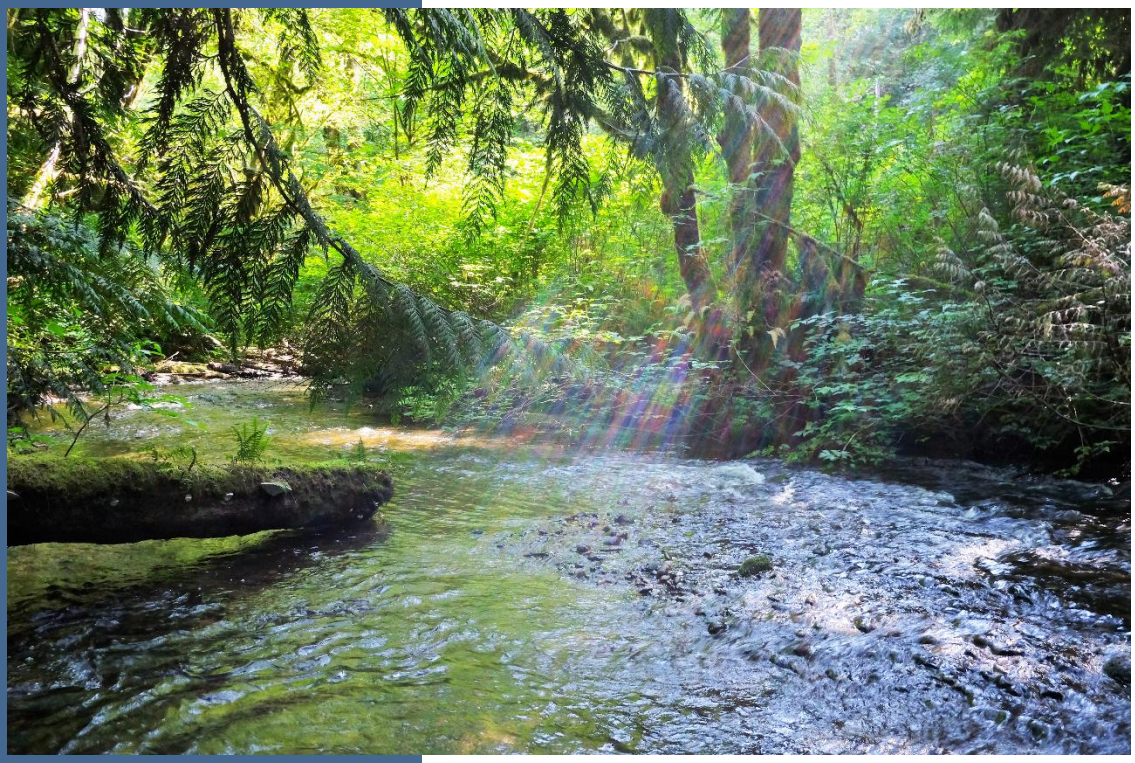

Watershed Restoration and Enhancement Plan

WRIA 15
Kitsap Watershed

Adopted by Ecology December 2024

Publication: 22-11-017

DEPARTMENT OF ECOLOGY
State of Washington

Publication Information

This document is available on the Department of Ecology's website at:
https://apps.ecology.wa.gov/publications/SummaryPages/2211017.html

Cover photo credit

- Curley Creek Courtesy of Great Peninsula Conservancy

Contact Information

Water Resources Program
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-6859
Website[1]: Washington State Department of Ecology

ADA Accessibility

The Department of Ecology is committed to providing people with disabilities access to information and services by meeting or exceeding the requirements of the Americans with Disabilities Act (ADA), Section 504 and 508 of the Rehabilitation Act, and Washington State Policy #188. To request an ADA accommodation, contact Ecology by phone at 360-407-6872 or email at WRpubs@ecy.wa.gov. For Washington Relay Service or TTY call 711 or 877-833-6341.

Language Services

The Department of Ecology offers free language services about our programs and services for people whose primary language is not English. We can provide information written in your preferred language and qualified interpreters over the telephone. To request these services, or to learn more about what we can provide, contact Ecology by email at WRProjects@ecy.wa.gov. Visit Ecology's website for more information.

[1] www.ecology.wa.gov/contact

Table of Contents

_Toc184030136

List of Figures and Tables ..... **ii**

Figures ii

Tables ii

Acknowledgements ..... **iv**

Executive Summary ..... **v**

Chapter One: Plan Overview **1**

1.1 Plan Purpose and Background 1

1.2 Watershed Restoration and Enhancement Committee Planning under RCW 90.94.030 3

1.3 Plan Requirements and Overview 5

Chapter Two: Watershed Overview **6**

2.1 Brief Introduction to WRIA 15 6

2.2 Watershed Planning in WRIA 15 13

2.3 Description of the Watershed – Geology, Hydrogeology, Hydrology, and Streamflow 16

Chapter Three: Subbasin Delineation **19**

3.1 Introduction 19

3.2 Approach to Develop Subbasins 19

3.3 WRIA 15 Subbasins 20

Chapter Four: New Consumptive Water Use Impacts **23**

4.1 Introduction to Consumptive Use 23

4.2 Projection of Permit-Exempt Well Connections (2018–2038) 23

4.3 Impacts of New Consumptive Water Use 26

Chapter Five: WRIA 15 Projects **32**

5.1 Description and assessment 32

5.2 Water Offset Projects 33

5.3 Habitat Projects 46

5.4 Project Implementation Summary 66

Chapter Six: Determination of Net Ecological Benefit **68**

6.1 Overview 68

6.2 Net Ecological Benefit Analysis 68

6.3 Uncertainty and Adaptive Management 82

6.4 NEB Determination 82

References **84**

Glossary **88**

Appendices **98**

List of Figures and Tables

Figures

Figure ES1: Water Resource Inventory Area 15 Summary of Findings. ____ *xi*
Figure 1: Water Resource Inventory Area 15 Overview. ____ *7*
Figure 2. WRIA 15 Subbasin Delineation for the Watershed Restoration and Enhancement Plan. ____ *21*
Figure 3. WRIA 15 Estimated Consumptive Use 2018-2038. ____ *31*
Figure 4. Water Offset Project Locations. ____ *36*
Figure 5. Habitat Project Locations. ____ *65*
Figure 6. Map of WRIA 15 Watershed Plan project locations overlain on WDFW Assessment Unit Habitat Indices ____ *81*

Tables

Table 1. WRIA 15 Committee Roster. ____ *4*
Table 2. Salmonid Species and Status in WRIA 15 ____ *9*
Table 3: Salmonid Presence and Life History Timing in Kitsap Basin ____ *10*
Table 4: WRIA 15 Subbasins ____ *21*
Table 5: Number of Permit-Exempt Connections Projected between 2018 and 2038 ____ *25*
Table 6: Indoor and Outdoor Consumptive Use Estimates by Subbasin for 2038 ____ *28*
Table 7. Summary of Offset Projects for WRIA 15. ____ *34*
Table 8. Managed Aquifer Recharge Package ____ *39*
Table 9. Package of Forests for Streamflow Projects in WRIA 15. ____ *42*
Table 10. Target Number of Raingarden and LID Projects. ____ *44*
Table 11. Habitat Projects in WRIA 15. ____ *46*
Table 12. Summary of WRIA 15 Water Offset Projects included in NEB analysis ____ *65*
Table 13. Subbasin Water Offset Totals compared to Subbasin Consumptive Use Estimate ____ *66*
Table 14. Summary of WRIA 15 Habitat Improvement Projects included in NEB Analysis ____ *69*
Table 15. Summary of Habitat Projects by Subbasin ____ *76*

Acronyms

LIO	Definition
AE	Application Efficiency
AFY	Acre-Feet per Year
AU	Assessment Unit
CFS	Cubic Feet per Second
CU	Consumptive Use
CUF	Consumptive Use Factor
GPD	Gallons per Day
GIS	Geographic Information System
IR	Irrigation Requirements
LID	Low Impact Development
LIO	Local Integrating Organization
MAR	Managed Aquifer Recharge
NEB	Net Ecological Benefit
PE	Permit-Exempt
RCW	Revised Code of Washington
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Areas

Acknowledgements

Ecology based much of this plan on work conducted through numerous committee and workgroup meetings of the WRIA 15 Watershed Restoration and Enhancement Committee. While the committee was unable to approve their version of the plan, the committee's contributions were instrumental to the development of this plan. Much of the underlying technical work was completed by a team of technical consultants, include HDR (Chad Wiseman and team), Anchor QEA (Bob Montgomery and team) and GeoEngineers (Bridget August and team). Our facilitation team was also instrumental to advancing the input and decisions by the committee, primarily Susan Gulick (Sound Resolutions) and Angela Pietschmann (Cascadia Consulting). Thank you to the Washington State Conservation Office and the Salmon Recovery Funding Board for providing a technical review of the final draft watershed plan prior to adoption.

Executive Summary

In January 2018, the Washington State Legislature passed the Streamflow Restoration law (RCW 90.94) to help support robust, healthy, and sustainable salmon populations while ensuring rural communities have access to water. The law directs the Department of Ecology to develop a Watershed Restoration and Enhancement Plan in Water Resource Inventory Area (WRIA) 15 that identifies projects to offset potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over 20 years (2018 – 2038), and provides a net ecological benefit to the watershed.

Following the provisions of the law, the Department of Ecology (Ecology) collaborated with a committee composed of tribes, counties, cities, state agencies, and special interest groups in WRIA 15 (the Kitsap watershed) to prepare a committee draft plan. The law requires all members of the committee to approve the watershed plan prior to Ecology considering plan adoption. However, the WRIA 15 committee draft plan was not approved by all members of the committee ahead of the legislative deadline. The Streamflow Restoration law recognizes that some committees may not complete their plan preparation process. It establishes an alternative pathway for plan preparation, adoption, and rulemaking.

Therefore, as directed by the law, Ecology completed this watershed plan without additional committee input. As Ecology developed the final watershed plan, Ecology followed the law, the Streamflow Restoration Policy and Interpretive Statement (POL-2094)(Ecology 2019a) and Ecology's Final Guidance on Determining Net Ecological Benefit (GUID-2094) (Ecology 2019b). Ecology also considered all available information, including draft materials developed by the committee. The Salmon Recovery Funding Board reviewed this plan and submitted recommendations, which Ecology considered, and incorporated as appropriate, prior to finalizing the watershed plan.

This watershed plan estimates 5,215 new permit-exempt domestic well connections (PE wells) over the planning horizon (2018-2038). The estimated consumptive water use associated with the new PE wells is 717.8 acre-feet per year (AFY) (123 gallons per day per household) in WRIA 15. The projects and actions in this watershed plan will address and offset the consumptive water use from those 5,215 new PE wells.

This watershed plan includes projects that provide an anticipated offset of 2,873.1 AFY to benefit streamflows and enhance the watershed. Additional projects in the plan provide benefits to fish and wildlife habitat, through floodplain and wetland restoration, riparian enhancements, and nearshore improvements.

As required by the law and to allow for meaningful analysis of the relationship between new consumptive water use and offsets, this watershed plan divides the watershed into seven subbasins. Subbasins help describe the location and timing of estimated new consumptive water use, the location and timing of impacts to instream resources, and the necessary scope,

scale, and anticipated benefits of projects. Figure ES-1 provides consumptive use estimates by subbasin and project locations for WRIA 15.

Based on the information and analyses summarized in this watershed plan, Ecology finds that this watershed plan, if implemented, would achieve a net ecological benefit, as required by RCW 90.94.030 and defined by the Final NEB Guidance (Ecology 2019b). Ecology and the state of Washington are invested in the implementation of this watershed plan, including periodically assessing plan and project implementation and issuing competitive grants to local projects that demonstrably implement this watershed plan while benefiting streamflows and aquatic habitat.

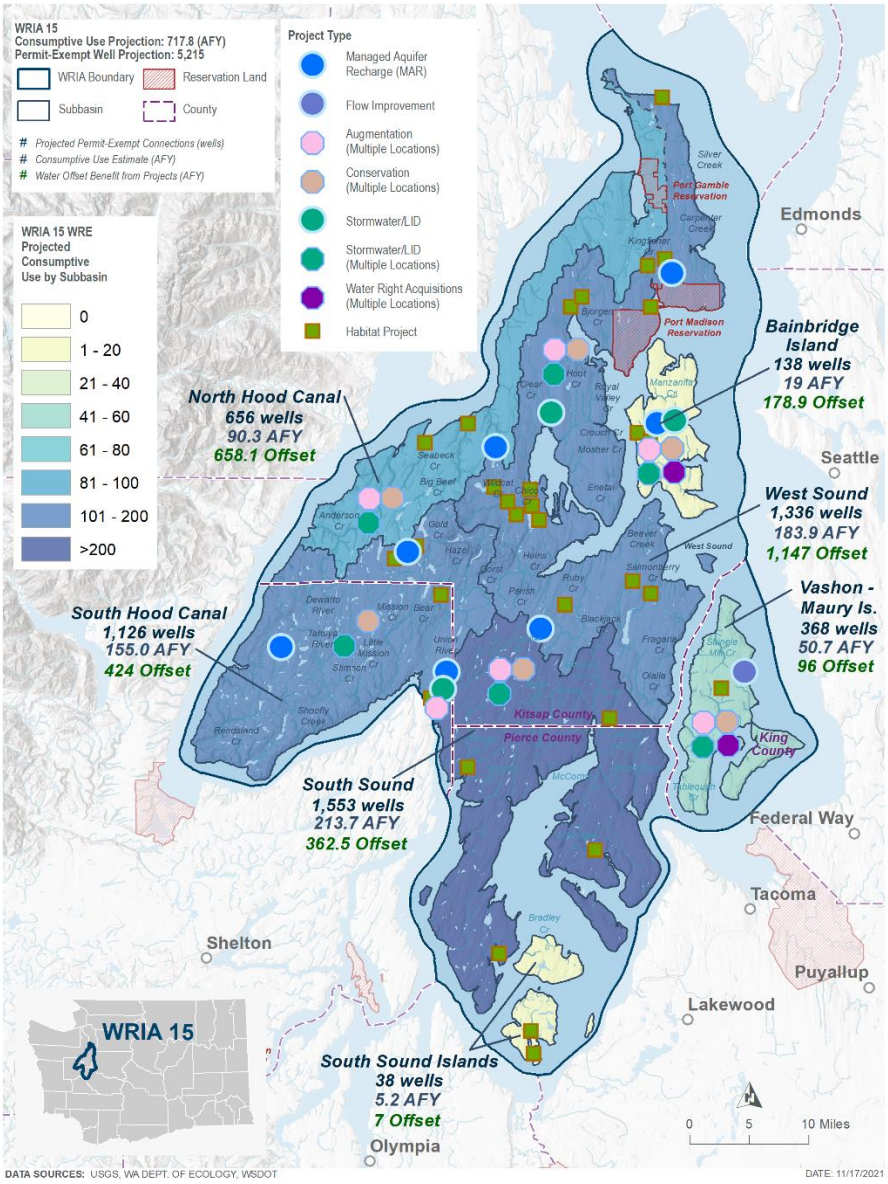

Figure ES 1: Summary of findings of the WRIA 15 Watershed Restoration and Enhancement Plan, including estimates for new domestic PE well growth, consumptive use estimates, and project offset benefits. Map prepared by GeoEngineers.

Chapter One: Plan Overview

1.1 Plan Purpose and Background

The purpose of this Water Resource Inventory Area (WRIA) 15 Watershed Restoration and Enhancement Plan (watershed plan) is to identify the projects and actions necessary to "offset potential impacts to instream flows associated with permit-exempt domestic water use"[2] and "result in a net ecological benefit (NEB) to instream resources within the [WRIA]."[3] This plan achieves these purposes consistent with the requirements of RCW 90.94.030, the Streamflow Restoration Policy and Interpretive Statement (POL-2094)(Ecology 2019a) and Ecology's Final Guidance on Determining Net Ecological Benefit (GUID-2094, referred to as the Final NEB Guidance throughout this plan) (Ecology 2019b). This plan considered all available information including priorities for salmon recovery, watershed recovery and the draft materials prepared by the WRIA 15 Watershed Restoration and Enhancement Committee (Committee).

In order to accomplish its purpose, all eight of the watershed plans required by RCW 90.94.030, including this one, estimated the potential consumptive impacts of new domestic permit-exempt wells (referred to as PE wells throughout this plan) on instream flows over the planning horizon (January 2018 to January 2038) and identified the projects and actions necessary to offset those impacts and result in a NEB within the WRIA.

In January 2018, the Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 (session law 2018 c 1). This law was enacted in response to the State Supreme Court's 2016 decision in Whatcom County vs. Hirst, Futurewise, et al. (commonly referred to as the "Hirst decision"). The law, now primarily codified as RCW 90.94, clarifies how local governments can issue building permits for homes intending to use a PE well for their domestic water supply. Additionally, the law required the preparation of new local watershed plans for eight specified WRIAs, including this one.

To support local planning, the law required Ecology to establish a committee. The law tasked the committee with preparing a watershed plan approved by every member of the committee. Once the committee approved the draft watershed plan, the law required Ecology to review it and, presuming it met the requirements, adopt it no later than June 30, 2021. Despite working diligently over two and a half years, the WRIA 15 Committee did not submit an approved plan to Ecology for review before the mandated deadline.[4] Consequently, and as required by RCW 90.94.030(3)(h), Ecology finalized this watershed plan and considered technical review and recommendations under an Inter-Agency Agreement with the Salmon Recovery Funding Board. Within six months of adopting this plan, Ecology will initiate the rulemaking required by this law. Ecology's rulemaking activities are a public process guided by the Washington

[2] RCW 90.94.030 (3)(b)
[3] RCW 90.940.030 (3)(c)
[4] Please see Section 1.2 of this watershed plan for more background on the WRIA 15 Committee and their planning process.

Administrative Procedure Act (APA), ch. 34.05 RCW. Rulemaking will occur consistent with the requirements of the streamflow restoration law (RCW 90.94.030) and will be completed within two years of initiation of this rule making. [5]

1.1.1 Permit-Exempt Domestic Wells

As noted above, this watershed plan, the law that calls for it, and the Hirst decision are all focused on the potential impacts of new PE well use on streamflows. Pumping water from PE wells can reduce groundwater discharge to springs and streams, reducing streamflows (Barlow and Leake 2012). Several laws pertain to the management of PE wells in WRIA 15. This plan summarizes those laws below to provide context for this WRIA 15 watershed plan.

First and foremost, RCW 90.44.050, commonly referred to as "the Groundwater Permit Exemption," establishes that certain small withdrawals of groundwater are exempt from the state's water right permitting requirements, including small indoor and outdoor water use associated with homes. Although these withdrawals do not require a state water right permit, the water right is still legally established by the beneficial use.

Even though a water right permit is not required for small domestic uses under RCW 90.44.050, there is still regulatory oversight, including from local jurisdictions. Specifically, in order for an applicant to receive a building permit from their local government for a new home, the applicant must satisfy the provisions of RCW 19.27.097 for what constitutes evidence of an adequate water supply.

RCW 90.94.030 adds to the management regime for new homes using PE wells in WRIA 15 and elsewhere. For example, local governments must, among other responsibilities relating to new PE wells, collect an added $500 fee for each building permit and record withdrawal restrictions on the title of the affected properties. Additionally, this law restricts new PE wells in WRIA 15 to a maximum annual average of up to 950 gallons per days per connection, subject to the five thousand gpd and ½-acre outdoor irrigation of non-commercial lawn/garden limits established in RCW 90.44.050. Upon issuance of a drought emergency order, groundwater withdrawal for permit exempt uses may be curtailed to no more than 350 gpd per connection for indoor use only. Ecology, through working with the planning committee and finalizing this plan, has determined that these statutorily established fee amounts and water use restrictions are appropriate and will be considered in the rulemaking required in RCW 90.94.030(3)(h).

Ecology published its interpretation and implementation of RCW 19.27.097 and RCW 90.94 in Water Resources POL 2094 (Ecology 2019a), which provide comprehensive details and agency interpretations.

[5] RCW 90.94.030 (3) (h)

1.2 Watershed Restoration and Enhancement Committee Planning under RCW 90.94.030

As discussed above, RCW 90.94.030 directed Ecology to establish the WRIA 15 Committee, invite the Committee participants, and chair the Committee.[6] As directed in RCW 90.94.030(3)(b) Ecology collaborated with the WRIA 15 Committee to prepare the watershed plan. In practice, the process of this collaboration and plan development was one of broad integration, collectively shared work, and a striving for consensus.

Ecology convened the WRIA 15 Committee in October 2018, and Ecology served as the Chair. The roster of Committee members is available in Table 1 and additional members of workgroups are available in Appendix A Over the course of the following two and a half years and with the support of the Committee's consulting team, [7] the WRIA 15 Committee held formal monthly Committee meetings as well as periodic subcommittee and working meetings. Ecology distributed the WRIA 15 Committee's draft watershed plan in February 2020 (and a revised draft in March 2020) for Committee member review and official approval from the entities they represented. The WRIA 15 Committee voted on the draft watershed plan in April 2020. This vote yielded 12 entities voting to approve, and 6 entities voting to disapprove, and 1 abstention. The final WRIA 15 Committee meeting summary, along with the voting record, is available in Appendix B.

Because the law required that all Committee members approve the watershed plan, the Committee did not approve their draft watershed plan.[8] Therefore, the watershed plan was not available for Ecology's review, and the June 30, 2021 statutory deadline for adoption was not met. Consequently, Ecology then implemented its mandate under RCW 90.94.030(3)(h) by finalizing this watershed plan. Ecology prepared the final plan based on all available information including priorities for salmon recovery and watershed recovery, draft materials developed by the WRIA 15 Watershed Committee, and recommendations from the Salmon Recovery Funding Board.

[6] RCW 90.94.030 (2)(b) and (3)

[7] HDR, Anchor QEA, and Pacific Groundwater Group were the primary technical consultants for WRIA 15. Funding for these consulting services was provided by Ecology through Legislative appropriations that accompanied the passage of RCW 90.94.

[8] "…all members of a Watershed Restoration and Enhancement Committee must approve the plan prior to adoption" – RCW 90.94.030(3)

Table 1. WRIA 15 Committee Roster. See Appendix A for full committee and workgroup membership.

Name	Representing	Primary/Alternate
Stacy Vynne McKinstry	Department of Ecology*	Primary
Stephanie Potts	Department of Ecology	Alternate
Brittany Gordon	Department of Fish and Wildlife*	Primary
Nam Siu	Department of Fish and Wildlife	Alternate
Dave Ward	Kitsap County*	Primary
Kathy Peters	Kitsap County	Alternate
Randy Neatherlin	Mason County*	Primary
David Windom	Mason County	Alternate
Dan Cardwell	Pierce County*	Primary
Austin Jennings	Pierce County	Alternate
Greg Rabourn	King County*	Primary
David Winfrey	Puyallup Tribe*	Primary
Alex Gouley	Skokomish Tribe*	Primary
Seth Book	Skokomish Tribe	Alternate
Dana Sarff	Skokomish Tribe	Alternate
Leonard Forsman	Suquamish Tribe*	Primary
Alison O'Sullivan	Suquamish Tribe	Alternate
Jeff Dickison	Squaxin Island Tribe*	Primary
Paul Pickett	Squaxin Island Tribe	Alternate
Sam Phillips	Port Gamble S'Klallam Tribe*	Primary
Paul McCollum	Port Gamble S'Klallam Tribe	Alternate
Jacki Brown	City of Port Orchard*	Primary
Zach Holt	City of Port Orchard	Alternate
Teresa Smith	City of Bremerton*	Primary
Allison Satter	City of Bremerton	Alternate
Trent Ward	City of Gig Harbor*	Primary
Brienn Ellis	City of Gig Harbor	Alternate
Michael Michael	City of Bainbridge Island*	Primary
Christian Berg	City of Bainbridge Island	Alternate
Joel Purdy	Kitsap Public Utility District, Non-Municipal Water Purveyor*	Primary
Mark Morgan	Kitsap Public Utility District, Non-Municipal Water Purveyor	Alternate
Russ Shiplet	Kitsap Building Association, Residential Construction Industry*	Primary
Josie Cummings[1]	Building Industry Association of Washington, Residential Construction Industry	Alternate

Name	Representing	Primary/Alternate
Nate Daniel	Great Peninsula Conservancy, Environmental Interest*	Primary
Jonathan Decker	Great Peninsula Conservancy, Environmental Interest	Alternate
Joy Garitone	Kitsap Conservation District, Agriculture Interest*	Primary
Brian Stahl	Kitsap Conservation District, Agriculture Interest	Alternate
Larry Boltz	Mason-Kitsap Farm Bureau	Ex Officio
Shawn O'Dell	Washington Water Service	Ex Officio

*Ecology was required to invite entity to participate in committee under RCW 90.94.030(2)(a). Note that the City of Poulsbo withdrew from the Committee.

