Watershed Restoration and Enhancement Plan

WRIA 14
Kennedy - Goldsborough Watershed

Adopted by Ecology December 2024

Publication: 22-11-016

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/2211016.html

Cover photo credit: Kennedy Creek, Angela Johnson (Washington Department of Ecology)

Contact Information

Water Resources Program

Address: 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 WRpublications@ecy.wa.gov. For Washington Relay Service or TTY call 711 or 877-833-6341. Visit Ecology's website for more information.

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

List of Figures and Tables

Figures

Tables

Acknowledgements

Ecology based much of this plan on work conducted through numerous committee and workgroup meetings of the WRIA 14 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 the 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 Jimmy Kralj (Environmental Science Associates [ESA]). 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) 14 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 14 (the Kennedy-Goldsborough 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 14 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 2019). 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 projects 4,294 new permit-exempt domestic well connections (PE wells) over the planning horizon (2018-2038). The estimated consumptive water use associated with the new PE well connections is 760 acre-feet per year (AFY) (1.05 cubic feet per second [cfs] or 677,591 gallons per day [gpd]) in WRIA 14. The projects and actions in this watershed plan will address and offset the consumptive water use from those 4,294 PE well connections.

This watershed plan includes 8 projects and project types that provide a potential offset of 1,725 acre-feet per year to benefit streamflows and enhance the watershed. Additional projects in the plan will provide benefits to fish and wildlife habitat, such as several thousand feet of streambed improvements, dozens of acres of restoration and protection, and many miles of riparian restoration across WRIA 14.

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 eight 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 14.

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 2019). 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.

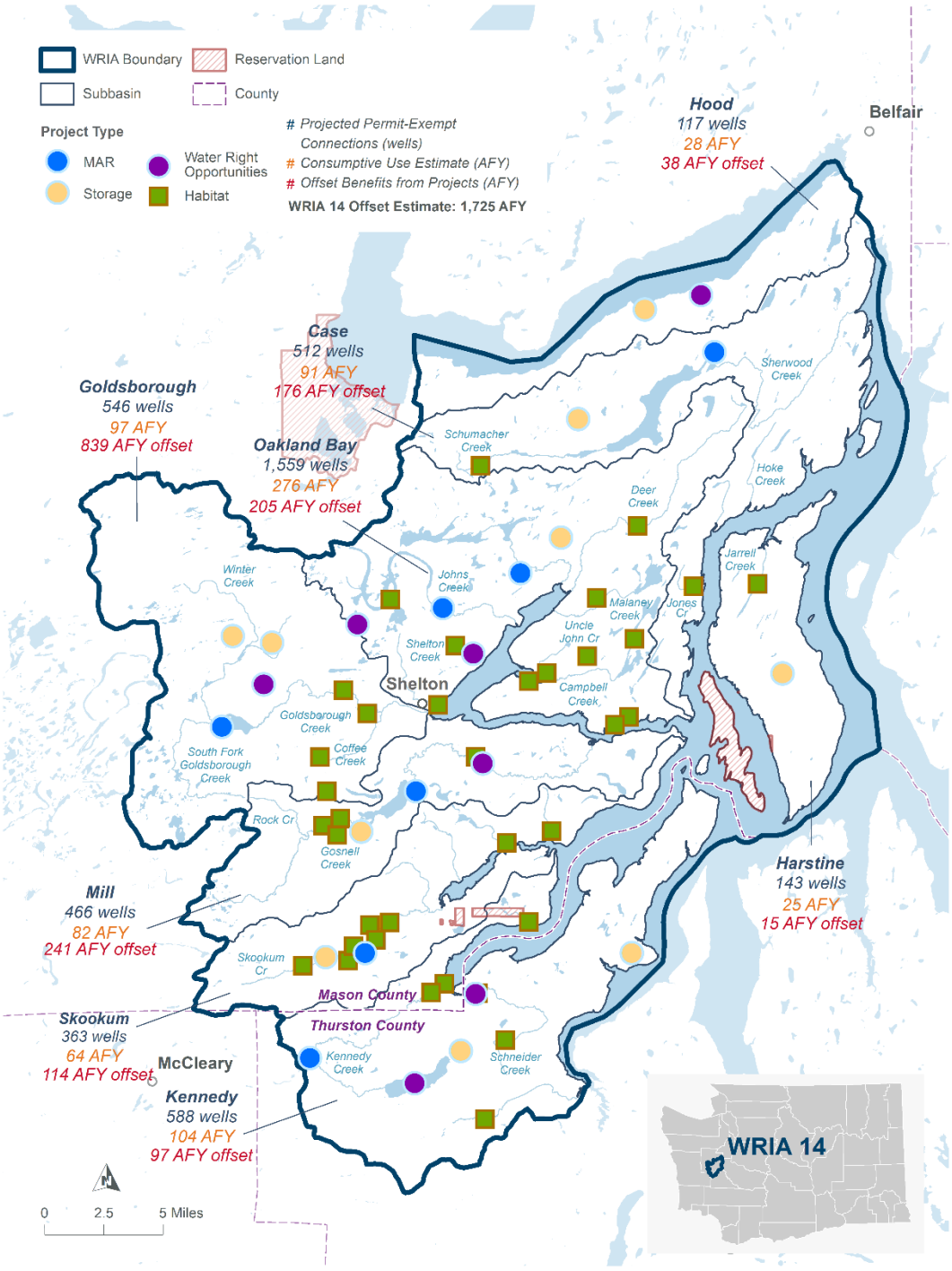

Figure ES 1: Summary of findings of the WRIA 14 Watershed Restoration and Enhancement Plan, including estimates for new domestic permit exempt well growth, consumptive use estimates, and project offset benefits. Map prepared by GeoEngineers.

