Viking Warehouse Facility Stormwater Outfall Deficiencies Report

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February 27 2023

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Table of Contents

List of Figures

1.0 INTRODUCTION

The Viking outfall structure currently discharges stormwater from one warehouse facility into the Puyallup River. It is proposed to use the same outfall to receive runoff from a future proposed warehouse development, which would be located directly east of the Viking facility. Since completion of the outfall in 2019, bank erosion and sedimentation have impacted the outfall and the surrounding mitigation planting area, even though stormwater flows are still far below their expected full development peaks.

This report documents the Northwest Hydraulic Consultants (NHC) review of the design, construction, and performance of the outfall structure from an engineering and hydraulics viewpoint, and documents SCJ Alliance (SCJ) review of habitat conditions in the mitigation planting areas surrounding the outfall structure.

Except when considering permit requirements, this review does not distinguish between the two sides of the outfall, as the design is identical, as are the river processes acting on it. Primary sources of information NHC used for this report include design drawings, numerous photos and videos, two site visits, a hydraulic model and accompanying report developed by WEST Consultants (WEST, 2021), and observations of hydraulic and hydrologic conditions experienced since the outfall structure was substantially completed in fall 2019. Primary sources of information SCJ used for this report include data gathered during two sites visits, review of the approved detailed mitigation and monitoring plan (Talasea, 2018), the May 15, 2018 Pierce County Hearing Examiner report, and the Soundview Consultants As-Built report (SVC, 2020).

The NHC review was hampered by the lack of engineering design criteria or calculations to review. The SCJ review was hampered by the lack of annual monitoring and maintenance reports for the mitigation planting areas, as were expected to follow submittal of the 2020 As-Built report.

NHC Section 2.1 of this report summarizes permit requirements relevant to the hydraulic design of the Viking outfall and a brief evaluation of the outfall's performance relative to those requirements. A detailed discussion of engineering deficiencies is provided in Section 2.2. A summary of NHC's findings is provided in Sections 2.3.

SCJ Sections 3.1-3.5 of this report summarize conditions in the mitigation planting area . This assessment is based on Performance Standards defined in the Pierce County approved mitigation plan (Talasea, 2018) and as-built conditions described in the SVC 2020 report.

1.1 Deficiency Report Background

Recent assessments of the Viking Warehouse outfall facility indicate that it is eroding and undercutting at the riverbank and is partially buried in flood sediment.

Deficiencies assessed and described in this report include both regulatory deficiencies (i.e., when the outfall area impacts or conditions did not meet Pierce County permit standards), and application

deficiencies (i.e., when the engineered aspects of the outfall structure did not meet water or soil management requirements, and when the planted habitat mitigation areas did not meet the mitigation plan Performance Standards).

The western half of the outfall structure receives current stormwater flows from the Viking warehouse facility, and is also intended to receive future flows from the greater stormwater basin upstream from the Viking facility as that basin area develops over time. The eastern half of the outfall structure is intended to receive future stormwater flows from the not-yet-constructed Knutson Farms Industrial Park (KFIP), located east of the Viking Warehouse facility, as well as additional future flows from the greater stormwater basin upstream from the proposed KFIP as that area develops over time.

The outfall structure is located in Pierce County, but because it receives flow from a City-permitted property (the Viking warehouse), there is a shared maintenance and operation agreement with the City of Puyallup. Per the shared monitoring and maintenance agreement with Pierce County, the City of Puyallup is carrying out an engineering and hydraulic assessment of the outfall structure to evaluate and document performance of the structure under current flow conditions, and to assess potential performance under future flow conditions. Also per the shared monitoring and maintenance agreement with Pierce County, in absence of annual mitigation monitoring reports (MMRs), the City's wetland consultants have evaluated and documented the mitigation planting area conditions, based on standards described in the 2018 Talasea Detailed Mitigation and Monitoring Plan (DVMP).

2.0 NORTHWEST HYDRAULIC CONSULTANTS DISCUSSION

2.1 Permit Requirements for Hydraulic Design

2.1.1 Washington State Department of Fish and Wildlife Hydraulic Project Approval

The Hydraulic Project Approval (HPA) for the project (permit 2018-6-194, issued 4 October 2018) includes conditions which address the hydraulic performance of the outfall structure and requirements for bank protection:

> *Provision 24. The biotechnical bank protection technique design must withstand the 100-year peak flow.*

Since completion of the outfall structure in fall 2019, there has been an almost complete failure of the biotechnical bank protection where the outfall discharges to the Puyallup River. The 100-year peak flow on the Puyallup River just upstream from its confluence with the White River (less than 0.5 miles downstream from the outfall) is estimated by FEMA as 43,500 cfs. The peak flow experienced since completion of the outfall structure, as reported by the USGS for the Puyallup River at E. Main Bridge (USGS gage 12096505, immediately downstream from the outfall), was 33,500 cfs on 7 February 2020. This was approximately a 25-year peak flow. It is evident that the bank protection as designed and built failed to meet the 100-year peak flow performance standard required under the HPA.

Provision 26. Use clean angular rock in the bioengineered stormwater release area. The rock must be large enough and installed to withstand the 100-year peak flow. The riprap will be covered with river rock sized to remain on-site during high flows.

Although no design calculations have been located, the following information from a stormwater conveyance report (Barghausen, 2018) is available on the basis for design of the armored channel into which Viking stormwater is discharged before flowing into the Puyallup River:

> *The recommended design flow of 45.17 cfs was applied across the 24-ft wide Viking outfall channel section. With this design flow, the depth of water flowing through the outfall pad will be 0.86-ft deep, flowing at a velocity of 2.11 fps.*

The assumed hydraulic conditions and hydraulic parameters are inconsistent with both required design standards and actual stormwater flow conveyance conditions.

The recommended design stormwater discharge of 45.17 cfs is the flow computed for a 25-year 24-hour storm plus "20% buffer capacity". It is not known how this compares with the 100-year peak stormwater discharge but is likely of similar magnitude.

The assumption that this design stormwater discharge would flow uniformly over the 24-ft-wide outfall channel is inconsistent with conditions at the facility as constructed. The facility design incorporates a series of logs to force stormwater to flow in meandering pattern, and sediment deposition in the outfall basin (discussed in Section 2.2.3 of this report) has confined stormwater discharges to a narrow deeply incised channel. Actual hydraulic conditions are therefore much different than those apparently assumed for design. There is currently no indication of damage from stormwater discharges within the landward portions of the outfall structure, but only a portion of the watershed tributary to the Viking outfall has been developed to date, and stormwater discharges experienced since completion of the outfall have not approached the design discharge.

2.1.2 2015 Pierce County Stormwater Management and Site Development Manual (2015 PCSMSDM)

Minimum Requirement #4 of the 2015 PCSMSDM reads in part:

> *2.4.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls*
>
> *All new development and redevelopment projects are responsible for maintaining natural drainage patterns, and discharges from the project site shall occur at the natural location, to the maximum extent practicable. The manner by which runoff is discharged from the project site must not cause a significant adverse impact to downstream receiving waters and downgradient properties…….*
>
> *All outfalls require energy dissipation.*

Essentially the same language is included in the 2014 Washington State Department of Ecology Stormwater Management Manual for Western Washington.

No energy dissipation has been provided where the stormwater discharge from the outfall structure flows into the Puyallup River. During low flows on the Puyallup River, this results in a condition where discharge from the outfall structure drops 4 to 5 ft into the river at its downstream end, resulting in erosion and undermining of the structure.

2.2 Engineering Deficiencies

The following sections document the major deficiencies identified in the design and/or operation of the outfall. As the narrative makes clear, these deficiencies are primarily related to the riverbank and associated riverine processes such as bank erosion and sedimentation. There are no indications that the landward half of the outfall currently has any engineering deficiencies; however, as pointed out in Section 2.1.1, there are no design calculations, hydraulic conditions in the landward half of the outfall are quite different from those apparently assumed in design, and stormwater discharges experienced to date are far below their expected full-development peaks.

2.2.1 Riverbank Erosion

Erosion of the riverbank is already occurring and likely to continue. In the following sections we discuss separate mechanisms and areas of bank erosion at and adjacent to the outfall.

2.2.1.1 Bank erosion at the outfall

Based on Figure 2.1, initial outfall construction consisted of cutting down trees and installing coir fabric on the bank along with plantings sometime in the winter of 2018/2019. It appears from the figure that the coir fabric was simply draped over the existing bank with minimal to no grading, based on the visibly lumpy surface. It also does not appear the coir was secured in place with any significant staking other than the plantings themselves. It is not known how the bottom of the coir blanket was secured. In the fall of 2019 additional coir was added to the top of the bank, it appears that the original coir lower on the bank was left in place. The full outfall was also constructed at this time. Based on Figure 2.1, recent site visits and the apparent ability to install the plant cuttings in the bank, we assume little to no riprap was encountered during any of the bank construction activities.

Figure 2.1: Initial coir installation, January 2019 or earlier. Note stormwater from pre-project outfall.

Since construction, much of the bank has been severely eroded, which is documented in numerous photographs. Much of this erosion has occurred near the upstream end and away from the primary stormwater discharge point, therefore we attribute it to bank erosion caused by river flows sweeping along the bank. Currently, most of the coir on the bank is gone, and some of the A-Jacks have been undermined and are only prevented from falling into the river by their retaining cables. Little to no riprap was visible in site visits, although the turbidity of the river prevented inspection below water level. Exposed bank soils are mostly comprised of erodible gravels, silts and sands, although the outfall's underlying quarry spall layer is starting to become exposed. Overall, it appears from 5 to 10 ft of bank has been lost along the outfall.

The current river configuration directs flow against the bank under all conditions – velocities are significant even under relatively low flows. Main channel flood velocities are in a locally slower zone based on the WEST Consultants hydraulic model, with rapid acceleration just downstream through the bridge openings. Main channel velocities are simulated to be around 7-8 ft/second at the outfall, with some high velocity zones on the bank due to converging return flows from the floodplain (see Figure 2.6). Therefore, we expect the erosive forces seen to date to continue into the future.