[1] Acted as primary representative for the residential construction industry in 2019.

1.3 Plan Requirements and Overview

The law, Ecology's interpretation of the law, and the NEB Guidance set the structure of the watershed plan by describing the required elements. At a minimum, the watershed plan must include projects and actions necessary to offset potential impacts of new PE wells on streamflows and provide a NEB to the WRIA. The legislation requires the watershed plan to include the following elements:

- Recommendations for projects and actions that will measure and enhance instream resources and improve watershed functions that support the recovery of threatened and endangered salmonids (RCW 90.94.030(3)(a)).
- Actions determined necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use (RCW 90.94.030(3)(b)).
- A cost evaluation or estimation of those actions (RCW 90.94.030(3)(d)).
- An estimate of the cumulative consumptive use impacts over the twenty-year period (2018-2038) (RCW 90.94.030(3)(e)).

This watershed plan includes six chapters:

1. Plan overview.
2. Overview of the watershed.
3. Summary of the subbasins.
4. Permit-exempt well projections and new consumptive use estimates.
5. Projects and actions identified to offset consumptive use and improve habitats.
6. Determination of net ecological benefit.

Chapter Two: Watershed Overview

2.1 Brief Introduction to WRIA 15

Water Resource Inventory Areas (WRIAs) are large watershed areas formalized under Washington Administrative Code (Water Resources Code of 1971) for the purpose of administrative management and planning. WRIAs encompass multiple landscapes, hydrogeological regimes, levels of development, and variable natural resources. WRIA 15, also referred to as the Kitsap Watershed, is one of the 62 designated major watersheds in Washington State.

WRIA 15 encompasses the entire Kitsap peninsula and surrounding islands. It comprises 676 square miles, including Kitsap County and portions of Pierce, Mason, and King counties (Figure 1). Major rivers include Union River, Tahuya River, and Dewatto River, all located in the western part of the watershed and draining to Hood Canal. These rivers are home to Chinook Salmon, Summer Chum, and steelhead, which are listed under the Endangered Species Act (ESA). Most of the area is drained by short streams that discharge directly into the surrounding marine waters of Puget Sound and Hood Canal.

2.1.1 Land Use in WRIA 15

Approximately 10 percent of the watershed is within a designated urban growth area. Major cities in WRIA 15 include Bremerton, Port Orchard, Bainbridge Island, Gig Harbor, Poulsbo, Silverdale (unincorporated), Belfair, and Kingston (unincorporated). The area's port districts are important as centers for commerce and military installations, as well as critical hubs for marine transportation (West Central LIO 2016). The area connects to Seattle via several ferry routes and local jurisdictions anticipate increased growth with the designation of several high-capacity transit communities (Puget Sound Regional Council 2019). Many people move to the area for its rural feel and choose to live outside of the incorporated areas (West Central LIO 2016).

Federal ownership makes up approximately two percent of the watershed. A number of naval installations are located within WRIA 15, including the active Puget Sound Naval Shipyard (part of the Naval Base Kitsap) at Bremerton. Approximately 12 percent of the watershed is under state ownership, primarily by Washington Department of Natural Resources and Washington Department of Fish and Wildlife. The largest areas of forestland use are in the southern and western Tahuya Peninsula in Mason County.

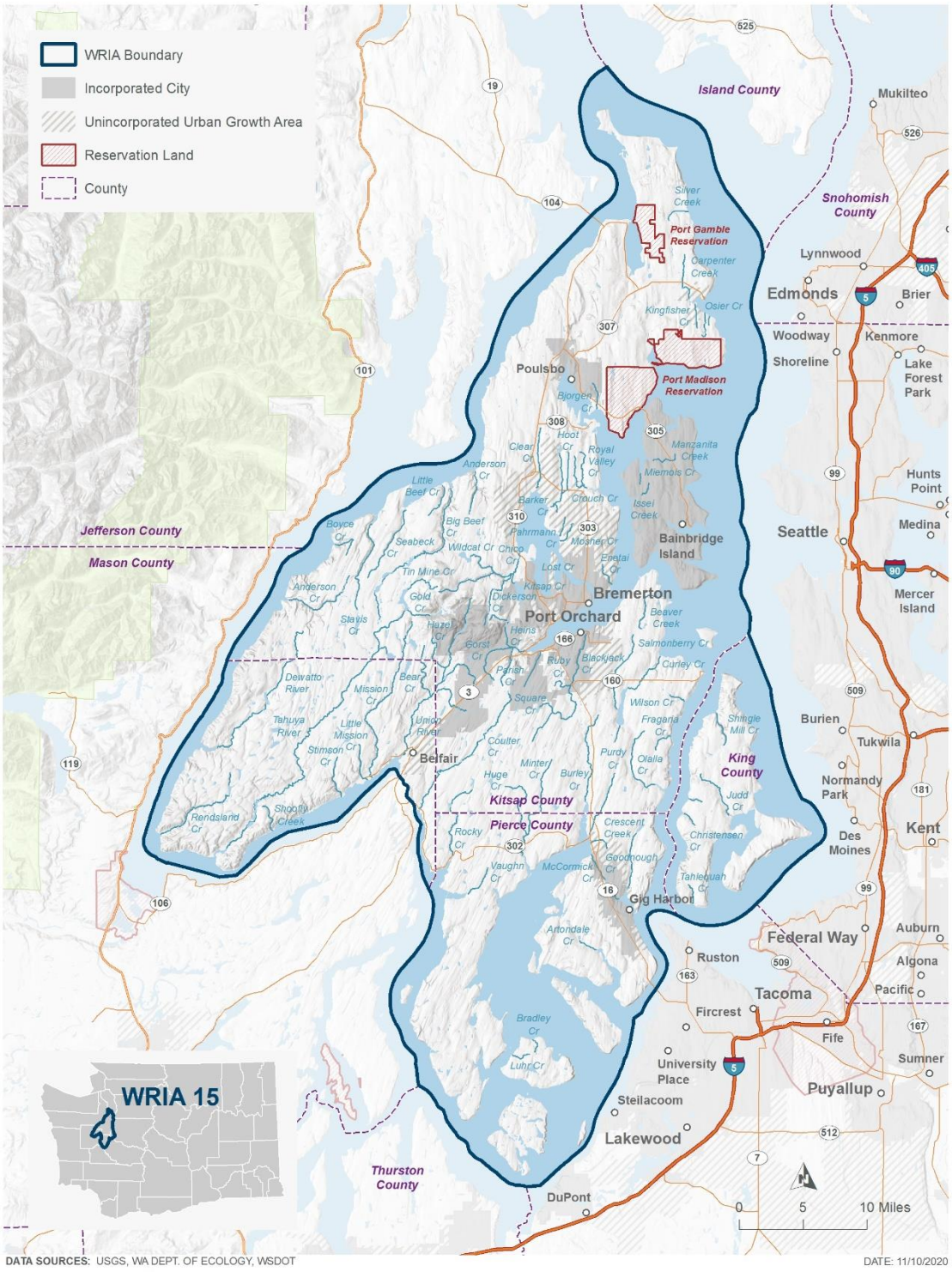

Figure 1: Water Resource Inventory Area 15 Overview. Map prepared by HDR.

2.1.2 Tribal Reservations and Usual and Accustomed Fishing Areas

The Port Gamble S'Klallam Tribe Reservation occupies approximately 1,700 acres in the northern portion of the WRIA. The Port Madison Indian Reservation (Suquamish Tribe) occupies approximately 7,458 acres within northeastern WRIA 15. Tribes with usual and accustomed fishing areas within WRIA 15 include the Suquamish, Port Gamble S'Klallam, Squaxin Island, Skokomish, Nisqually, and Puyallup Tribes (NWIFC 2019). Within WRIA 15, these Tribes hold Treaty-reserved fishing rights, and some tribes may hold senior water rights in the watershed (Treaty of Medicine Creek, Treaty of Point No Point, Treaty of Point Elliot).

2.1.3 Salmon Distribution and Limiting Factors

WRIA 15 includes numerous small, lowland stream systems which drain to both Puget Sound and Hood Canal. The West Sound, South Sound, Bainbridge Island, Vashon-Maury Island, and McNeil-Anderson-Ketron Islands (also referred to as South Sound Islands) subbasins drain to Puget Sound (further described in Chapter 3). The North Hood Canal and South Hood Canal subbasins drain to Hood Canal. Primary streams in the West Sound subbasin include Olalla, Blackjack, Chico, and Grovers Creeks. Primary streams in the South Sound subbasin include Coulter, Rocky, Burley, Purdy, Minter, and Crescent Creeks. Primary streams in the North Hood Canal subbasin include Big Beef, Anderson, Gamble, and Stavis Creeks. Primary rivers in the South Hood Canal subbasin include Dewatto River, Union River, Tahuya River, and Mission Creek (a more complete list of rivers and streams by subbasin is available in Chapter 3). The island subbasins generally have very small streams with only minor salmonid presence or use. The Puget Sound and Hood Canal drainages are described separately as different salmonid populations occupy the two areas.

The Puget Sound subbasins within WRIA 15 have anadromous salmon runs that include three of the five Pacific salmon species (WDF 1975, WDFW 2020a); Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), and Chum Salmon (*Oncorhynchus keta*). Chinook Salmon have been documented in Coulter, Rocky, Burley, Purdy, Curley, Crescent, Minter, Olalla, Blackjack, Gorst, Clear, Chico, Royal Valley, Barker, and Dogfish creeks (WDFW 2020a). However, spawning is only known to occur in Burley, Purdy, Olalla, Curley, Blackjack and Gorst Creeks. Both summer and fall-run Chum Salmon are present, with Summer Chum Salmon present in Rocky, Coulter, Burley, Curley, and Blackjack Creeks (WDFW 2020a). Steelhead trout (*Oncorhynchus mykiss*) and Cutthroat Trout (*Oncorhynchus clarki*) also inhabit Puget Sound subbasins.

The Hood Canal subbasins have anadromous salmon runs that include Chinook Salmon, Coho Salmon, Chum Salmon, and Pink Salmon (*Oncorhynchus gorbuscha*), as well as steelhead trout and Cutthroat Trout. Both summer and fall-run Chum Salmon are present. Pink Salmon are only present in the Dewatto River and Union River (WDFW 2020a).

Of these populations, three are federally listed as threatened species: Puget Sound Chinook Salmon, Puget Sound steelhead, and Hood Canal Summer Chum Salmon. Table 2 lists the species present in WRIA 15 and their regulatory status.

Table 2. Salmonid Species and Status in WRIA 15

Location	Common Name	Scientific Name	Population[1]	Critical Habitat	Regulatory Agency Status
Puget Sound	Chinook Salmon	*Oncorhynchus tshawytscha*	Puget Sound Chinook	Designated in 2005; does not include Kitsap Basin	NMFS/ Threatened/1999
Puget Sound	Chum Salmon	*Oncorhynchus keta*	Puget Sound Chum	No	Not listed
Puget Sound	Coho Salmon	*Oncorhynchus kisutch*	Puget Sound/Strait of Georgia Coho	No	NMFS/Species of Concern/1997
Puget Sound	Steelhead Trout	*Oncorhynchus mykiss*	Puget Sound steelhead	Yes/2016	NMFS/ Threatened/2007
Puget Sound	Coastal Cutthroat Trout	*Oncorhynchus clarki*	No listing	No listing	No listing
Hood Canal	Chinook Salmon	*Oncorhynchus tshawytscha*	Puget Sound Chinook	Designated in 2005; does not include Kitsap Basin	NMFS/ Threatened/1999
Hood Canal	Chum Salmon	*Oncorhynchus keta*	Hood Canal Chum	Yes/2005	NMFS/ Threatened/1999
Hood Canal	Coho Salmon	*Oncorhynchus kisutch*	Puget Sound/Strait of Georgia Coho	No	NMFS/Species of Concern/1997
Hood Canal	Steelhead Trout	*Oncorhynchus mykiss*	Puget Sound steelhead	Yes/2016	NMFS/ Threatened/2007
Hood Canal	Coastal Cutthroat Trout	*Oncorhynchus clarki*	No listing	No listing	No listing

Note: 1. Population indicates Evolutionary Significant Unit.

Table 3 lists the run timing and life stages of anadromous salmon and trout present throughout WRIA 15.

Table 3: Salmonid Presence and Life History Timing in Kitsap Basin

Species	Freshwater Life Phase	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Presence
Chinook Salmon (fall)	Upstream migration									■	■			Puget Sound -- Coulter, Rocky, Burley, Purdy, McCormick, Curley, Crescent, Judd, Minter, Olalla, Blackjack, Gorst, Clear, Crouch, Chico, Royal Valley, Barker, and Dogfish creeks Hood Canal -- Dewatto, Tahuya, and Union rivers, Mission, Anderson, Boyce, Big Beef creeks
	Spawning									■	■	■		
	Incubation	■	■							■	■	■	■	
	Juvenile rearing	■	■	■	■	■	■							
	Juvenile outmigration		■	■	■	■	■	■						
Coho Salmon	Upstream migration									■	■	■	■	All
	Spawning	■									■	■	■	
	Incubation	■	■	■							■	■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■	■							
Chum Salmon (summer)	Upstream migration								■	■	■			Puget Sound -- Rocky, Coulter, Burley, Curley, and Blackjack creeks Hood Canal -- Dewatto, Tahuya and Union rivers; Anderson and Big Beef creeks
	Spawning								■	■	■	■		
	Incubation	■	■							■	■	■	■	
	Juvenile rearing		■	■	■	■								
	Juvenile outmigration		■	■	■	■	■							
Chum Salmon (fall)	Upstream migration										■	■	■	All
	Spawning	■	■									■	■	
	Incubation	■	■	■	■							■	■	
	Juvenile rearing			■	■	■								
	Juvenile outmigration			■	■	■	■							

Species	Freshwater Life Phase	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Presence
Pink Salmon	Upstream migration								■	■				Hood Canal - Dewatto and Union rivers
	Spawning									■	■			
	Incubation	■	■								■	■	■	
	Juvenile rearing		■	■										
	Juvenile outmigration			■	■	■								
Coastal Cutthroat	Upstream migration											■	■	All
	Spawning	■	■	■	■								■	
	Incubation	■	■	■	■	■						■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■	■							
Steelhead (winter)	Upstream migration	■	■	■	■								■	All
	Spawning		■	■	■	■	■							
	Incubation			■	■	■	■	■						
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■								

Table Data Sources: Heard 1998; Johnson 1999; Wydoski & Whitney 2003; HCCC 2005; NSD & ICF 2014; WDFW 2020a

Limiting Factors

Development and population growth in the Puget Sound lowlands region has substantially altered WRIA 15 from its historic conditions and natural stream habitat forming processes. Extensive wetland systems or lakes in the headwaters have historically sustained many of these rainfall-dominated, lowland stream systems throughout the year. Development has led to the removal of forest canopy cover, filling and draining of wetlands, channelization of streams, implementation of numerous road crossing and fish passage barriers, and creation of substantial areas of impervious surfaces, resulting in habitat loss and degradation.

In general, the primary limiting factors in freshwaters of WRIA 15 include (Kuttel 2003; May & Peterson 2003):

- Channel and streambed degradation
- Increased peak flows
- Low streamflow

- Loss of upland forest cover
- Loss of riparian forest
- Loss of floodplain connectivity and habitats
- Degradation of wetland and shoreline habitats
- Conversion of wetlands to open water habitats
- Fish passage barriers
- Lack of large wood
- Fine sediment

Past timber harvest and ongoing residential and commercial development have removed forest and riparian cover and increased impervious surfaces in most areas of the Kitsap Basin. These changes (1) reduce infiltration and storage of groundwater; (2) can contribute to reduced streamflow; and (3) increase runoff during storms that can scour streambeds and contribute to bank erosion and instability. Loss of functioning riparian corridors, combined with low flows in summer, results in high water temperatures that can reduce habitat suitability and cause sublethal physiological changes in adult and juvenile salmonids—or even mortality at high temperatures (Shared Strategy 2007).

Roads and various land uses have straightened and constrained many streams, resulting in a loss of floodplain connectivity and off-channel habitats and simplification of in-stream habitats. Road crossings also create fish passage barriers in many locations.

To address low streamflow, the Instream Resources Protection Program (IRPP) for WRIA 15 (Ecology 1981) through chapter 173-515 WAC set minimum instream flows for 21 streams and closed 54 streams and their tributaries (including lakes) to further appropriation of surface water. An additional 14 streams and their tributaries are closed to further appropriation of surface water for part of the year. Section 2.3.3 further discusses instream flows.

The *East Kitsap Salmon Habitat Restoration Strategy* Summary (Kitsap County 2005) identifies protection and/or restoration of hydrologic and riparian functional integrity as the highest priority for freshwater areas. Tier 1 streams of focus include Chico, Minter, and Rocky Creeks.

The *East Kitsap Steelhead Recovery Plan* (ESA and Suquamish Tribe 2020) prioritizes Blackjack, Chico, Clear, Curley, Gorst, and Grovers Creeks for water quantity and quality protection and restoration.

The *Kitsap Salmonid Refugia Report* (May & Peterson 2003) identify Chico and Stavis Creeks and the Dewatto River and Tahuya River as the highest quality refugia for salmonids that should be protected, especially for hydrologic functions.

The *Hood Canal Summer Chum Salmon Recovery Plan* (HCCC 2005) identifies loss of channel complexity, lack of riparian forest, and high water temperatures as primary limiting factors in the Union River and Tahuya River. The Union River is home to ESA-listed Chinook Salmon,

Summer Chum Salmon, and steelhead. Coho Salmon spawn in this river and are a species of concern.

For the Dewatto River, Anderson Creek and Big Beef Creek, the significant change in hydrology (increased peak flows, reduced low flows), channel instability and erosion, loss of channel complexity, and loss of floodplain habitats are primary limiting factors. Salmon recovery lead entities provide additional information on limiting factors and priorities for WRIA 15.[9]

2.1.4 Water System Distribution and Impacts in WRIA 15

Groundwater is the primary source of drinking water for most of the population of the Kitsap Watershed and as such, demand for groundwater increases with population growth (Frans and Olsen 2016). According to the U.S. Geological Survey (USGS), the quantity of usable groundwater is likely limited, mostly due to (1) the geography and the potential for declines in water levels, (2) decreases in groundwater discharge to streams, and (3) seawater intrusion as groundwater usage increases (Frans and Olsen 2016).

Pumping from wells can reduce groundwater discharge to springs and streams by capturing water that would otherwise have discharged naturally. Surface water may be influenced by groundwater pumping such that flows are diminished. Consumptive water use (the portion not returned to the aquifer) potentially reduces streamflow, both seasonally and as average annual recharge. A well pumping from an aquifer connected to a surface water body can either reduce the quantity of water discharging to the river or increase the quantity of water lost from the river to groundwater (Barlow and Leake 2012).

2.2 Watershed Planning in WRIA 15

Citizens and local, state, federal, and tribal governments have collaborated on watershed and water resource management issues in WRIA 15 for decades. A brief summary of broad watershed planning efforts as they relate to the past, present, and future water availability in the Kitsap Watershed is provided in this section.

The WRIA 15 watershed plan builds on many previous and current watershed planning efforts, including previous watershed planning efforts under RCW 90.82. Other efforts include ecosystem recovery planning by local integrating organizations (LIOs) and salmon recovery planning by salmon recovery lead entities. WRIA 15 crosses boundaries with the West Central LIO (now merged with the West Sound Lead Entity and referred to as the “West Sound Partners for Ecosystem Recovery”), the Alliance for a Healthy South Sound, South Central LIO, and the Hood Canal Coordinating Council. The LIOs have completed ecosystem recovery plans as part of the Action Agenda for Puget Sound Recovery and are actively working to implement holistic

[9] More information on salmon recovery planning in Puget Sound, watershed plans, and limiting factors available here: https://www.psp.wa.gov/salmon-recovery-watersheds.php.

approaches to recovery, including projects on salmon and orca recovery, stormwater runoff, shellfish protection, and forest conservation.[10]

Several salmon recovery lead entities cross boundaries with WRIA 15, including the West Sound Partners for Ecosystem Recovery (previously known as West Sound Lead Entity), Hood Canal Lead Entity and Regional Organization, WRIA 9 Lead Entity (Green Duwamish), Puyallup Lead Entity, Nisqually Lead Entity, and South Sound Lead Entity.[11] Each of the salmon recovery lead entities facilitates implementation of their watershed recovery chapter as part of the Puget Sound Salmon Recovery Plan and the Puget Sound Steelhead Recovery Plan. The Hood Canal Lead Entity and Regional Organization is also responsible for facilitating implementation of the Hood Canal Summer Chum Recovery Plan. The salmon recovery lead entities are activity working with local governments, tribal governments, and other partners to implement salmon recovery actions across WRIA 15.

Watershed Characterization and Planning

The Puget Sound Watershed Characterization Project is a tool used in Puget Sound by planners and resource managers to identify areas to prioritize for habitat protection and restoration, and areas more suitable for development. The project covers the entire Puget Sound drainage area — from the Olympic Mountains to the Cascades.[12]

The characterization results may help:

- Achieve a more functional and resilient natural watershed ecosystem.
- Identify and resolve areas of conflict between proposed land use actions and protection of watershed resources.
- Identify the root cause of watershed issues and develop appropriate solutions.

For the purpose of this watershed plan, the characterization tool can help Ecology understand if identified projects are likely to achieve an ecological benefit. A component of the characterization project is a study by WDFW of the relative conservation value of freshwater habitat conducted at the small drainage area Assessment Unit (AU)[13] scale (Wilhere et. al.

[10] More information on local integrating organizations and their efforts to recovery Puget Sound is available here: https://www.psp.wa.gov/LIO-overview.php.
[11] Salmon recovery lead entities in Puget Sound were established under RCW 77.85.050. More information on their roles as well as links to the recovery plan and watershed chapters is available here: https://www.psp.wa.gov/salmon-recovery-overview.php.
[12] For more information on the watershed characterization project, visit: Watershed characterization project - Washington State Department of Ecology
[13] Assessment units are sub-watershed units from the Salmon and steelhead Habitat Inventory and Assessment Program. They are based primarily on gradient and confinement and reflect the processes that form and maintain stream segments.

2013).[14] This freshwater habitat index has three components: the density of hydro-geomorphic features, local salmonid habitats, and the accumulative downstream habitats. Quantity and quality of habitats were assessed for eight salmonid species. The index is the relative value of the freshwater habitat in an Assessment Unit based on an average of:

- The density of wetlands and undeveloped floodplains inside the AU.
- The quantity and quality of salmonid habitats inside the AU.
- The quantity and quality of salmonid habitats outside and downstream of the AU.

An analysis of projects in this plan in relation to the freshwater habitat index is presented in Chapter 6.2.4.

Pierce County, Kitsap County, and King County have adopted coordinated water system plans that focus on the Group A water systems. The water system plans determine water system service area boundaries and related laws and policies. These policies stipulate whether new homes connect to water systems or rely on new PE domestic wells.[15]

County and city comprehensive planning under the Growth Management Act (GMA) of 1990 identifies where and how future population, housing, and job growth is planned. The comprehensive plans set policy for development, housing, public services and facilities, and environmentally sensitive areas, among other topics. In WRIA 15 counties, comprehensive plans identify Kitsap, Pierce, Mason, and King counties' urban growth areas, set forth standards for urban and rural development, and provide the basis for zoning districts. Because of the overlap in planning for twenty years of growth, county staff helped ensure content of the WRIA 15 watershed plan was coordinated with the Kitsap, Pierce, Mason, and King counties' comprehensive plans.[16]

[14] This index is called the "Freshwater Lotic Habitats Assessment" (GIS layer attribute A3ns_avg) in the WDFW study and the "Sum of Freshwater Index Components" on the Puget Sound Watershed Characterization Project web map.

