

Appendix H – Projects

WRIA 8 – Project Description

Snohomish County Recycled Water Managed Aquifer Recharge

October 21, 2020

Project Name and Number

Snohomish County Recycled Water Managed Aquifer Recharge (8-LB-W1)

WRIA 8 WRE Subbasin

Little Bear

Water Offset

~181 acre-feet/year

Narrative Description

One of the non-acquisition water offset project ideas identified by the WRIA 8 WREC involves using recycled water as a source for managed aquifer recharge (MAR) projects. This project would augment stream flows by increasing surficial aquifer discharge above what occurs under existing conditions. The project concept includes diverting recycled water from Brightwater to a constructed MAR facility. Brightwater currently distributes reclaimed water from May to October, but recycled water may also be available year-round, if needed. This diverted water infiltrates into the shallow aquifer, is transported down-gradient, and ultimately discharges to one or more adjacent streams as re-timed groundwater baseflow. A specific site for this project has not yet been identified, however, there may be opportunity for MAR on Snohomish County-owned property immediately north of Brightwater (i.e. Carousel Ranch) or at other sites to be selected in the future. The goal of the project is to increase baseflow to the subject stream(s) by recharging the aquifer adjacent to the stream(s) and providing additional groundwater discharge to the river through MAR.

The project should be specifically designed to enhance streamflows and to avoid a negative impact to ecological functions and/or critical habitat needed to sustain threatened or endangered salmonids.

Brightwater is located in the Snohomish County portion of the City of Woodinville, Washington between State Route 9 and Highway 522 in the WRIA 8 delineated Little Bear subbasin. Currently, recycled water is only available via King County's recycled water pipeline which extends from the Brightwater tunnel alignment in Bothell, south through the Sammamish River Valley to Redmond. However, King County is in the process of designing and constructing additional storage capacity at Brightwater, which would allow for distribution of recycled water to areas proximal to the plant and eventually to other portions of Snohomish County as recycled water infrastructure expands to meet future demand.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The proposed recycled water MAR facility will result in streamflow benefits to one or more subject streams by diverting and temporarily storing recycled water into the shallow glacial or alluvial aquifer underlying the project site. The project is currently conceptual, but anticipates the ability to divert recycled water from the existing pipeline at a rate of approximately 0.5 cubic feet per second (cfs) for six months (May through October). The goal is to increase streamflow, especially during months when

demand for water is highest and surface flows are generally lowest (June through August). The proposed MAR facility will infiltrate recycled water into the shallow aquifer and provide increased baseflow to the subject stream and its tributaries, depending on where the facility is sited. The anticipated offset volume for this project is 181 acre-feet (AF) per year. The offset volume is calculated based on the quantity of water infiltrated annually, as described below.

Assuming water will be diverted between May 1 and October 31 every year (183 days), the annual diversion volume is estimated to be 181 acre-feet (AF) per year using Equation 1:

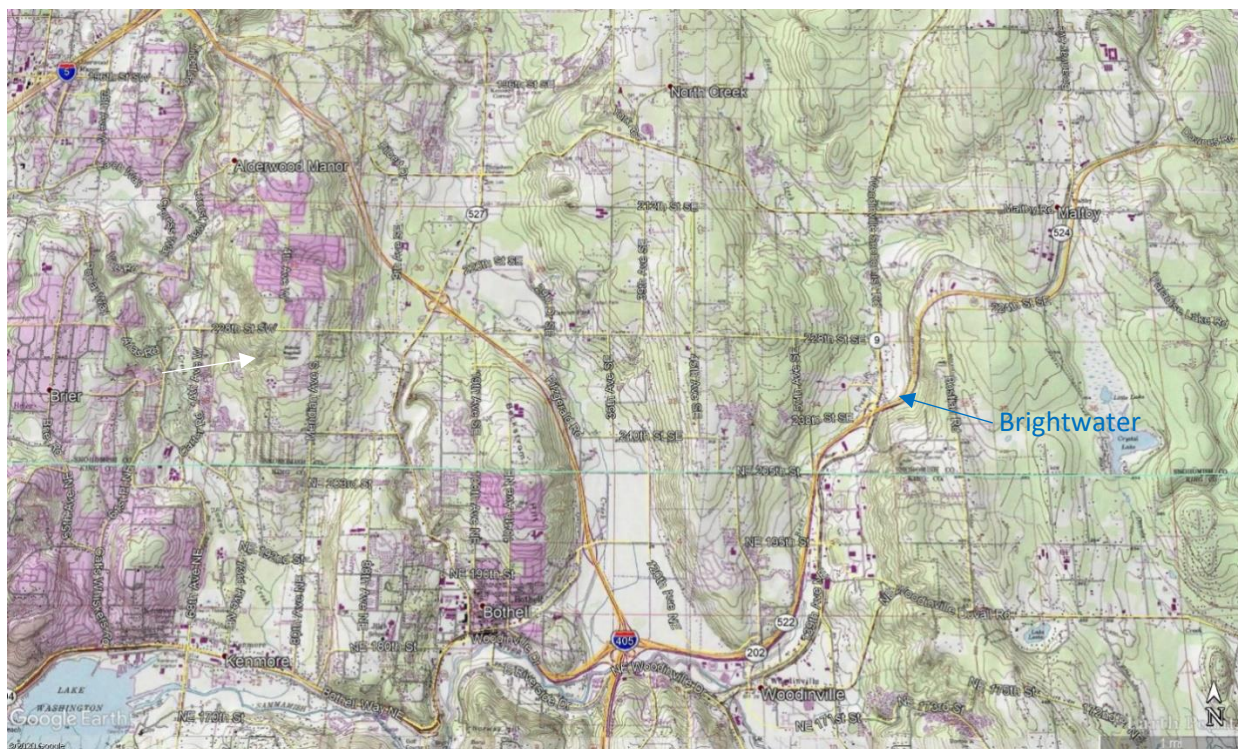
$$\text{Annual Volume} = \text{Diversion Rate} \times \text{Duration of Diversion} \text{ Equation 1}$$

It is anticipated that the MAR facility would be constructed as a buried infiltration gallery or open pond, but design details will be further developed at a later time. Development of this project would augment existing flow in subject stream(s) through an increase in groundwater baseflow, which could be year-round depending on site and down-gradient hydrogeology. The temporal distribution and absolute value of those benefits will be estimated during a feasibility study, which is required before a MAR project can proceed to construction and operation. Those streamflow augmentation benefits will continue to discharge to the river after each year's storage window closes because of the lag time of water moving through an aquifer and the distance of the flow path to the river. The rate at which the infiltrated water enters the river will vary based on in-situ aquifer parameters that will be tested and modeled during the feasibility study.

It is assumed that a site feasibility study will be conducted pursuant with Appendix B of Ecology's Net Ecological Benefit (NEB) guidance (Ecology 2019a) and Appendix D of the Streamflow Restoration grant application requirements, if funding from Ecology is pursued during a future grant round (Ecology 2019b). All values presented in this project description are for planning purposes and may not represent actual site conditions.

Conceptual-level map and drawings of the project and location.

No potential MAR facility site has currently been identified. The following map provides an aerial view of Brightwater and the surrounding area.



Description of the anticipated spatial distribution of likely benefits.

The Brightwater Treatment Plant is located in the Little Bear subbasin. The project is expected to provide streamflow benefits in the subject stream(s) and downstream subbasins (including the Sammamish River Valley, Greater Lake Washington, and Seattle Lake Union subbasins).

Location relative to future PE well demand.

The consumptive use estimate for the WRIA 8 Little Bear subbasin is 44.3 AF per year (GeoEngineers 2020). Consumptive use estimates for subbasins downstream of the Sammamish River Valley subbasin include the following (GeoEngineers 2020):

- Sammamish River Valley subbasin: 3.2 AF per year.
- Greater Lake Washington subbasin: 1.8 AF per year.
- Seattle Lake Union subbasin: 0 AF per year.

Performance goals and measures.

The performance goals are to increase water storage in the glacial or alluvial aquifer adjacent to the subject stream(s) by infiltrating 181 AF per year through the MAR facility to improve baseflow in the subject stream(s). The performance measures will be an increase in baseflow in the subject stream, especially during the critical flow period. The increased baseflow should have the added benefit of reducing water temperatures in the river.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Little Bear Creek subbasin drains to the Sammamish River Valley. Streams and tributaries in the Little Bear Creek subbasin are inhabited by numerous fish species, including sockeye salmon, fall chinook salmon, coho salmon, coastal cutthroat trout, winter steelhead, and kokanee salmon (WDFW 2020). Chinook and steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Identification of anticipated support and barriers to completion.

This project is believed to be in alignment with the goals of the Streamflow Restoration law. MAR is one of the identified project types that could address the new consumptive water use and achievement of NEB. In addition, this project would reduce the amount of treated wastewater that our region sends to Puget Sound and puts water to better use.

The barriers to completion include funding for construction and O&M costs. In addition, the water available for diversion from the Brightwater recycled water pipeline is treated wastewater. The Brightwater plant is an advanced treatment facility that combines standard biological wastewater treatment with membrane filters to produce higher quality water that is seven to ten times cleaner than typical secondary treated wastewater. After disinfection, water is 99 percent cleaner than when it came into the treatment plant. Brightwater recycled water currently is used for irrigation of golf courses, soccer fields and farms, as an alternative to irrigating with drinking water. It is also used for environmental projects wherever it is available. However, despite the advanced treatment technology, it is anticipated that, as a component of project feasibility evaluation, water quality will be evaluated, and a geochemical compatibility analysis will be conducted to evaluate the potential for water quality degradation.

Potential budget and O&M costs.

No specific MAR site has been selected. Currently, recycled water is only available via King County's recycled water pipeline which extends from the Brightwater tunnel alignment in Bothell, south through the Sammamish River Valley to Redmond. However, King County is in the process of designing and constructing additional storage capacity at Brightwater, which would allow for distribution of recycled water to areas proximal to the plant and eventually to other portions of Snohomish County as recycled water infrastructure expands to meet future demand.

Ultimately, the cost of constructing the project will depend on project location and the conveyance infrastructure required to transport recycled water from existing Brightwater conveyance structures to the MAR facility.

Purchase of reclaimed water from King County would be ongoing and dependent on the negotiated rate. Assuming a rate of \$0.26 per hundred cubic feet, which was the average reclaimed water rate in Florida in 2005 (King County Department of Natural Resources and Parks, 2008), the potential annual cost for an MAR project that injects 0.5 cfs for a period of 5 months would be approximately \$16,850.

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the MAR project to maintain the estimated water offset over time and despite changing external conditions (which could include seasonal variation in streamflow, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be durable, based on the following:

- The water source would be reliable.
- The rate of diversion would be precisely maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that significantly reduces the project offset.
- Land use changes external to the project site would have negligible impact on project function.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, and/or other impacts. We anticipate that the planned project would be resilient to the potential impacts of climate change based on the following:

- Project function would not be impacted by summer drought conditions.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the MAR site and surrounding area would not impact project function and the anticipated water offset.
- Sea level increase would not impact project function.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Washington Water Trust is a potential sponsor for this project.

Documentation of sources, methods, and assumptions.

Department of Ecology. 2019a. Final Guidance for Determining Net Ecological Benefit. GUID-2094 Water Resources Program Guidance. Publication 19-11-079. July 2019.

Department of Ecology. 2019b. Streamflow Restoration Competitive Grants, 2020: Guidance for project applicants. Publication 19-11-089. Revised December 2019.
<https://fortress.wa.gov/ecy/publications/documents/1911089.pdf>

GeoEngineers, Inc. (GeoEngineers). 2020. WRIA 8 Consumptive Use Estimates – Final Draft. Technical memorandum prepared for Washington State Department of Ecology. February 2020.

King County Department of Natural Resources and Parks, 2008. Reclaimed Water Feasibility Study. March. 185 p.

Washington State Department of Fish and Wildlife (WDFW). 2020. Salmonscape Mapping of Fish Distribution. <http://apps.wdfw.wa.gov/salmonscape/>

WRIA 8 – Water Right Project Opportunity Profile

Wayne Golf Course Water Right Acquisition

(Pre-identified No. 7)

Project Summary (8-SRV-W2)

Updated: 11/3/2020

FLOW BENEFIT: Additional .9 cfs in 1.8 miles of Sammamish River mainstem downstream to Lake Washington.

PRIORITY SUBBASIN: Sammamish River Valley

ESTIMATED OFFSET: 84.85 afy consumptive

PRIORITY DATE(S): 07/26/1949, 07/01/1974

SOURCE AND PURPOSE: Surface water for irrigation.

PERIOD OF USE: Seasonally from April 15th – October 1st and seasonally during irrigation season.

WRIA 8 INSTREAM FLOW RULE (1979): Sammamish River is closed to further consumptive appropriation¹

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook (Threatened), Puget Sound/Strait of Georgia Coho (Species of Concern), Winter/Summer Puget Sound Steelhead, Bull Trout (Threatened)

OUTREACH STATUS: Interested

Project Description

The Pre-identified Water Right No. 7 water right was included in the WRIA 8 water rights analysis by Ecology request. The land and an underlying a portion of the water right was previously used as a golf course, which according to online news sources, closed in 2017. The other active irrigation within the water rights places of use occurs on a city park. The property is located within the City of Bothell. The parcels comprising the golf course property, were used as a golf course from 1931-2017. Forterra purchased the property in 2016 for permanent protection as a parkland. The City of Bothell purchased the property from Forterra in 2017 with assistance from King County, which now holds a conservation easement over the property. With the property change, there may be an opportunity for a water rights acquisition. Ecology has conducted initial outreach to and the water right holder has indicated interest in temporarily donating a portion of the water rights to the Trust Water Rights Program and pursuing a permanent donation in the future.



¹ Chapter 173-508 WAC

Watershed

The Sammamish River is part of the Sammamish River Valley subbasin. The Sammamish River leaves Lake Sammamish and flows 14 miles before joining Lake Washington. The Sammamish River tributaries include: Little Bear Creek, Cottage Lake Creek, North Creek, Swamp Creek and Wildcat Creek. Water temperature and dissolved oxygen levels have been problems in the Sammamish River with increased flow cited as a solution. The Sammamish River and its tributaries were closed to further consumptive appropriation on the September 06, 1979. ²

Land Use & Ownership

According to the King County Assessor, the currently land uses are listed as Park, Public (Zoo/Arbor), Vacant (Single Family), Single Family (Residential Use), and the land is zoned R9600 and R4000. These parcels are located within the City of Bothell. Prior to coming into common ownership, these nine parcels totaling 127 acres were owned by separate entities and managed under two separate uses, a public park, and a golf course. A review of the WSDA 2019 Agricultural Land Use map, identifies Developed as the crop group, and sprinklers as the irrigation method. Additionally, portions of the place of use were developed and now part of the Riverbend and Valhalla neighborhoods while other portions are forested. Since these areas are not likely relying on the subject water right, nor owned by the water right holder, they are not discussed in this profile. Irrigation delineation indicates that as much as 44.9 irrigated acres in 2013. Delineating irrigated acreage may be challenging on this property related to known practices of irrigating only golf course tees and greens.

Table 1: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	44.9
2015	15.4
2017	23.9
2019	40.2

Water Right

Table 2: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.2 cfs	07/26/1949	Irrigation	20	Sammamish River
Certificate	96 afy	0.7 cfs	07/01/1974	Irrigation	48	Sammamish River

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

² Chapter 173-508 WAC

Water Right History:

There are two water right certificates with places of use that overlap to cover the entirety of the subject property. The original certificate was issued for the sole purpose of irrigation of 20 acres, has a priority date of 07/26/1949, and asserts 0.2 cfs as the Qi, and no listed Qa. Limited history was available for this right and supporting documents include the application, progress sheet, and certificate. The listed source of this right is the Sammamish River, withdrawn by surface pump.

The second certificate was filed by the owners of the golf course for the purpose of irrigation of 48 acres, and asserts 0.7 cfs and 96 afy. WRTS lists this use as primary, however, the application materials suggest this certificate is additive to the 07/26/1949 certificate. A Report of Examination (ROE) issued in 1975 did not modify any of the requested quantities. The listed source of this right is the Sammamish River, withdrawn by surface pump.

Metering Records:

There were no metering records available from Ecology.

Conclusion

This project was identified by Ecology as a potential acquisition opportunity. A portion of the land was as a golf course, which ceased operations in 2017. The City of Bothell currently owns the property where King County holds a conservation easement. The City of Bothell owns the other portion of the property, managed as a park. The City and Ecology have been in communication regarding temporarily donating a portion of these rights into the Trust Water Right Program. It is possible that a change in the land-use will decrease irrigation demands and a portion of these rights may be available for permanent acquisition.

No metering documents are in the WRTS database to support use of these water rights. Four years of delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 44.9 delineated acres, a difference of 23.1 acres. Although it is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

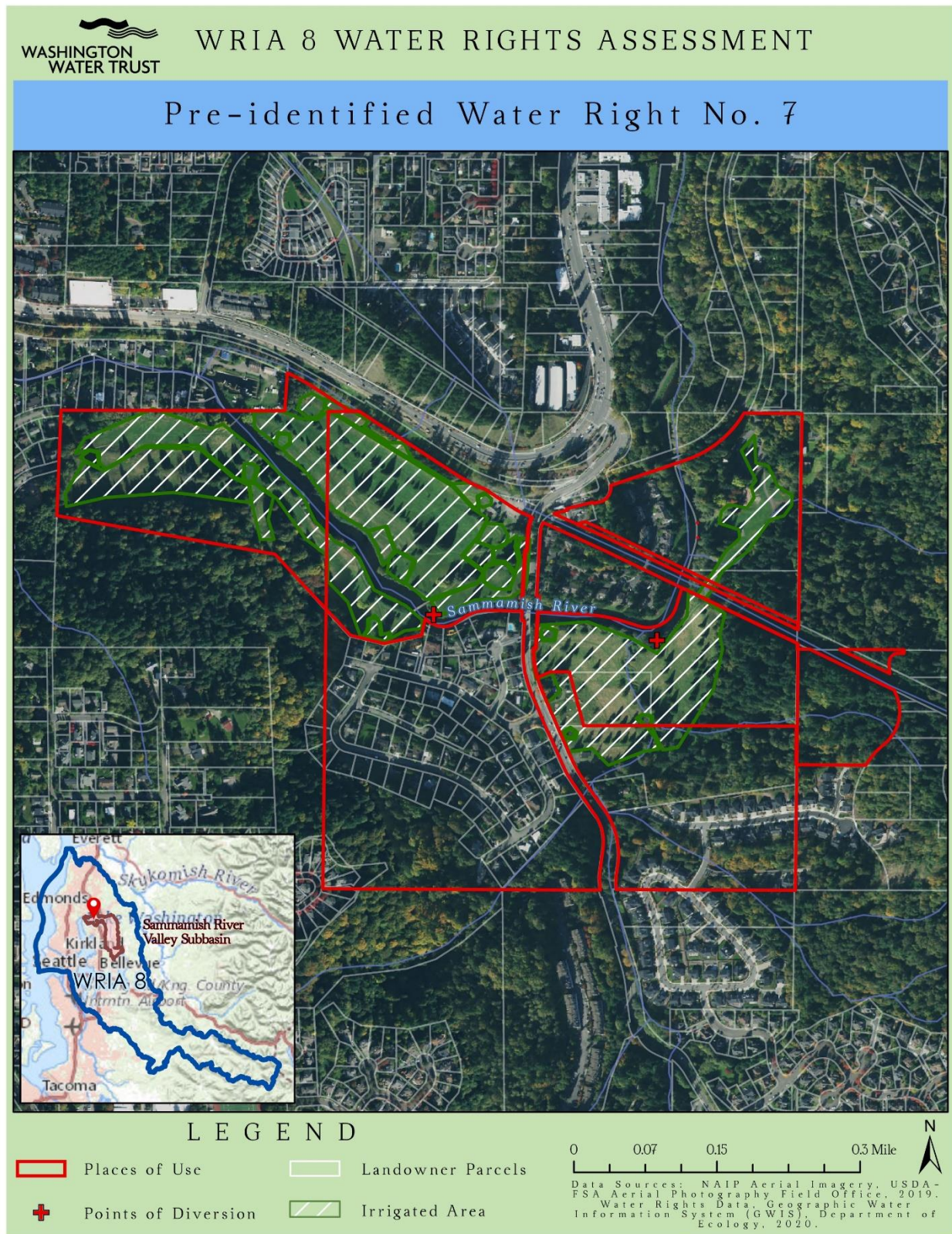
Due to lack of metering documents, WWT utilized delineations to estimate the potential consumptive use quantity that may be available for a transaction and as an offset. Since the property use is known, golf course/park, an estimate is developed based on the pasture/turf water duty (20.01 inches) found in the Washington Irrigation Guide (Seattle-Tacoma station, Appendix B) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the highest delineation (44.9 acres), and assuming pasture/turf and sprinkler irrigation, 84.85 afy consumptive is the estimated quantity available for a transaction.³

The Pre-identified No. 7 water rights have priority dates of 07/26/1949 and 07/01/1974, which are senior to the establishment of the Cedar-Sammamish Basin Instream Resources Protection Program) in 1979. These water rights do not have an instream flow provision listed in their supporting documentation.

³ This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 1: Project Map



WRIA 8 – Water Right Project Opportunity Profile

Sixty Acres Park Water Right Acquisition

Project Summary (8-SRV-W3)

Updated: 10/12/2020

FLOW BENEFIT: Additional 1.0 cfs in Sammamish River which is tributary to Lake Washington.

PRIORITY SUBBASIN: Sammamish River Valley

ESTIMATED OFFSET: 126 afy consumptive

PRIORITY DATE(S): 7/24/1953, 2/2/1953

SOURCE AND PURPOSE: Surface water for irrigation.

PERIOD OF USE: Seasonally from April 15th – October 1st.



WRIA 8 INSTREAM FLOW RULE (1979): Sammamish River and its tributaries are closed to further consumptive appropriation.⁴

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Interested

Project Description

The Sixty Acres Park water right was identified in the King County water right report. The property is comprised of a North and South Park, and is located about 3 miles north of Redmond. There are two surface water rights associated with the property, one associated with the North Park property and one associated with the South Park property. The combined 1.0 cfs and 200 afy demonstrate the paper water right of the two certificates, but make no determination as to the “wet” water right or the amount actually used for irrigation. The total irrigated land attributed to the two surfaces water rights is 100 acres.

Watershed

The Sammamish River is part of the Sammamish River Valley subbasin. The Sammamish River leaves Lake Sammamish and flows 14 miles before joining Lake Washington. Sammamish River tributaries include: Little Bear Creek, Cottage Lake Creek, North Creek, Swamp Creek, and Wildcat Creek. Water temperature and dissolved oxygen levels have been problems in the Sammamish River with increased flow cited as a solution. The Sammamish River and its tributaries were closed to further consumptive appropriation on the September 06, 1979.⁵

⁴Chapter 173-508 WAC

⁵ Chapter 173-508 WAC

Land Use & Ownership

In 1968, King County acquired this property and converted farmland to the Park it is today. The property is currently owned by King County and is administered by the Department of Natural Resources and Parks. According to the King County Assessors, the North Park parcel is 60 acres and the South Park parcel is 34.28 acres. Current land use for both parcels is listed as Vacant (Single-family) with zoning designated as A10 for the North Park and UR for the South Park. According to online sources, the two Parks include twenty-five well-maintained grass fields used for a multitude of sports, activities, and special events. Adjacent to the fields are parking lots, restrooms, and a covered picnic area. King County leases the property and the use of the North Park surface water right to the Lake Washington Youth Soccer Association (LWYSA) for its youth soccer program.

Irrigation delineation estimates as much as 35.5 irrigated acres in the North Park and 24 irrigated acres in the South Park. This estimate excludes the place of use areas that are not used for athletic fields and not owned by King County.

Table 3: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	59.5
2015	59.5
2017	59.5
2019	59.5

Water Right

Table 4: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate (S1-*12464CWRIS)	120	0.6 cfs	7/24/1953	Irrigation	60	Sammamish River
Certificate (S1-*12021CWRIS)	80	0.4 cfs	2/2/1953	Irrigation	40	Sammamish River

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The certificate (S1-*12464CWRIS) with a 7/24/1953 priority date was issued for the purpose of irrigation of 60 acres with a Qi of 0.6 cfs and a Qa of 120 afy. Water is sourced by a surface water pump from the Sammamish River, which is tributary to Lake Washington. King County acquired this property in 1968 and converted the farmland into a park.

According to Ecology's Water Rights Tracking System (WRTS), King County Natural Resources and Parks submitted a seasonal change application that was accepted by Ecology in 2019. King County proposed a 2020 seasonal transfer of 8 ac-ft. from the currently authorized point of diversion and place of use, to a

point of diversion downstream that will serve the county-owned farm, Sammamish River Farm. The Seasonal Change Authorization shall remain in effect until October, 1 2020, unless revoked sooner by Ecology. King County plans to continue to seasonally transfer some portion of this right downstream until recycled water or another feasible water source is available at the Sammamish Farm.

Under an agreement reached in August 2015, King County's Wastewater Treatment Division is committed to permanently supplying LWYSA with up to 24.55 afy of recycled water through a pipeline from the Brightwater Treatment Plant in Woodinville. The recent use of recycled water for irrigation supply at Sixty Acres Park has therefore reduced the volume of water historically pumped from the Sammamish River, thus freeing up water for the above mentioned transfer.

The certificate (S1-*12021CWRIS) with a 2/2/1953 priority date was issued for the purpose of irrigation of 40 acres with a Qi of 0.4 cfs and a Qa of 40 afy. Water is sourced by a surface water pump from the Sammamish River, which is tributary to Lake Washington. King County acquired this property in 1968 and converted the farmland into a park. According to WRTS, there have been no changes made to this right.

There is still debate about whether or not these water rights should be considered municipal water rights, and thus protected from relinquishment. Though their beneficial use (irrigation of a county park) counts as an appropriate beneficial use for a municipal water right, it was not the original purpose of the water right. To be considered a municipal water right, King County would have to officially change the certificate through the Department of Ecology.

Metering Records:

No metering records were available for these rights.

Conclusion

While the sum of the irrigable acres authorized by these water rights documents is 100 acres, the irrigation delineation suggests as much as 59.5 irrigated acres in the most recent 5 year period. The place of use for both certificates extends beyond King County's parcels and covers land that is not being irrigated. Therefore, through an aerial assessment that analyzed irrigation activity in 2013, 2015, 2017, and 2019, the irrigation delineation was determined as the 59.5 acres of athletic fields.

Without available metering records, the consumptive use was calculated in an analysis done by King County. King County's consultants calculated the seasonal average daily irrigation flowrate using an average irrigation rate of 0.33 mgd/100 acres and 75% efficiency or approximately one inch per acre per week.⁶ The average annual consumption of water for irrigation was estimated to be 76 acre-feet for the North Park and 50 acre-feet for the South Park.⁷ Based on the delineation of 59.5 irrigated acres and King County's calculations, the total estimated quantity available for transaction is 126 afy.⁸

The Sixty Acres Park water rights were identified King County as a potential source to donate, showing an intent and interest of the property owner in pursuing this project. Follow-up conversations with King

⁶ King County Department of Natural Resources and Parks, Wastewater Treatment Division, October 2005, *Reclaimed Water Backbone Project Draft White Paper*.

⁷ One (1) acre-foot is 326,000 gallons approximately. The assumed irrigation season comprises 150 days between May and September, annually.

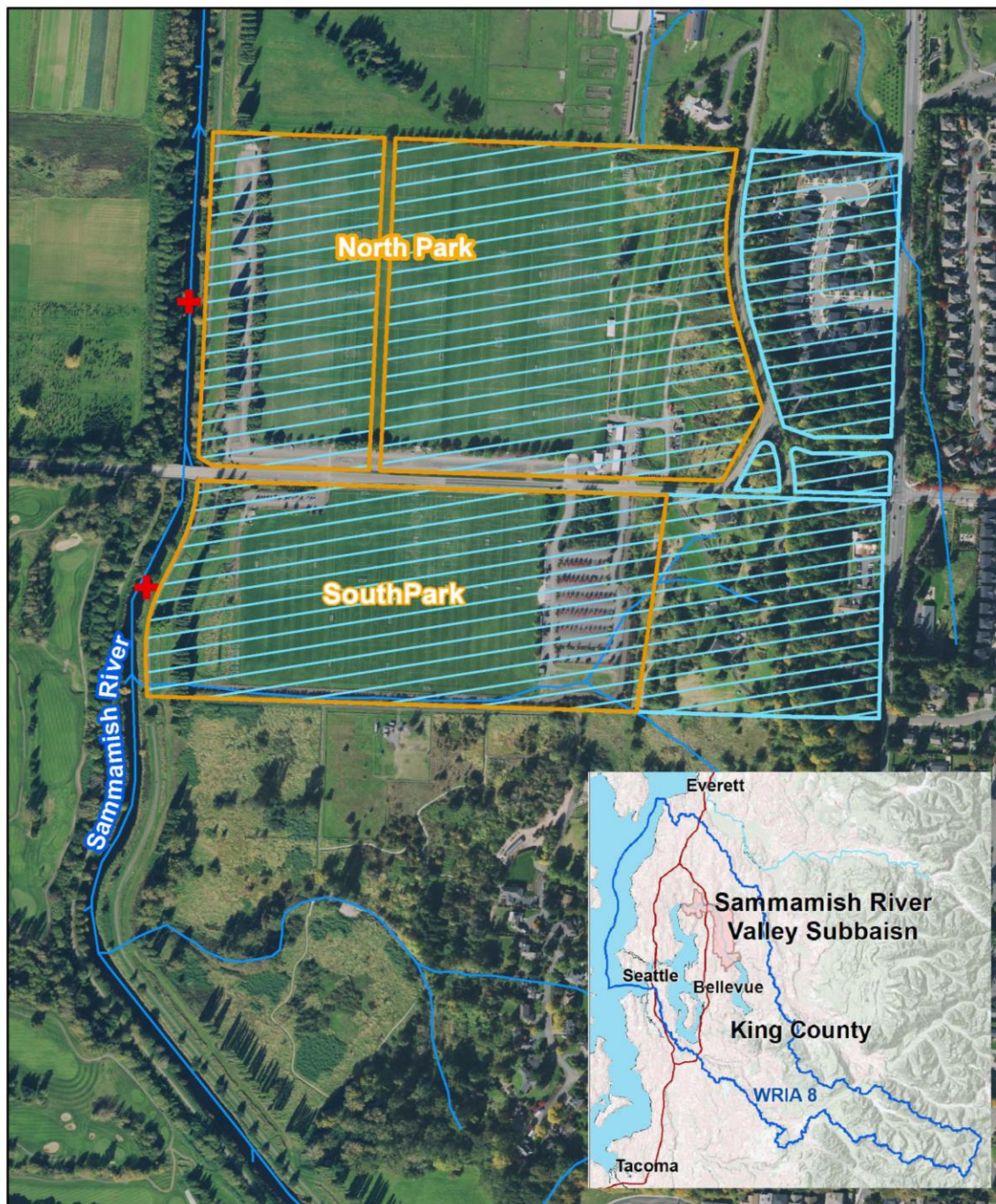
⁸ This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

County regarding the status of the certificates as municipal rights and validity of the certificates is recommended.

The water rights have priority dates of 7/24/1953 and 2/2/1953, which are senior to the establishment of the Cedar-Sammamish Instream Resources Protection Program in 1979.

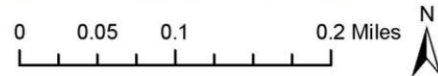
Figure 2: Project Map

Sixty Acres Park (North and South)



Legend

- Landowner Parcels
- Places of Use
- + Points of Diversion



Data Sources:
 NAIP Aerial Imaging, 2019. Water Rights Data.
 Geographic Water Imaging System (GWIS),
 Department of Ecology, 2020.

WRIA 8 – Water Right Project Opportunity Profile

Pre-identified No. 8 Water Right Acquisition

Project Summary (8-SRV-W4)

Updated: 11/3/2020

FLOW BENEFIT: Additional .467 cfs in 7.4 miles of Sammamish River mainstem downstream to Lake Washington.

PRIORITY SUBBASIN: Sammamish River Valley

ESTIMATED OFFSET: 23.43 afy consumptive

PRIORITY DATE(S): Claimed first use 1910, claimed first use 1974

SOURCE AND PURPOSE: Surface water for irrigation and stockwater.

PERIOD OF USE: Year-round.

WRIA 8 INSTREAM FLOW RULE (1979): Sammamish River is closed to further consumptive appropriations⁹

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Initial



Project Description

The Pre-identified No. 8 water right was included in the WRIA 8 water rights analysis by Ecology request. There are three water rights appurtenant to the parcels owned by this entity. These parcels are located within the city limits of Woodinville. Two of the three water right place of use also encompasses an adjacent property that is owned and managed by a separate entity. This project opportunity excludes that portion of that place of use owned by a separate entity, discussed in a separate profile. Shared use of this water right between these two entities may make it difficult to understand how much water is has been used under each operation. Prior to this acquisition, these parcels were under common ownership and management with the other parcels within the place of use, and were operated as a farm. The other water right claim appurtenant to this property covers an area that appears to be completely forested. The land under common management for this project opportunity is comprised of five parcels totaling 92.93 acres. Online sources indicate these parcels were purchased by the current owners and developed into a winery and vineyard in 1976. Due to proximity to the Brightwater Treatment Plant recycled water central service line, there may be potential for a source switch to recycled water. The cultivation of edible food crops and willingness to use recycled water may create a

⁹ Chapter 173-508 WAC

barrier to a recycled water source switch. There may be landscape irrigation needs on site as well. Washington Water Trust, King County Recycled Water and Washington State University are currently engaged in a project to assess and increase the viability of recycled water as an irrigation source. Any outreach on these water right(s) should defer to the ongoing efforts of the above project, WWT and King County. Given the parcel location within the City of Woodinville, a municipal supply source switch may also be an option. Additional documentation supporting beneficial use will be necessary to more accurately determine potential consumptive offset quantity available. Initial contact with the landowner has been made by King County Recycled Water.