2.2.1.2 Upstream Bank Erosion

The bank immediately upstream of the outfall is eroding. Several trees have fallen in the past few years and a vertical soil bank is exposed. No riprap is visible in this bank, as compared to the bank on the downstream end of the outfall Figure 2.2. The erosion is clearly visible comparing 2011 and 2020 LiDAR (Figure 2.3).

Figure 2.2: Banks upstream (left) and downstream (right) of the outfall, Sep 14, 2021, Balmelli.

Currently some erosion protection is being provided by fallen trees lining the bank, but these are deciduous and expected to decay or be washed away in the next few years. Further bank erosion here could flank the outfall and erode under the upstream edge of the Armorflex.

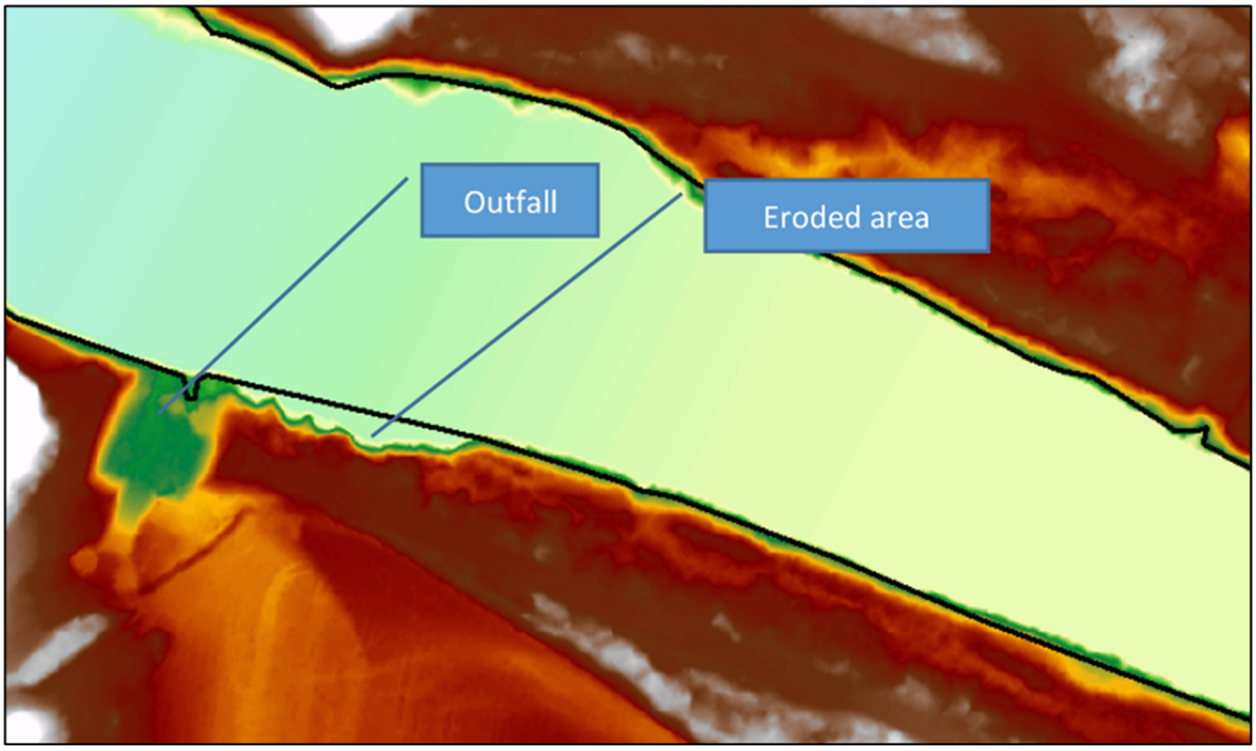

Figure 2.3: 2020 LiDAR topography with 2011 bank line in black showing bank erosion upstream of the outfall.

When this erosion started is not clear from the evidence reviewed, but the City Engineer, Hans Hunger, reported observing some bank erosion in September 2019. Some construction area and riverbank clearing was initiated as early as November 2018, but site photos indicate that main outfall construction was underway by early October 2019.

The existing contour mapping on the design plans do not show any of the complex bank line now evident, but it is also unlikely that much if any effort was put into surveying the bank upstream of the outfall. The earliest visual evidence reviewed is from photos and drone flights from December 2019, that show a length of bank with signs of erosion similar to the extents shown in Figure 2.3. Indicators of erosion include vertical dirt banks, exposed fresh roots, scallops, and undercutting (Figure 2.4). The evidence indicates that this upstream bank erosion was present to some degree prior to the start of construction and was certainly evident by 2019. Regardless of when this erosion started, prudent engineering would have taken erosion into account during the design phase or by adapting the design during construction.

Figure 2.4: December 2019 UAV image annotated with erosional features.

2.2.1.3 High Velocity Overbank Flows

The location of the outfall has historically been a point where overbank flood flows return to the river channel due to the blocking of the floodplain by the railroad embankment. These flows accelerate over the bank and drop into the river channel, creating high velocities and shear stresses on and near the bank. The effects of this can be seen in post-flood photos from the large January 2009 event, where velocities were high enough to strip off turf and scour into the levee prism (Figure 2.5). The location of damage shown in Figure 2.5 corresponds well with maximum velocities under the pre-project conditions predicted by the WEST Consultants hydraulic model (top, Figure 2.6).

Figure 2.5: Scour and erosion of levee due to January 2009 flood at the location of the current outfall.

Removal of the levee and then further lowering the ground level for the outfall has created a point of concentration for these overbank flows returning to the river during floods. While this was always the case at this location, the outfall has increased flow velocities, concentration of flow, and shear stresses. Figure 2.6 shows results from the WEST Consultant hydraulic model of the site used to evaluate scour risk. Velocities are increased in the area of the outfall as the return flows accelerate into the main channel. Velocity hotspots exceed 10 ft/second on both the up and downstream edges of the outfall. While the Armorflex layer is likely capable of withstanding this, the high velocities also occur outside the limits of the Armorflex. The upstream high velocity area is of more concern due to the lack of erosion protection measures outside of the Armorflex. Downstream of the outfall and transitioning into the bridge abutment, riprap is visible, appears to be in generally good shape, and the modeling indicates it has likely been repeatedly exposed to these high velocities in prior floods. Furthermore, the site has been exposed to a 10-year and 25-year flood since construction with no apparent overbank damage around the perimeter of the outfall, so this risk appears to be less of a concern than the other types of ongoing erosion at the site.

The concentrated flows also increase the forces on the outfall bank itself. The WEST Consultants report (WEST, 2021) notes:

The constructed outfall is expected to increase the risk of local scour at the base of the outfall embankment for each of the modeled flood scenarios if the existing countermeasures in place at the outfall are not sufficient (Table 4). The greatest anticipated change between pre- and post-project conditions will occur at the 10-year event, where results show the scour depth will increase by about 38%. …. The increase in local scour for the post-project condition is caused by an increase in unit discharge flowing over the outfall, which nearly doubles from the pre-project condition in which the levee is unnotched.

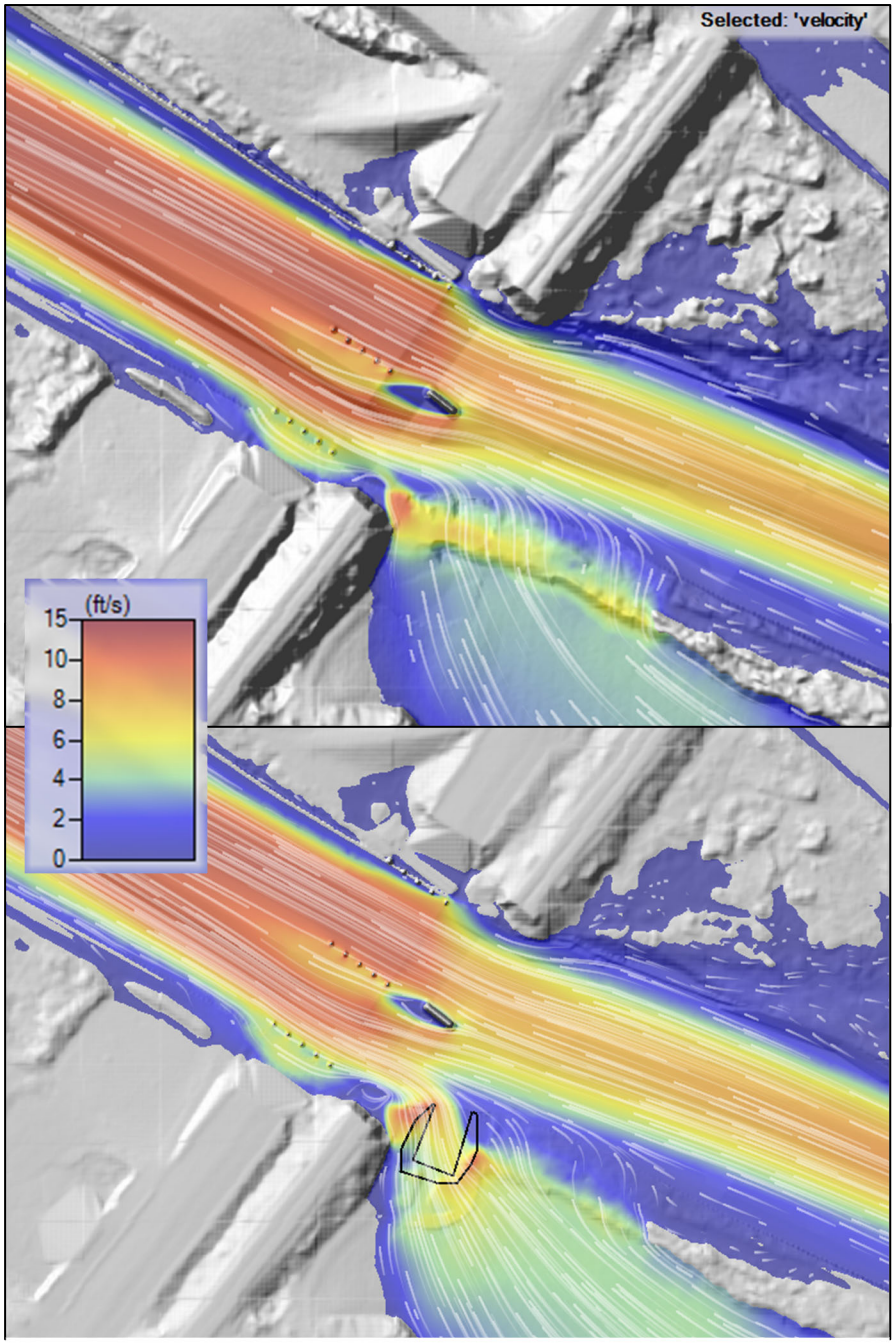

Figure 2.6: Velocity magnitude and flow path under pre-project (top) and post-project (bottom) conditions for the 10-year flood. Outfall outlined in black. Results from WEST HEC-RAS model.

