terraphase engineering

# Technical Memorandum

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| cc: | Tom Pors, Law Office of Thomas M. Pors<br>Byron Amerson, Senior Geomorphologist, Environmental Science Associates | | |
| Date: | March 18, 2026 | Project No.: | W304.001.001 |
| Subject: | **City of Sumner Final Mitigation Plan for Foster Pilot Project Water Rights** | | |

## Executive Summary

Terraphase Engineering Inc. (Terraphase) is the lead consultant for the city of Sumner (City or Sumner) in relation to the processing of one new water right application and two water right change applications. The proposed water rights will allow the City to use the Central and Dieringer Wells for new production as well as new points of withdrawal for the West and South Well water rights. Under current law, these applications would almost certainly be denied by the Washington State Department of Ecology (Ecology) due to a lack of available mitigation to offset impacts on local stream flows from these wells 100 percent in-time, in-place, and in-kind. However, the City is one of five entities allowed by state legislation to process water right applications under the so-called Foster pilot program.[1] Foster pilot projects are allowed to use alternate mitigation sequencing standards described in Revised Code of Washington (RCW) 90.94.090(9). This technical memorandum describes the City's proposed mitigation plan for the City's pending applications under the Foster pilot program standards.

The change applications were filed in 2004 and the new water right application was filed in 2009. In 2010, the City drilled and constructed the Central Well under a preliminary permit for the two change applications. The well was tested at rates between 1,850 to 2,160 gallons per minute (gpm), including a 24-hour constant-rate test at 2,085 gpm.

In the mitigation plan described in this document, tier 1 mitigation (avoidance) is provided by limiting how the wells can be used, thus avoiding use patterns that lead to higher impacts. Because all impacts cannot be avoided, tier 2 mitigation (minimization) is allowed, and the plan includes tier 2 replacement water mitigation using trust water rights.

[1] Revised Code of Washington, Title 90, Chapter 90.94, Section 90.94.090, "Joint legislative task force on water resource mitigation—water resource mitigation pilot projects" https://app.leg.wa.gov/RCW/cite=90.94.090.

Tier 2 mitigation cannot totally replace all impacts at all times and at all reaches and tributaries of the White and Puyallup Rivers. Therefore, tier 3 mitigation is allowed to cover impacts for those times and places where tier 2 mitigation is not totally effective. The City is developing a habitat restoration project on the White River for tier 3 mitigation.

## Introduction

Terraphase has prepared this technical memorandum to describe the proposed mitigation plan for streamflow impairments identified for the City's water rights being processed under the City's water resource mitigation pilot project under RCW 90.94.090 (Foster pilot project). The City is seeking to process a new water right and two change water right applications using the pilot mitigation process defined by RCW 90.94.090. The new water right is for the Central and Dieringer Wells, and the change applications involve the South and West Wells. The mitigation plan provided herein is designed to offset streamflow impairments identified for water rights G2-30534, CG-21980, and CG-2-23281.

## Project History

In 2017, Ecology issued a temporary use permit for the two change applications allowing the use of the Central Well at an instantaneous production rate (Qi) of 1,050 gpm and an annual production rate (Qa) of 560.7 acre feet (af). This temporary use permit requires mitigation to offset predicted streamflow depletion of the White River of up to 76.8 af per year (afy) resulting from moving production from the South and West Wells to the Central Well. The mitigation consists of a temporary trust donation of one of the City's surface water rights.

The temporary use permit is effective "until the U.S. Geological Survey (USGS) finalizes their Puyallup basin groundwater model where potential impacts of the full transfer can be re-evaluated or until such time as a permit is issued under pending application G2-30534." The USGS Puyallup basin groundwater modeling work was combined with the modeling of the adjoining Clover-Chambers Creek watershed into a single southeastern Puget Sound area modeling effort. In August 2024, the USGS published their report titled "Numerical Model of the Groundwater-Flow System Near the Southeastern Part of Puget Sound, Washington" (Long, et al. 2024) which describes their model informally known as the Southeast Sound (SES) Model. The modeling code itself was published in 2023.

After the publication of the SES modeling code, Terraphase used the SES model to predict impacts to regulated and closed surface waters for all three pending water rights applications. Initial modeling was completed for 342.75 additive acre-feet of annual production. Modeling was later revised to 377.75 additive acre-feet to meet the total projected City's water system demand by 2068. Results of steady-state and transient modeling indicate year-round impacts to the White River. The modeling found year-round increases in the flow of the Puyallup River exclusive of the flow contribution from the White River. However, the deficit in the White River is greater than the improvement in the Puyallup River, such that below the confluence of the two rivers where the White River flow contributes to the Puyallup River, flows in the Puyallup River are negatively impacted.

A plan was developed to provide mitigation for the modeled impact on the White River, the Puyallup River below the confluence, and impacted tributaries following standards allowed under the Foster pilot program. The Foster pilot program allows three "tiers" of mitigation. The first tier is avoidance of impacts. If impacts cannot be reasonably avoided, tier 2 mitigation, minimization of impacts, is allowed. The Foster pilot program specifically defines tier 2 mitigation as "minimizing impacts by providing permanent new or existing trust water rights or through other types of replacement water supply resulting in no net annual increase in the quantity of water diverted or withdrawn from the stream or surface water body and no net detrimental impacts to fish and related aquatic resources." Only if tier 2 mitigation is not reasonably attainable can tier 3 mitigation be used. Tier 3 mitigation compensates for impacts by providing "net ecological benefits" to fish and aquatic resources within the subject water resource inventory area (WRIA). To qualify, the benefits of the tier 3 mitigation must outweigh the impacts of the water right to fish and related aquatic resources. Unlike tier 2 mitigation, tier 3 mitigation can be in-kind or out-of-kind and does not need to occur in the same place and at the same time as the impacts, needing only to be within the same WRIA as any impacts.

## Summary of Impairment

Modeled impacts to closed and regulated streams were defined by Terraphase and are fully described in our prior reports detailing the steady-state and transient modeling of the proposed water rights (Terraphase 2024a, 2024b, and 2025). Using the SES groundwater flow model published by the USGS (Wright, Long and Fuhrig 2023), 11 different potential pumping scenarios for using the proposed new and changed water rights were simulated using the steady-state model to define streamflow impairment. Five of those scenarios were also investigated with the transient model, and the two scenarios with the highest impacts on the Puyallup and White Rivers were re-modeled when the total additive Qa was changed from 342.75 to 377.75 acre-feet. Model results were examined for impacts within 5 miles of Sumner's wells. The closed or instream flow regulated water bodies within the area of interest are listed in Table 1.

**Table 1. Regulated Surface Waters from WAC 173-509 and WAC 173-510 within the Study Area**

| WRIA | Watershed | Waterbody | Status | Period of Closure or Regulation |
|---|---|---|---|---|
| 9 | Green River | Green River | minimum in-stream flows | no closure, year-round instream flow regulation |
| | | All tributaries of the Green River | closed | year round |
| 10 | Puyallup River | Puyallup River | minimum in-stream flows | no closure, year-round instream flow regulation |
| | | Van Ogle Creek | minimum in-stream flows | no closure, year-round instream flow regulation |
| | | Unnamed Spring (T20N/R4E/35 SENE) | closed | year round |
| | | Clarks Creek | closed | year round |

| | | | | |
|---|---|---|---|---|
| | | White River and all tributaries | closed | year round |
| | | Salmon Creek | closed | year round |
| | Puget Sound | Hylebos Creek | closed | year round |
| | | Wapato Creek | closed | year round |

Of the 11 pumping scenarios investigated, five were found to have impacts on the White River of more than 800 afy. The City is proposing, under the new water rights, to only use the wells in line with the four of the six lowest impact scenarios (due to operational concerns, the City cannot use the remaining two of the six lowest impact scenarios).

Tables 2a and 2b, below, list the maximum (most negative) change in groundwater contribution to stream baseflow within particular stream segments for the four scenarios to be used by the City. Negative numbers represent declines in groundwater baseflow contributions, and positive numbers represent increases in groundwater contributions to baseflow. Bold numbers represent changes in groundwater contributions above the modeling uncertainty limit and non-bold numbers fall beneath the uncertainty limit.[2]

**Table 2a. Highest Monthly Change in Groundwater Contribution to Baseflow from Scenarios P2, P5, P6, or P10 af**

| Stream/Month | White above RM 5 | White RM 2.3 - 5 | White below RM 2.3 | Puyallup above confluence | Puyallup below confluence | Hylebos and Wapato | Green |
|---|---|---|---|---|---|---|---|
| October | -2 | **-9** | **-80** | -2 | **6** | 0 | 0 |
| November | -2 | **-9** | **-59** | -2 | **3** | 0 | 0 |
| December | -2 | **-9** | **-45** | -3 | 2 | 0 | 0 |
| January | -2 | **-8** | **-43** | -2 | 1 | 1 | 0 |
| February | -1 | **-7** | **-39** | -1 | 1 | 0 | 0 |
| March | -2 | **-8** | **-41** | -1 | 1 | 0 | 0 |
| April | -1 | **-7** | **-42** | -1 | 0 | 0 | 0 |
| May | -1 | **-8** | **-54** | -1 | 2 | 0 | 0 |
| June | -1 | **-8** | **-69** | -1 | **6** | 0 | 0 |
| July | -2 | **-10** | **-85** | -1 | **10** | 0 | 0 |
| August | -2 | **-11** | **-98** | -1 | **13** | 0 | 0 |
| September | -2 | **-10** | **-92** | -1 | **11** | 0 | 0 |
| Annual Total | -18 | **-103** | **-746** | -17 | **56** | 1 | 0 |

[2] The uncertainty limits are defined as less than 3 acre-feet per month, see Terraphase (2024b).

*RM = river mile*

**Table 2b. Highest Monthly Change in Groundwater Contribution to Baseflow from Scenarios P2, P5, P6, or P10 (cubic feet per second [cfs])**

| Stream/Month | White above RM 5 | White RM 2.3 - 5 | White below RM 2.3 | Puyallup above confluence | Puyallup below confluence | Hylebos and Wapato | Green |
|---|---|---|---|---|---|---|---|
| October | -0.03 | -0.15 | -1.30 | -0.03 | 0.09 | 0.00 | 0.00 |
| November | -0.03 | -0.15 | -0.99 | -0.04 | 0.05 | 0.00 | 0.00 |
| December | -0.03 | -0.14 | -0.73 | -0.04 | 0.03 | 0.00 | 0.00 |
| January | -0.03 | -0.13 | -0.70 | -0.03 | 0.02 | 0.02 | 0.00 |
| February | -0.02 | -0.12 | -0.70 | -0.02 | 0.02 | 0.00 | 0.00 |
| March | -0.02 | -0.12 | -0.67 | -0.02 | 0.01 | 0.00 | 0.00 |
| April | -0.02 | -0.12 | -0.71 | -0.02 | 0.01 | 0.00 | 0.00 |
| May | -0.02 | -0.12 | -0.88 | -0.01 | 0.03 | 0.00 | 0.00 |
| June | -0.02 | -0.14 | -1.15 | -0.01 | 0.10 | 0.00 | 0.00 |
| July | -0.03 | -0.16 | -1.39 | -0.01 | 0.17 | 0.00 | 0.00 |
| August | -0.03 | -0.18 | -1.59 | -0.02 | 0.21 | 0.00 | 0.00 |
| September | -0.03 | -0.17 | -1.55 | -0.02 | 0.18 | 0.00 | 0.00 |
| Annual Total | -0.03 | -0.14 | -1.03 | -0.02 | 0.08 | 0.00 | 0.00 |

*RM = river mile*

Changes in groundwater contributions to Van Ogle Creek, the unnamed spring regulated by WAC 173-510, Clarks Creek, Salmon Creek, and other tributaries of the White and Puyallup Rivers were not analyzed separately. Baseflow changes to Van Ogle Creek are included with the Puyallup River above the confluence. Changes in the unnamed spring and Clarks Creek are included with the Puyallup River below the confluence. Changes in Salmon Creek are included with the White River below river mile 2.3.

Table 3 shows the maximum (most negative) total change in baseflow for the White and Puyallup Rivers at the indicated location. These values represent the sum of all the changes in groundwater contributions upstream from the indicated locations.