Chapter One: Plan Overview

1.1 Plan Purpose and Background

The purpose of this Water Resource Inventory Area (WRIA) 14 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 (referred to as the Final NEB Guidance throughout this plan) (Ecology 2019). This plan considered all available information including priorities for salmon recovery and watershed recovery and the draft materials prepared by the WRIA 14 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 14 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.

[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 14 Committee and their planning process.

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 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 concerned with the 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 2021). Several laws pertain to the management of PE wells in WRIA 14. This plan summarizes those laws below to provide context for this WRIA 14 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 14 and elsewhere. For example, local governments must, among other responsibilities relating to new PE wells, collect a $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 14 to a maximum annual average of up to 950 gallons per days per connection, subject to the five thousand gallons per day and ½-acre outdoor irrigation of non-commercial lawn/garden limits established in RCW 90.44.050. 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(3h).

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 14 Committee, invite the Committee participants, and chair the Committee.[6] As directed in RCW 90.94.030(3)(b) Ecology collaborated with the WRIA 14 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 14 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 C. Over the course of the following two and a half years and with the support of the Committee's consulting team, [7] the WRIA 14 Committee held formal monthly Committee meetings as well as periodic workgroup meetings. Ecology distributed the WRIA 14 Committee's draft watershed plan in January, 2021 for Committee member review and official approval from the entities they represented. The WRIA 14 Committee voted on the draft watershed plan in April, 2021. This vote yielded 7 entities voting to approve, and 4 entities voting to disapprove. The final WRIA 14 Committee meeting summary, along with the voting record, is available in Appendix D. The law required that all Committee members approve the watershed plan, so 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 14 Watershed Committee, and recommendations from the Salmon Recovery Funding Board.

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

[7] Facilitation support was provided by Sound Resolutions (Susan Gulick), with support from ESA (Jimmy Kralj). Technical consulting support was provided by HDR (Chad Wiseman). 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 14 Committee Roster. See Appendix xx for workgroup membership.

Primary Representative Name	**Alternate Representative Name**	**Entity Name**
Commissioner Kevin Shutty	Commissioner Randy Neatherlin, David Windom	Mason County*
Joshua Cummings	Kaitlynn Nelson, Brad Murphy	Thurston County*
Ken Gill	Mark Ziegler, Jason Dose	City of Shelton*
Alex Gouley	Seth Book , Dana Sarff	Skokomish Indian Tribe*
Jeff Dickison	Paul Pickett	Squaxin Island Tribe*
Angela Johnson	Mike Noone, Rebecca Brown	Department of Ecology*
Allison Cook	Darrin Masters, Tristan Weiss, Megan Kernan	Department of Fish and Wildlife*
Commissioner Ron Gold	James Reyes, Brandy Milroy, Kristin Masteller	Mason County PUD #1*
Elaine Packard	Lois Ward	Washington State Chapter Sierra Club*
Josie Cummings		Building Industry Association of Washington (previous participation from Olympia Master Builders)*
Larry Boltz	Paul Miller	Mason-Kitsap Farm Bureau*
Fern Schultz		Department of Health (ex officio)
John Bolender	Barbara Adkins	Mason Conservation District (ex officio)
Patti Case		Green Diamond (ex officio)

*Ecology was required to invite entity to participate in committee under RCW 90.94.030(2)(a).

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:

- Plan overview.
- Overview of the watershed.
- Summary of the subbasins.
- Growth projections and consumptive use estimates.
- Description of the recommended projects and actions identified to offset the future permit-exempt domestic water use in WRIA 14.
- Evaluation and consideration of NEB.

Chapter Two: Watershed Overview

2.1 Brief Introduction to WRIA 14

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 14, also referred to as Kennedy-Goldsborough, is one of the 62 designated major watersheds in Washington State (Figure 1).

The 381 square mile Kennedy-Goldsborough Watershed is within Mason and Thurston counties and includes an extensive network of independent streams that issue from springs, wetlands, small lakes, and surface water drainages (Figure 1). These streams originate from the hills located between the inlets of southern Puget Sound and the Olympic Mountains to the northwest and Black Hills to the southwest, emptying into shallow bays and inlets. Principal drainages include Cranberry, Goldsborough, Kennedy, Perry, Mill, Sherwood, Johns, Deer, Alderbrook, Shumocher and Skookum Creeks. The Kennedy-Goldsborough Watershed has no major river system.

2.1.1 Land Use in WRIA 14

The upland portion of the watershed generally consists of forested land with large acreages of second and third growth coniferous trees. Land uses shift to rural and urban developments in the lower portions of streams near salt water bays. Rural residential development has primarily occurred in the unincorporated areas of Mason and Thurston counties (Figure 1).