The scour depths the WEST report refers to are calculated for the bed of the main channel. The WEST report concluded that there was no risk to the railroad bridge from the outfall, but this analysis did not evaluate the risk of bank erosion at the outfall progressing down into the bridge embankment. We see this as the highest potential risk to the bridge from the outfall. We note that while these high velocity river return flows may be infrequent, the depths, velocities and shear stresses they generate are significantly larger than those created by stormwater discharge from the pipe. It is possible some of the failure on the riverbank is due to both these return flows and mainstem flows as discussed earlier.

2.2.2 Stormwater Spill Erosion

The outfall design appears to follow a standard Contech outfall energy dissipation design using Armorflex and A-Jacks. This design may be appropriate where a pipe discharges into a conveyance channel that continues downstream far past the outfall at a moderate slope. However, in this case the design did not address the need to convey stormwater into the river channel down a far steeper riverbank slope. The outfall design appears to have assumed that a steep bank comprised of native vegetation could withstand continuously saturated soil and continuous seasonal and storm flows flowing down over it without damage while allowing plant growth. This is not a situation observed in any natural system and is not a condition we believe could ever be made sustainable. Flows have concentrated and eroded the bank, undermining much of the vegetated berm (Figure 2.7). The undermining has progressed to the point where the A-Jacks have started to fall down the bank and some of the bedding rock underlying the Armorflex is now visible. The point of undermining has varied over time as extensive overbank deposition of sediment has resulted in the concentrated flows attacking varied locations on the bank. This erosion is occurring under small, non-storm flows far less than those that will be generated once the watersheds are fully developed.

Figure 2.7: Concentrated flow spilling over, eroding, and undercutting vegetated bank. March 15, 2022, NHC.

2.2.3 River Sedimentation Processes

The outfall grading has created an unnaturally low alcove in the Puyallup River floodplain. High river flows inundate the alcove, and the low velocities allow suspended sediments to drop out. The high sediment load carried by the river has consequently resulted in extensive sedimentation in the alcove, with the stormwater flows carving a channel through the sediments. Using the adjacent floodplain elevations as a guide, we would expect about 6 ft of sedimentation to occur in the outfall area outside of the active channel. We estimated the frequency of flooding using stage data from the USGS East Main Street gage located just downstream, transposed to the site assuming a 1.2-ft drop of water surface between the outfall and gage based on LiDAR water surface data. We estimate the bank edge of the

outfall is flooded by the river at flows of about 5,300 cfs. Between 2011-2022 around seven events per year reached this threshold, for an average 250 hours/year. Since outfall construction, peak flows of 27,300 cfs and 33,500 cfs have occurred, which are about 10-year and 25-year events using the FEMA FIS flood frequency data. Given this frequency we expect continued sedimentation over most of the outfall.

As the planted and volunteer vegetation establishes, we expect the development of a more stable channel pattern that will be substantially narrower than the 24-ft-wide flat armored bottom each side of the outfall was designed with. Natural channels in similar settings will typically create deeply incised channels whose bed is at or below river summer water levels and whose top of bank elevations match the surrounding floodplain. In this case, the Armorflex has prevented the development of a sloped outfall channel down to summer Puyallup River water levels, instead forcing all of the head drop to occur at the bank itself.

2.3 Summary of NHC findings

The outfall is failing because the design does not address numerous engineering issues related to its position on the banks of the Puyallup River, namely:

- Erosion from attempting to convey stormwater down a steep vegetated bank,
- Bank erosion from high river flows,
- Flanking erosion risk from the failing upstream bank,
- Return flow erosion risk in large floods, and
- Sedimentation processes of the Puyallup River.

If no actions are taken, we expect continued erosion of the bank, the A-Jacks falling into the channel, and potential undermining of the riverward end of the Armorflex. We do not see much risk of erosion proceeding back to the pipe outlets. Additional erosion risks may occur due to continued erosion of the upstream bank and high velocity return flows during larger floods. This above discussion is focused on engineering design criteria only and does not consider impacts to vegetation in surrounding mitigation planting areas.

3.0 SCJ MITIGATION PLANTING AREA ASSESSMENT

3.1 Overview

This section of the Deficiencies Report describes current conditions in planted mitigation areas located in and around the Viking warehouse stormwater outfall structure. The Viking warehouse is located at 302 33rd Street SE in Pierce County WA, in the City of Puyallup UGA. The Viking warehouse facility (permitted in 2018) currently sends stormwater overflow to and through an outfall facility located at the top of bank on the left side of the Puyallup River. According to SCV 2020 As-Built report, clearing in preparation for construction of the Viking outfall facility was initiated in November 2018. The outfall structure and mitigation planting installations were substantially complete by September 2020. Information from City of Puyallup staff indicates that primary outfall structure construction was

underway by October 11, 2019, but flooding during the 2019-2020 winter affected project timing, resulting in the planting area installation being finalized in September 2020.

Under Pierce County Critical Area Regulations (PC-CAR), impacts to a critical area buffer, a floodplain or a shoreline zone must be mitigated, as described in a Habitat Assessment study, which includes a detailed mitigation and monitoring plan. Talasea Consultants submitted the Viking detailed mitigation and monitoring plan (VDMP) to Pierce County in early March, 2018. According to the SVC 2020 As-Built report (dated October 1, 2020), the habitat mitigation planting installation was finalized in September 2020. No subsequent annual monitoring and maintenance reports have been submitted to Pierce County.

The mitigation planting area field assessment described below is based on information and guidance provided in the approved 2018 VDMP, which defined Performance Standards (required outcomes) for the habitat mitigation planting area work, and on the SVC 2020 As-Built report, which documented post-planting site conditions and As-Built changes to the original Talasea mitigation plan.

The Viking mitigation planting work and standards related to protection and replacement of habitat functions is evaluated separately from the Viking outfall structure design and engineering standards, which were described in Section 2 of this report. The mitigation planting goal is to replace natural habitat functions that were lost when constructing the outfall, and the outfall structure's engineering goal is to manage and control stormwater. The mitigation planting work is typically evaluated by a wetland or habitat scientist; an engineered stormwater facility is typically evaluated by a licensed engineer or hydraulics professional. However, some of the outfall structure functions must also meet standards of certain Pierce County Critical Area Regulations related to water quality and erosion control impacts, as described in more detail below.

The outfall structure and documentation of its engineering design changes over time was reported in both the VDMP (Talasea 2018) and the As-Built Report (SVC 2020). Therefore, some of the mitigation planting discussion below also includes some information about the outfall structure conditions that affect erosion and water quality at the edge of the Puyallup River. This discussion is not an engineering assessment, but rather just a description of erosion and sediment conditions that affect regulated mitigation planting area functions and conditions.

3.2 2018 Viking Detailed Mitigation Plan Summary

The detailed Viking mitigation and monitoring plan (VDMP, Talasea, 2018) approved by Pierce County in 2018 described a native planting area around the outfall structure that was intended to compensate for loss of habitat and associated buffer functions caused by clearing the previously vegetated riverine buffer and subsequent construction. The outfall structure is located at the edge of the Puyallup River within the regulated floodplain, within the regulated shoreline setback area, and within the wildlife habitat buffer of the Puyallup River. Although not specifically described in the Talasea report, a scaled measurement of the provided drawing indicates that the clearing and construction area impacted about 15,000 sq-ft of riverine buffer area.

To ensure that the mitigation planting area conditions and changes over time are adequately documented, City of Puyallup staff and consultants have visited the outfall site several times in the past few years and have documented critical features and conditions in and around the outfall structure and the associated mitigation planting area.

As described above, the mitigation planting installation was finalized in the fall of 2020, and an As-Built Report by SoundView (Wetland) Consultants (SVC 2020) was submitted to Pierce County in October 2020. The SVC report mentioned erosion and sediment issues associated with the outfall structure conditions at that time. This description was written by a wetland consultant, and was not an engineering assessment of the outfall's structure or stability. The 2018 Talasea report mentions generally how the outfall facility is *intended* to work, but does not document its engineering design specifics and how they accomplish this intent.

Talasea, 2018, page 3:

> "The outfall structure will require periodic maintenance over time, but this will not diminish the temporary impacts for the installation of the structure. Long-term impacts will be minimized through the bioengineered structure that will provide additional shading in its mature form near the river to protect river temperature, minimize risks of erosion along the shoreline, and the native plants used to stabilize both the slopes and enhance the shoreline."

Deficiency: As described above in Section 2, a copy of the project-specific engineering and hydraulic analysis that was used to design the outfall structure has been requested from Pierce County and the project engineer, but none has been provided. Therefore, no professional engineering assessment, modeling or associated report describing current outfall structural or engineered component conditions and performance standards is available to determine whether the outfall structure is working as designed or will work under future increased stormwater discharge conditions.

According to the 2018 Talasea VDMP and Pierce County Critical Areas Regulations (PC-CAR), the mitigation planting area was to be monitored with annual reports submitted to the County for a minimum of three years following plant installation and submittal of the As-Built report, i.e., an annual monitoring and maintenance report (MMR) would be due at the end of 2021, 2022 and 2023.

Deficiency: Copies of the required annual MMRs have been requested from Pierce County, but none have been provided, indicating that no annual monitoring reports have been submitted to Pierce County to date.