**Table 3. Highest Monthly Change in Baseflow for the White and Puyallup Rivers from Scenarios P2, P5, P6, or P10**

| Stream/Month | White at confluence | | Puyallup at mouth | |
|---|---|---|---|---|
| | af | cfs | af | cfs |
| October | -91 | -1.47 | -87 | -1.41 |
| November | -69 | -1.16 | -68 | -1.14 |

**Table 3. Highest Monthly Change in Baseflow for the White and Puyallup Rivers from Scenarios P2, P5, P6, or P10**

| Stream/Month | White at confluence | | Puyallup at mouth | |
|---|---|---|---|---|
| | af | cfs | af | cfs |
| December | -55 | -0.90 | -56 | -0.91 |
| January | -53 | -0.86 | -53 | -0.87 |
| February | -47 | -0.84 | -47 | -0.85 |
| March | -50 | -0.81 | -51 | -0.82 |
| April | -51 | -0.85 | -51 | -0.86 |
| May | -63 | -1.03 | -62 | -1.01 |
| June | -78 | -1.32 | -73 | -1.23 |
| July | -97 | -1.58 | -87 | -1.42 |
| August | -110 | -1.80 | -99 | -1.60 |
| September | -104 | -1.74 | -95 | -1.59 |
| Annual Total | -867 | -1.20 | -829 | -1.15 |

## Mitigation Plan

Under RCW 90.94.090, water resource mitigation pilot projects can use a three-tiered, sequenced approach for mitigation of impairment to minimum instream flows and closed surface water bodies. Specifically, RCW 90.94.090(9) requires mitigation to follow the following sequence:

> *(a) Avoiding impacts by: (i) Complying with mitigation required by adopted rules that set forth minimum flows, levels, or closures; or (ii) making the water diversion or withdrawal subject to the applicable minimum flows or levels; or*
>
> *(b) Where avoidance of impacts is not reasonably attainable, minimizing impacts by providing permanent new or existing trust water rights or through other types of replacement water supply resulting in no net annual increase in the quantity of water diverted or withdrawn from the stream or surface water body and no net detrimental impacts to fish and related aquatic resources; or*
>
> *(c) Where avoidance and minimization are not reasonably attainable, compensating for impacts by providing net ecological benefits to fish and related aquatic resources in the water resource inventory area through in-kind or out-of-kind mitigation or a combination thereof, that improves the function and productivity of affected fish populations and related aquatic habitat. Out-of-kind mitigation may include instream or out-of-stream measures that improve or enhance existing water quality, riparian*

> *habitat, or other instream functions and values for which minimum instream flows or closures were established in that watershed.*

The City's mitigation plan follows the mitigation sequencing process under RCW 90.94.090. Under tiers 2 and 3, the City will provide mitigation that is conservative and provides a margin of safety.

## Tier 1: Avoidance

The first mandated level of mitigation is avoiding impacts. As the first level of avoidance, Sumner's water system is practicing conservation to lower the water demand. The amount of new water the City is seeking under water right G2-30534 is being reduced by conservation to a request of 377.75 afy from the amount applied for on the application, 1,580 afy.

As demonstrated by the modeling and discussed above, different pumping scenarios can result in different levels of impact. The steady-state modeling (Terraphase 2024a) simulated 11 different well production scenarios thought to represent the full range of possible pumping configurations from Sumner's wells and springs. Five of the scenarios were found to have higher amounts of negative impacts to surface waters than the other six scenarios. Due to operational concerns, the City cannot use two of the remaining six scenarios. Consequently, to avoid streamflow impacts to the degree possible under the proposed water rights, the City will only operate its wells within the range of the remaining four scenarios. The maximum annual production values allowed by well are listed in Table 4.

**Table 4. Annual Well Production Limits under Tier 1 Mitigation (afy)**

| Well | Maximum Scenario Production | Notes and Production Limits under the Mitigation Plan |
|---|---|---|
| Sumner Springs | 1,325.14 | Spring sources using full existing water right |
| Crystal and County Springs | 908.86 | |
| West Well | 30.00 | Production for irrigation of the City Cemetery only |
| South Well | 542.00 | Total production between South and Central Wells is limited to 921 afy; South Well production cannot exceed 532 afy unless Central Well production is less than 354.00 afy |
| Dieringer Well | 135.52 | Production limited to 75 afy if the Central Well produces more than 283.48 afy |
| Central Well | 821.00 | Total production between South and Central Wells is limited to 921 afy |
| | | Total production up to 3,260 afy |

For the well production limits, as listed in Table 4, additional avoidance of impairment is not reasonably attainable because the City is required by state law to plan for and accommodate future population growth, and such planning identifies the need for an additional supply. While an interruptible water supply could potentially avoid impairment of the Puyallup River since it has minimum instream flows, the White River and its tributaries are fully closed. Further, interruptible water supplies are not an

option for a public water system that is mandated under state and local law to provide adequate water. Therefore, impairments caused by the new and changed water rights, using the production limits in Table 4, must be minimized by tier 2 mitigation if it is reasonably attainable, or compensated by out-of-kind or out-of-place mitigation if tier 2 mitigation is not reasonably attainable.

## Tier 2: Minimization

The second mandated level of mitigation is minimizing impacts by providing permanent replacement water. This water must be in-kind, in-time, and in-place relative to the impairments. Five methods of providing tier 2 mitigation were investigated (Table 5). The investigation concluded that only a portion of the White River, and then only in May through August, can be fully mitigated by the reasonably attainable tier 2 mitigation. The rest of the White River and the Puyallup River below the confluence can only be partially mitigated with tier 2 mitigation.

**Table 5. Tier 2 Mitigation Strategies Investigated**

| Mitigation Strategy | Comments |
|---|---|
| Trust Water Rights | Acquire perfected water rights and permanently donate to the Washington Trust Water Rights Program (Trust) |
| CWA Regional Reserve Water | Initially considered to be available when flows in the White River are above minimum instream flows established in water right permit S2-29920(B) |
| Lake Tapps Tail Race Water | Purchase of discharge water from Lake Tapps |
| Stream Augmentation | Direct replacement water derived from municipal water supplies |
| Permit-exempt Well Replacement | Connecting homes currently using exempt wells to the municipal water supplies to reduce withdrawals from shallow aquifers |
| Shallow Well Replacement with Deep Sources | This strategy is partially built into the proposed water rights through the change applications with moving some shallower production to deeper wells; other options (beside using the City's wells) were examined |

### Reasonably Attainable Tier 2 Methods

Only one tier 2 mitigation method was deemed reasonably attainable. It is incorporated into the mitigation plan and is described below.

#### Trust Water Rights Controlled by the City

A donation to the Trust can provide mitigation by acquiring and retiring water rights, which reduces water use and increases stream flows. The City controls three surface water rights that are currently in temporary trust status. Change applications to place these rights into permanent trust status are currently being prepared and processed. In addition, Sumner executed a purchase and sale agreement with Sonoco Products Company to purchase two additional ground water rights located near the Central Well. Water right change applications are also currently being prepared and processed for these rights. As part of the mitigation plan, these five rights will be permanently placed into the Trust to provide mitigation for the new water rights (Table 6). Pending confirmation of scope and validity determinations

made when the change applications are processed, these donations will provide a total of 312.4 af of mitigation to the White River and the Puyallup River below the confluence. The amount available varies monthly, but most of the donations will occur between April and September (Table 7). The acquisition of additional trust water rights was deemed not reasonably attainable (see below).

**Table 6. Water Rights Proposed for Permanent Trust Donation**

| Water Right | Quantity Available | | Period Available | Effective Mitigation Area | Current Status and Notes |
|---|---|---|---|---|---|
| | Qi | Qa | | | |
| CS2-SWC3752, Sumner Golf Course | 0.76 cfs | 90.3 af[a] | April – September[b] | White River downstream from RM 5.0, Puyallup River downstream of confluence with the White River | Accepted into temporary Trust on August 1, 2014; change application to place permanently into Trust in process |
| CS2-SWC11173(B), Ota/Perfield | 0.19 cfs | 38.6 af | April 15 – October 1 | White River downstream from RM 2.3, Puyallup River downstream of confluence with the White River | Accepted into temporary Trust on August 7, 2013; change application to place permanently into Trust in process |
| CS2-SWC2451, Ota/Clerget | 0.16 cfs | 29.51 af[c] | April – September[b] | White River downstream from RM 2.3, Puyallup River downstream of confluence with the White River | Accepted into temporary Trust on January 11, 2012; change application to place permanently into Trust in process |
| G2-*00332SWRIS, Sonoco Products Co. | 700 gpm[d] | 180 af[d] | Year round | White River below RM 2.3 and Puyallup River[e] | Purchase agreement executed, change applications for trust donation in process |
| G2-*00333SWRIS, Sonoco Products Co. | | | | | |

[a] *Qa listed as 90.3 af on the certificate and trust application. The water rights tracking system (WRTS) lists the Qa as 90.03 af. This appears to be a data entry error.*

[b] *Estimated season (see text); dates not specified on the water rights documents.*

[c] *No Qa listed on WRTS, the underlying certificate (02451 S2*06789 C), nor on the temporary trust application. However, evidence of beneficial use of 29.51 afy through 2009 is available.*

[d] *The Qi and Qa for these two rights are listed on their certificates as 700 gpm and 1120 af. Evidence suggests recent beneficial use may have been limited to 180 afy; this amount will need to be confirmed through the trust donation process.*

[e] *Simulation of the Sonoco well in the SES Model at an annual production of 180 af, placing the well in the same aquifer as the Central Well (aquifer C) indicated impacts in the White River below RM 2.3 and in the Puyallup River above the confluence with the White River. Should the Qa available for trust donation be more than 180 af, the effective mitigation area may extend further upstream on the White River.*

The Sumner Golf Course water right (CS2-SWC3752) is an irrigation right for 0.76 cfs and 90.3 af from the White River with an underlying priority date of August 8, 1949. The period of use is not specified on

the water right certificate, but it is estimated to be from April to September based on the crop irrigation requirement for turf grass at Puyallup from Appendix B of the Washington State Irrigation Guide (U.S. Dept. of Agriculture 1997). The right is now temporarily in the Trust but will be moved to permanent status as tier 2 mitigation. This right will provide tier 2 mitigation for the White River below river mile 5 and the Puyallup River below the confluence with the White River. The amount of mitigation provided per month (calculated from the Washington State Irrigation Guide Appendix B [U.S. Dept. of Agriculture 1997]) ranges from 4.7 af in April to 26.1 af in July (Table 7).

**Table 7. Monthly Mitigation Quantities for Proposed Trust Donations (af)**

| **Surface Water Rights** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **April** | **May** | **June** | **July** | **August** | **September** | **Annual Quantity** |
| Monthly Percent[a] | 5.2% | 14.5% | 19.1% | 28.9% | 20.4% | 11.9% | 100% |
| CS2-SWC3752, Sumner Golf Course | 4.7 | 13.1 | 17.2 | 26.1 | 18.5 | 10.7 | 90.3 |
| CS2-SWC11173(B), Ota/Perfield | 2.0 | 5.6 | 7.4 | 11.2 | 7.9 | 4.6 | 38.6 |
| CS2-SWC2451, Ota/Clerget | 1.5 | 4.3 | 5.6 | 8.5 | 6.0 | 3.5 | 29.51 |
| Sub-total | 8.3 | 22.9 | 30.2 | 45.8 | 32.4 | 18.8 | 158.41 |

| **Ground Water Rights** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Annual Quantity** |
| G2-*00332SWRIS, G2-*00333SWRIS, Sonoco Products Co. | 13 | 12 | 13 | 13 | 13 | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 154 |

| **Total both Surface and Ground Water Rights** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Annual Quantity** |
| Total | 13 | 12 | 13 | 21.3 | 35.9 | 42.2 | 58.8 | 45.4 | 31.8 | 13 | 13 | 13 | 312.41 |

[a] *Based on crop irrigation requirement for turf grass from Appendix B of the Washington State Irrigation Guide (U.S. Dept. of Agriculture 1997).*

The Perfield right (CS2-SWC11173(B)) is an irrigation right for 0.19 cfs and 38.6 af from diversions on the White River and Salmon Creek with a period of use from April 15 to October 1 and a priority date for the original certificate of September 9, 1952. The right is now temporarily in the Trust but will be moved to permanent status as tier 2 mitigation. This right will provide tier 2 mitigation for the White River below

river mile 2.3 and the Puyallup River below the confluence with the White River. The amount of mitigation provided per month ranges from 2.0 af in April to 11.2 af in July (Table 7).

The Clerget right (CS2-SWC2451) is an irrigation right for 0.16 cfs from a diversion on the White River[3] with an underlying priority date of November 28, 1945. The water right certificate does not list an annual quantity nor a period of use. Evidence of beneficial use for this right indicates the perfected Qa is 29.51 af and the period of use is estimated (based on the Washington Irrigation Guide) as April through September. This right will provide tier 2 mitigation for the White River below river mile 2.3 and the Puyallup River below the confluence with the White River. The amount of mitigation provided per month ranges from 1.5 af in April to 8.5 af in July (Table 7).

The Sonoco Products Company (Sonoco) rights (G2-*00332SWRIS, G2-*00333SWRIS) are year-round groundwater rights for 700 gpm and 1,120 af for manufacturing use with a 1915 priority date. The Sonoco plant, which recently closed, produced cardboard boxes using water from a well located approximately 600 feet north and 300 feet east of the Central Well. The well is completed between 376 and 426 feet below ground surface, which is slightly higher than the Central Well but within the same aquifer. In a preliminary investigation by the City, data was obtained indicating a maximum annual withdrawal of 180 afy of these water rights in the last five years. A scope and validity analysis confirming the maximum annual withdrawal in the past five years will be completed as part of the water right change process. However, for the purposes of this document, the amount is assumed to be 180 afy. Groundwater modeling of the Sonoco rights indicate cessation of the annual production of 180 af (production assumed to be constant throughout the year) results in improvement of flows in the White River below river mile 2.3 of 11 to 12 af per month and in the Puyallup River above the confluence of 1 af per month (Table 7). The City recently purchased these water rights and will place them permanently into the Trust to provide tier 2 mitigation.