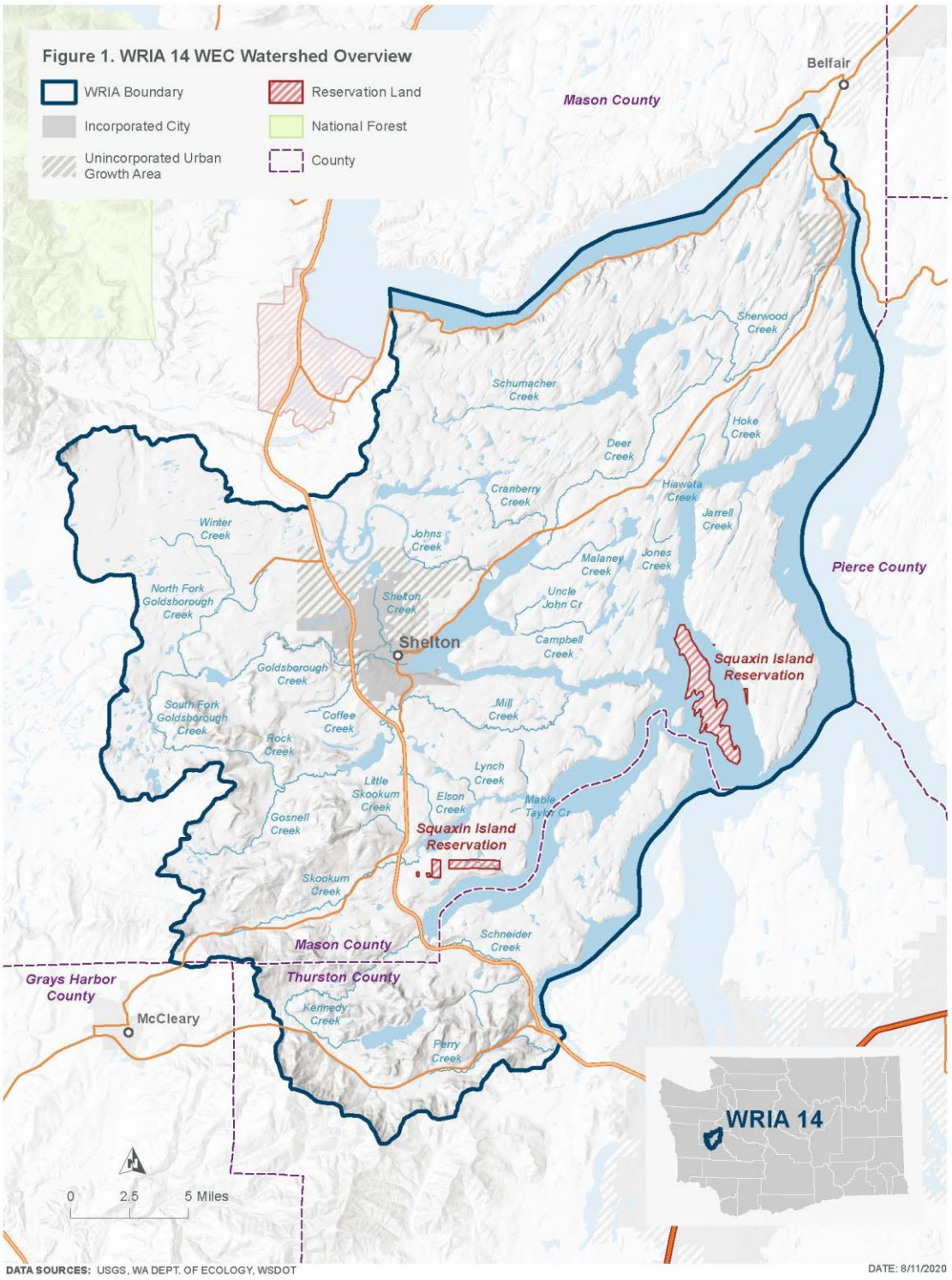

Figure 1: WRIA 14 WRE Watershed Overview. Map prepared by HDR.

The central portion of the Kennedy-Goldsborough Watershed, near Shelton is predominantly urbanized, characterized by a combination of residential, civic/institutional, and commercial land covers. Undeveloped land makes up most of the portion of WRIA 14 that is in Thurston County, while forest land makes up most of the portion of WRIA 14 that is in Mason County. WRIA 14 has both unincorporated urban growth areas and incorporated urban growth areas, totaling approximately 4 percent of the watershed. The Squaxin Island Tribe's Reservation and Off-Reservation trust land occupies approximately 2,162 acres of WRIA 14 (Figure 1).

2.1.2 Tribal Reservations and Usual and Accustomed Fishing Areas

Tribes with usual and accustomed fishing areas within WRIA 14 include the Skokomish and Squaxin Island Tribes. These tribes hold reserved fishing rights in WRIA 14 under their treaties with the federal government (Treaty of Point No Point, Treaty of Medicine Creek).

The Tribes claim Treaty-reserved water rights in WRIA 14 under federal law that are necessary to support healthy salmon populations; to support and maintain hunting, fishing and cultural resource harvesting rights; and to meet all homeland purposes reserved by the Treaties. These rights have not been confirmed and quantified through an adjudication in federal or state court. Reserved water rights are necessary to fulfill the promises and purpose of the Treaties. Federal Indian water rights retain a senior priority date over all other federal and state water rights holders and state instream flow rules. Although federal Indian water rights in WRIA 14 have yet to be adjudicated, any Treaty-reserved water rights are senior to all other rights and have not been fully accounted for by the State of Washington in the way in which the State determines water availability and over appropriation, and adopts instream flow rules.

2.1.3 Salmon Distribution and Limiting Factors

The Kennedy-Goldsborough Watershed is an important and productive system for salmonids. Several tributaries provide spawning and rearing habitat for fall and Summer Chum Salmon (*Oncorhynchus keta*), Coho Salmon (*Oncorhynchus kisutch*), Winter Steelhead (*Oncorhynchus mykiss*) and Coastal Cutthroat (*Oncorhynchus clarkii clarkia*). Chinook Salmon (*Oncorhynchus tshawytscha*) are known to occur, but not spawn and rear in these steams. These streams often experience low streamflows during critical migration and spawning time. In addition, damming of wetlands to create man-made lakes and shoreline modifications, conversion of forestland to agricultural or residential land uses have altered streams in WRIA 14.[9] Similar to climate projections for much of the Western United States, WRIA 14 is projected to experience increasing stream temperatures, increasing flooding and declining summer minimum flows. These changes are likely to cause additional disruption to salmon as they migrate, spawn and rear (Mauger et al., 2015).

