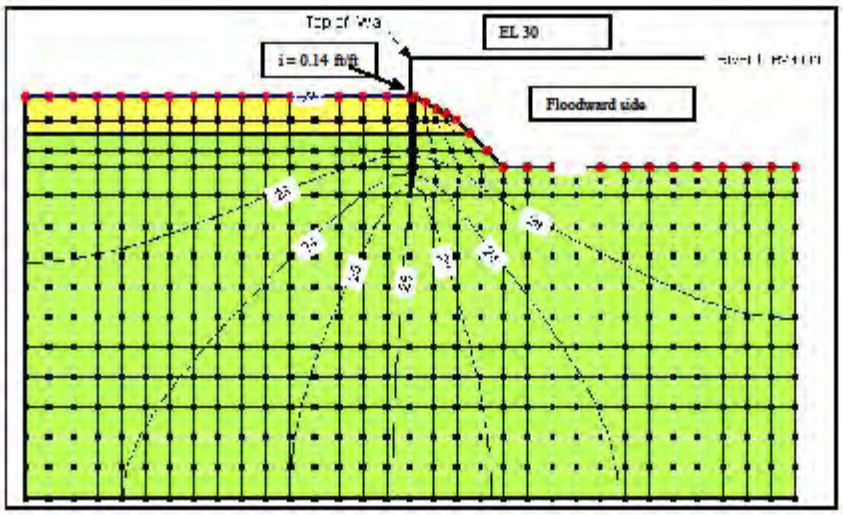
VEGETATION IMPACTS TO:

a. Seepage

The result of the seepage analysis shows an exit gradient of 0.14 ft/ft. The factor of safety ($FS_{g)}$ was determined from the ratio of buoyant weight of soil (72.6 pcf) and the unit weight of water (62.4 pcf) times the exit gradient. Heave is not a factor since there is no landside blanket so FS_h was not evaluated. The FS_g was found to be:

$$FS_g = g_{b\,/\,(}i*g_w\,)$$
$$= 72.6(.14*62.4)$$
$$= 8.3$$

The recommended factor of safety for ordinary condition is 3.0 and the results show a factor of safety of 8.3 with respect to seepage and piping. There is no slope on the landward side of the wall.



Site Information:
The surface soil is silty sandy gravel,
The layer below is silty sand with minor gravel
Saturated unit weight of soil = 135 pcf
Unit weight of water = 62.4 pcf
Exit gradient = 0.14 ft/ft
$FS_g = 8.3$

The evaluation was conducted on the current condition of the riverward bank. An evaluation was not conducted to investigate a condition where the loss of material along the riverward bank may decrease seepage path lengths due to tree overthrow and scour of river bank. Seepage does not appear to be a controlling factor for failure modes of this wall.

b. Scour

Flow velocities of 12 feet per second through this reach are anticipated based on the 100-year flow of 12,000 cfs. Scour depths of up to 8 feet vertically can be expected. The project design and construction did not alter the existing river bank. There currently exists bank armoring equivalent to Class 3 along approximately 1,300 feet from Logan Street bridge downstream and the lower 400 feet to the Boeing bridge has degraded or missing riprap. This area has experienced bank erosion and requests from the City for rehab assistance for this missing rock.

Trees growing in this armoring are mapped and detailed in Appendix B. Windthrow or overthrow of any kind has the potential for directing flows against the erodible bank and removing the soil embankment rapidly. The potential exists for areas of riverbank to erode from the existing condition all of the way to the I-Wall in one flood event. In some cases this could consist of 10 feet horizontally and 8 feet deep.

There are several cottonwood trees growing along the i-wall that have the potential to grow to 3-4 feet in diameter and have root pit diameters on the order of 18 feet (see Appendix C). These defects in the slope can direct flows against the bank and quickly erode the bank and supporting material resisting overturning.

c. Global Stability

A simple evaluation of the stability of the i-wall was conducted first with a scour of 6 foot and a scour of 8.5 feet that could be induced by tree windthrow. The results indicate a FS of 1.97 for the 6 foot scour and 1.51 for the 8.5 foot scour. Although still greater than one, the reliability of the structure is impacted by the loss of the resisting material on the riverward side of the wall. (See Appendix D for detailed calculations.)

d. Structural Integrity

Discussions with members of the vegetation solutions team at HQ and communication of the field investigation results prompted the following information with regard to the probability of the variance being approved from a structural integrity point of view:

After review of the attached report and associated photos and drawings you provided, it is the opinion of myself and Pete Rossbach, Structural CoP Leader, that a variance to ETL 1110-2-571, Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures, would not be appropriate. The main reasons for this opinion are:

2. *The vegetation (trees) are only approximately 13 years old and are already causing damage to, and penetration of, wall joints in the concrete cap. Joints are designed to be watertight and these penetrations will result in leakage during a flood event that could result in landside erosion, localized flooding, and/or loss of public confidence in the floodwall's integrity.*

3. *Based on the photos provided, the number and density of trees that appear to be within the 15' exclusion zone required by ETL 1110-2-571 would severely limit the ability to perform any riverside flood fighting activities. Additionally, routine inspection and maintenance activities would be impaired and be less safe to perform due to tree branches and underbrush.*

4. *As these trees and their root systems continue to grow, there will be potential for an uprooted tree to create an unacceptable seepage path. A larger uprooted tree could also cause localized damage to the wall by impact from the trunk or by roots that are interlocked with sheet piling and cap.*

Christopher H. Westbrook, P.E.
Structural Engineer
Bridge Safety Program Manager
Headquarters, U.S. Army Corps of Engineers

a. Operations and Maintenance

The thick brush and trees along the river side of the I-Wall inhibit access for maintenance. The bench on the riverward side allows for machinery and personnel to access the wall. However, the brush and large stemmed trees prevents maintenance and repair activities along the riverward face including spall repair, crack repair, sealant replacement, erosion and scour repair, as well as correcting tilt or lean of the wall.

b. Inspection

It has been very difficult to inspect the riverward side of the I-Wall for many years. During this investigation it was discovered that the joint sealant in the expansion joints along the riverward side of the wall were severely degraded or missing, but this was never found during inspections due to the heavy brush; including the HDR PI inspection of 2010.

11. Summary and Conclusions

Based on the analysis and field investigation study, it has been determined that the Cedar River I-wall is not a candidate for a variance to the USACE national standard on levee/I-Wall vegetation standards as outlined in ETL 1110-2-571.

Roots were found to have penetrated the I-Wall joints and destroyed or damaged joint seals in the concrete cap. Also roots up to ¾" were found along the steel sheet pile approximately 4 feet below grade. Although no access points were located through the i-wall itself, there are no trees on the landward side of the I-Wall that could have originated the root systems.

Access and inspection due to the heavy growth on the riverward side of the wall was such that damages to the joint sealants were not identified in any previous inspections. Also, no access for repairs is currently possible with the vegetation in it's current state.

Since the trees are relatively young, it is anticipated that the growth of the stem diameters for most of the trees could be expected to increase by up to 100% over the current condition. If the trees are currently 15 years old, they could be expected to live for another 50 years if disease and insect attack do not kill them.

Within this reach, trees cut to meet the national standard would increase public safety and return reliability of the facility to it's design condition. The result would leave 40 trees along the river to provide habitat to listed species in the Cedar River outside of the 15 foot minimum VFZ.

