1.0 Purpose and Need

Merrill Creek Operating Base (MCOB) is a fully functional transit operations and maintenance facility within Snohomish County located at 7000/7100 Hardeson Road in Everett, Washington and operated by Community Transit (CT). Adjacent to MCOB, a channelized section of Merrill and Ring Creek flows from south to north and outlets into the Possession Sound. This management program provides the guidance for responsible treatments and maintenance activities to the riparian vegetation and stream channel sediment for public safety, stormwater management, and stream channel enhancement. The plan does not negatively alter stormwater behavior or management within the basin and does not affect functionality of MCOB’s stormwater treatment and outfall systems.
1.1 Historic Conditions
The original Seaway Center project was a 300-acre master planned Business Park between Merrill Creek Parkway and 75th St SW – Sievers Darcy Rd. Merrill and Ring Creek was likely fed by seeps and springs from adjacent hillslopes. It is positioned atop a glacial plateau which historically cut through deposited glacial material (see adjacent image). During construction of Seaway Park in the 1980s, and prior to the installation of Merrill Creek Parkway, various flood management structures were constructed throughout the watershed primarily to manage surface water runoff in a development area. The LiDAR image depicts the extent of upstream knickpoint migration (yellow arrow) which stops abruptly at the outfall of an energy dissipation structure.

2.0 Baseline Conditions
Merrill and Ring Creek starts at 85th Place West and flows north under SR 526 for .8 miles with the East Fork tributary entering on Hardeson Road. 400 feet further the West Fork tributary enters continuing 2.3 miles to its Port Gardner Bay outlet.

Merrill and Ring Creek channel adjacent to Seaway Center is a vegetated, low gradient (1-2%) engineered channel with hardwoods, native and non-native shrubs. The channel is hardened with rip-rap to keep average flood flows within the primary channel. The stream bottom is also hardened with coarse substrate likely placed at the initial channelization construction in areas of erodible streambed.

Leaf and branch litter, dead trees and sediment from upstream have filled areas of the channel and small floodplain areas decreasing the capacity of the original channel design. Part of the sedimentation buildup is caused by mature vegetation establishing on the small floodplains within the channel and deeply rooted dense shrubs trapping sediment and building floodplain elevation. When the area experiences heavy rainfall, the segment of Merrill and Ring Creek abutting MCOB overflows into the surrounding riparian area and streets causing damage to the natural vegetation along the channel. Over time, the vegetation catches floating debris, traps sediment and reduces the channel hydraulic capacity, which results in flooding hazards for the local community.

The stream is classified as non-fish bearing. CT understands the riparian buffer requirements and management constraints and in this program propose to maintain baseline functionality of the riparian system to the extent practicable, in order to enhance/restore the stream channel and decrease/prevent flood hazards from occurring.

2.1 Land Use
The Seaway business area is a light industrial business park with a large percentage of impervious surfaces. Residential areas comprise the headwater areas of the creek and its tributaries. Most forested areas are concentrated in upland residential areas and below Merrill Creek Parkway in the natural channel.
2.2 Channel Conditions
The upper section of Merrill and Ring Creek maintains some natural channel areas and small wetlands that serve as storm water infiltration areas. The middle section (the industrial developed areas of the watershed) of the creek is highly channelized, culverted, and contains an in-channel gabion basket erosion control device. The channel maintains minimum habitat features and had been engineered primarily for hydraulic conveyance. There is evidence of scour and fill associated with the three (3) bridge areas. Scour at one of the bridges has caused channel deepening and therefore immediately downstream a widening. Although this type of channel diversity is suitable for natural unconstrained reaches, these channel changes are contributing to maintenance issues.

Once leaving the MCOB reach the channel encounters more bridges where similar evidence of debris buildup and dense floodplain vegetation can be observed. As the stream diverts away from running parallel to Hardeson Road it enters into a large channelized energy dissipation structure and outfalls into a large storm water detention pond. Flows through the elevated culvert outfall into a large culvert under the Merrill Creek Parkway where flows encounter energy dissipation baffles before entering into the natural lower section of Merrill and Ring Creek.

Lower Merrill and Ring Creek maintains natural conditions within a highly confined inner-gorge channel. The downstream portion receives regular salmon species use.