[9] Salmonid Habitat Limiting Factors WRIA 14.

Both incorporated and unincorporated municipalities, various small industrial and commercial facilities, and agriculture in the Kennedy-Goldsborough Watershed compete for a finite water supply, causing a strain on surface water availability, especially during low seasonal flows in productive salmonid streams. Many people depend on the salmon fishery. This includes the Squaxin Island Tribe and the Skokomish Indian Tribe, both with usual and accustomed areas in the Kennedy-Goldsborough Watershed (NWIFC 2014).

The Kennedy-Goldsborough watershed primarily supports Coho Salmon, Chum Salmon, winter steelhead, coastal cutthroat trout, and Chinook Salmon, (Tables 2, 3, and 4).

Table 2: Salmonid Species and Status in WRIA 14 - Puget Sound

Common Name	Scientific Name	Population[1]	Critical Habitat	Regulatory Agency Status
Chinook Salmon	Oncorhynchus tshawytscha	Puget Sound Chinook	No	NMFS/ Threatened/1999
Chum Salmon	Oncoryhnchus keta	Puget Sound Chum Salmon	No listing	Not listed
Coho Salmon	Oncorhynchus kisutch	Puget Sound/Strait of Georgia Coho Salmon	No	NMFS/Species of Concern/1997
Steelhead Trout	Oncorhynchus mykiss	Puget Sound Steelhead	Yes/2016	NMFS/ Threatened/2007
Rainbow Trout[10]	Oncorhynchus mykiss	No listing	No listing	No listing
Coastal Cutthroat Trout	Oncorhynchus clarki	No listing	No listing	No listing

Table 3: Salmonid Species and Status in WRIA 14 - Hood Canal

Common Name	Scientific Name	Population[1]	Critical Habitat	Regulatory Agency Status
Chinook Salmon	Oncorhynchus tshawytscha	Puget Sound Chinook	No	NMFS/ Threatened/1999
Chum Salmon	Oncoryhnchus keta	Hood Canal Chum Salmon	No Listing	No Listing
Coho Salmon	Oncorhynchus kisutch	Puget Sound/Strait of Georgia Coho Salmon	No	NMFS/ Threatened/1999
Steelhead Trout	Oncorhynchus mykiss	Puget Sound Steelhead	Yes/2016	NMFS/Species of Concern/1997
Rainbow Trout	Oncorhynchus mykiss	No listing	No listing	No listing
Coastal Cutthroat Trout	Oncorhynchus clarki	No listing	No listing	No Listing

[10] Note: Resident rainbow trout are the same species as steelhead and have a similar freshwater life history as steelhead. However, they are not anadromous residing in their stream of origin throughout their life.

Chinook Salmon have been documented to occur in some WRIA 14 streams, but there is no known documentation of spawning and rearing. Chinook presence is likely due to strays from other river systems. Estuaries such as the Oakland bay provide key habitat for juvenile rearing during smolt saltwater phases of Puget Sound stocks from other rivers and streams.

Coho Salmon enter WRIA 14 streams from mid-September to mid-November and spawn from late October to mid-December (Table 3). Incubation occurs through the following April. Juvenile rearing occurs for over a year before smolt outmigration the following spring.

Chum Salmon enter WRIA 14 streams in the fall and winter (Table 3). Summer Chum Salmon typically enter WRIA 14 streams in the late summer to fall and spawn from September to November. Fall Chum Salmon typically enter WRIA 14 streams in the fall and spawn primarily in November and December. Incubation occurs through the late winter. Juvenile rearing and smolt outmigration occurs from that spring to early summer.

Winter steelhead enter WRIA 14 streams in the late fall through the following spring and spawn in the spring (Table 3). Prior to spawning, maturing adults hold in pools or in side channels to avoid high winter flows. Steelhead tend to spawn in moderate to high gradient sections of streams and spawn higher in the watershed compared to other salmonids. Incubation occurs through the following summer. Juvenile rearing occurs for over a year before smolt outmigration the following spring.

Coastal cutthroat trout enter WRIA 14 streams in the late fall and spawn in the winter and early spring (Table 3). Freshwater rearing occurs for a full year with smolt outmigration occurring the following spring.

Table 4 below lists the run timing and life stages of anadromous salmon and trout present throughout the watershed.

Table 4: Salmonid Presence and Life History Timing in Kennedy-Goldsborough

Species	Freshwater Life Phase	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Subbasin
Coho Salmon	Upstream migration									■	■	■		All (except Harstine)
	Spawning	■									■	■	■	
	Incubation	■	■	■							■	■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■	■							
Chum Salmon (summer)	Upstream migration								■	■	■			Oakland Case
	Spawning									■	■	■		
	Incubation	■	■							■	■	■	■	
	Juvenile rearing		■	■	■	■								
	Juvenile outmigration		■	■	■	■	■							
Chum Salmon (fall)	Upstream migration										■	■	■	All (except Harstine)
	Spawning	■	■									■	■	
	Incubation	■	■	■	■							■	■	
	Juvenile rearing			■	■	■								
	Juvenile outmigration			■	■	■	■							
Coastal Cutthroat	Upstream migration											■	■	Kennedy Skookum Goldsborough Mill Oakland
	Spawning	■	■	■	■								■	
	Incubation	■	■	■	■	■						■	■	
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■	■							
Steelhead (winter)	Upstream migration	■	■	■	■								■	All (except Harstine)
	Spawning		■	■	■	■	■							
	Incubation			■	■	■	■	■						
	Juvenile rearing	■	■	■	■	■	■	■	■	■	■	■	■	
	Smolt outmigration			■	■	■								