## Non-Reasonably Attainable Tier 2 Methods

Five additional tier 2 mitigation methods were investigated but appeared not to be reasonably attainable. These are discussed below.

### Cascade Water Alliance Regional Reserve Water (RRW)

The CWA maintains water rights on the White River in relation to the river diversion that maintains water levels in Lake Tapps (and will, in the future, also provide water supply for the CWA). Sumner, along with three other cities (Auburn, Bonney Lake, and Buckley), are allowed by water right permit S2-29920(B) to acquire up to 10 cfs and 5,060 af (the total potential RRW) of CWA's White River right for mitigation purposes in the main stem White River downstream from the diversion at river mile 24.3. Sumner is eligible to acquire up to an average annual flow of 0.65 cfs and a peak flow of 1.0 cfs of the RRW.

[3] The right is actually for a diversion on the Stuck River. During a flood in 1906, the bank separating the White and Stuck Rivers was eroded, and the White River appropriated the Stuck River channel.

Sumner was interested in using the RRW as tier 2 mitigation, and toward that end, the City applied for and received a Streamflow Restoration grant from Ecology. However, when reviewing the option of the City using the RRW for mitigation, Ecology determined there were no legally viable methods to move the project forward. Consequently, in late 2025, Ecology informed the City the grant was not available, and in early 2026 the grant was closed out by Ecology. Without the availability of the streamflow restoration grant, use of the RRW is considered not reasonably attainable. Other Trust Water Rights

Other than the rights discussed above, the City has determined that no other rights are reasonably available for acquisition as tier 2 mitigation. Several years ago, Sumner staff and their outside legal counsel reviewed other potential tier 2 replacement water sources. Concerning this review, the City's outside legal counsel reports:

> *"Sumner did not consider it necessary to hire a consulting firm to survey the availability and attainability of additional water rights for mitigation because a similar survey was conducted by Washington Water Trust and Blue Water GIS in 2020 for Ecology as part of the WRIA 10 streamflow restoration planning process. That process was required by the 2018 Streamflow Restoration Act (Chapter 90.94 RCW), which designated WRIA 10 as one of the watersheds for which Ecology was required to plan for offsetting instream flow impacts from a 20-year forecast of permit-exempt well development in the basin. This WRIA 10 due diligence assessment investigated nearly 3,900 water right records in Ecology's database to find suitable water rights for potential acquisition for streamflow restoration purposes. The June 29, 2020 WRIA 10 Puyallup-White Priority Water Right Projects Report identified only 3 water rights in the White River-Boise Creek basin for prioritized acquisition review, which involves contacting water right owners. Ecology's final Watershed Restoration and Enhancement Plan WRIA 10 - Puyallup-White Watershed (June 2021, Publication 21-11-010) indicates that these water rights were discussed but not selected for acquisition as part of the first tier of projects to meet the Net Ecological Benefit requirements for the watershed. Based on this Ecology-sponsored due diligence and selection process, and a review with legal counsel about the likelihood of acquiring any of the identified water rights for Tier 2 mitigation, Sumner determined that none of the identified water rights were reasonably available for acquisition by the City as Tier 2 mitigation. " (T.M. Pors 2024; attached as Appendix A).*

The City also investigated the possibility of purchasing Riverside 5 LLC water right, certificate 11173(A), which was accepted into the Trust in 2012. In 2020, the City sent a letter to Riverside 5 LLC seeking information about the status of the right and whether it was available for purchase. Pors (2024) reports there was no response to the City's letter and, therefore, the use of this right for tier 2 mitigation is not reasonably available.

### Lake Tapps Tail Race Water

Currently, between 10 and 20 cfs of water is delivered from Lake Tapps to the White River through the Lake Tapps tailrace. Between 2019 and 2024, Sumner was in negotiations with CWA for the acquisition of Lake Tapps tailrace water (TRW) to be used not only as tier 2 streamflow replacement but also for tier 3 habitat mitigation and for the City's lower White River habitat project (LWRHP). After discussions

CWA, Ecology, and the Muckleshoot Indian Tribe, use of CWA's water rights as delivered through the tailrace was determined to not be reasonably attainable for various reasons (see Attachment A). Additionally, the current TRW is interruptible during planned maintenance periods. And further, after CWA completes its planned, future infrastructure upgrades to deliver municipal water to its members, the tailrace discharge will likely cease. Consequently, use of the TRW for tier 2 mitigation is deemed not reasonable attainable.

### Stream Augmentation

The City could potentially provide streamflow augmentation for the White River below river mile 2.3 and the Puyallup River below the confluence by allowing Sumner, Crystal, and County Springs to discharge to Salmon Creek rather than be used for municipal supply. This is already being done on a limited basis (90.03 afy) under the temporary water use permit for CG2-21980 and CG2-23281. However, the springs currently form the primary water supply source for the City's water system, and at full build out, the City will require the full water right amount from the springs. The City's water system is engineered to use the springs as the primary water supply source. As such, removing 867 af or more from the spring flow to the water system to provide stream augmentation mitigation is not practical. Additionally, shifting spring production to stream augmentation would require additional, offsetting production from the Central Well, which in turn would lead to further impacts. For these reasons, and with no other sources to provide streamflow augmentation, the City considers this option as not reasonably available.

### Permit-exempt Well Retirement

Water right permit-exempt wells are typically completed in shallow aquifers, which more readily provide discharge to streams than wells in deeper aquifers. Therefore, replacing exempt wells with service from municipal purveyors can provide additional baseflow to streams. While existing exempt wells in WRIA 10 are allowed a production up to 5,000 gallons per day (gpd),[4] few exempt wells produce this amount. Further, much exempt-well water use is returned to the groundwater system through septic drain fields and irrigation return flow. Consequently, the consumptive use for exempt wells is, on average, less than 100 gpd or less. Welch (2024) estimated that the single-domestic well use per person is 82 gpd for indoor use and ranges between 2 and 73 gpd for outdoor use between April and October (with 0 gpd outdoor use the rest of the year). Return flow was estimated at 90 percent for indoor use and 20 percent for outdoor use. Consequently, on average over the year, consumptive use is estimated at approximately 24 gpd. Welch (2024) also estimated there are 2.51 people per residential parcel in the area. Therefore, the annual consumptive use per exempt well is approximately 60 gpd.

Assuming each exempt well retirement provides 60 gpd of mitigation, to fully mitigate for a reduction in baseflow of the White River of 867 afy (Table 3), approximately 12,900 exempt wells would need to be retired. Considering there are only an estimated 33,073 single domestic wells in all unincorporated Pierce County (Pierce County 2024), it is highly unlikely that 12,900 exempt wells exist in the Group A

[4] New permit-exempt wells are now limited to a maximum annual average of 950 gpd under the WRIA's watershed plan.

service areas within the study area. Further, the cost to replace that many exempt wells would be prohibitive, estimated at upwards of $600 million.

### Shallow Well Replacement with Deep Sources

Replacing a shallow production well with a well completed in a deeper aquifer can reduce impacts on streams, particularly streams close to the source wells. And indeed, the steady-state modeling showed that at the Central Well location, production from aquifer E produces much less impact on the White and lower Puyallup Rivers than production from aquifer C (Terraphase, 2024a).

All known deep wells in the Sumner area produce from aquifers C or E. It is unknown whether there is a productive aquifer in the undifferentiated unit G in the Sumner area. The Central Well was drilled to be a deep aquifer source. At construction, Robinson Noble (RN) interpreted the well to be completed in aquifer E. Later, Pacific Groundwater Group made the same interpretation (Pacific Groundwater Group, 2016). Through the work on this project, Terraphase agrees with the aquifer E interpretation for the well. However, the USGS placed the Central Well to be in aquifer C within the SES model.

Since the local hydrogeology already supports that the Central Well is completed in aquifer E and there is no known expression of a deeper aquifer present in unit G near the site, it is not reasonable to drill a deeper well to replace the Central Well. Additionally, if a deeper well was an option, it would still cause impacts that could not totally be mitigated by tier 2 methods.

## Tier 3 Compensation

Sumner is constructing the LWRHP to improve habitats on the White River. A portion of that project, the Ditch 9 channel remeandering, is dedicated to providing tier 3 mitigation. Environmental Science Associates (ESA), a member of the City's consultant team, reviewed the Ditch 9 portion of the LWRHP designated for tier 3 mitigation for viability and conducted a net ecological benefit (NEB) analysis to determine whether it adequately compensates for impacted stream flows not covered by tier 2 mitigation (ESA 2026; Attachment B). ESA based its analysis on Ecology's 2019 *Final Guidance for Determining Net Ecological Benefit*.

Currently, Ditch 9 is a straight channel of approximately 850 feet in length near the lower end of the LWRHP, flowing into the White River at approximately river mile 2.8. The ditch is a straight trapezoidal channel with little riparian habitat, and there is a partial fish passage barrier in the ditch approximately 550 feet upstream from the river. Additionally, the ditch outlet is perched above the White River such that the ditch channel does not regularly backwater. The mitigation project will meander the ditch, remove the fish passage barrier, add large woody debris, and ensure the ditch is connected into the main stem White River during all seasons. The project will increase the total wetted area the ditch, and in low flow conditions will provide about 1,100 feet of meandering, low gradient, low velocity habitat. It will provide a low velocity refuge for fish and provide habitat for juvenile salmonids throughout the year (ESA 2026).

ESA incorporated many conservative assumptions (assumptions that overestimate the wetted area deficit resulting from the proposed water rights; see ESA 2026, Appendix B, for details), within their

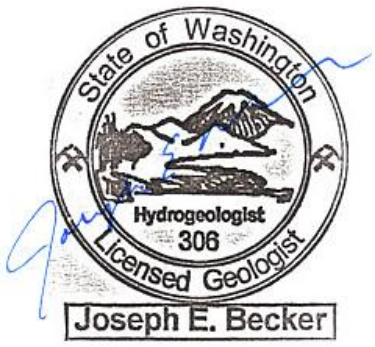
analysis, including that no tier 2 mitigation was available. With these conservative assumptions, the total wetted area debit resulting from the new water rights was calculated at 0.18 acres. Again, using conservative assumptions (assumptions that underestimated the benefits of the mitigation), the analysis indicates the Ditch 9 improvements result in weighted area credits of 0.9 acres during typical summer low flows (590 cfs), 0.23 acres during typical winter baseflows (1,000 cfs), and 0.38 acres during typical spring runoffs (2,000 cfs). On average over the entire year, the credit is 0.24 acres, and the balance between debits and credits is 0.15 acres. Therefore, NEB is achieved.

## Timing of Mitigation

Most of the mitigation will be available and active either this year or next. The trust water rights, other than the Sonoco rights, are currently owned by the City and are being moved from temporary to permanent Trust status. The City has purchased the Sonoco rights but the sale is contingent on the issuing of water right permits for the change applications, which are being prepared and processed. Construction on the tier 3 mitigation (the Ditch 9 project) began in the summer of 2025 and will be finished in 2026.

As full use of the proposed water rights will not occur for several decades, initially after the permits are issued, impacts on the regulated waters will be small. Because most the tier 2 mitigation will be active before the permits are issued, and likely the tier 3 mitigation as well, any small impacts that occur when beneficial use of the permits begins will be more than offset. The full mitigation package will be in place and active decades prior to the full impacts occurring.

Joseph E. Becker, LHG
Senior Principal Hydrogeologist
Terraphase Engineering, Inc.

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Attachments (2):

A Update to Pilot Project Mitigation Strategy and Acquisition Efforts Memorandum
B City of Sumner Foster Pilot Project Net Ecological Benefits Analysis

terraphase engineering

# Attachment A

## Update to Pilot Project Mitigation Strategy and Acquisition Efforts Memorandum

# Law Office of Thomas M. Pors

## MEMORANDUM

TO: Andrea Marquez, Mike Dahlem, Michael Kosa, Robbie Wright, Doug Beagle, Gursimran Singh, City of Sumner

CC: Joe Becker, Robinson Noble

FROM: Thomas M. Pors

SUBJECT: Update to Pilot Project Mitigation Strategy and Acquisition Efforts

DATE: December 5, 2024

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This memo describes Sumner's mitigation assets and efforts to acquire additional mitigation to satisfy the Pilot Project mitigation sequencing standards.

**1. Pilot Project Mitigation Sequence.** The Sumner's applications are being processed under the ESSB 6091, Part 3 mitigation sequence (RCW 90.94.090(9)) in lieu of the standard 4-part test for water right permits.

- The 3-tiered mitigation sequence and related findings are illustrated on the attached schematic diagram. *See detailed discussion of mitigation tiers below*.

- Sumner's primary Tier 1 (avoidance) mitigation is conservation and water use efficiency.

- Sumner's Tier 2 (in-kind minimize/replace) mitigation is a portfolio of existing water rights including Regional Reserved Water (RRW) and several surface water rights held in the Trust Water Program. Efforts to acquire additional water rights for mitigation from Sonoco Products Company are on-going.