Watershed

The Sammamish River is part of the Sammamish River Valley subbasin. The Sammamish River leaves Lake Sammamish and flows 14 miles before joining Lake Washington. Sammamish River tributaries include: Little Bear Creek, Cottage Lake Creek, North Creek, Swamp Creek, and Wildcat Creek. Water temperature and dissolved oxygen levels have been problems in the Sammamish River with increased flow cited as a solution. The Sammamish River and its tributaries were closed to further consumptive appropriation on the September 06, 1979.¹⁰

Land Use & Ownership

According to the King County Assessor, the current land-use is Industrial (Light) and Vacant (Single-family), and zoned as Industrial and R-4 Residential. The portion of the land under common ownership has been continuously operated as a vineyard/winery since it opened in 1976. Communication with King County Natural Resources indicate the parcels managed by this entity are not enrolled in the King County Farmland Preservation Program. A review of the WSDA 2019 Agricultural Land Use map, identifies no crop type on the property. Irrigation delineation indicates that as much 12.4 acres were irrigated in 2019. Although it is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 5: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	5.1
2015	5.1
2017	5.1
2019	12.4

¹⁰ Chapter 173-508 WAC

Water Right

Table 6: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Long Form Claim	24 afy (claimed)	200 gpm (claimed)	1910 (claimed)	Irrigation, fire protection, stock watering, cleaning barns	12	Unnamed creek
Long Form Claim	26 afy (claimed)	140 gpm (claimed)	1910 (claimed)	Domestic Supply and Irrigation	-	Spring-fed reservoir
Long Form Claim	7 afy (claimed)	10 gpm (claimed)	1974 (claimed)	Domestic Supply and Irrigation	7	Spring

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original claim was filed was 12/23/1973 and asserted 200 gpm continuously totaling 24 afy for the purposes of irrigation of 12 acres, fire protection, stock watering, and cleaning barns. Ecology lists the priority date as “date first use” which according to the claim form is 1910. The water is diverted via headworks installed in a creek. There are no additional documents suggesting changes to this water right.

The second claim was filed 01/23/1974 and asserted 140 gps continuously totaling 26 afy for the purposes of domestic supply, irrigation, and “milk barn”. Ecology lists the priority date as “date first use” which according to the claim form is 1910. The water is diverted via headworks installed in what is described as a spring-fed reservoir. There are no additional documents suggesting changes to this water right.

The third claim was filed 12/28/1973 and claimed 10 gpm continuously totaling 7 afy for the purposes of irrigation of 7 acres and domestic supply. Ecology lists the priority date as “date first use” which according to the claim form is 1974. The water is diverted via headworks. There are no additional documents suggesting changes to this water right.

Metering Records:

Ecology issued an Administrative Order dated 6/7/2002, ordering the water right holder to comply with metering actions described in Chapter 13-173 WAC. Communication with the Ecology Metering Coordinator revealed metering records for these rights were unavailable in the database.

Conclusion

This project was identified by Ecology as a potential acquisition opportunity. Initial conversations have occurred between King County and the landowner. There are three claims appurtenant to this property, all of which present challenges for acquisition. The places of use associated with the 1910 claims

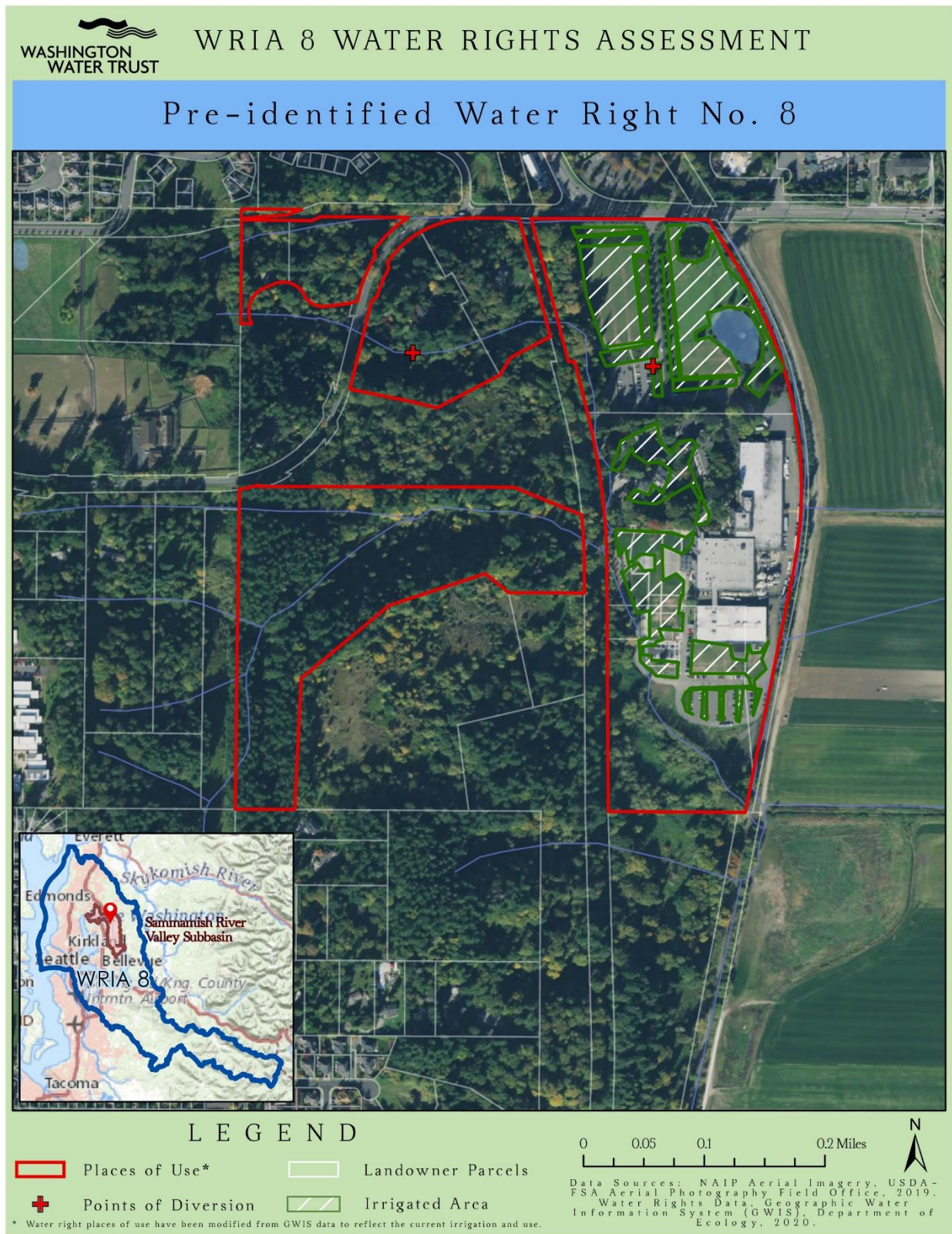
encompass property under different ownership and management. It may be difficult to determine to what extent these rights have been exercised by both parties. Additionally, aside from irrigation of 12 acres, these rights assert stock watering, fire protection, and cleaning barns as purposes of use. No metering records were available to indicate water use under these rights. The third water right mapped place of use appears to be completely forested. Irrigation and domestic use are listed as the purposes for this right. No metering records were available to indicate water use under this right. The production portion of the property is currently a vineyard/winery, and has been operated as such since it opened in 1976. There is a possibility that one or both of these rights are used to support wine production and a de facto change of use may have occurred. Ecology will have to make the determination if this is the case. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 12.4 irrigated acres. Although it is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user. Due to a lack of metering records, WWT utilized these delineations to estimate the potential consumptive use quantity that may be available to serve as an offset. Review of aerial imagery suggests the irrigated portion of the property appears to be primarily grass/turf. The estimate is developed based on the turf/pasture water duty (20.01 inches) found in the Washington Irrigation Guide (Seattle-Tacoma station, Appendix B) and irrigation method is assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the irrigation delineation of 12.4 acres and assuming turf/pasture, and sprinkler irrigation, 23.43 afy consumptive is the estimated quantity available for trust water transaction.¹¹

The Pre-identified No. 8 water rights have claimed first use priority dates of 1910 and 1974, which is senior to the establishment of the Cedar-Sammamish Basin Instream Resources Protection Program in 1979. These water rights do not have instream flow provisions listed in supporting documentation.

¹¹ This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition..

Figure 3: Project Map



WRIA 8 – Water Right Project Opportunity Profile

Sammamish River Valley No. 3 Water Right Acquisition

Project Summary (8-SRV-W5)

Updated: 11/3/2020

FLOW BENEFIT: Additional 1.65 cfs in 7.4 miles of Sammamish River mainstem downstream to Lake Washington.

PRIORITY SUBBASIN: Sammamish River Valley

ESTIMATED OFFSET: 551.83 afy consumptive

PRIORITY DATE(S): 03/29/1947, 07/09/1965, Pre-1901 (claimed)

SOURCE AND PURPOSE: 1-4) Surface water for irrigation; 5) surface water for irrigation, domestic multiple, and stockwater; 6) surface water for stockwater and irrigation; 7) surface water for irrigation, domestic multiple, and stockwater; 8-14) surface water for irrigation; 15) surface water for irrigation, domestic multiple, and commercial and industrial.

PERIOD OF USE: 1) Seasonally from June – September; 2) seasonally from April 1st – October 31st; 3) seasonally during irrigation season; 4) seasonally from April 1st – October 1st; 5-15) year-round.

WRIA 8 INSTREAM FLOW RULE (1979): Sammamish River is closed to further consumptive appropriation.¹²

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Initial

Project Description

The Sammamish River Valley No. 3 water right was identified in the WRIA 8 irrigation analysis performed by WWT. The property is located approximately 4 miles northwest of the City of Redmond. There are fifteen water right documents with congruent or overlapping places of use, held by the water right holder. Discussions with Ecology revealed that twelve of these are 97-98 era claims. Pursuant RCW 90.14.068, claims filed during this period are subordinate to any water right (permit, certificate, or claim) filed prior to July 27, 1997. Therefore, these claims are junior to the Cedar-Sammamish instream flow and thus not discussed further in this profile. Additional analysis of these rights would be necessary to determine their project potential. The three remaining rights appurtenant to the property have likely



¹² Chapter 173-508 WAC

been used to irrigate the property since the farm's establishment prior to 1910, according to online sources. The property is in close proximity the central service line for recycled water. In previous contact with the land user by WWT, they have expressed interest in learning more about the possibility of switching to recycled water. Additional information regarding the suitability of recycled water and cost associated to the switch to this source are potential barriers to this transaction with this user.

Watershed

The Sammamish River is part of the Sammamish River Valley subbasin. The Sammamish River leaves Lake Sammamish and flows 14 miles before joining Lake Washington. The Sammamish River tributaries include: Little Bear Creek, Cottage Lake Creek, North Creek, Swamp Creek, and Wildcat Creek. Water temperature and dissolved oxygen levels have been problems in the Sammamish River with increased flow is cited as a solution. The Sammamish River and its tributaries were closed to further consumptive appropriation on the September 06, 1979.¹³

Land Use & Ownership

These parcels, located in the King County designated Agriculture Production District. Communication with King County Natural Resources indicate three of the four parcels managed by this entity are dually enrolled in the King County Farmland Preservation, and Farm and Ag incentive programs.¹⁴ The fourth parcel is also enrolled in the Farm and Ag incentive program. According to the King County Assessor, the current land-use is Agricultural and the parcels are zoned as A10-Agricultural. The landowner holds four parcels totaling 401.87 acres. The smallest of these parcels is non-contiguous, located in the City of Kirkland jurisdiction, zoned RSA1 and completely forested. No agriculture appears to occur on this parcel. Review of the WSDA 2019 Agricultural Land Use map identifies turf grass as the crop type on irrigated portions of the property. Irrigation delineation suggests as much as 320.6 irrigated acres in 2019. The current operators lease the two larger parcels from the landowners. Underlying one of the water right documents, there is a portion of land owned and managed by a separate entity. At Ecology's request, this property is separately reviewed.

Table 7: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	311.3
2015	311.3
2017	314.7
2019	320.6

¹³ Chapter 173-508 WAC.

¹⁴ <https://www.kingcounty.gov/depts/dnrp/wlr/sections-programs/rural-regional-services-section/agriculture-program/farmland-preservation-program.aspx>

Water Right

Table 8: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	.8 cfs	03/29/1947	Irrigation	80	Sammamish River
Certificate	96 afy	.4 cfs	07/09/1965	Irrigation	200	Sammamish River
Claim Long Form	24 afy	.45 cfs	1910 (claimed)	Irrigation, Fire protection, Stockwatering, Cleaning Barns	12	Sammamish River

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate has a priority date of 03/29/1947 for the purpose of irrigation of 80 acres, with .8 cfs listed as the Qi and no listed Qa. This certificate has a metering order from Ecology, dated 06/04/2002. The source of this right is the Sammamish River and with water diverted to the property via a surface water pump.

The second certificate has a priority date of 07/09/1965 for the purpose of irrigation of 200 acres, with .4 cfs listed as Qi and 96 afy listed as the Qa. During the permit period for this certificate, an ROE directed a reduction in the Qa and Qi listed on the application. Certificated quantities were further reduced from those listed in the ROE. This certificate has a metering order from Ecology, dated 06/04/2002. The source for this right is the Sammamish River with water diverted via two surface water pumps.

The long form claim asserts first use as 1910, a purpose of fire protection, stockwatering, cleaning barns, and irrigation of 12 acres, with .45 cfs asserted as the Qi and 24 afy listed as the Qa. This right has a metering order from Ecology, dated 06/07/2002. A portion of this water right place of use is under different ownership and management, and reviewed separately for Pre-identified Water Right No. 8. The source for this right is a creek, which flows to the Sammamish River. Water is diverted from the creek using head works and a gravity system.

Metering Records:

Metering records are available by request from Ecology from 2006-2019. These records indicate water use from four separate diversions. These diversions serve the two certificates discussed above and two 97-98 era claims. These diversions are shared and further analysis is necessary to determine quantities used under each right. Meter records report as much as 326.7 afy of water during the last 5 years.

Conclusion

This project was identified by WWT as a potential source switch to recycled water. The land operates as a commercial turf farm. Given the non-edible crop type and the property's proximity to the recycled water central service line, this project shows strong potential to receive recycled water. Washington

Water Trust and King County have conducted initial outreach to the operators of this farm. Washington Water Trust, King County Recycled Water and Washington State University are currently engaged in a project to assess and increase the viability of recycled water as an irrigation source. Any outreach on these water right(s) should defer to the ongoing efforts of the above project, WWT and King County. The three rights discussed in this profile and the twelve additional 97-98 era claims present a complexity to fully understanding the quantity and validity of water rights appurtenant to this property. Quantities claimed on the 97-98 era claims appear excessive (e.g. Qa 36,500 afy, Qi 50 cfs). Additionally, incomplete metering records provide data for only four of the fifteen rights. Further due diligence is required to fully understand the extent of water use on this property.

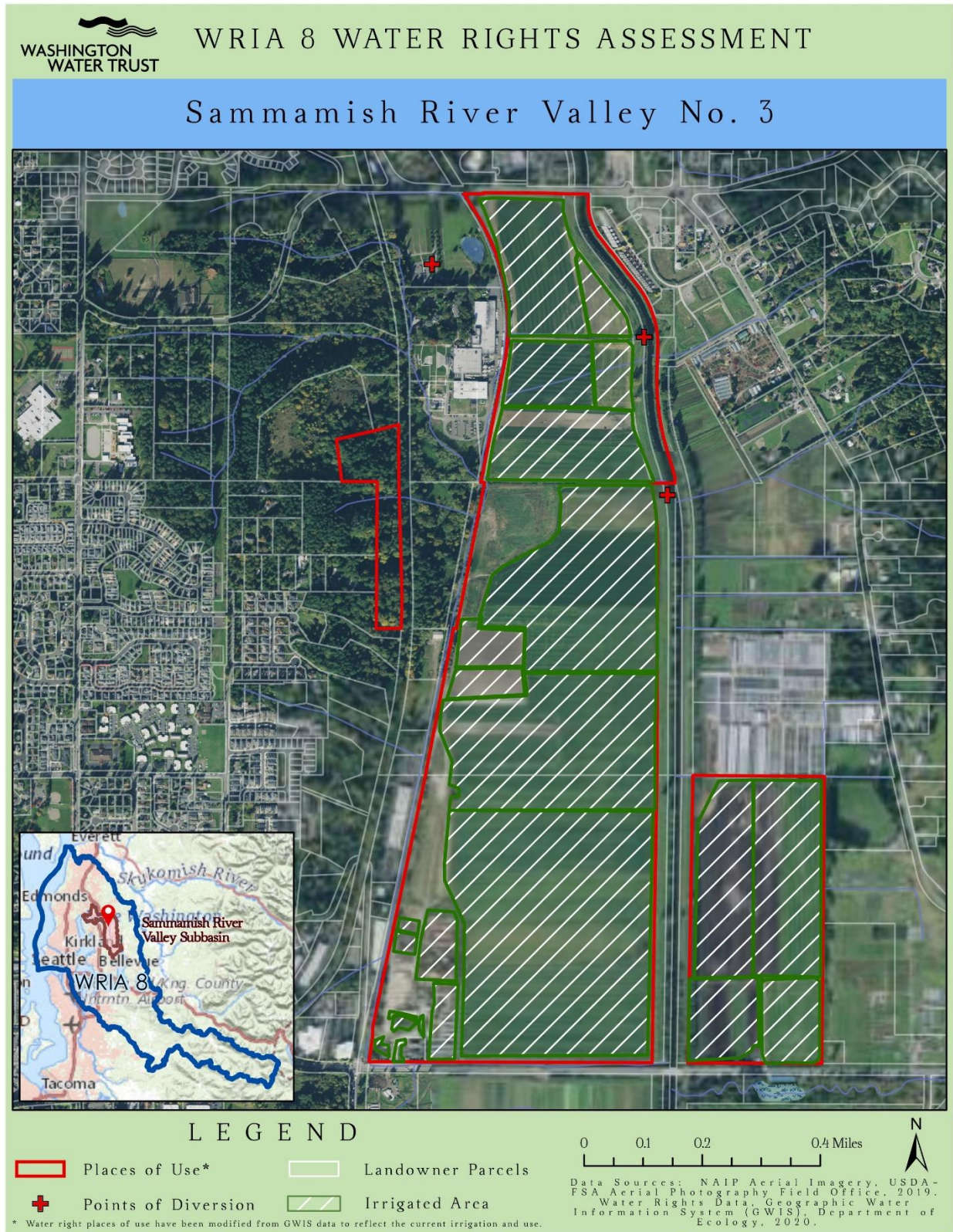
Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 320.6 irrigated acres. Consistent irrigation across years examined led WWT to utilize irrigation delineations to estimate the potential consumptive use quantity that may be available to serve as an offset. The estimated irrigation acreage was reduced to align with the total irrigated acreage under the three subject water rights. Since the property use is known, turf farm, an estimate is developed based on the turf/pasture water duty (20.01 inches) found in the Washington Irrigation Guide (Seattle-Tacoma station, Appendix B) and irrigation method is assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the three water rights documents listed above which authorize or assert 292 acres of irrigation, and assuming turf/pasture, and sprinkler irrigation, 551.83 afy consumptive is the estimated quantity available for transaction.¹⁵

The Sammamish River Valley No. 3 water rights have priority dates of 03/29/1947, 07/09/1965, and Pre-1901 (claimed), which are senior to the establishment of the Cedar-Sammamish Instream Resources Protection Program in 1979.

¹⁵ This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 4: Project Map



WRIA 8 –Project Description

Sammamish River Valley Recycled Water Managed Aquifer Recharge

October 21, 2020

Project Name and Number

Sammamish River Valley Recycled Water Managed Aquifer Recharge (8-SRV-W6)

WRIA 8 WRE Subbasin

Sammamish River Valley

Water Offset

~181 acre-feet/year

Narrative Description

One of the non-acquisition water offset project ideas identified by the WRIA 8 WREC involves using recycled water for managed aquifer recharge (MAR). This project would augment stream flows by increasing surficial aquifer discharge to the Sammamish River above what occurs under existing conditions. The project concept includes diverting recycled water from the existing Brightwater recycled water pipeline, which extends from the Brightwater tunnel alignment in Bothell, south through the Sammamish River Valley to Redmond. Brightwater currently distributes reclaimed water from May to October, but recycled water may also be available year-round, if needed. Diverted water would be conveyed from the recycled water pipeline and piped to a constructed MAR facility. This diverted water infiltrates into the shallow aquifer, is transported down-gradient, and ultimately discharges to the Sammamish River as re-timed groundwater baseflow. The goal of the project is to increase baseflow to the Sammamish River by recharging the aquifer adjacent to the river and providing additional groundwater discharge to the river through MAR.

The project should be specifically designed to enhance streamflows and to avoid a negative impact to ecological functions and/or critical habitat needed to sustain threatened or endangered salmonids.

A specific project site has not yet been identified, however, there are several suitable sites near the existing pipeline and in the WRIA 8 Sammamish River Valley subbasin.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The proposed recycled water MAR facility will result in streamflow benefits to the Sammamish River by diverting and temporarily storing recycled water into the shallow alluvial aquifer. The project is currently conceptual, but anticipates the ability to divert recycled water from the existing pipeline at a rate of approximately 0.5 cubic feet per second (cfs) for six months (May through October). The goal is to increase streamflow, especially during months when demand for water is highest and surface flows are generally lowest (June through August). The proposed MAR facility will infiltrate recycled water into the shallow aquifer and provide increased baseflow to the Sammamish River and its tributaries, depending on where the facility is sited. The anticipated offset volume for this project is 181 acre-feet (AF) per year. The offset volume is calculated based on the quantity of water infiltrated annually, as described below.

United States Geologic Survey mapping in the area suggests that alluvium deposits are present at the proposed locations (Minard 1983, 1985). United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soil maps indicate the sites are underlain by Snohomish silt loam, Tukwila muck, and Earlmont silt loam soils with an average saturated hydraulic conductivity (Ksat) ranging from 0.39 to 1.28 inches per hour (USDA 2020). For planning purposes, Ksat is assumed to be equivalent to infiltration rate. Site-specific data were not available so a safety factor of two was applied to the raw Ksat value to derive a corrected infiltration rate ranging from 0.19 to 0.63 inches per hour. Assuming water will be diverted between May 1 and October 31 every year (183 days), the annual diversion volume is estimated to be 181 AF per year using Equation 1:

$$\text{Annual Volume} = \text{Diversion Rate} \times \text{Duration of Diversion} \quad \text{Equation 1}$$

It is anticipated that the MAR facility would be constructed as a buried infiltration gallery or open pond, but design details will be further developed at a later time. Year-round groundwater baseflow will be added to actual streamflow in the Sammamish River if this project is developed. The temporal distribution and absolute value of those benefits will be estimated during the feasibility study that has to be conducted before a MAR project can proceed to construction and operation. Those streamflow augmentation benefits will continue to discharge to the river after each year's storage window closes because of the lag time of water moving through an aquifer and the distance of the flow path to the river. The rate at which the infiltrated water re-enters the river will vary based on in-situ aquifer parameters that will be tested and modeled during the feasibility study.

It is assumed that a site feasibility study will be conducted pursuant with Appendix B of Ecology's Net Ecological Benefit (NEB) guidance (Ecology 2019a) and Appendix D of the Streamflow Restoration grant application requirements, if funding from Ecology is pursued during a future grant round (Ecology 2019b). All values presented in this project description are for planning purposes and may not represent actual site conditions.

Conceptual-level map and drawings of the project and location.

No potential MAR facility site has currently been identified. The attached map provides an overview of Brightwater, the existing recycled water pipeline, and the surrounding area.

Description of the anticipated spatial distribution of likely benefits.

The project is expected to provide streamflow benefits in the Sammamish River and downstream subbasins (including the Greater Lake Washington and Seattle Lake Union subbasins).

Location relative to future PE well demand.

The consumptive use estimate for the WRIA 8 Sammamish River Valley subbasin is 3.2 AF per year (GeoEngineers 2020). Consumptive use estimates for subbasins downstream of the Sammamish River Valley subbasin include the following (GeoEngineers, 2020):

- Greater Lake Washington subbasin: 1.8 AF per year.
- Seattle Lake Union subbasin: 0 AF per year.

Performance goals and measures.

The performance goals are to increase water storage in the alluvial aquifer adjacent to the Sammamish River by infiltrating 181 AF per year through the MAR facility to improve baseflow in the Sammamish River. The performance measures will be an increase in baseflow in the Sammamish River, especially during the critical flow period. The increased baseflow should reduce water temperatures in the river.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Sammamish River and tributaries are inhabited by numerous fish species, including summer steelhead, winter steelhead, coho salmon, dolly varden/bull trout, pink salmon, rainbow trout, summer chinook salmon, fall chinook salmon, fall chum salmon, and coastal cutthroat trout (WDFW 2020). Chinook and steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Identification of anticipated support and barriers to completion.

This project is believed to be in alignment with the goals of the Streamflow Restoration law. MAR is one of the identified project types that could address the new consumptive water use and achievement of NEB. In addition, this project would reduce the amount of treated wastewater that our region sends to Puget Sound and puts water to better use.

The barriers to completion include funding for construction and O&M costs. In addition, the water available for diversion from the Brightwater recycled water pipeline is treated wastewater. The Brightwater plant is an advanced treatment facility that combines standard biological wastewater treatment with membrane filters to produce higher quality water that is seven to ten times cleaner than typical secondary treated wastewater. After disinfection, water is 99 percent cleaner than when it came into the treatment plant. Brightwater recycled water is reused on golf courses, soccer fields and farms, instead of using valuable drinking water for irrigation, and for environmental projects wherever it is available. However, despite the advanced treatment technology, it is anticipated that water quality will be evaluated and a geochemical compatibility analysis will be conducted to ensure no water quality degradation.

Potential budget and O&M costs.

No specific MAR site has been selected. Currently, recycled water is only available via King County's recycled water pipeline which extends from the Brightwater tunnel alignment in Bothell, south through the Sammamish River Valley to Redmond. However, King County is in the process of designing and constructing additional storage capacity at Brightwater, which would allow for distribution of recycled water to areas proximal to the plant and eventually to other portions of Snohomish County as recycled water infrastructure expands to meet future demand.

Ultimately, the cost of constructing the project will depend on project location and the conveyance infrastructure required to transport recycled water from existing Brightwater conveyance structures to the MAR facility.

Purchase of reclaimed water from King County would be ongoing and dependent on the negotiated rate. Assuming a rate of \$0.26 per hundred cubic feet, which was the average reclaimed water rate in Florida in 2005 (King County Department of Natural Resources and Parks, 2008), the potential annual cost for an MAR project that injects 0.5 cfs for a period of 5 months would be approximately \$16,850.

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the MAR project to maintain the estimated water offset over time and despite changing external conditions (which could include seasonal variation in streamflow, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be durable, based on the following:

- The water source would be reliable.

- The rate of diversion would be precisely maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that significantly reduces the project offset.
- Land use changes external to the project site would have negligible impact on project function.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, and/or other impacts. We anticipate that the planned project would be resilient to the potential impacts of climate change based on the following:

- Project function would not be impacted by summer drought conditions.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the MAR site and surrounding area would not impact project function and the anticipated water offset.
- Sea level increase would not impact project function.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Washington Water Trust is a potential sponsor for this project.

Documentation of sources, methods, and assumptions.

Department of Ecology. 2019a. Final Guidance for Determining Net Ecological Benefit. GUID-2094 Water Resources Program Guidance. Publication 19-11-079. July 2019.

Department of Ecology. 2019b. Streamflow Restoration Competitive Grants, 2020: Guidance for project applicants. Publication 19-11-089. Revised December 2019.
<https://fortress.wa.gov/ecy/publications/documents/1911089.pdf>

GeoEngineers, Inc. (GeoEngineers). 2020. WRIA 8 Consumptive Use Estimates – Final Draft. Technical memorandum prepared for Washington State Department of Ecology. February 2020.

King County Department of Natural Resources and Parks, 2008. Reclaimed Water Feasibility Study. March. 185 p.

Minard, J.P. 1985. Geologic Map of the Bothell Quadrangle, Snohomish and King Counties, Washington. USGS Miscellaneous Field Map MF-1747, Scale 1:24,000.

Minard, J.P. 1983. Geologic Map of the Kirkland Quadrangle, Washington. USGS Miscellaneous Field Map MF-1543, Scale 1:24,000.

US Department of Agriculture (USDA), 2020. Web Soil Survey.
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Washington State Department of Fish and Wildlife (WDFW). 2020. Salmonscape Mapping of Fish Distribution. <http://apps.wdfw.wa.gov/salmonscape/>

WRIA 8 – Water Right Project Opportunity Profile

Pre-identified No. 2 Water Right Acquisition

Project Summary (8-I-W8)

Updated: 11/3/2020

FLOW BENEFIT: Additional 0.38 cfs in 1 mile of Issaquah Creek, Lake Sammamish, 13 miles of Sammamish River mainstem, downstream to Lake Washington.

PRIORITY SUBBASIN: Issaquah and Sammamish River Valley

ESTIMATED OFFSET: 27.6 afy (consumptive), 52 afy (perfected), 110 afy (water right documents)

PRIORITY DATE(S): 06/01/1954, 09/02/1958

SOURCE AND PURPOSE: Groundwater for community domestic supply.

PERIOD OF USE: Year-round.

WRIA 8 INSTREAM FLOW RULE (1979): Issaquah Creek, Lake Sammamish, and Sammamish River are closed to Appropriation.¹⁶

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened).

OUTREACH STATUS: Interested

Project Description

The Overdale Water Association (Overdale) water right was pre-identified by Ecology request as a potential transaction. These two water rights previously served a Group A community water supply through 2004 until Overdale completed an intertie with the Sammamish Plateau Water and Sewer District (SPWSD) in 2005. Since completing the intertie, Overdale has relied on SPWSD for community water supply. The water right holder has temporarily donated the water right to the Trust Water Rights Program (TWRP) until January 01, 2036. Outreach to the water right holder has been initiated by Washington Water Trust.

Watershed

Issaquah Creek is within the Issaquah subbasin and a tributary to Sammamish River Valley subbasin. Issaquah Creek joins Sammamish Lake, which flows into the Sammamish River. Issaquah Creek, Sammamish Lake and Sammamish River were closed to appropriation in the September 06, 1979 WRIA 8 instream flow rule, Chapter 173-508 WAC.



¹⁶ Chapter 173-508 WAC

Land Use & Ownership

Overdale is a community water system that fits the definition of a municipality under the State's municipal water law. Overdale serves primarily residential homes through an intertie with SPWSD completed in 2005. After 2005, Overdale has not utilized its water rights to serve the community known as Overdale Park.

Water Right

Table 1: Current Water Rights

Document Type	Qa ¹⁷	Qi	Priority Date	Purpose of Use	WR Acres	Source
Trust Water Temp. Donation	52 afy	120 gpm	10/11/2016	Groundwater Preservation	-	Groundwater
Trust Water Temp. Donation	52 afy	50 gpm	10/11/2016	Groundwater Preservation	-	Groundwater
Certificate	30	190 gpm	06/01/1954	Domestic Multiple	-	Groundwater
Certificate	80	50 gpm	09/02/1958	Domestic Multiple	-	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

Water rights appurtenant to Overdale consist of two water right certificates: 1) GWC5975-A (G1-*03656CWRIS), and 2) GWC 4066-A (G1-*04988CWRIS). The following summarizes findings from previous beneficial use evaluations (Aspect, 2014) and Ecology's Trust Water Donation Letter. Trust Water Quantification, Department of Ecology, August, 18, 2017: "The Department of Ecology has reviewed the information provided by Overdale and by Aspect Consulting. Pursuant to RCW 90.42.080(l)(b), Ecology accepts your temporary donation in the amounts of 170 gpm (50 gpm + 120 gpm) and 52 afy (27.6 afy consumptive) under GWC 4066-A and GWC 5975-A. The purpose of your donation, per your request, is for groundwater preservation and instream flows."

Well Information:

According to Ecology records, the well serving the 06/01/1954 certificate was replaced in 2008. No dates were included in the well driller's log. This well has a diameter of eight inches, was drilled to a depth of 144 feet and was completed at 143 feet. It is noted in this paperwork that the original well was left open as a monitoring well and had not yet been decommissioned as required by Chapter 18.104 RCW. The well serving the 09/02/1968 certificate is 12 inches in diameter and was completed 08/28/1958 at a depth of 510 feet.

¹⁷ Quantities are non-additive.

Metering Records:

Table 2: SPWSD Deliveries to Overdale Water System¹⁸

Year	Annual Total (Million Gallons) ¹⁹	Annual Total (afy) 1	Annual Total (afy) 2 ²⁰
2005 (partial year)	11.7	35.9	NR
2006	16.5	50.6	52.1
2007	13.4	41.1	41.7
2008	13.8	42.4	41.0
2009	15.1	46.3	44.3
2010	12.6	38.7	38.6
2011	13.7	42.0	NR

Conclusion

According to the beneficial use report, summarized metering records and Ecology's Trust Water Donation Acceptance, the subject water rights appear to:

- 1) have been exempt from non-use as a municipal water supply, and
- 2) accepted in TWRP in the amounts of 170 GPM, an annual quantity of 52 afy and an estimated 27.6 afy consumptive use. Table 1 above summarizes the water right record.

This project was identified by Ecology request as a potential early acquisition opportunity. Review of the water right record, beneficial use analysis and recent Ecology decisions indicate strong evidence that the water right is valid and viable as a transaction. Initial outreach by Washington Water Trust confirms that Overdale is willing to discuss a transaction and interested in selling this water right.

Based on the water right record and previous technical analysis, and Ecology's trust water donation, an annual quantity of 52 afy (perfected) with an estimated 27.6 afy consumptive use is likely available for trust water transaction, though the sum of the certificates is 110 afy.

¹⁸ Compiled by Aspect Consulting

¹⁹ Annual totals in afy calculated from annual totals in millions of gallons reported by SPWSD.

²⁰ Annual totals as reported by Cascade Water Alliance

NR – Not reported

Figure 5: Project Map



WRIA 8 – Water Right Project Opportunity Profile

Pre-identified No. 4 Water Right Acquisition

Project Summary (8-I-W9)

Updated: 11/3/2020

FLOW BENEFIT: Additional 2.45 cfs in .1 miles of East Fork Issaquah Creek, 3 miles of Issaquah Creek, Lake Sammamish, and 14 miles Sammamish River mainstem.

PRIORITY SUBBASIN: Issaquah

ESTIMATED OFFSET: 336 afy consumptive²¹

PRIORITY DATE(S): 05/16/1974

SOURCE AND PURPOSE: Groundwater for commercial and industrial.

PERIOD OF USE: Year-round.

WRIA 8 INSTREAM FLOW RULE (1979): Issaquah Creek, Lake Sammamish, and Sammamish River are closed to appropriation.²²

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Initial



Project Description

The Pre-identified Water Right No. 4 was included in the WRIA 8 water rights analysis by Ecology request as a potential transaction. The land, and underlying water right, currently support commercial production of dairy products. According to online sources the facility, located in the City of Issaquah's Cultural Business District, has been continuously operated since 1909. As of 7/30/2018, a portion of the annual quantity of the subject water right was temporarily donated to the Trust Water Rights Program. The initial outreach was completed by the Washington Water Trust and the water right holder is open to future discussion. Further investigation revealed the water right holder holds a second water right certificate to support operations.