The Washington State Conservation Commission Limiting Factors Analysis (Kuttel 2002) identified specific limiting factors for specific waterbodies, but also provide the following general themes throughout WRIA 14 streams and rivers on a multi-species basis:

- Fish Passage
- Riparian Canopy Closure
- Streambank Condition
- Floodplain Connectivity
- Substrate Embeddedness
- Large Woody Debris

- Pool Frequency and Quality
- Off-channel Habitat
- Temperature
- Dissolved Oxygen
- Water Quantity/ Dewatering
- Change in Flow Regime
- Biological Processes

Water quantity/ dewatering was listed as a limiting factor in Skookum Creek, Mill Creek, Goldsborough Creek, Shelton Creek, Johns Creek, and Cranberry Creek. Changes in flow regime were a limiting factor in Skookum Creek, Goldsborough Creek, Shelton Creek, and Cranberry Creek.

2.1.4 Water System Distribution and Impacts in WRIA 14

Pumping from wells can reduce groundwater discharge to springs and streams by capturing water that would otherwise have discharged naturally. Surface water availability for streamflow may be influenced by groundwater pumping such that flows are reduced. Consumptive water use (that portion not returned to the aquifer) reduces streamflow, both seasonally and annually. A well pumping from an aquifer connected to a surface water body can either reduce the quantity of water discharging to surface water or increase the quantity of water leaking out of the river.[11]. As required by RCW 90.94, this watershed plan includes projects and actions that offset consumptive use associated with permit-exempt domestic water use, and restore streamflow.

2.2 Watershed Planning in WRIA 14

Citizens and local, state, federal, and tribal governments have collaborated on watershed and water resource management issues in WRIA 14 for decades. Watershed planning under RCW 90.82 resulted in a draft watershed plan,[12] but a final plan was never approved. It should be noted that RCW 90.82 provided that "the portion of the WRIA where surface waters drain into Hood Canal shall be considered WRIA 14b, and the remaining portion shall be considered WRIA 14a. Planning for WRIA 14b under this chapter shall be conducted by the WRIA 16 planning unit." Under RCW 90.98, this division did not occur, and the Plan will address all of WRIA 14.

[11] Department of Ecology, 1995

[12] WRIA 14 Watershed Management Plan – Kennedy–Goldsborough Watershed. Final Draft / February 2006. Prepared under Grant G0000107 for the WRIA 14 Planning Unit by Plateau Technical Communication Services. http://www.plateautechcomm.com/docs/WRIA14_Plan_FinalDraft.pdf

A brief summary of broad watershed planning efforts as they relate to the past, present, and future water availability in the Kennedy-Goldsborough Watershed is provided in this section.

This WRIA 14 watershed plan is building on many of the past efforts to further develop comprehensive plans for the entire watershed. The Kennedy-Goldsborough Watershed is within two Local Integrating Organizations (LIO), the Alliance for a Healthy South Sound (AHSS)[13] and the Hood Canal Coordinating Council (HCCC). The AHSS is developing an ecological recovery plan and the HCCC adopted an Integrated Watershed Plan in 2014. The LIOs have completed ecosystem recovery plans as part of the Action Agenda for Puget Sound Recovery and are actively working to implement holistic approaches to recovery including projects on salmon and orca recovery, stormwater runoff, shellfish protection, and forest conservation.[14] The planning process to develop an ecosystem recovery plan is community based with engagement by local, state and federal agencies. The community is engaged in a collaborative planning process to help understand priorities and support the health and sustainability of the watershed.

The Public Water System Coordination Act of 1977[15] created Critical Water Supply Service Areas (CWSSA). This Act requires each water purveyor in a CWSSA to develop a water system plan for their service area, with the boundaries being in compliance with the provision of the Act. The Washington State Department of Health is primarily responsible for the water system plan approval; however local governments ensure consistency with local growth management plans and development policies. This Act and the water system plans are important for the WRIA 14 watershed planning process as water system service areas and related laws and policies can set stipulations regarding timely and reasonable service as to whether new homes connect to water systems or rely on new permit-exempt domestic wells.[16] There are currently no Coordinated Water System Plans in WRIA 14.

2.2.1 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

[13] More information on the AHSS can be found here: https://www.healthysouthsound.org/
[14] More information on local integrating organizations and their efforts to recovery Puget Sound is available here: https://www.psp.wa.gov/LIO-overview.php.
[15] RCW 70.116.070
[16] County water system planning information is available for each county.
Mason County: https://www.co.mason.wa.us/health/environmental/drinking-water/public-water-systems.php
Thurston County: https://www.thurstoncountywa.gov/planning/Pages/comp-plan.aspx

areas more suitable for development. The project covers the entire Puget Sound drainage area — from the Olympic Mountains to the Cascades.[17]

The characterization results can 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 causes 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)[18] scale (Wilhere et al. 2013).[19] 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

Thurston County has adopted a coordinated water system plan that focuses on the Group A water systems. The water system plan determines 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.[20]

[17] For more information on the watershed characterization project, visit: Watershed characterization project - Washington State Department of Ecology

[18] 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.

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

[20] Water system planning information for Thurston County is available: https://www.co.thurston.wa.us/health/ehdw/pdf/SouthCountyCoordinatedWaterSystemPlan.pdf

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 14 counties, comprehensive plans identify Mason and Thurston 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 14 watershed plan was coordinated with the Mason and Thurston counties' comprehensive plans.[21]

2.2.2 Coordination with Existing Plans

Throughout the development of the watershed plan, Ecology streamflow restoration staff have engaged with staff from the Salmon Recovery Lead Entity and the Puget Sound Partnership, providing briefings on the streamflow restoration law, scope of the watershed plan, and plan development status updates. Ecology conducted outreach to the WRIA 14 Salmon Recovery Lead Entity to ensure alignment of salmon recovery priorities and the streamflow planning process. The WRIA 14 lead entity collaborated by selecting priority streams based on information from the Salmon Recovery Plan, incorporating priority salmon recovery projects in the watershed plan, and reviewing project lists and descriptions.