- Sumner's primary Tier 3 (out-of-kind compensation) mitigation is the LWRHP. Tier 3 mitigation is required because Sumner lacks Tier 2 replacement water for the mainstem White River at all times and in all locations.

- A final mitigation plan will be prepared based upon the impact analysis by Robinson Noble using the new USGS regional groundwater model.

**2. Notes re Availability of Mitigation Water and the RRW Winter Gap**.

- Sumner has an agreement in place (2010 Lake Tapps Area Water Resources Agreement) to acquire 0.65 cfs average flow/1.0 cfs peak flow of RRW from Cascade Water Alliance (Cascade). Sumner has grant funding from Ecology in place for this acquisition. Cascade confirmed that no additional agreement is

required to complete this RRW acquisition, but the purchase is conditioned upon Ecology's final approval of Sumner's applications.

- RRW is not available year-round; it has mitigation benefit only when minimum flows in the White and Puyallup Rivers are met. Sumner has temporary trust water rights perfected as irrigation water rights from the mainstem Lower White River which are available for mitigation during the irrigation season. This leaves a weather/flow dependent gap in Sumner's mainstem mitigation during late fall through mid-spring when minimum flows are not met (the "RRW Winter Gap").

**3. Sumner's Trust Water Portfolio[1]**

- Sumner Golf Course, temporary trust water right CS2-SWC3752; 0.76 cfs/90.3 AFY, for irrigation of 76 acres[2]

- Ota/Perfield temporary trust water right Cert. 11173(B), 0.19 cfs/38.6 AFY for irrigation of 19.5 acres

- Ota/Clerget temporary trust water right CS2-SWC2451; 0.16 cfs/29.51 AFY.

**4. Negotiations with Cascade for Mitigation Water**.

- Sumner negotiated with Cascade for acquisition of Lake Tapps Tail Race Water (TRW) for three potential purposes: (1) for hydrating the LWRHP wetlands; (2) for instream flow replacement water to cover the RRW Winter Gap; and (3), for additional Tier 3 instream flow habitat benefits. These negotiations included meetings and videoconferences and numerous phone calls and emails between officials and legal counsel for Cascade and Sumner between April 2019 and January 2024.

- The Sumner/Cascade negotiations were affected by a review from Ecology interpreting Cascade's water rights and limiting their availability for mitigation purposes. Sumner and Cascade posed several questions to Ecology about the use of Cascade water rights to supply various mitigation uses associated with Sumner's pilot project applications and the LWRHP. Ecology responded by letter dated September 27, 2021 to Sumner's attorney Thomas Pors which is included in the Appendix. Ecology responded that:

    - Regarding a use of 0.1 cfs of TRW to permanently hydrate LWRHP wetlands, only the use of Cascade's municipal permit S2-29920(A) could be used without the need to file a change application. The amended claim

[1] Water right change applications will be filed to change the purpose of use of these irrigation rights to mitigation and instream flow, and the rights will be deeded to Ecology's Trust Water Program in fulfillment of conditions of approval of the Pilot Project applications.

[2] This temporary trust water right is currently mitigating for the Central Well temporary water right under CG2-21980 and CG2-23281. A permanent trust water transfer will made following approval of the Pilot Project applications to conform to the approved mitigation plan.

Certificate of Change S2-CV1-2P168(B) could only serve as a source of water for the LWRHP if Cascade applied to amend the water right because the tailrace and habitat project is outside the place of use.

- Regarding the use of Cascade water rights as a source to augment streamflows in the White River for in-kind mitigation, the amended claim is a viable source but a change application would be necessary because the purpose of use of the amended claim does not include mitigation for new water uses. Also, Cascade's municipal permit S2-29920(A) "is not a viable source of mitigation water" because leaving inchoate water instream or diverting it from the White River only to discharge it back to the same river does not provide the benefits required to qualify as municipal use under RCW 90.03.550, therefore mitigation would have to be added as a purpose of use and "RCW 90.03.380 does not allow changes to add new purposes of use to inchoate water rights."

- In an April 21, 2022 meeting, confirmed by a May 9, 2022 email from Cascade attorney Adam Gravley, Cascade determined not to pursue an amendment to its water right claim S2-CV1-2P168(B) to enable Sumner to cover the RRW Winter Gap, based on climate change and future unavailability of this source of water to fulfill Sumner's needs. See Appendix A.

- Cascade was initially willing to negotiate the sale of a portion of their municipal permit S2-29920(A) for purposes of hydrating LWRHP wetlands, but negotiations for a purchase price and conditions relating to future availability after Cascade's changeover of Lake Tapps operations to municipal supply rendered this source of water not reasonably attainable. Similarly, Cascade's proposed pricing terms and future availability conditions rendered reasonably unavailable a water supply contract for the same mitigation purposes.

- In 2022, Sumner and the Muckleshoot Indian Tribe also proposed alternatives to Cascade for a future continuous 10 to 20 cfs flow through the Cascade Tailrace to provide habitat and instream flow benefits through the LWRHP. This included authorizing 10 cfs of the existing 20 cfs fish screen flow to the Tailrace and authorizing 10 cfs diversion for Tailrace flow-through from the amended Claim or as part of Cascade's permanent trust water right (CV2-160822CL@3). Cascade responded with an explanation of future water availability limitations and the need for reasonably unobtainable amendments to agreements, including Cascade's Trust Water Agreement with Ecology and the White River Management Agreement.

- On January 30, 2024, Sumner concluded negotiations with Cascade for additional mitigation water pursuant to letters to Ray Hoffman, Cascade CEO, and Councilmember Penny Sweet, Cascade's Board Chair. See Appendix B.

- To summarize the availability of Cascade water rights:

- Cascade's Claim (Certificate of Change S2-CV1-2P168(B)) is not reasonably available to Sumner for mitigation purposes because Ecology concluded that a water right change application would be needed to add "mitigation" as a purpose of use, and Cascade notified Sumner that it would not seek any changes to the Claim. Appendices A and B.

- Cascade's municipal permit S2-29920(A) is not reasonably available to Sumner for streamflow replacement mitigation purposes because Ecology concluded it was not a viable source of mitigation and the inchoate permit cannot be amended to add mitigation as a purpose of use. See Appendix B. . The municipal permit is also not reasonably available for Tier 3 mitigation purposes based on Cascade's pricing, membership and future availability conditions.

- A permanent Tailrace flow for mitigation purposes through either fish screen modifications or amendment of Cascade's Permanent Trust Water Right (CV2-160822CL@3) is also not reasonably available to Sumner because of future availability limitations and the need for multiple agency and third party approvals to alter Cascade's Trust Water Agreement and management of Lake Tapps.

- Tier 3 habitat water for wetland hydration: Due to other developments affecting the boundaries of the mitigation project, Sumner redesigned the LWRHP and no longer requires this future water supply.

- Tier 3 instream flow enhancement water: Any additional supply of TRW up to its current 20 cfs discharge appears to be either too speculative as to future availability after Cascade's future municipal changeover or too expensive to acquire at the Cascade membership rate.

5. **Other Tier 2 Mitigation and "Reasonably Attainable" Considerations.** The term "reasonably attainable" is not defined in ESSB 6091 but should account for the effort and expense of acquisition, limitations on future availability, and other uncertainties at the time of processing the Pilot Project applications.

    a. RRW. Ecology issued the RRW permit for this purpose and granted the City funds for the purchase of RRW. Therefore, it is presumed to be "reasonably attainable" replacement water mitigation, although minimum flow conditions create the Winter RRW Gap in availability described above.

    b. Trust Water Rights. These rights are already owned by the City and protected from relinquishment in the Trust Water Program, therefore they are attainable and useful for offsetting instream flow impacts in the mainstem river during the irrigation season.

    c. TRW. As explained above, the existing 10 to 20 cfs tail race discharge is interruptible for planned maintenance and will likely disappear when

Cascade upgrades infrastructure for delivering municipal water (year 2040 or later). Based on time and availability limitations and Cascade's pricing structure, this water source is not "reasonably attainable" for Tier 2 instream flow replacement mitigation.

d. Elhi and Sumner/Salmon Springs. The existing spring sources in the City's water right portfolio are its primary sources of municipal water supply. Bypassing them for instream flow mitigation purposes would only increase the City's future demands for groundwater and thus require additional mitigation, therefore they are not reasonably available as mitigation sources.

e. WRIA 10 Water Rights Assessment. Sumner staff and outside legal counsel reviewed other potential Tier 2 replacement water sources that came to light while this pilot project was pending. Sumner did not consider it necessary to hire a consulting firm to survey the availability and attainability of additional water rights for mitigation because a similar survey was conducted by Washington Water Trust and Blue Water GIS in 2020 for Ecology as part of the WRIA 10 streamflow restoration planning process. That process was required by the 2018 Streamflow Restoration Act (Chapter 90.94 RCW), which designated WRIA 10 as one of the watersheds for which Ecology was required to plan for offsetting instream flow impacts from a 20-year forecast of permit-exempt well development in the basin. This WRIA 10 due diligence assessment investigated nearly 3,900 water right records in Ecology's database to find suitable water rights for potential acquisition for streamflow restoration purposes. The June 29, 2020 WRIA 10 Puyallup-White Priority Water Right Projects Report identified only 3 water rights in the White River-Boise Creek basin for prioritized acquisition review, which involves contacting water right owners. Ecology's final Watershed Restoration and Enhancement Plan WRIA 10 - Puyallup-White Watershed (June 2021, Publication 21-11-010) indicates that these water rights were discussed but not selected for acquisition as part of the first tier of projects to meet the Net Ecological Benefit requirements for the watershed. Based on this Ecology-sponsored due diligence and selection process, and a review with legal counsel about the likelihood of acquiring any of the identified water rights for Tier 2 mitigation, Sumner determined that none of the identified water rights were reasonably available for acquisition by the City as Tier 2 mitigation.

f. Other Water Rights Investigated for Acquisition. The City examined the following opportunities to acquire other water rights for Tier 2 mitigation:

- Sonoco Products Company (Sonoco). The City contacted Sonoco in early 2024 after Sonoco announced the closure of its fibreboard manufactuting plan in Sumner and put its property (including water rights) up for sale. Sonoco owns two groundwater certificates for manufacturing (Certs. 290-D and 291-D) with a total quantity of 700

gpm and 1120 acre-feet/year. The authorized points of withdrawal and well logs indicate that Sonoco's water rights are from the same aquifer as the City's Central Well. In September 2024 the City sent Sonoco an offer to purchase these water rights for mitigation purposes, but negotiations have not been completed as of the date of this memo and the transferable quantity for instream flow mitigation purposes is currently unknown.

- Riverside 5 LLC. On May 11, 2012, Ecology acknowledged acceptance of a donation to the Trust Water Program by Riverside 5, LLC. The donation was a portion of Surface Water Right 11173(A) in the amount of 0.5 cfs and 60 acre-feet/year from the fallowing of 24 acres.[3] On January 6, 2020, the City sent a letter to Riverside 5, LLC requesting information about the status of this trust water right and whether it was available for purchase by the City to use as mitigation for its Pilot Project applications. Appendix C. There was no response from Riverside 5, therefore this water right is not reasonably available.

**6. Tier 2 "Mitigation Suitability" Considerations for Reasonably Available Sources**

a. RRW. RRW is suitable for all projected White River mainstem impacts and Puyallup River mainstem impacts below the confluence but is not suitable for tributary impacts. RRW is only available when minimum flows in the White and Puyallup Rivers are met, leaving the RRW Winter Gap outside the irrigation season.

b. Trust Water Rights. Sumner's trust water rights portfolio is available for mitigating streamflow impacts to the mainstem Lower White River during the irrigation season but they will only mitigate mainstem impacts downstream of their original point of withdrawal. Sumner will file water right change applications for its trust water rights to add mitigation and instream flow maintenance as a purpose of use. Those change applications will enable Ecology to determine the scope and validity of these rights and their mitigation suitability before accepting them as mitigation in the permanent Trust Water Program. See Ecology POL-1010, updated November 1, 2024.

c. Sumner/Salmon Springs. This source is currently being used in the winter season (October 1 to April 30) as partial mitigation for the Central Well temporary water right and is included in the pilot project conceptual mitigation plan as a Tier 2 mitigation source. To the extent the City continues to pump the Central Well in the winter season for purposes of maintaining a treatment system, it will free up a quantity of water

[3] The City acquired another portion of this water right, Cert, 11173(B), which is one of the temporary trust water rights in the City's portfolio of Tier 2 mitigation assets (see above).

historically diverted from Salmon Springs to Sumner's water system, resulting in some return flow to Salmon Creek and the White River. However, Sumner determined that this source is not reasonably available as a primary source for mitigating impacts to the mainstem White River because it is needed as the primary source for the municipal water system.