3.3 Habitat Mitigation Plan Purpose

The primary purpose of the Talasea 2018 mitigation planting plan is to describe how the Viking project will mitigate for impacts to Critical Areas, as required in the Pierce County Critical Areas Regulations (PC CAR1 18E.40, 18E.70, 18E.110), while also addressing regulated impacts to the Shoreline, as described in the Pierce County Shoreline Master Plan and associated regulations (PC-CAR 18S).

The impacted critical areas include the following:

- The riverine buffer area (150 ft landward from the OHWM), as defined in Section 18E.40 (Regulated Fish and Wildlife Species and Habitat Conservation Areas).
- The floodplain, as defined in Section 18E.70 (Flood Hazard Areas)
- The river bank as defined in Section 18E.110 (Riverine and Soil Erosion Hazard Areas, and Active Shoreline Erosion Hazard Areas)

Impacts to the river and its shoreline zone are also regulated under the Pierce County Shoreline Master Program, which identifies the Puyallup River at the KFIP site as a Shoreline of the state with a designation of Urban Conservancy. The regulated shoreline area includes all lands within 200 ft of the OHWM, plus all floodplains within 200 ft of the edge of the floodway and to the outer edge of all associated wetlands. At the outfall location, the shoreline zone includes the entire floodplain to the toe slope of the upper terrace.

3.3.1 Relevant Plans, Policies and Regulations

This section of the report provides an overview of Pierce County code and planning policies related to assessing critical area impacts from the outfall construction and requirements to mitigate for impacts to the riverine buffer habitat area and floodplain. In addition, there are associated federal and state regulations that may affect permitting and mitigation for some of the project impacts. Key regulations are summarized below.

Federal Endangered Species Act (ESA -- 16 USC 1531 et seq.)

The ESA requires that applicants seeking a permit for a project with potential impacts to listed species undergo consultation with USFWS and/or the National Marine Fisheries Service (NMFS). Federal ESA review is usually triggered by direct impacts to habitat areas under federal jurisdiction, such as Water of the United States (WOTUS). The outfall structure was redesigned to avoid direct structure impacts below the Ordinary High Water Mark (OHWM), so has not directly triggered federal oversight or permitting requirements.

However, the ESA prohibits "taking" (meaning to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect) any species listed as threatened or endangered under the ESA. “Taking” may include habitat impacts where wildlife is affected by impairing essential behavioral patterns, such as breeding, feeding, or sheltering.

Per guidance provided in many sections of Pierce County code as well as in project-specific permits:

> “The applicant must comply with all other local, state, and federal regulations and obtain relevant permits. This includes the U.S. Army Corps of Engineers, the Washington State Department of Ecology (ECY) and the Washington State Department of Fish and Wildlife (DFW) for Hydraulic Project Approval (HPA). It is the sole responsibility of the applicant to contact the other jurisdictions and secure all other permits required for this proposed project.”

Despite the project having no federal permit review process, the federal law protecting listed species still applies. Therefore, if any impacts from the outfall result in harm to listed fish species in the Puyallup

River, the structure is out of compliance with federal regulations and also with Pierce County permit requirements.

In contrast with testimony from some consultants during the 2018 Hearing Examiner process that indicated there was no significant habitat in the adjacent reach of the river (more details below), this section of the Puyallup River is documented by WDFW as providing rearing habitat for Fall run chinook salmon (*Oncorhynchus tshawytscha*) – a listed species, as well as coho (*Oncorhynchus kisutch,* a species of concern); spawning habitat for pink salmon (*Oncorhynchus gorbuscha)*; and shows a documented presence of bull trout (*Salvelinus confluentus*) and winter steelhead (*Oncorhynchus mykiss)* – both are listed species.

Deficiency: The existing outfall does not provide adequate erosion and sediment control nor adequate water quality treatment to mitigate impacts to the riverbank and federally protected species.

Washington State Department of Fish & Wildlife Hydraulic Project Approval (WAC 220-660)

The Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) program, regulated under Washington State law (RCW 77.55), requires that construction in or near state waters is done in such a way as to protect fish and their aquatic habitats. An HPA must be obtained from WDFW by anyone planning hydraulic projects in or adjacent to most marine and fresh waters.

This project is currently under review in light of its HPA, and the City is waiting for a determination from WDFW as to whether current conditions at the outfall (described in this report) meet requirements of the HPA permit.

According to May 15, 2015 Hearing Examiner findings (described in more detail below):

> "The applicant has submitted an application for an hydraulics project approval (HPA) from the State Department of Fish and Wildlife (DFW) and has also applied for a SDP [shoreline Substantial Development Permit] from Pierce County…"

The Hearing Examiner approved the SDP permit, but with conditions, based on the assumption that the HPA permit would be approved. However, the baseline permit requirements still apply if there is a different outcome relative to what is described in the permit.

The Pierce County SDP permit requirements assume that the outfall is in compliance with WDFW HPA requirements, which generally require that river bank at the edge of the structure is stable and not eroding or sending excess sediment to the river after three years of monitoring. The HPA compliance monitoring phase is still pending as of this date (February 2023). If the outfall conditions after three years of monitoring are out of compliance with WDFW requirements, corrections may be needed to finalize the WDFW review process.

Pierce County Shoreline Master Program (PCC 18S.10, 2022)

The Pierce County Shoreline Master Program (PCSMP) establishes allowed uses, and defines buffers, setback requirements, and mitigation requirements for regulated waterways. The PCSMP identifies the Puyallup River at the KFIP site as a Shoreline of the state with a designation of Urban Conservancy. The

regulated shoreline area includes all lands within 200 ft of the OHWM, plus all floodplains within 200 ft of the edge of the floodway and to the outer edge of all associated wetlands.

Thus, the entire floodplain and the floodplain wetlands at the KFIP site are in the regulated Shoreline zone and are subject to SMP regulations. As a general rule, only water-dependent uses are allowed within 50 ft of the OHWM in a regulated shoreline zone, although in some cases, utility impacts are allowed with mitigation if there is no reasonable alternative with less impact.

Per Section 18E.40.060.C.1(a)1 (Shoreline Master Program Buffers): "*Where SMP buffers differ from the applicable requirement of this Title, the most restrictive buffer width applies*". Please refer to PC CAR Section 18E discussion below for more restrictive buffer details.

Based on results of a Pierce County Public Hearing in 2018, a shoreline Substantial Development Permit was approved for the outfall construction serving **only** the Viking warehouse (i.e., no future development), subject to certain conditions.

As documented in the Hearing Examiner decision (dated May 15, 2018), Talasea consultants testified:

> "The flow area will consist of matting, rocks, logs, and willow trees. The trees will shade the water. The system will also slow the water flow and create habitat. The trees are at the top of the slope and will spread evenly across the area. This system will eliminate erosion. The bottom of the outfall will last three to four years and then vegetation will take over. … They will avoid disturbance to the river bank…"

The Hearing Examiner further described in Findings #8 and #9 that testimony indicated the following conditions would result from the outfall:

> "Willow fascines, logs of various sizes, and core [SIC coir] matting will create an organic environment that will provide both habitat and energy dissipation within the bioengineered stormwater release area. …"
>
> "… the applicant proposes to significantly improve an existing stormwater outfall that will feature trees for shading, water dissipation that will result in a sheet flow into the river, elimination of scouring, and improved habitat."

The Conditions of Hearing Examiner approval included a requirement to bond for both the installation and for three years of monitoring and maintenance, as required in code.

Deficiency: The stormwater outfall structure base is covered with 1-3+ ft of sandy flood sediment, and annual winter river flooding has scoured away most of the planted willow vegetation in the outfall base and at the river bank. The outfall is eroding at the riverbank, and the planted mitigation area does not currently meet the mitigation plan performance standard requirements (more on this below).

Pierce County Stormwater Management and Site Development Manual (PCSWM 2015)

The PCSWM provides regulations and detailed guidance on stormwater management, designed to meet the state Department of Ecology standards (as defined by the federal EPA NPDES program), and as required under the County NPDES permit. These regulations are primarily targeted toward protecting

water quality, but also to reduce negative impacts to habitat, flooding, aquatic biological diversity, and impacts from sediment and erosion.

Specific to this report section, the following guidance is noted:

- Minimum Requirement #4 in the PCSW Manual is related to Preservation of Natural Drainage Systems and Outfalls. It states that runoff cannot cause significant adverse impacts to downstream waters and downgradient properties. It further states that all outfalls are required to use energy dissipation systems, and to *"prevent erosion at and downstream of the discharge location"*.

Therefore, these stormwater management regulations apply directly to potential erosion, sediment and water quality impacts resulting from the outfall structure, which is constructed on the floodplain directly adjacent to the river. Under this requirement, runoff cannot cause significant adverse impacts downstream; the outfall is required to implement energy dissipation systems and is required to prevent erosion at and downstream of the discharge location.

Deficiency: The existing outfall does not provide adequate energy dissipation as needed to control or reduce significant erosion at the riverbank (See NHC discussion in Section 2).

Pierce County Critical Areas and Shoreline Regulations, 2022 (PC-CAR 18E and 18S)

Pierce County regulations intended to protect critical areas and shorelines are described in Title 18E, Development Regulations – Critical Areas and Title 18S, Development Policy and Regulations – Shorelines.

The entire floodplain is a regulated shoreline zone, and the following critical areas occur at or directly adjacent to the stormwater outfall structure:

- Regulated fish and wildlife species and habitat conservation areas,
- Flood hazard areas, and
- Erosion hazard areas.

Section 18E.40 (Regulated Fish and Wildlife Species and Habitat Conservation Areas [FWHAs]), defines activities allowed in stream buffer areas and defines stream buffer widths. Sections 18E.40.060.D, F and G describe specific requirements for buffer modification and widths.

Section D indicates that the riverine buffer can only be reduced through a variance procedure (PCC 18E.20.060), and reductions to a shoreline buffer are determined through Title 18S, Development Policies and Regulations – Shorelines. However, per Section 18E.40.060.C.1(a)1 (Shoreline Master Program Buffers):

> "Where SMP buffers differ from the applicable requirement of this Title, the most restrictive buffer width applies".

Furthermore, Section D.2(b) states:

"Regulated activities are to be kept out of the standard buffer where feasible, as required by the impact avoidance requirements of PCC 18E.40.050, Mitigation Requirements".