APENDICES

APPENDIX A: PROJECT LOCATION MAP AND SECTIONS

Figure 1 – Project Location Map and protected area

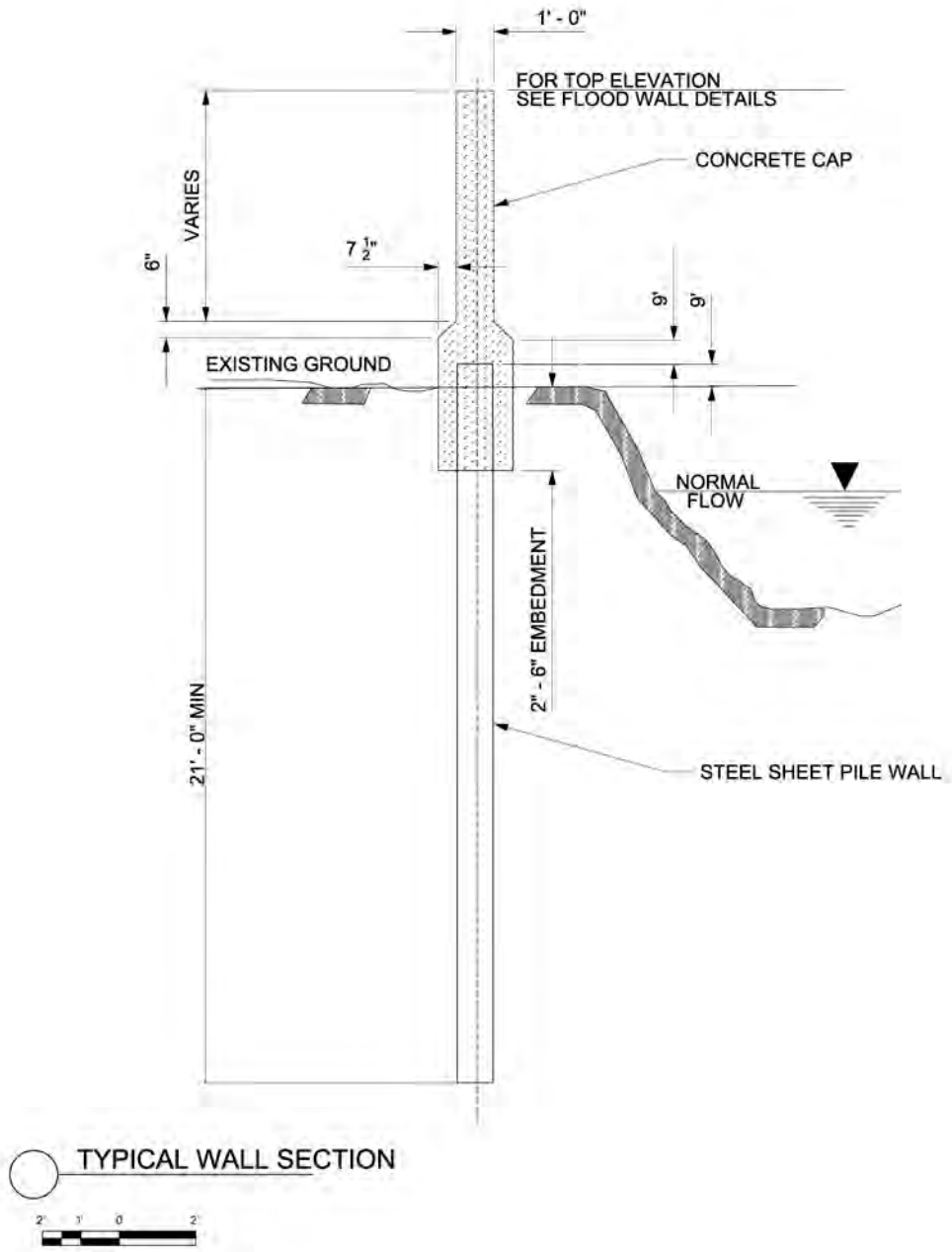


Figure 2 – I-Wall As-Built Section

APPENDIX B: SITE CHARACTERIZATION AND FIELD INVESTIGATION

TREE LOCATION AND IDENTIFICATION IN THE STUDY AREA:

Total Trees Located within 5 feet of the I-wall is 110. Station and offset and Diameter DBH with species listed below. Root spread approximated by 1.5 times diameter in inches to root spread in feet.

TABLE 1 - TREES LOCATED IN THE STUDY AREA WITHIN 5 FEET OF THE I-WALL

Trees Located in the Study area within 5 feet of the I-Wall

Station	Distance From Wall (ft)	Tree Diameter (in)	Species	Root Spread*(ft)
6+40	2	3	Alder	4.5
6+68	1	3.7	Alder	5.55
8+52	2	3.7	Alder	5.55
2+62	5	4	Alder	6
17+43	3	4.2	Alder	6.3
2+68	3	4.3	Alder	6.45
9+11	2	4.4	Alder	6.6
6+77	2	4.5	Alder	6.75
1+54	0.25	4.9	Willow	7.35
13+30	1	4.9	Alder	7.35
8+00	2	4.9	Alder	7.35
7+75	4	5	Alder	7.5
7+56	5	5	Alder	7.5
11+80	5	5	Alder	7.5
7+87	1.5	5.1	Alder	7.65
14+35	2.5	5.2	Alder	7.8
8+44	1	5.4	Alder	8.1
15+84	2	5.4	Alder	8.1
13+70	1.5	5.5	Alder	8.25
2+67	3	5.5	Alder	8.25
2+67	3	5.5	Alder	8.25
2+67	3	5.5	Alder	8.25
10+72	1	5.6	Alder	8.4
10+42	1.5	5.6	Alder	8.4
4+03	4	5.6	Alder	8.4
6+93	5	5.7	Alder	8.55
11+80	5	5.7	Alder	8.55
5+68	2	5.8	Alder	8.7
15+92	1	6	Alder	9
3+95	3	6	Alder	9
12+94	4.5	6	Alder	9
7+47	0.25	6.1	Alder	9.15
11+90	2	6.2	Alder	9.3
15+55	2.5	6.2	Alder	9.3
7+93	1.5	6.3	Alder	9.45
4+41	2	6.3	Alder	9.45
4+37	5	6.3	Alder	9.45
15+84	2	6.4	Alder	9.6
8+44	1	6.5	Alder	9.75

10+24	1.5	6.5	Alder	9.75
Station	**Distance From Wall (ft)**	**Tree Diameter (in)**	**Species**	**Root Spread*(ft)**
16+67	3	6.5	Fir	9.75
1+59	0.12	6.6	Cottonwood	9.9
16+00	2	6.7	Alder	10.05
14+35	2.5	6.7	Alder	10.05
13+25	4	6.8	Alder	10.2
9+03	1.5	7	Alder	10.5
5+88	1	7.1	Alder	10.65
14+35	2.5	7.1	Alder	10.65
4+25	2.5	7.3	Alder	10.95
3+77	2.5	7.4	Alder	11.1
14+67	2.5	7.4	Alder	11.1
10+67	1.5	7.5	Alder	11.25
15+65	2.5	7.5	Alder	11.25
4+90	1	7.6	Alder	11.4
13+02	2.5	7.6	Alder	11.4
5+98	1	7.7	Alder	11.55
13+51	1.5	7.7	Alder	11.55
11+57	1.5	8	Alder	12
4+41	2	8	Alder	12
13+02	2.5	8	Alder	12
14+44	2.5	8	Alder	12
7+69	5	8	Alder	12
10+50	4	8.1	Alder	12.15
5+11	1	8.2	Alder	12.3
13+33	1	8.2	Alder	12.3
8+75	2	8.2	Alder	12.3
10+72	1	8.3	Alder	12.45
9+19	2	8.3	Alder	12.45
5+50	3	8.3	Alder	12.45
11+68	1	8.4	Alder	12.6
13+61	3.5	8.4	Alder	12.6
2+48	0	8.5	Cottonwood	12.75
13+09	3.5	8.5	Alder	12.75
13+80	1	8.6	Alder	12.9
5+50	3	8.6	Alder	12.9
14+79	3	8.7	Alder	13.05
15+23	3	8.7	Alder	13.05
5+72	0.5	8.8	Alder	13.2
5+88	1	8.8	Alder	13.2
4+10	2.5	8.9	Alder	13.35
3+86	3	8.9	Alder	13.35
4+67	1	9	Alder	13.5
2+08	3.5	9	Alder	13.5
5+19	4	9	Alder	13.5
8+37	1.5	9.1	Alder	13.65
15+13	2.5	9.1	Alder	13.65
6+81	0.25	9.4	Alder	14.1
7+47	0.25	9.6	Alder	14.4
10+87	1.5	9.6	Alder	14.4
15+44	2	9.6	Alder	14.4
11+03	1.5	9.7	Alder	14.55

3+30	2	9.7	Alder	14.55
Station	**Distance From Wall (ft)**	**Tree Diameter (in)**	**Species**	**Root Spread*(ft)**
13+17	1	9.8	Alder	14.7
10+42	1.5	9.9	Alder	14.85
3+21	0.67	10.2	Alder	15.3
5+58	1	10.2	Alder	15.3
5+78	1	10.3	Alder	15.45
11+03	1.5	10.3	Alder	15.45
15+34	2.5	10.3	Alder	15.45
11+50	4	10.3	Alder	15.45
16+09	2.5	10.4	Alder	15.6
3+54	3	10.4	Alder	15.6
10+79	5	10.4	Alder	15.6
11+17	2.5	11.2	Alder	16.8
5+30	1	11.4	Alder	17.1
5+00	3	11.6	Alder	17.4
3+39	2.5	11.8	Alder	17.7
11+30	1.5	12.3	Alder	18.45
4+56	1	12.8	Alder	19.2
9+61	0.83	13.5	Alder	20.25

TABLE 2 - TREES LOCATED IN THE STUDY AREA BETWEEN 5 FEET AND 15 FEET OF THE I-WALL

Total Trees Located between 5 feet and 15 feet of the I-wall is 110. Station and offset and Diameter DBH with species listed below.