**7. Tier 3 Compensation NEB Considerations**

a. LWRHP. The Lower White River Habitat Project (LWRHP) began as a flood protection project but expanded to include habitat enhancements in consultation with the Puyallup Tribe of Indians and the Muckleshoot Indian Tribe. A lengthy dialogue process produced a project design that improves river migration and rearing channels and riparian habitat for salmon species of significance to the tribes and benefits for other endangered species including Orca whales. See Appendix D, Map of LWRHP. Sumner's consultant, ESA, is performing the NEB analysis of the LWRHP in consultation with the tribes, WDFW, and Ecology.

b. RRW. The Regional Reserved Water has no applicability to Tier 3 habitat improvements, but as Tier 2 mitigation it diminishes the number of unmitigated days per year in the main stem rivers for which Tier 3 compensation is needed. Because the availability of RRW limited due to minimum instream flow conditions, the NEB analysis will assume that LWRHP will provide Tier 3 compensating mitigation during a worst case scenario month when RRW is not available (e.g., September). This will render the mitigation plan and NEB analysis inherently conservative by providing additional mitigation even when RRW is available.

**8. Required Follow-up.**

a. RRW Grant Funding. Sumner was awarded a Streamflow Restoration Grant for acquisition of the RRW from Cascade. There are no conditions for closing on the purchase of the RRW from Cascade other than Ecology approval of a final ROE on Sumner's pilot project applications G2-30534A, CG2-21980C, and CG2-23281C and payment to Cascade of the negotiated purchase price.

b. Trust Water Change Applications. Ecology's POL-1010 (revised November 2024) requires water right change applications to qualify the Sumner's temporary trust water rights as permanent Tier 2 mitigation for the pilot project applications. Change approvals would then be followed by a deed to convey the water rights to Ecology. Sumner should request a technical assistance meeting with Ecology to determine the timing of these change applications and conveyance, i.e., whether it should be prior to, simultaneous with, or subsequent to the investigation and ROE for the Pilot Project applications.

APPENDIX A

[May 9, 2022 Gravley email]

APPENDIX B

[Ecology's 9/27/2021 letter]

APPENDIX C

[January 6, 2020 letter to Riverside 5, LLC]

APPENDIX D

[Figure __, Map of LWRHP]

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# Attachment B

## City of Sumner Foster Pilot Project Net Ecological Benefits Analysis

Final

# CITY OF SUMNER FOSTER PILOT PROJECT

## Net Ecological Benefits Analysis

**Prepared for**

**City of Sumner**

**March 2026**

ESA

Final

# CITY OF SUMNER FOSTER PILOT PROJECT

## Net Ecological Benefits Analysis

**Prepared for**
**City of Sumner**

**March 2026**

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# CITY OF SUMNER FOSTER PILOT PROJECT

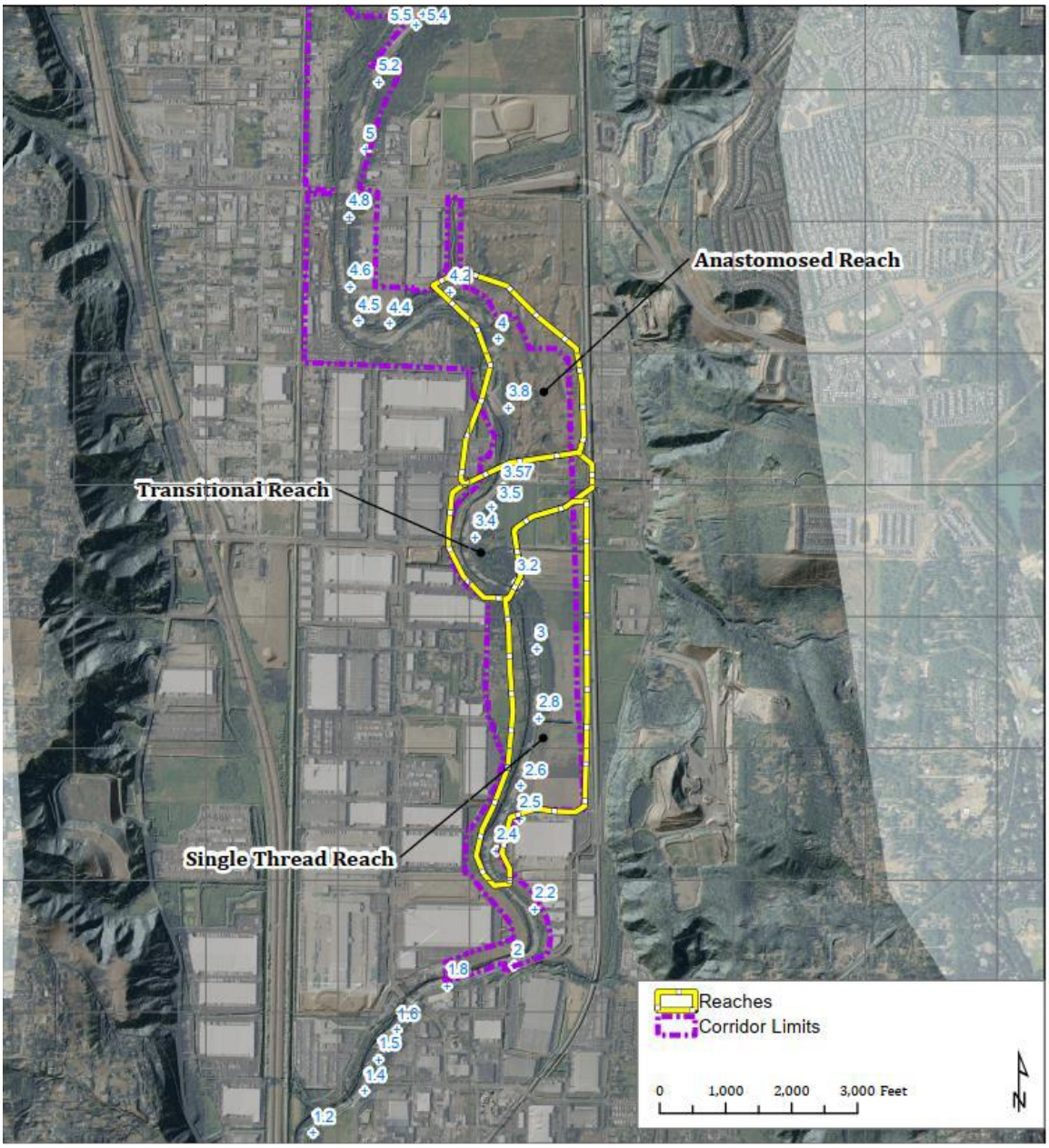
# Out-of-kind (Tier 3) Mitigation Analysis Methods and Results

## Introduction

Washington's 2018 Streamflow Restoration Act defines the types of out-of-kind restoration suitable as mitigation for pilot projects as follows (RCW 90.94.090): "*Out-of-kind mitigation may include instream or out-of-stream measures that improve or enhance existing water quality, riparian habitat, or other instream functions and values for which minimum instream flows or closures were established in that watershed.*" The City of Sumner identified that a discrete portion of their Lower White River Habitat Project (LWRHP) will provide substantial ecological improvements to offset modeled project impacts. To compensate for any impacts not addressed in tiers 1 and 2 mitigation, the Number 9 Ditch channel re-meandering element of the City of Sumner's LWRHP was identified as tier 3 mitigation per the Washington State Department of Ecology's 2019 Final Guidance for Determining Net Ecological Benefit.

Number 9 Ditch is a straightened channel located near the downstream end of the LWRHP (**Figure 1**). It is approximately 850 feet long and runs in an east to west orientation before flowing into the left bank of the White River at approximately river mile 2.8. The ditch receives water from areas east and west of the BNSF railroad running north-south and forming the eastern border of the LWRHP. Number 9 Ditch has a partial fish passage barrier approximately 550 feet upstream from the White River (WDFW Site ID 921388; WDFW 2019). The fish passage assessment lists potential salmonid species in the ditch as Chinook, coho, chum, pink, and sockeye salmon, steelhead, bull trout, sea-run cutthroat trout, and resident trout.

The proposed project is a realignment Number 9 Ditch to the south to maximize low gradient tributary length. By design, it will be subject to backwater from the mainstem over much of the hydrograph. It will cross below a forested berm in a 25-foot-wide culvert and then expand out into the floodplain of the White River. The new channel will be roughly 2,000 feet long. The design includes a low flow channel that is roughly 11 feet wide set within an inset bench that expands laterally moving downstream. The inset floodplain section is relatively narrow to begin with (about 10 feet either side) and broadens downstream to form an area intended to backwater under most flows and develop a wet riparian forest.

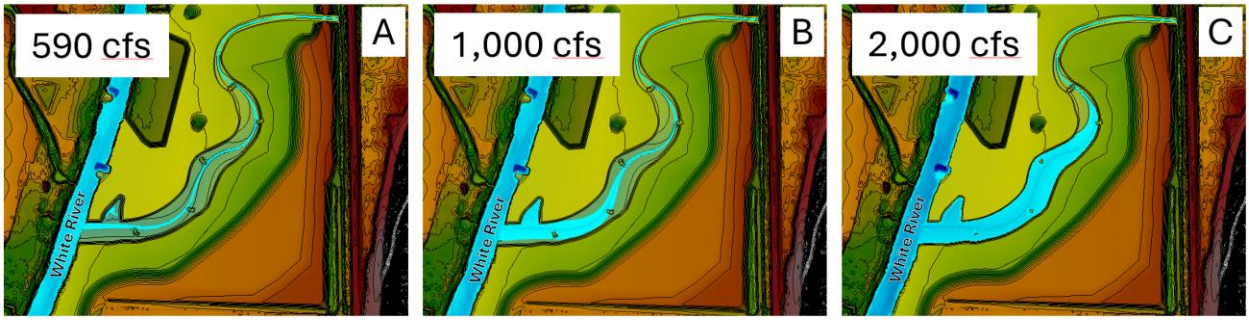



Source: Natural System Design Lower White River Habitat Project basis of design report.

**Figure 1.**
Lower White River Habitat Restoration Project Vicinity. The current confluence of Number 9 Ditch is at river 2.8. The proposed Number 9 Ditch project would span river miles 2.8 to 2.5 in the Single Thread Reach.

The Number 9 Ditch project is depicted in **Figure 2**, which highlights the hydrologic function of the restored ditch under a range of White River flows spanning the typical flow range in the system. Notably, the restored feature is connected to the mainstem during all seasons, yielding additional aquatic habitat year-round. Each panel of Figure 2 depicts the backwater effects on the Number 9 Ditch project channel under a range of flow conditions. Panel A depicts restored channel of the Number 9 Ditch at 590 cfs, which is a typical late summer low flow conditions when the backwater effect is minimal and the majority of the flow in the ditch comes from accretion of groundwater flow. Panel B of Figure 2 depicts conditions

at 1,000 cfs, which is a typical winter baseflow in the White River, and the backwater effects are stronger, indicated by an increased channel wetted area in the restored Number 9 Ditch channel. Finally, panel C of Figure 2 depicts the restored channel at 2,000 cfs, a typical spring runoff flow when the backwater effect fully inundates the restored stream channel. During winter baseflow and spring runoff, the restored Number 9 Ditch should provide velocity refugia for emigrating salmonids, and resident fishes. During later summer, the restored Number 9 Ditch will provide about 1,100 feet of meandering, low gradient, low velocity habitat that is distinct from the deep swift flow of the mainstem White River and should provide rearing and forage habitat for juvenile salmonids and resident fishes.




Source: Natural System Design Lower White River Habitat Project draft hydraulic model.

**Figure 2.**
Ditch Number 9 restoration design modeled inundation over range of discharge in the lower White River. The left panel depicts late summer base flow conditions, the middle panel depicts typical winter baseflow conditions, and the right panel depicts spring runoff conditions.

# Net Ecological Benefits Analysis Methods

The City's proposed mitigation plan includes in-kind and out-of-kind mitigation actions intended to more than offset the ecological (habitat and instream resource) impairments from the predicted reductions in surface water flows associated with the proposed water withdrawals. This is termed net ecological benefit (NEB) in Washington's 2018 Streamflow Restoration Act (RCW 90.94). In 2019, the Washington State Department of Ecology published "Final Guidance for Determining Net Ecological Benefit."

This section describes the evaluation framework developed to provide a structured and transparent analysis to assess whether NEB is achieved by the proposed mitigation, such that the ecological benefits of the mitigation actions exceed the ecological impacts of the water withdrawals. To characterize the impacts of water withdrawals, the surface water flow depletion (due to consumptive use) is compared against streamflow estimates and assumed physical channel characteristics to estimate the quantity and quality of the reduced wetted channel area. To characterize the benefits of out-of-kind mitigation actions (i.e., habitat restoration), changes to habitat area and habitat quality due to such mitigation are assessed. The evaluation framework for both impact and benefit assessments is based on several ecological assessment methods. The structure of this NEB framework is informed by the Lower Columbia River juvenile salmon Survival Benefit Unit methods developed by Krueger et al. (2017) and the habitat value inputs are based on both the U.S. Environmental Protection Agency's Stream Function Assessment Method (SFAM; Nadeau et al. 2020a) and the California State Water Resources Control Board's Functional Flows approach (Yarnell et al. 2020), which are described in the following sections.

The evaluation approach for determining whether NEB is achieved is based on a comparison of assessed impairments and assessed benefits entails four steps, which are detailed in the subsections below:

1. Quantify The Area of Affected Habitat
2. Determine Habitat Capacity Weighting Factor for the Affected Habitat
3. Determine Habitat Opportunity Weighting Factor for the Affected Habitat
4. Determine Certainty of Impacts or Benefits Weighting Factor for the Affected Habitat

After completing these four steps, the habitat impacts (debits) and the habitat benefits (credits) are compared to determine whether a net gain, or NEB, has been achieved.