County comprehensive planning under the Growth Management Act of 1990 identifies where and how future population, housing, and job growth is planned. Development of this plan was also coordinated with the Mason County and Thurston County comprehensive plans. The comprehensive plans set policy for development, housing, public services and facilities, and environmentally sensitive areas, among other topics. The comprehensive plans identify Mason and Thurston County's urban growth areas, set forth standards for urban and rural development, and provide the basis for zoning districts. Ecology used the Mason and Thurston County zoning districts as the basis for determining likely areas of future rural growth.

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 (Pringle, 2008). Multiple advances and retreats of the ice sheet formed the Puget Sound Lowlands, depositing a complex sequence of glacial and inter-glacial

[21] Comprehensive planning under GMA is available from each county:
Mason County: https://masoncountywa.gov/community-services/planning/2036-comp-plan-update/index.php
Thurston County: https://www.thurstoncountywa.gov/planning/Pages/comp-plan.aspx

sediments on top of older sediments and Eocene age (56 to 33.9 million yeaers ago) basalt bedrock.

The surficial geology of WRIA 14 is dominated by a sequence of unconsolidated glacial and interglacial deposits. Depth to bedrock can exceed 1,000 feet in the eastern part of the WRIA (Welch and Savoca, 2011). Basalt bedrock forming the Black Hills outcrops in the southwestern part of the WRIA and the unconsolidated deposits are thin or absent. Basalt bedrock is also present around the majority of Summit Lake, resulting in irregular and unpredictabe groundwater availability (Gray and Osborne 1991; WDNR 2004). Most residential permit-exempt groundwater wells "…utilize seep developments or dug wells which intercept the shallow groundwaters moving towards the lake…" (Noble and Wallace 1966).

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 permit-exempt wells.

2.3.2 Hydrogeologic setting

The U.S. Geological Survey (USGS) described the hydrogeology of the northern and eastern areas of WRIA 14 in a hydrogeologic framework report for the Johns Creek Subbasin (Welch and Savoca 2011). Surficial geologic maps of most of the WRIA have also been developed by the Washington State Department of Natural Resources.[22] The hydrogeologic units of the area are described as being either water-bearing ("aquifer") and 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 shallow, often discontinuous aquifers generally flows toward local surface water bodies (lakes and streams) while groundwater in deeper, more regional aquifers is expected to flow generally eastward toward inlets of Puget Sound or northward toward Hood Canal. In some areas, groundwater may flow in a different direction from surface water. For example, in upper Goldsborough Creek basin surface waters flow towards the South Sound, but some aquifers flow towards Hood Canal (Plateau 2006).

The USGS described the hydrogeology of the watershed as eight hydrogeologic units, typically alternating between aquifer and non-aquifer layers. This information is summarized in Appendix E: Regional Aquifer Units in WRIA 14. Four of the aquifers and two of the confining units defined by the USGS are present throughout watershed, except in the southwest portion where bedrock is at or near land surface. These four aquifers are the most likely water sources for new permit-exempt wells. The upper three aquifer units (AA, UA, MA) are also the main

[22] e.g., Derkey, et al., 2009a; Derkey, et al., 2009b; Polenz, et al., 2010

source of direct recharge or baseflow to the surface water system. The Lower Aquifer does not have surface expressions except below sea level where it projects into Hood Canal.

2.3.3 Hydrology and Streamflow

The Kennedy-Goldsborough Watershed (WRIA 14) hydrology is characterized by numerous independent and separate small streams that drain into the marine waters of Puget Sound. There are 139 identified streams totaling over 240 linear miles in the watershed. All of the streams are typical lowland types with their headwaters originating from natural springs, surface water drainages, wetlands, or small lakes in foothills. Despite its abundance of creeks, WRIA 14 has no major river systems. The principal drainages are Schumacher, Sherwood, Cranberry, Deer, Johns, Goldsborough, Mill, Kennedy, Perry, Alderbrook, and Skookum Creeks with many smaller streams discharging directly into Puget Sound (Figure 1) (Plateau, 2006). The topography is relatively flat (ranging from sea level to ~300+ feet elevation) except in the westerly portion of the watershed where elevations rise up to 2,400 feet.

The largest streams consist of Goldsborough (mean annual flow of ~125 cfs), Kennedy (mean annual flow of ~65 cfs), and Skookum (mean annual flow of ~55 cfs) Creeks. Approximately 20 percent of streamflows are supported by a relatively constant year-round discharge of groundwater as baseflow, varying from 6 percent in the Upper Kennedy catchment (which is underlain primarily by bedrock) to 24 percent in the Case Inlet drainages (which is underlain by sediments) (Golder 2003).

Because snow and snow pack are not major factors in the watershed, streamflows reflect seasonal variation in precipitation. Annual precipitation ranges from approximately 55 inches near the Puget Sound to approximately 85 inches on the west side of the watershed (Golder 2003). In addition to directly contributing to streamflow maintenance, precipitation also contributes to storage in lakes and aquifers that serve as natural reservoirs, helping to moderate extreme high and low flows. Much of the precipitation that falls in the Black Hills runs off because of the impermeable rock that dominates the landform. This causes many headwater streams originating in the southwestern portion of WRIA 14 to go dry during the summer months. Precipitation that falls on the unconsolidated sediment of the glacial plain tends to percolate into the groundwater, providing perennial flow to lowland streams. Groundwater provides all late summer baseflow to area streams (Molenaar and Noble 1970). Water recharged to the deeper groundwater system may discharge directly to Puget Sound, an ecologically important function that maintains nearshore marine habitat.