Station	Distance From Wall (ft)	Tree Diameter (in)	Species	Root Spread*(ft)
8+90	9.5	2.5	Oregon Ash	3.75
7+65	8	3	Alder	4.5
11+12	9	3	Alder	4.5
12+53	9	3	Alder	4.5
8+14	6	4	Alder	6
8+12	9	4	Alder	6
6+87	10	4	Alder	6
6+87	10	4	Alder	6
6+87	10	4	Alder	6
7+58	10	4	Alder	6
8+16	10	4	Alder	6
7+48	9	4.5	Alder	6.75
12+54	7.5	5	Alder	7.5
7+47	8	5	Alder	7.5
10+55	9	5	Alder	7.5
12+61	9	5	Alder	7.5
6+90	10	5	Alder	7.5
8+19	10	5	Alder	7.5
12+81	10	5	Alder	7.5

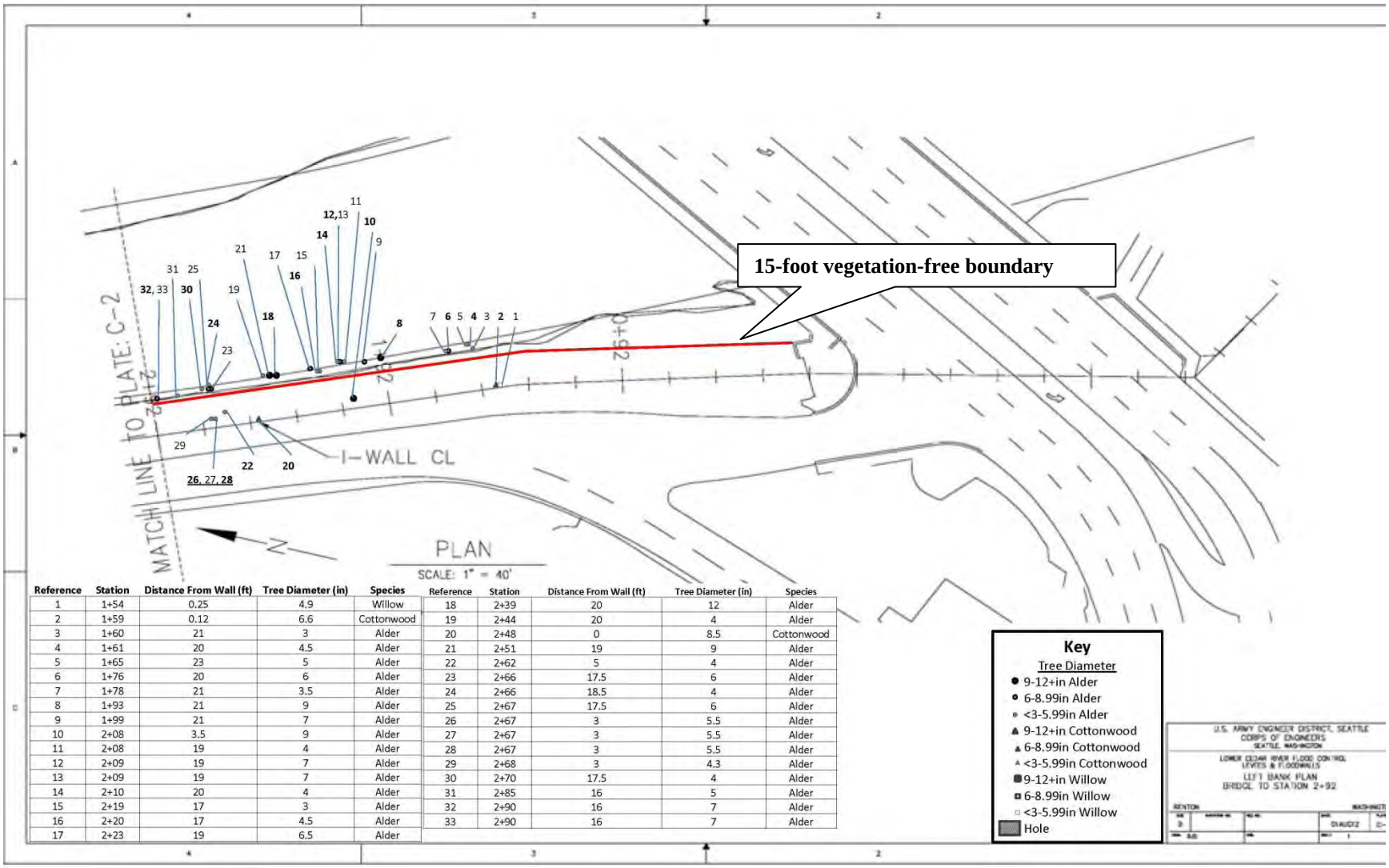
6+65	8	6	Alder	9
Station	**Distance From Wall (ft)**	**Tree Diameter (in)**	**Species**	**Root Spread*(ft)**
7+04	8	6	Alder	9
7+07	8	6	Alder	9
6+79	9	6	Alder	9
7+72	9	6	Alder	9
13+43	9	6	Alder	9
13+72	10	6	Alder	9
8+63	9.25	6.8	Alder	10.2
6+66	8	7	Alder	10.5
7+50	9	7	Alder	10.5
6+53	10	7	Alder	10.5
7+02	10	7	Alder	10.5
7+51	10	7	Alder	10.5
8+83	9.5	7.5	Alder	11.25
11+22	6	8	Alder	12
5+56	7.5	8	Alder	12
6+65	8	8	Alder	12
7+41	9	8	Alder	12
7+67	9	8	Alder	12
10+67	9	8	Alder	12
10+42	9	8.2	Alder	12.3
5+70	7	9	Alder	13.5
8+12	7	9	Alder	13.5
6+85	9	9	Alder	13.5
10+68	10	9	Alder	13.5
11+36	6	9.5	Alder	14.25
5+63	7	10	Alder	15
9+42	7.5	10.2	Alder	15.3
11+29	15	1	Alder	1.5
7+70	12	2	Alder	3
12+63	12	2	Alder	3
9+28	12.2	2	Alder	3
9+28	12.2	2	Alder	3
10+87	15	2	Alder	3
11+28	15	2	Alder	3
11+31	15	2	Alder	3
11+83	15	2	Alder	3
11+84	15	2	Alder	3
8+63	11	2.5	Alder	3.75
11+27	12	3	Alder	4.5
11+88	13	3	Alder	4.5
10+79	14	3	Alder	4.5
11+15	14	3	Alder	4.5
11+16	14	3	Alder	4.5
11+30	14	3	Alder	4.5
9+72	15	3	Alder	4.5
10+69	15	3	Alder	4.5
11+88	15	3	Alder	4.5
7+51	11	4	Alder	6
8+12	11	4	Alder	6
8+63	12	4	Alder	6
9+32	12	4	Alder	6

12+63	12	4	Alder	6
Station	**Distance From Wall (ft)**	**Tree Diameter (in)**	**Species**	**Root Spread*(ft)**
7+66	13	4	Alder	6
10+87	14	4	Alder	6
11+87	14	4	Alder	6
11+12	13	4.5	Alder	6.75
7+50	11	5	Alder	7.5
7+03	12	5	Alder	7.5
8+12	12	5	Alder	7.5
8+63	12	5	Alder	7.5
6+78	13	5	Alder	7.5
7+60	13	5	Alder	7.5
10+87	11	5.5	Alder	8.25
8+72	13.5	5.9	Alder	8.85
10+87	11	6	Alder	9
10+94	11	6	Alder	9
7+02	12	6	Alder	9
9+77	12	6	Alder	9
12+63	12	6	Alder	9
9+37	15	6	Alder	9
10+70	15	6	Alder	9
11+32	15	6	Alder	9
12+59	11	7	Alder	10.5
7+64	12	7	Alder	10.5
11+77	12	7	Alder	10.5
10+79	15	7	Alder	10.5
11+22	15	7	Alder	10.5
11+41	15	7	Alder	10.5
9+50	14	7.3	Alder	10.95
8+72	11.5	7.6	Alder	11.4
7+77	12	8	Alder	12
10+04	12	8	Alder	12
11+37	13	8	Alder	12
9+50	14	8	Alder	12
9+50	15	8.3	Alder	12.45
6+30	12	8.5	Alder	12.75
5+18	11	8.9	Alder	13.35
6+78	12	9	Alder	13.5
3+95	11	12	Alder	18
5+90	12	12	Alder	18

TABLE 3 - TREES LOCATED IN THE STUDY AREA GREATER THAN 15 FEET FROM THE I-WALL

Total Trees located beyond 15 feet of the wall is 40. Station and offset and Diameter DBH with species listed below.