## Applying a Conservative Approach

Throughout the development of the inputs to the evaluation framework, a conservative approach was taken such that impacts were more likely to be over-estimated and benefits were more likely to be under-estimated. This conservative approach was adopted to ensure the proposed mitigation actions clearly achieve NEB. The conservative aspects of the approach are summarized below and noted in the ensuing sections describing each step of the evaluation framework method.

- The analysis assumed that no Tier 2 was available, when in actuality, Tier 2 will be part of the project mitigation strategy.
- The impact calculation of a portion of the debits includes modeled impacts and projected changes in streamflow that are within groundwater model uncertainty but suggest potential for streamflow changes.
- This analysis was based on results of the P10 Scenario, which yielded the highest modeled baseflow reduction impacts in the White River
- The rate of wetted area depletion modeled for the White River was applied to the Puyallup River also, though baseflow reductions in the Puyallup River below the confluence were negligible or positive and the discharge of the Puyallup River is generally about twice that of the White River, yielding an overestimate of wetted area reduction.
- This approach assumes flow depletions occur immediately although they are not anticipated to occur for years until water right is used more fully.
- This approach incorporates a certainty of success factor to account for the uncertainty of restoration effectiveness by project type.

## Quantifying Area of Affected Habitat

Given the likely shortfall of water available for Tier 2 mitigation during later summer through early winter, as well as year-round for most tributaries of the White and Puyallup Rivers, the City has developed a Tier 3 strategy that fully offsets anticipated impacts. The analysis originally considered the potential use of Cascade Water Alliance Regional Reserve Water (RRW) as a Tier 2 mitigation element; however, RRW is no longer available as a mitigation option (see discussion below). Accordingly, when the analysis was first conducted, the month of September was selected as the basis for analysis of project

flow reduction effects on habitat area because it both has the second largest project effect[1] and historically had the least reliable RRW availability. The lack of RRW as Tier 2 mitigation does not affect the analysis.

The reduction in habitat was calculated based on a comparative analysis of stream discharge in the White River, simulations of the project effects on stream flow, and modeled reduction in wetted area for the stream channel in the White River due to streamflow reductions due to the project. For the hydrologic analyses, the period of record consisted of water years 2005 to 2024 to avoid the confounding effects of flow diversion for power generation on monthly streamflow statistics in the White River.[2]

The City evaluated several possible operational scenarios of water production from their various spring and well sources. Of these scenarios, Scenario P10 had the largest impact. Therefore, reductions of habitat due to the project were determined based on simulated effects of Scenario P10[3] on surface water discharge. Groundwater modeling found that under Scenario P10 there was no negative impact on the baseflow component of stream discharge in the Green River, Hylebos Creek, or Wapato Creek[4] (**Table 1**). There was a small reduction of predicted flow in the Puyallup River upstream of the confluence with the White River (range between -0.015 and -0.044 cfs). There is a larger flow reduction in the Puyallup downstream of the White River due to the flow reduction in the White River coupled with the small reductions to the Puyallup River upstream of the confluence (Table 1). The groundwater model simulated flow reductions in streamflow in the White River in all months of the year. As mentioned previously, the reduction of the baseflow component in the White River would contribute to an overall decrease in stream discharge in stream reaches downstream, including the mainstem Puyallup. Monthly flow reductions in the White River below RM 2.3 ranged between -0.813 and -1.796 cfs. Table 1 shows substantially smaller flow reductions in two upstream reaches (RM 2.3 to RM 5.0 and upstream of RM 5.0) compared to the lowest White River reach. The month with the largest flow reduction in the White River was the month of August, followed closely by September with estimated flow reductions of 1.796 and 1.743 cfs, respectively, under Scenario P10 (Table 1).

The City's draft mitigation plan included two Tier 2 components: the placing of five water rights into the Washington Trust Water Rights Program and the use of RRW as mitigation. The original NEB analysis considered the City's allocation of RRW as a potential Tier 2 mitigation element to offset the effects of flow depletion in the White River. Under the terms of the 2010 Lake Tapps Area Water Resources Agreement, the City's RRW allocation could have offset all simulated streamflow depletion not otherwise mitigated[5] during January through July and more than half of the depletion during August through December.[6] However, even when the RRW option was under consideration, its practical reliability was limited because availability depended on the interplay of natural streamflows, regulated minimum flow levels, and Cascade's water supply demands. For instance, between 2005 and 2018, RRW was

1 Terraphase (2024) reports August has slightly more impact than September.

2 Power generation at Lake Tapps ceased in January 2004.

3 Scenario P10 is described as: use full Springs rights; use the Central Well as the main source with the West Well only for irrigation and the South an Dieringer Wells' production as fill in (estimated at 100 and 75 afy, respectively).

4 Impacts to rivers and streams within a 5-mile radius of each City production well or spring were included in the evaluation, including the Green, White, and Puyallup Rivers, as well as a set of streams and creeks not tributary to the three major rivers. These other streams were grouped together and referred to as "Other" for results reporting. The results for the major rivers are compiled to include tributaries to each river.

5 Through the City's plan to place five water rights into the Washington Trust Water Rights Program as Tier 2 mitigation.

6 Sumner has an agreement in place (2010 Lake Tapps Area Water Resources Agreement) to acquire 0.65 cfs average flow/1.0 cfs peak flow of RRW from Cascade Water Alliance (Cascade). As noted, RRW is not longer being considered as Tier 2 mitigation.

unavailable in September between 1 and 30 days per water year, with a median of 25 days of unavailability (Table 2). Because RRW is no longer available as a mitigation option, the Tier 3 out-of-kind mitigation strategy, which was originally designed to be protective regardless of RRW availability, now serves as the sole compensatory mechanism for project-related flow depletions other than the placement of the five water rights into the Trust.

**TABLE 1. SIMULATED MONTHLY CHANGE IN STREAMFLOW (CFS) DUE TO THE PROJECT UNDER SCENARIO P10 IN VARIOUS STREAM REACHES.**

| Month | White above RM 5 | White RM 2.3 - 5 | White below RM 2.3 | Puyallup above confluence | Puyallup below confluence | Hylebos/ Wapato | Green |
|---|---|---|---|---|---|---|---|
| Oct | -0.025 | -0.180 | -1.474 | -0.026 | -1.411 | 0.000 | 0.000 |
| Nov | -0.029 | -0.174 | -1.162 | -0.036 | -1.144 | 0.000 | 0.000 |
| Dec | -0.027 | -0.164 | -0.896 | -0.044 | -0.905 | 0.000 | 0.000 |
| Jan | -0.025 | -0.154 | -0.859 | -0.034 | -0.869 | 0.016 | 0.000 |
| Feb | -0.023 | -0.150 | -0.844 | -0.024 | -0.852 | 0.000 | 0.000 |
| Mar | -0.025 | -0.147 | -0.813 | -0.021 | -0.823 | 0.000 | 0.000 |
| Apr | -0.025 | -0.143 | -0.849 | -0.017 | -0.859 | 0.000 | 0.000 |
| May | -0.024 | -0.146 | -1.026 | -0.015 | -1.011 | 0.000 | 0.000 |
| Jun | -0.024 | -0.166 | -1.315 | -0.015 | -1.234 | 0.000 | 0.000 |
| Jul | -0.025 | -0.191 | -1.576 | -0.015 | -1.422 | 0.000 | 0.000 |
| Aug | -0.026 | -0.202 | -1.796 | -0.019 | -1.603 | 0.000 | 0.000 |
| Sep | -0.026 | -0.479 | -1.743 | -0.024 | -1.588 | 0.000 | 0.000 |

Source: TerraPhase, 2025.

**TABLE 2. NUMBER OF DAYS IN EACH MONTH WHEN REGIONAL RESERVED WATER WAS UNAVAILABLE SUMMARIZED FOR WATER YEARS 2005 – 2018.**

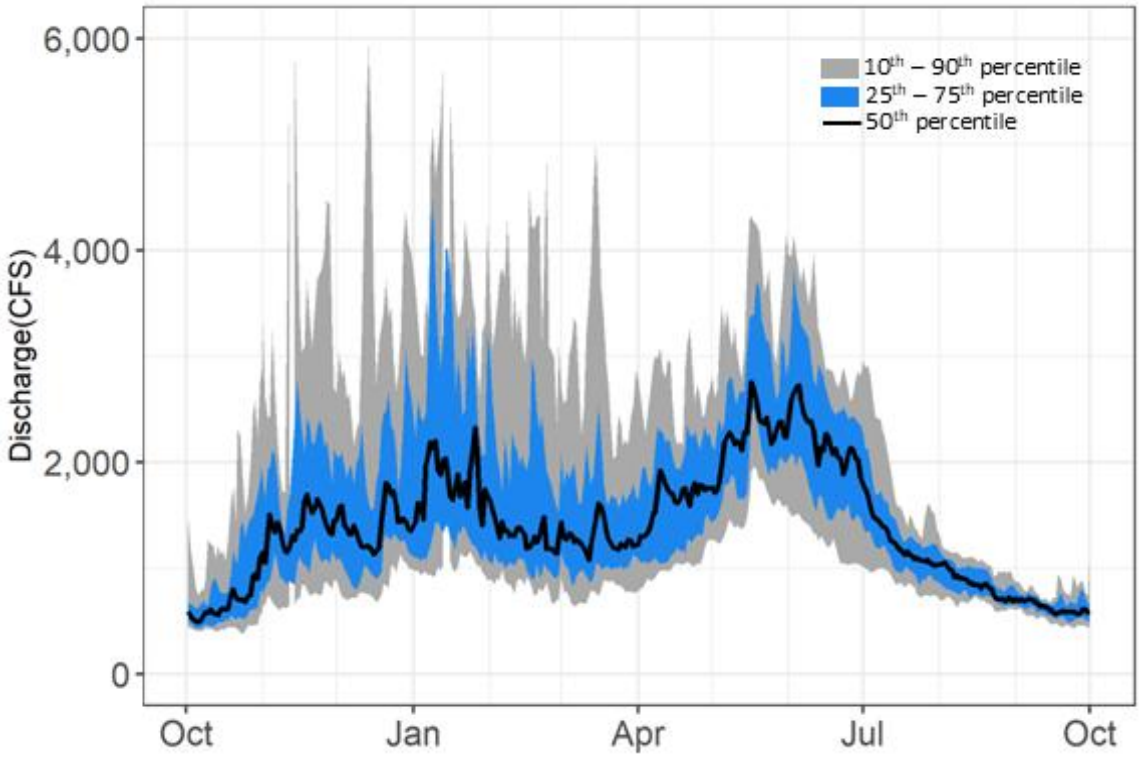
| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2004 | - | - | - | - | - | - | - | - | - | 15 | 0 | 0 |
| 2005 | 14 | 14 | 28 | 0 | 0 | 0 | 3 | 15 | 29 | 18 | 0 | 12 |
| 2006 | 0 | 10 | 17 | 8 | 0 | 0 | 1 | 15 | 30 | 31 | 3 | 0 |
| 2007 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 1 | 0 | 0 |
| 2008 | 1 | 7 | 0 | 11 | 0 | 0 | 0 | 0 | 9 | 31 | 0 | 0 |
| 2009 | 0 | 12 | 9 | 0 | 0 | 0 | 0 | 0 | 1 | 23 | 0 | 0 |
| 2010 | 0 | 7 | 15 | 7 | 0 | 0 | 0 | 4 | 1 | 12 | 0 | 0 |
| 2011 | 0 | 1 | 4 | 0 | 0 | 0 | 5 | 0 | 0 | 8 | 0 | 13 |
| 2012 | 0 | 5 | 0 | 0 | 0 | 0 | 6 | 1 | 24 | 25 | 0 | 0 |
| 2013 | 5 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 5 | 0 | 0 |
| 2014 | 0 | 1 | 0 | 0 | 0 | 0 | 7 | 0 | 26 | 20 | 0 | 0 |
| 2015 | 0 | 6 | 0 | 5 | 25 | 21 | 23 | 25 | 30 | 30 | 0 | 0 |
| 2016 | 0 | 4 | 0 | 0 | 0 | 0 | 8 | 23 | 29 | 9 | 0 | 4 |
| 2017 | 16 | 2 | 0 | 0 | 0 | 0 | 1 | 12 | 25 | 18 | 0 | 0 |
| 2018 | 0 | 3 | 0 | 0 | 0 | 0 | 5 | 8 | 30 | - | - | - |
| Minimum | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Mean | 2.6 | 6.1 | 5.2 | 2.2 | 1.8 | 1.5 | 4.2 | 7.4 | 18.2 | 17.6 | 0.2 | 2.1 |
| 50th Percentile | 0 | 6 | 0 | 0 | 0 | 0 | 2 | 3 | **25** | 18 | 0 | 0 |
| Maximum | 16 | 14 | 28 | 11 | 25 | 21 | 23 | 25 | 30 | 31 | 3 | 13 |

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

Source: based on an analysis by Aspect Consulting, 2022. Lake Tapps Systems Model Update.