2.3 Hydrology and Soils
Merrill and Ring Creek runs in a south-north direction and discharges into Port Gardner Bay. The headwaters attain a maximum elevation of 620 feet (Source: StreamStats). The drainage area above the Merrill Creek facility is about 7 square miles from the northernmost part of the MCOB property. Culverts, incised drainages, and wetlands comprise the upper drainage water system. Uncalibrated hydrologic modeling in the Merrill and Ring Basin Plan (City of Everett 2017) estimates about 92 CFS at Hardeson Road and 333 CFS at Merrill Creek Parkway for the 100 year flood frequency return interval. Future increase in impervious surface in the basin will likely increase these values.

The dominant soil types in the subject reach along Hardeson Rd between Merrill Creek Parkway and Sievers-Duecy Boulevard is outwash from the Everett soil series. Saturated (storm water pond area, portions of the downstream creek channel and small low-lying areas of the headwaters) and Till (all others areas) comprise the remaining portions

2.4 Riparian
Within the facility reach the riparian zone is hardwood dominant with alder (Alnus rubra), big leaf maple (Acer circinatum), and cottonwood (Populus balsamifera) comprising the majority of canopy. Understory primary species include vine maple (Acer circinatum), salmonberry (Rubus spectabilis), Indian plum (Oemlaria cersiformus), salal (Gaultheria shallon), horsetail (Equisetum sp.), bracken fern (Pterilium aquilinium), stinging nettle (Urtica dioica), and red-osier dogwood (Cornus sirclea).

2.5 Wetlands
Within the facility reach small emergent wetlands have formed in various places along the channel margins and floodplain of Merrill and Ring Creek. Most wetland areas mapped by soil type within the National Wetlands Inventory (USFWS) have been developed over or are emergent via creation of storm water detentions area.
2.6 Fish Use
Various agencies have different regulatory stream type ratings for the reach abutting MCOB.

- City of Everett: Non-fish bearing seasonal
- Snohomish County: Non-fish habitat, perennial
- WA Department of Natural Resources: Type F – fish bearing

Washington Department of Fish and Wildlife Stream Catalog and SalmonScape (a regional fish distribution mapping tool) indicate no record of salmonid use. Tulalip Tribe fish survey indicates salmonid use in the lower reaches of the creek downstream of Merrill Creek Parkway.

3.0 Proposed Maintenance Activities
In order to properly manage the vegetation, stream hydraulic capacity below the bridge, and the channels and outfalls of the areas surrounding the Merrill and Ring Creek, certain best management practices can be applied to maintain the channel's expected performance and enhance the riparian area. Please see Appendix A for full Best Management Practices recommendations for the proposed maintenance activities.

3.1 Vegetation Management
CT proposes to perform removal of in-channel debris, trees and limbs, understories, and canopies in order to maintain the designed hydraulic capacity of the channel, to minimize the floodplain sediment retention and to increase visibility for pedestrians and automotive operators. The primary objective of vegetative management is to reduce debris volume that accumulates to the extent flows are altered and channel capacity is reduced. Vegetation management will also include limbing/trimming hazardous trees in the riparian area. This maintenance action will not compromise the integrity of the riparian area, but it will allow CT to remove hazardous trees and branches before they drop either into the stream channel or adjacent pedestrian sidewalk.

3.2 Below-Bridge Hydraulic Capacity Management
CT proposes to excavate and place material on uplands or haul off site to achieve the original as-built cross sections and restore hydraulic capacity. This will only be performed on an as-needed basis, not to exceed 2 times per year.

3.3 Channel Maintenance
To improve grade management by maintaining equilibrium gradient and reducing scour and fill variation, CT proposes to perform sediment removal, soil stabilization and other practices to maintain channel stability and hydraulic capacity of the Merrill and Ring Creek channel on an as-needed basis. These maintenance activities will reduce the risk of overbank flooding which creates a traffic safety hazard on Hardeson Road. Existing openings in riparian areas will be used for channel access. Actions will be conducted primarily manually.

3.4 Outfall Maintenance
Outfall and storm water treatment upgrades were installed recently to effectively manage MCOB facility runoff. CT plans to incorporate practices to initiate debris removal from outfall areas in order to maintain free flow including sediment deposition removal and vegetation removal that impedes outfall function.
4.0 **Initial Treatments/Actions**

Original channel design and bridge design considered the hydraulic capacity of the upper basin foreseeing industrial and residential development and their effects on storm water runoff. The 1980s construction as-built was a bare, engineered channel with no vegetation. Over time vegetation has established within the channel. The riparian area has introduced healthy ecological functions of shading, nutrient input and bank stability that help with overall stream health. However, the abundance of vegetation has affected channel capacity by trapping sediments and building small floodplains. Absence of vegetation management has also allowed invasive plants to establish including Himalayan blackberry, bittersweet nightshade and English ivy.