In areas where unavoidable impacts to FWHAs or their buffers are proposed, a Habitat Assessment report is required. Per Section 18E.40.070 – Appendix D: (Habitat Assessment Reports), the report must describe the following:

- How natural shoreline processes will be maintained and will not result in increased erosion or alterations to, or loss of, shoreline substrate within 1/4 mile of the site.
- How erosion control measures will not adversely impact critical fish or wildlife habitat areas or associated wetlands.
- How mitigation measures (per PCC 18E.40.050) will ensure that no net loss of intertidal or riparian habitat or function occurs as a result of erosion control measures.

In addition to habitat mitigation requirements described in Section 18E.40.070, Section 18E.40.040(B)11 (Stormwater Conveyance Facilities) describes mitigation required if stormwater conveyance structures (such as an outfall and pipes) are permitted in the riverine buffer zone. The structure may be allowed subject to all of the following standards:

a. No other feasible alternatives with less impact exist;
b. Mitigation for impacts is provided;
c. Stormwater conveyance facilities incorporate fish habitat features;
d. Vegetation is be maintained or added adjacent to all open channels and ponds in order to retard erosion, filter out sediments, and shade the water.

Deficiency: The mitigation provided to compensate for construction of the outfall is not adequate to control erosion, filter out sediments or shade the water. Vegetation installed within the outfall structure has mostly been scoured away or replaced by non-native invasive species.

18E.40.070 – Appendix E Monitoring Requirements describes requirements for monitoring and reporting on regulated mitigation areas.

A. "….A financial guarantee on a form acceptable to the County is required for the duration of the monitoring period, and the guarantee plus any accrued interest will be released by the County **when the required mitigation and monitoring are completed**…."
B. Requirements of the monitoring program are as follows:
    1. Scientific procedures are to be used for establishing the success or failure of the project.
    2. Monitoring reports prepared by a fish or wildlife biologist are to be submitted for Department review. Monitoring reports generally will include discussions of wildlife utilization of the site, habitat structure establishment, water quality, and existing or potential degradation.
    3. Monitoring reports for mitigation projects specific to vegetative restoration or enhancement shall comply with the following:

a. Monitor for a period of time appropriate to the nature of the project… The majority of monitoring programs will last a minimum of three years and are to be submitted according to the following schedule:
    1. At completion of construction of mitigation project (as-built report);
    2. Thirty days after completion;
    3. Early in the first growing season after construction;
    4. End of the first growing season after construction;
    5. Twice the second year; and
    6. Annually after the second year.
b. Deviation from this schedule may be allowed based upon project specific conditions.

Deficiency: No annual monitoring reports have been submitted according to the schedule described above. Following submittal of the 2020 SVC As-Built Report, the County released funds designated for completion of plant installation on January 27, 2021, but no new bond for monitoring and maintenance has been defined or required.

Section 18E.70 (Flood Hazard) regulations are intended to minimize losses due to floods and to provide rules about activities allowed within flood hazard areas. These rules specifically describe an intent to minimize damage to critical fish and wildlife habitat areas (18E.70(A01.a)). In general, new development in a flood zone is discouraged, but may be allowed with proper engineering, mitigation and floodproofing, as long as the project does not "*cause an adverse impact to crucial fish or wildlife habitat*".

Deficiency: Under current conditions, degraded outfall functions resulting from erosion and structural changes along the riverbank in addition to poorly vegetated habitat mitigation areas are resulting in adverse impacts to regulated fish and wildlife habitat areas.

18E.110 (Erosion Hazard Areas) defines areas with potential erosion hazard that may result in land retreat, usually related to impacts from an adjacent water body, but also from unprotected surface erosion. This regulation applies on river floodplains mapped by FEMA, specifically within the mapped Channel Migration Zone (CMZ) on the onsite floodplain adjacent to the Puyallup River. Erosion and flow conveyance protection is required in the floodplain to minimize risk of riverine erosion.

- ***"Flow Conveyance.*** New excavated conveyance areas shall be equivalent to existing conveyance within the flood fringe. Equivalent shall mean a mechanism for transporting water from one point to another using an open channel system."
- "***Erosion Protection.*** Development shall be protected from flow velocities greater than 2 ft per second through the use of bio-engineering methods or, when bio-engineering methods have been deemed insufficient to protect development, then hard armoring may be utilized. All erosion protection shall extend 1 to 3 ft, depending on development requirements, above the base flood elevation and shall be covered with topsoil and planted with native vegetation. (See Figure 18E.70-14 in Chapter 18E.120 PCC.)."

Deficiency: Under current conditions, the degrading outfall structure is located below the base flood elevation and is causing riverbank undercutting and erosion. It is sited within an area that floods regularly with velocities in excess of 2 ft per second, and thus the area in and around the outfall is expected to continue to erode and accumulate sediment. Natural hydraulic processes are expected to increase disfunction and degradation over time.

3.4 Review of the 2018 Talasea Detailed Mitigation Plan

The Talasea Detailed Mitigation Plan describes a plan intended to mitigate for the "Puyallup River Outfall", the western half of which was intended to provide a stormwater outfall pathway into the Puyallup River from the Viking (Van Lierop) warehouse. Figure 3.1 depicts the proposed outfall structure and location on the bank of the Puyallup River, within the 150-ft regulated Puyallup River buffer area. Pierce County code requires compensation to mitigate for the loss of the previously vegetated riverine buffer habitat. The 2018 Talasea mitigation planting plan was approved by Pierce County.

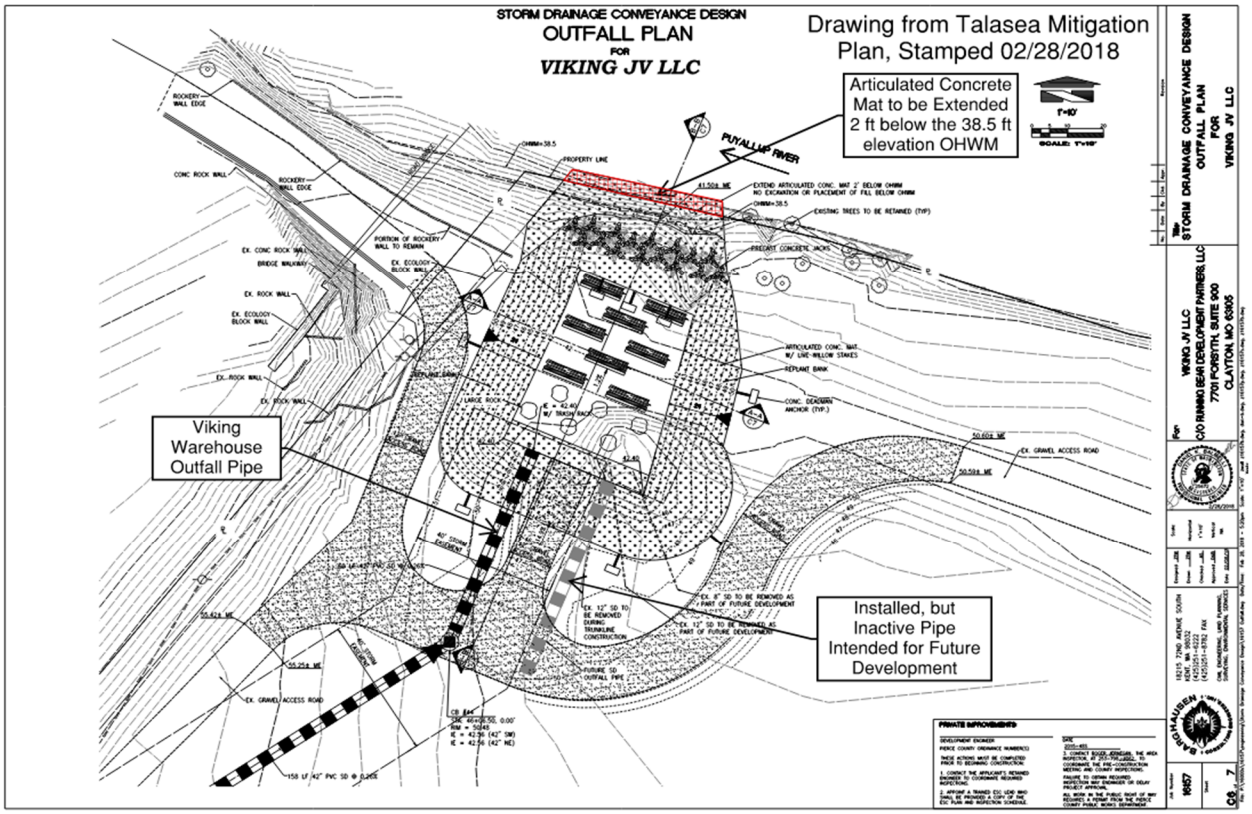

Figure 3.1: Drawing adapted from Talasea 2018 Mitigation Plan, Sheet C6 of 7, stamped 2/28/2018.

The 2018 Talasea Mitigation Plan was intended to mitigate impacts cause by construction of the entire outfall structure, including the eastern portions of the outfall that were intended to receive future stormwater runoff from other areas.

The Talasea mitigation plan included the following:

- A description of the proposed mitigation;
- Site-specific goals, objectives, and performance standards;

- A long-term monitoring plan; maintenance plan and contingency plan; and
- A description of the financial guarantees required by Pierce County for the installation.

3.4.1 Record of Outfall Structure Design Drawing Revisions

The Talasea mitigation planting plan layout was based on the original outfall structure plans (engineer drawing stamped 2/28/2018) that were available at the time of the report preparation, dated March 1, 2018 (Figure 3.1, above).

The following series of figures provides documentation of changes over time to the outfall structure design, but the associated discussion is not an assessment of structural function. The outfall structure functions and documentation of potential failures are discussed in a separate section of this report by appropriately qualified engineers and hydraulics experts.

Both Figure 3.1 (above) and Figure 3.2 (below) show that the original 2018 approved outfall structure design included extending the Contech underlayment mat down the riverbank to 2 ft below the OHWM. Figure 3.2 shows the revised outfall structure design that was submitted to Pierce County one month after the Talasea Report by Barghausen Engineers (stamped on March 27, 2018). The revised drawing removed two central logs and added a line of Ecology blocks up the center of the outfall, apparently intended to separate the approved and permitted Viking warehouse outfall area easement (west half of the facility) from the outfall area intended to serve other future development (east half of the facility).