Watershed

Issaquah Creek is within the Issaquah subbasin and a tributary to Lake Sammamish. Issaquah Creek joins Lake Sammamish, which flows into the Sammamish River for 14 miles before joining Lake Washington. Ecology notes that groundwater in the vicinity has direct effect on instream flows and lake levels.

²¹ Assumes 100% of Qa indicated by metering records is used consumptively.

²² Chapter 173-508 WAC.

Land Use & Ownership

According to the King County Assessor, the current land-use is listed as Industrial (Gen Purpose) and the land is zoned as CBD (Cultural and Business District) by the City of Issaquah. The land underlying the Pre-identified Water Right No. 4, has been continuously used for production of dairy products since 1909. The property was acquired by its current owners in the early 1960's.

Water Right

Table 9: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Change Application (Withdrawn)	1232 afy	2.45 cfs	3/1/1999	Fish Propagation	N/A	Groundwater
Trust Water Temporary Donation	286 afy	0 cfs	7/30/2018	Groundwater Preservation	N/A	Groundwater
Certificate	1232 afy	2.45 cfs	5/16/1974	Commercial and Industrial	N/A	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The water right certificate of interest was issued for continuous manufacturing at an existing facility. Prior to issuance of this certificate, the facility was served by a surface water right from the East Fork Issaquah Creek and a groundwater right. Relinquishment of the surface water right was a condition for issuance of the 05/16/1974 groundwater certificate. This certificate is listed as primary and approves an instantaneous quantity of 2.45 cfs totaling 1232 afy for the purpose of Commercial and Industrial. There was a change application was filed 3/1/1999 for this certificate, which was later withdrawn. On 7/30/2018, 286 afy of this right was temporarily donated to the Trust Water Right Program for the purpose of groundwater preservation. The water right holder provided metering records with the donation application and noted that 336 afy were put to beneficial use under this right in the past 5 year period (2013-2017), which may suggest relinquishment of the remaining 896 afy listed on the certificate. The donation letter requests that 286 afy be placed in the Trust Water Rights Program and 50 afy be retained for use. The water right holder retained the full instantaneous quantity and noted on the application that they expect to withdraw the donated portion when plant activities increase to regular levels.

Review of documents associated with the 05/16/1974 certificate revealed the water right holder also holds a second groundwater certificate with a priority date of 04/06/1949. This certificate is listed as primary and approves an instantaneous quantity of 1.11 cfs totaling 405 afy for the purpose of Commercial and Industrial.

Well Information:

The Ecology Well Report Map contained no information regarding either of the wells serving this right. The ROE for the 1974 right notes that the well was completed in 1937 and is 16 inches in diameter and drilled to a depth of 89'. A well report for this right dated 01/16/1996 documents the replacement of the original well completed in 1937. The new well is located 15 feet south of the original well. This well is 16 inches in diameter and was drilled to a depth of 113 feet and completed at a depth of 101 feet. It is

noted in the report that the new well is incapable of meeting the certificated instantaneous quantity, and it is recommended that the 1937 well be used as a monitoring well, providing the option for reconstruction to provide increased pumping capacity during summer months.

Metering Records:

Metering records for 2013-2017 were submitted with the donation application. It is noted on this document that there were periods during this time that the well meter failed. Usage for these periods was calculated based on average usage during the same months in different years. As much as 336 acre feet of water use was indicated by these records during this 5-year period. A metering request to Ecology produced no additional metering records.

Conclusion

This project was identified by Ecology as a potential acquisition opportunity based on a portion of the right being donated to the Trust Water Rights Program. The land use has remained constant since the facility opened in 1909. The 2018 temporary donation of 286 afy citing a temporary reduction in production quantified total use under this certificate in the most recent 5-year period as 336 afy. This use history may indicate relinquishment of 896 afy of the annual quantity listed on the original certificate. This water right may provide an opportunity for a full or partial transaction.

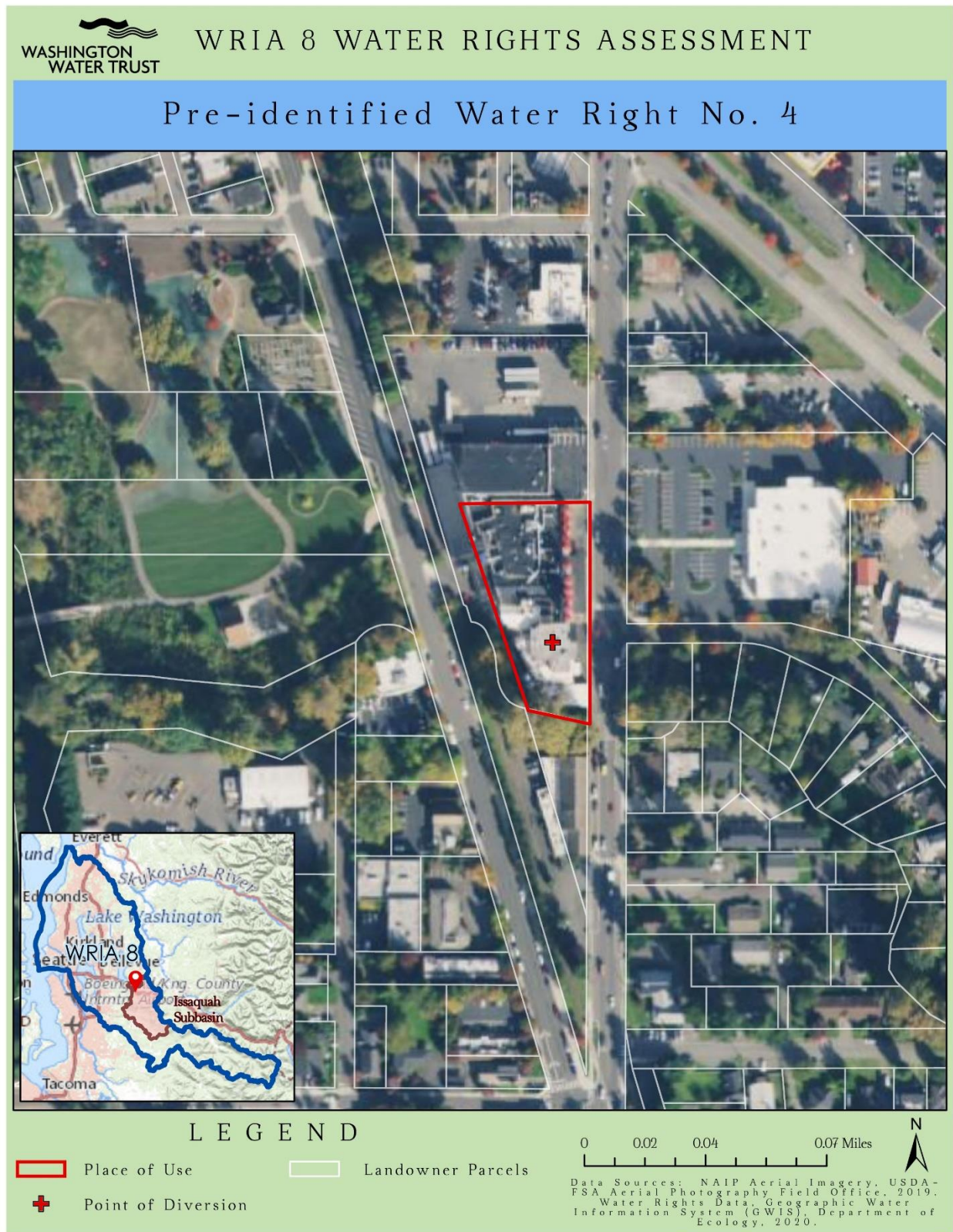
Potential to return to previous production levels at the facility may create a barrier to permanent acquisition. Additionally, a lack of comprehensive metering documents as well as an understanding of water use practices at this time make it difficult to estimate beneficial use and consumptive quantities. Ultimately, these quantities must be determined by Ecology. Based on the 2018 donation application, 336 afy (diverted) may be available for transaction. Of this 336 afy, 286 afy have been donated to the Trust Water Rights Program through 08/01/2023.

- Based on the water right document which authorizes 1232 afy (diverted) and the 7/30/2018 donation application suggesting 336 afy (diverted) of beneficial use at the time of donation, and 336 afy (consumptive) is the estimated quantity available for transaction.²³

Further due diligence is necessary to determine consumptive quantities associated with this opportunity. The Pre-identified No. 4 water right has a priority date of 05/16/1974, which is senior to the establishment of the Cedar-Sammamish Basin Instream Resources Protection Program (Instream Flow Rule) in 1979. This water right does not have an instream flow provision.

²³ This is only an estimate of consumptive use quantity and assumes 100% consumption for dairy production. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 6: Project Map



WRIA 8 – Water Right Project Opportunity Profile

Riverbend Mobile Home Park Water Right Acquisition (Pre-identified No. 9)

Project Summary (8-LC-W10)

Updated: 11/3/2020

FLOW BENEFIT: Additional .6 cfs in 7.5 miles of the Cedar River mainstem downstream to Lake Washington.

PRIORITY SUBBASIN: Lower Cedar

ESTIMATED OFFSET: 20.079 afy (consumptive), TBD²⁴ (perfected), 120 afy (water right document)

PRIORITY DATE(S): 1/9/1973

SOURCE AND PURPOSE: Groundwater for domestic multiple.

PERIOD OF USE: Year-round.

WRIA 8 INSTREAM FLOW RULE (1979): There is an instream flow established in the Cedar River.²⁵

ESA LISTED FISH: Spring/Summer/Fall Puget Sound Chinook Salmon (Threatened), Puget Sound/Strait of Georgia Coho Salmon (Species of Concern), Winter/Summer Puget Sound Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Interested

Project Description

The Pre-identified No. 9 water right was included in the WRIA 8 water rights analysis by Ecology request. The land, and underlying water right, were previously used as a mobile home park, and are located 4.5 miles east of the City of Renton. Per communications with Ecology and online records, the property and water right were acquired by King County in 2013. The property was purchased as part of a levee setback and floodplain restoration project. The property change of use may provide an opportunity for water rights acquisition. A lack of available metering records create a data gap in determining the portion of the certificate available for transaction. Ecology has been in contact with King County discuss permanent donation of this water right.



²⁴ At the time of this report no information was available indicating the perfected quantity of this right

²⁵ Chapter 173-508 WAC

Watershed

The Cedar River originates in the Cascade Mountains and flows 45 miles through the Upper and Lower Cedar subbasins to Lake Washington. The Cedar River and its tributaries including Rock Creek and Jones Creek are under restricted appropriation subject to low flow limitations consistent with Chapter 75.20 RCW as of September 06, 1979.²⁶

Land Use & Ownership

According to the King County Assessor, the current land-use is listed as Mobile Home Park (18.64 ac) and zoned as RA-5 (Rural Area). There are two parcels in the southeast corner of the water right place of use, which are not part of the mobile home park. These parcels have a current land-use of Single Family (Res Use/Zone) and zoned RA5 (Rural Area 5). The landowner and water right holder also own an adjacent property to the east with a current land use of Vacant (Multi-family) and zoned as RA5 (Rural Area 5). A review of the WSDA 2019 Agricultural Land Use map, identifies no crop type on the property. Irrigation delineation indicates as much as 9.3 acres were irrigated in 2019. These parcels were acquired by King County in 2013 as part of a strategy to address chronic flooding and for floodplain restoration. According to online resources, resident relocation was completed in 2016. Due to the change in use of the property, there may be an opportunity for acquisition of the water right.

Table 10: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	.4
2015	.5
2017	0
2019	9.3

Water Right

Table 11: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	120 afy	268 gpm	1/9/1973	Domestic Multiple	N/A	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original water right application was filed 1/9/1973 for continuous community domestic water supply. The initial Report of Examination (ROE) was completed on 4/26/1973 recommended a Qi of 268 gpm and a Qa of 120 afy for continuous domestic supply for 94 mobile homes and 40 travel trailers. Proof of appropriation was filed 4/14/1975. The certificate was issued 6/30/1975 for the amounts listed in the ROE. It was noted in the ROE that the works were completed prior to the submission of the

²⁶ Chapter 173-508 WAC

application. The source of this water right is a well. No applications related to changing this water right are documented in Ecology's Water Rights Tracking System.

Well Information:

The proof of appropriation documentation indicates that the approximate completion date of the well and first use of the water occurred in 1957. The well is 10 inches in diameter and was completed at an estimated depth of 28 feet. Review of Ecology's Well Construction and Licensing tool indicate no additional information is available.

Metering Records:

Communication with the Ecology revealed that no metering records are available for this well.

Conclusion

This project was identified by Ecology as a potential acquisition opportunity. The previous land use was a mobile home park which appears to have fully ceased operations in 2016, making the water potentially available for acquisition. The lack of metering records make beneficial use difficult to quantify. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) suggesting as much as 9.3 acres of irrigation occurred as recent as 2019.

Lack of metering data make it difficult to quantify beneficial use. Proof of appropriation was filed August 14, 1975. Per RCW 90.03.015(4)(a), this water right meets the criteria for a Group A water system (over 15 connections). Therefore, this right may not be subject to relinquishment as a municipal water right.²⁷ Determining the portion of the 120 afy authorized on the certificate that is available for transaction will require a determination of extent and validity by Ecology. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which indicate areas as much as 9.3 acres were irrigated. Due to lack of meter records, WWT utilized the irrigation delineations and the WRIA 8 Consumptive Use Estimate for indoor consumptive use to estimate the potential consumptive use quantity that may be available to serve as an offset. The irrigation estimate was based on the turf/pasture water duty (20.01 inches) found in the Washington Irrigation Guide (Seattle-Tacoma, Appendix B) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on an estimated 60 gpd per person domestic use (10% consumptive), 2.73 people per household, and assuming full occupancy of the mobile home park (134 residences²⁸), and 9.3 acres of delineated irrigation and assuming pasture/turf and sprinkler irrigation, 20.079 afy consumptive use is the estimated quantity available for transaction.²⁹
- The Qa listed in on the water right document is 120 afy. Without further examination, it is unclear what portion of this quantity has been perfected.

The Pre-identified Water Right No. 9 has a priority date of 01/09/1973, which is senior to the establishment of the Cedar-Sammamish Basin Instream Resources Protection Program in 1979. This water right does not have instream flow provisions included in the ROE.

²⁷ RCW 90.14.140

²⁸ The ROE issued 01/09/1973 reported 94 mobile homes and 40 travel trailers.

²⁹ This is an estimate only, actual indoor use in mobile homes may be less. An extent and validity determination would be required to determine the quantity available for acquisition.

Figure 7: Project Map



WRIA 8 – Project Description

North Creek Beaver Dam Analog and Log Jam Installation Project

October 16, 2020

Project Name and Number

North Creek Beaver Dam Analog and Log Jam Installation Project (8-SN-H12)

WRIA 8 WRE Subbasin

Swamp/North

Narrative Description

In partnership with the City of Everett and Snohomish Co. Parks, Adopt-A-Stream Foundation (AASF) will install 16-beaver dam analogs (BDA) and logjams at 3 locations in the upper 2.5 miles of North Creek. These 3-locations are in the upper third of the main stem of North Creek that flows from South Everett to Bothell and the Sammamish River. Installation of BDAs and logjams in the headwaters of this heavily urbanized stream will improve habitat for all aquatic life and a wide range of wildlife. These features will reduce peak winter flows and increase groundwater recharge improving summer flows. AASF will also contact 162 landowners between site locations to inform them that the purpose of the project is to increase the water table, channel complexity, species diversity, and salmonid habitat. Each landowner will be encouraged to consider making riparian improvements where North Creek flows through their property. This project will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize the North Creek as spawning and rearing habitat. Chinook and Steelhead are protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The installed series of beaver analogs and log jams will improve the habitat for all aquatic life and a wide range of wildlife; reduce peak storm flows and channel scouring; and increase sediment deposition. The restoration actions will improve the function of North Creek's hyporheic zone at the 3 locations and allow stream flows to move laterally into soils adjacent to the stream channel that will slowly release back into the channel when rainfalls decrease. Salmonid spawning and rearing habitat will improve.

A map and drawings of the project location.

Site 1 is within an 80-acre park, Site 2 is a 6.16-acre natural area and Site 3 is a 5.08-acre natural area (see attached Site Plan). Site photos are also included at the end of this document.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to install beaver analogs and logjam features at three locations within the upper 2.5-miles of North Creek. These installed features will provide immediate and direct habitat benefits at those location and, water quality/quantity benefits downstream.

Performance goals and measures.

Installed BDAs and logjams will result in reduced channel down-cutting and sediment aggradation at three North Creek headwater locations and increased groundwater, channel complexity and salmonid habitat.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

A primary objective of this project is to reduce peak winter flows and the duration of time that the headwaters of North Creek are dry in the summer so it can again be suitable habitat for salmonid spawning and rearing. Specific species that have been documented within this section of North Creek are: Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout. Chinook and Steelhead are priority species, protected under the ESA.

Identification of anticipated support and barriers to completion.

One site is on property owned by Snohomish Co. Parks, Rec. and Tourism, and two sites are City of Everett property. They and the downstream cities of Mill Creek and Bothell have issued letters of support. In addition, WDFW Habitat Biologist Miles Penk has determined that this is a “fish enhancement project” and that drawings submitted with the grant application are sufficient for the required JARPA.

Estimate of capital costs and reoccurring O&M costs.

Estimated total cost is anticipated to be up to \$94,193.

Anticipated durability and resiliency.

Each of the 3 publicly owned project locations are heavily wooded natural areas. The 16 installed structures will recruit woody debris long after project completion. It is anticipated that this will be a very durable and resilient project.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Adopt-A-Stream Foundation. Sponsor contact: Tom Murdoch, tomm@streamkeeper.org. The sponsor is ready to proceed when funded.

Documentation of sources.

None

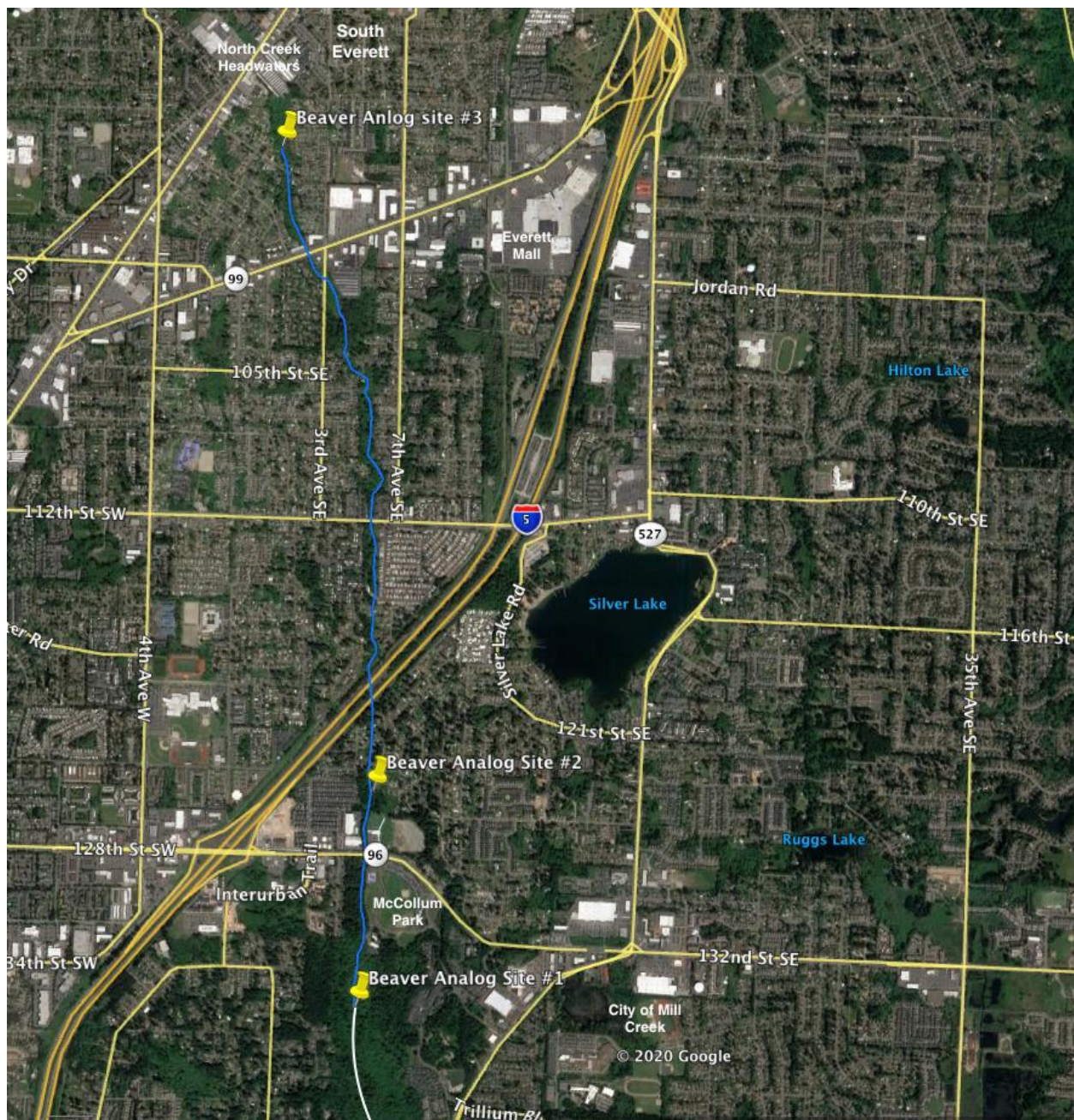


Figure 1. Site Plan for North Creek Beaver Dam Analog and Log Jam Project. Site 1 is in Snohomish County's McCollum Park; Sites 2 and 3 are located in natural areas owned by the City of Everett.



Photographs 1 and 2. Site 1: channel-spanning logjams and BDA's will be installed in the 14-foot wide channel to reduce scour down cutting that is up to four feet deep on both sides of the channel as shown on the right.



Photograph 3. Site 2 bank erosion up to 2-feet in depth that will benefit from logjams and BDA's.

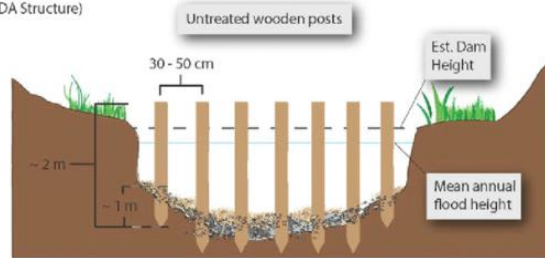


Photograph 4 (left). Riparian intrusion from residential structure just upstream from Site 2 (photograph taken March 25, 2020)

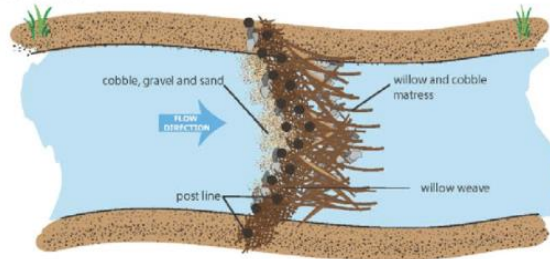
Photograph 5 (right). Site 3 includes great material for construction of BDA's and channel spanning logjams (photograph taken March 25, 2020)

Basic Beaver Dam Analog design

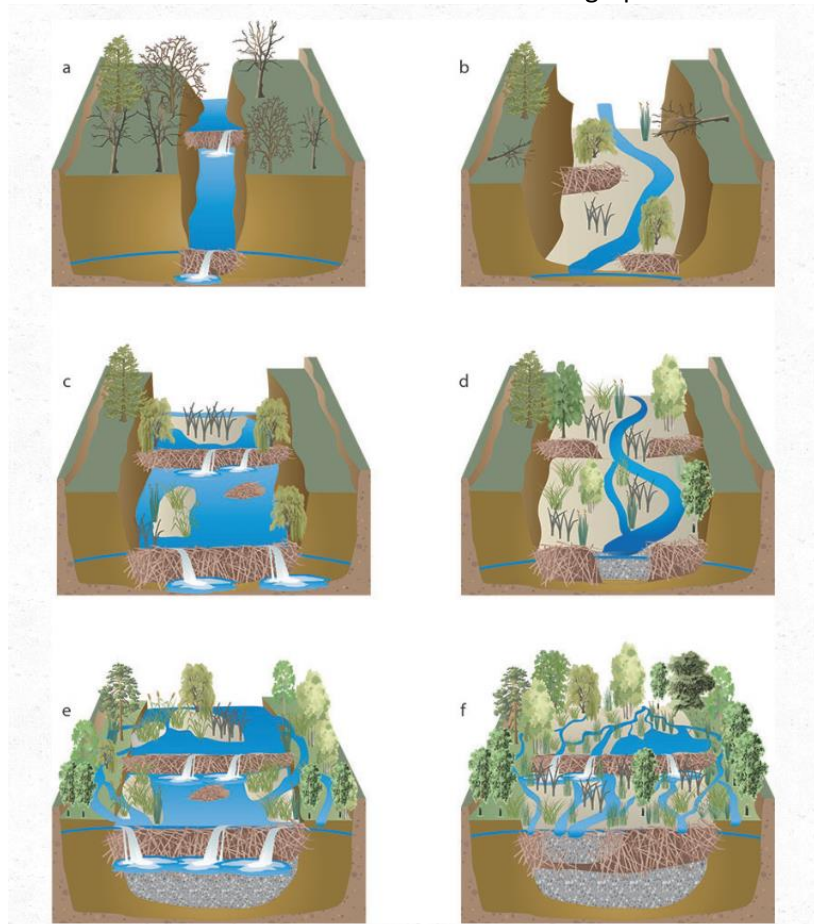
Cross Section View
(Generic BDA Structure)



Plan View
(Convex Primary Dam)



Over time the effects should resemble the graphic below:



WRIA 8 – Project Description

Canyon Park Business Park Redevelopment

October 15, 2020

Project Name and Number

Canyon Park Business Park Redevelopment (8-SN-13)

WRIA 8 WRE Subbasin

Swamp/North

Narrative Description

The City of Bothell is rezoning the Canyon Park business park area to include mixed use. The project is in very early phases and specific information is not yet available. The project would support redevelopment of the Canyon Park business park, potentially reducing overall impervious surface area, and would include stormwater improvements and potentially restoration and/or wetland enhancements along North Creek.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project sponsor assumes they will increase dead and live storage under any scenario, which will decrease stormwater runoff flow rates, increase water quality benefit through retrofitting and enhancing the existing storm system, and increase effective wetland areas through restoration and enhancement.

The project would include improvements to the existing stormwater system, including additional detention and infiltration. LID techniques could be incorporated into the design to provide additional infiltration and impervious surface reduction. Redevelopment will trigger water quality and flow control requirements, so only treatment exceeding those requirements would count toward offsets. Based on hydrologic modeling of stormwater infiltration for several projects in King and Snohomish counties, infiltration could transfer on the order of 1 acre-foot per acre of contributing area from surface runoff to groundwater, delaying contribution to streamflow. Magnitude of infiltration offset would depend on infiltration rates at the site as well as the amount of infiltration area added above and beyond required stormwater treatment. Wetland enhancements could also provide some (likely small) storage benefit.

Conceptual-level map and drawings of the project and location.

See Canyon Park area map at the end of the project description.

Description of the anticipated spatial distribution of likely benefits.

North Creek through and downstream of Canyon Park.

Performance goals and measures.

For stormwater, retrofit area treated, infiltration footprint, infiltration rates. For wetland, stream length restored, wetland water levels.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Historically, North Creek supported runs of Chinook, sockeye, kokanee, and coho salmon and steelhead and coastal cutthroat trout. From 1997 to 2015, volunteers with the Salmon Watcher Program recorded salmon observations at various locations in North Creek. Volunteers consistently saw Chinook, coho, kokanee and sockeye in the creek. Less commonly spotted were chum salmon. The Canyon Park segment of North Creek features multiple wetlands. Channel and habitat structure through this portion of the creek is generally degraded compared to properly functioning conditions.

Identification of anticipated support and barriers to completion.

The owners, developers, and property managers are very interested in working together on a combined regional facility. While this project is not yet listed in Bothell's Capital Facilities Plan, there is an ongoing retrofit program with partnerships that would meet this criteria. The City does not currently own and operate this regional pond, so would need permission to expand the existing private pond or would create features downstream within the right-of-way on city-owned property. If storage of the existing pond is expanded, dam safety regulations from Ecology may be triggered if the total capacity exceeds 10 acre feet. For wetland/stream restoration and enhancement, options would be discussed with the permitting agencies to see what is needed.

Potential budget and O&M costs.

To be determined. The budget for a feasibility study would likely be around \$150,000 depending on what monitoring is needed. Funding for design and construction would include regional pond, ditch, and swale redesign, wetland/stream enhancement and restoration, and low impact development features to provide additional flow control and water quality benefit for existing development. The O&M costs would be absorbed by the City Stormwater Utility while a covenant would be placed on any private systems to require the private property owners to maintain all improvements as needed.

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an

increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

This project will be designed to the highest stormwater criteria for flow control and water quality treatment. This area was originally designed in the 1980's, so there is very minimal flow control and water quality existing onsite. Any designs will also include additional flood storage capacity, so this system would be anticipated to increase durability and resiliency within the Canyon Park Subarea.

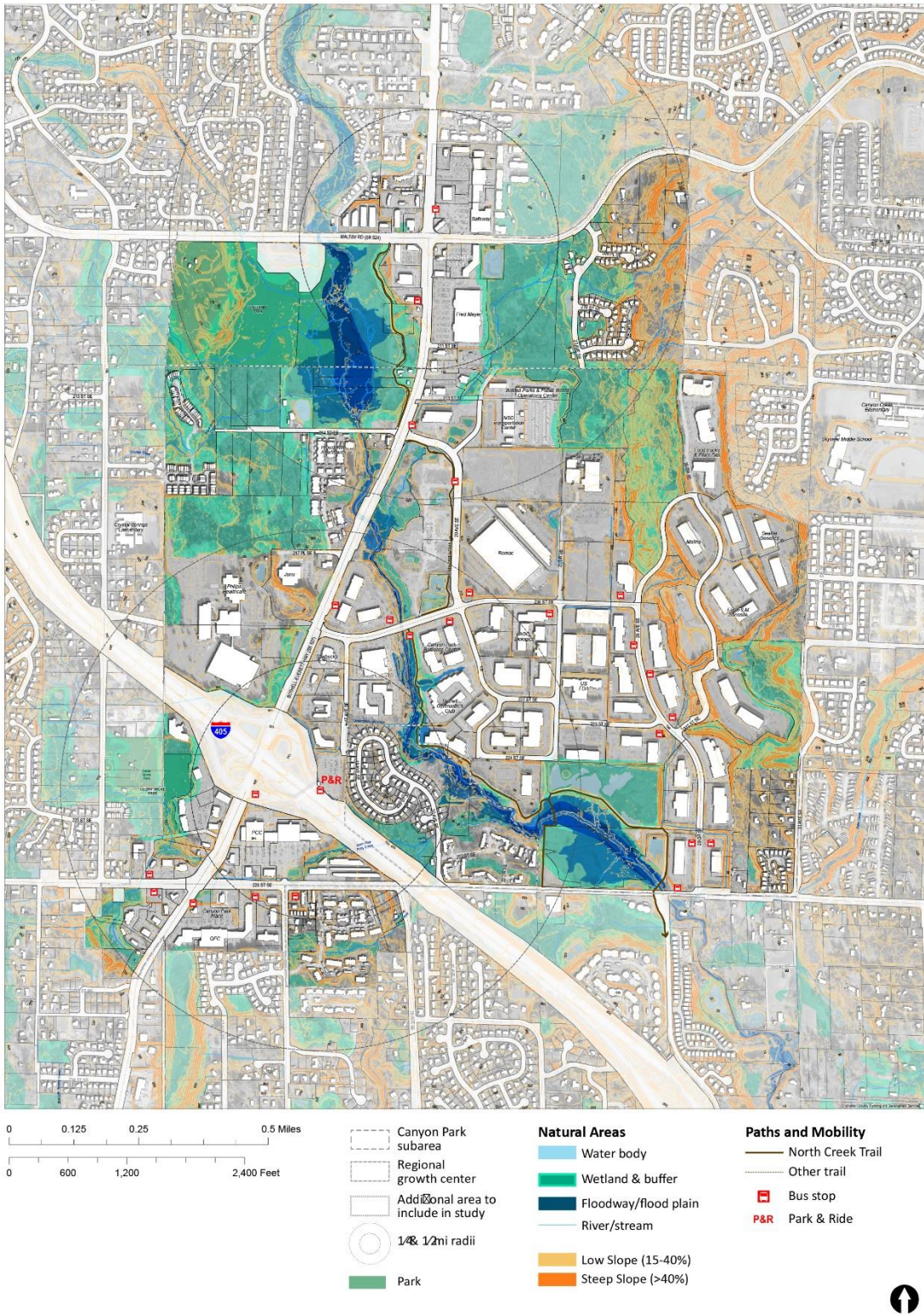
Project sponsor(s) (if identified) and readiness to proceed/implement.

City of Bothell would be the project sponsor.

Documentation of sources.

Original plat documents and drainage reports for subarea development
Past and current Bothell Surface Water Design Manuals

Canyon Park Subarea



WRIA 8 – Project Description

Cutthroat Creek Restoration at Carousel Ranch

October 16, 2020

Project Name and Number

Cutthroat Creek Restoration at Carousel Ranch (8-LB-H14)

WRIA 8 WRE Subbasin

Little Bear

Narrative Description

This project includes stream, riparian, and upland restoration on Cutthroat Creek at Carousel Ranch, a tributary to Little Bear Creek within the Little Bear subbasin in Woodinville, Washington. The project will implement improvements along 870-feet of Cutthroat Creek. Restoration actions include large wood debris (LWD) placement to increase hydraulic diversity and structure and to build/maintain channel grade at the new Maltby Area Community Park. This project will restore stream habitat, native vegetation, protect and restore water temperature, provide active erosion abatement, and control invasive vegetation. These restoration actions will also benefit Little Bear Creek downstream.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize Cutthroat Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the stream, riparian and upland habitats associated with Cutthroat Creek. Installation of LWD has several ecological functions including increasing hydraulic diversity, managing flows, creating deeper pools that provide refugia for fish, preventing bank erosion, and trapping organic material that provides nutrients for insects and invertebrates which are a prey source for fish. Shade from installed riparian vegetation will moderate water temperature, reduce evaporation and create habitat. The project area has moderate communication with the groundwater table and contributes to a high infiltration area along the confluence of Little Bear Creek and Cutthroat Creek.