Initial treatments propose to maintain the ecological functions currently provided by the riparian area and channel and create conditions that:

- Restore the intended hydraulic capacity of the channel,
- Increase pedestrian, driver and MCOB staff safety, and
- Create conditions that minimize future maintenance activities associated with Merrill and Ring Creek and its riparian area.

4.1 **Select Tree Limbing/Trimming**

Establishment of some maturing individual trees and their expanding root systems are contributing to significant large sediment accumulation that directly impact channel capacity. Diseased or dying trees are also contributing to MCOB personnel, pedestrian and vehicular safety hazards from branch breakage or tree fall over the Hardeeson Road sidewalks or MCOB facility. During annual review, CT will identify tree limbs and branches that may be hazardous during future storm events. They will remove these branches from the trees as a part of the maintenance activities in order to prevent them from falling into the stream channel—thereby increase flooding issues—or onto the pedestrian walkway adjacent to the stream channel.

4.2 **Invasive or non-native vegetation removal**

The invasive species present in the riparian corridor (Himalayan blackberry, English ivy for example) are increasing litter debris accumulation in the stormwater channel and subtracting from the vegetation community diversity. This maintenance plan proposes sequential removal of patches of these invasive species and replanting native species to maintain the channel bank stabilization. This activity will be completed on an as-needed basis and will follow the BMPs listed in Appendix A to minimize adverse impacts to the stream channel and riparian area.

4.3 **Sediment accumulations**

Upstream of bridge crossings and in some areas of channel margins, sediment has accumulated and reduced the hydraulic capacity of the channel during flood events. This action may involve use of an excavator or manual labor to remove impounded sediment that is affecting the channel.

4.4 **Canopy Thinning**

Dense canopies are inputting a tremendous amount of branch and leaf matter to the stream. These are favorable ecological functions that will not be eliminated, but managed. Selective removal of hazard branches or ones in locations that will not compromise shade function or nutrient input will help manage the voluminous input of debris into the channel. This action will minimize the rate at which the hydraulic capacity of the channel is lessened without compromising the riparian contribution to stream health.
5.0 Conclusion

The reach abutting MCOB is non-fish bearing and serves primarily as a stormwater routing system that outlets into a large detention pond upstream of Merrill Creek Parkway. Streamflow through this reach will still pass through two energy dissipation structures, 2 artificial barriers that are part of permanent infrastructure and a large detention pond prior to entering fish bearing waters. This maintenance program describes physical, structural, and managerial maintenance activities in conjunction with BMPs seeks to restore/enhance the riparian habitat along the stream channel and prevent flooding/tree hazards in the local community. We believe that through the minimal maintenance activities over the course of five years that this stream channel will not only enhance the riparian habitat but will also reduce flood hazard risks for Community Transit and their neighbors.
APPENDIX A

Merrill Creek Operating Base Channel Maintenance Best Management Practices
Merrill Creek Operating Base Channel Maintenance Activities and Best Management Practices

1. Introduction

The Merrill Creek Operating Base Channel Maintenance Program describes the suggested work activities, calendar timing for activities and Best Management Practices to be implemented while performing the work and work specific exclusions. The following sections outline the regulatory requirements, suggested maintenance activities and best management practices to minimize effects on the stream channel.

1.1. Purpose

The purpose of this channel maintenance program is to conduct activities that will decrease maintenance and emergency actions, remove hazardous tree limbs and prevent local flooding during storm events. The recommendations in this program are to provide semi-regular activities that will decrease the accumulation of debris and sediment in the stormwater channel, thereby reducing flooding in the nearby neighborhoods.

1.2. Regulatory Requirements

The following permit-related procedures were completed to support this channel maintenance program:

- **SEPA Checklist**—a SEPA checklist to accompany the HPA with WDFW
- **JARPA**—a JARPA for this long-term channel maintenance program
- **City of Everett Level II Permit Application**— Review Process Level II completed to satisfy Chapter 37 of the City of Everett Zoning Code
- **WDFW HPA**—Submitted an HPA application though the WDFWs APPS online application program


2.1. Channel Maintenance

Channel maintenance activities include those that help maintain an equilibrium gradient and reduce scouring during flood events. This will keep the stream channel functioning at highest capacity which will reduce if not eliminate flooding on adjacent streets. Channel maintenance recommended actions include:
• Sediment removal (as needed following initial treatment)
• Soil stabilization
• Debris removal

Existing openings in the riparian area will be used for channel access to minimize bank sediment disruption. Actions will primarily be conducted on an annual basis, however more frequent actions may be required following storm events.