1. This table shows the frequency that water would potentially be available for the Reserved Water Program, after meeting the MIF and Cascade's diversions for operation of Lake Tapps and water supply.
2. The scenario shown is: Water Supply Withdrawal of 48.5 MGD, distributed based on the 2019 Cascade demand pattern, winter low pool elevation of 539 ft, summer pool elevation of 542.7 ft.

Daily flow statistics ($10^{th}$, $25^{th}$, $50^{th}$, $75^{th}$, $90^{th}$ percentiles and mean) for stream discharge in the for water 2005 to 2024 were calculated based on a stream discharge time series for the White River Near Auburn stream gage (USGS 12100496) for water years 2005 through 2009 combined with the White River at R Street Near Auburn stream gage (USGS 12100490) for water years 2010 through 2024 (**Figure 3**). The minimum median daily discharge for the month of September was calculated, yielding a value of 564.5 cfs (**Table 3**). This value is used as a representative September low flow value as a steady flow boundary condition for the 2D HEC-RAS hydraulic model for a 3.3-mile-long reach of the White River bounding the site of the LWRHP[7] site (Figure 1).




Source: White River Near Auburn stream gage (USGS 12100496) for water years 2005 – 2009 combined with the White River at R Street Near Auburn stream gage (USGS 12100490) for water years 2010 – 2024.

**Figure 3.**
Daily flow statistics for the White River in the project area for water years 2005 – 2024.

7 The Lower White River Habitat Project (LWRHP) began as a flood protection project but expanded to include habitat enhancements in consultation with the Puyallup Tribe of Indians and the Muckleshoot Indian Tribe. The model domain spans the White River from RM 1.7 at the Tacoma Avenue Bridge to RM 5 at the Stewart Road Bridge.

**TABLE 3. DAILY FLOW STATISTICS FOR THE MONTH OF SEPTEMBER FOR THE WHITE RIVER IN THE PROJECT AREA.**

| Day of Month | Mean Discharge (cfs) | 10th Percentile Discharge (cfs) | 25th Percentile Discharge (cfs) | 50th Percentile Discharge (cfs) | 75th Percentile Discharge (cfs) | 90th Percentile Discharge (cfs) |
|---|---|---|---|---|---|---|
| 1 | 741.2 | 603.1 | 656.8 | 718.0 | 785.5 | 858.2 |
| 2 | 713.1 | 615.8 | 638.3 | 690.5 | 761.0 | 883.7 |
| 3 | 714.4 | 618.4 | 643.3 | 707.5 | 748.8 | 828.6 |
| 4 | 683.9 | 568.0 | 615.3 | 686.0 | 747.0 | 793.6 |
| 5 | 685.2 | 555.1 | 616.0 | 695.0 | 742.0 | 776.7 |
| 6 | 734.2 | 548.3 | 618.0 | 708.5 | 782.0 | 806.3 |
| 7 | 710.4 | 561.4 | 644.3 | 704.5 | 745.8 | 854.5 |
| 8 | 693.6 | 544.0 | 636.5 | 697.5 | 746.3 | 802.6 |
| 9 | 663.8 | 522.7 | 582.0 | 668.0 | 738.8 | 754.9 |
| 10 | 648.6 | 522.1 | 574.5 | 663.5 | 720.8 | 752.4 |
| 11 | 632.7 | 554.8 | 597.8 | 632.5 | 668.5 | 695.1 |
| 12 | 632.0 | 536.0 | 584.3 | 639.0 | 680.0 | 717.5 |
| 13 | 624.6 | 529.6 | 564.5 | 636.0 | 676.0 | 711.4 |
| 14 | 602.4 | 488.4 | 552.0 | 615.5 | 654.3 | 687.4 |
| 15 | 594.7 | 466.9 | 547.5 | 610.5 | 661.3 | 677.0 |
| 16 | 593.4 | 470.5 | 529.0 | 575.5 | 647.0 | 730.6 |
| 17 | 595.9 | 480.3 | 523.3 | 566.0 | 674.3 | 711.4 |
| 18 | 662.6 | 472.5 | 521.8 | 579.0 | 706.3 | 1,005.5 |
| 19 | 662.1 | 447.3 | 551.5 | 588.5 | 788.3 | 890.6 |
| 20 | 632.4 | 440.5 | 539.3 | 597.5 | 706.5 | 788.7 |
| 21 | 622.3 | 468.2 | 511.8 | 578.0 | 631.8 | 768.8 |
| 22 | 595.8 | 459.8 | 487.3 | 587.5 | 661.8 | 747.2 |
| 23 | 596.2 | 447.8 | 489.3 | 594.5 | 690.8 | 751.8 |
| 24 | 680.3 | 432.9 | 500.3 | 578.0 | 670.8 | 982.8 |
| 25 | 638.0 | 434.3 | 526.3 | 583.5 | 643.3 | 860.5 |
| 26 | 640.3 | 475.8 | 534.0 | ***564.5*** | 710.5 | 805.9 |
| 27 | 666.6 | 452.9 | 526.3 | 574.0 | 813.0 | 905.9 |
| 28 | 661.9 | 455.1 | 546.5 | 630.0 | 792.5 | 853.6 |
| 29 | 752.8 | 460.1 | 516.5 | 600.0 | 694.0 | 748.4 |
| 30 | 787.5 | 441.3 | 491.3 | 580.5 | 642.8 | 740.6 |

Source: White River Near Auburn stream gage (USGS 12100496) for water years 2005 – 2009 combined with the White River at R Street Near Auburn stream gage (USGS 12100490) for water years 2010 – 2024.

## White River Hydrologic Analysis and Estimated Decrease in Aquatic Habitat

To estimate the change in wetted aquatic habitat area in the White River due to flow reductions attributable to the project, two steady flow simulations of the LWRHP HEC-RAS hydraulic model were run: one for existing condition under the minimum daily median September discharge and one representing the minimum daily median September discharge under the P10 Scenario without any Tier 2 mitigation. The difference in modeled aquatic habitat area was then calculated. Taking the difference of modeled aquatic area between two models with such a small difference in stream discharge is at the limit

of sensitivity for the hydraulic model, so the project effect for the month of September was rounded up to 2 cfs. This is a conservative approach that works to overestimate the streamflow impact of the proposed project. The two steady state model scenarios are summarized in **Table 4**.

**TABLE 4. SUMMARY OF STREAM DISCHARGE VALUES USED AS BOUNDARY CONDITION IN THE HYDRAULIC MODEL.**

| Scenario | Discharge (cfs) |
|---|---|
| Existing Conditions[1] | 564.5 |
| P10 Scenario Conditions[2] (i.e., with proposed project) | 562.8 |
| Difference[3] | 2.0 |

1. Based on analysis of White River Near Auburn stream gage (USGS 12100496) for water years 2005 – 2009 combined with the White River at R Street Near Auburn stream gage (USGS 12100490) for water years 2010 – 2024. Refer to Table 3.
2. Based on analysis by TerraPhase, 2024. Refer to Table 1.
3. This value has been rounded to the nearest whole cfs value.

While the LWRHP HEC-RAS model was used to estimate the difference in aquatic habitat, the area in which these reductions were applied extended beyond the model domain and therefore required extrapolation. The LWRHP HEC-RAS hydraulic model spans approximately river mile (RM) 1.75 to RM 5.5 of the White River. Project effects on flows were evaluated within a 5-mile radius of each City production well (TerraPhase 2024), which yields a span from approximately RM 0.0 to RM 8.5 on the White River and RM 4.5 to RM 10.2 on the Puyallup River. The Puyallup River impact area included the upstream extent of impacts all the way to its mouth (i.e., RM 0.0 to RM 10.2). The per mile calculations on reduced aquatic area from the LWRHP HEC-RAS model were used to estimate aquatic habitat reductions throughout the entire project effects area (i.e., 15.7 miles combined in the White and Puyallup Rivers). The model results, the area reduction per mile estimates, and total area reduction in each river reach are summarized in **Table 5**.

**TABLE 5. SUMMARY OF WETTED AREA REDUCTIONS IN THE PROJECT AREA.**

| Description | Value |
|---|---|
| Estimated wetted area reduction in the 3.3-mile White River hydraulic model domain | 0.04 acres |
| Estimated wetted area reduction per river mile in the White River | 0.01 acre/mile |
| Total White River wetted area reduction[1] | 0.08 acres |
| Total Puyallup downstream of confluence area reduction[2] | 0.10 acres |
| Total wetted area reduction | 0.19 acres[3] |

1. White River RM 0 – RM 8.5
2. Puyallup River RM 0 – 10.5
3. Rounded up to the nearest 0.01 acres

# Quantifying Potential Out-of-Kind Mitigation Project Areas

The area of the Number 9 Ditch mitigation project area was estimated under a range of White River flow conditions (e.g., 590; 1,000; and 2,000 cfs, respectively) to estimate potential NEB value in different seasons[8] (Figure 1). The restoration project area was defined as the area of stream channel and accessible

[8] White River flow of 590 cfs is a typical late summer low flow condition, 1,000 cfs is a typical winter baseflow, and 2,000 cfs is a typical spring runoff flow.

off-channel that is directly affected by the proposed mitigation action (i.e., within the project work area). The area of the Number 9 Ditch restoration is summarized in **Table 6**.

**TABLE 6. ESTIMATED HABITAT AREA FOR THE NUMBER 9 DITCH RESTORATION PROJECT.**

| Project # | Number 9 Ditch Project Component | Project Area (acres)[1] |
|---|---|---|
| B1 | No. 9 Ditch Aquatic Habitat (590 cfs) | 0.3 |
| B2 | No. 9 Ditch Aquatic Habitat (1,000 cfs) | 1.1 |
| B3 | No. 9 Ditch Aquatic Habitat (2,000 cfs) | 1.6 |

Source: 2024 Lower White River Habitat Project, Natural Systems Design.

1. These values are subject to revision as the design is finalized.

# Quantifying Habitat Capacity

Habitat capacity is the ability of the habitat to promote ecological function including services like forage and refuge (Simenstad and Cordell 2000). The habitat capacity of affected and restored areas (acres) was characterized by assigning relative habitat values (RHVs) as determined using SFAM, a tool developed for evaluating the ecological functions of stream channels and riparian areas (Nadeau et al. 2020b). This relative habitat values score was used to weight restored areas.

SFAM was developed to provide a predictable, transparent, and scientifically robust approach to assessing the ecological processes affected by unavoidable impacts to streams in Oregon (Nadeau et al. 2020a). In conjunction with developing the tool, Nadeau et al. (2020b) developed the SFAM scientific rationale for individual function and value measures which includes a detailed description of the standard performance index for each function measure and establishment of a standard index scale to give ecological meaning to measure scores. Many of the SFAM attributes and scientific rationale for the scoring are applicable to this assessment.

For all channel areas affected by flow depletions (i.e., no longer wetted perennially or seasonally), the relative habitat values were assumed to be 100%, or highest habitat capacity. This is a conservative approach and assumes pristine stream conditions in all impact areas, thereby resulting in the largest possible debit amount for the lost wetted habitat area. It is likely that field observations would indicate lower habitat quality of the impact areas and result in less debit than the approach used. This conservative approach is adapted from the Yelm Foster Pilot project NEB analysis (Brogan and Garvey 2021) and their work titled “Net Ecological Benefit Evaluation for Woodland Creek Basin.”

For the restoration project area, the relative habitat value, or the Habitat Capacity Weighting Factor, was determined using selected attributes from SFAM and Brogan and Garvey (2021) shown in **Table 7**. The scoring criteria specific to each attribute uses a 0 - 1 scale (Brogan and Garvey 2021). Assessing the relative habitat values can rely heavily on best professional judgement when scoring habitat functions. Therefore, only the SFAM attributes most relevant to each restoration project were selected to assess relative habitat values in a consistent and scientifically defensible manner. Restoration projects were assessed, and their most relevant attributes were organized into four categories as shown in Table 7. For example, elements of the project that only include riparian habitat were evaluated using only riparian habitat attributes and project elements that also include instream habitat areas were evaluated using riparian and instream habitat attributes.

**TABLE 7. RELATIVE HABITAT VALUE ATTRIBUTES USED TO CHARACTERIZE HABITAT CAPACITY BY PROJECT TYPE.**

| Relative Habitat Value Attributes | Assessed Project Type |
|---|---|
| | Seasonally Backwatered Tributary Channel |
| Incision | X |
| Wetted Width | X |
| Pool Frequency | X |
| Substrate Variability | X |
| Embeddedness | X |
| Wood | X |
| Fish Passage Barriers | X |

# Quantifying Habitat Opportunity

Habitat opportunity is the degree to which habitats are accessible (Simenstad and Cordell 2000). The Habitat Opportunity weighting factor was determined using concepts from the Functional Flows approach (Yarnell et al. 2020), a framework established by the California State Water Resources Control Board. This framework (Yarnell et al. 2020) categorizes a stream's hydrology into ecologically relevant time periods within a year. That is, functional flow components (FFC) are identified as discrete periods of the flow regime that have documented relationships with ecological, geomorphic, or biogeochemical processes in riverine systems (Yarnell et al. 2020; 2015). For example, overbank (flood) flows are a well-recognized functional flow component that supports a broad suite of physical and ecological processes, including the maintenance of habitat heterogeneity in space and time (Ward 1998), providing cues for fish migration and reproduction (Jeffres et al. 2008) and controlling patterns of riparian succession (Ward and Stanford 1995). The functional flows approach rests on the assumption that managing for these key flow components will preserve the necessary hydrologic signals upon which biophysical processes and native fish life histories depend (Yarnell et al. 2020). In other words, managing for these key flow components will maintain or increase opportunity to access habitats across a greater number of life stages for a greater number of species.