For this project, two concepts have been proposed depending on funding available to complete.

Concept A includes traditional channel restoration including wood placement to increase hydraulic diversity and structure and build/maintain channel grade throughout Zone 1 (see Figure 1). This includes bank stabilization/erosion management along the steep left bank portion of Cutthroat Creek from approximate station 0+50 to 1+50.

Concept B includes elements in addition to Concept A (see Figure 2). This concept includes aggressive floodplain grading and instream wood placement from culvert to 400 feet upstream of culvert to the high-quality wetland area. The goal would be to spread flow, reduce shear stress, and engage floodplain to convert to wetland function with a smaller defined low-flow channel. Additionally, this concept includes targeted wood placement, from approximate station 4+00 to the upstream parcel boundary, to induce scour and create covered pool habitat. Concept B incorporates groupings of brush wood to function as small jams relative to the creek, providing cover and habitat enhancement.

A map and drawings of the project location.

For each concept, the project site is shown in relation to surrounding physical features on the attached Site Plans.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore 870 feet of Cutthroat Creek at Carousel Ranch, which will also benefit the Little Bear Creek downstream.

Performance goals and measures.

The goal for this project is to shift the stream from an alluvial condition to a wetland condition, from approximately 400 to 800 feet upstream of the culvert, in anticipation of reduction in sediment mobility. Water quality is expected to improve with reduction of erosion and temperature as a direct benefit of increased shading. The control of sediment transport and reduction and maintenance of reduced temperatures are beneficial to the mainstem of Little Bear Creek that provides direct benefit for improvement to Chinook habitat. In addition, increased riparian vegetation and cover will likely improve B-IBI (Benthic Index of Biotic Integrity) scores.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize Cutthroat Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA. LWD and restoration of riparian vegetation will directly benefit prey availability, spawning success as well as survival of pre-migrant and outmigrating juvenile salmonids.

Identification of anticipated support and barriers to completion.

A Centennial Clean Water Fund (CCWF) application is a candidate source of support for either Concept A or Concept B. The Streamflow Restoration funding is another applicable funding opportunity for this project.

Barriers to completion include funding for preliminary and full design, and construction. Since the parcel is owned by Snohomish County Parks Division, this location is accessible for construction and presents no additional costs to Snohomish County for property acquisition.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are estimated at \$330,000 in 4-year work plan and between \$412,000 to \$669,000 in Little Bear Plan.

Anticipated durability and resiliency.

The current stream condition includes aggradation at several locations with identifiable knickpoints that would be addressed with proposed design concept elements. Spreading flow reduces shear stress and reduces sediment transport currently a problem in the lower portion of the project area. Engaging the floodplain to convert to wetland function with a smaller defined low-flow channel will ensure reduction of potential for future sediment transport.

Resiliency of the project has key components that are focused on sediment transport reduction and maintenance of in-channel water volume during drought years. Expanding the wetland footprint and spreading flow will reduce eroding streambanks and aggradation of the stream channel during high

flows. Spreading flow increases the footprint of open water along with wetland expansion potentially interacting with the groundwater table.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Snohomish County. Sponsor contact: Elisa Dawson, Elisa.Dawson@co.snohomish.wa.us. The sponsor is at the conceptual design stage and ready to proceed with design immediately.

Documentation of sources, methods, uncertainties, and assumptions.

A conceptual plan was completed for this site with development of two concepts to accommodate for available funding. This project is a component of a larger effort to identify and prioritize five projects in the Little Bear Creek watershed. Citation for this report is as follows:

Snohomish County. 2018. Instream Projects: Final Report of Task 2.07.2 of the Little Bear Creek Basin Plan, A Final Watershed-Scale Stormwater Plan. Prepared by Northwest Hydraulic Consultants Inc. Snohomish County Surface Water Management Division, Everett, WA. 42p.

A single design uncertainty was identified as moderate in the ranking process of potential projects sites. Overhead power lines near the culvert traverse the project area and were determined to be of moderate concern when considering proposed restoration improvements. In ranking of potential project locations, this project was ranked highest priority for implementation.

Assumptions include agreement with Snohomish County Parks Division to expand the footprint on this County-owned property to include this restoration project along with the planned Maltby Area Community Park. Parks Division and the project sponsor are in agreement to move forward with addition of the restoration project. Park implementation is expected to begin as early as May 2021. This restoration project occupies the northwest corner of this Carousel Ranch property.

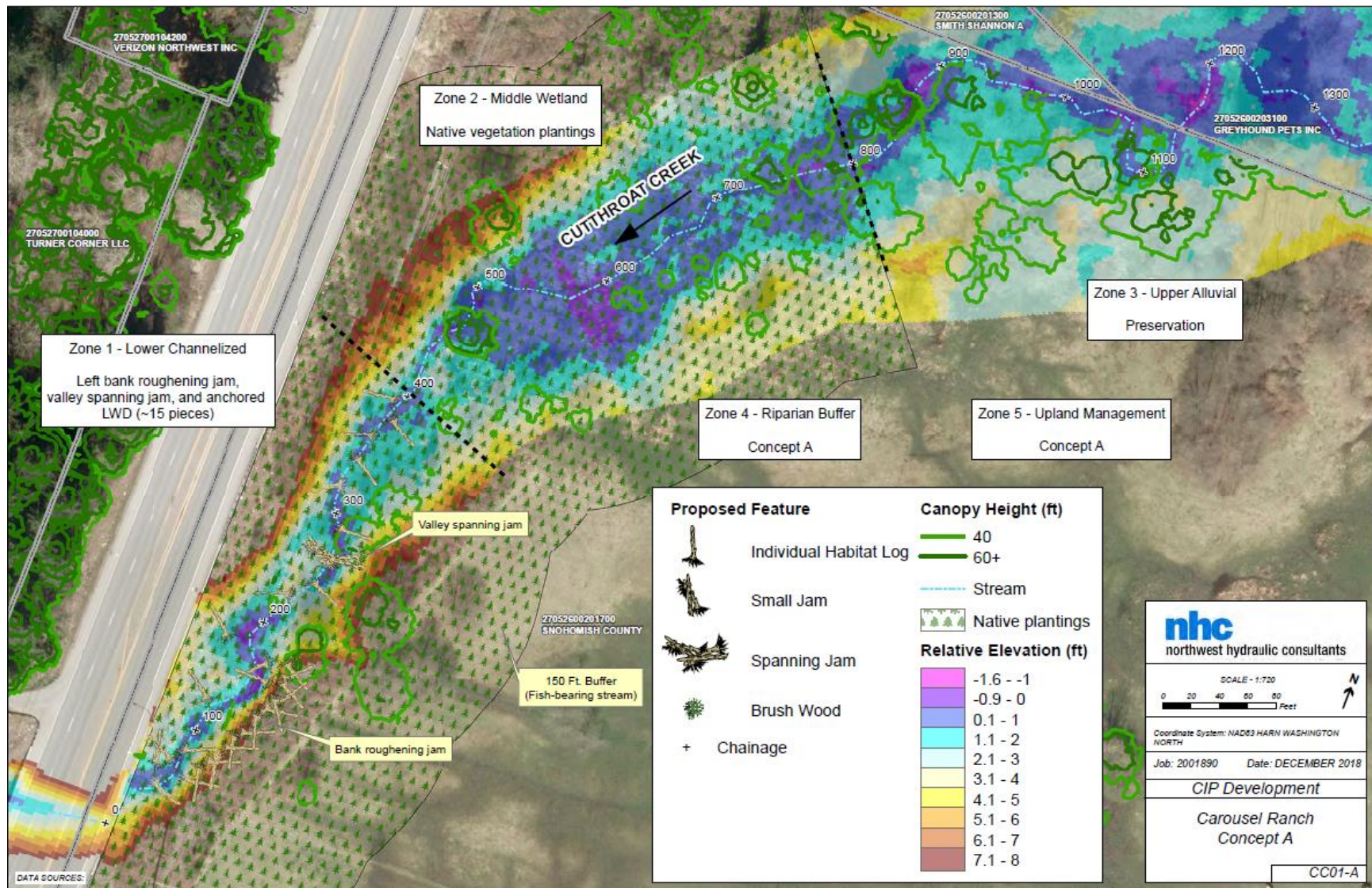


Figure 1. Site Plan for Carousel Ranch Concept A

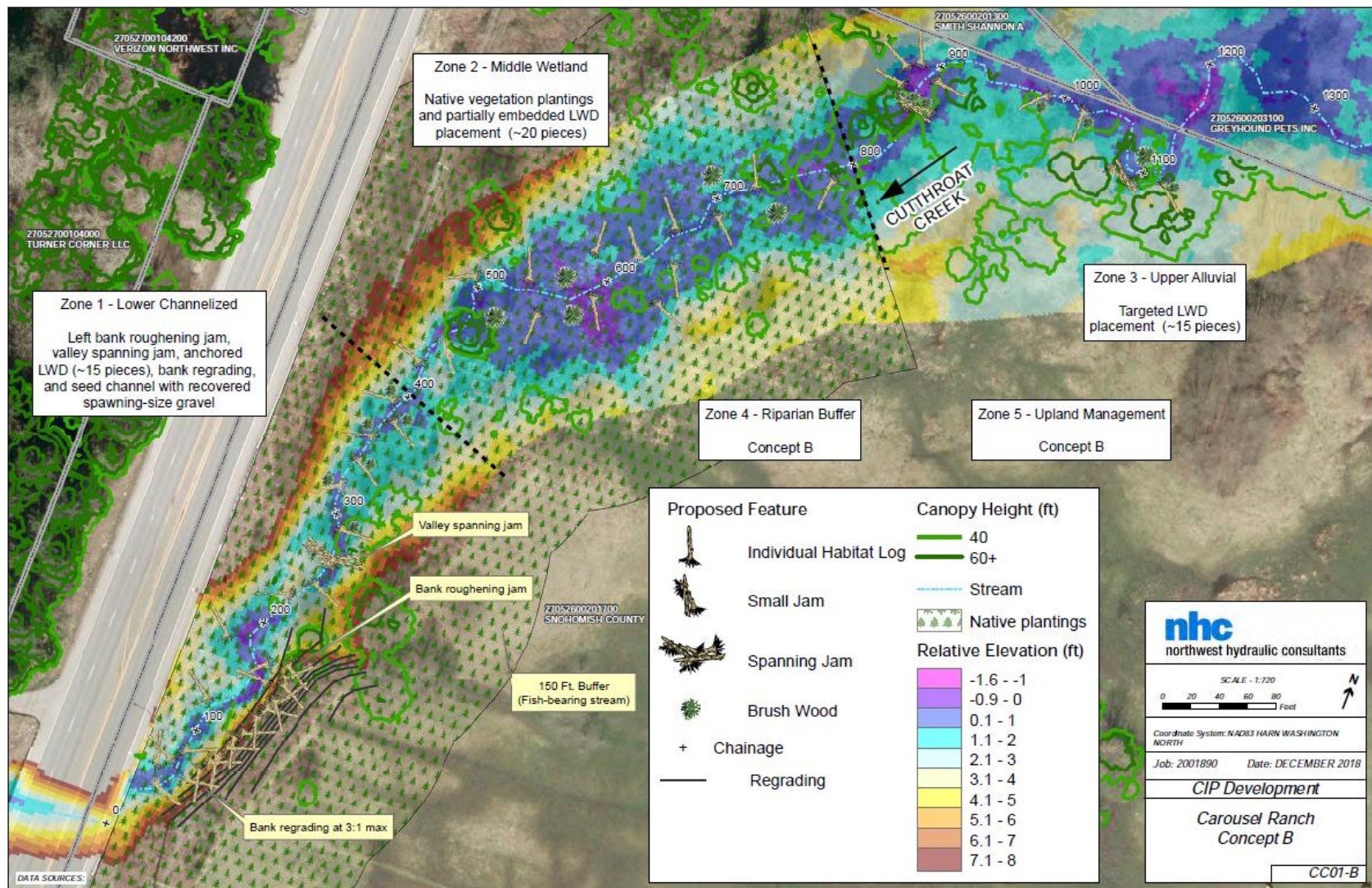


Figure 2. Site Plan for Carousel Ranch Concept B

WRIA 8 – Project Description

Little Bear Instream Projects

October 16, 2020

Project Name and Number

Little Bear Instream Projects (8-LB-H15)

WRIA 8 WRE Subbasin

Little Bear

Narrative Description

This project includes multiple sites along Little Bear Creek located in the Little Bear subbasin in Woodinville, Washington. A total of four sites along Little Bear Creek are proposed for restoration. The four sites and the proposed restoration actions are:

- LB02 (Little Bear Creek at 228th Street SE): Improve riparian cover and hydraulic diversity with large woody debris (LWD) placement instream. Add riparian buffer zone. Include a modified log jack (angled log pile) at head of sediment bar to encourage persistent flow split (dividing flow between two or among more channels) and roughened right bank to improve eroding conditions. Increase meander length.
- LB03 (Little Bear Creek near 224th Street SE): Floodplain reconnection and riprap removal. Add LWD and incorporate small training (encouraging flow away from areas prone to erosion) features
- LB05 (Little Bear Creek at Trovas HOA at 196th Street SE): Stabilize eroding tributary and improve hydraulic diversity by adding instream wood and more riparian planting.
- LB06 (Little Bear Creek at Lightfoot): Riparian planting and removal of invasives, incorporate wood in-channel.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Little Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the stream and riparian habitats associated with Little Bear Creek. Installation of LWD has several ecological functions including increasing hydraulic diversity, managing flows, creating deeper pools that provide refugia for fish, preventing bank erosion, and trapping organic material that provides nutrients for insects and invertebrates which are a prey source for fish. Shade from installed riparian vegetation will moderate water temperature, reduce evaporation and create habitat.

A map and drawings of the project location.

This project proposes restoration actions at four sites along Little Bear Creek in Woodinville, Washington. The project site is shown in relation to surrounding physical features on the attached series of Site Plans included at the end of this document (Figures 1 through 8).

Description of the anticipated spatial distribution of likely benefits.

The project proposes restoration actions at four different locations along Little Bear Creek. Two conceptual plans have been proposed for each of the projects: LB02, LB03, LB05, and LB06. Concept selection depends on funding available to implement each project. See attached site plans (end of document) for spatial distribution of benefits.

Performance goals and measures.

LB02

Large woody debris in Concept A may lead to a moderate increase of Chinook habitat quality due to increased instream cover and hydraulic complexity. Adding riparian plantings will improve shading and thereby maintain and reduce instream temperatures, providing direct benefit to Chinook habitat. The wood jam in Concept B will create and support lower velocity refugia habitat.

LB03

Both concepts are expected to increase habitat quantity and quality and reduce roadway-related contaminant inputs. These projects will create substantial additional spawning and rearing area for Chinook near high-value beaver-dammed pond rearing habitat. Woody debris incorporation would improve bed material gradation and hydraulic diversity for Chinook habitat uplift.

LB05

Arresting tributary erosion will reduce sediment load and help improve water quality and Chinook spawning habitat. Increasing LWD along the mainstem would provide hydraulic complexity and cover, providing Chinook habitat uplift.

LB06

Riparian restoration would provide shading to reduce stream temperatures, enhance natural wood recruitment, and provide food sources for Chinook and other aquatic species. Woody debris incorporation would improve bed material gradation, cover, and hydraulic diversity for Chinook habitat uplift.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Little Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA. LWD and restoration of riparian vegetation will directly benefit prey availability, spawning success as well as survival of pre-migrant and outmigrating juvenile salmonids.

Identification of anticipated support and barriers to completion.

A Centennial Clean Water Fund (CCWF) application is a candidate source of support for either Concept A or Concept B for each of the Little Bear Creek projects. The Streamflow Restoration funding is another applicable funding opportunity when two or more of these projects are bundled in order to increase the combined groundwater contribution estimate that meets the minimum annual goals. Areas along Little Bear Creek are known to have high infiltration rates to groundwater.

Barriers to completion include funding for preliminary and full design, and construction. Parcels in the project areas are either County-owned or owned by the Washington State Department of

Transportation (WSDOT). WSDOT and USACE have been updated on the County's proposed projects, where applicable, and are in agreement with project concepts.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are estimated by restoration site are:

- LB02: \$153,000 - \$167,000
- LB03: \$246,000 - \$298,000
- LB05: \$170,000-\$270,00
- LB06: \$69,000 - \$109,000

Anticipated durability and resiliency.

Little Bear Creek project locations are deficient in the variety of habitat types that support Chinook salmon; spawning and rearing among the most important. Outmigrants are affected by warm water temperatures during their migration to larger rivers. Reduction of road runoff into some of the project areas as well as re-establishing riparian areas that serve as barriers to pollutant introduction to these reaches are central themes.

Retention of water for earlier life stages is important on the mainstem and establishing a variety of hydraulic habitats will enhance survivability of several life stages. The mainstem of Little Bear Creek has substantial sediment transport mediated by winter stormflows and catastrophic summer stormflow events. Burying of benthic habitat is a significant barrier for Chinook salmon life cycle completion. These projects, sometimes working in tandem, have a greater effect on achieving goals and in maintaining suitable habitat.

Resiliency of these projects is increased by key components that are focused on sediment transport reduction, maintenance of in-channel water volume during drought years and maintenance of low water temperatures. Hydraulic diversity promotes reduction in erosion of streambanks and aggradation of the stream channel during high flows. Spreading flow out increases the footprint of open water potentially allowing interaction with the groundwater table.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Snohomish County. Sponsor contact: Elisa Dawson, Elisa.Dawson@co.snohomish.wa.us. The sponsor is at the conceptual design stage and ready to proceed with design immediately.

Documentation of sources, methods, uncertainties, and assumptions.

A conceptual plan was completed for this site with development of two concepts to accommodate for available funding. This project is a component of a larger effort to identify and prioritize five projects in the Little Bear Creek watershed. Citation for this report is as follows:

Snohomish County. 2018. Instream Projects: Final Report of Task 2.07.2 of the Little Bear Creek Basin Plan, A Final Watershed-Scale Stormwater Plan. Prepared by Northwest Hydraulic Consultants Inc. Snohomish County Surface Water Management Division, Everett, WA. 42p.

Design uncertainties were identified for each of the Little Bear Creek mainstem projects. Uncertainties were ranked based on specific issues identified at each of the property locations. Those uncertainties are listed below:

LB02

Design Uncertainty: Concept A is **Low** (no identified issues with design elements). Concept B requires further investigation of adjacent parcels and infrastructure for impacts in the floodplain (**Moderate**). Concept C has the same concerns as Concept B and would require work on private land. (**Moderate to High** uncertainty).

LB03

Design Uncertainty: Concept A includes removal of riprap off bed which would cause the creek to be less stable. Removing riprap creates slight risk of down cutting in the channel upstream, which could adversely impact beneficial beaver-dammed reach (**Moderate** uncertainty). Concept B would result in less flow in this location and would be a situation that is less risky. Concepts could affect beaver activity and realignment of the channel could impact mitigation credits (WSDOT property in Year 7 of Mitigation Monitoring) (this Concept presents a **Moderate** uncertainty).

LB05

Design Uncertainty at this location in Little Bear Creek involves determining source of erosion and coordination with property owner to mitigate transport to Little Bear Creek (uncertainty is determined to be **Moderate** at this location).

LB06

There are no identifiable design uncertainties at this proposed project location (uncertainty is determined to be **Low**).

