

**ATTACHMENT E**

**Summary of compensatory mitigation (on and off site) for watershed, wetland, and stream impacts at Seattle-Tacoma International Airport.**

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
<b>ON-SITE MITIGATION</b>			
<b>Permanent Impacts</b>			
Approximately 980 linear ft of Miller Creek channel will be filled to accommodate third runway embankment and South 154 <sup>th</sup> Street relocation.	Relocate approximately 1,080 ft of Miller Creek channel.	Fish and aquatic habitat Amphibian habitat Organic matter export	The channel design includes instream habitat features, including improved substrate conditions, LWD, channel diversity, and increased channel length. A buffer around the new channel will be vegetated with native trees and shrubs to provide shade and organic matter inputs to the stream.
Drainage channels will be filled near 12 <sup>th</sup> Avenue South to accommodate the third runway embankment.	Create new permanent drainage channels.	Organic matter export functions Groundwater exchange functions	Approximately 1,290 ft of new permanent drainage channels will provide ecological functions by planting the channel margins with native vegetation to provide buffer functions. Functions include shade to control water temperatures and provide organic matter input. The channels will be designed to connect to the embankment drainage layer material to promote groundwater discharge. Connection to wetlands and Miller Creek will promote organic matter transport and export to the creek.
Approximately 8,500 cy of Miller Creek floodplain will be filled to accommodate third runway embankment and South 154 <sup>th</sup> Street relocation.	Replace lost floodplain.	Flood storage	Approximately 9,600 cubic yards of soil will be excavated to suitable elevations that achieve storage of 5.94 acre-ft of floodwaters. Suitable grades and elevations will allow overbank and backwater flooding to occur in this floodplain.

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<p>Approximately 18.37 acres of wetland will be filled during construction of the third runway embankment and other construction-related projects.</p>	<p>Restore about 9 acres of the Vacca Farm site to shrub-dominated wetlands.</p> <p>Groundwater exchange</p> <p>Small mammal habitat</p> <p>Reduced waterfowl habitat</p>	<p>Nutrient and sediment trapping functions</p> <p>Organic matter export</p> <p>Groundwater exchange</p> <p>Small mammal habitat</p> <p>Reduced waterfowl habitat</p>	<p>Plowed farmland will be stabilized with dense shrub and herbaceous plantings.</p> <p>Overbank and backwater flooding will occur to promote organic matter export.</p> <p>Subsurface drainage systems will be removed to promote natural groundwater discharge and flow patterns.</p> <p>Hummocks vegetated with dense native vegetation in wetlands and buffers will be provided as habitat for small mammals. This attribute will be augmented with LWD in wetlands and buffers.</p> <p>Large areas of emergent vegetation, open water, or long-term flooding that could promote waterfowl use will be avoided.</p> <p>Converting lawn areas to riparian buffer communities will be established by planting with native wetland and upland shrub vegetation (refer to Table 5.1-1 in Section 5).</p> <p>Overhanging dense shrub vegetation will improve aquatic habitat, reduce waterfowl use of shoreline areas, and promote export of organic matter from shoreline to aquatic habitats.</p> <p>Removal of bulkhead along the Lora Lake shoreline will improve shoreline habitat for amphibians, fish, and aquatic insects.</p> <p>Removing structures and restoring native wetland vegetation (Table 4.1-3) will enhance riparian and other wetlands. Areas of non-native vegetation will be removed and native trees and shrubs planted in the wetland.</p>
<p>Restore wetland buffer conditions (0.30 acre) around the north and west sides of Lora Lake.</p>	<p>Fish, amphibian, and aquatic habitat</p> <p>Organic matter export</p> <p>Reduce wildlife attractants</p>	<p>Fish, amphibian, and aquatic habitat</p> <p>Organic matter export</p> <p>Reduce wildlife attractants</p>	<p>Converting lawn areas to riparian buffer communities will be established by planting with native wetland and upland shrub vegetation (refer to Table 5.1-1 in Section 5).</p> <p>Overhanging dense shrub vegetation will improve aquatic habitat, reduce waterfowl use of shoreline areas, and promote export of organic matter from shoreline to aquatic habitats.</p>
<p>Enhance approximately 10.25 acres of wetlands along Miller Creek</p>	<p>Nutrient and sediment trapping</p> <p>Small mammal habitat</p>	<p>Nutrient and sediment trapping</p> <p>Small mammal habitat</p>	<p>Removing structures and restoring native wetland vegetation (Table 4.1-3) will enhance riparian and other wetlands. Areas of non-native vegetation will be removed and native trees and shrubs planted in the wetland.</p>