Streamflows in WRIA 14 are typically lowest during the late summer and early fall, when precipitation is low and infrequent. Flows are sustained by groundwater contributions during this period, when rearing juvenile coho and late summer spawning Chum Salmon are most impacted by low flows. Extreme low flows in these streams can occur during years with relatively low precipitation, because of lower water tables and reduced shallow subsurface flows from summer precipitation.

The USGS provided the streamflow statistics for Kennedy and Goldsborough Creeks, both of which have at least ten years of continuous stream gauging data and an established minimum

instream flow regulation.[23] Streamflow statistics from stream gage data provided by the Squaxin Island Tribe were developed by the Department of Ecology, and are included in Appendix K. Analyses indicate that minimum instream flows in these creeks were not met between 50-60% of the time during the period of record, which was considered to be within a wet cycle of the Pacific Decadal Oscillation (PDO) (Golder 2003) (Kuttel 2002). Kennedy creek is regulated by a discharge structure in Summit Lake, and the shallow underlying bedrock ties the lake and stream together creating a unique situation as it relates to meeting instream flows.

WAC 173-514 set minimum instream flows for the Kennedy-Goldsborough watershed and its tributaries, closing streams to further appropriation of surface water. WAC 173-515 set minimum instream flows for 10 streams and their tributaries, including lakes. Eight of these 10 streams and their tributaries are closed to further appropriation of surface water for part of the year. An additional 11 streams and their tributaries are closed to further appropriation of surface water from May 1 – October 31. Streams subject to minimum instream flows include Shumocher Creek, Sherwood Creek, Deer Creek, Cranberry Creek, Johns Creek, Goldsborough Creek, Mill Creek, Skookum Creek, Kennedy Creek, and Perry Creek. Many of these streams, including Cranberry Creek, Johns Creek, Goldsborough Creek, Skookum Creek, and Mill Creek, have average monthly flows that are less than the minimum instream flows on a seasonal basis (SIT 2020).

To help understand the connection between groundwater and surface water and the effects of PE well pumping in the watershed, a three dimensional, steady-state groundwater model was developed by Ecology (Golder Associates), and the Squaxin Island Tribe (Keta Waters). A 2015 Golder Associates (Golder) report developed for Ecology describes the in results of eight modeling scenarios run on behalf of Ecology using the model to evaluate the effects of groundwater withdrawals by new PE wells in the Johns Creek subbasin. One significant finding was that instead of reducing streamflows, groundwater withdrawals in the Johns Creek subbasin primarily decreased submarine groundwater discharge to Oakland Bay. Furthermore, with some scenarios, streamflows actually increased slightly in upper Johns Creek watershed, representing a redistribution of water in the system from septic return flows. Overall, Golder's results indicate that the percent reduction of streamflows within modeled reaches of Johns Creek ranged from a gain of 0.09 to a loss of 0.15 percent (Golder 2015).

The University of Washington Climate Impact Group has developed numerous downscaled global climate models to forecast streamflow and precipitation changes in the Puget Sound, including WRIA 14. General trends such as increased stream temperatures, earlier streamflow timing, increased winter flooding, and lower summer minimum flows are expected (Mauger, et al. 2015).[24]

[23] USGS streamflow statistics are available here: (https://waterdata.usgs.gov/wa/nwis/sw)
[24] Climate forecasts for WRIA 14 can be found here: https://climatetoolbox.org/

Chapter Three: Subbasin Delineation

3.1 Introduction

To allow for meaningful analysis of the relationship between new consumptive use and offsets per Ecology's Final NEB Guidance, Ecology divided WRIA 14 into eight subbasins for the purposes of this watershed plan.[25] This was helpful in describing the location and timing of projected new consumptive water use, the location and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects. In some instances, subbasins do not correspond with hydrologic or geologic basin delineations (e.g., watershed divides).[26]

A more detailed description of the subbasin delineation is in the technical memo available in Appendix G.

3.2 Approach to Develop Subbasins

This watershed plan divides WRIA 14 into eight subbasins for the purposes of assessing new PE wells, consumptive use, and project offsets initially using the delineations used in the draft WRIA 14 Watershed Management Plan.[27] The considerations in delineating subbasin boundaries for this planning process were:

- Existing or concurrent planning efforts may have already delineated subbasins.
- The receiving salt waterbody to which surface waters drain.
- Stream distribution within each subbasin.
- Fishery resources within each subbasin.
- Streams with closures and minimum flows within each subbasin.

[25] The WRIA 14 Committee reached agreement on the subbasin delineations presented in this watershed plan. Ecology concurs with the subbasin delineation.

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

[27] This 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 90.94.020(4)(b).