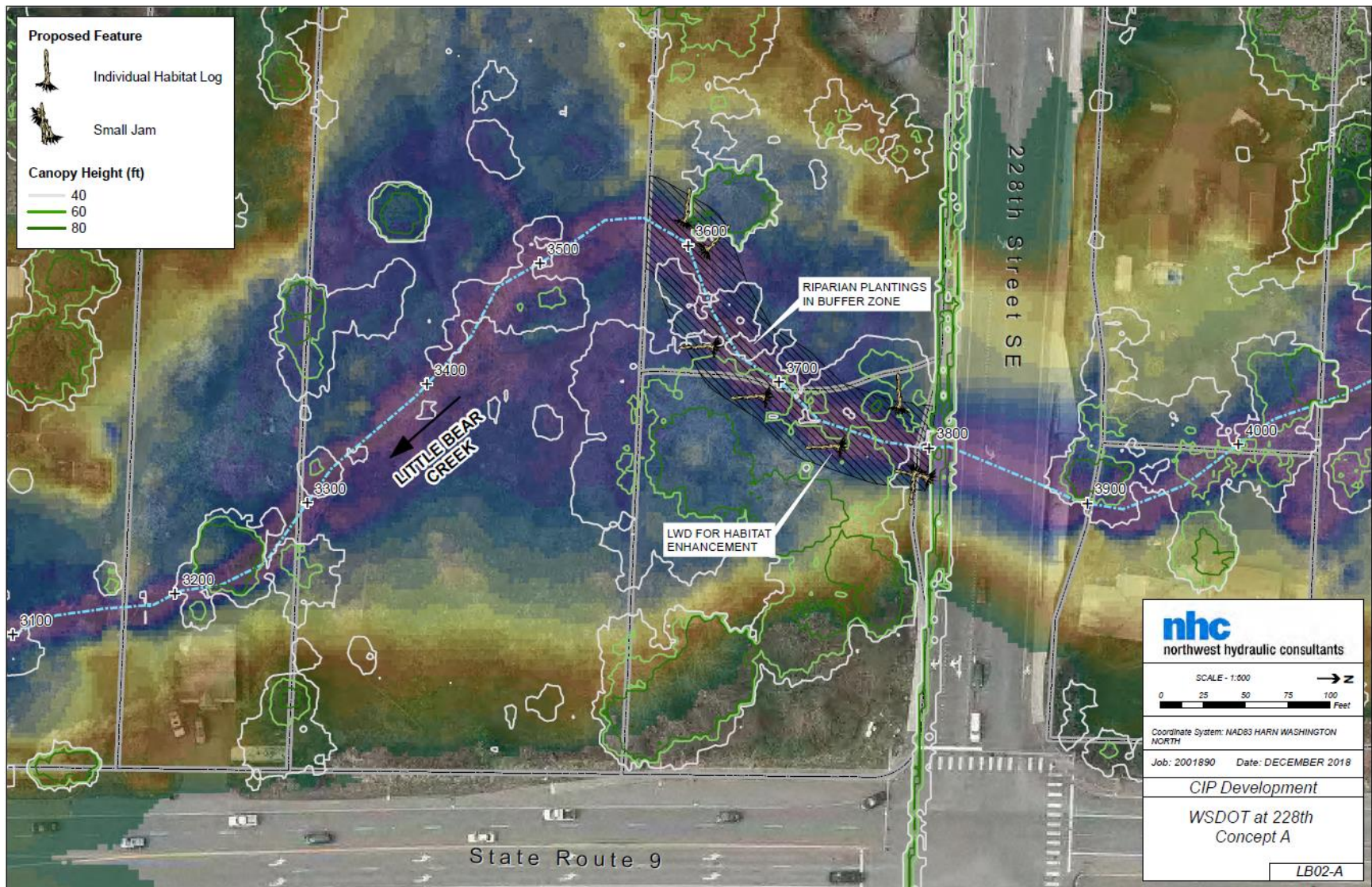


Figure 1. Site Map for Little Bear Instream LB02 Concept A

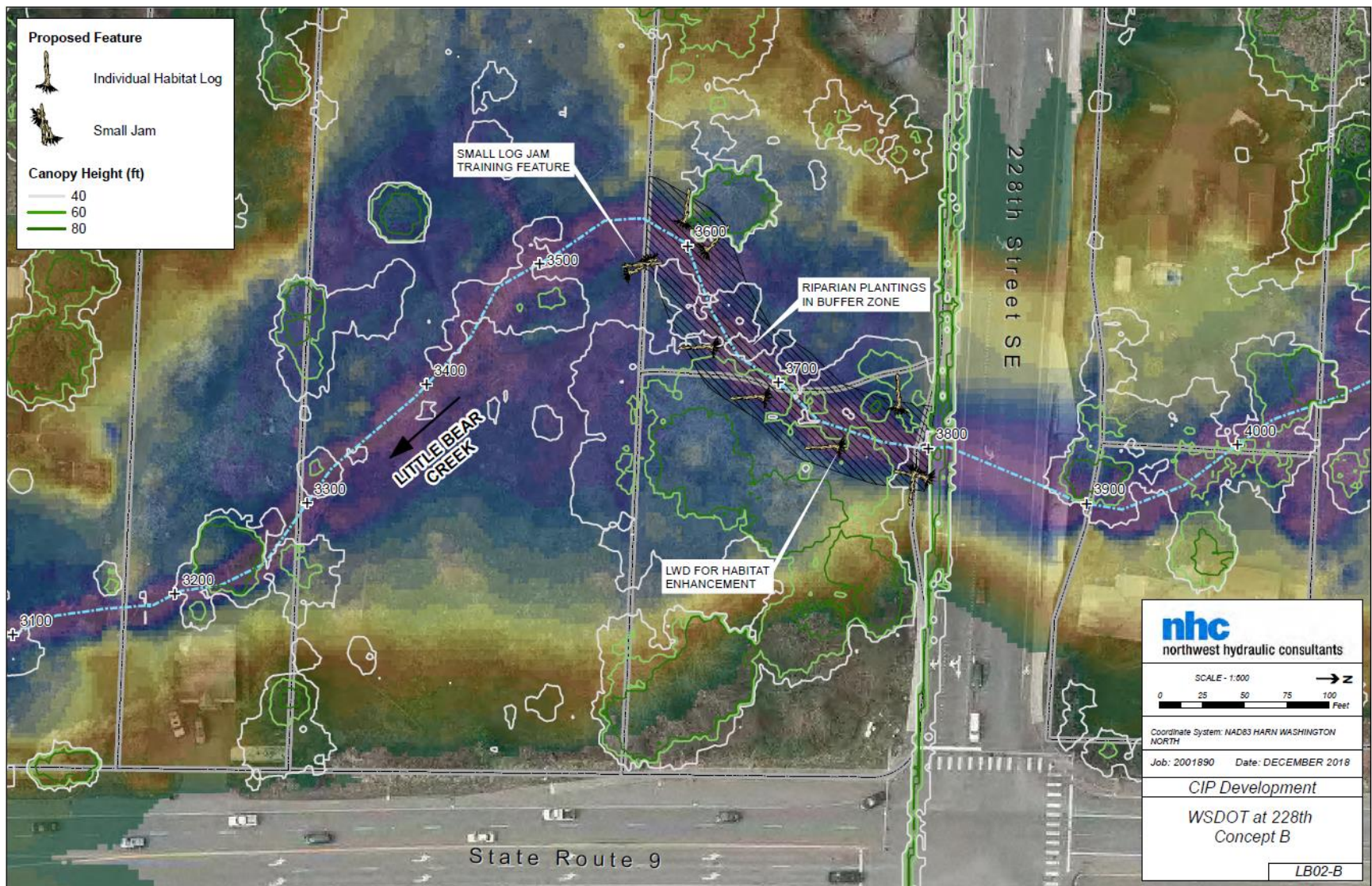


Figure 2. Site Map for Little Bear Instream LB02 Concept B

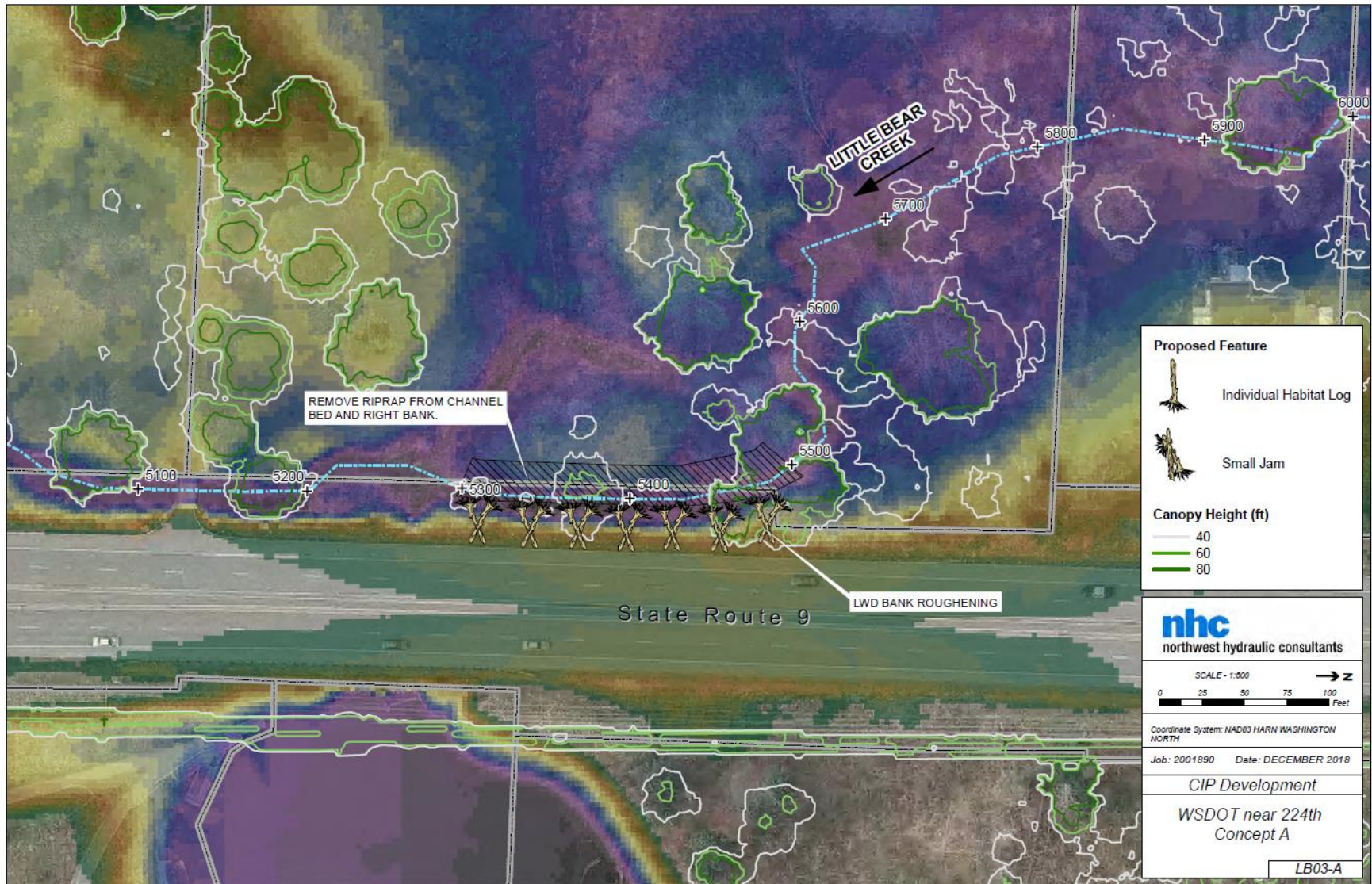


Figure 3. Site Map for Little Bear Instream LB03 Concept A

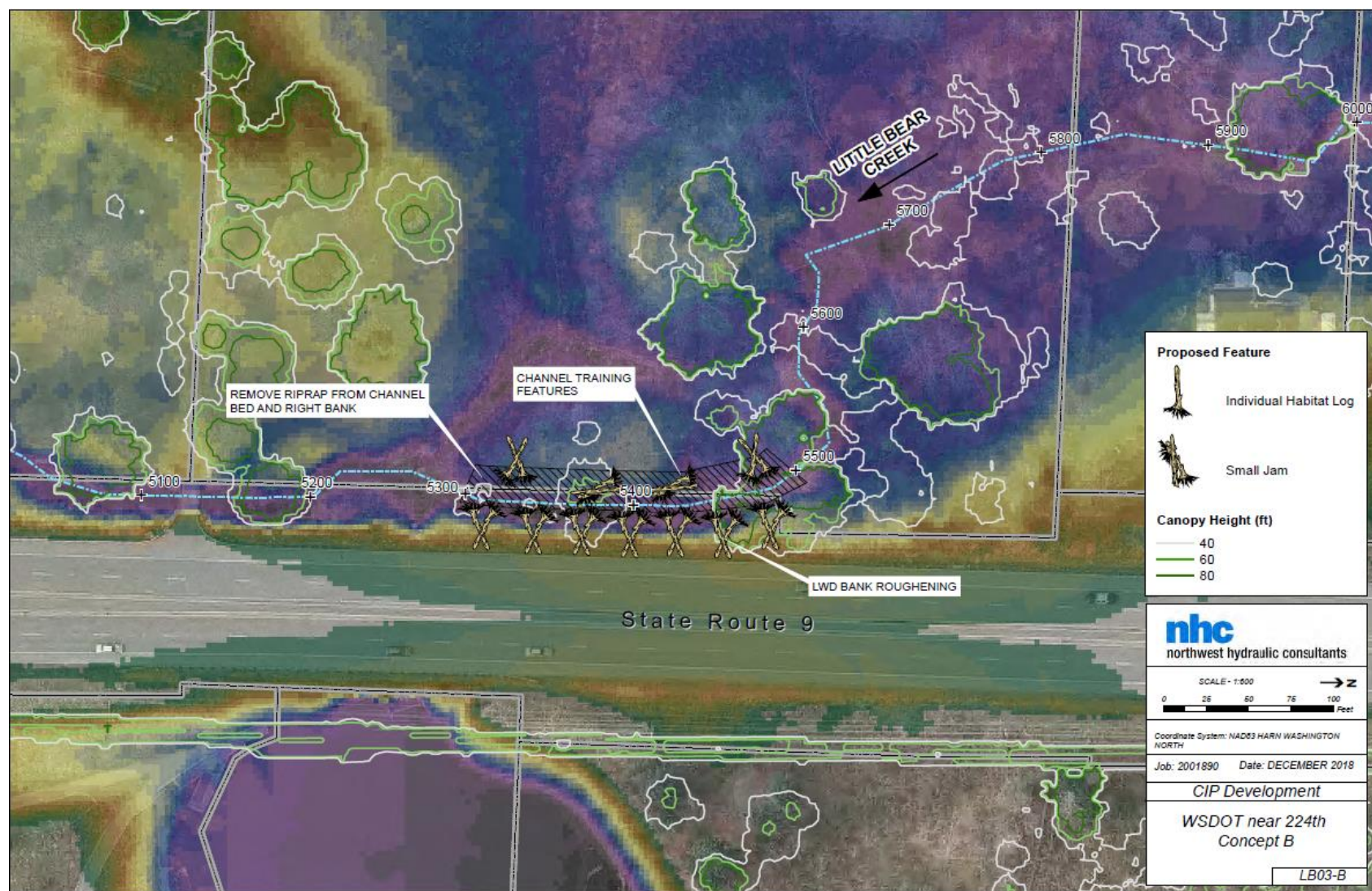


Figure 4. Site Map for Little Bear Instream LB03 Concept B

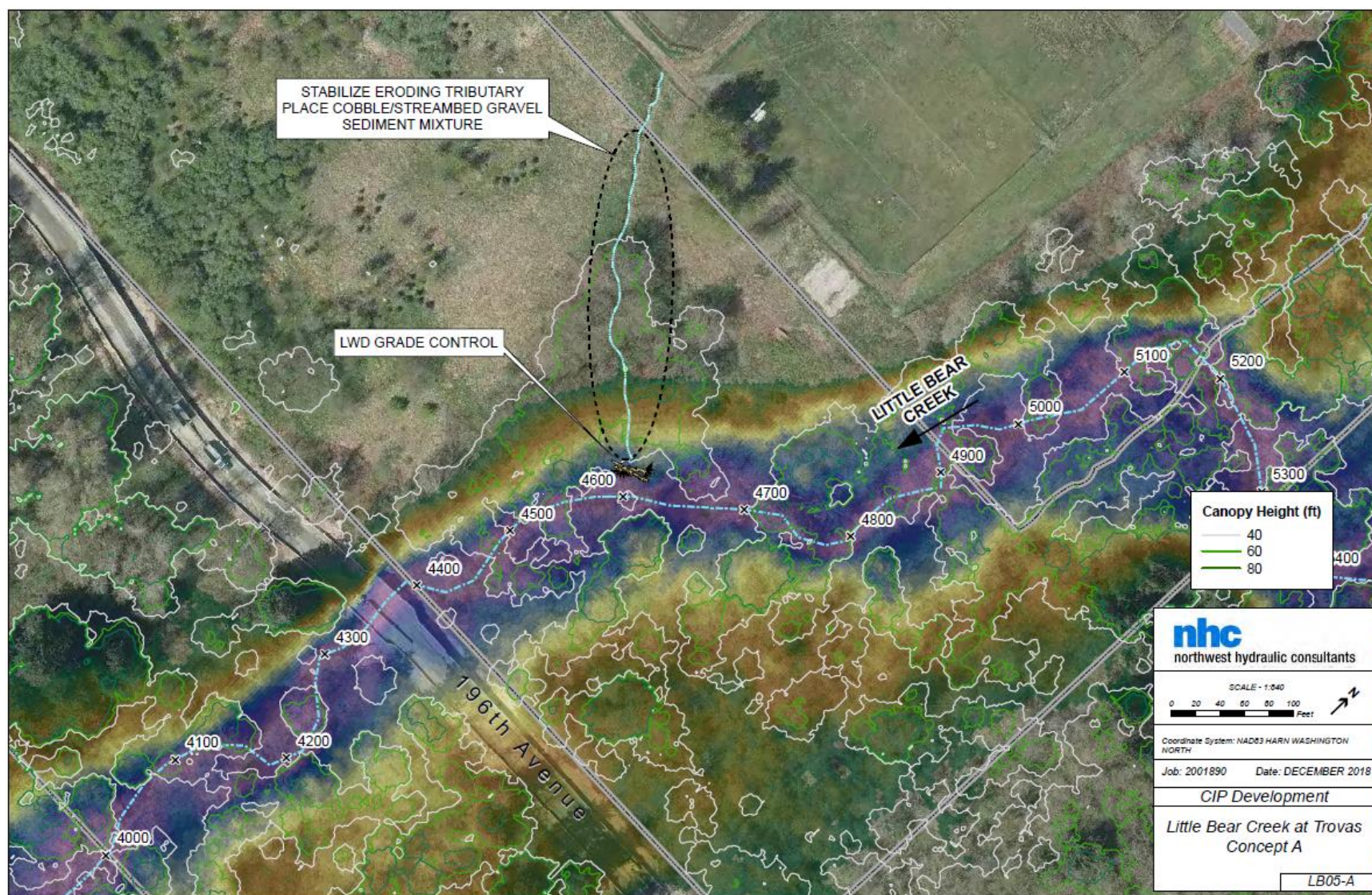


Figure 5. Site Map for Little Bear Instream LB05 Concept A

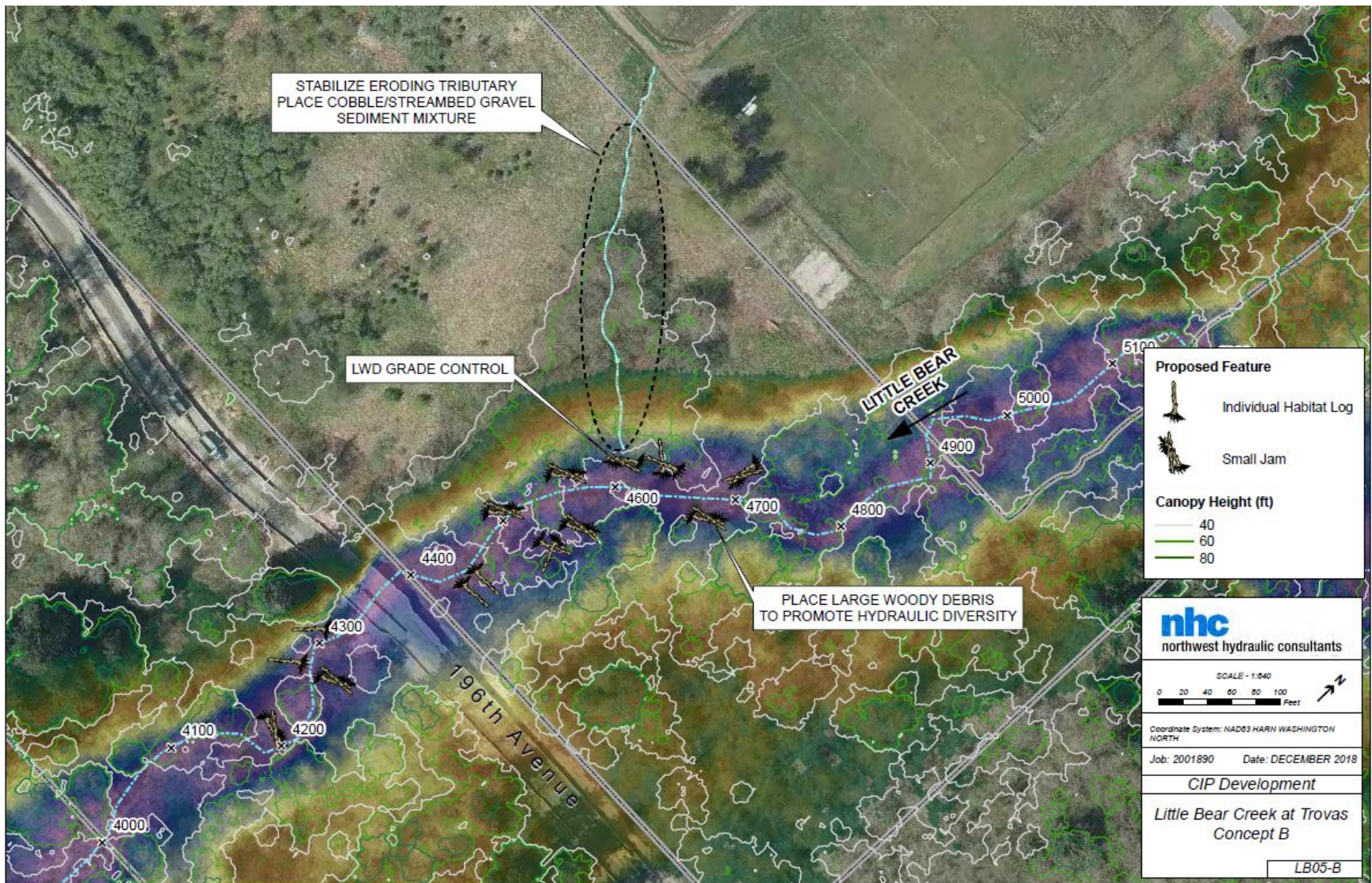


Figure 6. Site Map for Little Bear Instream LB05 Concept B

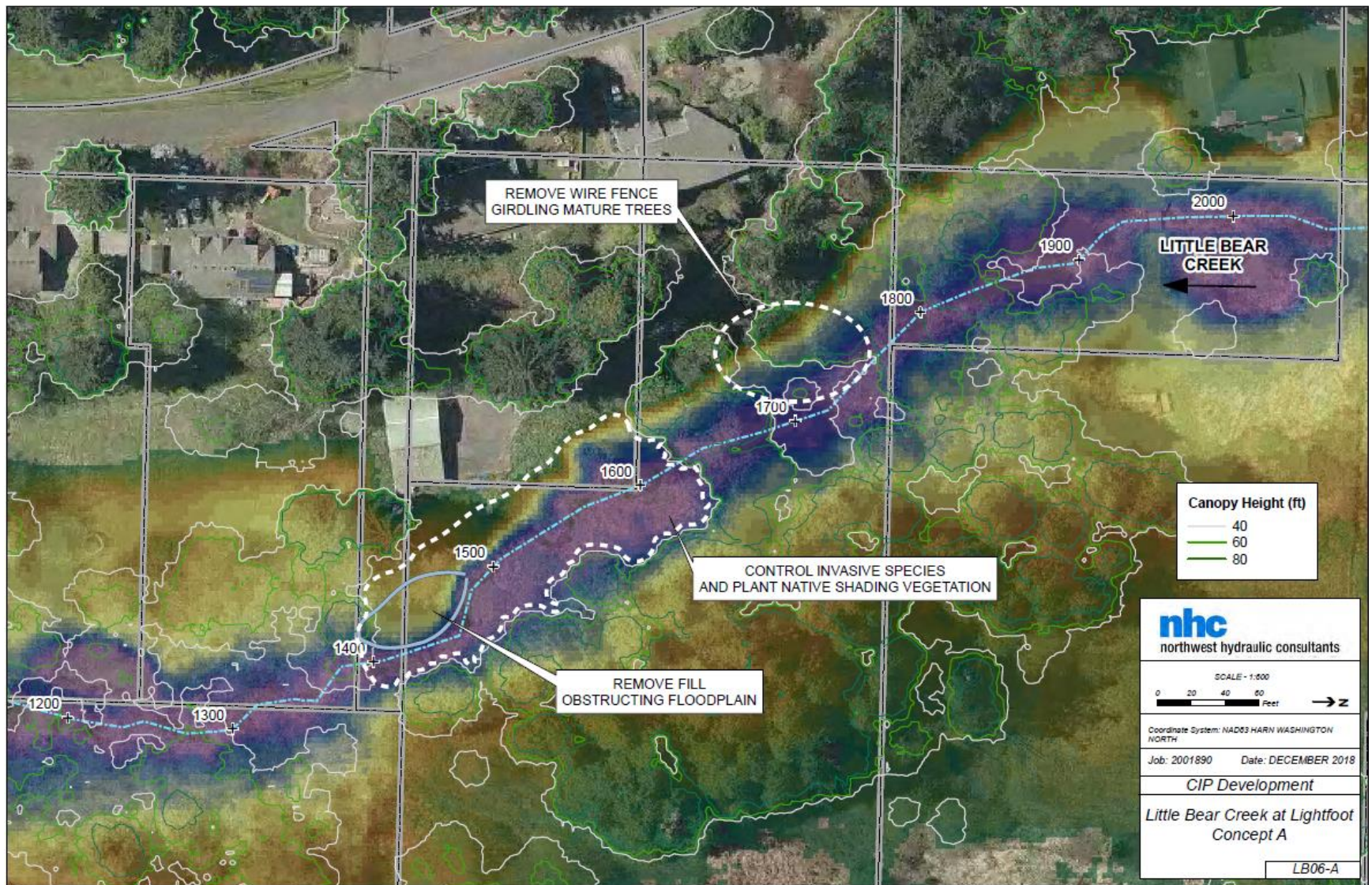


Figure 7. Site Map for Little Bear Instream LB06 Concept A

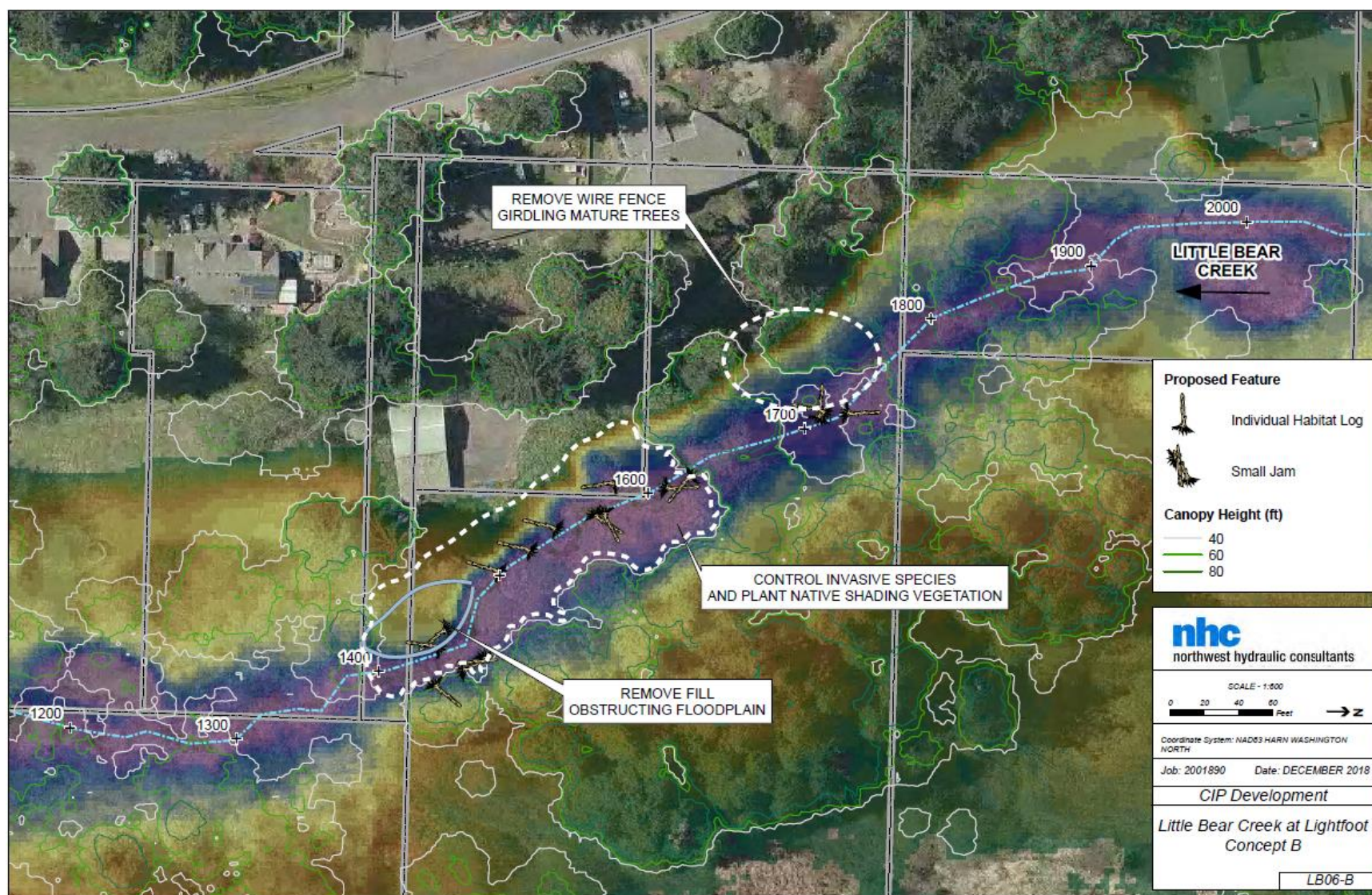


Figure 8. Site Map for Little Bear Instream LB06 Concept B

WRIA 8 – Project Description

Silver Firs Stormwater Pond Retrofits

October 15, 2020

Project Name and Number

Silver Firs Stormwater Pond Retrofits (8-LB-H16)

WRIA 8 WRE Subbasin

Little Bear

Narrative Description

Snohomish County has identified several potential stormwater retrofit projects in the Little Bear Creek basin, including two stormwater pond infiltration retrofits in the Silver Firs subdivision. The County plans to retrofit two existing ponds to increase infiltration capacity. The two ponds are part of the existing stormwater drainage system; each receives surface storm runoff from about 125 acres of residential development.

The first pond (County CIP site 10) is located in Silver Firs Sector 3 Division 7. The project would involve expanding the existing pond by deepening and increasing pond infiltration potential. This would add 1.09 acre-feet (af) of storage and increase infiltration. The second pond (CIP site 16) is located in Silver Firs Sector 7. This project would increase the existing pond volume by deepening and increase pond infiltration potential. This would add 2.0 af of storage. Neither existing pond was designed as an infiltration facility, but infiltration has been observed to occur. The difference between existing infiltration and infiltration after retrofits would provide water offset.

Preliminary modeling and conceptual design have been performed and the projects are included on the County CIP list.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

HSPF modeling was conducted as part of Snohomish County's retrofit analysis to quantify benefits of proposed projects. The HSPF model was used to estimate the average annual offset volumes for the two pond projects. The modeling analysis assumed existing infiltration at 1.2 inches per hour for both ponds, doubling to 2.4 inches per hour with modifications.

At Site 10, the model showed a net increase of 38 af/year of infiltration. Additional infiltration at Site 16 was estimated to be 7 af/year. A minimum annual offset can be estimated by looking at just the driest years in the simulated record. Using the 10 driest years from the 63-year simulation (based on annual precipitation), the minimum annual offset can be estimated as 25 af/year for Site 10 and 2 af/year for Site 16.

Conceptual-level map and drawings of the project and location.

See map at the end of the project description.

Description of the anticipated spatial distribution of likely benefits.

Based on previous groundwater studies and watershed modeling (Golder, 2005; King County, 2005; Snohomish County, 2017), it is believed that groundwater in this area flows east to the Snoqualmie

River, rather than locally to Little Bear Creek. Thus, water offsets from enhanced infiltration would accrue to WRIA 7 rather than WRIA 8. However, reductions in peak streamflows and stream flashiness would benefit Little Bear Creek.

The closest mapped streams in WRIA 7 to the pond locations are Thomas Creek (approximately 5,000 feet to mapped headwater) and Larimer Creek (approximately 5,500 feet to mapped headwaters). Both streams drain through lowland agricultural drainage systems to the Snohomish River in the vicinity of Ebey Slough.

Performance goals and measures.

Performance goal is to infiltrate as much water from the ponds as possible. Infiltration is difficult to measure directly; proxy measures include area treated, pond water levels, and pond outlet discharges.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Little Bear Creek system is an important resource for fish and the following salmonid species are known to be present in the basin: chinook, sockeye, kokanee, and coho salmon. The WRIA 8 Chinook Salmon Recovery Plan notes that the estimated number of Chinook salmon spawning in Little Bear Creek averaged 11 fish for many years up to 1998. Coastal cutthroat trout and steelhead/rainbow trout have also been observed. Anadromous salmon and trout access almost all of this system, though there are some significant passage barriers to adults during periods of low stream water flows, and to juveniles during high flows

Identification of anticipated support and barriers to completion.

This project is currently listed in Snohomish County's Little Bear Creek Basin Plan and Snohomish County intends to implement the project, when funding is available.

Potential budget and O&M costs.

CIP Site 10: \$600,000 design & construction

CIP Site 16: \$815,000 design & construction

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal

temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Snohomish County Public Works.

Documentation of sources.

Golder and Associates, 2005. *Little Bear Creek Hydrogeologic Overview*. Prepared for Jones and Stokes and Snohomish County.

King County, 2005. *Brightwater Treatment System Environmental Impact Statement*. Available online: <http://www.kingcounty.gov/environment/wtd/Construction/North/Brightwater/Background/Env-Review.aspx>

Snohomish County, 2016. *Little Bear Creek Basin Planning: Current Conditions Assessment Report*.

Snohomish County, 2017. *Little Bear Creek Basin Plan. Appendix B: Watershed Modeling Report*.

Snohomish County, 2019. *Stormwater Treatment CIPs: Final Report of Task 2.07.1 of the Little Bear Creek Basin Plan*.

WRIA 8 – Project Description

East Side Wayne Sammamish/Waynita Restoration

October 16, 2020

Project Name and Number

East Side Wayne Sammamish/Waynita Restoration (8-SRV-H17)

WRIA 8 WRE Subbasin

Sammamish River Valley

Narrative Description

This project includes restoration of the eastside of the former Wayne Golf Course property, which is formerly the back nine and covers 31.6 acres. The project is located within the WRIA 8 Sammamish River Valley subbasin. This property includes 1,000 linear feet of the south bank of the Sammamish River, along with the mouth and lower reach of Waynita Creek. Restoration approach is dependent on results from a feasibility study but could include: enhancing Waynita Creek habitat at the mouth, Sammamish floodplain restoration, improving riparian conditions, and creating cold water refuge.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, Bull Trout, Rainbow Trout, Largemouth Bass, and resident Cutthroat Trout that utilize the Sammamish River and Lake Sammamish as rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore 1,000 linear feet of the south bank of the Sammamish River along with the mouth and lower reach of Waynita Creek. These restoration actions are designed to enhance the habitat at the mouth of Waynita Creek with the Sammamish River, restore floodplain function of the Sammamish River, improve riparian conditions, and create cold water refuge for fish species.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore 1,000 linear feet of the south bank of the Sammamish River along with the mouth and lower reach of the Waynita Creek, located in Kenmore, Washington.

Performance goals and measures.

All performance goals will be based off results from the feasibility study and conceptual design but may include: linear feet of cool water refuge in relation to Sammamish River, linear feet of day-lighted tributary, acres of buffer added, large wood additions, and acres of invasive vegetation removal.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, Bull Trout, Rainbow Trout, Largemouth Bass, and resident Cutthroat Trout that utilize the Sammamish River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected

under the ESA. Restoring floodplain function and improving riparian habitat will have numerous benefits including benefitting prey availability for fish species, water quality and water quantity.

Identification of anticipated support and barriers to completion.

Anticipated support includes King County, WRIA 8 Salmon Recovery Council, King County Flood Control District, and City of Bothell Parks Department. Currently phase I (feasibility study and conceptual design) is expected to be fully funded. The City will seek further funding for final design and construction of the preferred restoration alternative. The final restoration alternative chosen for construction will need to be approved by City Council. This site is also a public park and the final restoration will need to balance recreation with ecological restoration goals. Potential barriers to completion would be lack of grant funding for future phases.

Estimate of capital costs and reoccurring O&M costs.

Estimated total cost will be dependent on the preferred restoration alternative chosen. Depending on the selected restoration alternative, total costs could be up to \$7 million.

Anticipated durability and resiliency.

Once the construction phase is completed, post restoration maintenance and monitoring will need to be conducted for plant survival, invasive maintenance, and potential in-stream channel monitoring. Most likely invasive vegetation control will be continual on-site after construction. All maintenance and monitoring activities will be determined after the preferred restoration alternative is selected.

Project sponsor(s) (if identified) and readiness to proceed/implement.

City of Bothell. Sponsor contact: Chris Hall, chris.hall@bothellwa.gov. The sponsor is at the ready to begin a feasibility study to develop conceptual restoration design.

Documentation of sources.

None



Figure 1. Site Plan for the East Side Wayne Sammamish/Waynita Restoration Project

WRIA 8 – Project Description

Reconnection of Wetland 38

October 16, 2020

Project Name and Number

Reconnection of Wetland 38 (8-SRV-H18)

WRIA 8 WRE Subbasin

Sammamish River Valley

Narrative Description

This project proposes to reconnect Wetland 38 with the Sammamish River, located within the Sammamish River Valley subbasin at the south end of the City of Woodinville, Washington. This project would need to evaluate whether reconnecting the wetland to the river would affect the hydrology of the wetland and potentially drain the wetland feature. The project does have the potential to provide an additional source of cold water to the river to augment streamflow and reduce temperature simultaneously. There are other adjacent projects already working to address water temperatures and flow in the river both through riparian restoration and reconnecting Derby Creek and cool water inputs on the opposite bank and just upstream of this site.

Connecting this wetland with the Sammamish River has the potential to benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize Sammamish River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will reconnect a wetland feature, known as Wetland 38, with the Sammamish River which will improve hydrologic conditions and provide refugia for fish and vegetation and nutrients for insects and invertebrates which are a prey source for fish. Reconnecting the wetland with the river will potentially provide another source of cool water directly to the Sammamish.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to connect Wetland 38 with the Sammamish River, which will benefit the fish species that spawn and rear within this section. Connecting the Sammamish River with Wetland 38 will also have downstream water quality and water quantity benefits.

Performance goals and measures.

Performance goals and measures will be based on area of wetland reconnected to the river, number of pieces of wood placed in the wetland to provide refugia habitat, area of refugia habitat created, number of trees and shrubs planted around the reconnected wetland, and water temperature at the outlet of the wetland where it enters the river.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize the Sammamish River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the ESA. Connecting Wetland 38 with the Sammamish River has significant benefits to juvenile salmonids by directly benefitting prey availability, spawning success, as well as survival of pre-migrant and outmigrating juvenile salmonids.

Identification of anticipated support and barriers to completion.

The project is identified in the Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan as potential habitat restoration for the Sammamish River. Assuming the project could reconnect the wetland to the Sammamish River without draining the wetland, the WRIA 8 Salmon Recovery Council would likely support the project as salmon habitat restoration.

Potential barriers include approval from current property owner and funding for implementation. One recent development is there is a change in usage of the wetland area of the property by the current owner's tenants that may make it more available for restoration.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are currently unknown.

Anticipated durability and resiliency.

The durability and resiliency of the project depends on project feasibility and design.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Mid Sound Fisheries Enhancement Group. The sponsor is ready to proceed with basic scoping and reconnaissance. Additional feasibility analysis would be possible if funding was available. The sponsor is visiting the site regularly to implement riparian restoration on the river shoreline adjacent to the wetland site and has the necessary landowner contact information to initiate conversations.

Documentation of sources.

None

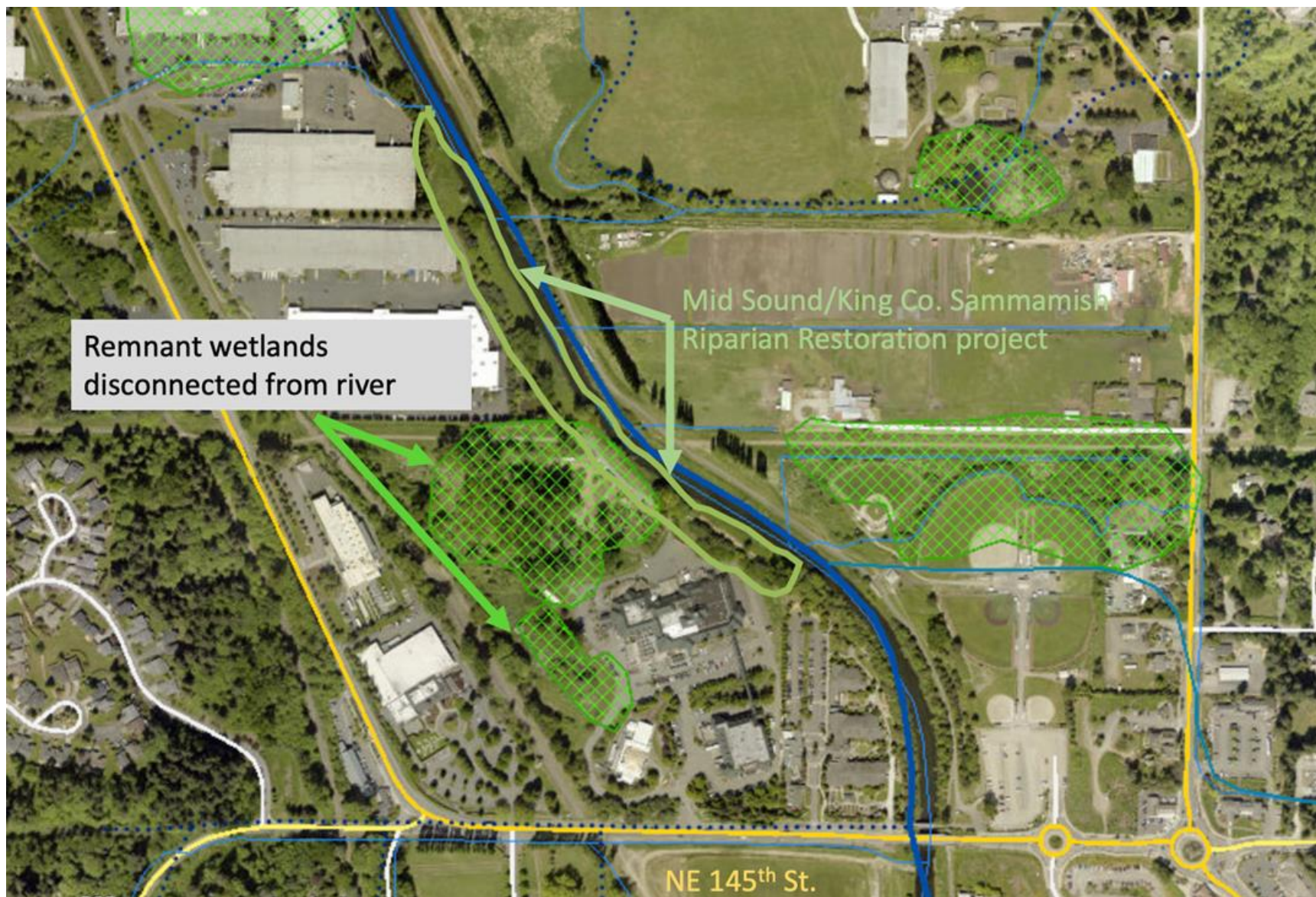


Figure 1. Site Map for Reconnection of Wetland 38 Project

WRIA 8 – Project Description

Seawest Granston/Middle Bear Creek Natural Area Restoration

October 16, 2020

Project Name and Number

Seawest Granston/Middle Bear Creek Natural Area Restoration (8-BE-H20)

WRIA 8 WRE Subbasin

Bear/Evans

Narrative Description

King County is proposing enhancements to the Seawest Granston Reach of Bear Creek within the Bear/Evans subbasin in Cottage Lake, Washington. This project proposes the addition of woody debris, creation of off-channel habitats, and revegetation of the floodplain and riparian areas. This project will restore up to 3,300 lineal feet of stream and approximately 32 acres of wetland and riparian areas in this reach of Bear Creek. Given the scale of this project, it will provide the Middle Bear reach with a significant amount of improved salmonid habitat.

The goal of this project will be to increase the volume and availability of off-channel habitat for juvenile salmonids and to increase overall channel complexity and habitat quality. To accomplish this, the project design will implement a “Stage Zero” strategy to push the channel plan form from a single-threaded channel towards an anastomosing plan form with multiple channels and off-channel features. This strategy will include adding woody debris and beaver dam analogue structures to the mainstem channel and potentially excavating side channels, backwater channels and/or pilot channels within the floodplain. It is expected that these measures will raise baseflow and groundwater elevations in the surrounding floodplain to more frequently inundate off-channel features, many of which already exist and more of which may be created by excavation. This project will also provide increased storage capacity and may augment streamflow and help to moderate stream temperature during critical low flow periods.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat trout that utilize Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

This project will restore up to 3,300 lineal feet of stream and approximately 32 acres of wetland and riparian areas in this reach of Bear Creek. It is expected that the proposed restoration measures will raise baseflow and groundwater elevations in the surrounding floodplain to more frequently inundate off-channel features, many of which already exist and more of which may be created by excavation. This project will also provide increased storage capacity and may augment streamflow and help to moderate stream temperature during critical low flow periods.

King County is conducting a current conditions assessment, including streamflow data collection and monitoring the project site groundwater table. The project footprint will not change.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the Site Plan below. The project is in predesign phase and site plans are not currently available.



Figure 1. Seawest Granston/Middle Bear Creek Natural Area Restoration

Description of the anticipated spatial distribution of likely benefits.

This project will restore up to 3,300 lineal feet of stream and approximately 32 acres of wetland and riparian areas in this reach of Bear Creek. Given the scale of this project, it will provide the Middle Bear reach with a significant amount of improved salmonid habitat.

Performance goals and measures.

1. Provide instream structure and provoke sorting of the substrate by adding woody debris.
2. Increase connection with the floodplain and activate existing habitat features by raising water elevation several inches.
3. Decrease instream water temperatures at the downstream end of the reach by planting the riparian areas with native species and, possibly, by grading new features in the floodplain that increase groundwater exchange.
4. Enhance the ecological functions of the existing Class 1 wetland by replanting degraded areas with appropriate native species.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize the Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA.

Creation of side channels, backwater channels and/or pilot channels within the addition of woody debris and beaver dam analogue structures will provide hydraulic complexity in addition to benefitting prey availability for fish species, water quality and water quantity.

Identification of anticipated support and barriers to completion.

This project is supported by the WRIA 8 Salmon Recovery Council and King County. There are no known barriers to completion, although the project footprint will benefit from a conservation easement on one property not yet attained.

Estimate of capital costs and reoccurring O&M costs.

Estimated total cost to design, permit, and construct the project is \$1,440,000.

Anticipated durability and resiliency.

This project will reconnect the creek with its floodplain through the creation of side channels that will provide additional conveyance capacity and enhance and maintain floodplain processes and riparian health. Additions of instream large wood, and potentially beaver dam analogs will also aid in hyporheic exchange. Ecosystem benefits and hydrologic outcomes are expected to endure and help to ameliorate stream temperatures by lowering them during critical low flow periods.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Denise Di Santo, ddisanto@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance immediately.

Documentation of sources.

None

WRIA 8 – Project Description

Little Bit Restoration

October 16, 2020

Project Name and Number

Little Bit Restoration (8-BE-H21)

WRIA 8 WRE Subbasin

Bear/Evans

Narrative Description

This project includes restoration of Bear Creek along the Little Bit Reach, within the Bear/Evans subbasin in Redmond, Washington named for its proximity to the Little Bit Therapeutic Riding Center facilities near NE 106th. This reach is about 650 feet long and situated between two other reaches owned by King County, both locations of recent restoration efforts.

King County is proposing similar enhancements to the Little Bit Reach, including addition of woody debris, excavation of off-channel habitats and revegetation of the floodplain and riparian areas. The channel within this reach also runs against the Avondale Road NE embankment for about 250 feet, which prevents natural channel migration and morphology and compromises riparian functions. The goal of this project will be to increase the volume and availability of off-channel habitat for juvenile salmonids and to increase overall channel complexity and habitat quality. To accomplish this, the project design will add woody debris and incorporate elements such as excavated side channels, backwater channels and/or pilot channels within the floodplain.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

The project footprint will not change. Hydrologic modeling will be completed to assess design alternatives and ability to meet project goals and objectives. The project is expected to be constructed in 2023.