[15] Water system planning information for each county is available.
Kitsap County: https://kitsappublichealth.org/environment/files/regulations/CWSP2005.pdf
Pierce County: https://www.co.pierce.wa.us/951/Coordinated-Water-System-Planning
Mason County: https://www.co.mason.wa.us/health/environmental/drinking-water/public-water-systems.php
King County: https://www.kingcounty.gov/depts/dnrp/utilities-technical-review-committee/coordinated-water-system-plans.aspx

[16] Comprehensive planning under GMA is available from each county:
King County: https://www.kingcounty.gov/depts/executive/performance-strategy-budget/regional-planning/king-county-comprehensive-plan/2020-Executive-Recommended-Plan.aspx [see Chapter 5, p. 5-42; Chapter 9, p 9-19]
Kitsap County: http://compplan.kitsapgov.com/Pages/home.aspx
Pierce County: https://www.co.pierce.wa.us/950/Comprehensive-Plan
Mason County: https://www.co.mason.wa.us/community-services/planning/2036-comp-plan-update/index.php

2.3 Description of the Watershed – Geology, Hydrogeology, Hydrology, and Streamflow

2.3.1 Geologic setting

Pleistocene glaciation (2.6 million to 11,700 years ago) played an important role in sculpting the landscape of the Puget Sound Lowlands. Reaching a maximum extent during the Vashon stage of the Fraser Glaciation approximately 16,000 years ago, an ice sheet advanced southward into present day Puget Sound (Futornick 2008). Multiple advances and retreats of the ice sheet formed the Puget Sound Lowlands, depositing a complex sequence of glacial and inter-glacial sediments on top of older bedrock.

The landforms and subsurface area of WRIA 15 are dominated by a sequence of unconsolidated glacial and interglacial deposits. Depth to bedrock ranges from exposed at ground surface near the center of the WRIA to more than 2,000 feet below land surface (Welch et al. 2014).

Understanding the geologic setting allows characterization of surface and groundwater flow through the basin. Defining the relationships between surface water flow and deeper groundwater are important to understanding how to manage surface water resources and can be helpful in identifying strategies to offset the impacts of pumping from PE wells.

2.3.2 Hydrogeologic setting

The USGS described the hydrogeology of WRIA 15 in a hydrogeologic framework report for the Kitsap Peninsula titled *Hydrogeologic Framework, Groundwater Movement, and Water Budget of the Kitsap Peninsula, West-Central Washington* (Welch et al. 2014). The study area covered all of WRIA 15, except for the southern Key Peninsula; Anderson, McNeil, and Ketron Islands; and Vashon-Maury Island. The hydrogeologic units of the area are described as being either water-bearing (“aquifer”) or non-water-bearing (“aquitard” or “confining layer”) sediments, without regard to geologic origin or age. Major groundwater aquifers are found in the unconsolidated glacial and interglacial sediments.

Groundwater in the aquifers generally flows radially outward from the peninsula to Puget Sound or Hood Canal. These generalized flow patterns are complicated by the presence of low permeability confining units and bedrock that separate discontinuous bodies of aquifer material and act as local groundwater-flow barriers (Welch et al. 2014). The USGS describes the hydrogeology of the watershed as 12 hydrogeologic units, typically alternating between aquifer and non-aquifer layers. Some aquifers may be continuous beneath several drainage basins (Ecology 1981; Kitsap Public Utility District 1997). Summer base flows in the watershed are sustained by groundwater.

As discussed in the USGS study, all aquifer and confining units other than the Vashon Recessional Aquifer (Qvr) are present throughout the area, except in the center of the WRIA where bedrock is at or near ground surface. Of these units, the relatively shallow and laterally extensive Vashon Advance Aquifer (Qva) and Sea Level Aquifer (QA1) are the most heavily used

and most likely water sources for new PE wells. The upper three aquifer units (Qvr, Qva, QC1) are also the main source of direct recharge or baseflow to the surface water system.

2.3.3 Hydrology and Streamflow

Due to its irregular configuration, relatively small size, and geologic and topographic characteristics, the Kitsap Peninsula is drained by hundreds of relatively small lowland stream and river systems. Most of the area is drained by short streams that discharge directly into surrounding marine waters. Over 580 streams and 180 lakes, reservoirs, ponds, and marshes have been inventoried in WRIA 15 (Garling et al. 1965). WRIA 15 is unique hydrologically, as only 12 streams in the area have surface drainage areas that exceed 10 square miles, and most are less than one square mile.

Temperatures rarely drop below freezing in WRIA 15, and as a result, snowfall accumulation is minimal. There is no contribution from upstream watersheds because WRIA 15 is mostly surrounded by marine waters. Because all streams are contained in the WRIA, upstream sources, snow, and snowpack are not influencing factors in the watershed. Precipitation as rainfall is the dominant natural input of fresh water to the basin and streamflows are extremely sensitive to areal and seasonal variations in precipitation (Golder Associates 2004).

Annual precipitation varies considerably, ranging from an average of less than 30 inches in the northern tip of the peninsula to more than 80 inches along Hood Canal in the southwest portion of the WRIA. Most of the WRIA receives an average of 40 to 60 inches of precipitation annually (Kitsap PUD 2020). In general, precipitation increases by one inch for every mile southward from the northern tip of the Peninsula. On average, July is the driest month, and December is the wettest month (Golder Associates and EES 2002).

In addition to directly contributing to streamflow maintenance, precipitation also contributes to storage in lakes and groundwater aquifers that serve as natural reservoirs, helping to moderate extreme high and low flows. Groundwater provides the majority of late summer flow to area streams. Practically all streams in WRIA 15 are augmented by groundwater discharge and many would go dry if groundwater recharge during precipitation became insufficient to maintain streamflow during dry periods (Ecology 1981). Small streams draining the east shore of Hood Canal typically originate in lakes and wetlands, have moderate gradients, and exhibit low flows in late summer and early fall (Kuttel 2003).

Chapter 173-515 WAC set minimum instream flows for 21 streams and closed 54 streams and their tributaries (including lakes) to further appropriation of surface water. An additional 14 streams and their tributaries are closed to further appropriation of surface water for part of the year. Some of the streams with partial closures are in basins which also have minimum instream flows set (Ecology 1981).[17]

[17] Chapter 173-515 WAC provides the instream resource protection program for WRIA 15: https://apps.leg.wa.gov/wac/default.aspx/default.aspx?cite=173-515&full=true&pdf=true

Climate change may impact streamflows during the planning horizon. Precipitation is projected to increase in fall, winter, and spring and decrease in summer. Mean annual air temperatures is expected to increase by a couple of degrees between 2010 and 2039. Temperatures will increase in all seasons. In addition, heavy rainfall events are projected to become more severe and occur more frequently (Mauger et al. 2015). With a reduction in summer precipitation and increases in temperature, streams in WRIA 15 may experience declines in streamflow during summer. Water temperatures are also expected to rise which will impact salmonid survival, growth, and fitness.

Chapter Three: Subbasin Delineation

3.1 Introduction

To allow for meaningful analysis of the relationship between new consumptive use and offsets, and per Ecology's Final Net Ecological Benefit (NEB) Guidance (Ecology 2019b), this watershed plan divides WRIA 15 into seven subbasins.[18] This division was helpful in describing (1) the location and timing of projected new consumptive water use, (2) the location and timing of impacts to instream resources, and (3) the necessary scope, scale, and anticipated benefits of projects. In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g., watershed divides).

3.2 Approach to Develop Subbasins

This watershed plan divides WRIA 15 into seven subbasins for purposes of assessing projections for new permit-exempt (PE) wells, consumptive use, and project offsets.[19] In delineating subbasin boundaries for this planning process, Ecology built on the considerations identified during the Committee process:

- The subbasins are part of a nested approach—with further subdivision at the HUC12 and Puget Sound Watershed AU scales applied as appropriate—where projects will be placed as close to projected impacts as possible.[20]
- Subbasin boundaries were used for generating growth projections and consumptive use estimates.
- Isolated areas like islands without connectivity should be included as their own subbasins.

Other considerations included:

- Right-sizing subbasins such that offset projects have some geographic relevance to the location of withdrawal (e.g., an offset project in Seabeck bears little relevance to withdrawals in Longbranch).
- Surface water flows and rainfall patterns should be included.

[18] The term "subbasin" is used for planning purposes only and to meet the requirements of RCW 90.94.030 (3)(b). Ecology retained the subbasin delineation developed through the WRIA 15 Committee process.
[19] This approach is consistent with Final NEB Guidance that defines subbasins as a geographic subarea within a WRIA. A subbasin is equivalent to the words "same basin or tributary" as used in RCW 90.94.030(3)(b). Ecology retained the same subbasin delineation as was developed through the Committee process.
[20] This was a preference of the WRIA 15 Committee, but is also spoken to in the law, "…highest priority recommendations must include replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary." RCW 90.94.030(3)(b)

- Rural growth pattern projections will likely drive project and impact locations.
- Priority areas for salmon recovery should be included.

The WRIA 15 Subbasin Delineation Technical Memorandum available in Appendix C provides a more detailed description of the subbasin delineation.

3.3 WRIA 15 Subbasins

Table 2 presents the map of WRIA 15 subbasin delineations, which are also summarized in Table 4.

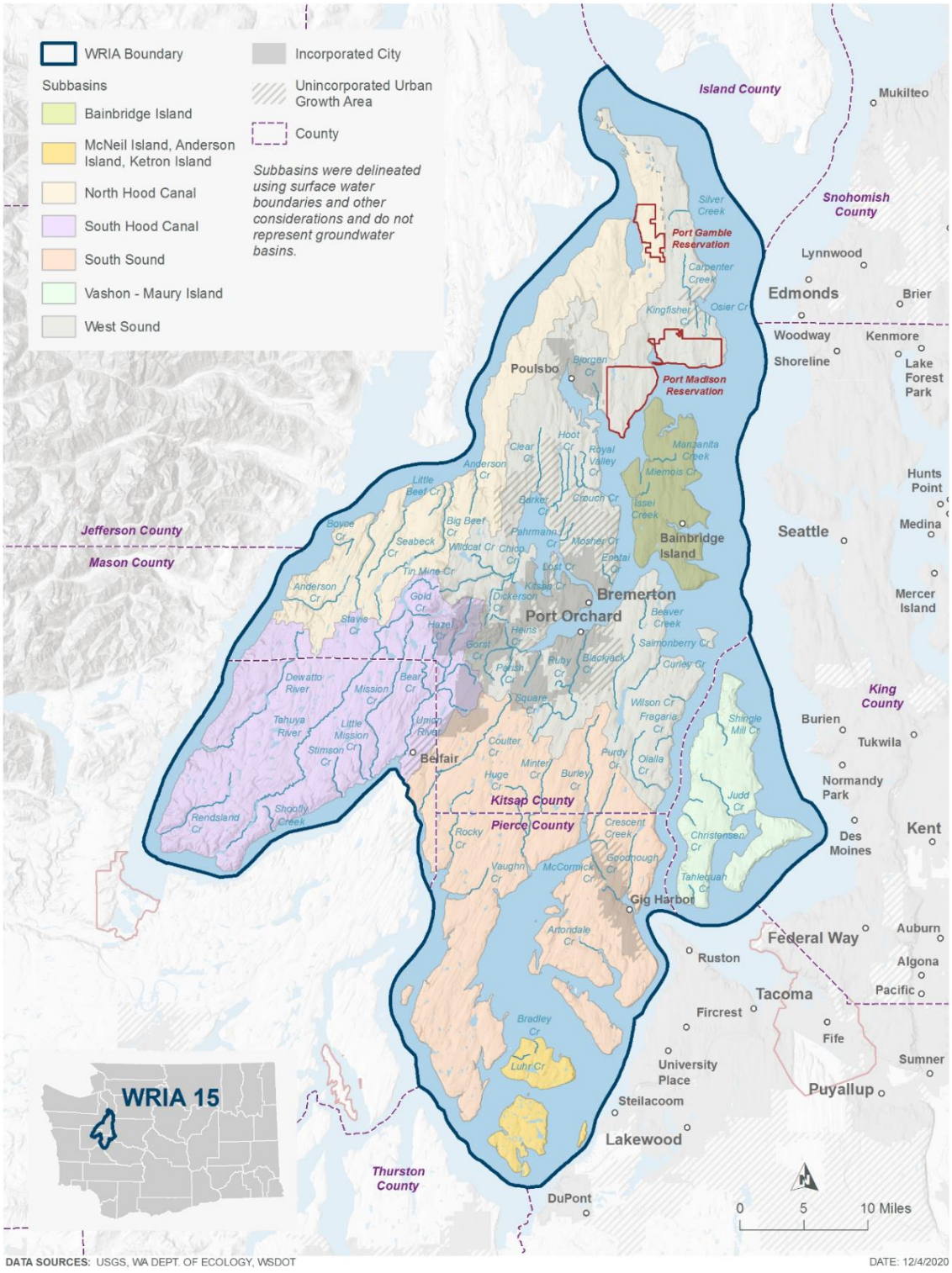

Figure 2. WRIA 15 Subbasin Delineation for the Watershed Restoration and Enhancement Plan. Map prepared by HDR.

Table 4: WRIA 15 Subbasins

Subbasin Name	Primary Rivers and Tributaries	County
Bainbridge Island	Manzanita Creek, Issei Creek, Miemois Creek, Springbrook Creek, Murden Creek (Doe-qud-sake-qub), Mac's Dam Creek, Cooper Creek, Schel Chelb Creek	Kitsap
McNeil Island, Anderson Island, Ketron Island	Luhr Creek, Bradley Creek, Schoolhouse Creek	Pierce
North Hood Canal	Boyce Creek, Anderson Creek, Stavis Creek, Seabeck Creek, Big Beef Creek, Little Beef Creek, Port Gamble Creek, Martha John Creek, Kinman Creek	Kitsap
South Hood Canal	Rendsland Creek, Dewatto River, Tahuya River, Stimson Creek, Mission Creek, Union River, Bear Creek, Hazel Creek, Tin Mine Creek	Kitsap and Mason
South Sound	Vaughn Creek, Rocky Creek, Coulter Creek, Huge Creek, Artondale Creek, Crescent Creek, Burley Creek, Purdy Creek	Pierce and Kitsap
Vashon - Maury Island	Judd Creek, Tahlequah Creek, Christensen Creek, Green Valley Creek, Shingle Mill Creek	King
West Sound	Olalla Creek, Fragaria Creek, Curley Creek, Wilson Creek, Salmonberry Creek, Beaver Creek, Black Jack Creek, Ruby Creek, Parish Creek, Lost Creek, Kitsap Creek, Wildcat Creek, Chico Creek, Mosher Creek, Enetai Creek, Pahrmann Creek, Silver Creek, Carpenter Creek, Osier Creek, Clear Creek, Crouch Creek, Barker Creek, Salmon Creek, Grovers Creek, Clear Creek, Crouch Creek, Illahee Creek, Steele Creek, Big Scandia Creek, Johnson Creek, Dogfish Creek, Bjorgen Creek, Klebeal Creek, Sam Snyder Creek, Gorst Creek	Kitsap

Chapter Four: New Consumptive Water Use Impacts

4.1 Introduction to Consumptive Use

Ecology's Final Net Ecological Benefit (NEB) Guidance states, "watershed plans must include a new consumptive water use estimate for each subbasin, and the technical basis for such estimate" (Ecology 2019b, page 7).[21] This chapter provides Ecology's projections of new domestic permit-exempt (PE) well connections and their associated consumptive use for the 20-year planning horizon. A more detailed description of the method and results for PE well and consumptive use projections is provided in a technical memorandum available in Appendix D.

4.2 Projection of Permit-Exempt Well Connections (2018–2038)

This watershed plan addresses new consumptive water use from projected new homes connected to PE wells. Generally, new homes are associated with wells drilled during the planning horizon. However, new uses can occur where new homes are added to existing PE wells serving small Group B water systems, as allowed under RCW 90.44.050. This plan addresses both types of new well use. PE wells are used to supply houses and, in some cases, other equivalent residential units (ERUs) such as small apartments. For the purposes of this document, the terms "house" or "home" refer to any PE domestic groundwater use, including other ERUs.

To estimate new consumptive water use, the counties or technical consultants (depending on the county) developed projections for the number of new PE wells over the planning horizon in WRIA 15. The methods for projections were based on recommendations from Appendix D of the Final NEB Guidance. WRIA 15 is predominantly rural, and projections demonstrate a wide distribution of PE wells throughout the watershed.

The following sections provide (1) the 20-year projections of new PE wells for each subbasin within WRIA 15, (2) the methods used to develop the projections, and (3) the uncertainties associated with the projections.

---

[21] Though the statute requires the offset of "consumptive impacts to instream flows associated with PE domestic water use" (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the consumptive use of new permit exempt domestic withdrawals. Ecology uses consumptive use as a surrogate for consumptive impact to eliminate the need for detailed hydrogeologic modeling, which is costly and likely infeasible to complete within the limited planning timeframes provided in chapter 90.94 RCW. RCW 90.94.020 and 90.94.030 direct how watershed plans are to project, offset, or account for "water use." Ecology interprets these subsections of the law (RCW 90.94.020(4)(b), 90.94.020(4)(c), 90.94.030(3)(b), 90.94.030(3)(c), 90.94.030(3)(d), and 90.94.030(3)(e)) to relate to the consumptive water use of new PE domestic withdrawals that come online during the planning horizon. (Ecology, 2019a, page 7)

Addressing Uncertainties, Assumptions, and Limitations Associated with Projections for Growth and Consumptive Use. Uncertainties and limitation are inherent with any planning process. Appropriate data are not always available, so analyses rely on the best available information and often require assumptions to fill the gaps. Ecology based the PE well projections and consumptive use estimates in this chapter on the best information available at the time and provides assumptions associated with the projections. The technical memos in Appendix C and D provide more detail on the assumptions that Ecology used in this plan.

The WRIA 15 watershed plan compiles the growth projection data both at the WRIA scale and by subbasin. This section presents WRIA 15 growth projection data for Kitsap, King, Mason, and Pierce counties. Table 5 shows the projected number of new PE wells per subbasin.

The estimates for the number of new PE wells in unincorporated areas of the four counties (within WRIA 15) over the planning horizon is as follows:

- Kitsap County: 2,568 new PE wells
- King County: 368 new PE wells
- Mason County: 1,301 new PE wells
- Pierce County: 978 new PE wells

The total estimate is 5,215 PE wells over the planning horizon.[22]

Using past building permits to predict future growth is one of the recommended methods in the Final NEB Guidance (Ecology 2019a). In this final plan, Ecology deferred to and incorporated the information provided by Kitsap County, City of Bainbridge Island, King County, Mason County, and Pierce County. Each entity used different methods to calculate the projections, which are summarized below.

- Kitsap County's method is based upon a land capacity analysis, using the Kitsap Regional Coordinating Council growth targets. Kitsap County developed the projections. Kitsap County relied on historical data, assuming these historical trends will continue into the future. Kitsap County also made assumptions on the distribution of new PE wells based on available parcels larger than 0.75 acres and farther than 200 feet from water and sewer lines. Kitsap County based growth distribution in each subbasin on the proportion of the historical number of building permits in each subbasin from 2002 to 2019.

[22] The WRIA 15 Committee considered a "lower" and "higher" growth projection in addition to the "moderate" or "most likely" PE well projection. Those projections are not presented in this chapter as they were not considered for calculating the consumptive use estimate. The higher and lower projections are described in the technical memorandum in Appendix D. The Kitsap County numbers were revised following the WRIA 15 Committee process due to a Bainbridge Island well projection update based on an approach that was more applicable for Bainbridge Island compared to the Kitsap County approach.

- Bainbridge Island's method is based upon historical building permit data for Single Family Residential permits over the last 7.5 years.[23] The City of Bainbridge Island developed projections for the Bainbridge Island Subbasin.
- King County's method is based upon historical building permit data. King County developed the projections. King County relied on historical data, assuming these historical trends will continue into the future. King County based the percentage of houses with PE wells on historical trends from 2000-2017.
- Mason County's method is based upon Office of Financial Management 2040 moderate growth population forecasts. The technical consultant team developed the projections. Mason County assumed the proportion of houses with PE wells is equal to the proportion of buildout capacity in rural areas compared to urban growth areas.
- Pierce County's method is based on historical well permit data. The technical consultant team developed the projections. Pierce County relied on historical data, assuming these historical trends will continue into the future. Pierce County also made assumptions on the distribution of new PE wells based on available parcels larger than 0.75 acres and farther than 200 feet from water and sewer lines. Pierce County assumed the same historic growth rate in PE wells by subbasin will occur in the future. Wells were projected within UGAs or existing water system boundaries if the parcels met the criteria discussed above.

The WRIA 15 Permit-Exempt Growth and Consumptive Use Summary (HDR 2020) in Appendix D provides more detail on each of the growth projection methods.

Table 5: Number of Permit-Exempt Connections Projected between 2018 and 2038

Subbasin	Kitsap	Pierce	Mason	King	Total
West Sound	1,336				1,336
North Hood Canal	656				656
South Hood Canal	49		1,077		1,126
Bainbridge Island	138				138
South Sound	389	940	224		1,553
Vashon-Maury Island				368	368
South Sound Islands		38			38
Total	**2,568**	**978**	**1,301**	**368**	**5,215**

[23] Revisions were made to the Bainbridge Island projections after the completion of the WRIA 15 Committee process. Based on communication from Christian Berg on August 3, 2021. Sources for the data include SmartGov Adhoc report of all Single Family Residential permits (issued and / or finalized), Kitsap County Parcel Layer, and Kitsap Public Utility District well locations.

4.3 Impacts of New Consumptive Water Use

This watershed plan used the 20-year projections of new PE wells to estimate the consumptive water use that must be addressed and offset. As above, this section uses "new PE wells" as a shorthand for new domestic permit-exempt well connections unless otherwise described. This section includes an overview of (1) the method used to estimate new consumptive water use (consumptive use), (2) the anticipated impacts of new consumptive use in WRIA 15 over the planning horizon, and (3) other considerations and assumptions. The WRIA 15 Permit-Exempt Growth and Consumptive Use Summary provides a more detailed description of the analysis and alternative scenarios considered during the Committee process (Appendix D).

The consumptive use estimate in this plan is 717.8 acre feet per year (AFY).[24] This estimate uses the growth projection and incorporates an indoor use assumption as well as an outdoor use based on estimates for irrigation. Based on historical information and current understanding of water use in WRIA 15, this estimate is the most likely consumptive use.

This section provides an overview and results of the method used to estimate consumptive use.

4.3.1 Methodology to Estimate Indoor and Outdoor Consumptive Water Use

Indoor and outdoor water use patterns differ. Indoor use is generally constant throughout the year, while outdoor use occurs primarily in the summer months. Similarly, the portion of water use that is consumptive varies for indoor and outdoor water uses.

To estimate consumptive use, this watershed plan applies the Irrigated Area Method to estimate outdoor consumptive use using aerial imagery of existing new homes combined with an indoor estimate for consumptive use. Additional details on the methodology is available in Appendix D.[25] The Final NEB Guidance Appendix B describes the Irrigated Area method.

Consistent with the Final NEB Guidance Appendix B, Ecology assumed that impacts from consumptive use on surface water are steady-state, meaning impacts to the stream from pumping do not change over time. The wide distribution of future well locations and depths across varying hydrogeological conditions led to this assumption.

[24] The consumptive use estimate of 717.8 AFY is slightly lower than the consumptive use estimate developed by the Committee, due to the lower PE well projection for Bainbridge Island. The Committee also considered a higher offset target in the draft plan. The higher offset target is not presented here because Ecology considers 717.8 AFY a reasonable estimate of consumptive water use. Additional information is presented in the technical memorandum in Appendix D.

[25] The WRIA 15 Committee considered other methods applicable in WRIA 15, including the "USGS Method" and the "Metered Data Method". Those methods are not included in the plan for calculating the consumptive use estimate as the Committee ultimately did not use them for the consumptive use estimate, but are discussed in the technical memorandum in Appendix D.

New Indoor Consumptive Water Use

Indoor water use refers to the water that households use (such as in kitchens, bathrooms, and laundry) and that leave the house as wastewater (Kenny and Juracek 2012). The method uses the NEB Guidance recommendation for indoor daily water use per person and consumptive use factor (CUF), and relies on local data for the average number of people per household to estimate new indoor consumptive water use (Ecology 2019b):

- 60 gpd per person, as recommended in Final NEB Guidance Appendix B.
- 2.5 persons per household assumed for rural portions of WRIA 15, based on the Office of Financial Management and County data.
- 10 percent of indoor use is consumptively used (or a CUF of 0.10), based on the assumption that homes on PE wells are served by onsite sewage systems. Onsite sewage systems percolate back to groundwater; a fraction of that water is lost to the atmosphere through evaporation in the drain field.