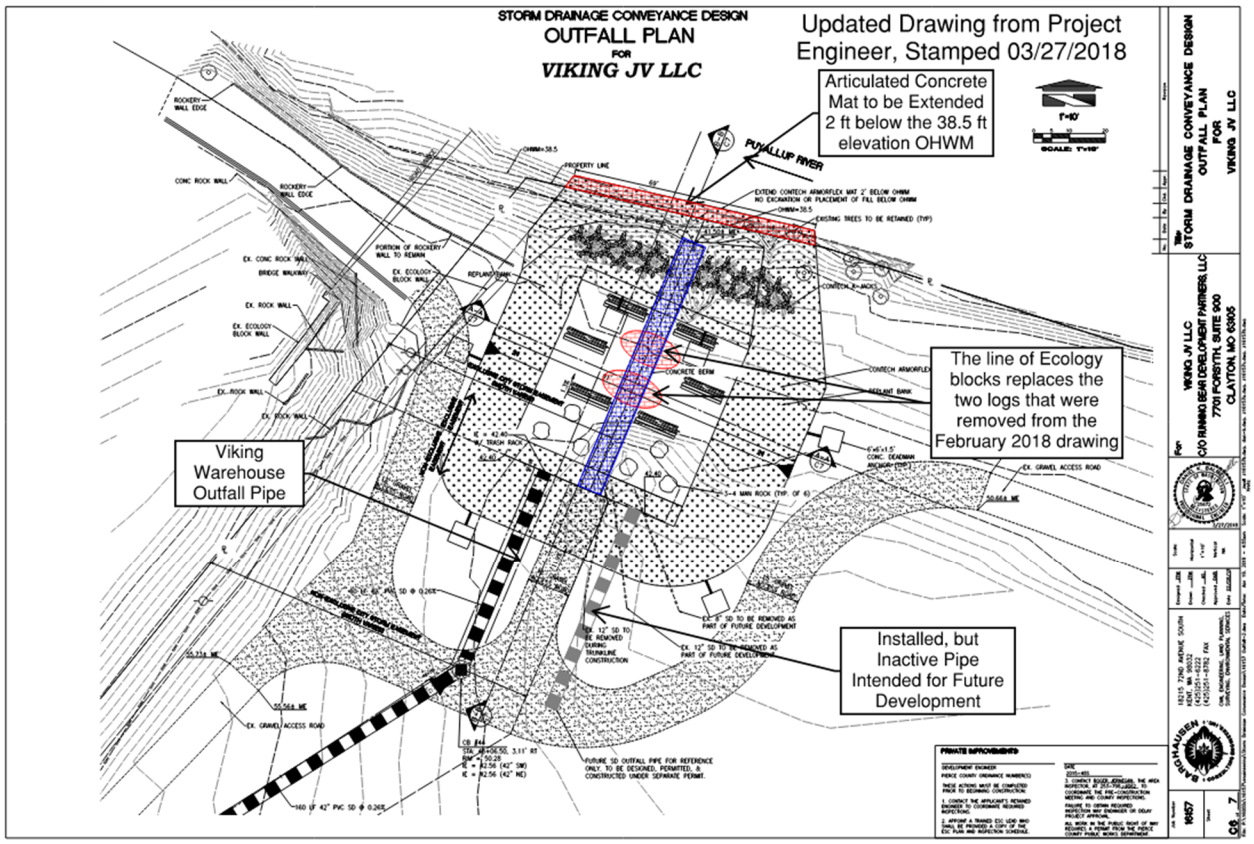

Figure 3.2: Updated figure, removes two central logs and adds central line of Ecology blocks.

SVC prepared and submitted an As-Built mitigation plan report in the form of a Technical Memorandum dated October 21, 2020. The report includes a revised outfall design drawing stamped and dated 04/02/2019 by the project engineer (Figure 3.3). The SVC report describes outfall construction area impacts as occurring in 2018 and 2019; and described habitat mitigation area plant installations as being final in September 2020.

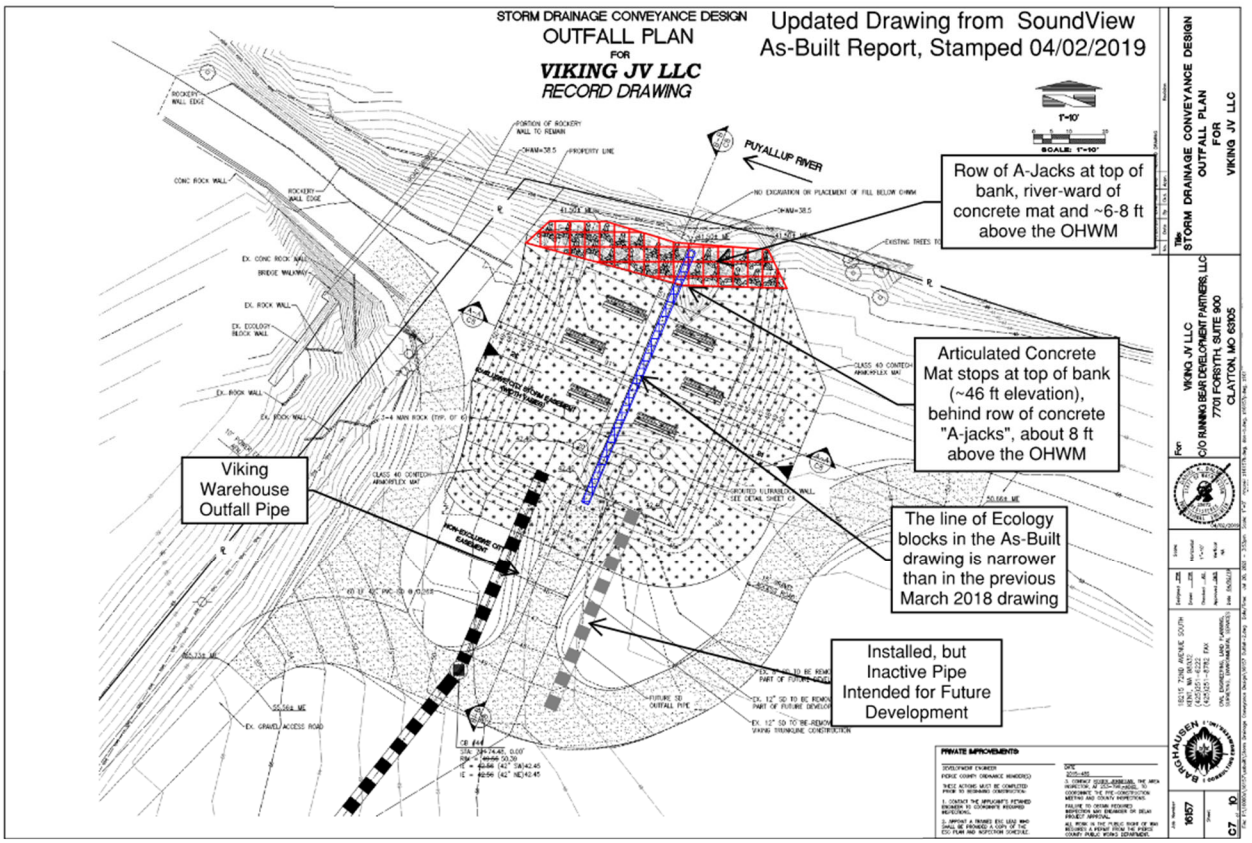

Figure 3.3: Adapted plan view of As-Built changes from the originally approved outfall structure design.

Per the SVC report, construction for the outfall (fall 2018 to spring 2019) included initial clearing and grading of the river bank and buffer area. In early October 2019 (personal communication, City of Puyallup engineers), SVC described installation of a base geotextile mat, then overlaid by Contech articulating concrete mat, then overlaid by 1.5 ft depth of quarry spalls and river rock. Water diversion logs (1.5-2 ft diameter) and large boulders were installed and/or anchored at the surface, and willow/ red osier dogwood fascines were anchored in coir logs between the wood logs. Finally, the surface within the outfall as well as bare soil areas on the slope around the edge of the outfall structure were hydroseeded.

The SVC report indicated that Puyallup River flooding in February 2020 deposited “a substantial amount” of river sediment. This together with fish construction window limitations and COVID shutdowns resulted in the mitigation plantings being delayed until fall of 2020.

The As-Built drawings (Figure 3.3, Figure 3.4, and Figure 3.5) showed the following changes to the outfall structure relative to the previously approved (3/27/2018) structure design drawings:

- In 2020, the Contech articulated mat is shown as stopping near the top of bank, about 10-15 ft landward from the OHWM (Figure 3.3 and Figure 3.5) at about 46 ft elevation, rather than the 2018 design (Figure 3.1, Figure 3.2, and Figure 3.4) which showed the articulated mat extending over the top of slope and down the bank to 2 ft below the 38.5 ft elevation OHWM.
    - No engineering documentation was provided to explain why this change was made. From a permitting standpoint, this revision would eliminate direct hard-armor impacts to the river (a Water of the US [WOTUS]), and also avoided federal review of the outfall structure and associated new impacts to the Puyallup River.