Station	Distance From Wall (ft)	Tree Diameter (in)	Species	Root Spread*(ft)
11+33	16	1	Alder	1.5
9+61	19	1.5	Alder	2.25
11+26	15.5	2	Alder	3
11+34	16	2	Alder	3
9+62	18	2	Alder	3
9+61	18	2.5	Alder	3.75
10+87	16	3	Alder	4.5
10+94	16	3	Alder	4.5
2+19	17	3	Alder	4.5
9+81	18	3	Alder	4.5
11+25	18	3	Alder	4.5
1+60	21	3	Alder	4.5
1+78	21	3.5	Alder	5.25
2+95	16	4	Alder	6
2+95	16	4	Alder	6
2+99	16	4	Alder	6
2+99	16	4	Alder	6
10+69	16	4	Alder	6
2+70	17.5	4	Alder	6
2+66	18.5	4	Alder	6
2+08	19	4	Alder	6
2+10	20	4	Alder	6
2+44	20	4	Alder	6
2+20	17	4.5	Alder	6.75
1+61	20	4.5	Alder	6.75
2+85	16	5	Alder	7.5
10+93	16	5	Alder	7.5
1+65	23	5	Alder	7.5
2+66	17.5	6	Alder	9
2+67	17.5	6	Alder	9
1+76	20	6	Alder	9
2+23	19	6.5	Alder	9.75
2+90	16	7	Alder	10.5
2+90	16	7	Alder	10.5
2+09	19	7	Alder	10.5
2+09	19	7	Alder	10.5
1+99	21	7	Alder	10.5
2+51	19	9	Alder	13.5
1+93	21	9	Alder	13.5
2+39	20	12	Alder	18



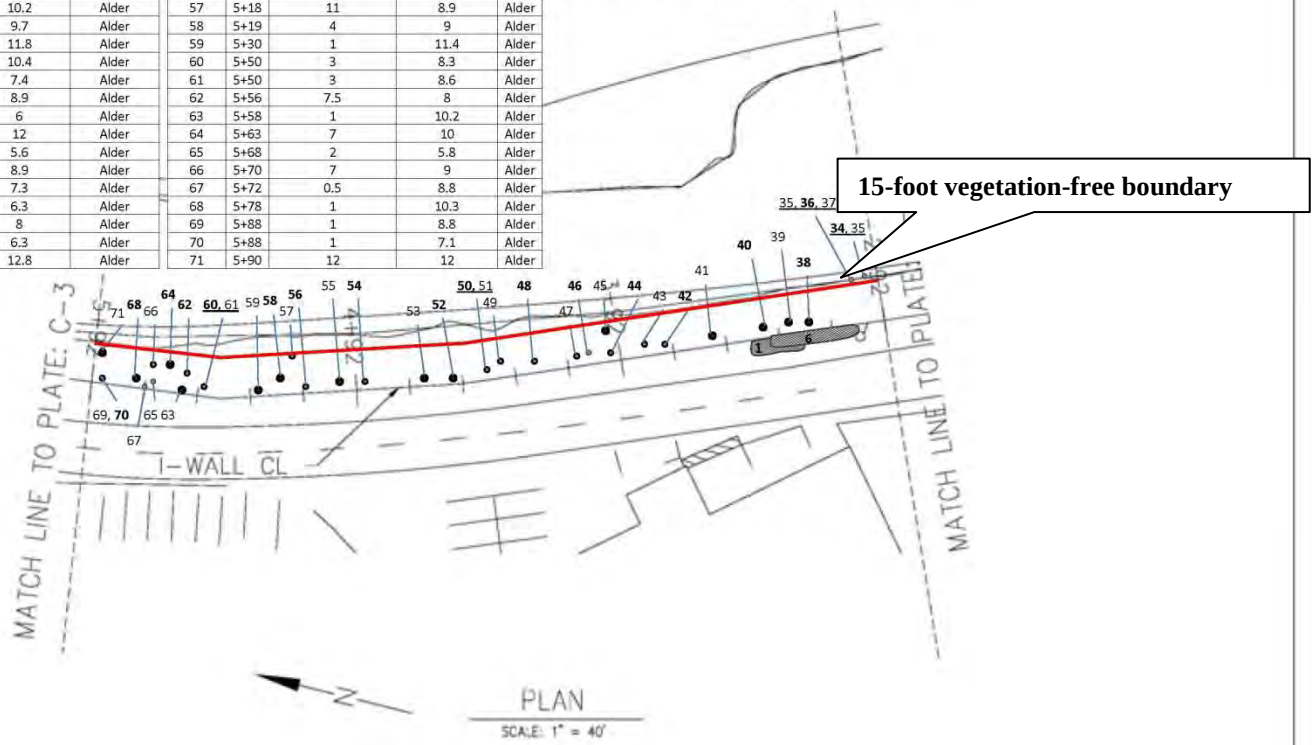
Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
1	1+54	0.25	4.9	Willow
2	1+59	0.12	6.6	Cottonwood
3	1+60	21	3	Alder
4	1+61	20	4.5	Alder
5	1+65	23	5	Alder
6	1+76	20	6	Alder
7	1+78	21	3.5	Alder
8	1+93	21	9	Alder
9	1+99	21	7	Alder
10	2+08	3.5	9	Alder
11	2+08	19	4	Alder
12	2+09	19	7	Alder
13	2+09	19	7	Alder
14	2+10	20	4	Alder
15	2+19	17	3	Alder
16	2+20	17	4.5	Alder
17	2+23	19	6.5	Alder
18	2+39	20	12	Alder
19	2+44	20	4	Alder
20	2+48	0	8.5	Cottonwood
21	2+51	19	9	Alder
22	2+62	5	4	Alder
23	2+66	17.5	6	Alder
24	2+66	18.5	4	Alder
25	2+67	17.5	6	Alder
26	2+67	3	5.5	Alder
27	2+67	3	5.5	Alder
28	2+67	3	5.5	Alder
29	2+68	3	4.3	Alder
30	2+70	17.5	4	Alder
31	2+85	16	5	Alder
32	2+90	16	7	Alder
33	2+90	16	7	Alder

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
34	2+95	16	4	Alder
35	2+95	16	4	Alder
36	2+99	16	4	Alder
37	2+99	16	4	Alder
38	3+21	0.67	10.2	Alder
39	3+30	2	9.7	Alder
40	3+39	2.5	11.8	Alder
41	3+54	3	10.4	Alder
42	3+77	2.5	7.4	Alder
43	3+86	3	8.9	Alder
44	3+95	3	6	Alder
45	3+95	11	12	Alder
46	4+03	4	5.6	Alder
47	4+10	2.5	8.9	Alder
48	4+25	2.5	7.3	Alder
49	4+37	5	6.3	Alder
50	4+41	2	8	Alder
51	4+41	2	6.3	Alder
52	4+56	1	12.8	Alder

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
53	4+67	1	9	Alder
54	4+90	1	7.6	Alder
55	5+00	3	11.6	Alder
56	5+11	1	8.2	Alder
57	5+18	11	8.9	Alder
58	5+19	4	9	Alder
59	5+30	1	11.4	Alder
60	5+50	3	8.3	Alder
61	5+50	3	8.6	Alder
62	5+56	7.5	8	Alder
63	5+58	1	10.2	Alder
64	5+63	7	10	Alder
65	5+68	2	5.8	Alder
66	5+70	7	9	Alder
67	5+72	0.5	8.8	Alder
68	5+78	1	10.3	Alder
69	5+88	1	8.8	Alder
70	5+88	1	7.1	Alder
71	5+90	12	12	Alder

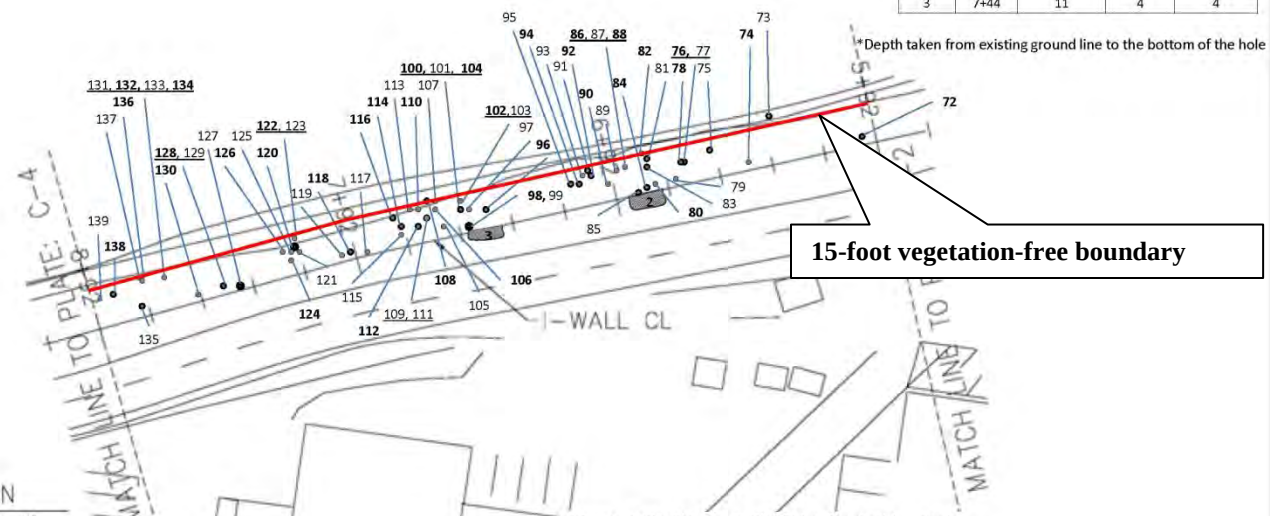
Hole #	Station	Length (ft)	Width (ft)	Depth* (ft)
1	3+36	17	5	4.6
6	3+36	30	4	5

*Depth taken from existing ground line to the bottom of the hole



Hole #	Station	Length (ft)	Width (ft)	Depth* (ft)
2	6+81	11	5	3.5
3	7+44	11	4	4

*Depth taken from existing ground line to the bottom of the hole



Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
72	5+98	1	7.7	Alder
73	6+30	12	8.5	Alder
74	6+40	2	3	Alder
75	6+53	10	7	Alder
76	6+65	8	8	Alder
77	6+65	8	6	Alder
78	6+66	8	7	Alder
79	6+68	1	3.7	Alder
80	6+77	2	4.5	Alder
81	6+78	12	9	Alder
82	6+78	13	5	Alder
83	6+79	9	6	Alder
84	6+81	0.25	9.4	Alder
85	6+85	9	9	Alder
86	6+87	10	4	Alder
87	6+87	10	4	Alder
88	6+87	10	4	Alder
89	6+90	10	5	Alder
90	6+93	5	5.7	Alder
91	7+02	12	6	Alder
92	7+02	10	7	Alder
93	7+03	12	5	Alder