The equation used to estimate household consumptive indoor water use is:

$$60 \text{ gpd} \times 2.5 \text{ people per house} \times 365 \text{ days} \times 0.10 \text{ CUF}$$

This results in an average indoor consumptive use of 15 gpd per well and an annual average of 0.0168 AFY per well.

New Outdoor Consumptive Water Uses

Most outdoor water is used to irrigate lawns, gardens, and landscaping. To a lesser extent, households use outdoor water for car and pet washing, exterior home maintenance, pools, and other water-based activities. Water from outdoor use does not enter onsite sewage systems, but instead infiltrates into the ground or is lost to the atmosphere through evapotranspiration (Ecology 2019b, page 19).

The technical consultant used aerial imagery to measure the irrigated areas of 80 randomly selected parcels served by PE wells to develop an average outdoor irrigated area. This analysis returned more than one-half of the parcels with no visible irrigation, resulting in irrigated area values of zero. The average irrigated area for the 80 randomly selected parcels was 0.08 acre, which includes the zero values. This method uses the 0.08 acre value in the consumptive use calculations.[26] This estimate is based on the understanding that the consumptive use calculation likely overestimates water use and the independent analyses performed to confirm the measurements of irrigated acreage.

Ecology used the following assumptions, recommended in the Final NEB Guidance Appendix B, to estimate outdoor consumptive water use:

[26] The WRIA 15 Committee agreed to 0.08 acres as representative for the irrigated area.

- Crop irrigation requirements (IR) for turf grass according to WAIG (NRCS-USDA 1997): 16.84 inches per year for the Bremerton WAIG station. This value was rounded up to 17 inches (1.42 feet) per year and used to estimate the amount of water needed for outdoor irrigation.
- An irrigation application efficiency (AE) to account for water that does not reach the turf: 75 percent. This AE increases the amount of water used to meet the crop's IR by 25 percent.
- CUF of 0.8, reflecting 80 percent consumption for outdoor use. This means a return of 20 percent of outdoor water to the immediate water environment.
- Outdoor irrigated area based on existing homes using PE wells: 0.08 acre.

The equation used to estimate household consumptive outdoor water use is:

$$Household\ Outdoor\ CU = \left(\frac{1.42\ feet}{0.75\ AE}\right) x\ 0.08\ acre\ x\ 0.8\ CUF$$

This calculation results in an annual average outdoor consumptive use of 0.121 AF per PE well. While this estimate is an average for the year, Ecology expects that outdoor water use will occur mainly in summer. The outdoor consumptive use may vary by subbasin because of differences in temperature and precipitation across the watershed. The same IR for turf grass is used to simplify the calculations.

4.3.2 Total Consumptive Use Estimate

The total consumptive use estimate for WRIA 15 is the number of PE wells projected (see Section 4.2) multiplied by the total indoor and outdoor consumptive use per PE well. The combined total indoor and outdoor consumptive use per PE well is 0.138 AFY. The total consumptive use estimate for WRIA 15 for is 717.8 AFY.

Table 6: Indoor and Outdoor Consumptive Use Estimates by Subbasin for 20386 summarizes the estimated indoor and outdoor consumptive use by subbasin. Ecology expects the highest consumptive use to occur in the South Sound subbasin, which has the most projected new PE wells. Figure 3 presents the PE well projections and consumptive use estimate by subbasin.

Table 6: Indoor and Outdoor Consumptive Use Estimates by Subbasin for 2038

Subbasin	Projected PE wells	Indoor CU (AFY)	Outdoor CU (AFY)	Total CU in 2038 (AFY)
West Sound	1,336	22.4	161.5	183.9
North Hood Canal	656	11.0	79.3	90.3
South Hood Canal	1,126	18.9	136.1	155.0
Bainbridge Island	138	2.3	16.7	19
South Sound	1,553	26.0	187.7	213.7
Vashon-Maury Island	368	6.2	44.5	50.7
South Sound Islands	38	0.6	4.6	5.2
Total	**5,215**	87.6	630.2	**717.8**

4.3.3 Assumptions with Calculating Consumptive Use

The law calls for an estimate of "consumptive water use impacts" (RCW 90.94.030(3)(e). However, the process of estimating impacts is complex, and therefore Ecology estimated the amount of new consumptive use for the offset amount and the impacts of that use. This approach is consistent with the Final NEB Guidance Appendix A (Ecology 2019b).

The irrigated area method relies on a measured factor and assumed values from literature or research to estimate consumptive water use, as described in Section 4.3.1. The measured factor is the average outdoor irrigated area per parcel. The average outdoor irrigated area estimate relies on a sample size of 80 parcels, distributed by location and property values. To account for the small sample size and to further test the assumption that the 80 parcels were fairly representative of outdoor irrigation in WRIA 15, Kitsap PUD and the Suquamish Tribe performed independent analyses on the list of parcels to confirm the findings of the irrigated area analysis. HDR also compared the results of the analysis with similar analyses undertaken in other WRIAs (GeoEngineers and HDR 2020). While the results showed that on average, HDR's methods resulted in a lower outdoor irrigation estimate, Ecology concluded that the results were within a reasonable range for WRIA 15.

The outdoor consumptive use calculation for the irrigated area method assumes that homeowners water their lawns and gardens at the rate needed for commercial turf grass (i.e., watering at rates that meet crop IR per the WAIG). Although the WAIG provides estimates of crop IRs using meteorological data prior to 1985, this assumption likely results in an overestimate as the irrigated area analysis demonstrated that many people irrigate their lawns enough to keep the grass alive through the dry summers, but not at the levels that commercial turf grass requires. The method also assumes that residential pop-up sprinkler systems irrigate lawns with an efficiency of 75 percent. In reality, households apply water to their lawns and

gardens in many different ways, at rates more or less efficient than a 25 percent water loss. The method assumes 10 percent indoor consumptive use and 80 percent outdoor consumptive use.

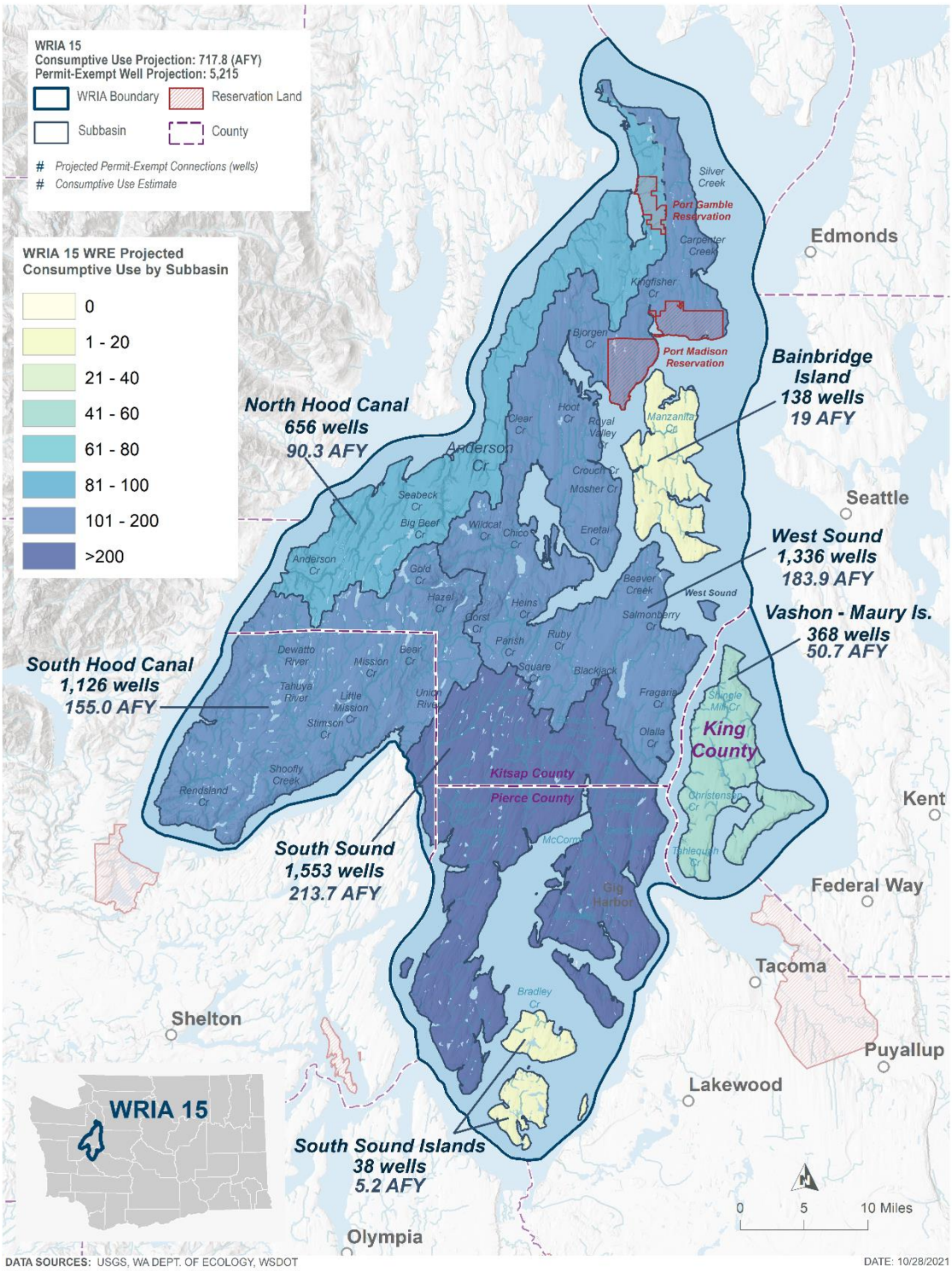

Figure 3. WRIA 15 Estimated Consumptive Use 2018-2038. Map prepared by GeoEngineers.

Chapter Five: WRIA 15 Projects

5.1 Description and assessment

Watershed plans must identify projects that offset the potential impacts that future PE wells will have on streamflows and provide a NEB to the WRIA.[27] This chapter describes projects to offset consumptive use and meet NEB:

- **Water offset projects** have a quantified streamflow benefit and contribute to offsetting consumptive use.
- **Habitat projects** contribute toward achieving NEB by improving the ecosystem function and resilience of aquatic systems, supporting the recovery of threatened or endangered salmonids, and protecting instream resources, including important native aquatic species. Some habitat projects included in this watershed plan will also result in an increase in streamflow, but the water offset benefits for these projects are difficult to quantify. Therefore, this watershed plan does not rely on habitat projects to contribute toward offsetting consumptive use.

To identify the projects, Ecology relied on information generated through the WRIA 15 Committee process. Ecology and the technical consultants[28] also identified projects with potential streamflow benefit from the Puget Sound Action Agenda near term actions, salmon recovery lead entity four-year workplans, streamflow restoration grant applications, and public works programs. Following the conclusion of the Committee process, Ecology worked with technical consultants to develop additional project information to build reasonable assurance for meeting offset need and NEB. Projects that did not provide a reasonable benefit for the anticipated cost were removed. In addition, projects were removed if local partners deemed they were not feasible or beneficial for streamflow. Projects that were considered by the Committee, but that the Committee was unable to reach full support, were reconsidered for inclusion if the streamflow benefit was high, there was a willing sponsor, and likelihood of implementation was high. Ecology and the technical consultants reached out to all identified project sponsors to confirm interest prior to including the projects in the watershed plan.

The technical consultants developed detailed analyses on the subset of projects determined to provide an offset benefit and contribute to streamflows. This chapter presents summaries of those projects with additional detail on each project in Appendix E.

In a separate effort, Ecology contracted with Pacific Groundwater Group (PGG) to support identification of water right acquisition opportunities for WRIA 15. PGG developed a short list

[27] The NEB Guidance defines "projects and actions" as "General terms describing any activities in watershed plans to offset impacts from new consumptive water use and/or contribute to NEB." (Ecology 2019b, page 5) This watershed plan uses the term "projects" for simplicity to encompass both projects and actions as defined by the NEB guidance.

[28] Technical support for projects provided by HDR, Anchor QEA, Pacific Groundwater Group (PGG) and GeoEngineers.

of projects and developed detailed project descriptions for water right acquisition opportunities that appeared to be the most valid.[29] For each water right acquisition project, Ecology included PGG's estimate of the consumptive use portion of the right. Before these rights are acquired and put into the Trust Water Rights Program,[30] they will go through a full extent and validity analysis to determine the consumptive use offset component. As this analysis cannot happen until the owner of the right has agreed to sell, Ecology is relying on the PGG evaluations to estimate the offset volumes described in Section 5.2. PGG developed a more detailed description of the water rights analysis, provided in Appendix F.

For projects that did not provide a measurable streamflow benefit, information on these projects is based on available information from WRIA 15 partners and publicly accessible project databases. Ecology focused the technical resources and expertise on finding projects that provide quantifiable offset benefits.

The projects identified in this plan are consistent with the project type examples listed in Ecology's Final NEB Guidance: (a) water right acquisition offset projects; (b) non-acquisition water offset projects; and (c) habitat and other related projects (Ecology 2019b).

All project proponents voluntarily agreed to have their projects listed in the watershed plan. Although project proponents noted a willingness to proceed, the listing of a project herein does not obligate Ecology to fund a project or the project proponent to carry out the project (see Ecology's POL-2094). Therefore, neither the completion of projects nor the attainment of their anticipated results are guaranteed. However, the inclusion of multiple projects vetted for pertinence and feasibility provides reasonable assurance that projected consumptive use from new domestic permit-exempt withdrawals will be offset and that NEB will be achieved. Ecology encourages project proponents and advocates to work towards completing the projects, and uses incentives through the grant funding provided under the law.

In finalizing this plan, Ecology evaluated projects based on their feasibility and likelihood of implementation. This plan contains projects that Ecology has identified as having a high likelihood of implementation based on their technical merit and project sponsor support.

5.2 Water Offset Projects

The projects presented below have quantifiable streamflow benefit and Ecology identified these projects as having the greatest potential for implementation and achieving the required offset need. Water offset amounts for each project identified in this plan are based on calculations developed by project sponsors and technical consultants. In finalizing this plan, Ecology deferred to projects developed by the WRIA 14 committee, and provided further evaluation to include projects that have a high certainty of providing the estimated water

[29] Input provided by the WRIA 15 Committee on this process. No further work done on water right opportunities following the Committee process.

[30] More information on Ecology's Trust Water Rights Program available at: https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-rights/Trust-water-rights

offset. More information on the certainty of project implementation is described in Section 5.4.3 below. Some of these project benefits may span across subbasins, but detailed modeling of streamflow benefits was not completed during this planning process. Detailed descriptions, including water offset calculations and assumptions, are available in Appendix E.

Table 7 provides a summary of the 15 water offset projects identified to offset consumptive use and contribute toward NEB. The total offset potential for WRIA 15 is 2,873.1 AFY. Offset benefits are anticipated in the subbasins listed in Table 7 as well as downstream of the respective project locations. Figure 4 is a map of the watershed that shows the location of the projects listed in Tables 7.

Table 7. Summary of Offset Projects for WRIA 15.

Project No.	Project	Estimated Offset Benefits (AFY)	Subbasins Benefiting	Project Sponsor(s)	Estimated Costs (total for project packages)
15-WS-OP1; 15-WS-OP2; 15-SHC-OP1; 15-SHC-OP2; 15-BI-OP1; 15-SS-OP1; 15-SS-OP2	MAR Package	1,434.2	North Hood Canal, South Hood Canal, South Sound, West Sound, Bainbridge Island	Various	$38,000,000
15-BI-OP2	M&E Farm Stormwater Infiltration	8	Bainbridge Island	City of Bainbridge	$270,000
15-WS-OP3	Ridgetop Blvd Stormwater	126.7	West Sound	Kitsap County	$2,000,000 (remaining need)
15-SS-OP3	Mason County Rooftop Runoff	71	South Sound, South Hood Canal	Mason County	$5,300,000
15-VM-OP1	Beall Creek	26	Vashon Maury	Water District 9	$110,000
15-WRIA-OP1	Stream Augmentation	632	West Sound, North Kitsap, South Sound, Bainbridge Island	Kitsap PUD	$100,000

Project No.	Project	Estimated Offset Benefits (AFY)	Subbasins Benefiting	Project Sponsor(s)	Estimated Costs (total for project packages)
15-WRIA-OP2	Forests for Streamflow	241.2	North Hood Canal, South Hood Canal, South Sound, West Sound, Bainbridge Island, Vashon Maury, South Sound Islands	Various	$25,800,000
15-WRIA-OP3	Raingardens	188	North Hood Canal, South Hood Canal, South Sound, West Sound, Bainbridge Island, Vashon Maury	Kitsap Conservation District, Mason Conservation District, Pierce Conservation District	$4,200,000
15-WRIA-OP4	Water Right Acquisitions	146	Vashon Maury, Bainbridge Island	Various	$730,000
Total		2,873.1			

*Does not include O&M.

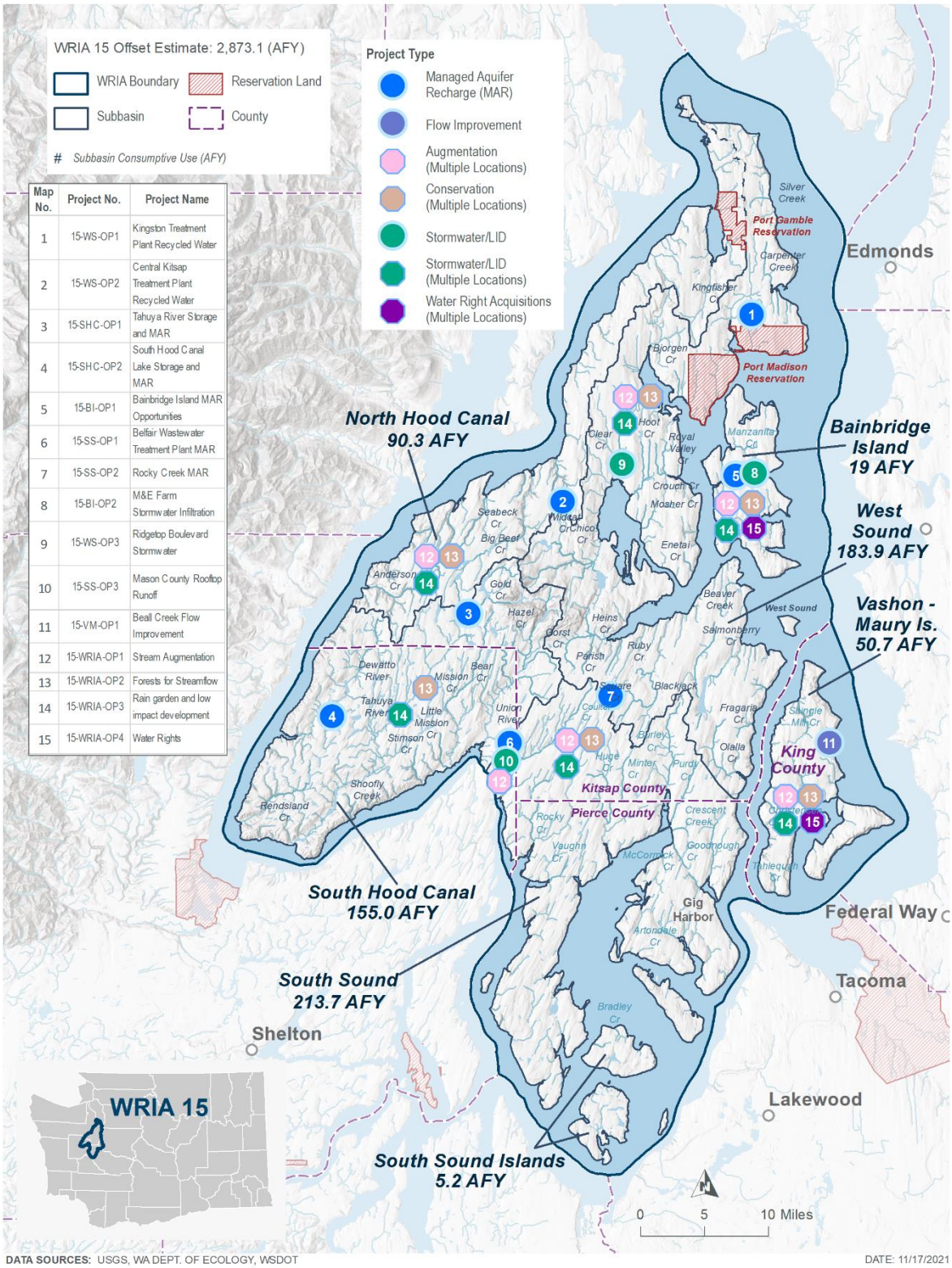

Figure 4. Water Offset Project Locations. Map prepared by GeoEngineers.

5.2.1 Managed Aquifer Recharge Projects

Managed Aquifer Recharge (MAR) is the purposeful recharge of water into aquifers for eventual groundwater discharge to benefit streamflows. MAR projects can augment streamflow by increasing surficial aquifer discharges to the streams beyond what occurs under current conditions. MAR projects typically involve diverting a small fraction of high-flow seasonal streamflows to spreading basins or other infiltration facilities in the adjacent floodplain or uplands. This diverted surface water infiltrates into a shallow aquifer, migrates through the aquifer, and ultimately discharges back to surface water as re-timed groundwater base flow.

MAR projects in WRIA 15 are estimated to have a total potential water offset of 1,434.2 AFY. The MAR projects presented in this watershed plan are the known opportunities at the time of publication, and calculations are based on the best available site information. These projects represent well-formed project concepts, but they do not provide design or feasibility study elements. WRIA 15 partners may identify future projects that are consistent with those presented in this watershed plan which will support offset benefits.[31] Ecology encourages project partners to undergo a feasibility study for all MAR projects to identify any water quality, permitting, and design requirements. MAR projects funded through Streamflow Restoration grant funding are required to complete a feasibility study prior to any other phases of the MAR project being eligible for funding.

Brief descriptions of each MAR project are provided below followed by a summary of the MAR projects in Table 8. More detailed descriptions of the projects are available in Appendix E.

Project Name: Kingston Treatment Plant Recycled Water (15-WS-OP1)

Kitsap County will produce Class A recycled water at the existing Kingston Wastewater Treatment Plant (WWTP), which would be used for summer irrigation at the White Horse Golf Course (WHGC) and winter indirect groundwater recharge to the area north of WHGC. Delivery of recycled water to WHGC would preserve 29 million gallons per year (89 AFY) of potable water from KPUD's groundwater supply system and eliminate the stress to the supply system imposed by large swings in potable water system demands during the irrigation season. Recycled water use will also decrease the risk of saltwater intrusion within the regional sea-level aquifer and extend the useful life of existing potable water infrastructure. The proposed Project would infiltrate about 107 million gallons per year (328 AFY) of highly treated recycled water into the shallow aquifer that provides baseflow to Grovers Creek and its tributaries. Assuming an average infiltration volume of 0.3 million gallons per day, the Project could increase baseflow in Grovers Creek by roughly 0.5 cfs. The water offset quantity for the WRIA 15 Watershed Plan would be 328 AFY.

[31] The WRIA 15 Committee supported MAR and other storage projects that re-time flood-level flows to provide streamflow benefits during low-flow periods. The Committee also encouraged storage projects in the headwaters or high in the system, as well as those that provide multiple benefits (e.g., flood reduction, habitat benefits).

Project Name: Central Kitsap Treatment Plant Recycled Water (15-WS-OP2)

Silverdale Water District No. 16 (SWD) is building infrastructure to move recycled water throughout most of their service area. The source of the recycled water is wastewater that originates from surrounding communities of Poulsbo, Bangor, Silverdale, and Central Kitsap, and flows to the Central Kitsap Wastewater Treatment Plant (CKWWTP). Currently, the treated effluent discharges into Puget Sound approximately 3,200 feet offshore at Port Orchard Bay. The average daily rate of discharge is about 3.4 million gpd (MGD). The goal for the project is for zero discharge into Puget Sound. The CKWWTP will produce recycled water ("Class A" reclaimed water) using a sand filtration system with a capacity of 4 MGD. SWD will distribute the recycled water for various uses, including irrigation, dual-plumbing (flushing toilets), construction, streamflow augmentation and aquifer recharge. SWD estimates the total amount available for stream augmentation through infiltration at the Newberry Hill Road sites is approximately 0.5 MGD, equivalent to 560 AFY.