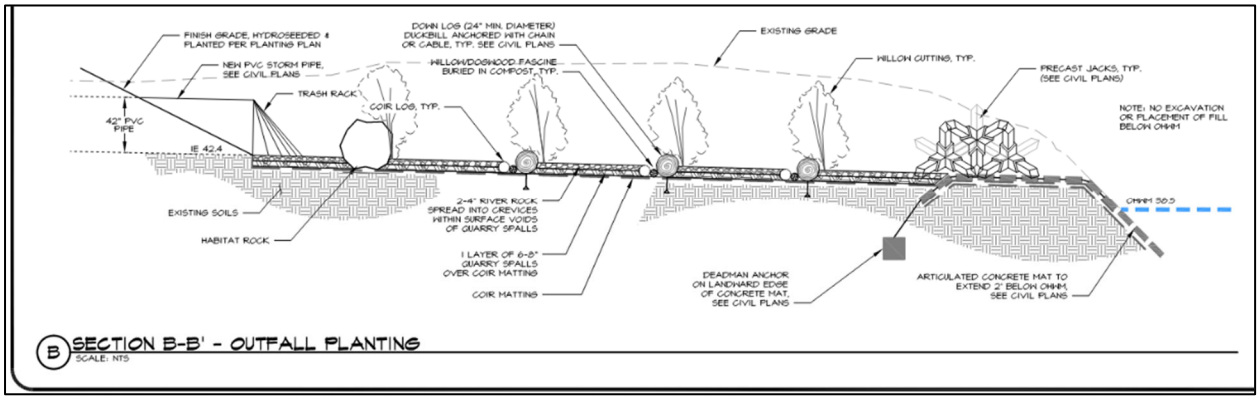

Figure 3.4: Side view of original (2018) approved outfall structure design.

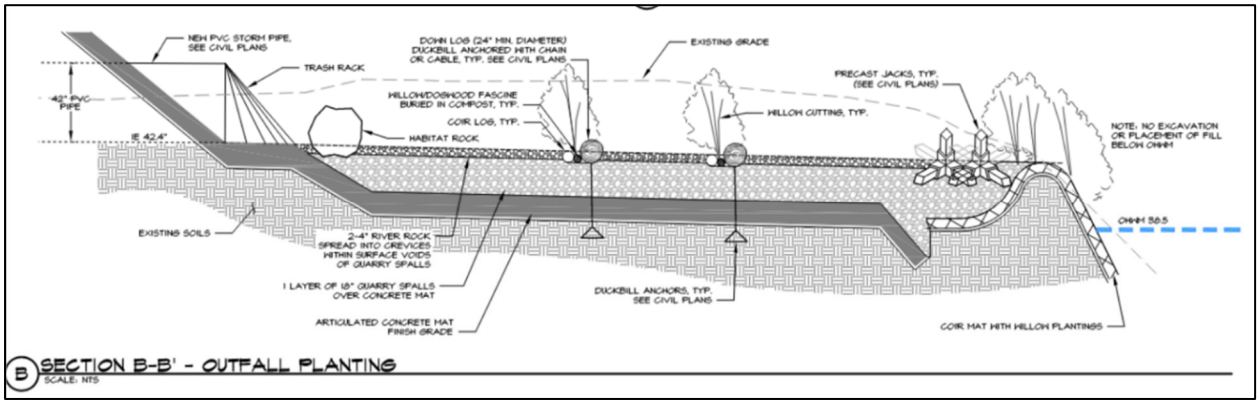

Figure 3.5: Side view of As-Built (2020) changes from the originally approved outfall structure design.

- The A-Jacks which previously were situated above the Contech mat at top of the bank (Figure 3.4) were instead installed on top of a coir fiber mat laid over a constructed soil berm at the top of the riverbank (Figure 3.5). The coir mat starts about 10-15 ft landward from the top of the bank and extends riverward to below the OHWM. The top of bank berm was subsequently planted with willow wands (see Figure 3.5).

- Deadman anchors on each side of the outfall structure in the 2018 design drawings (Figure 3.2 and Figure 3.4) are not shown in the As-Built drawings (Figure 3.3 and Figure 3.5), but individual log anchors are shown.
- Coir logs with willow stakes originally shown on the upslope side of the horizontal logs (Figure 3.4) were moved to the downslope side of the logs (Figure 3.5).
    - Note, despite the side view drawing (Figure 3.5) indicating fewer logs were installed in 2020, the plan view drawing shows that a total of six logs were installed, the same as the March 2018 design.

In summary, the outfall structure design changes over time were documented in the wetland reports, but there is no associated engineering or hydraulics report that explains how the outfall structure was initially designed or redesigned to accommodate current or expected future flow rates or impacts from river flooding over time.

Due to ongoing facility maintenance requirements and associated regular disturbances, even a carefully designed, naturally vegetated or appearing stormwater management facility and/or outfall structure cannot be used to replace or mitigate for loss of natural habitat functions. Therefore, the mitigation planting area assessment below evaluates only habitat planting areas outside of the engineered outfall structure and evaluates whether the habitat mitigation area meets requirements defined in Pierce County Regulations.

To meet County code, the habitat area and functions lost when clearing the riverine buffer are to be replaced in kind and must result in a neutral or positive increase in riverine buffer habitat function, relative to the buffer conditions in place at the time of clearing. In addition, erosion and sediment conditions in place prior to construction of the outfall must remain the same or be improved.

3.4.2 Mitigation Planting Area Assessment

The February 2018 Talasea habitat mitigation planting area proposed design (Figure 3.6) differs slightly from the SVC 2020 As-Built drawings and plant list (Figure 3.7). The most significant differences are to the engineered structure, and include the loss of the two central energy dissipation logs, replaced by a line of Ecology blocks (as shown in the March 2018 engineering drawing in Figure 3.2) and termination of the Contech underlayment mat about 10-15 ft landward from the OHWM, rather than it being extended over the bank and downslope to 2 ft below the OHWM. The Contech mat was replaced by a coir fiber mat and willow wands planting. No engineering explanation or justification was provided in support of this revised design.

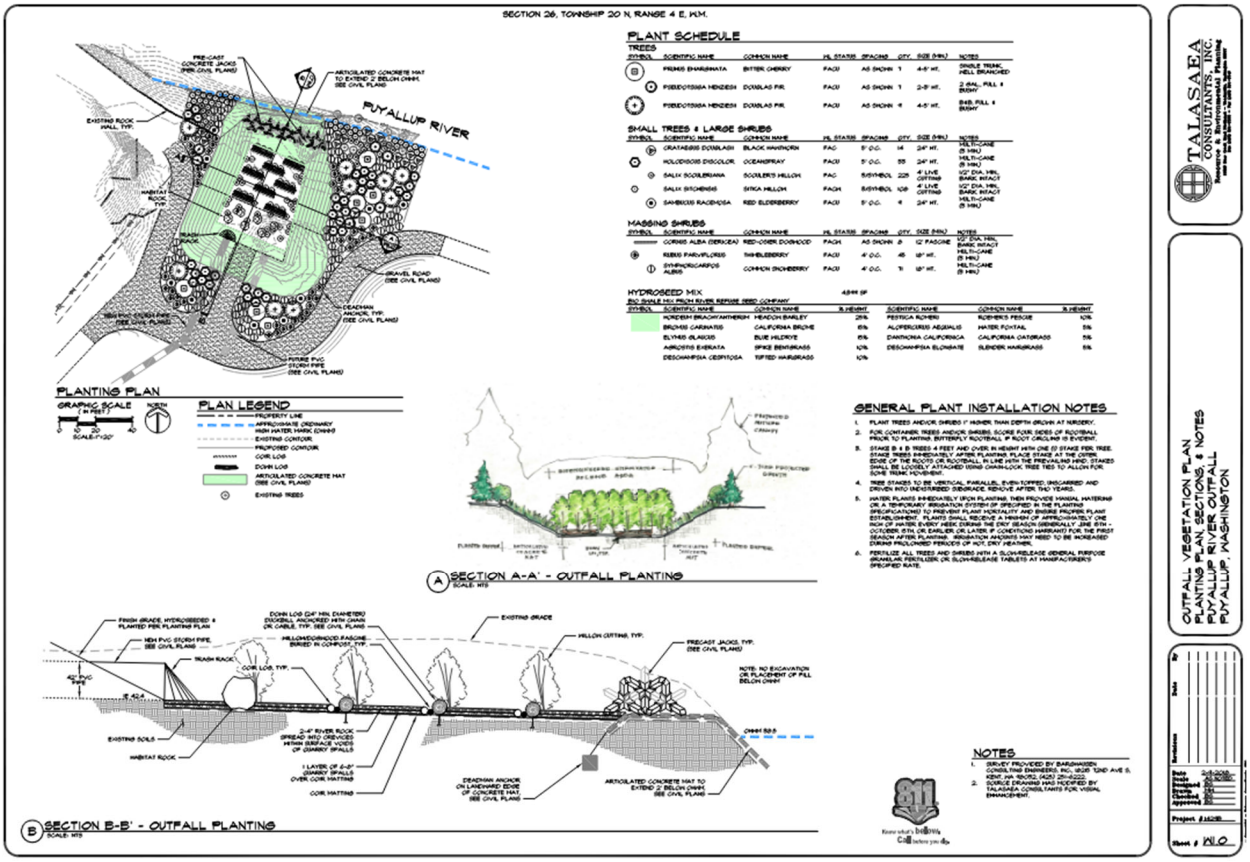

Figure 3.6: 2018 Talasea habitat mitigation planting plan.

Some of these changes appear to have resulted in destabilization and increased erosion at the riverbank, which does not meet requirements described in various PC-CAR code standards (see discussion in Section 3.3.1). Any engineering deficiencies (rather than habitat mitigation deficiencies) that have resulted from these changes are addressed elsewhere in this report by qualified engineering and hydraulic specialists.