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
94	7+04	8	6	Alder
95	7+07	8	6	Alder
96	7+41	9	8	Alder
97	7+47	8	5	Alder
98	7+47	0.25	9.6	Alder
99	7+47	0.25	6.1	Alder
100	7+48	9	4.5	Alder
101	7+50	9	7	Alder
102	7+50	11	5	Alder
103	7+51	11	4	Alder
104	7+51	10	7	Alder
105	7+56	5	5	Alder
106	7+58	10	4	Alder
107	7+60	13	5	Alder
108	7+64	12	7	Alder
109	7+65	8	3	Alder
110	7+66	13	4	Alder
111	7+67	9	8	Alder
112	7+69	5	8	Alder
113	7+70	12	2	Alder
114	7+72	9	6	Alder
115	7+75	4	5	Alder

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
116	7+77	12	8	Alder
117	7+87	1.5	5.1	Alder
118	7+93	1.5	6.3	Alder
119	8+00	2	4.9	Alder
120	8+12	7	9	Alder
121	8+12	9	4	Alder
122	8+12	11	4	Alder
123	8+12	12	5	Alder
124	8+14	6	4	Alder
125	8+16	10	4	Alder
126	8+19	10	5	Alder
127	8+37	1.5	9.1	Alder
128	8+44	1	6.5	Alder
129	8+44	1	5.4	Alder
130	8+52	2	3.7	Alder
131	8+63	9.25	6.8	Alder
132	8+63	11	2.5	Alder
133	8+63	12	4	Alder
134	8+63	12	5	Alder
135	8+75	2	8.2	Alder
136	8+72	11.5	7.6	Alder
137	8+72	13.5	5.9	Alder
138	8+83	9.5	7.5	Alder
139	8+90	9.5	2.5	Oregon Ash

Key

Tree Diameter

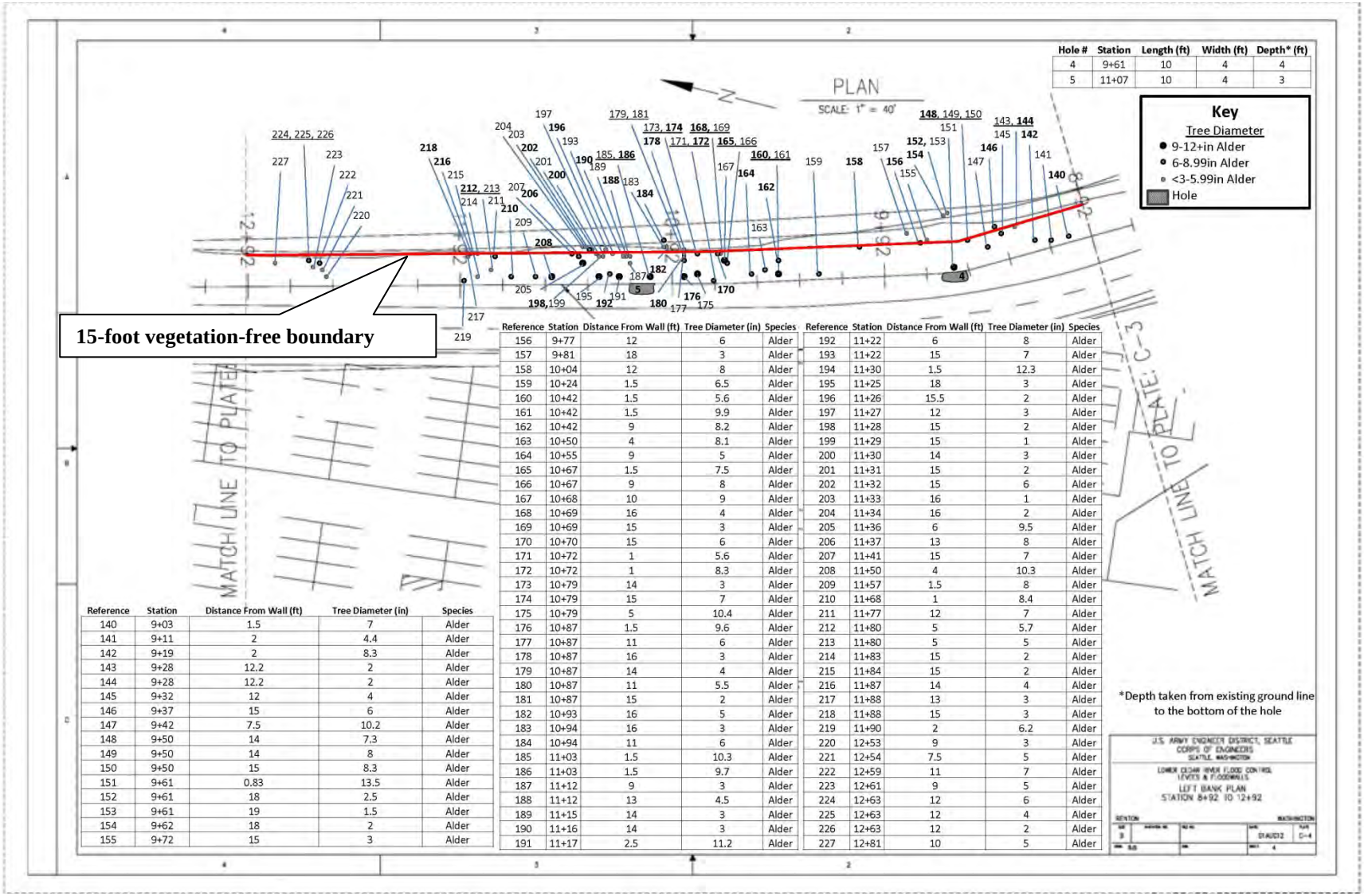
- 9-12+in Alder
- 6-8.99in Alder
- <3-5.99in Alder
- 9-12+in Oregon Ash
- 6-8.99in Oregon Ash
- <3-5.99in Oregon Ash
- Hole