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

This project will restore up to 650 feet of Bear Creek within the Little Bit Reach to connect to recent restoration projects performed by King County. The project proposes to add woody debris, create off-channel habitat and revegetate the floodplain and riparian areas. These restoration actions will increase the volume and availability of off-channel habitat for juvenile salmonids and increase overall channel complexity and habitat quality. To accomplish this, the project design will add woody debris and incorporate elements such as excavated side channels, backwater channels and/or pilot channels within the floodplain.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

This project will restore up to 650 feet of Bear Creek within the Little Bit Reach. This restoration will connect two recent restoration efforts performed by King County and provide a significant stretch of restored stream with improved salmonid habitat.

Performance goals and measures.

1. Constraints to channel migration and habitat forming processes will be removed or minimized from 800 linear feet of Bear Creek.
2. Missing structure in the form of woody debris will be restored to the 800 linear feet of Bear Creek to create more complex and diverse instream habitat.
3. A more effective buffer will be established between Avondale Road NE and the channel of Bear Creek.
4. 2.7 acres of riparian habitat will be enhanced by removing or suppressing invasive species and planting with native trees and shrubs.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Bear Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA.

Creation of side channels, backwater channels and/or pilot channels within the addition of woody debris and beaver dam analogue structures will provide hydraulic complexity in addition to benefitting prey availability for fish species, water quality and water quantity.

Identification of anticipated support and barriers to completion.

This project is supported by WRIA 8 Salmon Recovery Council. There are no known barriers to completion.

Estimate of capital costs and reoccurring O&M costs.

Estimated total cost to design, permit and construct the project is \$1,000,000.

Anticipated durability and resiliency.

This project will reconnect the creek with its floodplain through the creation of side channels that will provide additional conveyance capacity and enhance and maintain floodplain processes and riparian health. Additions of instream large wood will also aid in hyporheic exchange. Ecosystem benefits and hydrologic outcomes are expected to endure over time under low and high flow conditions.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Denise Di Santo, ddisanto@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance immediately.

Documentation of sources.

None



Figure 1. Site map for Little Bit Restoration Project

WRIA 8 – Project Description

Bear Creek Water Quality Enhancement Projects

October 15, 2020

Project Name and Number

Bear Creek Water Quality Enhancement Projects (8-BE-H22)

WRIA 8 WRE Subbasin

Bear/Evans

Narrative Description

King County has a planning project underway to prioritize 3 subbasins for further investigation of future stormwater retrofit projects. These investigations will work to identify and prioritize potential Water Quality Capital Improvement Projects within the prioritized subbasins.

The current planning project will leverage the Bear Creek Watershed Management Study (King County 2018) to prioritize subbasins and identify sites for Water Quality Capital Improvement Projects within the prioritized subbasins. Future project types have not yet been defined but would be targeted at water quality treatment, stream shading/temperature reduction, and or enhanced flow control of storm runoff.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

Projects to be determined by the study so potential offsets cannot be determined at this time. Infiltration retrofits or enhancements could be expected to redirect on the order of 10 to 100 acre-feet per year from surface runoff to groundwater, delaying contribution to streamflow.

Conceptual-level map and drawings of the project and location.

The map at the end of the description shows the portion of Bear Creek considered in the Bear Creek Watershed Management Study. Project locations have not been determined.

Description of the anticipated spatial distribution of likely benefits.

Depends on project location(s). Benefits anticipated to occur to portions of Bear Creek and its tributaries within King County.

Performance goals and measures.

To be determined.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Bear Creek currently supports a wide range of salmonids including Chinook, sockeye, coho, kokanee, steelhead and coastal cutthroat. Moreover, Bear Creek has been identified as one of two high priority habitats to restore for Chinook Salmon recovery (known as "Tier 1" habitat) by the Water Resource Inventory Area 8 (WRIA 8) Salmon Conservation Plan, covering the Greater Lake Washington Watershed. The Washington Department of Ecology identified Bear Creek as a targeted watershed for stormwater retrofit planning due to its high ecological integrity.

Identification of anticipated support and barriers to completion.

To be determined.

Potential budget and O&M costs.

To be determined.

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

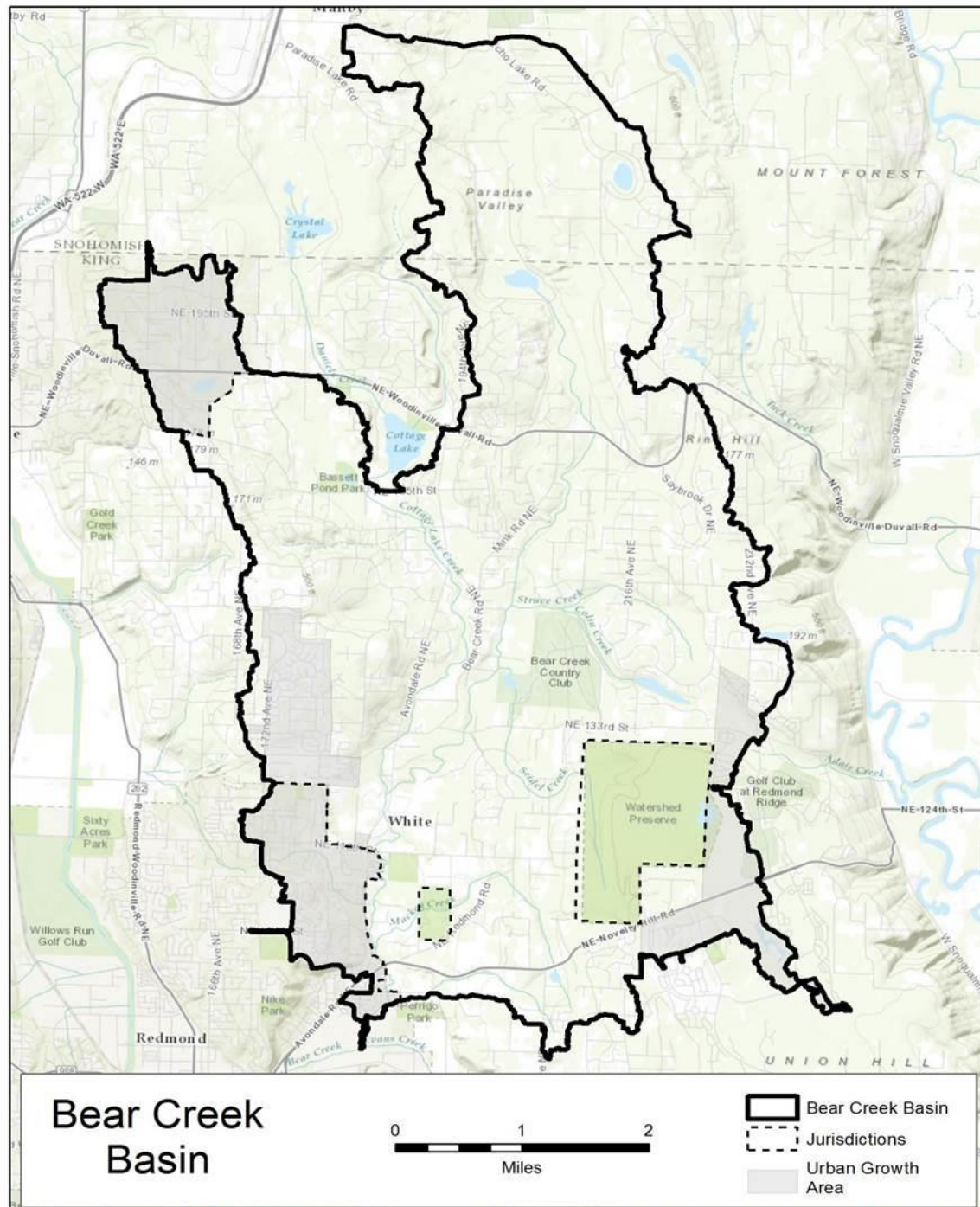
- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County is the likely project sponsor. Projects have not yet been identified so are at least several years from implementation.

Documentation of sources.

King County. 2018. Bear Creek Watershed Management Study. Prepared by Timothy Clark, Sevin Bilir, Jeff Burkey, Jessica Engel, Eric Ferguson, Claire Jonson, Josh Kubo, Scott Miller, Jen Vanderhoof, and Mark Wilgus, Water and Land Resources Division. Seattle, Washington.



WRIA 8 – Project Description

Lake Washington Institute of Technology

Stormwater Infiltration Vault

November 2, 2020

Project Name and Number

Lake Washington Institute of Technology Stormwater Infiltration Vault (8-GLW-H23)

WRIA 8 WRE Subbasin

Greater Lake Washington

Narrative Description

The Lake Washington Institute of Technology (LWIT) Infiltration Vault would provide water quality treatment and subsequent infiltration of stormwater for 23.4 acres of contributing area. It was developed through the Totem Lake Stormwater Retrofit Planning Effort, a watershed scale plan that investigated opportunities for stormwater retrofit projects. The project will infiltrate stormwater before it reaches Totem Lake and subsequently Juanita Creek, a Salmon bearing stream in Kirkland.

The stormwater system within the 23.4 acres of contributing area is already established and gravity flows through or nearby to this parking lot. The two separate pipe systems that flow here would be connected to the vault treatment and infiltration system through to-be-constructed short sections of pipe. The vault will be sized to accommodate the treatment and infiltration of the stormwater, up through and including a 50-year storm event. Because of the large area available, the vault will be sized as large as is feasible based on budget constraints.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project is at the conceptual design phase. The LWIT Infiltration Vault project is anticipated to include two vaults, beginning with a pre-treatment vault, followed by an infiltration vault. These vaults would be constructed underneath an existing parking lot and would clean and infiltrate stormwater from 23.4 acres. The infiltration vault will be sized totaling 15,000 square feet by 10.5 feet deep live storage (assuming 2 in./hr. infiltration rate). A similar project within Kirkland, *132nd Square Park* with 48.5 acres of contributing area, has been designed to achieve an annual infiltration volume of approximately 70 acre-feet. This project is expected to be similar in size and scope, and based on the *132nd Square Park* results, anticipates an annual infiltration volume of approximately 33.8 acre-feet. The actual infiltration volume achieved will be dependent on geotechnical exploration beneath the proposed facility.

Currently Kirkland is a Phase II permittee under the NPDES Stormwater Permit. Retrofitting stormwater systems installed before stormwater regulations became required for most development projects is not required through this permit. This treatment, infiltration, and flow control would be voluntary and beyond existing stormwater requirements. This project will ensure flow control and water quality to meet *2016 King County Stormwater Drainage Manual requirements and City of Kirkland Policy D-10, the Addendum to the King County Stormwater Drainage Manual*.

Stormwater will be treated with flow control facilities (infiltration vault), and water quality facilities (pre-treatment vault). This vault will either allow for sediment to settle out by reducing flow or will include cartridges which force stormwater to be filtered through media. Both techniques remove suspended solids which are known to contain nutrients, pesticides, heavy metals, and volatile chemicals, such as petroleum products.

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

The retrofit projects are designed using design practice per the Ecology manual to restore hydrology of the stream and watershed. Improvements in this stormwater system will benefit the Totem Lake tributary of Juanita Creek and Totem Lake and its associated wetland complex as well.

Performance goals and measures

The performance goal is to infiltrate as much stormwater runoff as feasible given site constraints. See the [Stormwater Retrofit Analysis for Juanita Creek Basin in the Lake Washington Watershed](#) (King County, 2012) report for further details.

Target flows will be meeting the ECY08 target. Target water quality will be to provide the Basic Water Quality Treatment for all pollution generating impervious surface (PGIS).

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Totem Lake Tributary to Juanita Creek supports Coho and Resident Cutthroat Trout and the mainstem of Juanita Creek additionally supports Winter Steelhead, Sockeye, and Fall Chinook.

Identification of anticipated support and barriers to completion.

Support from Lake Washington Institute of Technology is critical to the success of the project; this will be sought early in the design phase. Funding for the project, particularly considering COVID-19 budget impacts, is likely the primary barrier to completion of the project.

Potential budget and O&M costs.

Budget and O&M costs will be approximately \$2.5M per retrofit plan in FY2015 USD, or \$2.71M in FY2020 USD considering inflation.

Anticipated durability and resiliency.

The infiltration facilities are typically designed with a 25-year lifespan and will be maintained by the City of Kirkland maintenance crews while viable.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).

- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Project is in conceptual design phase. Project sponsor not yet identified.

Documentation of sources.

King County, 2012. *Stormwater Retrofit Analysis for Juanita Creek Basin in the Lake Washington Watershed*. Ecology Grant: G0800618. King County Department of Natural Resources and Parks, Water and Land Resources Division, Seattle, WA.

City of Kirkland, 2015. *Totem Lake/Juanita Creek Basin Stormwater Retrofit Conceptual Design Plan*. City of Kirkland, Storm & Surface Water Division, Kirkland, WA.
<https://www.kirklandwa.gov/Assets/Public+Works/Public+Works+PDFs/Surface+Water/Surface+Water+Grants/Totem+Lake+Stormwater+Retrofit+Final+Report.pdf>



WRIA 8 – Project Description

Juanita/Cedar Creek Stormwater Retrofit Planning

November 2, 2020

Project Name and Number

Juanita/Cedar Creek Stormwater Retrofit Planning (8-GLW-H24)

WRIA 8 WRE Subbasin

Greater Lake Washington

Narrative Description

The Juanita/Cedar Creek Stormwater Retrofit Planning project will conduct stormwater retrofit planning for Cedar Creek, a 500-acre subbasin of the Juanita Creek Watershed, resulting in conceptual design and cost estimates for three facilities and an implementation plan. Stormwater retrofit facilities will contribute to stream restoration efforts that include installation of a fish passable culvert.

The projects will likely use new and existing storm infrastructure typical of urban right of way (catch basins with grate, curb inlets, drainage pipes, etc.).

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project is currently in the planning phase. The retrofit facilities will be designed to be as large as is feasible within the spatial constraints of the basin. The land use is mostly residential. The facilities will likely treat and infiltrate or detain as much polluted runoff as feasible, and excess flows will bypass the facilities. A similar project underway within Kirkland (132nd Square Park retrofit) is designed to achieve an annual infiltration rate of 70 acre-feet/year with a contributing basin of approximately 50 acres. The Cedar Creek retrofit project will seek similar treatment performance but is highly dependent on the type of soils beneath the infiltration facilities, which will require exploration work. Stormwater will be treated per the Ecology stormwater manual or equivalent.

This retrofit project will voluntarily improve existing stormwater infrastructure, most of which was built before modern stormwater standards were in place, and in an area that is unlikely to redevelop in a way that would require new stormwater detention and water quality measures.

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

Cedar Creek/Juanita Creek.

Performance goals and measures

The performance goal is to infiltrate as much stormwater runoff as feasible given site constraints.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

A habitat restoration plan for Cedar Creek is currently being co-developed with this project to guide decision-making on future retrofit facilities. The project will complement installation of fish passable

culverts on Juanita Creek at 100th Avenue NE and at NE 137th Place – City projects which are currently in design and construction.

Identification of anticipated support and barriers to completion.

Funding for construction of the identified projects, particularly considering budget impacts related to the COVID-19 pandemic, is likely the primary barrier to their completion.

Potential budget and O&M costs.

Based on experience from previous projects within Kirkland, capital costs will be approximately \$1.5M - \$2.0M for each of the three retrofit projects, for a total of \$6 million in 2020 US dollars. O&M costs are approximately \$5000 per year for each facility, for a total of \$15,000 in 2020 US dollars.

Anticipated durability and resiliency.

Stormwater retrofit facilities are typically designed with a 25-year lifespan and will be maintained by the City of Kirkland maintenance crews.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.

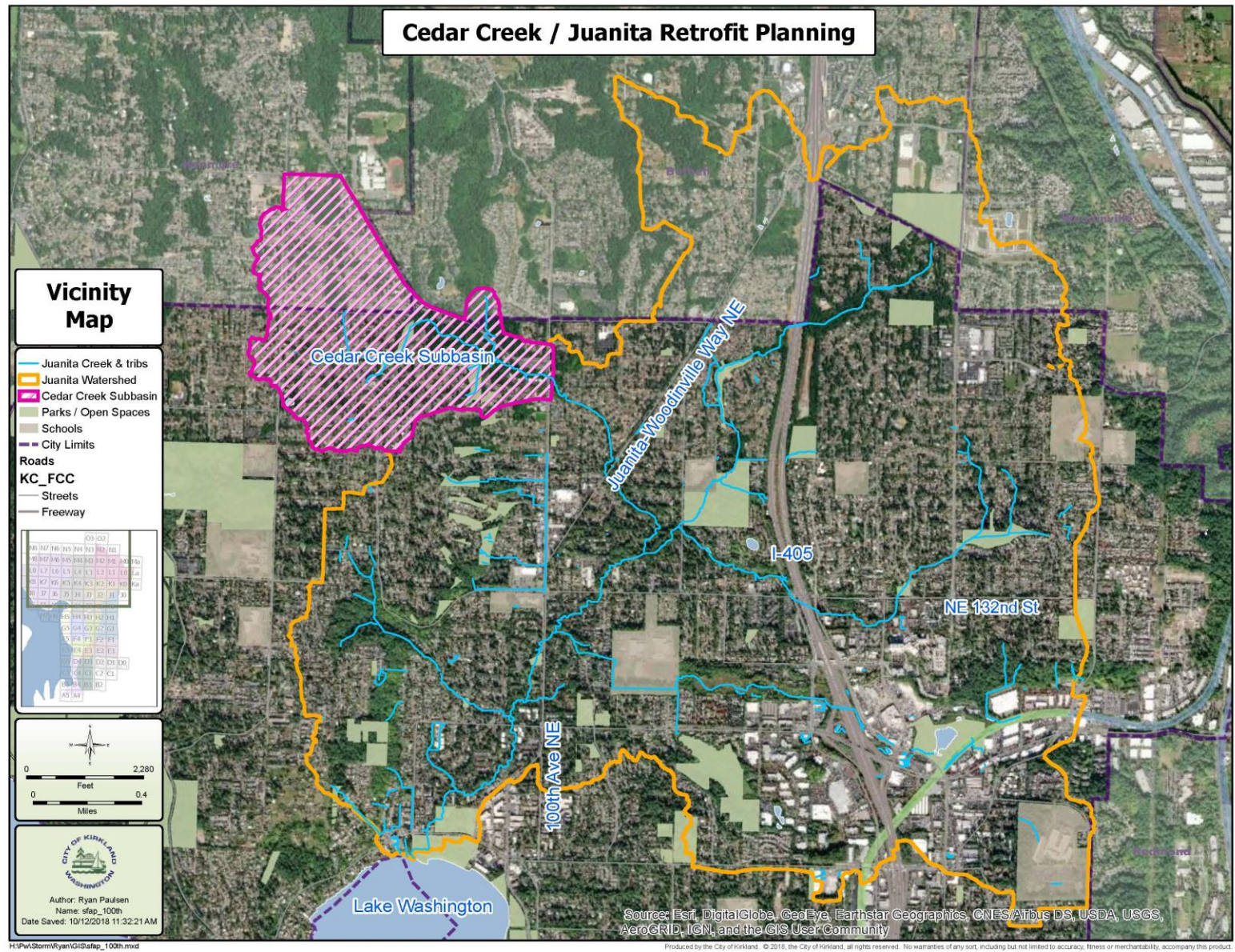
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

City of Kirkland is the project sponsor. An Ecology grant (Stormwater Financial Assistance Program) is being used to fund the planning effort, which will produce three 30% designs for retrofit projects. Additional funding will be needed to complete designs and construction.

Documentation of sources.

Ecology SFAP grant agreement available upon request. 2012 King County retrofit study available at:
<https://www.kingcounty.gov/services/environment/watersheds/cedar-river-lake-wa/documents/juanita-creekstormwater-retrofit.aspx>



WRIA 8 – Project Description

Forbes Creek / North Rose Hill Basin Stormwater Retrofit

November 2, 2020

Project Name and Number

Forbes/North Rose Hill Stormwater Retrofit (8-GLW-H25)

WRIA 8 WRE Subbasin

Greater Lake Washington

Narrative Description

The Forbes Creek Watershed within the City of Kirkland comprises 1837 acres that drain to Lake Washington. The creek now receives 2-year flows that are approximately 10 times higher than under pre-developed conditions. Kirkland received an EPA NEP grant in 2016 to identify and perform preliminary design work on 3 stormwater retrofit facilities to improve the creek's water quality and hydrology. The stormwater facilities were designed to 30% in Phase 1 of the project, which was completed in 2019. Additional funding is needed to take the projects to full design and construction.

The projects will likely use new and existing storm infrastructure typical of urban ROW (catch basins with grate, curb inlets, drainage pipes, etc.).

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

Once built, the stormwater retrofit facilities are expected to provide 0.39 MG total of storage and treatment for the water quality flowrate of 2.04 cfs from 50.2 acres. These estimates were calculated by a consultant and details are available upon request. The facilities are designed to infiltrate as much water as feasible, but infiltration rates are currently unknown. Stormwater will be treated per the Ecology stormwater manual or equivalent.

This retrofit project will voluntarily improve existing stormwater infrastructure, most of which was built before modern stormwater standards were in place, and in an area that is unlikely to redevelop in a way that would require new stormwater detention and water quality measures.

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

Forbes Creek

Performance goals and measures

The performance goal of the retrofit facilities is to provide water quality treatment of 50.2 acres of storm runoff, and infiltration or flow control to the maximum extent feasible.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Forbes Creek is classified as a Tier 3 stream by WRIA 8. The facilities will improve water quality and reduce flows to meet the Ecology 8% flow duration standard for the 50.2 acre catchment area.

Identification of anticipated support and barriers to completion.

Funding for the project, particularly considering COVID-19 budget impacts, is likely the primary barrier to completion of the project.

Potential budget and O&M costs.

Based on experience from previous projects within Kirkland, budget and O&M costs will be approximately \$1.5M - \$2.0M per retrofit plan in 2020 US dollars.

Anticipated durability and resiliency.

Stormwater retrofit facilities are typically designed with a 25-year lifespan and are maintained by the City of Kirkland maintenance crews while viable.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.

- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

City of Kirkland is the project sponsor. Phase I of the project was completed with Ecology grant funding. Phase II & III are currently unfunded.

Documentation of sources.

Ecology NEP grant agreement available upon request.

City of Kirkland, 2019. Forbes/North Rose Hill Stormwater Retrofit Planning Project – grant deliverables. Ecology National Estuary Program Grant: WQNEP2016-KirkPW-00010.

King County, 2012. Stormwater Retrofit Analysis for Juanita Creek Basin in the Lake Washington Watershed. Ecology Grant: G0800618. King County Department of Natural Resources and Parks, Water and Land Resources Division, Seattle, WA.
<https://www.kingcounty.gov/services/environment/watersheds/cedar-river-lake-wa/documents/juanita-creek-stormwater-retrofit.aspx>

**Figure 3 - North Rose Hill Sub-basin
within Forbes Creek**

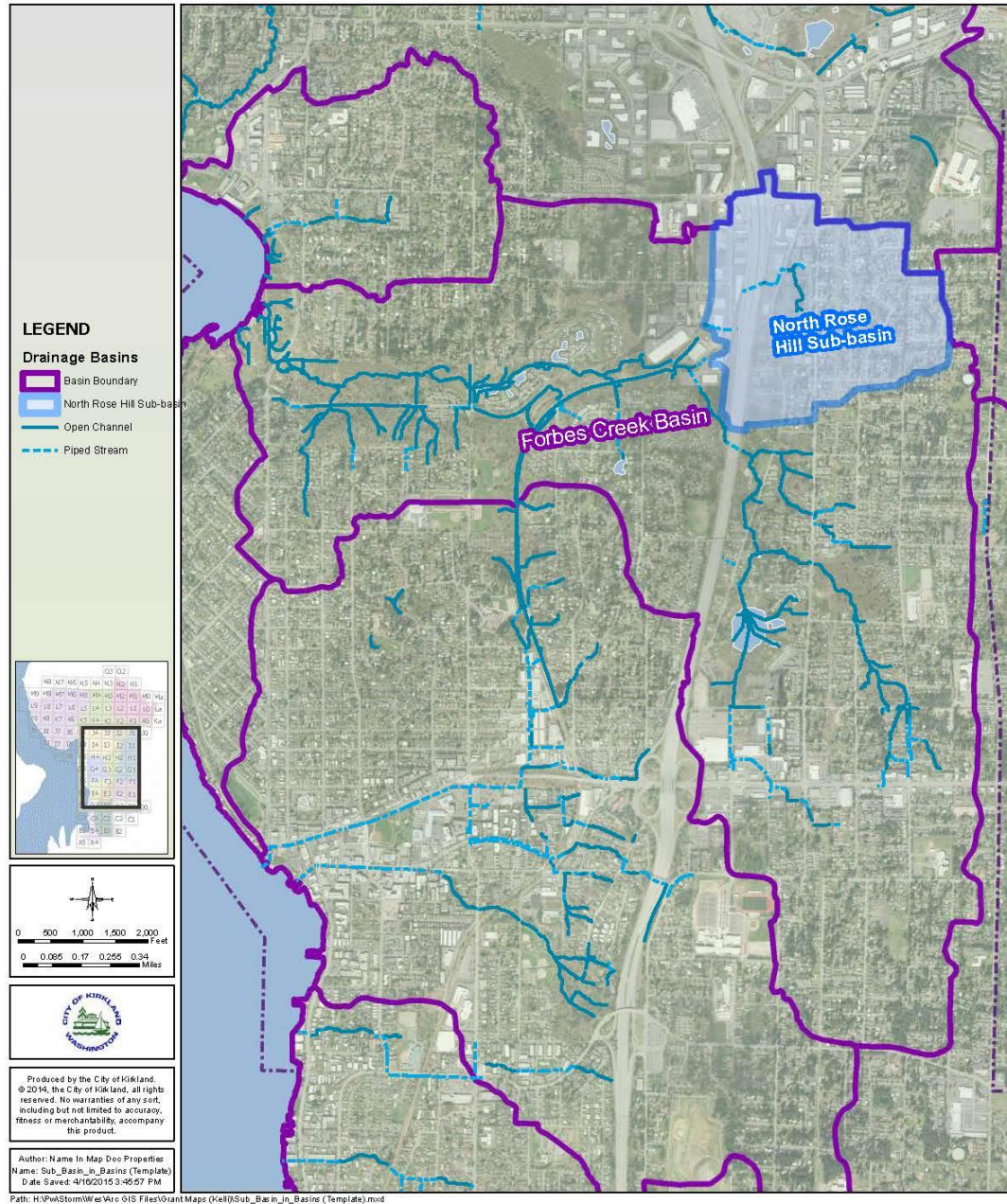


Figure 1: Forbes/North Rose Hill Stormwater Retrofit

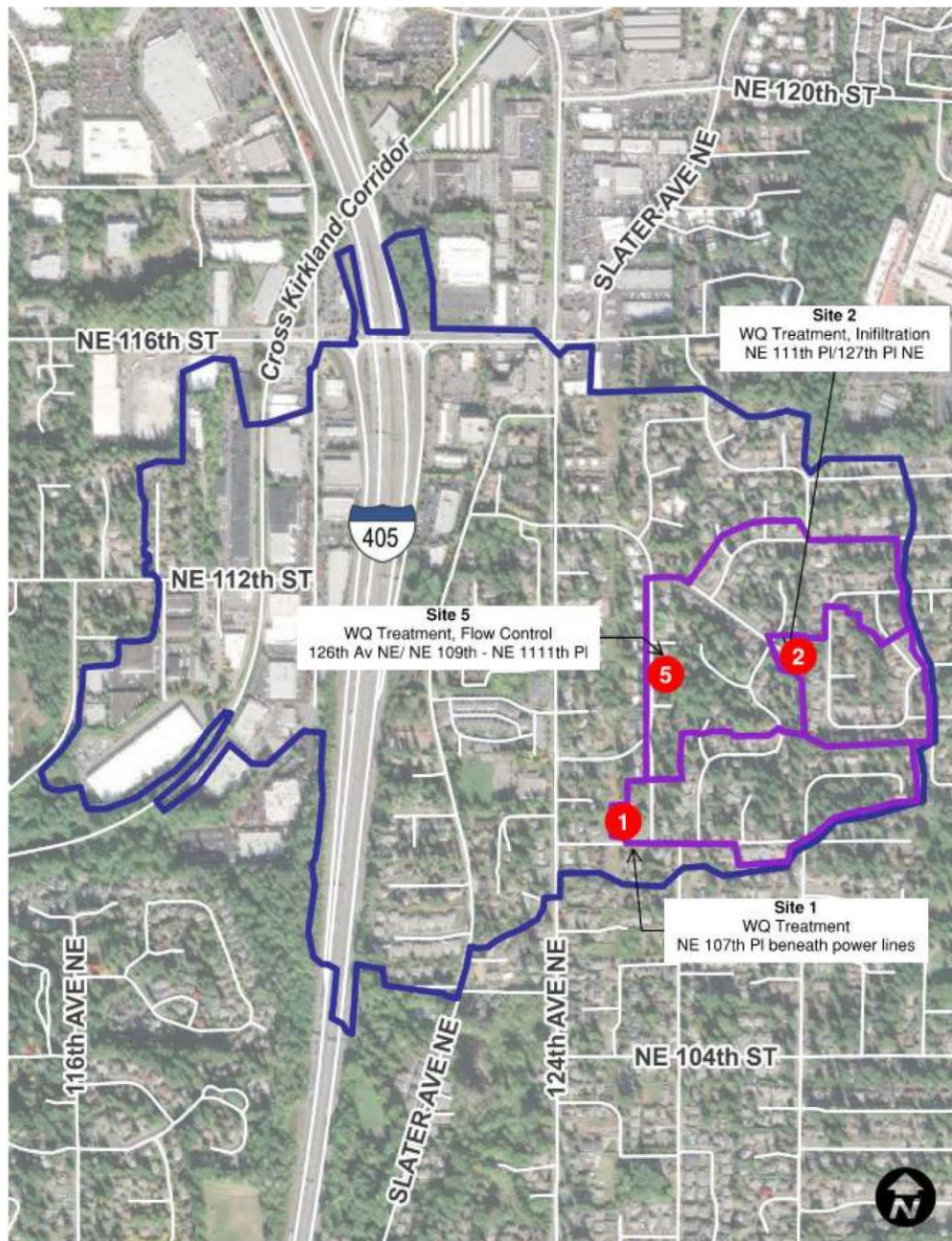


Figure 2: Forbes/North Rose Hill Stormwater Retrofit

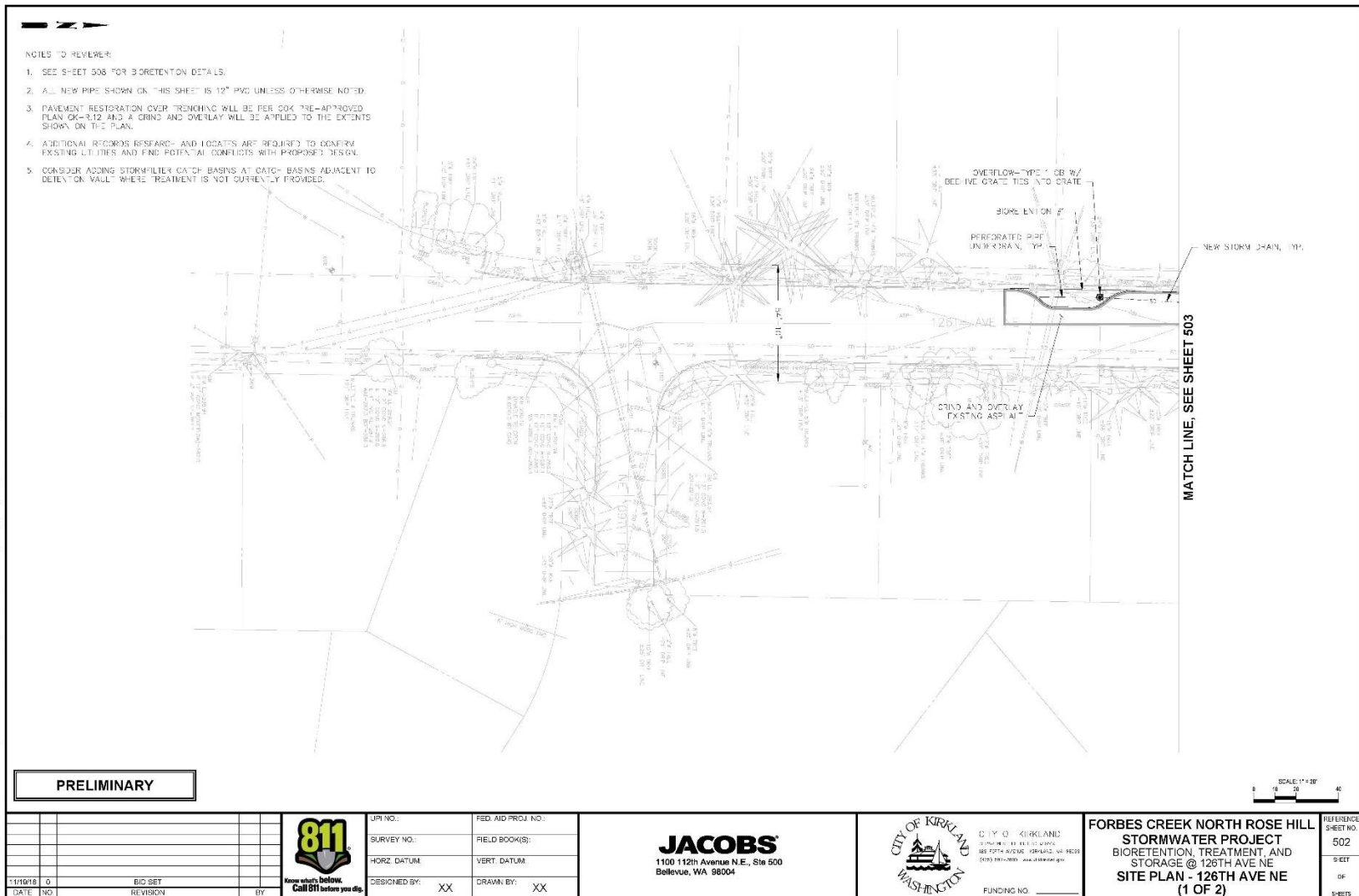


Figure 4: Forbes/North Rose Hill Stormwater Retrofit

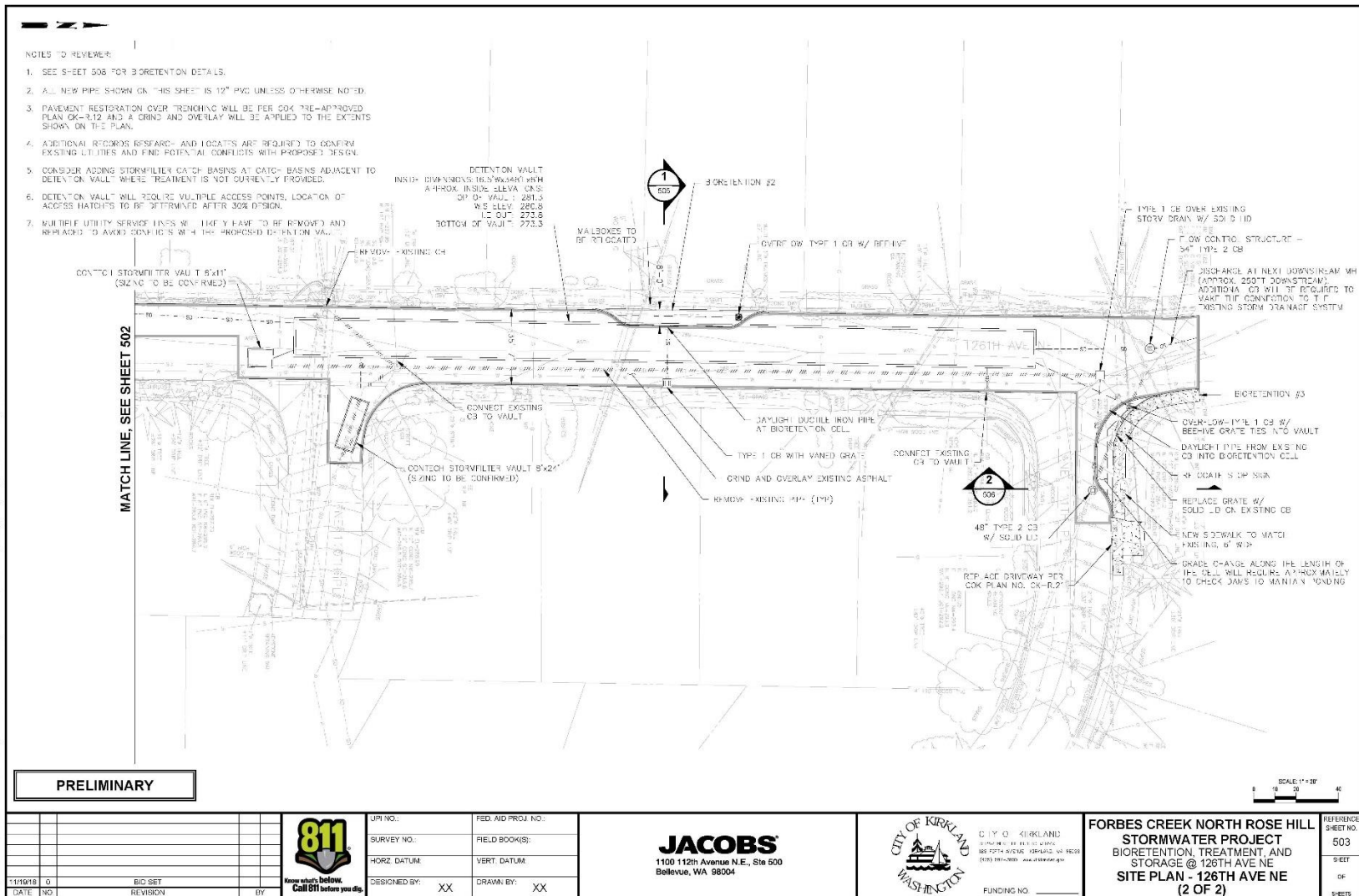


Figure 5: Forbes/North Rose Hill Stormwater Retrofit

WRIA 8 – Project Description

High Woodlands Stormwater Retrofit

October 16, 2020

Project Name and Number

High Woodlands Stormwater Retrofit (8-GLW-H26)

WRIA 8 WRE Subbasin

Greater Lake Washington

Narrative Description

The City of Kirkland (City) will site and size stormwater retrofit facilities within the High Woodlands sub-basin of Juanita Creek. Retrofit facilities in this 431-acre basin will contribute to improved flows and water quality in the overall Juanita Creek Watershed as envisioned in King County's [2012 Juanita Retrofit Study](#). Stormwater retrofit facilities will contribute to stream restoration efforts that include installation of a fish passable culvert at I-405/NE 145th Street to be installed by WSDOT by 2025.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project is currently in the planning phase. Planning will quantify the overall need for flow control and water quality facilities, and will identify sites and 30% designs for up to 3 facilities. Infiltration is the preferred stormwater management method. The project will include geotechnical exploration to identify and size infiltration projects such as infiltration wells or infiltration vaults. Although specific information is not yet available for projects in this basin, a similar project within Kirkland, *132nd Square Park* with 48.5 acres of contributing area, has been designed to achieve an annual infiltration volume of approximately 70 acre-feet. A rough estimate for this subbasin is that the three projects would together serve a similar area.