Project Name: Tahuya River Storage and MAR (15-SHC-OP1)

The Tahuya River Storage and MAR project will augment stream flows by increasing shallow aquifer discharge (baseflow) to the Tahuya River, which flows into Hood Canal at the community of Tahuya, Washington. The Tahuya River has instream flow conditions and is closed to additional consumptive appropriations between June 15 and October 15 by WAC 173-515-030. The project concept is predicated on diverting water from the Tahuya River when streamflow conditions allow; for the purposes of this project description an assumed 100-day diversion period between the months of November and March is assumed. Diverted water will be conveyed from a constructed Tahuya River diversion to a constructed MAR facility located at sufficient distance from the Tahuya River to create favorable return flow timing. The diverted water will infiltrate into the shallow aquifer underlying the MAR facility, be transported down-gradient, and ultimately discharge to the Tahuya River as re-timed baseflow. The anticipated offset volume for this project is 200 AFY.

Project Name: South Hood Canal Lake Storage and MAR (Oak and Shoe Lakes) (15-SHC-OP2)

The South Hood Canal Lake Storage and MAR project is centered around surface water storage and potential aquifer recharge within two small lakes, Shoe Lake and Oak Lake. These lakes outflow to tributaries to the Dewatto River in the South Hood Canal subbasin. The project would increase storage in winter and release it throughout summer at a controlled rate that is higher than natural streamflow, especially in summer. If a suitable MAR site is nearby, the releases could be timed to maximize streamflow benefit by using the time lag from infiltration to benefit streamflow. It would also reduce the potential for water quality impacts from surface water releases in summer, which would likely be warm. The cumulative offset benefit for the South Hood Canal Lake MAR project ranges from 62 AFY to 137 AFY, depending on the height of lake water level rise. This estimate does not include any offset achieved by MAR, which would be additive and requires additional hydrogeologic investigation to evaluate MAR feasibility and rate/volume. The offset benefit accounted for in this watershed plan is 62 AFY, assuming one

of the projects moves forward. The project is expected to provide streamflow benefits in the Dewatto River, which discharges to Hood Canal at Dewatto Bay.

Project Name: Bainbridge Island MAR Opportunities (Johnson Farm and Miller Rd) (15-BI-OP1)

The Bainbridge Island MAR Opportunities project consists of the Manzanita Creek Miller Road Parcel Infiltration Project, the Johnson Farm Springbrook Creek MAR Project. Both projects are centered around diversion of flow from area creeks for infiltration at a constructed MAR facility. The cumulative offset benefit for the Bainbridge Island MAR Opportunities is 64.2 AFY. Incorporation of additional MAR project opportunities, if identified in the future, would increase the projected offset. The project is expected to provide streamflow benefits in various streams within the Bainbridge Island subbasin. Streamflow benefits in the form of increased baseflow would occur within Manzanita Creek and Springbrook Creek. Groundwater recharge could also enhance wetlands associated with groundwater discharge areas.

Project Name: Belfair Wastewater Treatment Plant MAR (15-SS-OP1)

The Belfair Wastewater and Water Reclamation Facility is authorized to distribute Class A reclaimed water to public and private entities for commercial and industrial uses, to apply reclaimed water to land for irrigation at agronomic rates, and/or for groundwater recharge by surface percolation at locations listed in the permit. The irrigation site is in the West Fork Coulter Creek basin. Currently, the plant is at about ½ capacity and treats/irrigates about 70 AFY, which would equate to the total offset benefit for the project.

Project Name: Rocky Creek MAR (15-SS-OP2)

This project is a potential MAR project on a tributary to Rocky Creek, south of Trophy Lake Golf Course. The tributary has a watershed area of approximately 1,200 acres upstream of its confluence with Rocky Creek. The project would function by diverting flows from the tributary during winter and conveying it to an infiltration facility. Water quality treatment of the diverted water would also be required before infiltration to settle out fine particles which may plug an infiltration facility. Rocky Creek has minimum flows per WAC 173-515 and is closed to further consumptive use from mid-June through October. The assumptions made in estimating the potential volume of groundwater recharge were the infiltration facility would operate in the winter and early spring (November to March) and the infiltration rate would be 1 cfs (approximately 60 acre-feet/month). That infiltration volume is assumed based upon a soil infiltration rate of 2 feet/day (1 inch/hour) and an infiltration basin size of one acre. It is also assumed that the facility would operate 50% of the time to account for periods that minimum flows are not met in Rocky Creek. With those assumptions, up to 150 AFY could be recharged.

Table 8. Managed Aquifer Recharge Package

Subbasin	Project number	MAR Project Name (sponsor, if identified)	Potential Offset (AFY)	Anticipated Timing of Streamflow Benefit (if known)
West Sound	15-WS-OP1	Kingston Treatment Plant Recycled Water (Kitsap County)	328	Summer low streamflows predicted to be increased
	15-WS-OP2	Central Kitsap Treatment Plant[1] (Silverdale Water District)	167	Variable, can be designed to time benefits
North Hood Canal	15-WS-OP2	Central Kitsap Treatment Plant, includes Asbury Parcel[1] (Silverdale Water District)	393	Variable, can be designed to time benefits
South Hood Canal	15-SHC-OP1	Tahuya River MAR	200	TBD
	15-SHC-OP2	Lake Storage and MAR	62	TBD
Bainbridge Island	15-BI-OP1	Bainbridge Island MAR Opportunities	64.2	TBD
South Sound	15-SS-OP1	Belfair WWTP MAR	70	TBD
	15-SS-OP2	Rocky Creek MAR	150	TBD
Total			**1,434.2 AFY**	

1 Central Kitsap Treatment Plant could provide water offsets to both West Sound and North Hood Canal subbasins. An assumption of the split in benefits was made (2/3 North Hood Canal, 1/3 West Sound).

5.2.2 Additional Offset Projects

Project name: M&E Farm Stormwater Infiltration (15-BI-OP2)

The M&E Farm Manzanita Creek Stormwater Infiltration project would function by collecting stormwater from an adjacent residential area and directing it to a city-owned parcel (the historic M&E Tree Farm) near the upper reaches of Manzanita Creek. An infiltration facility would be constructed on that site to recharge groundwater. A stormwater pond may be required for flow equalization and settling out fine particles which may plug an infiltration facility. The initial geologic review indicated there is potential for groundwater recharge. A more detailed geotechnical evaluation would be required to confirm the site suitability and provide recommendations on the design of the infiltration facility. To estimate the volume of stormwater runoff that may be available for recharge, the National Resource Conservation Service (NRCS) runoff equation was used, as described by NRCS (USDA and NRCS 2004). The

NRCS runoff equation estimates total runoff from total rainfall using input parameters based on land use, soil group, and precipitation characteristics.

The precise quantity that can be infiltrated will not be known until more detailed geotechnical investigations are completed. However with those assumptions, approximately 8 AFY of annual groundwater recharge is estimated. This is approximately 9 percent of the annual precipitation and 13 percent of the seasonal (November through March) precipitation at Washington Climate Station No. 457488. The water offset quantity for the WRIA 15 Watershed Plan is preliminarily estimated to be up to 8 AFY.

Project Name: Ridgetop Boulevard Stormwater (15-WS-OP3)

As a part of a regional effort to improve water quality and aquatic habitat in streams and the Puget Sound, Kitsap County has implemented a plan for LID stormwater retrofit improvements in the Silverdale urban growth area. One of these improvements proposes to retrofit Ridgetop Boulevard NW (from State Highway 303/Northwest Waaga Way to Silverdale Way Northwest) with water quality treatment and infiltration. Two of three project phases are complete; the third phase is seeking funding in the amount of $2 million. Kitsap County Public Works is the project sponsor and the only current barrier to the project is funding. The County has conducted extensive studies on the hydrography and infiltration rates. The infiltration rates for Phases 1 and 2 are 82.7 acre feet. The additional infiltration volume for Phase 3 is estimated at 44 acre-feet. The total volume for all three phases is estimated at 126.7 AFY. Clear Creek is the benefiting stream. This is an initial estimate and further analysis is needed.[32]

Project Name: Mason County Rooftop Runoff (15-SS-OP3)

Mason County's Rooftop Runoff Infiltration Program includes a modification of the Mason County building code to require capture of roof runoff from new rural residential (RR) development, typically on 5-acre parcels or greater, with direct connection to home site infiltration facilities. Home site infiltration facilities could consist of dry wells, infiltration trenches, infiltration galleries, rain gardens, or other approved infiltration structure. This proposed code revision would typically require conveyance and infiltration facilities that infiltrate a minimum of 85 percent of the annual average rooftop runoff for new rural residential development, with a reduced percentage possible in less permeable soils. The infiltrated runoff will recharge the shallow aquifer system, with an assumed downgradient surface water benefit to the baseflow of receiving streams. For WRIA 15, the projected water offset for 926 new PE wells will be approximately 79 AF per year, which is equivalent to about 70,550 gpd. Ecology considers it likely that some small number of parcels associated with new permit-exempt domestic wells will not support roof runoff infiltration facilities due to limiting

[32] More information on the project is available from the following resources: Ridgetop Boulevard Project Page - KCPW Projects (arcgis.com); Herrera Environmental Consultants, Inc. 2013. Silverdale Low Impact Development Retrofit Plan. Prepared for Kitsap County.; Kindred Hydro. 2014. Infiltration Testing and Assessment – Ridgetop Boulevard Green Stormwater Project, Silverdale, Washington. Prepared for Kitsap County.

site conditions. The projected water offset estimates for each of the subbasins it therefore reduced by 10 percent. This reduction is to account for the fact that the county's new modified building code (if adopted) will likely allow exceptions due to limitations involving depth to groundwater, steep slopes, property setbacks, etc. Factoring in this 10% reduction, the project offset will be 71 AFY (65 AFY anticipated in the South Hood Canal subbasin, and 6 AFY in the South Sound subbasin).

Project Name: Beall Creek Flow Improvement (15-VM-OP1)

The Beall Creek project is located in the Vashon-Maury Island subbasin. The project intends to develop a more accurate measurement of the Water District 19 water requirements at their diversion on Beall Creek and improve bypass flow at the diversion, resulting in flow improvements to Beall Creek at an estimated rate of 26 AFY.

Project name: Stream Augmentation (15-WRIA-OP1)

Kitsap Public Utility District (KPUD) has identified at least 10 potential streamflow augmentation projects within their service area boundaries with the potential to add additional sites depending on future water system acquisitions and new water rights. KPUD is proposing to augment streams that are located near transmission mains of their systems in West Sound, north Hood Canal, South Sound and Bainbridge Island (future) subbasins. The water would be produced from either existing water-supply wells or new wells installed solely for the purpose of streamflow augmentation. The project requires the occurrence of a target stream in proximity to KPUD water mains or wells, as well as available unperfected (inchoate) water rights for municipal supply. The objective of the project is to provide "water-for-water" offset for future permit-exempt (PE) wells by discharging water indirectly into the stream (i.e., via constructed infiltration trenches, existing stormwater facilities, etc.) to augment streamflow. This project would discharge water throughout summer (i.e., July through October) at a controlled rate to augment streamflow. The total cumulative offset benefit for the KPUD Streamflow Augmentation project is currently estimated at 632 AFY.

Project Name: Forests for Streamflow Package (15-WRIA-OP2)

Forests for Streamflow projects rely on the acquisition of forest lands (or change in forest management practices) to preserve stands or emphasize a longer harvest interval. Preserving or maintaining forests with stand ages more than 40 years can increase dry-season low flows. Table 9 presents the acreage of potential forest projects identified by sponsors. The projects listed in the table are preliminary opportunities, but new projects may arise in the future that provide benefit for streamflow. Each project will need to be evaluated for its potential offset based on location as well as historical and planned forestry practices.

The total target acreage is 1,723 acres, which will provide an estimated 241 AFY of water offset. The projects identified need further confirmation to determine whether they would meet the criteria of having forest stands greater than 40 years old and subject to harvest.

Table 9. Package of Forests for Streamflow Projects in WRIA 15.

Subbasin	Project Name (Sponsor, if known): Preliminary Sites	Acreage: Preliminary and Target	Potential Streamflow Restoration Increase (AFY)
Bainbridge Island	Springbrook Creek Protection and Restoration (Bainbridge Island Land Trust)	22.85	3.2
North Hood Canal	May include: • Crabapple Creek Habitat Acquisition and Restoration • Little Anderson Creek Habitat Protection • Divide Block Habitat Acquisition and Restoration • West Port Gamble Block Habitat Protection • Port Gamble Heritage Park Timber Rights Acquisition[1] • Gamble Creek Parcel • Boyce Anderson DNR Parcel • Seabeck DNR Parcel • Grovers Creek Mainstem protection and restoration (Sponsors may be Great Peninsula Conservancy and Port Gamble S'Klallam Tribe)	Approx. 2,100 acres has been identified as potential projects by sponsors, target for Community Forest in this subbasin is 500 acres	70
South Hood Canal	May include: • Bear Creek Protection • Tahuya Headwaters (Sponsors may be Great Peninsula Conservancy and others)	Target is 500 acres in South Hood Canal Subbasin	70
South Sound	May include: • Rocky Creek Preserve • Coulter Creek Overton Lands • Key Peninsula Forest Lands (Sponsors may be Great Peninsula Conservancy and others)	Target is 500 acres in South Sound Subbasin	70

Subbasin	Project Name (Sponsor, if known): Preliminary Sites	Acreage: Preliminary and Target	Potential Streamflow Restoration Increase (AFY)
Vashon Maury	May include: • Judd Creek Headwaters • Shinglemill Creek Headwaters • Mileta Creek Headwaters • Christiansen Creek Headwaters • Fisher Creek Headwaters • Tahlequah Creek Headwaters (Sponsors may be Vashon-Maury Island Land Trust or King County)	Target is 100 acres in Vashon Maury Subbasin	14
West Sound	May include: • East Branch Ostrich Bay Creek along Skylark Drive W. • Strawberry and L. Anderson Creek Parcel (Sponsors may be Great Peninsula Conservancy and others)	Target is 50 acres in West Sound Subbasin	7
South Sound Islands	May include: • Near Idie Ulsh Park (40 acres total) • Other areas (Sponsors may include Anderson Island Parks and Recreation District, Great Peninsula Conservancy, and other land trusts)	Target is 50 acres in South Sound Islands Subbasin	7
Totals		**Overall Target is 1,723 acres**	**241.2 AFY**

[1] Subject to existing agreements.

Project Name: Rain Garden and Low Impact Development Package (15-WRIA-OP3)

This project entails installing Rain Garden and Low Impact Development (LID) projects at existing homes and driveways, roadways, parking lots, and other impervious areas that generate stormwater. These projects would focus on critical WRIA 15 stream basins in which PE well numbers are projected to be high, and with homes that have the greatest potential for new infiltration. Techniques include rain gardens, bio-infiltration swales, permeable pavement, and reductions in the footprint of roadways with permeable surface replacement.

Kitsap Conservation District (KCD) has a Rain Garden and LID Program that works cooperatively with county services, landowners, and local communities to expand knowledge and use of LID practices throughout Kitsap County, including some cities within the county. Since 2010, the KCD Rain Garden and LID cost-share program has helped landowners fund and install 320 rain

gardens. Pierce Conservation District (PCD) and Mason Conservation District (MCD) have similar programs.

KCD can implement 50 projects a year with existing staff resources, assuming sufficient funding. The capacity of PCD and MCD is less than KCD, but with funding, is assumed to be 10 per year, per district. The average offset will vary with precipitation, soils, and other factors but is likely about 0.15 acre-foot per residential rain garden. Other LID practices can infiltrate more water, depending on the impervious surface treated. The total amount of potential offset benefit is 188 AFY.

Table 10 presents a recommended target and distribution of rain garden projects per year and potential range of water offsets over the life of the plan.

Table 10. Target Number of Raingarden and LID Projects.

Subbasin	Targeted Number of Projects per year	Total Amount of Potential Offset Benefit by 2038 (18 years of projects), acre-feet/year
North Hood Canal	10	27
West Sound	20	54
Bainbridge Island	5	13.5
South Sound	25	66.5
South Hood Canal	10	27
Totals	**70**	**188**

Project Name: Water Rights on Vashon-Maury and Bainbridge Island (15-WRIA-OP4)

This project would acquire (through fees and conservation easements) sensitive habitats and water rights in the Vashon-Maury Island subbasin with the intent of enhancing instream flows and mitigating out of stream uses (i.e., reductions in flows associated with PE wells). Assuming property acquisition is coupled with water right acquisition, associated habitat benefits could include removal of structures and impervious surfaces, wetland and riparian protection and restoration, and decommissioning PE wells.

The range of potential offset benefit from the water right acquisition opportunities on Vashon Maury is approximately 56 AFY, but may be substantially higher based on opportunities and negotiations. There are at least two water right opportunities on Bainbridge Island, totaling 90 AFY. This watershed plan does not present the details of the potential water rights on Vashon-Maury or Bainbridge Island in order to protect the privacy of the water right holders.

In addition to the water right acquisition project summarized above, Ecology supports the full and partial acquisition of water rights from willing sellers to increase streamflows and offset the impacts of PE wells in WRIA 15. Water rights will be permanently and legally held by Ecology in the Trust Water Rights Program to ensure that the benefits to instream resources are permanent.

5.3 Habitat Projects

Table 11 provides a summary of the 31 habitat projects identified to provide ecological benefits to WRIA 15. Figure 5 provides the location of the projects in WRIA 15. The habitat projects included in this plan have project sponsors and are expected to be implemented within the planning horizon. Although many of these projects have potential streamflow benefits, Ecology has elected not to quantify water offsets from habitat projects.[33] In finalizing this plan, Ecology deferred to projects proposed by the WRIA 14 committee (including the Salmon Recovery Lead Entity Coordinator) and provided further evaluation to include projects that have a high certainty of providing stated habitat benefits.

[33] This approach is consistent with the WRIA 15 Committee approach.

Table 11. Habitat Projects in WRIA 15.

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-BI-H1	Little Manzanita Protection and Restoration II	The project will acquire 5.13 acres of estuarine, nearshore and riparian habitat along a fish bearing stream, 2,147 feet of shoreline, and 2.55 acres of tidelands. Restoration will be focused on the removal of invasive plants and increasing native plant communities along the shoreline and stream.	Bainbridge Island	$ 755,000	Bainbridge Island Land Trust
15-BI-H2	Springbrook Creek Restoration	This project will implement the five protection and restoration projects identified in the Springbrook Creek Watershed Assessment (published 2019) to (1) regain a broad spectrum of ecological functions, (2) improve stream health (water quality and quantity), (3) implement climate resilient actions, (4) educate and engage the public, and (5) re-establish ESA listed Puget Sound steelhead in this historical steelhead trout stream. Projects will remove culverts and improve access to over 7 miles of stream habitat, in addition to protecting 23 acres of forest land.	Bainbridge Island	Unknown - cost estimates for 5 conceptual designs were developed, but costs of implementing all recommend-ations has not been calculated	Multiple

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-NHC-H1	Big Beef Restoration and Protection	This project will (1) increase main stem channel complexity and promote natural sediment processes; (2) improve spawning habitat conditions, especially for summer Chum; (3) increase the amount of available winter rearing habitat for juvenile Coho Salmon, steelhead trout, and cutthroat trout, especially off-channel areas; (4) promote and protect functioning riparian habitats, especially in productive tributaries; (5) protect 297.12 acres of estuary, freshwater wetland and riparian habitat.	North Hood Canal	$ 4,320,970	Hood Canal Salmon Enhancement Group
15-NHC-H2	Finn Creek Restoration	The project will realign nearly 1,000 feet of Finn creek and its estuary through the park, install LWD to improve in stream habitat complexity and associated natural processes, remove the tide gate to restore tidal inundation and fish passage at the mouth of the watershed, and restore a native riparian corridor.	North Hood Canal	$ 750,000	Wild Fish Conservancy
15-NHC-H3	Seabeck Creek Watershed Restoration	This project will (1) restore fish passage to upstream habitats; (2) improve accessibility to spawning habitats for Chum Salmon, Coho Salmon, and steelhead trout; (3) increase the amount of available rearing habitat for Coho Salmon, steelhead trout, and cutthroat trout (4) slow the flow of water during high flows and maintain flows in the dry summer months; and (5) improve sediment retention and reduce channel incision, especially in the upper watershed.	North Hood Canal	$ 1,522,448	Hood Canal Salmon Enhancement Group

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-SHC-H1	Coulter Creek Protection	This project site is a 3 to 5 mile riparian corridor owned by a single landowner. The project will protect riparian buffers and restore floodplain through acquisition or easement.	South Hood Canal	TBD	Great Peninsula Conservancy
15-SHC-H2	Tahuya Headwaters	This project site includes up to 3 miles of riparian corridor in the upper Tahuya River and tributaries. Through purchase and/or easement, the project has the potential for floodplain restoration by large woody debris placement and beaver dam analogs.	South Hood Canal	TBD	Great Peninsula Conservancy
15-SHC-H3	Tahuya Mainstem	Phase 1 of the project includes purchasing 150 acres, including one mile of mainstem of the Tahuya River, and several water rights. Significant restoration is planned including: removal of armoring, floodplain and side channel connections. Phase II includes additional purchase and restoration of parcels along the mainstem.	South Hood Canal	TBD	Great Peninsula Conservancy
15-SHC-H4	Bear Creek Restoration and Protection	This project plans to acquire two miles of streamfront owned by single landowner. In addition, the project plans to acquire 200 acres for a riparian corridor.	South Hood Canal	$ 800,000	Great Peninsula Conservancy
15-SS-H1	Gig Harbor Golf Club Artondale Creek Habitat Improvement	A portion of Artondale Creek and approximately 2 acres of the floodplain would be restored by replacing two existing bridges to open up the floodplain and plantings to increase shade, improve instream habitat, reduce stream temperature, and improve riparian buffers and upland habitat conditions. The restoration project may also be extended downstream if needed to improve fish passage to the project site.	South Sound	TBD	Gig Harbor Golf Club

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-SS-H2	Rocky Creek Protection and Riparian Buffer	This project includes the protection (acquisition of fee or easement) of riparian buffer and floodplain restoration of ~4 mile riparian corridor owned by single landowner.	South Sound	TBD	Great Peninsula Conservancy
15-SS-H3	Filucy Bay Protection	This project will protect and restore riparian hydrologic and habitat function in the Filucy Bay watershed. Activities include purchase of riparian forest parcels and wetland habitat.	South Sound	TBD	Great Peninsula Conservancy
15-SS-H4	Kim Dam Removal	The project is located on a tributary to Purdy Creek and includes design of a driveway culvert and removal of an instream concrete patio/dam, located on Bandix Rd. in Olalla, WA. The purpose of this project is to restore fish passage to this tributary and restore natural stream functions along this reach. The use of large woody debris will be incorporated into the channel restoration to improve instream habitat and improve channel morphology. The riparian area will also be planted with native trees and shrubs. This project will benefit Coho Salmon, steelhead trout and Cutthroat Trout.	South Sound	$ 170,000	Kitsap Conservation District
15-SSI-H1	South Oro Bay Protection and Restoration	This project will protection of 78 acres of nearshore, wetland, tributary stream, and forested upland habitats along South Oro Bay on Anderson Island in Pierce County. These properties include 2,700 feet of marine shoreline. Permanent protection of this site will provide opportunities to enhance coastal wetland and nearshore riparian habitat. Plans for habitat restoration will be developed after the acquisition is completed.	South Sound Islands	$ 1,172,000	Nisqually Land Trust

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-SSI-H2	Schoolhouse Creek Restoration	This project would remove two barriers, one on the County road and one on a private road. The barriers are preventing salmon from reaching the upper spawning area. The project also seeks to allow for meandering and wetland restoration on a section of creek that was previously ditched and used for agriculture.	South Sound Islands		Anderson Island Parks District or Land Trust
15-VM-H1	Nearshore Revegetation (Mainland and Vashon-Maury)	This project plans for the revegetation of nearshore properties and creeds which contribute insect production as food source and shade/cover along shoreline.	Vashon Maury Island	$ 800,000	King County - WLRD - Vashon-Maury Island Steward

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H1	Chico Bridge - Golf Club Hill NW	This project will restore approximately 1 acre of floodplain and 1000 feet of in-stream habitat within Keta Park, and approximately 1000 feet of in-stream habitat downstream of Keta Park through the golf course reach. Project goals are: (1) Remove Golf Club Hill Road, a documented stressor to habitat conditions and fish passage, and replace with a bridge sized at a minimum to meet stream simulation standard, (2) Increase habitat resilience in the "Keta Park" and "Golf Course" reaches upstream and downstream from Golf Club Hill Road, (3) Provide adequate sediment and wood storage through increased floodplain area - trap sediment and debris moving down Chico Creek, (4) Use increased floodplain storage and enhanced channel and floodplain roughness to attenuate flood peaks moving downstream, (5) Increase salmon rearing, spawning, and resting habitat by providing channel complexity (perennial side channels and off channel areas) through the use of in-stream wood structures and appropriately sized active floodplain. Kitsap County Public Works will remove the 3 box culvert located under Golf Club Hill Road and replace it with a bridge to further restore the floodplain.	West Sound	$ 4,000,000	Kitsap County