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

LOWER CEDAR RIVER FLOOD CONTROL
LEVEES & FLOODWALLS

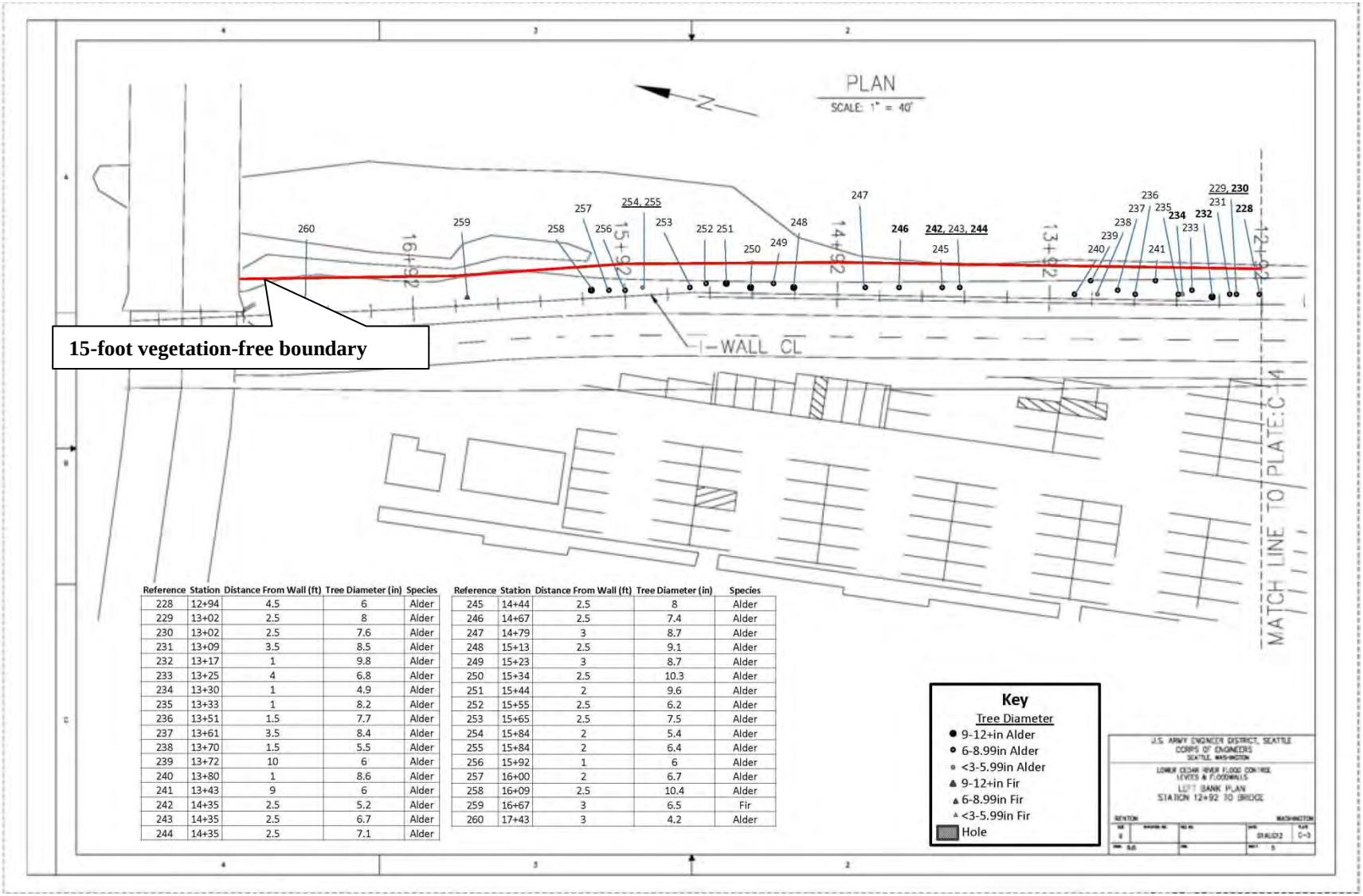
LEFT BANK PLAN
STATION 5+92 TO 8+92

RENTON WASHINGTON



Hole #	Station	Length (ft)	Width (ft)	Depth* (ft)
4	9+61	10	4	4
5	11+07	10	4	3

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
140	9+03	1.5	7	Alder
141	9+11	2	4.4	Alder
142	9+19	2	8.3	Alder
143	9+28	12.2	2	Alder
144	9+28	12.2	2	Alder
145	9+32	12	4	Alder
146	9+37	15	6	Alder
147	9+42	7.5	10.2	Alder
148	9+50	14	7.3	Alder
149	9+50	14	8	Alder
150	9+50	15	8.3	Alder
151	9+61	0.83	13.5	Alder
152	9+61	18	2.5	Alder
153	9+61	19	1.5	Alder
154	9+62	18	2	Alder
155	9+72	15	3	Alder
156	9+77	12	6	Alder
157	9+81	18	3	Alder
158	10+04	12	8	Alder
159	10+24	1.5	6.5	Alder
160	10+42	1.5	5.6	Alder
161	10+42	1.5	9.9	Alder
162	10+42	9	8.2	Alder
163	10+50	4	8.1	Alder
164	10+55	9	5	Alder
165	10+67	1.5	7.5	Alder
166	10+67	9	8	Alder
167	10+68	10	9	Alder
168	10+69	16	4	Alder
169	10+69	15	3	Alder
170	10+70	15	6	Alder
171	10+72	1	5.6	Alder
172	10+72	1	8.3	Alder
173	10+79	14	3	Alder
174	10+79	15	7	Alder
175	10+79	5	10.4	Alder
176	10+87	1.5	9.6	Alder
177	10+87	11	6	Alder
178	10+87	16	3	Alder
179	10+87	14	4	Alder
180	10+87	11	5.5	Alder
181	10+87	15	2	Alder
182	10+93	16	5	Alder
183	10+94	16	3	Alder
184	10+94	11	6	Alder
185	11+03	1.5	10.3	Alder
186	11+03	1.5	9.7	Alder
187	11+12	9	3	Alder
188	11+12	13	4.5	Alder
189	11+15	14	3	Alder
190	11+16	14	3	Alder
191	11+17	2.5	11.2	Alder
192	11+22	6	8	Alder
193	11+22	15	7	Alder
194	11+30	1.5	12.3	Alder
195	11+25	18	3	Alder
196	11+26	15.5	2	Alder
197	11+27	12	3	Alder
198	11+28	15	2	Alder
199	11+29	15	1	Alder
200	11+30	14	3	Alder
201	11+31	15	2	Alder
202	11+32	15	6	Alder
203	11+33	16	1	Alder
204	11+34	16	2	Alder
205	11+36	6	9.5	Alder
206	11+37	13	8	Alder
207	11+41	15	7	Alder
208	11+50	4	10.3	Alder
209	11+57	1.5	8	Alder
210	11+68	1	8.4	Alder
211	11+77	12	7	Alder
212	11+80	5	5.7	Alder
213	11+80	5	5	Alder
214	11+83	15	2	Alder
215	11+84	15	2	Alder
216	11+87	14	4	Alder
217	11+88	13	3	Alder
218	11+88	15	3	Alder
219	11+90	2	6.2	Alder
220	12+53	9	3	Alder
221	12+54	7.5	5	Alder
222	12+59	11	7	Alder
223	12+61	9	5	Alder
224	12+63	12	6	Alder
225	12+63	12	4	Alder
226	12+63	12	2	Alder
227	12+81	10	5	Alder



Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
228	12+94	4.5	6	Alder
229	13+02	2.5	8	Alder
230	13+02	2.5	7.6	Alder
231	13+09	3.5	8.5	Alder
232	13+17	1	9.8	Alder
233	13+25	4	6.8	Alder
234	13+30	1	4.9	Alder
235	13+33	1	8.2	Alder
236	13+51	1.5	7.7	Alder
237	13+61	3.5	8.4	Alder
238	13+70	1.5	5.5	Alder
239	13+72	10	6	Alder
240	13+80	1	8.6	Alder
241	13+43	9	6	Alder
242	14+35	2.5	5.2	Alder
243	14+35	2.5	6.7	Alder
244	14+35	2.5	7.1	Alder

Reference	Station	Distance From Wall (ft)	Tree Diameter (in)	Species
245	14+44	2.5	8	Alder
246	14+67	2.5	7.4	Alder
247	14+79	3	8.7	Alder
248	15+13	2.5	9.1	Alder
249	15+23	3	8.7	Alder
250	15+34	2.5	10.3	Alder
251	15+44	2	9.6	Alder
252	15+55	2.5	6.2	Alder
253	15+65	2.5	7.5	Alder
254	15+84	2	5.4	Alder
255	15+84	2	6.4	Alder
256	15+92	1	6	Alder
257	16+00	2	6.7	Alder
258	16+09	2.5	10.4	Alder
259	16+67	3	6.5	Fir
260	17+43	3	4.2	Alder

Tree Root Field Investigation
CEDAR RIVER I-WALL

11 July 2012

Project Name: Cedar River Flood Control Project

Inspection Personnel: Charles Ifft – Soils Section
Bob Wilkins– Soils Section
Vyacheslav Govorushkin – EM
Emerinciana Nolasco – EM
Doug Weber – EM

Other Personnel: Operators for a Case Backhoe and compactor – City of Renton
Kate Akyuz – King County
Craig Garric – King County
Amanda Ogden – ECRB
Dennis Fischer – Soils Section
Steve Lee – City of Renton

General Information: The site is located on the right bank of the Cedar river in an urban/industrialized area of Renton, WA. The I-wall is approximately 1,500 long between the Logan street bridge and the Boeing bridge. The wall is 1 foot thick concrete at the crest and is generally 7 feet tall above the existing ground. The steel sheet pile is on-average driven to 20 feet below grade. Soils consist of river gravels with sand.

The I-wall was constructed in 1999 by the Corps of Engineers, Seattle District under a CAP Section 205 authority. The records of construction are generally unavailable, but the as-built plans show plantings on the riverward side of the wall. It is assumed that the trees on the riverward side are approximately 13 years old and were planted as mitigation for the project construction. The existing trees on the riverward side consist mostly of alder ranging in diameter from 2” to 14” and a general canopy height of 25-30 feet. The majority of the trees are around 12” dia. There are approximately 120 trees of significant size along the water side of the I-wall; some located within inches of the concrete. Other species along the wall include cottonwood, willow, and cedar. In 2007, there were two large cottonwoods (24-30” dia) within 2 feet of the wall that were felled by beavers. They hit the wall, but did not damage the cap.

The bench on the riverward side of the wall is generally flat and varies in width from 4 feet to 18 feet and is approximately 2 feet above OHW. There is some rock armoring along the river bank, but it does not appear that any bank protection was installed as part of the I-wall project.

Procedures for investigation: It was anticipated that the concrete cap extended 3.5 feet below grade and that an excavation of 4-5 feet was needed to expose the sheet pile under the cap The City of Renton provided a Case 580 backhoe and a compactor along with two personnel to operate them. Five to ten holes were expected along 1,500 feet of wall to characterize the root penetration.

The backhoe dug a pit along the face of the wall at each location to about 1 foot below the bottom of the concrete cap and then hand shoveling was utilized to dig out under the cap to the steel sheet pile. The sheet pile surface ranged from 6 inches from the concrete face to 18 inches from the face.

The first test pit (see photo 1 and 2) uncovered a large root that the team followed parallel to the wall for approximately 12 feet (see photo 3). Kate (a biologist from King County) believed that the root was a cottonwood root since there were no nitrogen fixing nodules on it. There are no cottonwood or alder trees on the landward side of the levee, so the only place the root could have come from is the riverward side of the wall. Since the root is on the landward side of the wall, it follows that there must be a crossing point. And the only cottonwood tree nearby on either side of the wall was about 90 feet upstream on the riverward side.