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<p><b>Temporary Impacts</b></p> <p>Construction of temporary stormwater management ponds and other projects may temporarily impact up to 2.05 acres of wetland.</p>	<p>Restore wetlands on the Tyee Valley Golf Course.</p>	<p>Nutrient and sediment trapping</p> <p>Organic matter export</p> <p>Reduce waterfowl habitat</p> <p>Small mammal habitat</p>	<p>Dense native shrub vegetation will be planted in Des Moines Creek floodplain and riparian areas (see Table 4.1-3).</p> <p>The wetland and riparian vegetation will promote increased export of organic matter to Des Moines Creek compared to the existing turf vegetation.</p> <p>Shrub communities will reduce waterfowl use and improve habitat for small mammals.</p>
<p><b>Temporary Impacts</b></p> <p>Construction of temporary stormwater management ponds and other projects may temporarily impact up to 2.05 acres of wetland.</p>	<p>Restore forest and shrub communities to Wetland A17.</p> <p>Restore wetland areas after construction is complete.</p>	<p>Nutrient and sediment trapping</p> <p>Organic matter export</p> <p>Groundwater exchange</p> <p>Small mammal habitat</p>	<p>Restoration of wetlands that will be temporarily filled or disturbed will restore functions that previously existed on these sites. Restoration will include establishing pre-disturbance topography and planting the area with native shrub or forest vegetation.</p>
<p><b>Indirect and Cumulative Impacts</b></p> <p>Filled wetlands near Miller Creek will reduce aquatic habitat value of the stream.</p>	<p>Establish and enhance buffers along Miller Creek.</p>	<p>Nutrient and sediment trapping</p> <p>Organic matter export</p> <p>Small mammal habitat</p>	<p>Integration of these areas with the replacement drainage channel mitigation and the embankment drainage layer will promote restoration of pre-existing hydrologic and water quality functions.</p> <p>Conversion of residential lands to vegetated stream buffers will promote nutrient and sediment trapping functions and reduce pollutant loading.</p> <p>Greater densities of riparian vegetation will increase shade, instream habitat, and organic matter export to Miller Creek.</p> <p>Riparian buffer vegetation will contribute to bank stabilization, sediment, and nutrient removal. It will also provide small mammal habitat (see Table 4.1-3).</p>

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<p>Additional development in the basins could result in additional cumulative impacts.</p>	<p>Participate in developing and implementing Miller Creek and Des Moines Creek basin plans.</p>	<p>Aquatic habitat Stream and/or basin hydrology</p>	<p>These planning processes will identify effective, long-term solutions to restore additional fish habitat functions to Miller and Des Moines Creeks. Projects are anticipated to focus on restoring basin hydrology through increased regional stormwater detention facilities and improved fish habitat through habitat restoration projects.</p> <p>The Port will contribute staffing resources and funds to support these efforts. The Port will work with other cooperating jurisdictions to plan and implement appropriate basin restoration projects.</p> <p>The Port will establish a trust fund to help promote aquatic habitat and other basin restoration actions.</p>
<p>The runway fill or borrow area excavation may eliminate water sources that contribute to remaining wetlands downslope of the runway.</p>	<p>Provide trust fund to basin restoration projects.</p>	<p>Cumulative impacts to aquatic habitat</p>	<p>Subsurface and surface replacement channels will continue to collect and distribute groundwater currently surfacing near 12<sup>th</sup> Avenue South to Miller Creek and associated wetlands.</p> <p>Surface drainage patterns and conveyance swales will be designed to collect and distribute groundwater seepage and surface runoff to wetlands downslope of the borrow areas.</p>
<p>The runway fill or borrow area excavation may eliminate water sources that contribute to remaining wetlands downslope of the runway.</p>	<p>Design internal drainage and conveyance channels to promote and retain wetland hydrology and streamflow.</p> <p>Monitor wetlands adjacent to the third runway embankment and borrow areas to ensure wetland hydrology is maintained.</p>	<p>Groundwater exchange Organic matter export</p>	<p>A variety of wetland classes and vegetation types on a large protected site will provide high quality habitat for a diverse array of birds and small mammals.</p> <p>Open water habitat (including vegetated aquatic beds) will support waterfowl and other bird species that require small ponds for forage or nesting.</p>

**OFF-SITE MITIGATION**

**Permanent Impacts**

Approximately 18.37 acres of wetland wildlife (avian) habitat will be lost.

Explanation and Key Attributes that Provide	Target Functions to Replace	Mitigation Action	Impact
Target Functions			
<p>Waterfowl and other marsh birds will use flooded persistent and non-persistent emergent plant communities for forage and nesting. These communities will produce organic matter and aquatic insects that provide forage in open water areas.</p>			
<p>Shrub wetland will fringe marsh communities and provide nesting and forage habitat for songbirds as well as export organic matter to emergent areas.</p>			
<p>Multi-storied forest communities will provide habitat to songbirds, raptors, and small mammals.</p>			
<p>A densely vegetated 100-ft-wide buffer will provide additional upland habitats and protect interior upland and wetland habitats from potential disturbances if off-site areas are developed.</p>			
<p>Microhabitat features-including LWD, vegetated hummocks, interspersed of vegetation types, and proximity to the Green River riparian corridor-will further enhance the area for wildlife.</p>			
<p>Excavation of portions of the site below an elevation of 45 ft and connection to the floodplain of the Green River by enhancing existing drainage channels will provide flood-storage functions.</p>			

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