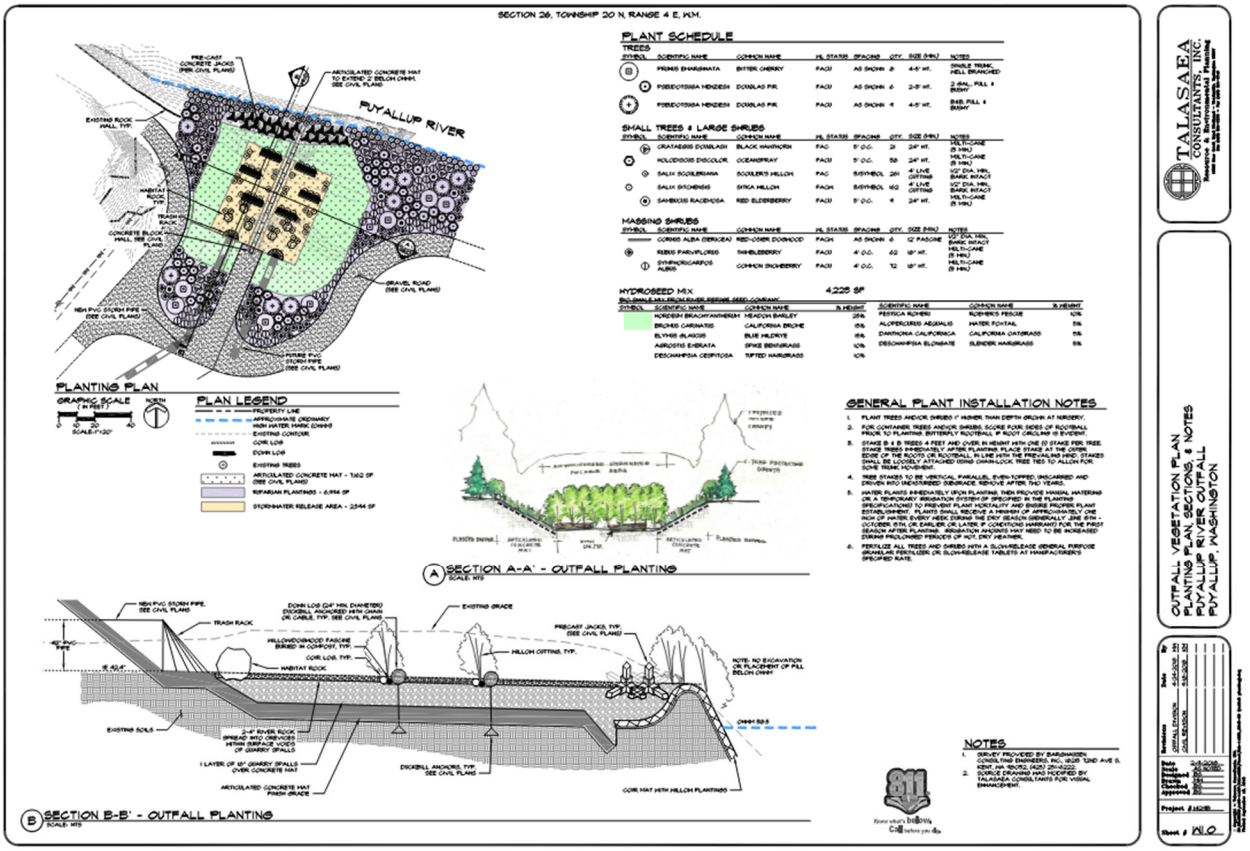

Figure 3.7: 2020 SVC As-Built habitat mitigation area conditions.

The minimum standards for mitigation require in-kind replacement of habitat functions and values equivalent to the area impacted for construction. Therefore, assessment of this mitigation plan starts with the assumption (based on scaled site plan measurements) that about 15,000 sq-ft of riverine buffer was cleared. Some of the cleared area was already impacted to varying degrees by dirt farm roads and agricultural impacts which were replaced by improved gravel roads and the hardscape outfall structure. However, even in already impacted buffer areas, buffer regulations still indicate avoiding new impacts to the 150 ft buffer if possible, and still require mitigation for new impacts to the riparian buffer, usually on a 1:1 replacement ratio basis. However, if a smaller area is planted, other complementary work can be carried out to ensure no net loss of habitat, such as more dense plantings or fencing.

The approved VDMP proposed replanting about 5,800 sq-ft of buffer area. Similar scaled measurements of the SVC 2020 report indicate that about 6,300 sq-ft of habitat area was actually planted.

The Plant Schedule described in the 2018 Talasea report was not significantly different from the one described in the SVC 2020 As-Built report. The species list was substantially the same, and despite minor adjustment to the total plant count, the overall numbers were not significantly different, comparing a total proposed plant count of 224 potted or fascine stake plants (red osier dogwood), and 343 live willow cuttings to 197 potted or fascine stake plants, and 423 live willow cuttings.

Both the 2018 Mitigation Plan and the 2020 As-Built report included a description of willow cuttings that were installed within the outfall facility rather than in the surrounding habitat mitigation area – specifically willows that were planted beside the anchored logs and in the coir covered river bank riverward of the outfall structure. Planted areas within an engineered facility with engineering purposes would not typically be considered to provide for habitat mitigation, and they are described in the Mitigation Plan as "non-mitigation areas". They are part of the engineered outfall structure and thus, due to structural maintenance requirements for engineered stormwater facilities, are not expected to provide long-term stable and persistent habitat functions. However, those plantings were included in the approved mitigation plan, and thus must be addressed when we review the mitigation plan outcome. The Mitigation Plan Performance Standards do define separate objectives for the vegetated bioengineering areas within the outfall structure (see Objective B) from conditions in the mitigation habitat planting areas outside of the outfall (see Objective A). Objective C only applies to habitat mitigation planting areas, i.e., not to areas within the structure.

The willow plantings within and directly riverward of the outfall structure were intended to reduce erosion and sediment movement associated with the outfall structure, and thus were intended for erosion mitigation. A detailed bioengineering standard used for design has not been provided to date. In any case, the willows and the coir wrapped earth berm along the top of bank at the structure have all been scoured away during recurring, normal winter flood events, and therefore, are not currently providing either bioengineering or habitat function.

The Performance Standards and monitoring guidance provided in Section 4.2 of the Talasea report were as follows:

- Objective A: Create plant species diversity in the mitigation areas.
    - Performance Standard A1: At least 6 species of desirable native plants will be present in the planted buffer area during each year of the monitoring period. Species may be comprised of both planted and naturally colonized vegetation.
    - Performance Standard A2: Percent survival of all planted woody species must be at least 100% at the end of Year 1 (per contractor warranty), and at least 80% at the end of Year 2.
    - Performance Standard A3: Total percent areal woody plant coverage must be at least 10% by the end of Year 1, 20% by the end of Year 2, and 30% by the end of Year 3. Woody plant coverage may be comprised of both planted and recolonized native species; however, at no time during the monitoring period shall a recolonized native species (e.g., red alder) comprise more than 35% of the total woody plant cover in this community.
- Objective B: Ensure survival in the non-mitigation areas.
    - Performance Standard B1: Percent survival of all planted woody species must be at least 100% at the end of Year 1 (per contractor warranty).
    - Performance Standard B2: Coverage of herbaceous vegetation on the articulated concrete mat shall be at least 30% by the end of Year 1, 40% by the end of Year 2, and 50% by the end of Year 3.

- Objective C: Limit the amount of invasive and exotic species in the mitigation areas.
    - Performance Standard C1: After construction and throughout the 3-year monitoring period, areal coverage by non-native invasive plant species shall be maintained at 10% or less throughout the mitigation area. These species include, but are not limited to: Scot's broom, Himalayan and evergreen blackberry, purple loosestrife, hedge bindweed, and creeping nightshade.

The following discussion will address Performance Standards (PS) and outcomes or current conditions within the defined mitigation areas.

- Meets PS#1:
    - Based on most recent field visit assessments of the mitigation planting area, there are at least 6 species of desirable native plants present, thus meeting *Performance Standard A1*.

- Does not meet PS#2:
    - There are many dead and dying plants in the planting area around the perimeter of the outfall structure which will need to be replaced. Conditions indicate that the currently planted habitat mitigation area did not meet either the 100% survival end of Year 1, or the 80% survival requirement for the end of Year 2 *Performance Standard A2*.

- Meets PS#3:
    - Because some of the installed mitigation planting area includes an already partially vegetated buffer area directly upstream of the outfall structure, even with high mortality in the planted areas directly upslope of the hardscape outfall structure, the total mitigation habitat area appears to meet the 10-30% total area woody plant coverage standard described in *Performance Standard A3*.

- Does not meet PS#B1:
    - *Performance Standard B1* is related to vegetation planting actions within the outfall structure, and thus are not typically considered habitat replacement plantings, but rather are assessed as bioengineering. Most of the willow stakes in the top of bank coir-wrapped soil berm have been scoured away, and due to the entire loss of at least one log within the outfall structure, and deep sediment burying or partially burying two of the other logs, including their adjacent willow fascines, the 100% survival standard was not met. Less than half of the originally installed willow fascines are currently in place, and due to scouring actions breaking or stripping away leaves and branches, growth is minimal.

- Does not meet PS#B2:
    - *Performance Standard B2* also refers to herbaceous plants that were installed within the outfall. The standard requires only that herbaceous cover be at least 50% by the end of Year 3, without describing what kind of herbaceous vegetation should be in place. Regardless, about half of the facility base is covered with bare or sparsely vegetated

sandy river sediments, and most of the vegetation west of the Ecology block centerline is watercress (*Nasturtium officinale*), a non-native, invasive species.

- Does not meet PS#C1:
    - *Performance Standard C1* requires that cover by non-native plants in the habitat planting area (i.e., ignoring the interior outfall structure plantings described above) cannot exceed 10%. Species observed within and directly adjacent to the current planting area include Japanese knotweed (*Fallopia japonica*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), English holly (*Ilex aquifolium*), English ivy (*Hedera helix*), poison hemlock (*Conium maculatum*), common evening primrose (*Oenothera biennis*), redstem filaree (*Erodium cicutarium*), birdseye speedwell (*Veronica persica*), and tansy ragwort (*Jacobaea vulgaris*). Therefore, this standard has not been met.

Deficiency: The currently planted habitat areas as well as planted area within the outfall structure are failing to meet several of the required Performance Standards defined in the 2018 Talasea VDMP.

3.5 SCJ Summary

The mitigation planting area around the perimeter of the outfall structure is not meeting Performance Standards defined in the approved mitigation plan. The mitigation has failed and has not been maintained. Without some adjustment or change it is likely to continue to fail.

4.0 REFERENCES

Barghausen Consulting Engineers, Inc., 2018. Off-Site Conveyance Analysis Report. Proposed Van Lierop Property. Report prepared for Running Bear Development Partners, LLC. June 14, 2018.

Soundview Consultants, 2020. Technical Memorandum As-Built Report and Post-Construction Baseline, File number 1412.0001-B. October 21, 2020.

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WEST Consultants Inc., 2021. Knutson Farm Scour Analysis. Report prepared for Viking JV, LLC and Running Bear Development Partners, LLC. August 17, 2021.