There are currently no requirements for stormwater retrofit of existing development. In order to make as much progress as possible toward restoration of pre-development hydrologic conditions, this project will to the degree feasible apply flow control and water quality treatment requirements of the 2016 King County Stormwater Drainage Manual to the tributary area for the project.

Stormwater will be intercepted and stored by re-routing or initiating stormwater connections (storm drainage lines, curb cuts, etc.), and/or flow control facilities (detention tank, vault, etc.). Stormwater will be treated by water quality facilities (wetvault, UIC, proprietary treatment, etc.). Facilities will meet the Basic and/or Enhanced level of treatment as noted in the 2016 King County Stormwater Drainage Manual

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

This project focuses on the High Woodlands sub-basin of the Juanita Creek Watershed. Juanita Creek drains to Lake Washington, part of the Lake Washington/Cedar/Sammamish Water Resources Inventory Area (WRIA) 8. The project channel extent for hydrologic analysis and stream protection and

enhancement includes the reach from the culvert at the intersection of 111th Avenue NE and NE 141st Street upstream to a stormwater inlet on 119th Avenue NE near the intersection with NE 148th Street.

Performance goals and measures

The performance goal is to infiltrate as much stormwater runoff as feasible given site constraints. See the [Stormwater Retrofit Analysis for Juanita Creek Basin in the Lake Washington Watershed](#) (King County, 2012) report for further details.

Target flows will be meeting the ECY08 target. Target water quality will be to provide the Basic Water Quality Treatment for all pollution generating impervious surface (PGIS). Metrics found in December 2019 Preliminary Hydraulic Design Report (WSDOT, 2019).

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Restoration of the pre-development hydrologic regime through stormwater management is one aspect of an overall stream restoration program that also includes installation of fish passable culverts (Kirkland recently replaced the culvert at 111th Ave NE/NE 141st Street, and WSDOT will be replacing the culvert at I-405 and NE 145th Street by 2025), instream physical habitat restoration, and water quality improvement efforts such as spill control/cleanup and public education. Taken as a whole, this program has the goal of restoring salmon populations in Juanita Creek.

Identification of anticipated support and barriers to completion.

Community outreach will be part of the planning process – identified stormwater projects must provide ancillary benefits where possible, and must be designed to incorporate community interests and concerns. Funding for the project, particularly considering COVID-19 budget impacts, is likely the primary barrier to construction of the projects identified via this planning effort.

Potential budget and O&M costs.

Based on experience from previous projects within Kirkland, it is likely that projects to serve 10-20 acres of tributary area will cost on the order of \$2 million, for a total of \$6 million for the three projects identified via this planning process. Operation and Maintenance costs for water quality treatment and infiltration facilities of this size are generally in the order of \$5,000 per year each, for a total of \$15,000 per year for three facilities.

Anticipated durability and resiliency.

The infiltration facilities are typically designed with a 25-year lifespan and will be maintained by the City of Kirkland maintenance crews while viable.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.

- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

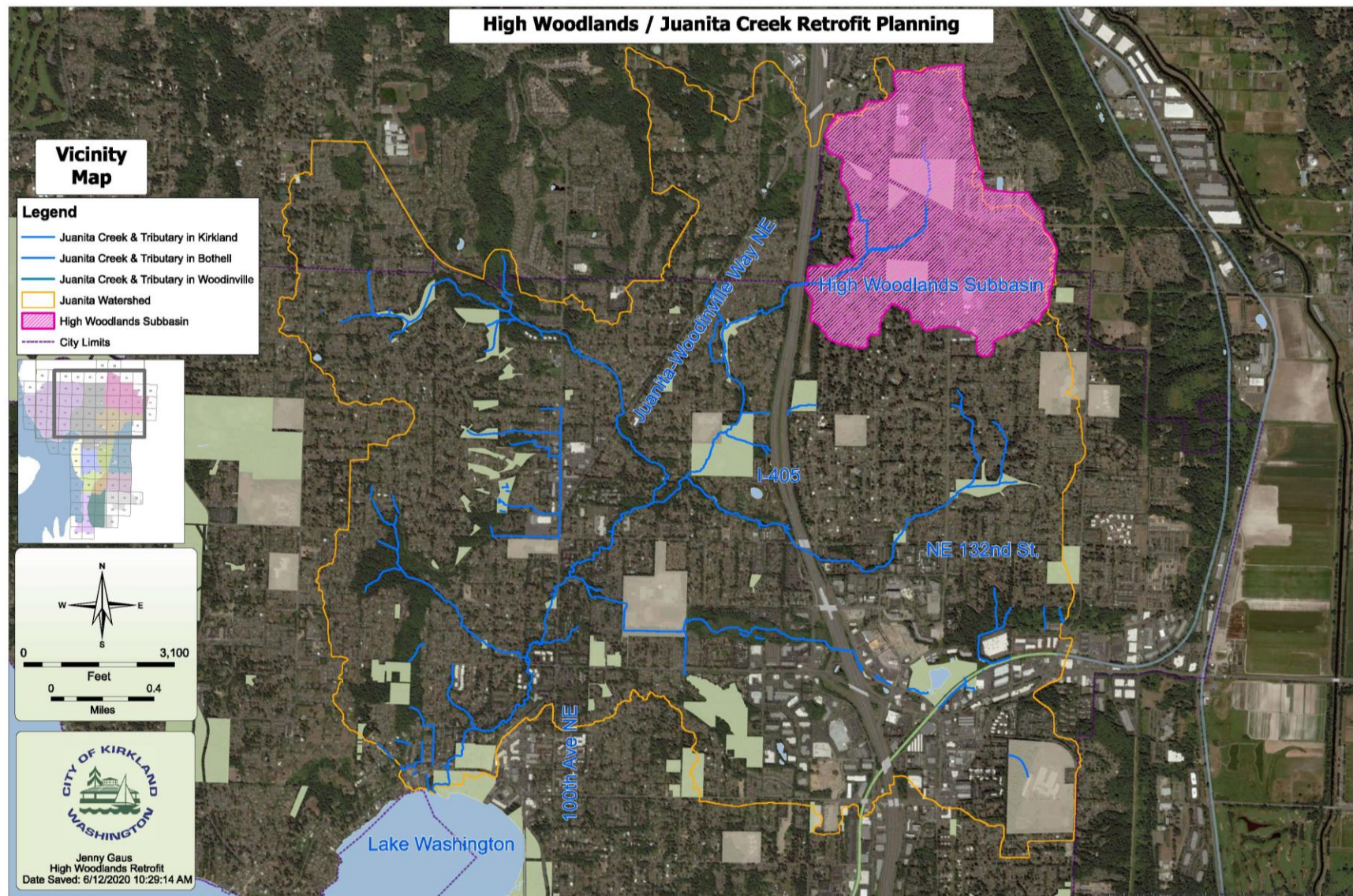
Project sponsor(s) (if identified) and readiness to proceed/implement.

This project is currently supported by funds from the Kirkland Surface Water Utility (i.e. local funds).

Documentation of sources.

King County, 2012. *Stormwater Retrofit Analysis for Juanita Creek Basin in the Lake Washington Watershed. Ecology Grant: G0800618.* King County Department of Natural Resources and Parks, Water and Land Resources Division, Seattle, WA.

WSDOT, 2019. *I-405 MP 21.94 Juanita Creek: Preliminary Hydraulic Design Report.* Washington Department of Transportation, Headquarters Hydraulics Office, Olympia, WA.



WRIA 8 – Project Description

Spinney Homestead Park Stormwater Retrofit Planning and Construction

October 15, 2020

Project Name and Number

Spinney Homestead Park Stormwater Retrofit Planning and Construction (8-GLW-H27)

WRIA 8 WRE Subbasin

Greater Lake Washington

Narrative Description

The Spinney Homestead Park Stormwater Retrofit Planning and Construction Project (project) will conduct stormwater retrofit planning, design development, and facility construction at Spinney Homestead Park. The stormwater from 53 acres that surround the park is conveyed by pipes and flows untreated into Forbes Creek. The park is situated ideally in the Forbes Watershed landscape to receive this re-routed stormwater, treat and infiltrate or detain as much of the stormwater as possible. Excess flows will bypass the facility.

Currently two stormwater systems flow around the park and outlet to Forbes Creek. These two systems would be piped into the park and managed through the retrofit facility. The project is still in the feasibility phase but as more information is gathered, Kirkland will prioritize water quality with infiltration first, followed by a detention facility.

Due to the desire to retain community use of the ball field, the systems will be underground vaults or tanks.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project is currently in the feasibility analysis phase. The facility will be designed as feasible within the spatial constraints of the park. The facility will be sized between 23,000 square feet by 4 feet deep (assuming 10 in./hr. infiltration rate) to 67,600 square feet by 5 feet deep (assuming minimal infiltration). A similar project within Kirkland, *132nd Square Park* with 48.5 acres of contributing area, has been designed to achieve an annual infiltration volume of approximately 70 acre-feet. This project is expected to be similar in size and scope, anticipating an infiltration volume of approximately 76.5 acre-feet. This expectation is highly dependent on geotechnical exploration beneath the infiltration facility.

Currently Kirkland is a Phase II permittee under the NPDES Stormwater Permit. Retrofitting stormwater systems installed before stormwater regulations became required for most development projects is not required through this permit. This treatment, infiltration, and flow control would be voluntary and beyond existing stormwater requirements. This project will ensure flow control and water quality to meet *2016 King County Stormwater Drainage Manual* requirements and *City of Kirkland Policy D-10, the Addendum to the King County Stormwater Drainage Manual*.

Stormwater will be treated by flow control facilities (detention tank, vault, etc.), and/or water quality facilities (wetvault, UIC, proprietary treatment, etc.). Both techniques remove suspended solids which

are known to contain nutrients, pesticides, heavy metals, and volatile chemicals, such as petroleum products.

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

The retrofit projects are designed using standard design practices to benefit the overall environmental health of Forbes Creek through reduction of runoff and removal of pollutants, but specific habitat improvements are not considered.

Performance goals and measures

The performance goal is to infiltrate as much stormwater runoff as feasible given site constraints. See the [King County's Stream Report Webpage](#) for further details.

Target flows will be meeting the ECY08 target. Target water quality will be to provide the Basic Water Quality Treatment for all pollution generating impervious surface (PGIS).

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

One of the predominant issues of stormwater is that it changes local hydrology to increase the speed and height of peak flows following a rain event. These quicker, larger flows can be extremely erosive for creeks that had once been surrounded by forest. Forbes Creek supports coho and steelhead salmon.

Identification of anticipated support and barriers to completion.

Funding for the project, particularly considering COVID-19 budget impacts, is likely the primary barrier to completion of the project.

Potential budget and O&M costs.

Based on experience from previous projects within Kirkland, capital costs will be approximately \$4.2M - \$5.2M for each of the retrofit facility in 2020 US dollars. O&M costs are approximately \$5,000 per year in 2020 US dollars.

Anticipated durability and resiliency.

The infiltration facilities are typically designed with a 25-year lifespan and will be maintained by the City of Kirkland maintenance crews while viable.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.

- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

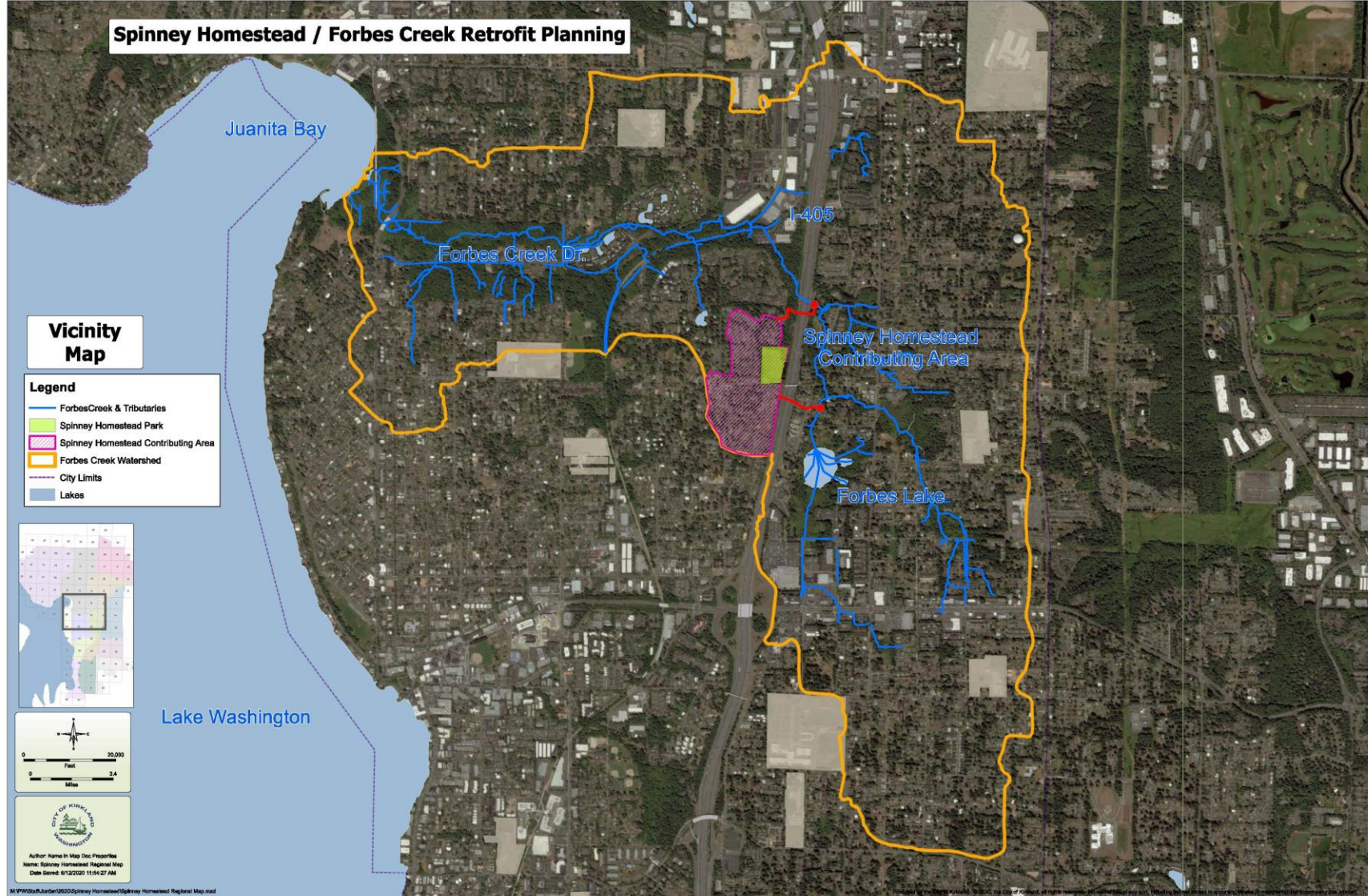
- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.
- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

The Kirkland City Council has funded the feasibility study and conceptual design.

Documentation of sources.

“Stream Report.” *Stream Report - King County*, 2 Nov. 2016, green2.kingcounty.gov/streamsdata/watershedinfo.aspx?Locator=0456.



WRIA 8 – Project Description

Cemetery Pond Stormwater Retrofit and Wetland Restoration

November 9, 2020

Project Name and Number

Cemetery Pond Stormwater Retrofit and Wetland Restoration (8-MC-H28)

WRIA 8 WRE Subbasin

May/Coal

Narrative Description

This project will improve the water quality in May Creek through the retrofit design of an existing stormwater detention pond (DR0509) at SE 128th Street and 165th Avenue SE in an unincorporated area of King County near Renton. The facility will reduce flows to May Creek by providing stormwater detention.

The Washington Department of Ecology identified May Creek as a targeted watershed for stormwater retrofit planning due to its high ecological integrity, indicating that stormwater retrofit actions within the watershed will have a greater probability of contributing to the recovery and stability of a functioning aquatic ecosystem. The Final Adopted May Creek Basin Action Plan recommends enhancement and restoration of the wetland by cleanup of existing trash piles, replanting of native vegetation and restoration of filled wetland areas. This work will serve as a pilot demonstration project to inform future stormwater retrofit projects involving wetlands.

The project is currently in early design stages under a grant from Washington Department of Ecology. The 90% design package will be completed in June 2021.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The project is anticipated to reduce flows to May Creek by providing stormwater detention. Infiltration capacity at the site has not yet been determined. Surface geology at the site consists of wetland and till, so significant infiltration is unlikely.

Conceptual-level map and drawings of the project and location.

See map on last page of project description.

Description of the anticipated spatial distribution of likely benefits.

Primary benefits expected for May Creek Tributary 291A. Benefits may carry down to May Creek.

Performance goals and measures.

Pond water levels, storm flow releases, downstream water quality and B-IBI scores.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

May Creek supports five species of fish: Chinook, sockeye, coho and kokanee salmon, and steelhead and cutthroat trout (Kerwin, 2001; "Stream List," 2016). From 2000 to 2015, volunteers with the King County Salmon Watcher Program observed salmon in May Creek. Volunteers consistently saw sockeye salmon. Less commonly spotted were Chinook salmon, coho salmon, cutthroat trout, and kokanee salmon.

Identification of anticipated support and barriers to completion.

King County currently has ownership of the project. The project sponsor has not yet confirmed willingness of current owners to sell the proposed project site, nor support from surrounding neighbors.

Potential budget and O&M costs.

Construction and O&M costs not yet determined.

Anticipated durability and resiliency.

In this context, durability refers to the capacity of the stormwater project to maintain benefits over time and despite changing external conditions (which could include seasonal variation in stormwater runoff, seasonal and/or long-term fluctuation in regional groundwater elevation, adjacent land use changes, and/or other factors). We anticipate that the planned project will be moderately durable, based on the following:

- Stormwater infrastructure would be maintained through engineering controls and conveyed with minimal loss to the recharge location.
- Groundwater recharge rate would be maintained through a program of periodic rehabilitation of the infiltration structure(s).
- The anticipated range in regional groundwater elevation fluctuation would not impact the groundwater flow field in a manner that impacts the project offset.
- Land use changes external to the project site would have negligible impact on project function.
- The water source likely would lack the predictability inherent to other types of managed aquifer recharge projects because it relies on the timing, rate, and volume of area precipitation.

Herein, resiliency refers to the capacity of the project to maintain the estimated water offset despite the impacts of climate change. Within the watershed, climate change could result in an increase in seasonal temperature, a decrease in summer precipitation, an increase in winter rainfall, a decrease in winter snowfall and/or spring snowpack, an increase in the frequency and/or intensity of storm events, an increase in wildfires, an increase in sea level, or other impacts. We anticipate that the planned project would be moderately resilient to the potential impacts of climate change based on the following:

- The project water source is not tied to the water right permitting process and is not subject to regulatory or other anthropogenic interruption.
- The project does not remove water from surface water, and therefore is not reliant on minimum streamflow requirements.
- The project does not remove water from a groundwater body, and therefore is not subject to well interference.
- The project diversion can be engineered and constructed in a manner that is resilient to flood events.
- Wildfire damage to the stormwater infiltration site and surrounding area likely would not impact project function and the anticipated benefits.
- Sea level increase would not impact project function.

- Project function could be impacted by a decrease in summer precipitation, drought conditions, an increase in the frequency and/or intensity of storm events, an increase in evaporation, or other climatic factors.

Project sponsor(s) (if identified) and readiness to proceed/implement.

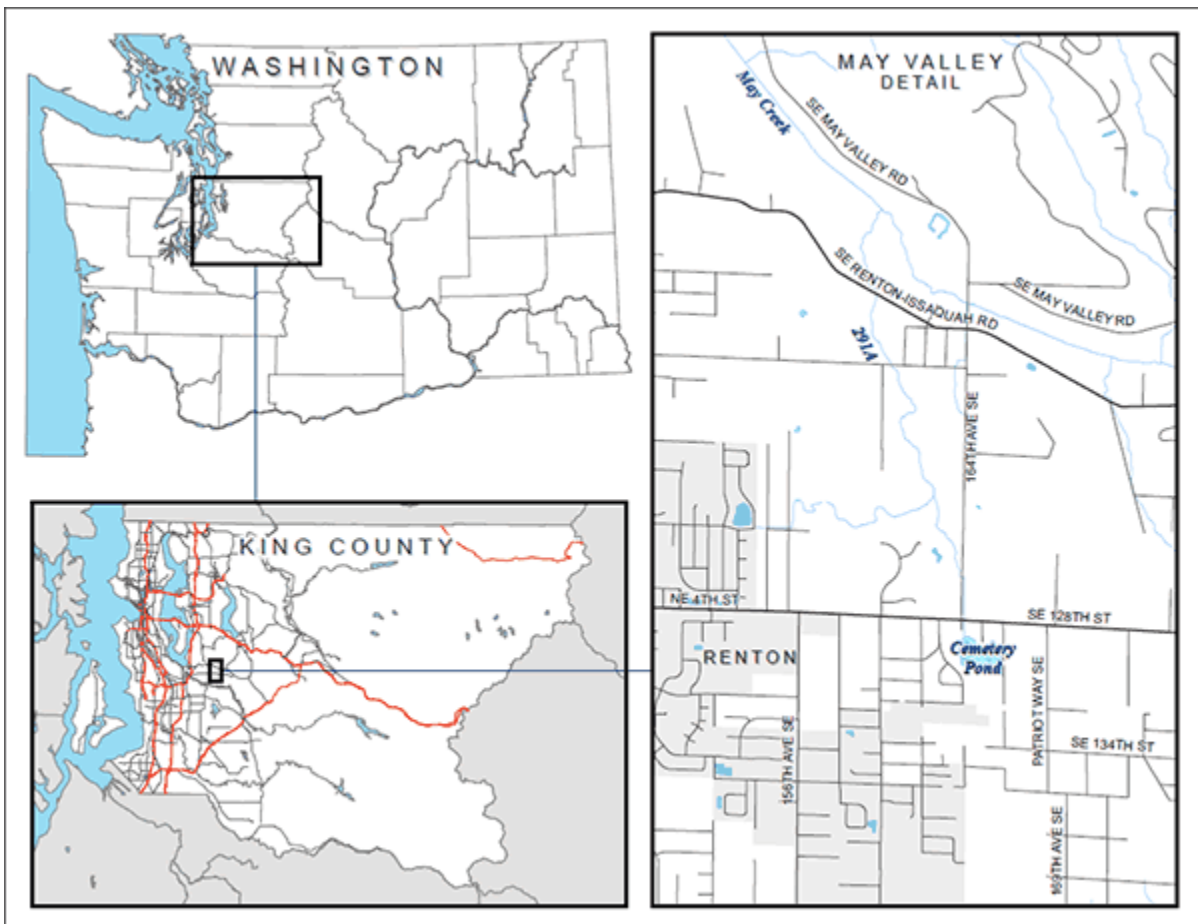
King County is conducting project design with grant funding from Washington Department of Ecology. Additional grant funding would likely be sought for project implementation, no earlier than 2022.

Documentation of sources.

Kerwin, J., 2001. Salmon and Steelhead Habitat Limiting Factors Report for the Cedar – Sammamish Basin (Water Resource Inventory Area 8). Washington Conservation Commission. Olympia, WA.

King County “Stream List,” 2016: <https://www.kingcounty.gov/services/environment/animals-and-plants/salmon-and-trout/salmon-watchers/streams.aspx>

Project website: <https://kingcounty.gov/depts/dnrp/wlr/sections-programs/stormwater-services-section/capital-services-unit/small-stream-basin-retrofit/may-creek-trib-291A-retrofit.aspx>



Map source: <https://kingcounty.gov/depts/dnrp/wlr/sections-programs/stormwater-services-section/capital-services-unit/small-stream-basin-retrofit/may-creek-trib-291A-retrofit.aspx>

WRIA 8 – Project Description

Carey/Holder/Issaquah Confluence Restoration

October 16, 2020

Project Name and Number

Carey/Holder/Issaquah Confluence Restoration (8-I-H30)

WRIA 8 WRE Subbasin

Issaquah

Narrative Description

This project includes restoration at the confluence of Carey, Holder and Issaquah Creeks located in the Issaquah subbasin in Hobart, Washington. The confluence is on a 120-acre site in King County ownership. This project proposes to restore riparian vegetation, add livestock fencing, and implement other best management practices for livestock. Some fencing has already been built. This project also has the opportunity to install large woody debris to facilitate floodplain interactions and off-channel habitat creation, including wetlands.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident cutthroat trout that utilize these three creeks as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

This project will restore the confluence of Carey, Holder, and Issaquah Creeks on a site in King County ownership. The proposed restoration actions include adding woody debris to facilitate floodplain interactions and create off-channel habitat, including wetlands. This proposal also includes revegetating riparian areas and installing livestock fencing. These restoration actions will increase the volume and availability of off-channel habitat for juvenile salmonids and increase overall channel complexity and habitat quality.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

This project includes restoration at the confluence of Carey, Holder and Issaquah Creeks located in the Issaquah subbasin in Hobart, Washington. The confluence is on a 120-acre site in King County ownership. Associated wetlands and small streams will also be included in the future project footprint.

Performance goals and measures.

Project is in feasibility phase, performance goals and measures are in development at this time.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident cutthroat trout that utilize these three creeks as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA.

Creation of edge habitat and enhanced riparian buffers through the addition of woody debris and restoration of wetlands will provide hydraulic complexity in addition to benefitting prey availability for fish species, water quality and water quantity. Riparian vegetation will provide shade to help protect water temperatures and detritus, essential for the aquatic food web.

Identification of anticipated support and barriers to completion.

Project is in feasibility phase and anticipated support and barriers to completion are unknown at this time.

Estimate of capital costs and reoccurring O&M costs.

Estimated total cost is unknown at this time.

Anticipated durability and resiliency.

Not available at this feasibility stage.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Judy Blanco, jublanco@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance immediately.

Documentation of sources.

None



Figure 1. Site Plan for Cary/Holder Issaquah Confluence Restoration Project

WRIA 8 – Project Description

Issaquah Creek In-Stream & Riparian Restoration - Lake Sammamish State Park

October 16, 2020

Project Name and Number

Issaquah Creek In-Stream & Riparian Restoration - Lake Sammamish State Park (8-I-H31)

WRIA 8 WRE Subbasin

Issaquah

Narrative Description

The Mountains to Sound Greenway Trust will complete in-stream restoration and riparian buffer restoration along 6,000' of Issaquah Creek within Lake Sammamish State Park, a Tier 1 system in the WRIA 8 Salmon Recovery Plan. This project will provide significant habitat benefits for juvenile Chinook and other salmonids including in-creek Large Woody Material (LWM) placement for structural diversity and creation of floodplain and side-channel connectivity, resulting in more functional and complex refuge and foraging habitat.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Issaquah Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the stream and riparian habitats associated with Issaquah Creek within Lake Sammamish State Park in Issaquah, Washington. Creation of floodplain and side-channel connectivity and installation of LWM has several ecological functions including increasing hydraulic diversity, managing flows, creating deeper pools that provide refugia for fish, and trapping organic material that provides nutrients for insects and invertebrates which are a prey source for fish. Shade from installed riparian vegetation will moderate water temperature, reduce evaporation, create habitat, and provide long-term recruitment of LWM.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore 6,000 feet of Issaquah Creek within the Lake Sammamish State Park, which connects with Lake Sammamish immediately downstream of the proposed project area.

Performance goals and measures.

The primary goal for this project is to enhance the quality and quantity of key, strategically located salmonid habitat, particularly for juvenile Chinook rearing and adult Chinook holding in Issaquah Creek to support WRIA 8 Salmon recovery goals. Adding large wood to the creek will create a suite of low-velocity habitats promoting longer stream residence. The hydrology of the system will engage the floodplain, and the LWM will scour out pools. Increase in refuge areas will result in longer periods of

rearing, helping fish achieve greater fitness and condition. Riparian reforestation will provide future LWM recruitment, shade the creek, provide additional nutrients, and other benefits.

This will be completed through the following objectives/measures:

- Improve canopy cover by revegetating 5 acres of riparian habitat with the installation of 4,000 native trees and shrubs to achieve a diverse conifer-based forest to increase shading and food sources for salmonids within 150' of creek. Installed trees will provide an important source of wood recruitment to the stream over the coming decades.
- Continue active restoration on more than 40 acres of existing riparian buffer enhancement projects. Install at least 5,000 native trees and shrubs to continue establishment of coniferous forest canopy.
- Create a 193' pilot channel to reconnect the creek to oxbow channel providing an additional 0.3 miles (1.5 acres) of habitat for salmonids which will be available immediately and provide opportunity for the creek to migrate more freely within the delineated channel migration zone.
- Scrape 250' of steep banks to accelerate channel widening and increase sinuosity. Assuming a 10-year flood event, an additional 50' of bank is expected to naturally erode increasing the width of the lower floodplain bench and adding channel length.
- Construct 3 apex jams and 17 large spur jams to partition stream flow, increase sinuosity, create a velocity shadow downstream to form gravel bars, improve hyporheic flow to reduce stream temps, and create 23 pools for juvenile rearing/adult holding.
- Install 32 logs, 16 log jacks and 1 small spur jam in and along the creek and oxbow channel to immediately improve in-water habitat for salmonids, increase bank roughness to provide refugia for juvenile salmonids during higher flows, and supporting pool and multifractional size sediment bar formation (operating in conjunction with larger structures).

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, Kokanee, and resident Cutthroat Trout that utilize Issaquah Creek as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the ESA. LWM and restoration of riparian vegetation will directly benefit prey availability, spawning success as well as survival of pre-migrant and outmigrating juvenile salmonids.

Identification of anticipated support and barriers to completion.