A total of five holes were dug and roots were found to some degree in four out of the five holes below the concrete cap. Also roots were found to be penetrating the water stops in the concrete cap (see photo 4 and 5).

Recent Repairs: The City identified bank erosion in front of the I-wall about 300 feet upstream of the boeing bridge and requested Corps assistance under the RIP program in 2009. The District determined that the damage was not significant enough to warrant a repair and the situation is basically unchanged today.

Next actions: The excavation for pit one was outside of the utility locate, so the team dug by hand for another 3 feet through very rocky and dense soil. The root at the end of the hole was still parallel to the steel sheet pile, so it was determined to backfill the existing hole and coordinated with the City to bring out the backhoe again on the following Tuesday.

Photo 1 – Location of Hole #1

Photo 2 – Hole #1 Pit

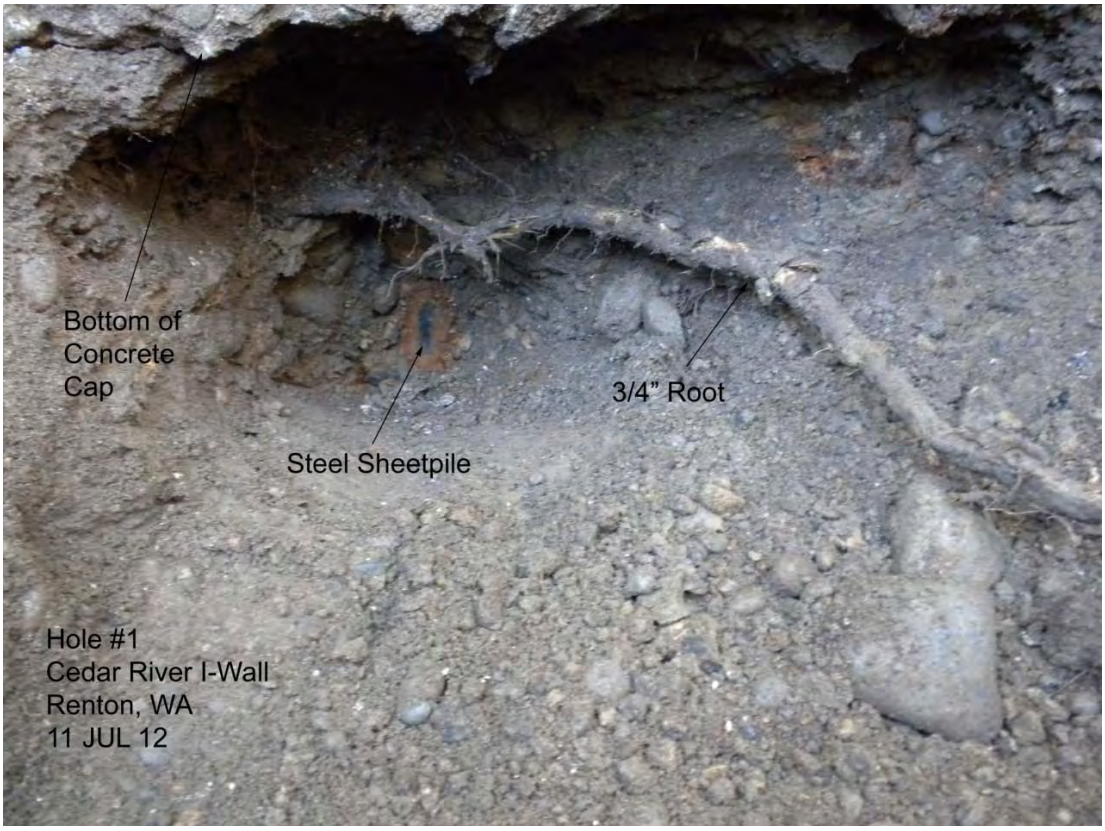


Photo 3 – Hole #1 root along sheet pile

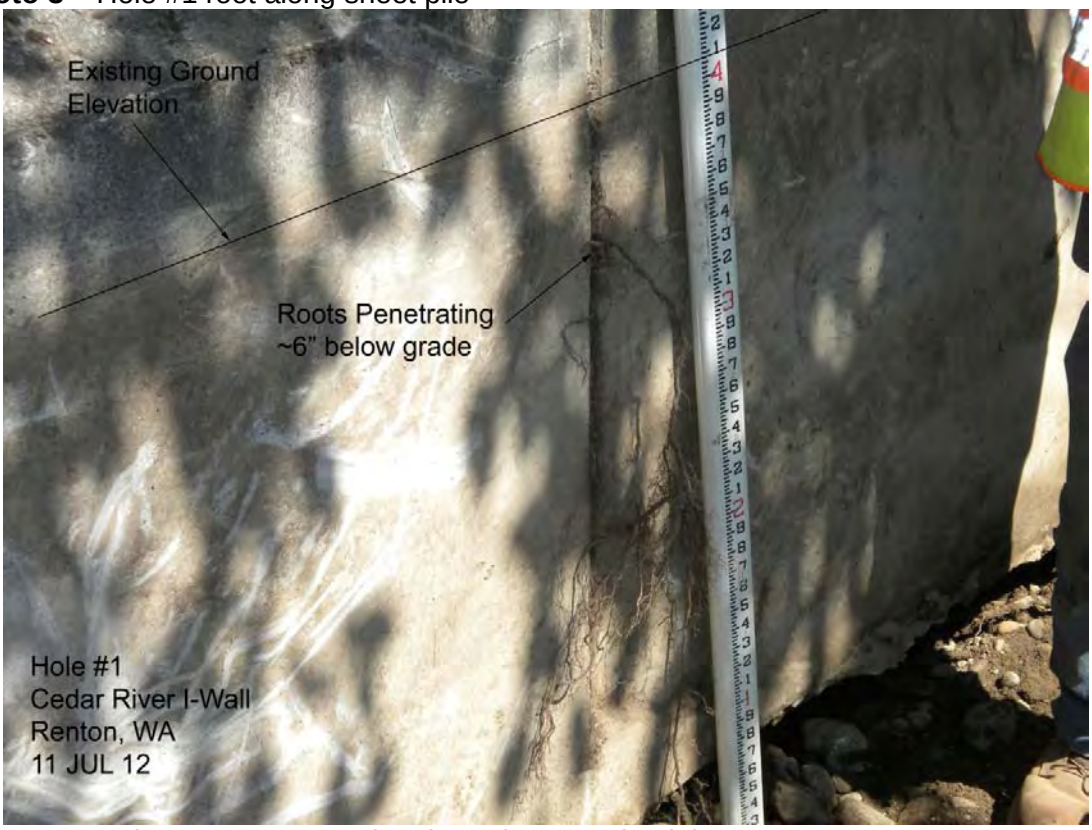


Photo 4 – Hole #1 root penetration through expansion joint

Photo 5 – Roots penetrating expansion joint in concrete cap

Tree Root Field Investigation (Round 2)
CEDAR RIVER I-WALL
17 July 2012

Project Name: Cedar River Flood Control Project

Inspection Personnel: Charles Ifft – Soils Section
Bob Wilkins – Soils Section
Vyacheslav Govorushkin – EM

Other Personnel: Operators for a Case Backhoe and compactor – City of Renton
Kate Akyuz – King County

General Information: The site is located on the right bank of the Cedar river in an urban/industrialized area of Renton, WA. The I-wall is approximately 1,500 long between the Logan street bridge and the Boeing bridge. The wall is 1 foot thick concrete at the crest and is generally 7 feet tall above the existing ground. The steel sheet pile is on-average driven to 20 feet below grade. Soils consist of river gravels with sand.

Procedures for investigation: The investigation for this day was a continuation of the work perform on 11 July 2012. The hole dug at Sta 3+36 uncovered significant roots and further investigation was needed to see if the location for the roots crossing the I-Wall could be determined. There are significant trees on the riverward side of the wall and a 12 foot grass strip along a 20 foot wide paved road on the landward side. This is adjacent to a Boeing manufacturing plant with no trees of significance for hundreds of feet.

The backhoe dug a pit along the face of the wall to about 1 to 2 feet below the bottom of the concrete cap and then hand shoveling was utilized to dig out under the cap to the steel sheet pile. The sheet pile surface ranged from 6 inches from the concrete face to 18 inches from the face. A large root was found just under the cap on the landward side (see photo 1, 2 and 3) and it was followed for approximately another 30 feet from where the previous excavation ended on the 11th. It appeared that the root was going downward when the excavation was stopped. A total of 50 feet of trench was dug along the wall and the root was over ½ in for most of the length. There were also numerous smaller roots and branches of roots that worked their way along the wall. Several significant roots were found in the expansion joint of the concrete cap near Sta 3+36 as well.

During the time the excavation was ongoing on the landward side, a brushing effort on the riverward side cleared blackberries and knotweed so that inspection and access was once again possible. When the team looked at the riverward side of the wall, a root from an alder tree was found penetrating the expansion joint above ground (see Photo 4 and 5).