Two target fish species and their life histories were selected to represent the native biological communities of the streams in the study area: the Puyallup River Fall Chinook salmon and the White River Spring Chinook salmon.[9] The habitat requirements of these native species do not comprehensively represent the habitat requirements of all native organisms within these systems, however, their presence and/or absence can be used as an indicator of natural stream hydrology and conditions (Roll et al. 2012).

For all channel areas affected by flow depletions, the FFC, or Habitat Opportunity weighting factor, was determined to be 100%. This assumes that all affected channel areas were available year-round to all life stages of all target species. This assumption posits that prior to the project, all affected channel areas were available and provided value year-round to all life stages of all aquatic organisms. This conservative approach, again, subtly skews the result for a greater debit of affected habitat area than field observations would likely indicate.

9 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/6075.

For all restoration project areas, the FFC, or the Habitat Opportunity Weighting Factor, was determined using a 0 - 1 scale and criteria adapted from Yarnell et al. (2020) as shown in **Table 8**. Using the FFC score as a weighting factor rests on the rationale that restored habitats that provide greater opportunity and/or are more available to many life stages of target species are highly valued habitats and restored habitats that provide less opportunity (or are less available) to fewer life stages of target species are lesser valued habitats.

**TABLE 8. HABITAT OPPORTUNITY WEIGHTING FACTORS BASED ON FUNCTIONAL FLOW COMPONENTS BENEFITING FROM A POTENTIAL MITIGATION PROJECT.**

| Functional Flow Component | Ecological Functions | Score |
|---|---|---|
| A. Dry-season baseflow | Limit warming of water, support algal growth and primary productivity, maintain habitat availability and connectivity for aquatic species | 1.0 |
| B. Fall pulse flow | Flush fine sediment and organic material from substrate, increase longitudinal hydrologic connectivity, increase nutrient cycling, decrease water temperature and increase dissolved oxygen | 0.8 |
| C. Wet-season baseflow | Maintain longitudinal hydrologic connectivity, support hyporheic exchange, support riparian habitat along channel margins, maintain habitat availability and connectivity for aquatic species | 0.7 |
| D. Wet-season peak flow | Scour and deposit sediment and large wood in channel and overbank zones, increase lateral hydrologic connectivity, support riparian vegetation diversity and health through disturbance and overbank inundation, limit non-native species and in-channel vegetation encroachment through disturbance and displacement | 0.4 |
| E. Spring recession flow | Maintain hydraulic habitat diversity that supports diversity of aquatic plants and animals | 0.8 |

# Characterizing Certainty

The Certainty of Effect weighting factor is intended to reflect confidence that the proposed actions will achieve long-term expectations for the project (Krueger et al. 2017). When determining this weighting factor, it is assumed each project will be completed as proposed. The weighting factor assignments reflect certainty of ecological effectiveness (performance) of the action by project type.

For all channel areas affected by flow depletions, the Certainty of Effect was assumed to be 100%, or to have the highest likelihood of taking effect. This approach represents the assumption that the predicted effects of flow depletions to Habitat Capacity and Habitat Opportunity are highly likely to occur.

For all restoration project actions, the scoring criteria for Certainty of Effect is adapted from Krueger et al. (2017) and is driven by whether the project area involves six primary attributes:

- a natural process or landform is being restored,
- the restoration methods have a history of successfully re-establishing the desired process or landform,
- the site will require future maintenance,
- the restoration is complex (i.e., restoration success depends on the results of several actions),
- the benefits to fish are well documented, and
- exotic or invasive plants or animals could influence the biological community (Krueger et al. 2017).

# Results

## Ecological Impacts of Flow Depletions

Results of the wetted area deficit analysis were presented in Table 5. Based on the modeled effect for the month of September, we found a total loss of habitat area of 0.08 acres in the White River and another 0.10 acres in the Puyallup River downstream of its confluence with the White River. Rounding upward, this totals to 0.19 acres of wetted area reduction. As described above, the method conservatively estimates the maximum debit by applying weighting factors of 1.0 for all three weighting factors (Habitat Capacity, Habitat Opportunity, and Certainty of Affect). As a result, the total wetted area debit is 0.19 (**Table 9**).

**TABLE 9. SUMMARY OF THE HABITAT DEBIT WEIGHTED AREA ANALYSIS FOR HABITAT REDUCTIONS IN THE WHITE AND PUYALLUP RIVERS.**

| Habitat Feature | Project Area (acres)[1] | FFC Score | RHV Delta | Certainty for Success | Weighted Area (Debits) |
|---|---|---|---|---|---|
| Project Area Aquatic Habitat | 0.19 | 1.0 | 1 | 1 | 0.19 |

1. From Table 5

## Ecological Benefits of Proposed Mitigation

As described in sections above, to characterize the benefits and acreage of out-of-kind mitigation actions (i.e., habitat restoration), the NEB analysis uses three weighting factors, or multipliers: Habitat Capacity, Habitat Opportunity, and Certainty of Effect. The Certainty of Effect weighting factor is dependent on the goals, methods, and predicted outcomes of the proposed restoration project. In general, the end goal of riparian and instream habitat restoration is the restoration of key ecological functions including bank stability, floodplain connectivity, prey production, thermal regulation, pollution removal, detrital nutrient contributions, and large woody debris accumulation (Rentz et al. 2020). Thus, restoration incorporates structure, composition, and process.

The first analysis to be completed is calculation of relative habitat values (RHV) for the pre-and-post project conditions for each of the proposed actions for the Number 9 Ditch restoration project. The analysis of the RHV for the aquatic habitat restoration is summarized in **Table 10**.

**TABLE 10. SUMMARY OF THE RELATIVE HABITAT VALUE SCORE FOR THE NUMBER 9 DITCH AQUATIC HABITAT RESTORATION PROJECT.**

| Condition | Fish Passage Barriers | Incision | Wetted width | Pool Frequency | Substrate Variability | Embeddedness | Wood | Mean RHV Score |
|---|---|---|---|---|---|---|---|---|
| Ditch No. 9 Pre-project | 0.3 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.2 | 0.13 |
| Restored Channel Post-project | 1 | 0.9 | 0.9 | 0.5 | 0.5 | 0.6 | 0.7 | 0.73 |
| Delta RHV | | | | | | | | 0.60 |

The NEB analysis evaluated aquatic habitat for the proposed Number 9 Ditch restoration. Under pre-project conditions the Number 9 Ditch is a straight trapezoidal channel, with little riparian habitat, that passes through one culvert that is a fish passage barrier. The channel outlet is perched above the White

River such that the channel does not regularly backwater. The Number 9 Ditch project will restore fish passage via removal of a problematic concrete spill to the mainstem and a second partial barrier (WDFW 2019), provide velocity refugia, and provide rearing habitat for outmigrating juvenile salmonids during all seasons of the year. The project also will restore channel complexity and includes installation of large woody debris, particularly in the vicinity of the confluence with the White River. Moreover, the riparian corridor along the restored channel will be planted with native trees and shrubs.

The total available aquatic habitat, and the mitigation benefit, will vary seasonally depending on stream discharge in the White River and the degree of backwatering into the restored alignment of Number 9 Ditch. Therefore, the NEB analysis for the aquatic habitat restoration was evaluated at the three discharges (590 cfs: 1,000 cfs; and 2,000 cfs) representing the typical range of discharge of the White River hydrograph and mimics the flows depicted in Figure 1.

The results of stream wetted area depletion analysis by stream discharge (**Table 11**) yields a summary of the weighted acres of habitat value provided by each restoration project.

**TABLE 11. SUMMARY OF THE HABITAT CREDIT WEIGHTED AREA ANALYSIS FOR THE NUMBER 9 DITCH PROJECT.**

| Project # | Project Name | Project Area (acres)[1] | FFC Score | RHV Delta | Certainty for Success | Weighted Area (Credits) |
|---|---|---|---|---|---|---|
| B1 | Ditch No. 9 Aquatic Habitat (590 cfs) | 0.3 | 1.0 | 0.6 | 0.7 | 0.13 |
| B2 | Ditch No. 9 Aquatic Habitat (1,000 cfs) | 1.1 | 0.7 | 0.6 | 0.7 | 0.32 |
| B3 | Ditch No. 9 Aquatic Habitat (2,000 cfs) | 1.6 | 0.8 | 0.6 | 0.7 | 0.54 |

Source: 2024 Lower White River Habitat Project, Natural Systems Design.

1. These values are subject to revision as the design is finalized.

A comparison of weighted area debits and credits is summarized in **Table 12**. For the aquatic habitat restoration, the balance of weighted area is -0.06 for the 590 cfs flow (the dry season) but is positive for 1,000 cfs and 2,000 cfs (winter baseflow and spring runoff) with values of 0.13 and 0.35, respectively. Averaged over all flows, the balance is 0.14. Hence, from an annual perspective NEB is achieved via the Number 9 Ditch Project.

**TABLE 12. BALANCE OF WEIGHTED AREA DEBITS AND CREDITS.**

| Project # | Project Name | Weighted Area (Credits) | Weighted Area (Debits)[1] | Balance (NEB) |
|---|---|---|---|---|
| B1 | Ditch No. 9 Aquatic Habitat (590 cfs) | 0.13 | 0.19 | -0.06 |
| B2 | Ditch No. 9 Aquatic Habitat (1,000 cfs) | 0.32 | 0.19 | 0.13 |
| B3 | Ditch No. 9 Aquatic Habitat (2,000 cfs) | 0.54 | 0.19 | 0.35 |
| Average | | | | 0.14 |

1. From Table 9

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# Mitigation Summary

The City's proposed Tier 3 mitigation project achieves NEB. The proposed mitigation will provide complex side channel habitat on the Lower White River that will be accessible to salmon throughout the year. The White River will backwater into the created habitat to provide additional aquatic habitat. When considered annually, the ecological benefits of this restoration will more than offset the impacts of the modeled flow reduction from the proposed water right.

Moreover, while the preceding analysis considered NEB in the context of no Tier 2 mitigation, in fact Tier 2 mitigation is available for certain much of the year (TerraPhase 2024). When the streamflow impacts are evaluated, including Tier 2 mitigation, the total stream flow reduction was found to be reduced for all seasons in all stream reaches (i.e., **Table 13** in contrast to Table 1). Hence, given that the preceding Tier 3 NEB analysis found that the Number 9 Ditch aquatic habitat project will achieve NEB via Tier 3 mitigation for the project on an annual basis, when combined with Tier 2 there is ample mitigation to offset project impacts and achieve NEB.

This conclusion is based on functional habitat framework that factors in habitat area and functional habitat quality (capacity, opportunity, certainty).

**TABLE 13. SIMULATED MONTHLY CHANGE IN STREAMFLOW (CFS) DUE TO THE PROJECT UNDER SCENARIO P10 IN VARIOUS STREAM REACHES ACCOUNTING FOR TIER 2 MITIGATION FLOWS OTHER THAN REGIONAL RESERVE WATER.**

| Month | White above RM 5 | White RM 2.3 - 5 | White below RM 2.3 | Puyallup above confluence | Puyallup below confluence | Hylebos/ Wapato | Green |
|---|---|---|---|---|---|---|---|
| Oct | -0.025 | -0.178 | -1.279 | -0.014 | -1.203 | 0 | 0 |
| Nov | -0.029 | -0.175 | -0.963 | -0.022 | -0.93 | 0 | 0 |
| Dec | -0.027 | -0.166 | -0.695 | -0.03 | -0.69 | 0 | 0 |
| Jan | -0.025 | -0.158 | -0.66 | -0.019 | -0.655 | 0.016 | 0 |
| Feb | -0.023 | -0.146 | -0.647 | -0.01 | -0.641 | 0 | 0 |
| Mar | -0.025 | -0.147 | -0.617 | -0.008 | -0.614 | 0 | 0 |
| Apr | -0.025 | -0.064 | -0.516 | -0.004 | -0.513 | 0 | 0 |
| May | -0.024 | 0.066 | -0.461 | -0.003 | -0.434 | 0 | 0 |
| Jun | -0.024 | 0.126 | -0.616 | -0.003 | -0.522 | 0 | 0 |
| Jul | -0.025 | 0.235 | -0.64 | -0.004 | -0.474 | 0 | 0 |
| Aug | -0.026 | 0.097 | -1.077 | -0.007 | -0.873 | 0 | 0 |
| Sep | -0.026 | -0.016 | -1.233 | -0.013 | -1.067 | 0 | 0 |

Source: TerraPhase, 2025.

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