2.2. Outfall Maintenance

Outfall upgrades were recently installed by CT staff, which will help manage MCOB facility run-off. To maintain the outfall structure, more effort will be focused as part of channel maintenance to remove debris from the channel, which will help prevent sediment accumulation and flow disruption. However, the outfall should be observed throughout the year, especially following storm events to ensure that best management practices are effectively maximizing channel flow and run-off catchment from the MCOB facility.

2.3. Sediment Accumulations

During initial treatments, hand tools and excavators will be used to remove accumulated sediment and restore the grade of the channel to as-built conditions. With the accompanying suggested actions of removing debris and tree limbs from the channel, sediment accumulation should decrease significantly going forward. We recommend completing a walkthrough of the channel once per year (depending on rainfall and storms in the area) to evaluate the need for sediment removal. Critical areas to check for sediment accumulations are under/upstream of bridge crossings and just upstream of the outfall. With initial treatments and annual debris removal, there should be minimal need to remove additional sediment every year, however it is critical to keep observing local conditions and adjusting plans to stay ahead of any accumulation.


3.1. Tree Maintenance

3.1.1. Limb/Tree Removal

The stormwater channel has a healthy riparian habitat on both sides, dominant tree species are Red alder (*Alnus rubra*) and Pacific willow (*Salix laciandra*). While these trees are adding biodiversity and nutrient input to the riparian habitat, they also become potential sources of channel debris as they age. We recommend as part of the channel maintenance program to annually identify potentially problematic trees and remove either the entire tree (limbs, trunk and roots) or remove the limbs that could fall into the channel and block sediment/water flow. Here are some examples of trees whose limbs we would recommend removing:
Additionally some trees will become unhealthy as they age, and eventually could collapse into the channel causing sediment/debris blockage and increased risk of flooding. These trees, once identified, will be removed in entirety (limbs, trunk, and roots). Below are example of dead or dying, or channel-blocking trees marked for treatment or removal.

3.1.2. Canopy Thinning

Dense canopies are inputting a tremendous amount of branch and leaf matter into the stream channel. While this indicates a healthy functioning riparian habitat, it is resulting in debris and sediment accumulation in the channel which is causing the flooding issues at MCOB. It is recommended that a part of annual maintenance is identifying thick sections of the canopies and thinning them out to prevent the accumulation of branch/leaf litter in the stream channel.

In addition to tree branch canopy, it will also be important to thin/manage blackberry vine overgrowth—especially where they have climbed trees and are hanging down. These are an additional potential source of leaves/branches falling into the channel and increasing sediment accumulation.
3.1.3. **Invasive/Non-native vegetation control**

There are currently overgrown invasive species in the stream channel riparian habitat. The dominant invasive species observed are Himalayan blackberries (*Rubus ursinus*) and English holly (*Ilex aquifolium*). We are recommending removal of these invasive species during the initial treatment phase. Annual maintenance should focus on preventing these invasive species from becoming dominant again as they are large contributors to the build-up of sediment in the stream channel.

3.1.4. **Native Species Supplemental Planting**

In addition to removing invasive species, we recommend the supplemental native species plantings to help maintain bank stability and reduce the recurrence of invasive species. This will also enhance the riparian habitat by increasing species diversity. Because the channel habitat is highly shaded we recommend planting shrub species Indian plum (*Oemleria cerasiformis*) and Evergreen huckleberry (*Vaccinium ovatum*) and ground cover species such as sword fern (*Polystichum munitum*) and Evergreen blackberry (*Rubus ursinus*) along the stream banks as areas are cleared following the initial invasive species removal. These plants should do well in the environment but should be evaluated for successful growth as part of the monitoring program each year.

4. **Conclusion**

This management program allows Merrill Creek Operating Base to conduct minor channel maintenance activities to 1) maintain the hydraulic capacity of the channel, 2) reduce or eliminate overland flooding onto Hardeson Road while maintaining riparian function to the degree where litterfall, shade and bank stability functions are maintained in perpetuity and 3) remove hazardous trees and limbs before they fall into the channel or onto the neighboring street. This program also decreases the potential administrative load from multiple agencies each time a maintenance activity is proposed.
Figure 2—Summary table of proposed maintenance activities and the purposes they serve (borrowed from Pierce County ESA manual)