Photo 1 – Root and I-Wall

Photo 2 – Root in pit

Photo 3 – Root and sheet pile joint

Photo 4 – Riverward side of I-Wall with alder root penetrating the expansion joint

Photo 5 – Riverward side of I-Wall with alder root penetrating the expansion joint

APPENDIX C - COTTONWOOD TREE ROOTBALL CHARACTERIZATION

Elwha Levee Tree Information

Pictures taken on 17 JUN 2012

Location on Elwha Bluffs Rd, Port Angeles, WA

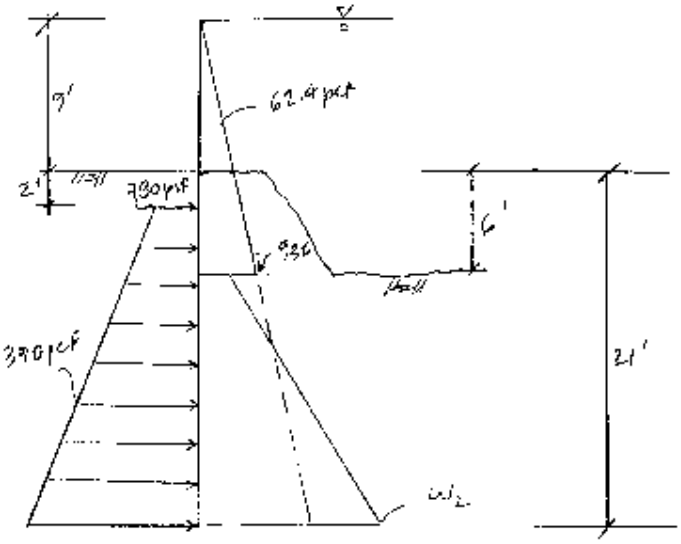
Name	Elwha Tree 1
Root Ball	9.5’
Root Hole	16’ Diameter
Depth of Root Hole	~4’
DBH	34”

Name	Elwha Tree 2
Root Ball	8.5’
Root Hole (Diameter)	14.5’ x 18’
Depth of Root Hole	~4.5’
DBH	42”

APPENDIX D – GLOBAL STABILITY ANALYSIS

U.S. ARMY CORPS OF ENGINEERS

PROJECT: Cedar River	COMPUTED BY: FAC	DATE: 3/7/11
SUBJECT: I wall	CHECKED BY: FAC	SHT: 1 OF PART:



$\phi = 30°$ $\gamma = 130$

$p_{p_1} = 3(130) = 390$ pcf

$p_{p_2} = 3(130 - 62.4) = 203$ pcf

$W_1 = 62.4(9+6) = 936$ psf

$W_2 = 203(21-6) = 3045$ psf

$p_{p_2} = \frac{3045}{21+9} = 102$ pcf

NPD FORM 7A-R (REV) AUG 82 [10 Grid]

U.S. ARMY CORPS OF ENGINEERS

PROJECT: Cedar River	COMPUTED BY: BPC	DATE: 5/8/11
SUBJECT: I wall	CHECKED BY: [illegible]	SHT: 2 OF PART:

Using Shoring program

Passive Diameter 8'

Active Diameter 8'.

Spacing 8'

y = 0.0 @ zero pressure

x = 4.52 @ zero shear

$M_c = 60.7'^k$ – $V_c = 20.2^k$.

$M = 110.7'^k$ – $V_{max} = 30.2^k$

$M_{max} = 197.3'^k$

$0.3D^4 + 21.6D^3 - 198.4D^2 - 3352.2D - 9446.7 = 0$

$D = 14.3'$ – Embed = 16.3' ⇒ SF = 1.0

Use 21' embed.

Moment S.F. = 3.61

Load S.F. = 1.97

NPD FORM 7A-R (REV) AUG 82 (10 Grid)

U.S. ARMY CORPS OF ENGINEERS

PROJECT: Cedar River	COMPUTED BY: FRC	DATE: 3/29/11
SUBJECT: I wall	CHECKED BY: FRC	SHT: 1 OF 1 PART:

scour depth 8.5 ft instead of 5' show S.F. '.5'

$w_2 > 203(21 - 8.5) = 2537.5$ psf

$P_{p_2} = \frac{2537.5}{21+9} = 84.58$

y_1, x, M_c, M_1, M_{max} are the same as before

Quartic Equation

$0.5D^4 + 17.3D^3 - 176.5D^2 - 2981.9D - 3428.1 = 0$

$D = 16'$ − Embed = 13' for S.F. = 1.0

Use 21' embed

Moment S.F = 2.26

Load S.F. = 1.51

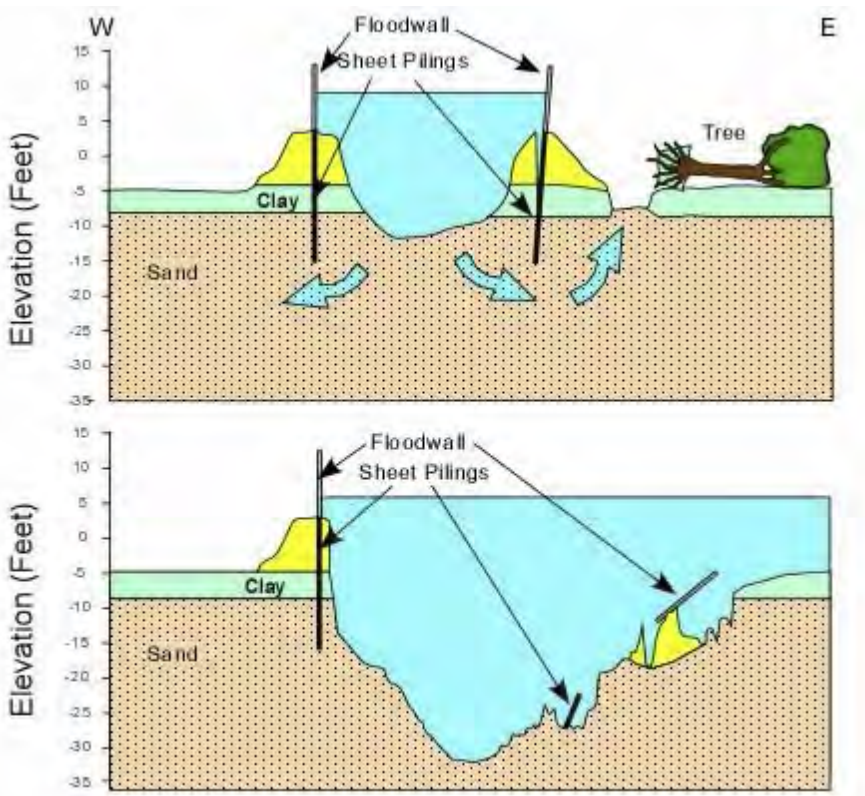
NPD FORM 7A-R (REV) AUG 82 (10 Grid)

APPENDIX E – LITERATURE REVIEW

In reference to trees and their effect on floodwalls, Chapter 3 of the Army Corps of Engineers ETL-1110-2-571 dated 10 April 2009 explains how large tree roots can damage structures by lifting them causing cracking as well as causing a seepage path along the structure foundation. Roots may also grow through wall joints damaging their characteristics.

In the report "Lessons Learned from Katrina and Reducing Vulnerability" Fall 2011 by; Professor Stephen A. Nelson of Tulane University, more evidence of flood wall failure due to adjacent trees is described. The report explains that the void left by the root ball of toppled trees in a flooded area will accelerate the flood wall levee erosion and undermine the structure causing eventual failure.

Failure of the levee on Floodwall on the east side of the London Avenue Canal was due to failure to drive sheet pilings deep enough to cut off underseepage through the sand underlying the canal and levee.
This failure could also have been initiated by uprooting of a tree by hurricane force winds to initiate the breach. In either case, the sheet piles were not driven deep enough to prevent the underseepage through the sand.



As described in Technical Report No. VI., Case Study of the SELA Dwyer Road Drainage Pumping Station Improvements, Discharge Tubes and Canal Report to Katrina Canal Breaches Consolidated Litigation, tree roots can have a detrimental effect of I-

Wall and T-Wall type flood walls incorporating steel sheet pile. The report identifies tree roots and organic debris as a potential path for under seepage as discovered during excavation and removal of the sheet pile wall base. This was demonstrated by fluid transmission through the soils as far as 60 feet from the slurry injection point and is apparent in Figure 14 of the attached report.

T-Wall Demolition Work Outcomes and Observations

The excavations near the T-Wall allowed unique access to view the subsurface conditions. While excavating underneath the T-wall at the north end of the excavation, the contractor encountered tree roots and organic debris (Figure 14) at El. (-) 12.0 ft NGVD (see Table 1, Loc. I), which is a potential path for underseepage.

The experiences filling pile voids demonstrated the transmission of fluid (bentonite slurry mix) through the soils. As the mix was injected, the material flowed from other pile voids as far as 60 feet away—indicating subsurface transmission through the soils (McElwee 2008)

Figure 14 - View of the T-wall cut-off sheet pile (center) showing tree root debris at the tip of the existing sheet. Note what appears to be a sheet of plywood for scale, upper left. (McElwee 2008)