15-WS-H2	Curley Creek Acquisition and Restoration Actions	This project will build upon work done through the SRFB Curley Creek Estuary Acquisition and Curley Creek Feasibility study. Project will acquire highest quality remaining Chinook Salmon and steelhead trout habitat available on lower Curley Creek as well as implement restoration actions. Examples of top priority projects include: • Long Lake: Predation in Long Lake has previously been identified as an impediment to Coho Salmon production in the watershed, and water quality issues have been affecting the lake for decades. This action would address predation of native salmon in Long Lake, restore riparian shoreline vegetation, and work with lake front landowners to reduce nutrient and pesticide inputs. Mid Sound will begin conversations with partners to create a road map to address these conditions. • Salmonberry Creek Culverts: This action would improve fish passage on the two lowest culverts on Salmonberry Creek. These culverts present a partial barrier to fish and disrupt watershed processes. Repairing these culverts would improve access to 10 miles of stream, including cool water refuges on the aptly named Cool Creek. • Yang's Botanical Gardens: This action would enhance salmon habitat and watershed processes along a 1km reach of Salmonberry Creek, including the confluence of Cool Creek. The creek has previously been straightened and channelized through this reach, and the floodplain is overgrown with reed canary grass. Restoration will add complexity to the stream, broaden the channel migration zone and improve floodplain health.	West Sound	TBD	Various

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H3	Dogfish Creek Wetland Restoration	This project involves enhancement of 2,832 feet of Dogfish Creek and enhancement of 24 acres of mapped wetland. The 80 acres owned by Malone was historically farmed, reed canary grass established and stream channel ditched. The project will enhanced beaver activity and establish wetland and riparian vegetation. This project will also improve stream flow and floodplain function. This project will benefit Coho Salmon, Chum Salmon, steelhead trout and cutthroat trout habitat. Funding for restoration design has been obtained and preliminary design is in progress.	West Sound	TBD	Kitsap Conservation District

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H4	Fleming Fish Passage and Restoration Feasibility	The purpose of the project is to consider restoration alternatives and create a preliminary design that will restore fish access to one mile of stream in the upper Dickerson Creek watershed, install woody material to increase habitat complexity, aggrade the stream channel, and improve floodplain connectivity. Approximately 750 ft. of Dickerson Creek flows through the Carpenter, Fleming, and Ruiz parcels and restoration design is proposed for approximately 2.5 acres of riparian and floodplain area. The project will benefit wild steelhead, Coho Salmon, Chum Salmon, and cutthroat trout spawning and rearing habitat. Dickerson Creek is a tributary to Chico Creek, which is one of the highest priority salmon streams in Kitsap County identified by the West Sound Lead Entity and Suquamish Tribe. Prior 2007 log weirs were installed to improve fish passage and maintain grade, however, erosion and flooding washed out the weirs and caused three 33% fish barriers, located on the Carpenter property. These barriers limit fish access to approximately one mile of high quality spawning and rearing habitat. The design will also address removing roadbed fill in the floodplain and look at developing side channel habitat. A noxious weed removal and planting plan will be developed.	West Sound	$ 90,450	Kitsap Conservation District

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H5	Grovers Creek and Leyman Wetland Restoration	This project proposes stream channel and wetland restoration on 1,600 feet of Grovers Creek and 10 acres of wetlands. Two parcels were historically farmed, reed canary grass established and stream channel ditched. The project will improve fish passage and establish wetland and riparian vegetation while also enhancing water infiltration and improving floodplain function. This project will benefit Coho Salmon, Chum Salmon, steelhead trout and cutthroat trout habitat. Funding for restoration design has been obtained and preliminary design is in progress. Funding for final design and construction are needed.	West Sound	TBD	Kitsap Conservation District

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H6	Grovers Creek Protection Phase II	Great Peninsula Conservancy will acquire high habitat-value riparian properties within the Grovers Creek watershed in northern Kitsap County. This Grovers Creek Phase II project will permanently protect 111 acres of interconnected, highly-functioning riparian habitat along 1.13 miles of fish bearing main-stream and tributaries within the lower reach of Grovers Creek. This project protects the creek's main-stem and tributaries; mature Sitka Spruce-Western Red Cedar forests; and palustrine scrub-shrub, emergent and floodplain wetlands through fee simple acquisition of 60 acres and conservation easements on 51 acres. The property's habitat provides spawning and rearing refugia for anadromous fish including ESA-listed winter steelhead trout; aquatic and terrestrial-linked habitat for amphibians; nesting and foraging area for birds; and a migratory corridor for mammals. This project is a critical link within a larger wildlife corridor.	West Sound	$ 385,000	Great Peninsula Conservancy

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H7	Kitsap Creek at Northlake Way Culvert Replacement	This project proposes to restore a section of Kitsap Creek that flows through a 200 ft long 72" culvert, 35 feet below the road surface. The primary objective of the Northlake Way culvert replacement project is to replace the existing culvert, which acts as a partial fish barrier, with a structure designed to provide fish passage to the upper basin and Kitsap Lake. This culvert, located about 400 feet downstream of the Kitsap Lake outlet, at the crossing of Northlake Way and Kitsap Creek. The project is located at Northlake Way NW and Kitsap Lake Rd in the City of Bremerton, Kitsap County, where Kitsap Lake flows into Kitsap Creek, a tributary of Chico Creek. The long, steep culvert is undersized and a partial fish barrier (33% passable). By eliminating this barrier, the City of Bremerton will open 1,082 square meters of spawning area and 104,170 square meters of rearing area for Coho Salmon, Chum Salmon, steelhead trout, and cutthroat trout.	West Sound	$ 8,700,000	City of Bremerton

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H8	Protect Corridor at Confluence with Tributary from Newberry Hill Wetlands	This project will establish conservation easements for the entire stream corridor, and/or pursue land acquisition for conservation purposes. There is an approximately 500 ft long segment along Wildcat Creek at the tributary junction and additional 800 ft of tributary channel that is under private ownership, and therefore is at risk of future timber harvest and development that could impair habitat-forming processes within the corridor. The stream corridor should be protected to maintain habitat forming processes in this segment.	West Sound	TBD	Great Peninsula Conservancy
15-WS-H9	Ruby Creek Restoration	Approximately .44 miles of stream will be enhanced by excavating reed canary grass from the channel which is also inhibiting fish passage in this stream section. Installation of LWD, excavation of planting mounds and riparian planting are also proposed. The overall project involves restoration and enhancement of 11.7 acres of stream and wetland habitat. Chum Salmon, Coho Salmon, Cutthroat Trout and steelhead trout are documented in this reach of Ruby Creek. Design is complete and funding is needed for construction. This project is part of a larger fish barrier removal project that will provide access to 3.5 miles.	West Sound	TBD	Kitsap Conservation District
15-WS-H10	Salmonberry Creek and Wetland Protection Project	This project will protect 90 acres of riparian, wetland, and fish habitat through purchasing a conservation easement on property on Salmonberry Creek in Kitsap County. Salmonberry Creek contains Endangered Species Act-listed steelhead trout.	West Sound	TBD	Great Peninsula Conservancy

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H11	Dogfish Creek Fish Passage and Wetland Restoration	This project involves removal of a fish barrier, enhancement of 2,832 feet of Dogfish Creek and enhancement of 24 acres of mapped wetland. The 80 acres was historically farmed, reed canary grass established and stream channel ditched. The project will enhanced beaver activity, improve fish passage and establish wetland and riparian vegetation. This project will also improve stream flow and floodplain function. This project will benefit Coho Salmon, Chum Salmon, steelhead trout and Cutthroat Trout habitat.	West Sound	TBD	Kitsap Conservation District
15-WS-H12	Forrester Barrier Removal	This project aims to remove a fish barrier. The project site is located on the mainstem Dickerson Creek; a tributary to Chico Creek- 0.35 miles upstream of the confluence with Chico Creek, which outlets to Dyes inlet, within the Central Puget Sound Basin, in Kitsap County. The culvert is currently identified as 67% passable velocity barrier, inhibiting fish passage to 1 mile of upstream habitat. Chum Salmon, Coho Salmon, Cutthroat Trout and steelhead trout are documented in this reach of Dickerson Creek.	West Sound	$ 210,000	Kitsap Conservation District

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H13	Cowling Creek Culvert Replacement	The Cowling Creek watershed is located near Suquamish, Washington, on the Kitsap Peninsula. The watershed covers an area of 1.9 square miles and contains approximately 12 miles of streams, 5.5 miles of which are fish bearing (Wild Fish Conservancy 2010). Cowling Creek crosses under Miller Bay Road NE, approximately 350 feet upstream of its outlet into Miller Bay. Currently, the crossing consists of two 36-inch-diameter concrete culverts that are covered by approximately 40 feet of fill by the Miller Bay Road NE embankment. A feasibility study with a preferred conceptual design has been completed. The recommendation is a 50-foot long bridge, which will provide a 40 foot wide opening for Cowling Creek to pass under Miller Bay Road NE. The removal of the twin culverts would allow for approximately 140 feet of stream channel to be constructed, resulting in habitat increase with the project reach. Other habitat elements may be added to provide additional habitat benefits.	West Sound	$ 3,500,000	Mid Sound Fisheries Enhancement Group (Feasibility study); Kitsap Co

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
15-WS-H14	Protect Corridor Upstream of Mountaineers Foundation Rhododendron Preserve	This project plans to establish conservation easements for the entire stream corridor, and/or pursue land acquisition for conservation purposes. There is an approximately 3,500 ft long segment along Wildcat Creek, between the Rhododendron Preserve and WDNR properties that is under private ownership. Future timber harvest and/or development may impair riparian and other habitat-forming processes within the corridor. The stream corridor should be protected to maintain habitat forming processes in this segment.	West Sound	TBD	West Sound Partners for Ecosystem Recovery

15-WRIA-H1	WRIA-wide Beaver Project	Among numerous other benefits, beaver habitats store surface water and recharge groundwater to benefit streamflows. A multi-faceted approach would provide additional tools for jurisdictions and landowners to help protect and restore beaver habitats. Funding is needed through legislative appropriations, grants, pooling of resources by partners, and/or other means. 1. Map and protect likely beaver habitat: A pilot project with Kitsap County and Great Peninsula Conservancy to identify potential easements to purchase and protect as beaver habitat. Use mapping and modeling to understand both the water holding potential and beaver habitat suitability of selected areas. Additional work by Wild Fish Conservancy and partners will include refining a beaver intrinsic potential model to identify potential beaver habitat restoration and protection projects in West Sound watersheds based on similar work underway in the Chehalis Basin. Easements would be purchased on a voluntary basis and certain areas of the WRIA need to be protected for drinking water. 2. Education & outreach: A partnership between local organizations to develop and implement an education and outreach program to landowners regarding beavers and beaver management. The partners could also reach out to entities to address known concerns (e.g., tree loss, hazard trees, encroaching on farmland, change of vegetation, flooding) associated with beavers and develop/discuss non-lethal conflict resolution options. 3. Monitoring & research: Develop a monitoring program for beaver habitats which may include	WRIA wide	TBD	Multiple entities

Project Number	Project Name	Project Description	Subbasin	Estimated Total Project Cost	Project Sponsor
		collecting information on fish passage, groundwater levels, reach hydrology, vegetation types, permits, and the effectiveness of beaver dam analogues relative to natural beaver habitat. Streamflow and fish/amphibian/waterfowl habitat benefits should be quantified where possible to help define the benefit from a surface water / habitat perspective (e.g., temperature, streamflows, salmon, riparian vegetation, etc.). Implementing entities could include local jurisdictions, tribes, federal or state agencies.			

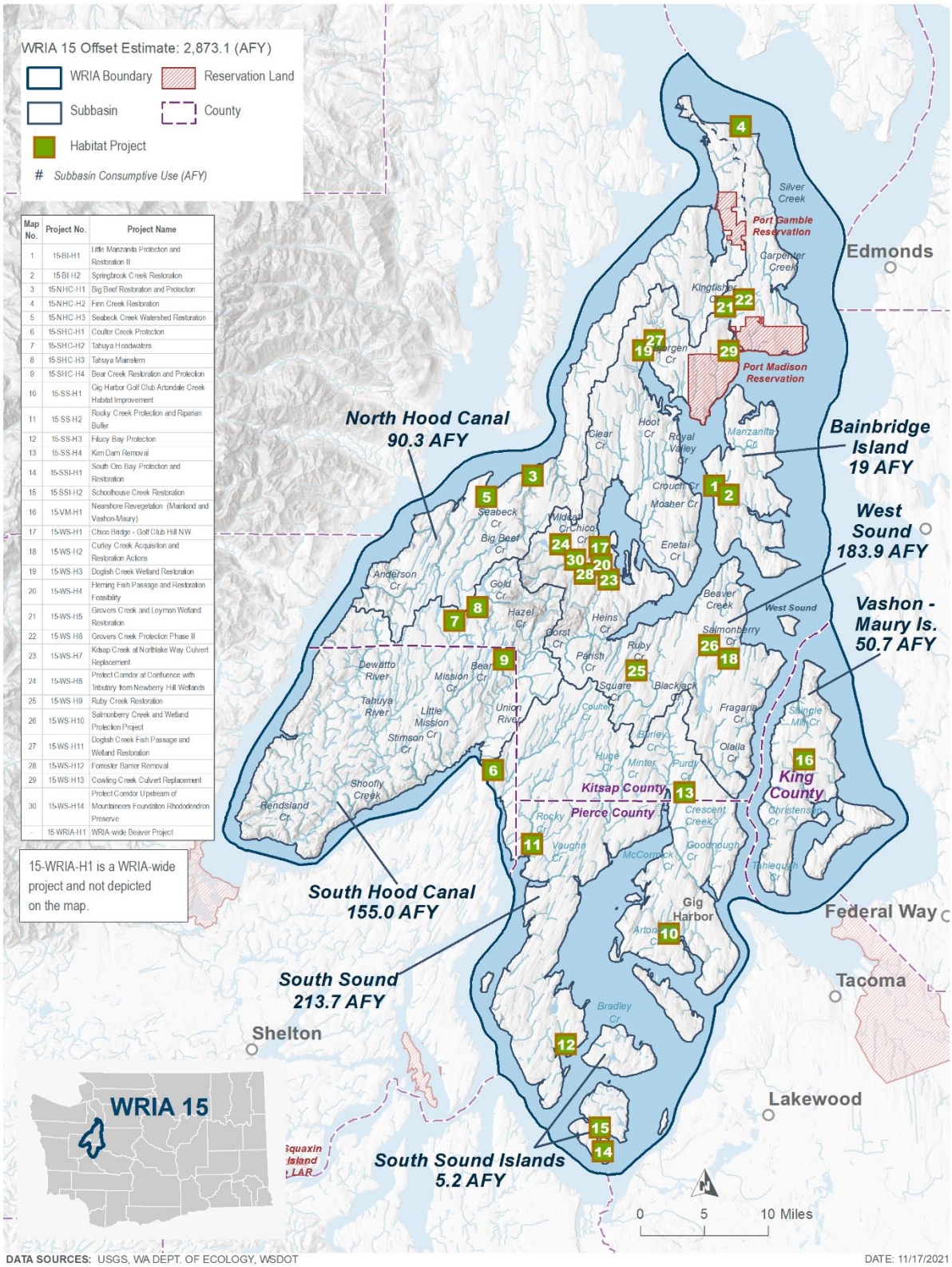

Figure 5. Map of WRIA 15 Habitat Projects. Prepared by GeoEngineers.

5.4 Project Implementation Summary

5.4.1 Summary of Projects and Benefits

Per RCW 90.94.030(3), this watershed plan must include actions necessary to offset potential impacts to instream flows associated with new PE well water use and result in a net ecological benefit to instream resources within the WRIA.

As described in Chapter 4, the plan estimates 717.8 AFY of consumptive use from new PE wells over the planning horizon. The plan includes 7 MAR projects and an additional 8 projects to offset consumptive use. The water offset projects included in Table 7 provide an estimated offset of 2,873.1 AFY and exceed the estimated consumptive use across the watershed.

This plan includes 31 habitat projects shown in Table 11. Ecological benefits associated with these projects vary and include floodplain restoration, wetland reconnection, riparian restoration, nearshore restoration, land acquisitions for restoration and to prevent future development, improving upstream access for fish, and increase in channel complexity. While many of these projects have potential streamflow benefits, this plan does not account for water offset from habitat projects. The ecological and streamflow benefits from habitat projects are supplemental to the quantified water offsets and contribute to achieving a net ecological benefit.

5.4.2 Cost Estimate for Offsetting New Domestic Water Use Over 20 Year Planning Horizon

Per RCW 90.94.030(3)(d), this watershed plan must include an evaluation or estimation of the cost of offsetting new domestic water uses over the subsequent twenty years. To satisfy this requirement, the technical consultants developed planning-level cost estimates for each of the water offset projects listed in Section 5.2 and included cost estimates for habitat projects where readily available from the project sponsors.

The estimated cost of implementing individual water offset projects range from $25,000 for acquiring a small set of water rights to over $15 million for the Central Kitsap Water Treatment Plant MAR project. The total estimated cost for implementing the water offset projects listed and described in this chapter is approximately $76 million. Assuming 2,873.1 AFY of water offset is achieved through implementation of these projects, the average cost per AFY is approximately $26,500.

The estimated cost of implementing habitat projects range from $10,000 to several million dollars for large land acquisition and restoration projects. The total estimated cost for implementing habitat projects is unknown because information is not available for all projects. A general project cost per acre of acquisition or restoration is challenging to provide given the difference in costs across the WRIA (e.g., land costs may differ by region/county). However, the West Sound Partners for Ecosystem Recovery provide an average cost of $1.4 million for projects submitted as Near-Term Actions in the 2018-2022 Puget Sound Action Agenda. Their projects address stormwater improvements, habitat restoration and protection, floodplain

restoration, shoreline restoration, monitoring and modeling, and fish barrier removal. This average cost may be applicable for the range of projects included in the WRIA 15 watershed plan. Details on known costs for individual projects are provided in the project summaries above.

5.4.3 Certainty of Implementation

Certainty of implementation depends on many factors, including identification and support of project sponsors, readiness to proceed and implement the project, and identification of potential barriers to completion.

Several types of water offset projects are included in this plan, such as water storage, stream augmentation, raingardens, and water right acquisitions. These types of projects have been successfully implemented within Washington and the technology to implement these types of projects is proven. Each of the water offset projects listed in Table 7 have likely project sponsors who have experience implementing these types of projects and are ready to proceed with project development. The water offset projects included in the plan are likely to be implemented and provide benefits during the planning horizon.

The habitat projects included in the plan, if funded, are expected to be implemented within the planning horizon. The habitat projects have project sponsors with experience implementing habitat restoration and acquisition projects.

Chapter Six: Determination of Net Ecological Benefit

6.1 Overview

Watershed Restoration and Enhancement Plans must identify projects and actions to offset the potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over the planning horizon and provide a net ecological benefit to the WRIA. The Final NEB Guidance establishes Ecology's interpretation of the term "net ecological benefit" as "the outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary" (Ecology 2019b). This chapter provides Ecology's analysis of the WRIA 15 watershed plan's reasonable assurance in meeting NEB.

6.2 Net Ecological Benefit Analysis

The WRIA 15 watershed plan provides a path forward for offsetting an estimated 717.8 AFY of new consumptive water use in WRIA 15. The watershed plan primarily achieves this offset through 15 water offset projects with a total estimated offset of 2,873.1 AFY. This total offset yields a surplus offset of 2,155.3 AFY above the 717.8 AFY consumptive use estimate. This plan also includes 31 habitat projects, which provide numerous additional benefits to aquatic and riparian habitat. The ecological and streamflow benefits from these habitat projects are supplemental to the quantified water offset projects and will contribute to achieving a NEB.

6.2.1 Review of PE Well Projection and Consumptive Water Use Estimate

This plan divides WRIA 15 into 7 subbasins (see Figure 3.1), then distributes the number of projected PE wells across the subbasins based on historic building trends.

This plan projects 5,215 new PE wells installed in WRIA 15 over the planning horizon. Based on this projection, the plan estimates 717.8 AFY of new consumptive water use from new PE wells in WRIA 15.

The method for estimating outdoor water use (outlined in Ecology's NEB Guidance) was designed to be protective of instream resources. The outdoor water use component was based on the assumption that every new PE well homeowner will water their lawn at rates equal to those of commercial turf grass in the Washington Irrigation Guide (NRCS 1997). Commercial turf grass irrigation rates are much higher than typical domestic applications. Therefore, Ecology considers 717.8 AFY a conservative estimate of consumptive water use.

6.2.2 Quantity and Spatial Distribution of Water Offset Project Benefits

Table 12 provides a summary of the 16 water offset projects listed in the plan to offset consumptive use and contribute toward achieving NEB in WRIA 15. The potential water offset of these ten projects is 2,873.1 AFY, a surplus of 2,155.3 AFY above the consumptive use estimate. Therefore, the plan succeeds in offsetting consumptive use impacts at the WRIA scale. Water offset benefits are anticipated in the subbasins listed in Table 12 as well as downstream of the respective project locations.

If funded, Ecology expects projects will be implemented within the planning horizon and provide benefits beyond the planning horizon and as long as new PE well use continues. Ecology finds that the offset amounts are reasonable, and that these projects, once implemented, will meet the requirements of RCW 90.94.030.

Table 12. Summary of WRIA 15 Water Offset Projects included in NEB analysis

Project No.	Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (AFY)
15-WS-OP1	Kingston WWTP	Reclaimed water to recharge groundwater	West Sound, North Hood Canal	328
15-WS-OP2	Central Kitsap WTP	Reclaimed water for stream augmentation	West Sound, North Hood Canal	560
15-SHC-OP1	Tahuya MAR	Managed aquifer recharge	South Hood Canal	200
15-SHC-OP2	South Hood Canal Lakes MAR	Surface water storage and aquifer recharge	South Hood Canal	62
15-BI-OP1	Bainbridge Island MAR Opportunities	Managed aquifer recharge through diversion of flow and infiltration	Bainbridge Island	64.2
15-SS-OP1	Belfair WTP	Reclaimed water for infiltration to recharge groundwater	South Sound	70
15-SS-OP2	Rocky Creek MAR	Managed aquifer recharge through diversion of flow and infiltration	South Sound	150
15-BI-OP2	M&E Farm Stormwater Infiltration	Stormwater collection and infiltration to recharge groundwater	Bainbridge Island	8
15-WS-OP3	Ridgetop Blvd Stormwater	Stormwater collection and infiltration to recharge groundwater	West Sound	126.7
15-SS-OP3	Mason County Rooftop Runoff	Recharge groundwater through infiltration at homes	South Sound, South Hood Canal	71
15-VM-OP1	Beall Creek	Flow improvements	Vashon Maury	26
15-WRIA-OP1	Stream Augmentation	Discharge water indirectly into streams to augment streamflow	West Sound, North Kitsap, South Sound, Bainbridge Island (future)	632

Project No.	Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (AFY)
15-WRIA-OP2	Forests for Streamflow	Acquire forest lands to preserve stands or emphasize longer harvest interval	North Hood Canal, South Hood Canal, South Sound, West Sound, Bainbridge Island, Vashon Maury, South Sound Islands	241.2
15-WRIA-OP3	Raingardens and LID	Improve infiltration on impervious surfaces that generate stormwater	North Hood Canal, South Hood Canal, South Sound, West Sound, Bainbridge Island, Vashon Maury	188
15-WRIA-OP4	Water Right Acquisitions	Permanently protect water rights, habitat improvements	Vashon Maury, Bainbridge Island	146
			Total	**2,873.1**

Table 13 provides a summary of estimated water offset and consumptive use by subbasin, including surplus or deficit.