The Greenway Trust has completed significant partner and stakeholder engagement in this effort, with efforts including Washington State Parks & Recreation Commission (the landowner and land manager) engaged routinely and regularly in planning and design, seeking input from staff from multiple tribes, ongoing conversations with the City of Issaquah, close coordination with the Lake Washington/Cedar/Sammamish Watershed (WRIA 8) and the WRIA 8 Technical Committee, and discussion with other interested parties (Washington Dept. of Fish and Wildlife, King County Kokanee Work Group, nonprofit partners).

Funding for the design phase of the project has been secured via grants from the WRIA 8 / King County Flood Control District (KCFCD) Cooperative Watershed Management (CWM) grant program, the Salmon Recovery Funding Board (through the Washington State Recreation & Conservation Office), and from private contributions from The Boeing Company.

The Greenway Trust is currently seeking funding to complete construction of the project in Phases, with anticipated grants from WRIA 8/KCFCD CWM program, and from the Salmon Recovery Funding Board and Puget Sound Acquisition and Restoration programs. The Greenway Trust is also seeking funding from other public and private sources including the National Fish and Wildlife Foundation.

Possible barriers to completion are limited. An uncommon aspect of this project is the relatively unique opportunity to complete in-stream and riparian habitat restoration on such a large stretch of Creek within an otherwise heavily developing area. Two key project partners (State Parks and the City of Issaquah) have placed only a handful of limitations on the project:

- No additional adverse impact to existing and future State Parks facilities (Sunset Beach bathhouse and pedestrian bridge, small pump station in Reach 4).
- Leave an area for a future mid-Park channel-spanning bridge across the Creek (in Reach 3, where the Creek is deeply incised and unlikely to meander substantially).
- Flood Impacts: Zero rise at the Park-City boundary upstream, and compliance with City and FEMA requirements for projects within a FEMA-regulated floodway.

An additional possible constraint is associated with the overall cost of the project, as funding is being sought to complete the effort in multiple Phases. The Greenway Trust anticipates initiating the project in the 2022 construction window using grants that are conditionally approved at this time and will continue to seek funding to complete the project in the coming years.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are estimated at \$427,142.

Anticipated durability and resiliency.

After the project is completed, there will still be some need for site maintenance in order to achieve functional forested riparian habitat. Throughout the duration of this project, the Greenway Trust will focus on invasive weed control, mulching, monitoring and adaptive site management, and plant replacement with a goal of minimizing the need for long term maintenance. The Greenway Trust will complete a minimum of 5 years of intensive maintenance of the riparian buffer restoration plantings with a focus on native plant survival and invasive weed control. Maintenance intervals will be reduced as viable after 5 years. The Greenway Trust has a 15+ year history of performing similar activities in the Park, supported by local grants, Greenway Trust staff, sponsored AmeriCorps members, volunteers, and other elements. The Greenway Trust has been successful in obtaining stewardship and maintenance funding from other funding sources, including state and local grants and private funding from the Greenway Trust's partnership with Carter Subaru. The Greenway Trust also has a long history of working with volunteers and schools in Lake Sammamish State Park and will continue to lead volunteer stewardship events to remove invasive weeds in the riparian corridor of Issaquah Creek.

In-stream restoration will be monitored, and is not anticipated to be maintained. The in-stream elements of the project are designed and engineered with minimal anchoring to function naturally in a dynamic process-based system. The Greenway Trust is working with State Parks on a conceptual plan for maintenance of the in-stream features to support prevention of damage to the Park's facilities, and this plan will continue to be refined over the coming years. As described elsewhere in this proposal, the in-stream restoration components incorporate many elements that are designed to provide long-term functionality, including spur and apex jams that will help to capture mobile wood throughout the project area.

Numerous stakeholders have expressed an interest in long-term effectiveness monitoring for the project, and while funding has not been identified, this aspect will continue to be explored.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Mountains to Sound Greenway Trust. Sponsor contact: Mackenzie Dolstad, mackenzie.dolstad@mtsgreenway.org. The sponsor has submitted for funding and is ready to proceed with implementation of riparian buffer restoration immediately, as funding from other sources allows for completion of Final Design for in-stream restoration components.

Documentation of sources.

More details on the sources, methods, uncertainties, assumptions, and proposal can be found in the Greenway Trust's Preliminary Design report for the project, prepared by Northwest Hydraulic Consultants and The Watershed Company (2020). Additional project information and a link to the Preliminary Design report is available at: <https://mtsgreenway.org/lower-issaquah-creek>.

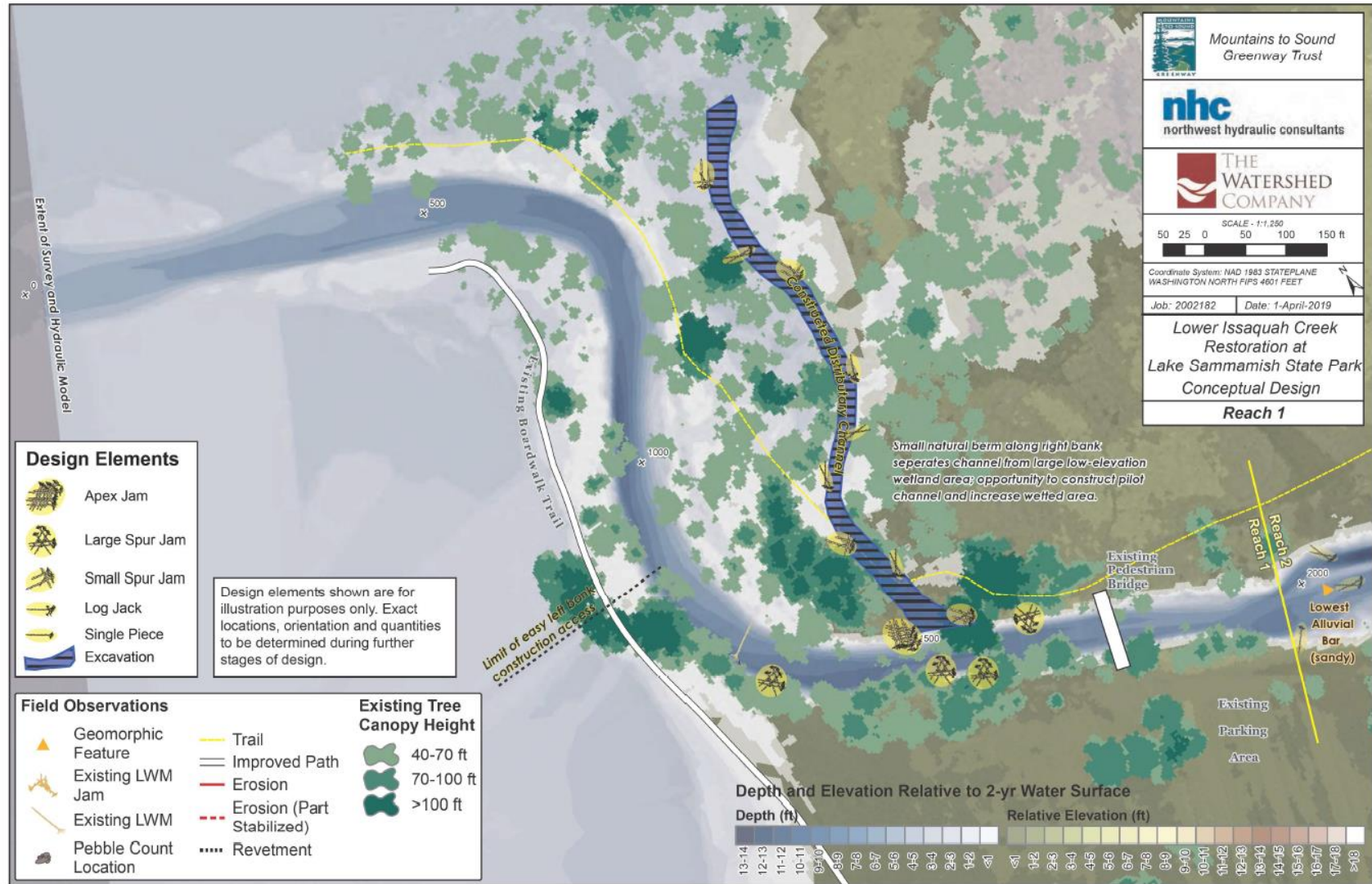


Figure 1. Site Plan for the Issaquah Creek In-Stream & Riparian Restoration Project

WRIA 8 – Project Description

Royal Arch Reach Acquisitions and Floodplain Connection

October 16, 2020

Project Name and Number

Royal Arch Reach Acquisitions and Floodplain Connection (8-LC-H32)

WRIA 8 WRE Subbasin

Lower Cedar

Narrative Description

This project includes floodplain reconnection and restoration along the Cedar River within the Royal Arch Reach located in the Lower Cedar subbasin just north of Maple Valley, Washington.

Specifically, this project proposes to acquire floodplain properties from State Route (SR) 169 to Highway (HWY) 18 for future floodplain reconnection and restoration. Some floodplain properties are already in public ownership as a result of an effort being led by Seattle Public Utilities. These efforts align with the Cedar Corridor Plan Habitat Opportunity Area #20 and 21. Upon acquiring sufficient land along the right bank, the project proposes to remove bank armoring and reconnect and restore the floodplain in the reach. These efforts align with Cedar Corridor Plan Habitat Opportunity Area #20 and Project 21. The first sub-project is now in design to restore approximately 8 acres of floodplain in the upper Royal Arch Reach.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye and resident Cutthroat Trout that utilize the Cedar River as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the floodplain connectivity improving the aquatic habitats associated with the Cedar River through acquisition of properties within the floodplain from SR 169 to HWY 18.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore floodplain connectivity along the Cedar River from SR 169 to HWY 18 just north Maple Valley, Washington, in what is known as the Royal Arch Reach.

Performance goals and measures.

Acquire property and remove hardened banks, historic fills, and structures to restore connectivity of the natural floodplain of the Cedar River in the reach, with the primary goal of increasing off-channel rearing and refuge habitat for juvenile salmonids.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize the Cedar River as spawning and especially rearing habitat. Chinook and Steelhead are priority species, protected under the ESA. Floodplain restoration will directly benefit fish by restoring riparian vegetation communities, food web complexity and expanding available habitats for flood refuge, foraging, and spawning.

Identification of anticipated support and barriers to completion.

Consistent and repeated funding support has come from WA State Salmon Recover Funding Board (SRFB), including the current sub-project now in design. The biggest barrier to full-reach-scale acquisition and restoration is unwilling sellers of large parcels of land, especially the Royal Arch Mason Park.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are estimated at \$3.5-5 million.

Anticipated durability and resiliency.

Acquisition of land in-fee, followed by process-based reconnection of natural floodplain is anticipated to be naturally resilient and perpetually durable.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Seattle Public Utilities. Sponsor contact: Brent Lackey, Brent.Lackey@seattle.gov. The sponsor is actively seeking additional property acquisitions (15 parcels/30 acres have been acquired as 2020) in the 70-acre reach. Currently in design of first large floodplain reconnection sub-project.

Documentation of sources, methods, uncertainties, and assumptions.

Historic floodplain maps and detailed flow and inundation modeling and studies (SPU 2014-2020); Feasibility and options analyses, and multiple grant application proposals (SPU 2007-2020). Assumes river hydrology is largely static over the course of at least this century. Assumes ongoing occupation of Cedar River by target salmonid species.

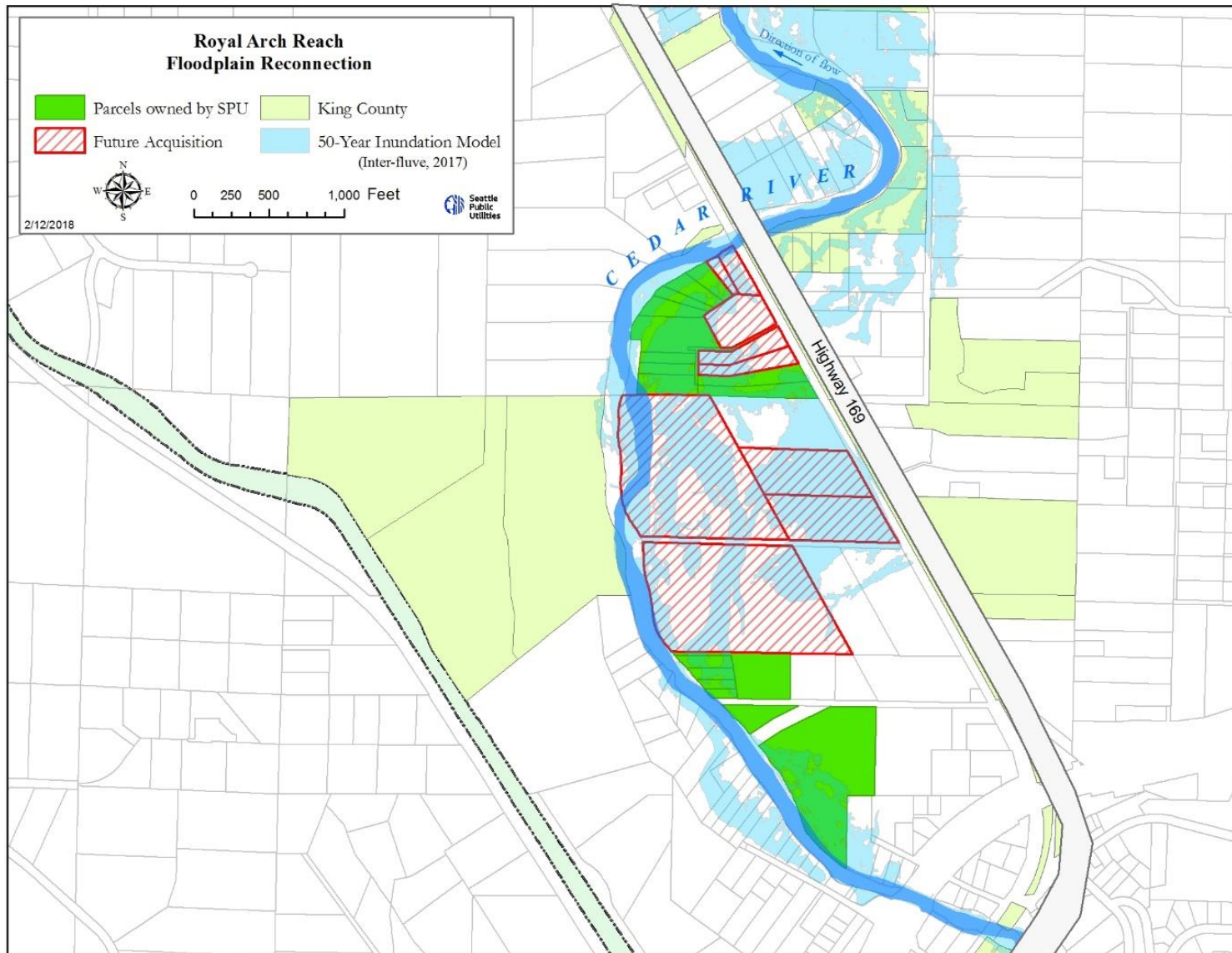


Figure 1. Site Plan for Royal Arch Reach Project

WRIA 8 – Project Description

Elliot Bridge Reach Floodplain Restoration

October 16, 2020

Project Name and Number

Elliot Bridge Floodplain Restoration (8-LC-H33)

WRIA 8 WRE Subbasin

Lower Cedar

Narrative Description

This project includes acquisition of parcels near the former Elliot Bridge site to enable floodplain reconnection and restoration along the Cedar River located in the Lower Cedar subbasin in Renton, Washington.

Once property is acquired, the project proposes to restore the floodplain, including setting back or removing the Elliot Bridge levee, removing the old Elliot Bridge abutments and portions of 149th Ave., and potentially removing the toe rock from the Orting Hill revetment (left in place following a mitigation project). As part of this restoration, this project will also evaluate relocation of lower Madsen Creek to enhance habitat conditions in the creek.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, resident Cutthroat Trout, Kokanee and Bull Trout that utilize the Cedar River as spawning and rearing habitat. Chinook, Steelhead, and bull trout are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the floodplain connectivity improving the aquatic habitats associated with the Cedar River through acquisition of properties within the floodplain.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore floodplain connectivity along the Cedar River through acquisition of two parcels on the right bank just upstream of the Punnett Briggs revetment and up to four parcels on the left bank along the river and 149th Ave SE. This project proposes to remove the Elliot Bridge levee and abutments and potentially the toe rock from the Orting Hill revetment. The project will also evaluate the relocation of lower Madsen Creek to improve habitat conditions with its connection point with the Cedar River.

Performance goals and measures.

To be determined.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

Chinook, Coho, Steelhead, Sockeye, resident Cutthroat Trout, Kokanee and Bull Trout that utilize the Cedar River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the ESA. Floodplain restoration will directly benefit fish by restoring riparian vegetation communities, food web complexity and expanding available habitats for foraging and spawning.

Identification of anticipated support and barriers to completion.

Project has been identified by King County and WRIA 8 Salmon Recovery Council as important habitat recovery planning area.

Estimate of capital costs and reoccurring O&M costs.

The total project costs are currently unknown.

Anticipated durability and resiliency.

Project will encourage the establishment of natural riverine processes.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Sponsor contact: Judy Blanco, jublanco@kingcounty.gov. The project sponsor will proceed with scoping and reconnaissance once additional property is conserved.

Documentation of sources.

None



Figure 1. Site Plan for Elliott Bridge Reach Floodplain Restoration

WRIA 8 – Project Description

WPA Levee Removal

October 16, 2020

Project Name and Number

WPA Levee Removal (8-LC-H34)

WRIA 8 WRE Subbasin

Lower Cedar

Narrative Description

This project proposes to acquire the remaining parcel not on public ownership and setback or remove the WPA levee. This would allow for floodplain restoration along the Cedar River in the Lower Cedar subbasin in the East Renton Highlands, Washington. This project would also include revegetation of the floodplain with riparian plantings.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, resident Cutthroat Trout, Kokanee and Bull Trout that utilize the Cedar River as spawning and rearing habitat. Chinook, Steelhead, and bull trout are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the floodplain connectivity improving the aquatic habitats associated with the WPA levee on the Cedar River through acquisition of the remaining parcel not in public ownership.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The spatial distribution of the proposed WPA levee setback or WPA levee removal would have direct benefits within the footprint of the project but also provide benefit to downstream habitats through water quality, water quantity and nutrient availability.

Performance goals and measures.

Project goals and measures have not been drafted yet.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

The species that will benefit are Chinook, Coho, Steelhead, Sockeye, resident Cutthroat Trout, Kokanee and Bull Trout that utilize the Cedar River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the ESA. Floodplain restoration will directly benefit fish by restoring riparian vegetation communities, food web complexity and expanding available habitats for foraging and spawning.

Identification of anticipated support and barriers to completion.

Future project area has one inholding that will require acquisition to move forward.

Estimate of capital costs and reoccurring O&M costs.

The total cost of the proposed project is unknown.

Anticipated durability and resiliency.

Floodplain connectivity will restore natural riverine processes to the site.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Judy Blanco, Jublanco@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance once inholding parcel is secured.

Documentation of sources.

None.

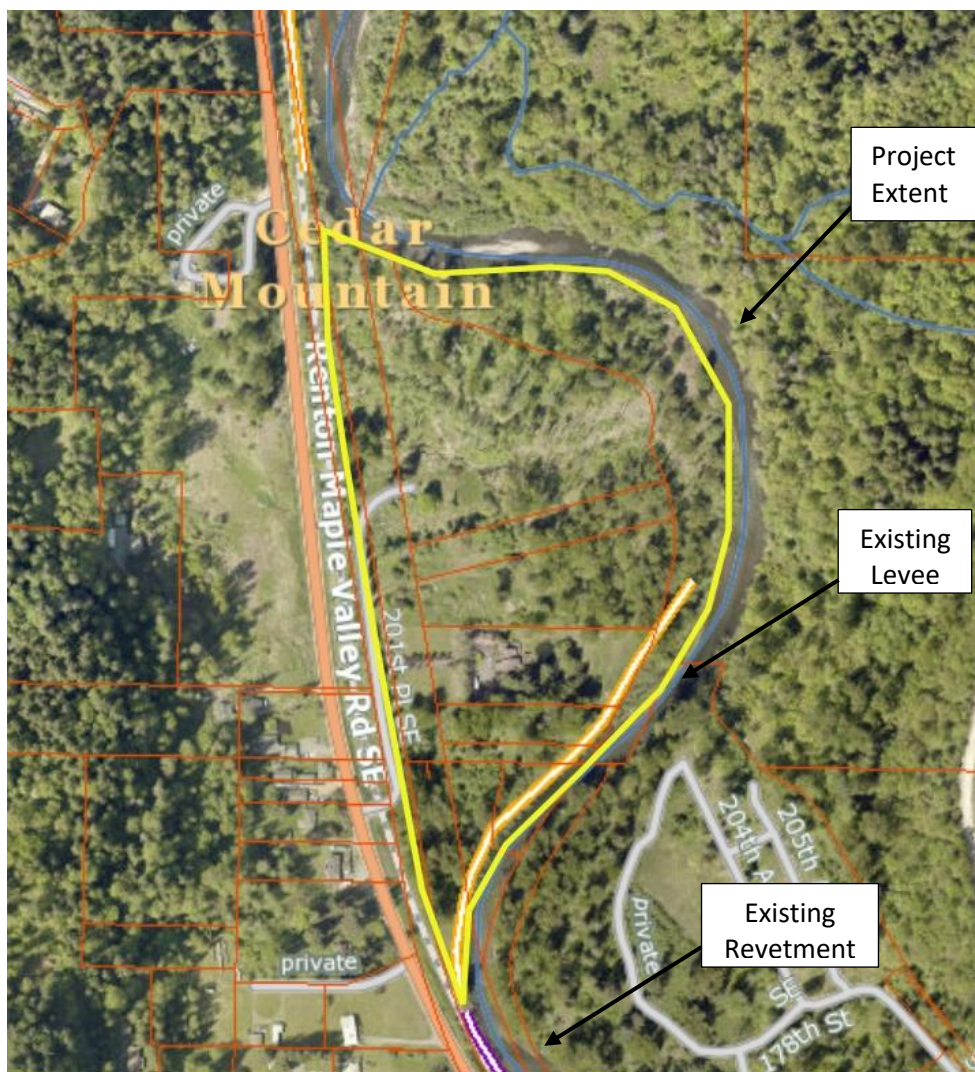


Figure 1. Site Plan for WPA Levee Removal Project

WRIA 8 – Project Description

Rutledge-Johnson Lower and Rhode Levee Setback/Removal

October 16, 2020

Project Name and Number

Rutledge-Johnson Lower and Rhode Levee Setback/Removal (8-LC-H35)

WRIA 8 WRE Subbasin

Lower Cedar

Narrative Description

This project includes two proposals along the Cedar River in the Lower Cedar subbasin in Maple Valley, Washington. These proposals are the Rutledge-Johnson Lower and Rutledge-Johnson/Rhode projects. The Rutledge-Johnson Lower project proposes removal or setback of the downstream 600 feet of the Rutledge-Johnson levee to allow for floodplain connection with an existing King County owned parcel. This would restore 16 acres of reconnected floodplain habitat. The second proposal under this project is the Rutledge Johnson/Rhode project which proposes to acquire remaining parcels along the left bank behind the Rhode and Rutledge-Johnson levee and remove or setback the levees and restore the floodplain.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat trout that utilize the Cedar River as spawning and rearing habitat. Chinook and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will restore the floodplain connectivity improving the aquatic habitats associated with the Cedar River through levee removal or setback. The Rutledge-Johnson levee removal or setback is estimated to restore 16 acres of reconnected floodplain habitat.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to restore floodplain connectivity along the Cedar River in the area around the Rutledge-Johnson and the Rhode levees, just south of Cedar Grove in Maple Valley, Washington. Floodplain restoration will directly benefit the habitat within the project footprint and there are downstream benefits with respect to water quality, water quantity and nutrient availability.

Performance goals and measures.

This is not applicable at this early design phase of the project.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

Chinook, Coho, Steelhead, Sockeye, resident Cutthroat Trout, Kokanee and Bull Trout that utilize the Cedar River as spawning and rearing habitat will benefit from these proposed actions. Chinook, Steelhead, and Bull Trout are priority species, protected under the ESA. Floodplain restoration will directly benefit fish by restoring riparian vegetation communities, food web complexity and expanding available habitats for foraging and spawning.

Identification of anticipated support and barriers to completion.

Project is supported by the WRIA 8 Salmon Recovery Council and has received design funding from state and local sources. Project is in early design phase and anticipated support and barriers to completion are currently under review.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are currently unknown.

Anticipated durability and resiliency.

Project will allow natural riverine processes to return to the site.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Judy Blanco, jublanco@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance immediately.

Documentation of sources.

None

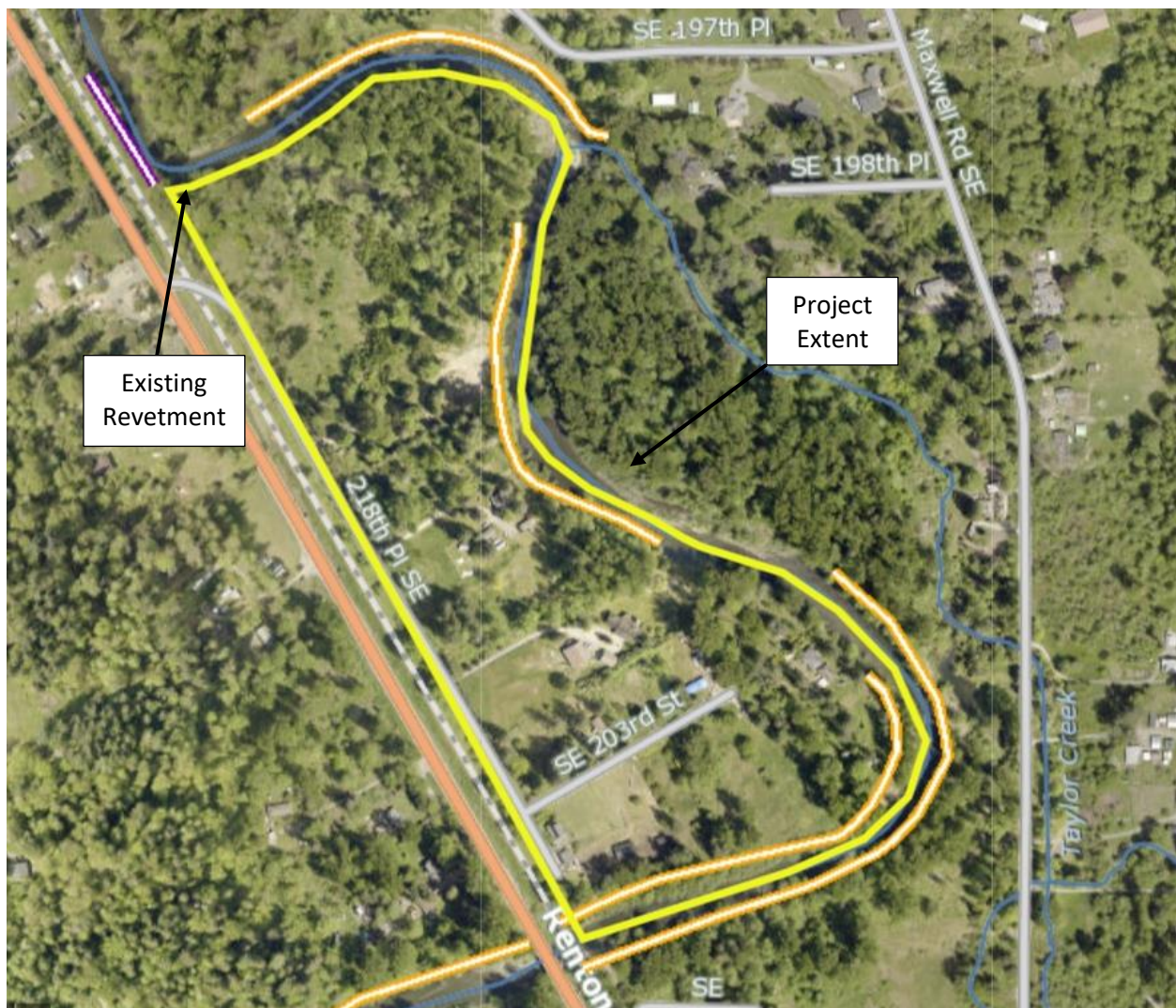


Figure 1. Site Plan for Rutledge-Johnson Lower (a) and Rutledge Johnson/Rhode (b) Project

WRIA 8 – Project Description

Reconnection of Wetland 69

October 16, 2020

Project Name and Number

Reconnection of Wetland 69 (8-LC-H36)

WRIA 8 WRE Subbasin

Lower Cedar

Narrative Description

This project proposes to reconnect Wetland 69, an oxbow, with the Cedar River. This project is located within the Lower Cedar subbasin in Hobart, Washington. This project also proposes removing all, or portions of, the CRT 9 Revetment. To accomplish these project tasks, additional land acquisition is necessary as well as relocating a trail behind the wetland.

These proposed restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout that utilize Cedar River as spawning and rearing habitat. Chinook, and Steelhead are priority species, protected under the U.S. Endangered Species Act (ESA).

Quantitative or qualitative assessment of how the project will function, including water offset benefits, if applicable.

The proposed project will reconnect a wetland feature, known as Wetland 69, with the Cedar River which will provide refugia for fish and vegetation and nutrients for insects and invertebrates which are a prey source for fish.

A map and drawings of the project location.

The project site is shown in relation to surrounding physical features on the attached Site Plan.

Description of the anticipated spatial distribution of likely benefits.

The project proposes to connect Wetland 69 with the Cedar River, which will benefit the fish species that spawn and rear within this section. Connecting the Cedar River with Wetland 69 will also have downstream water quality and water quantity benefits.

Performance goals and measures.

Unknown at this project stage.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed. Note if threatened and endangered fish species would benefit.

These restoration actions will benefit documented Chinook, Coho, Steelhead, Sockeye, and resident Cutthroat Trout, and Bull Trout that utilize Cedar River as spawning and rearing habitat. Chinook, Steelhead, and Bull Trout are priority species, protected under the ESA. Connecting Wetland 69 with the Cedar River has significant benefits to juvenile salmonids by directly benefit prey availability, spawning success as well as survival of pre-migrant and outmigrating juvenile salmonids.

Identification of anticipated support and barriers to completion.

Unknown at this project stage. Project is outlined in King County basin planning documents and is included in the WRIA 8 Salmon Recovery project list.

Estimate of capital costs and reoccurring O&M costs.

Total project costs are currently unknown.

Anticipated durability and resiliency.

Unknown at this project stage.

Project sponsor(s) (if identified) and readiness to proceed/implement.

King County. Sponsor contact: Judy Blanco, jublanco@kingcounty.gov. The sponsor is ready to proceed with scoping and reconnaissance if project area is secured through land acquisition.

Documentation of sources.

None

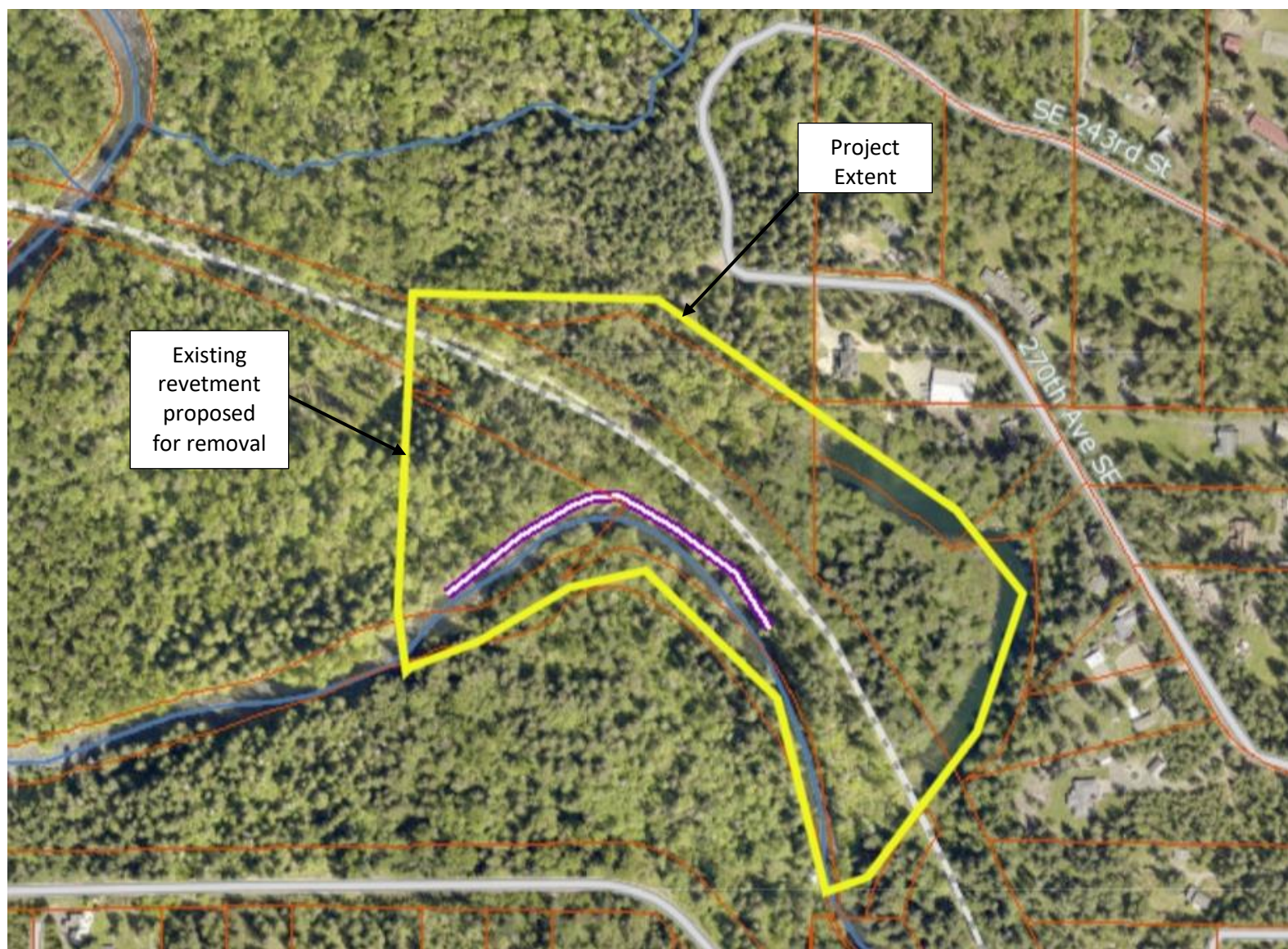


Figure 1. Site Plan for Reconnection of Wetland 69 Project