Table 13. Subbasin Water Offset Totals compared to Subbasin Consumptive Use Estimate

Subbasin	Offset Project Totals (AFY)	Consumptive Use (AFY)	Surplus/Deficit (AFY)
West Sound	1,147	183.9	+962.7
North Hood Canal	658.1	90.3	+567.8
South Hood Canal	424	155	+269
South Sound	362.5	213.7	+148.8
South Sound Islands	7	5.2	+1.8
Vashon Maury	96	50.7	+45.3
Bainbridge Island	178.9	19	+159.9
WRIA 15 Total	**2,873.1**	**717.8**	**+2,155.3**

The water offset projects provide additional benefits to instream resources beyond those necessary to offset the impacts from new consumptive water use within the WRIA. These additional benefits for the project types planned in WRIA 15 include the following:

- Water right acquisition projects: Aquatic habitat improvements during key seasonal periods; reduction in groundwater withdrawals and associated benefit to aquifer resources; and/or beneficial use of reclaimed water (if applicable).
- MAR projects: Aquatic habitat improvements during key seasonal periods; increased groundwater recharge; reduction in summer/fall stream temperature; increased groundwater availability to riparian and nearshore plants; and beneficial use of reclaimed water.
- Stream Augmentation: Discharge of relatively cool groundwater directly into streams during the summer months resulting in a decrease in water temperature and increase in summer low flows.
- Stormwater and LID: Capture of high flows occurring during rain events to reduce flooding and erosion. Recharged stormwater will augment groundwater baseflow discharge back to streams to help cool surface waters during the summer months while also increasing summer low flows.

- Other Project Categories: Increased streamflow and decreased water temperature during summer months.

6.2.3 Quantity and Spatial Distribution of Habitat Project Benefits

The watershed plan presents a suite of 31 habitat projects that will provide ecological benefits to the watershed beyond those necessary to offset the impacts from new consumptive water use. Habitat improvement tactics associated with these projects include a combination of aquatic habitat restoration, riparian vegetation plantings, land acquisition, large woody debris installation, fish access, nearshore restoration and beaver habitat mapping and protection. Many of the habitat improvement projects include more than one of these elements. Project descriptions are summarized in Table 14.

These projects target the salmonid habitat limiting factors identified for this watershed. Benefits include protection of upload forest cover and riparian forest, restoration of floodplain and wetland habitats, removal of fish passage barriers, wood placement, improved spawning and rearing habitat, and water quality benefits, among other benefits (see Table 14). Some of these habitat projects have potential streamflow benefits, but those quantities were not estimated due to uncertainties regarding magnitude, reliability, and timing of streamflow benefits.

All 31 of the habitat projects have identified project sponsors, and if funded, are expected to be implemented within the planning horizon.

Table 14. Summary of WRIA 15 Habitat Improvement Projects included in NEB Analysis

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-BI-H1	Little Manzanita Protection and Restoration II	Acquisition and restoration of estuarine, nearshore and riparian habitats.	Bainbridge Island	• 5.13 acres protected • 2,147 feet of shoreline • 2.55 acres of tidelands	• Loss of riparian forest • Degradation of shoreline habitats • Channel and streambed degradation
15-BI-H2	Springbrook Creek Restoration	Implement five protection and restoration projects.	Bainbridge Island	• Barriers removed • 7 miles of stream access • Protect 23 acres	• Fish passage barriers • Loss of upland forest cover
15-NHC-H1	Big Beef Restoration and Protection	Restore and protect main stem and habitats throughout the system	North Hood Canal	• 297 acres protected	• Loss of riparian forest • Degradation of wetland and shoreline habitats
15-NHC-H2	Finn Creek Restoration	Realign creek, remove barriers, and restore habitat.	North Hood Canal	• 1,000 feet restored • Barriers removed	• Loss of riparian forest • Fish passage barriers
15-NHC-H3	Seabeck Creek Watershed Restoration	Provide upstream access and restore habitat and flows.	North Hood Canal		• Channel and streambed degradation • Degradation of wetland and shoreline habitats Loss of upland forest cover

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-SHC-H1	Coulter Creek Protection	Protect and restore riparian corridor and floodplain.	South Hood Canal	• 3-5 mile riparian corridor restored	• Loss of riparian forest • Loss of floodplain connectivity and habitats
15-SHC-H2	Tahuya Headwaters	Protect riparian and floodplain habitats; install large wood debris and beaver dam analogs.	South Hood Canal	• 3 miles of riparian corridor restored	• Loss of riparian forest
15-SHC-H3	Tahuya Mainstem	Land acquisition, water right acquisition and habitat restoration.	South Hood Canal	• Acquire 150 acres • Acquire one mile along mainstem	• Loss of upland forest cover • Loss of riparian forest
15-SHC-H4	Bear Creek Restoration and Protection	Land and riverfront acquisition.	South Hood Canal	• Acquire 2 miles riverfront • Acquire 200 acres riparian corridor	• Loss of upland forest cover • Loss of riparian forest
15-SS-H1	Gig Harbor Golf Club Artondale Creek Habitat Improvement	Restore floodplain and surrounding habitats.	South Sound	• Restore 2 acres floodplain	• Loss of floodplain connectivity and habitats

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-SS-H2	Rocky Creek Protection and Riparian Buffer	Acquisition and restoration of floodplain.	South Sound	• 4 mile riparian restored	• Loss of floodplain connectivity and habitats • Loss of riparian forest
15-SS-H3	Filucy Bay Protection	Acquire and restore riparian areas and wetlands.	South Sound	• Acquire and restore riparian and wetlands	• Loss of riparian forest • Degradation of wetland and shoreline habitats
15-SS-H4	Kim Dam Removal	Remove barrier and restore habitat.	South Sound	• Remove 1 barrier	• Loss of riparian forest • Fish passage barriers • Lack of large wood
15-SSI-H1	South Oro Bay Protection and Restoration	Protection of nearshore, wetland and uplands.	South Sound Islands	• Protect 78 acres nearshore, wetland, uplands • Protect 2,700 feet of shoreline	• Degradation of wetland and shoreline habitats
15-SSI-H2	Schoolhouse Creek Restoration	Barrier removal and restoration.	South Sound Islands	• 2 barriers removed	• Degradation of wetland and shoreline habitats
15-VM-H1	Nearshore Revegetation (Mainland and Vashon-Maury)	Restore nearshore properties.	Vashon Maury Island		• Degradation of wetland and shoreline habitats

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-WS-H1	Chico Bridge - Golf Club Hill NW	Barrier removal and floodplain restoration.	West Sound	• Restore 1 acre of floodplain • Restore 1,000 feet of instream habitat • Remove 1 barrier	• Loss of floodplain connectivity and habitats • Loss of riparian forest • Fish passage barriers
15-WS-H2	Curley Creek Acquisition and Restoration Actions	Remove barriers, increase stream complexity and restore floodplains.	West Sound	• 2 barriers and access to 10 miles • Restore 1km creek	• Fish passage barriers • Loss of floodplain connectivity and habitats • Channel and streambed degradation
15-WS-H3	Dogfish Creek Wetland Restoration	Habitat restoration and enhancement.	West Sound	• 2,832 feet of creek restored • 24 acres of wetlands restored	• Loss of floodplain connectivity and habitats • Low streamflow • Degradation of wetland and shoreline habitats
15-WS-H4	Fleming Fish Passage and Restoration Feasibility	Restore access and improve habitat.	West Sound	• Restore access to 1 mile • Restore 2.5 acres	• Channel and streambed degradation • Loss of floodplain connectivity and habitats • Degradation of wetland and shoreline habitats • Lack of large wood

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-WS-H5	Grovers Creek and Leyman Wetland Restoration	Restore fish passage and habitat.	West Sound	• 1,600 feet along creek restored • 10 acres of wetlands restored	• Degradation of wetland and shoreline habitats • Loss of floodplain connectivity and habitats • Loss of riparian forest • Fish passage barriers
15-WS-H6	Grovers Creek Protection Phase II	Acquire land to protect floodplains, wetlands and riparian corridors.	West Sound	• 111 acres acquired	• Degradation of wetland and shoreline habitats • Loss of floodplain connectivity and habitats • Loss of riparian forest
15-WS-H7	Kitsap Creek at Northlake Way Culvert Replacement	Restore fish passage.	West Sound	• Remove 1 barrier	• Fish passage barriers
15-WS-H8	Protect Corridor at Confluence with Tributary from Newberry Hill Wetlands	Protect stream corridor.	West Sound	• Acquire (easement) 1,300 ft of stream	• Channel and streambed degradation

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-WS-H9	Ruby Creek Restoration	Restore riparian and wetland habitat.	West Sound	• .44 miles stream enhanced • 11.7 acres restored	• Degradation of wetland and shoreline habitats • Loss of riparian forest • Lack of large wood
15-WS-H10	Salmonberry Creek and Wetland Protection Project	Protect riparian, wetland and fish habitat.	West Sound	• Protect 90 acres	• Degradation of wetland and shoreline habitats • Loss of riparian forest
15-WS-H11	Dogfish Creek Fish Passage and Wetland Restoration	Remove barrier and restore habitat.	West Sound	• Remove 1 barrier • Restore 2,832 feet of creek • Restore 24 acres wetland	• Degradation of wetland and shoreline habitats • Loss of riparian forest • Fish passage barriers
15-WS-H12	Forrester Barrier Removal	Remove barrier.	West Sound	• Remove 1 barrier	• Fish passage barriers
15-WS-H13	Cowling Creek Culvert Replacement	Remove barriers.	West Sound	• Remove 2 barriers	• Fish passage barriers

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
15-WS-H14	Protect Corridor Upstream of Mountaineers Foundation Rhododend-ron Preserve	Stream protection.	West Sound	• 3,500 ft of stream protected	• Channel and streambed degradation
15-WRIA-H1	WRIA-wide Beaver Project	Map and protect likely beaver habitat; education and outreach; monitoring and research.	WRIA wide		• Degradation of wetland and shoreline habitats • Loss of floodplain connectivity and habitats

Projects will protect over 950 acres of wetland, floodplain area, and other habitats for fish and wildlife. Over 17,000 feet along the streams will be protected or restored. Projects will restore over 10 miles of riparian areas and over 75 acres of other habitats. These benefits will contribute to improving habitat for multiple salmonid species. Projects are spread throughout the WRIA and the stream systems, providing benefits for different life stages of salmonid. Habitat projects are distributed across the seven subbasins.

Table 15. Summary of Habitat Projects by Subbasin

Subbasin	Habitat Projects	Benefiting Streams
West Sound	15-WS-H1, 15-WS-H2, 15-WS-H3, 15-WS-H4, 15-WS-H5, 15-WS-H6, 15-WS-H7, 15-WS-H8, 15-WS-H9, 15-WS-H10, 15-WS-H11, 15-WS-H12, 15-WS-H13, 15-WS-H14	Chico, Curley, Salmonberry, Dogfish, Dickerson, Grovers, Kitsap, Wildcat, Ruby, Cowling
North Hood Canal	15-NHC-H1, 15-NHC-H2, 15-NHC-H3	Big Beef, Finn, Seabeck
South Hood Canal	15-SHC-H1, 15-SHC-H2, 15-SHC-H3, 15-SHC-H4	Coulter, Tahuya, Bear
South Sound	15-SS-H1, 15-SS-H2, 15-SS-H3, 15-SS-H4	Artondale, Rocky, Filucy Bay, Purdy
South Sound Islands	15-SSI-H1, 15-SSI-H2	South Oro Bay, Schoolhouse
Vashon Maury	15-VM-H1	Nearshore
Bainbridge Island	15-BI-H1, 15-BI-H2	Little Manzanita, Springbrook

6.2.4 Watershed Characterization Analysis

Ecology compared the spatial distribution of the watershed plan's water offset and habitat projects against the freshwater habitat index from the Puget Sound Watershed Characterization Project (Wilhere et. al. 2013), which is discussed in Chapter 2.2.

This comparison shows the relationship between projects in the watershed plan and the general state of salmon habitat in the watershed. Figure 6 shows the project locations with respect to the freshwater habitat index in WRIA 15. Red on the map indicates lower-valued habitat, yellow for moderate-valued habitat, and green for higher-valued habitat. The project map symbols correspond with those in Figures 4 and 5, with circles indicating water offset projects listed in Tables 7 and squares indicating habitat projects listed in Table 11.

As is evident on Figure 6, the watershed plan's water offset and habitat projects are primarily located in areas with relatively higher-valued habitat (green and yellow), which means that projects are more likely to benefit fish and other instream resources. This provides added assurance that the watershed plan will result in a NEB.

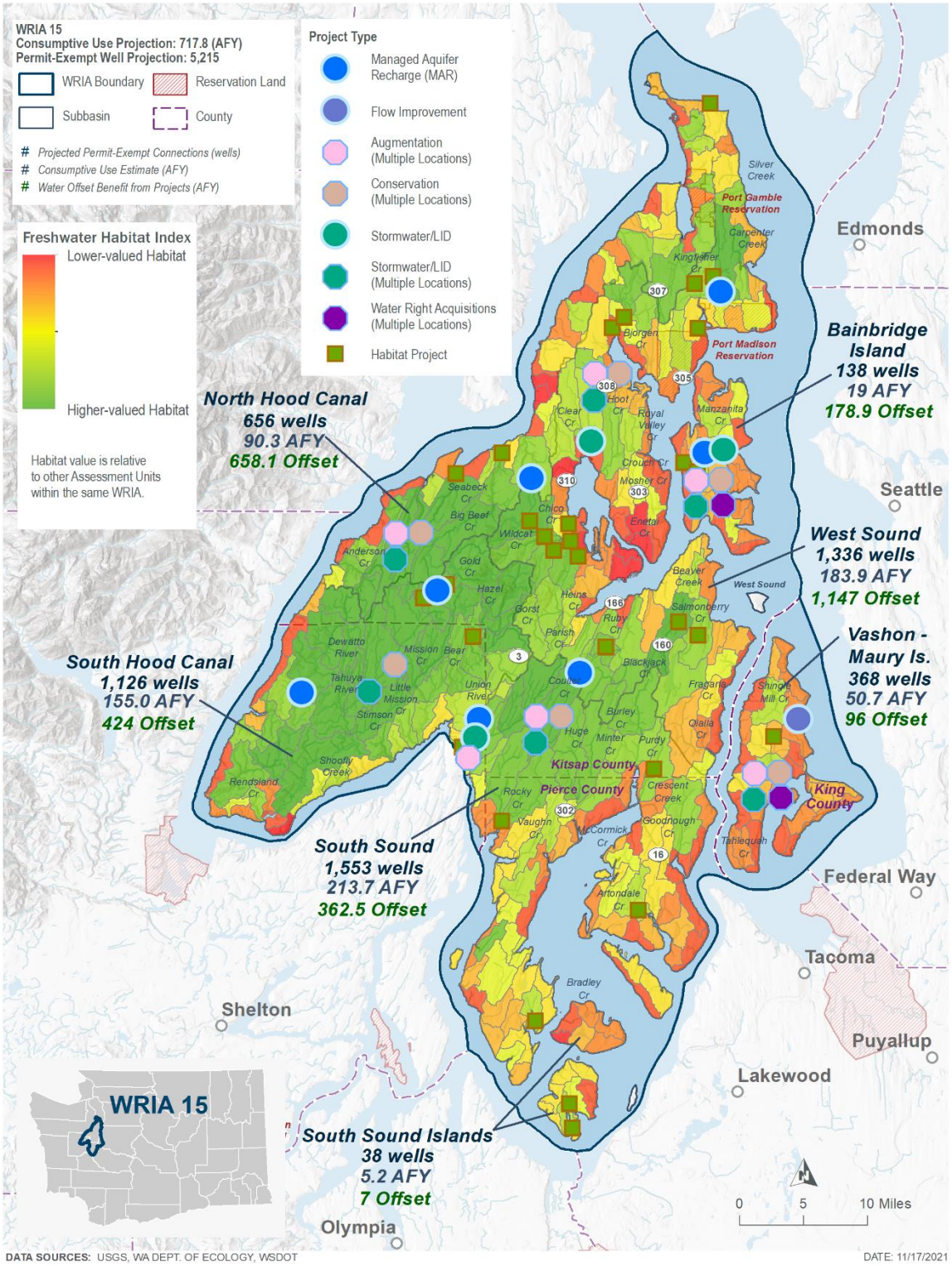

Figure 6. Map of WRIA 15 Watershed Plan project locations overlain on WDFW Assessment Unit Habitat Indices

6.3 Uncertainty and Adaptive Management

There is uncertainty associated with all of the analyses presented in the plan – including the projected number of new PE wells, the consumptive use estimates, the water offset benefits from the proposed projects, and the likelihood that all projects will be implemented and maintained. In addition, external factors like climate change and human migration patterns could influence the projections and estimates in this plan. Ecology relied on data available at the time of writing this plan and is transparent in the assumptions used in the analyses. Because of the large surplus in water offset, if some offset projects are not developed or benefits are less than expected, a subset of projects can still provide sufficient water to offset the estimated new consumptive use.

Ecology and the state of Washington are invested in the implementation of this watershed plan, including periodically assessing plan and project implementation and issuing competitive grants to local projects that demonstrably implement this plan while benefiting streamflows and aquatic habitat. As required by RCW 90.94.050, Ecology will also prepare and deliver a report to the Legislature in 2027 that includes: watershed planning progress under this law; a description of current and potential program projects, costs, and expenditures; an assessment of the benefits from projects; a listing of other directly related efforts; the total number of, and estimates of consumptive water use impacts associated with, new withdrawals exempt from permitting under each WRIA by this law. Ecology also acknowledges and supports the importance of adaptively managing the implementation of any plan that covers a 20-year planning horizon.

Ecology's periodic plan and project implementation assessments coupled with the availability of hundreds of millions of state appropriated dollars in competitive grant funding provide important catalysts for the necessary local action needed to coordinate project implementation and any associated adaptive management necessary as new information or changed circumstances arise. During the WRIA 15 Committee process, the Committee proposed a number of recommendations for adaptive management, and are provided for reference purposes in Appendix F.

6.4 NEB Determination

This watershed plan identifies 15 projects to offset 717.8 AFY of potential consumptive impacts from new permit-exempt domestic groundwater withdrawals on instream flows over 20 years (2018 – 2038), and provide a net ecological benefit to the watershed. The watershed plan provides a surplus of 2,155.3 AFY in water offset benefits from 15 water offset projects. Thirty-one habitat projects provide additional ecological and streamflow benefits that contribute to achieving a net ecological benefit at the WRIA scale. The surplus water offset and habitat improvement projects provide reasonable assurance that the plan will adequately offset new consumptive use from PE wells anticipated during the planning horizon and achieve a net ecological benefit.

Based on the information and analyses summarized in this plan, Ecology finds that this WRIA 15 watershed plan, if implemented, would achieve a net ecological benefit, as required by RCW 90.94.030 and defined by the Final NEB Guidance (Ecology 2019b).

References

Barlow and Leake. 2012. Streamflow Depletion by Wells - Understanding and Managing the Effects of Groundwater Pumping on Streamflow: U.S. Geological Survey Circular 1376, p. 83. https://pubs.usgs.gov/circ/1376/pdf/circ1376_barlow_report_508.pdf.

ESA and Suquamish Tribe. 2020. Puget Sound Steelhead East Kitsap DIP Recovery Plan. https://westsoundwatersheds.org/pdfs/3%20Executive%20Summary%20Puget%20Sound%20Steelhead%20East%20Kitsap%20DIP%20RP%20May2020_web.pdf. Accessed December 23, 2020.

Frans, L.M. and Olsen, T.D. 2016. Numerical Simulation of the Groundwater-Flow System of the Kitsap Peninsula, West-Central Washington. U.S. Geological Survey Scientific Investigations Report 2016-5052.

Futornick, Z. O., Barry S. Goldstein, Brittany L. Parker, and Patrick T. Pringle. 2008. "Sedimentologic evidence for a glacial outburst flood and resulting debris flow; Puget Lowland, Washington State." Abstracts With Programs - Geological Society Of America 40 (11).

Garling, M.E., Molenaar, D.E. and others. 1965. Water Resources and Geology of the Kitsap Peninsula and Certain Adjacent Islands. WA State Division of Water Resources, Water Supply Bulletin No. 18, 309p., 5 plates.

GeoEngineers and HDR. 2020. Draft Irrigated Acreage Comparability Study.

Golder Associates and Engineering and Economic Services (EES). 2002. Kitsap Basin (WRIA 15) Phase II – Level 1 Assessment. Data Compilation and Preliminary Assessment. Prepared for WRIA 15, Planning Unit. Port Orchard, WA. June 21, 2002.

Golder Associates. 2004. Draft WRIA 15 Watershed Management Plan. Prepared for the WRIA 15 Planning Unit. August 31, 2004.

HDR. 2020. WRIA 15 Permit-Exempt Growth and Consumptive Use Summary, HDR 2020.

Heard, W.R. 1998. Life History of Pink Salmon (Oncorhynchus gorbuscha). In Groot, C. and L. Margolis, eds, Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, BC.

HCCC (Hood Canal Coordinating Council). 2005. Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Salmon Recovery Plan. Prepared by S. Brewer, J. Watson, D. Christensen, and R. Brocksmith. November 2005.

Johnson, O.W., M.H. Ruckelshaus, W.S, Grant, F.W. Waknitz, A.M. Garrett. G.J. Bryant, K. Neely, and J.J. Hard. 1999. *Status review of coastal cutthroat trout from Washington. Oregon, and California*. U.S. Dept. of Commerce., NOAA Tech Memo. NMFS-NWFSC-37, 292 p.,

Kenny, J.F., and Juracek, K.E. 2012. Description of 2005–10 domestic water use for selected U.S. cities and guidance for estimating domestic water use: U.S. Geological Survey Scientific Investigations Report 2012–5163, 31 p.

Kitsap County. 2005. East Kitsap Salmon Habitat Restoration Strategy Summary. https://westsoundwatersheds.org/pdfs/Strategy_Summary_2005_final.pdf. Accessed December 23, 2020.

Kitsap Public Utility District. 1997. Kitsap County Initial Basin Assessment. October 1997. https://fortress.wa.gov/ecy/publications/documents/oftr9704a.pdf.

Kitsap Public Utility District. 2020. Data accessed from http://64.146.148.103/Kitsap_Hybrid_Maps/Kitsap_Mean_Rain.pdf. Accessed Nov 19, 2020.

Kuttel, Michael. 2003. Salmonid Habitat Limiting Factors Water Resource Inventory Area 15, (West), Kitsap Basin and 14 (North), Kennedy-Goldsborough Basin. Washington Conservation Commission. June 2003.

Mauger, G.S., J.H. Casola, H.A. Morgan, R.L. Strauch, B. Jones, B. Curry, T.M. Busch Isaksen, L. Whitely Binder, M.B. Krosby, and A.K. Snover. 2015. State of Knowledge: Climate Change in Puget Sound. Report prepared for the Puget Sound Partnership and the National Oceanic and Atmospheric Administration. Climate Impacts Group, University of Washington, Seattle. doi:10.7915/CIG93777D

May, C.W. and G. Peterson. 2003. Kitsap Salmonid Refugia Report. Available: https://salishsearestoration.org/images/c/c7/May_%26_Peterson_2003_kitsap_salmon_refugia_report.pdf

NWIFC (Northwest Indian Fisheries Commission). 2019. Annual Report: Treaty Indian Tribes in Western Washington. Available: https://nwifc.org/publications/annual-report/

NRCS (Natural Resource Conservation Service). 1997. Washington Irrigation Guide (WAIG). U.S. Department of Agriculture.

NSD and ICF (Natural Systems Design and ICF). 2014. Chico Creek Watershed Assessment for the Identification of Restoration and Protection Actions. Prepared for the Suquamish Tribe. Available at: http://westsoundwatersheds.org/default.aspx?ID=2.

Puget Sound Regional Council. 2019. Vision 2050 (Draft). Available at: https://www.psrc.org/sites/default/files/draft-vision2050-mpp-rgs.pdf.

Revised Code of Washington (RCW). 2019. Streamflow Restoration, Chapter 90.94 RCW. Accessed on June 23, 2019. Available: https://app.leg.wa.gov/RCW/default.aspx?cite=90.94.

Revised Code of Washington (RCW). 2019. Watershed Planning, Chapter 90.82 RCW. Accessed on June 23, 2019. Available: https://app.leg.wa.gov/rcw/default.aspx?cite=90.82.

Revised Code of Washington (RCW). 2019. Regulation of Public Groundwaters, Chapter 90.44 RCW. Accessed on June 23, 2019. Available: https://apps.leg.wa.gov/rcw/default.aspx?cite=90.44.

Revised Code of Washington (RCW). 2019. State Building Code, Chapter 19.27 RCW. Accessed on June 23, 2019. Available: https://apps.leg.wa.gov/rcw/default.aspx?cite=19.27.

Shared Strategy. 2007. Puget Sound Salmon Recovery Plan. Adopted by the National Marine Fisheries Service, January 19, 2007.

USDA (United States Department of Agriculture) and NRCS (Natural Resources Conservation Service). 2004. National Engineering Handbook Part 630 Hydrology. Available at: https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17752.wba

Washington Administrative Code (WAC). 1988. Chapter 173-515 WAC – Instream Resources Protection Program – Kitsap Water Resource Inventory Area (WRIA) 15. Available: https://apps.leg.wa.gov/wac/default.aspx?cite=173-515

Washington State Department of Ecology (Ecology). 1981. Instream Resources Protection Program Kitsap.

Washington State Department of Ecology (Ecology). 2019a. Streamflow Restoration Policy and Interpretive Statement. July 31, 2019. Available: https://appswr.ecology.wa.gov/docs/WaterRights/wrwebpdf/pol-2094.pdf.

Washington State Department of Ecology (Ecology). 2019b. Final Guidance for Determining Net Ecological Benefit, GUID-2094 Water Resources Program Guidance. Washington State, Department of Ecology, Publication 19-11-079.

Washington State Department of Ecology (Ecology). 2020a. Current EPA-Approved Water Quality Assessment. Queried on August 21, 2020. https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-improvement/Assessment-of-state-waters-303d/EPA-approved-assessment.

Washington State Department of Ecology (Ecology). 2020b. Focus on: How the Foster decision affects our work. July, 2020. Available: https://fortress.wa.gov/ecy/publications/documents/2011083.pdf.

Washington Department of Ecology (Ecology). 2020c. Existing Washington State permit-exempt well metering programs and metering data from permit-exempt wells. April 17, 2020.

WDFW (Washington State Department of Fish and Wildlife). 2020. SalmonScape Web Map. Accessed August 18, 2020. Accessed at: http://apps.wdfw.wa.gov/salmonscape/.

WDFW (Washington State Department of Fish and Wildlife). 2020a. Statewide Washington Integrated Fish Distribution. Available at: http://geo.wa.gov/datasets/4ed1382bad264555b018cc8c934f1c01_0?geometry=-122.777%2C47.430%2C-122.518%2C47.471.

WDF (Washington State Department of Fisheries). 1975. "A Catalog of Washington Streams and Salmon Utilization, WRIA 15." Accessed at: https://www.streamnetlibrary.org/?page_id=95.

Welch, W.B, L.M. Frans, and T.D. Olsen. 2014. *Hydrogeologic Framework, Groundwater Movement and Water Budget of the Kitsap Peninsula, West-Central Washington*, Scientific Investigation Report 2014-5106.

West Central Local Integrating Organization. 2016. Ecosystem Recovery Plan. December 29, 2016. Available from: https://pspwa.app.box.com/s/nxli7o61pnjxx4rkmo7nokcjh9huc0kf/file/293115183651.

Wilhere, G.F., T. Quinn, D. Gombert, J. Jacobson, and A. Weiss. 2013. A Coarse-scale Assessment of the Relative Value of Small Drainage Areas and Marine Shorelines for the Conservation of Fish and Wildlife Habitats in Puget Sound Basin. Washington Department Fish and Wildlife, Habitat Program, Olympia, Washington.

Wydoski, R.S. and R.R. Whitney. 2003. *Inland Fishes of Washington*. American Fisheries Society and University of Washington Press. 332 pp.

Glossary

Acre-feet (AF): A unit of volume equal to the volume of a sheet of water one acre in area and one foot in depth. (USGS)

Adaptive Management: An iterative and systematic decision-making process that aims to reduce uncertainty over time and help meet project, action, and plan performance goals by learning from the implementation and outcomes of projects and actions. (NEB)

Annual Average Withdrawal: RCW 90.94.030 (4)(a)(vi)(B) refers to the amount of water allowed for withdrawal per connection as the annual average withdrawal. As an example, a homeowner could withdraw 4,000 gallons on a summer day, so long as they did not do so often enough that their annual average exceeds the 950 gpd.

Beaver Dam Analogue (BDA): BDAs are man-made structures designed to mimic the form and function of a natural beaver dam. They can be used to increase the probability of successful beaver translocation and function as a simple, cost-effective, non-intrusive approach to stream restoration. (From Anabranch Solutions)

Critical Flow Period: The time period of low streamflow (generally described in bi-monthly or monthly time steps) that has the greatest likelihood to negatively impact the survival and recovery of threatened or endangered salmonids or other fish species targeted by the planning group. The planning group should discuss with Ecology, local tribal and WDFW biologists to determine the critical flow period in those reaches under the planning group's evaluation. (NEB)

Cubic feet per second (CFS): A rate of the flow in streams and rivers. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second (about the size of one archive file box or a basketball). (USGS)

Domestic Use: In the context of Chapter 90.94 RCW, "domestic use" and the withdrawal limits from permit-exempt domestic wells include both indoor and outdoor household uses, and watering of a lawn and noncommercial garden. (NEB)

ESSB 6091: In January 2018, the Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 in response to the Hirst decision. In the Whatcom County vs. Hirst, Futurewise, et al. decision (often referred to as the "Hirst decision"), the court ruled that the county failed to comply with the Growth Management Act requirements to protect water resources. The ruling required the county to make an independent decision about legal water availability. ESSB 6091 addresses the court's decision by allowing landowners to obtain a building permit for a new home relying on a permit-exempt well. ESSB 6091 is codified as Chapter 90.94 RCW. (ECY)

Evolutionarily Significant Unit (ESU): A population of organisms that is considered distinct for purposes of conservation. For Puget Sound Chinook, the ESU includes naturally spawned

Chinook Salmon originating from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia. Also, Chinook Salmon from 26 artificial propagation programs. (NOAA)

Foster Pilots and Foster Task Force: To address the impacts of the 2015 Foster decision, Chapter 90.94 RCW established a Task Force on Water Resource Mitigation and authorized the Department of Ecology to issue permit decisions for up to five water mitigation pilot projects. These pilot projects will address issues such as the treatment of surface water and groundwater appropriations and include management strategies to monitor how these appropriations affect instream flows and fish habitats. The joint legislative Task Force will (1) review the treatment of surface water and groundwater appropriations as they relate to instream flows and fish habitat, (2) develop and recommend a mitigation sequencing process and scoring system to address such appropriations, and (3) review the Washington Supreme Court decision in Foster v. Department of Ecology. The Task Force is responsible for overseeing the five pilot projects. (ECY)

Four Year Work Plans: Four year plans are developed by salmon recovery lead entities in Puget Sound to describe each lead entity's accomplishments during the previous year, to identify the current status of recovery actions, any changes in recovery strategies, and to propose future actions anticipated over the next four years. Regional experts conduct technical and policy reviews of each watershed's four year work plan update to evaluate the consistency and appropriate sequencing of actions with the Puget Sound Salmon Recovery Plan. (Partnership)

Gallons per day (gpd): An expression of the average rate of domestic and commercial water use. 1 million gallons per day is equivalent to 1.547 cubic feet per second.

Group A public water systems: Group A water systems have 15 or more service connections or serve 25 or more people per day. Chapter 246-290 WAC (Group A Public Water Supplies), outlines the purpose, applicability, enforcement, and other policies related to Group A water systems. (WAC)

Group B public water systems: Group B public water systems serve fewer than 15 connections and fewer than 25 people per day. Chapter 246-291 WAC (Group B Public Water Systems), outlines the purpose, applicability, enforcement, and other policies related to Group B water systems. (WAC)

Growth Management Act (GMA): Passed by the Washington Legislature and enacted in 1990, this act guides planning for growth and development in Washington State. The act requires local governments in fast growing and densely populated counties to develop, adopt, and periodically update comprehensive plans.

Home**:** A general term referring to any house, household, or other Equivalent Residential Unit. (Policy and Interpretive Statement)

Hydrologic Unit Code (HUC): Hydrologic unit codes refer to the USGS's division and sub-division of the watersheds into successively smaller hydrologic units. The units are classified into four levels: regions, sub-regions, accounting units, and cataloging units, and are arranged within each other from the largest geographic area to the smallest. Each unit is classified by a unit code (HUC) composed of two to eight digits based on the four levels of the classification in the hydrologic unit system (two digit units are largest, and eight digits are smallest). (USGS)

Impact: For the purpose of streamflow restoration planning, impact is the same as new consumptive water use (see definition below). As provided in Ecology WR POL 2094 "Though the statute requires the offset of 'consumptive impacts to instream flows associated with permit-exempt domestic water use' (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the consumptive use of new permit-exempt domestic well withdrawals. Ecology recommends consumptive use as a surrogate for consumptive impact to eliminate the need for detailed hydrogeologic modeling, which is costly and unlikely feasible to complete within the limited planning timeframes provided in chapter 90.94 RCW. " (NEB)

Instream Flow: A designated flow (also in cfs) that is set by rule as the amount of water needed to protect beneficial uses and used for determining whether there is water available for appropriation. Flow levels set as Instream Flows do not reflect the actual amount of water flowing at a given time. They are designated, or administrative numbers (flow levels) that are set for periods of time (bi-weekly to several months) throughout the year. The instream flows vary by season and account for different instream resource needs (such as fish spawning, rearing and migration). When (actual) stream flow is lower than the Instream Flow, there is not water available for appropriation (Instream Flows are not being met) and water users whose water rights are junior to the Instream Flows must discontinue water use under that right.
Instream Flow Rule: An administrative rule that establishes Instream Flows. See Instream Flows.

Instream Resources Protection Program (IRPP): The IRPP was initiated by the Department of Ecology in September 1978 with the purpose of developing and adopting instream resource protection measures for Water Resource Inventory Areas (WRIAs) (see definition below) in Western Washington as authorized in the Water Resources Act of 1971 (RCW 90.54), and in accordance with the Water Resources Management Program (WAC 175-500).

Instream Resources: Fish and related aquatic resources. (NEB)

Large woody debris (LWD): LWD refers to the fallen trees, logs and stumps, root wads, and piles of branches along the edges of streams, rivers, lakes and Puget Sound. Wood helps stabilize shorelines and provides vital habitat for salmon and other aquatic life. Preserving the debris along shorelines is important for keeping aquatic ecosystems healthy and improving the survival of native salmon. (King County)

Lead Entities (LE): Lead Entities are local, citizen-based organizations in Puget Sound that coordinate salmon recovery strategies in their local watershed. Lead entities work with local

and state agencies, tribes, citizens, and other community groups to adaptively manage their local salmon recovery chapters and ensure recovery actions are implemented. (Partnership)

Listed Species: Before a species can receive the protection provided by the Endangered Species Act (ESA), it must first be added to the federal lists of endangered and threatened wildlife and plants. The List of Endangered and Threatened Wildlife (50 CFR 17.11) and the List of Endangered and Threatened Plants (50 CFR 17.12) contain the names of all species that have been determined by the U.S. Fish and Wildlife Service (Service) or the National Marine Fisheries Service (for most marine life) to be in the greatest need of federal protection. A species is added to the list when it is determined to be endangered or threatened because of any of the following factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its survival. (USFWS)

Local Integrating Organizations (LIO): Local Integrating Organizations are local forums in Puget Sound that collaboratively work to develop, coordinate, and implement strategies and actions that contribute to the protection and recovery of the local ecosystem. Funded and supported by the Puget Sound Partnership, the LIOs are recognized as the local expert bodies for ecosystem recovery in nine unique ecosystems across Puget Sound. (Partnership)

Low Impact Development (LID): Low Impact Development (LID) is a stormwater and land-use management strategy that tries to mimic natural hydrologic conditions by emphasizing techniques including conservation, use of on-site natural features, site planning, and distributed stormwater best management practices (BMPs) integrated into a project design. (ECY)

Managed Aquifer Recharge (MAR): Managed aquifer recharge projects involve the addition of water to an aquifer through infiltration basins, injection wells, or other methods. The stored water can then be used to benefit stream flows, especially during critical flow periods. (NEB)

National Pollutant Discharge Elimination System (NPDES): The NPDES permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created by the Clean Water Act in 1972, the EPA authorizes state governments to perform many permitting, administrative, and enforcement aspects of the program. (EPA)

Net Ecological Benefit (NEB): Net Ecological Benefit is a term used in ESSB 6091 as a standard that watershed plans (see below for definition) must meet. The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary. See *Final Guidance for Determining Net Ecological Benefit - Guid-2094 Water Resources Program Guidance.* (NEB)

Net Ecological Benefit Determination: Occurs solely upon Ecology's conclusion after its review of a watershed plan submitted to Ecology by appropriate procedures, that the plan does or

does not achieves a NEB as defined in the Net Ecological Benefit guidance. The Director of Ecology will issue the results of that review and the NEB determination in the form of an order. (NEB)

Net Ecological Benefit Evaluation: A planning group's demonstration, using NEB Guidance and as reflected in their watershed plan, that their plan has or has not achieved a NEB. (NEB)

New Consumptive Water Use: The consumptive water use from the permit-exempt domestic groundwater withdrawals estimated to be initiated within the planning horizon. For the purpose of RCW 90.94, consumptive water use is considered water that is evaporated, transpired, consumed by humans, or otherwise removed from an immediate water environment due to the use of new permit-exempt domestic wells. (NEB)

Office of Financial Management (OFM): OFM is a Washington state agency that develops official state and local population estimates and projections for use in local growth management planning. (OFM)

Offset: The anticipated ability of a project or action to counterbalance some amount of the new consumptive water use over the planning horizon. Offsets need to continue beyond the planning horizon for as long as new well pumping continues. (NEB)

Permit exempt wells: The Groundwater Code (RCW 90.44), identified four "small withdrawals" of groundwater as exempt from the permitting process. Permit-exempt groundwater wells often provide water where a community supply is not available, serving single homes, small developments, irrigation of small lawns and gardens, industry, and stock watering.

Permit-exempt uses: Groundwater permit exemptions allow four small uses of groundwater without a water right permit: domestic uses of less than 5,000 gallons per day, industrial uses of less than 5,000 gallons per day, irrigation of a lawn or non-commercial garden, a half-acre or less in size, or stock water. Although exempt groundwater withdrawals don't require a water right permit, they are always subject to state water law. (ECY)

Planning groups: A general term that refers to either initiating governments, in consultation with the planning unit, preparing a watershed plan update required by Chapter 90.94.020 RCW, or a watershed restoration and enhancement committee preparing a plan required by Chapter 90.94.030 RCW. (NEB)

Planning Horizon: The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed, based on the requirements set forth in Chapter 90.94 RCW. (NEB)

Projects and Actions: General terms describing any activities in watershed plans to offset impacts from new consumptive water use and/or contribute to NEB. (NEB)

Puget Sound Acquisition and Restoration (PSAR) fund: This fund supports projects that recover salmon and protect and recover salmon habitat in Puget Sound. The state legislature appropriates money for PSAR every 2 years in the Capital Budget. PSAR is co-managed by the Puget Sound Partnership and the Recreation and Conservation Office, and local entities identify and propose PSAR projects. (Partnership)

Puget Sound Partnership (Partnership): The Puget Sound Partnership is the state agency leading the region's collective effort to restore and protect Puget Sound and its watersheds. The organization brings together hundreds of partners to mobilize partner action around a common agenda, advance Sound investments, and advance priority actions by supporting partners. (Partnership)

Puget Sound Regional Council (PSRC): PSRC develops policies and coordinates decisions about regional growth, transportation and economic development planning within King, Pierce, Snohomish and Kitsap counties. (PSRC)

RCW 90.03 (Water Code): This chapter outlines the role of the Department of Ecology in regulating and controlling the waters within the state. The code describes policies surrounding surface water and groundwater uses, the process of determining water rights, compliance measures and civil penalties, and various legal procedures.

RCW 90.44 (Groundwater Regulations): RCW 90.44 details regulations and policies concerning groundwater use in Washington state, and declares that public groundwaters belong to the public and are subject to appropriation for beneficial use under the terms of the chapter. The rights to appropriate surface waters of the state are not affected by the provisions of this chapter.

RCW 90.44.050 (Addresses groundwater permit exemption): This code states that any withdrawal of public groundwaters after June 6, 1945 must have an associated water right from the Department of Ecology. However, any withdrawal of public groundwaters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for single or group domestic uses in an amount not exceeding five thousand gallons a day, or for an industrial purpose in an amount not exceeding five thousand gallons a day, is exempt from the provisions of this section and does not need a water right.

RCW 90.54 (Water Resources Act of 1971): This act set the stage for the series of rules that set instream flow levels as water rights, as well as a compliance effort to protect those flows.

RCW 90.82 (Watershed Planning): Watershed Planning was passed in 1997 with the purpose of developing a more thorough and cooperative method of determining what the current water resource situation is in each water resource inventory area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resource management and development.

RCW 90.94 (Streamflow Restoration): This chapter of the Revised Code of Washington codifies ESSB 6091, including watershed planning efforts, streamflow restoration funding program and the joint legislative task force on water resource mitigation and mitigation pilot projects (Foster task force and pilot projects).

Reasonable Assurance: Explicit statement(s) in a watershed plan that the plan's content is realistic regarding the outcomes anticipated by the plan, and that the plan content is supported with scientifically rigorous documentation of the methods, assumptions, data, and implementation considerations used by the planning group. (NEB)

Revised Code of Washington (RCW): The revised code is a compilation of all permanent laws now in force for the state of Washington. The RCWs are organized by subject area into Titles, Chapters, and Sections.

Salmon Recovery Funding Board (SRFB): Pronounced "surfboard", this state and federal board provides grants to protect and restore salmon habitat. Administered by a 10-member State Board that includes five governor-appointed citizens and five natural resource agency directors, the board brings together the experiences and viewpoints of citizens and the major state natural resource agencies. For watersheds planning under Section 203, the Department of Ecology will submit final draft WRE Plans not adopted by the prescribed deadline to SRFB for a technical review (RCO and Policy and Interpretive Statement).

Section 202 or Section 020: Refers to Section 202 of ESSB 6091 or Section 020 of RCW 90.94 respectively. The code provides policies and requirements for new domestic groundwater withdrawals exempt from permitting with a potential impact on a closed water body and potential impairment to an instream flow. This section includes WRIAs 1, 11, 22, 23, 49, 59 and 55, are required to update watershed plans completed under RCW 90.82 and to limit new permit-exempt withdrawals to 3000 gpd annual average.

Section 203 or Section 030: Refers to Section 203 of ESSB 6091 or Section 030 of RCW 90.94 respectively. The section details the role of WRE committees and WRE plans (see definitions below) in ensuring the protection and enhancement of instream resources and watershed functions. This section includes WRIAs 7, 8, 9, 10, 12, 13, 14 and 15. New permit-exempt withdrawals are limited to 950 gpd annual average.

SEPA and SEPA Review: SEPA is the State Environmental Policy Act. SEPA identifies and analyzes environmental impacts associated with governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilitates, or adopting regulations, policies, and plans. SEPA review is a process which helps agency decision-makers, applications, and the public understand how the entire proposal will affect the environment. These reviews are necessary prior to Ecology adopting a plan or plan update and may be completed by Ecology or by a local government. (Ecology)

Stream Flow: A specific flow level measured at a specific location in a given stream, usually described as a rate, such as a cfs. Stream flow is the actual amount of real water at a specific place and a given moment. Stream flows can change from moment to moment.

Subbasins: A geographic subarea within a WRIA, equivalent to the words "same basin or tributary" as used in RCW 90.94.020(4)(b) and RCW 90.94.030 (3)(b). In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g. watershed divides). (NEB)

Trust Water Right Program: The program allows the Department of Ecology to hold water rights for future uses without the risk of relinquishment. Water rights held in trust contribute to streamflows and groundwater recharge, while retaining their original priority date. Ecology uses the Trust Water Right Program to manage acquisitions and accept temporary donations. The program provides flexibility to enhance flows, bank or temporarily donate water rights. (ECY)

Urban Growth Area (UGA): UGAs are unincorporated areas outside of city limits where urban growth is encouraged. Each city that is located in a GMA fully-planning county includes an urban growth area where the city can grow into through annexation. An urban growth area may include more than a single city. An urban growth area may include territory that is located outside of a city in some cases. Urban growth areas are under county jurisdiction until they are annexed or incorporated as a city. Zoning in UGAs generally reflect the city zoning, and public utilities and roads are generally built to city standards with the expectation that when annexed, the UGA will transition seamlessly into the urban fabric. Areas outside of the UGA are generally considered rural. UGA boundaries are reviewed and sometimes adjusted during periodic comprehensive plan updates. UGAs are further defined in RCW 36.70.

WAC 173-566 (Streamflow Restoration Funding Rule): On June 25, 2019 the Department of Ecology adopted this rule for funding projects under RCW 90.94. This rule establishes processes and criteria for prioritizing and approving grants consistent with legislative intent, thus making Ecology's funding decision and contracting more transparent, consistent, and defensible.

Washington Administrative Code (WAC): The WAC contains the current and permanent rules and regulations of state agencies. It is arranged by agency and new editions are published every two years. (Washington State Legislature)

Washington Department of Ecology (DOE/ECY): The Washington State Department of Ecology is an environmental regulatory agency for the State of Washington. The department administers laws and regulations pertaining to the areas of water quality, water rights and water resources, shoreline management, toxics clean-up, nuclear and hazardous waste, and air quality.

Washington Department of Fish and Wildlife (WDFW): An agency dedicated to preserving, protecting, and perpetuating the state's fish, wildlife, and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities. Headquartered in Olympia, the department maintains six regional offices and manages dozens of wildlife areas

around the state, offering fishing, hunting, wildlife viewing, and other recreational opportunities for the residents of Washington. With the tribes, WDFW is a co-manager of the state salmon fishery. (WDFW)

Washington Department of Natural Resources (WADNR or DNR): The department manages over 3,000,000 acres of forest, range, agricultural, and commercial lands in the U.S. state of Washington. The DNR also manages 2,600,000 acres of aquatic areas which include shorelines, tidelands, lands under Puget Sound and the coast, and navigable lakes and rivers. Part of the DNR's management responsibility includes monitoring of mining cleanup, environmental restoration, providing scientific information about earthquakes, landslides, and ecologically sensitive areas. (WADNR)

Water Resources (WR): The Water Resources program at Department of Ecology supports sustainable water resources management to meet the present and future water needs of people and the natural environment, in partnership with Washington communities. (ECY)

Water Resources Advisory Committee (WRAC): Established in 1996, the Water Resources Advisory Committee is a forum for issues related to water resource management in Washington State. This stakeholder group is comprised of 40 people representing state agencies, local governments, water utilities, tribes, environmental groups, consultants, law firms, and other water stakeholders. (ECY)

Watershed Plan: A general term that refers to either: a watershed plan update prepared by a WRIA's initiating governments, in collaboration with the WRIA's planning unit, per RCW 90.94.020; or a watershed restoration and enhancement plan prepared by a watershed restoration and enhancement committee, per RCW 90.94.030. This term does not refer to RCW 90.82.020(6). (NEB)

Watershed Restoration and Enhancement Plan (WRE Plan): The Watershed Restoration and Enhancement Plan is directed by Section 203 of ESSB 6091 and requires that by June 30, 2021, the Department of Ecology will prepare and adopt a watershed restoration and enhancement plan for WRIAs 7, 8, 9, 10, 12, 13, 14 and 15, in collaboration with the watershed restoration and enhancement committee. The plan should, at a minimum, offset the consumptive impact of new permit-exempt domestic water use, but may also include recommendations for projects and actions that will measure, protect, and enhance instream resources that support the recovery of threatened and endangered salmonids. Prior to adoption of an updated plan, Department of Ecology must determine that the actions in the plan will result in a "net ecological benefit" to instream resources in the WRIA. The planning group may recommend out-of-kind projects to help achieve this standard.

WRIA: Water Resource Inventory Area. WRIAs are also called basins or watersheds. There are 62 across the state and each are assigned a number and name. They were defined in 1979 for

the purpose of monitoring water availability. A complete map is available here: https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Watershed-look-up.

Appendices

WRIA 15 Kitsap Watershed

The following appendices are linked to this report as an Appendices file at:
https://apps.ecology.wa.gov/publications/SummaryPages/2211017.html

Appendix A – Committee Roster

Appendix B – Final Meeting Summary of the WRIA 15 Watershed Restoration and Enhancement Committee

Appendix C – Subbasin Delineation Memo

Appendix D – Growth Projections and Consumptive Use Memo

Appendix E – Detailed Descriptions for Water Offset Projects

Appendix F – Water Rights Assessment Technical Memo

Appendix G – Policy, Regulatory, and Adaptive Management Recommendations Proposed by the WRIA 15 Committee