3.3 Subbasin Map

The WRIA 14 subbasin delineations are shown on Figure 2 and summarized below in Table 5:

Table 5: WRIA 14 Subbasins

Subbasin Name	Primary Rivers and Tributaries	County
Case	Sherwood Creek, Shumocher Creek, Hoke Creek, Hiawata Creek, and Jones Creek	Mason
Goldsborough	Goldsborough Creek, North Fork Goldsborough Creek, South Fork Goldsborough Creek, Winter Creek, and Coffee Creek	Mason
Harstine	Jarrell Creek	Mason
Hood	Alderbrook Creek and multiple small drainages discharging directly to Hood Canal	Mason
Kennedy	Kennedy Creek, Perry Creek, Snodgrass Creek, Schneider Creek and other small drainages	Thurston and Mason
Mill	Mill Creek, Rock Creek, Gosnell Creek and small drainages discharging to the south shore of Hamersley Inlet	Mason
Oakland	Deer Creek, Cranberry Creek, Johns Creek, and other small drainages discharging to Oakland Bay	Mason
Skookum	Deer Creek, Lynch Creek, Elson Creek, Little Skookum Creek, Skookum Creek, and all drainages discharging to Little Skookum Inlet	Mason

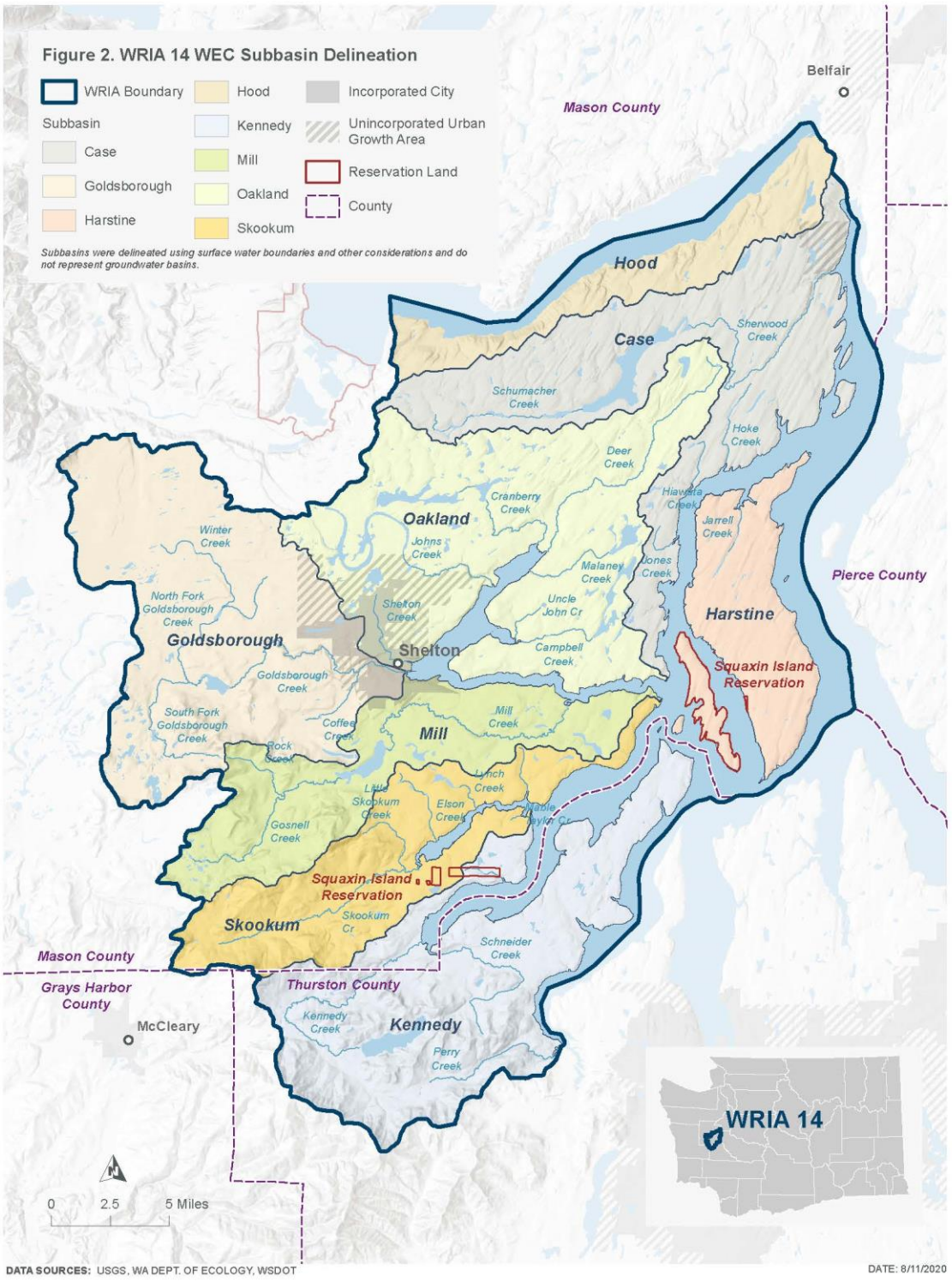

Figure 2: WRIA 14 WRE Subbasin Delineation. Map prepared by HDR.

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).[28] 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 methods and results for PE well and consumptive use projections is provided in a technical memorandum available in Appendix H.

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 wells serving group systems under RCW 90.44.0050. The well use discussed in this plan refers to both of these types of new well use. PE wells may be 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" and "home" refer to any permit-exempt domestic groundwater use, including other ERUs.

The method used to project the number of new PE wells in WRIA 14 is based on recommendations from Appendix A of Ecology's Final NEB Guidance.

The projection for new PE wells in WRIA 14 by subbasin is shown in Table 5 and Figure 3. This watershed plan projects 4,294 PE wells over the planning horizon.[29] The largest number of these wells are likely to be installed in the Oakland Bay subbasin.

[28] 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 recommends 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)

[29] Ecology concurs with the PE well projection methods and results developed by the WRIA 14 committee.

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 presents assumptions associated with the projections. The technical memo in Appendix H provide more detail on the assumptions that Ecology used in this plan.

4.2.1 Methodology

Ecology gave deference to each county for identifying the most appropriate method of projecting PE wells within their jurisdiction. Each county used a different method for calculating the PE well projections within their jurisdiction. Both the Mason County and Thurston County methods are based on Office of Financial Management (OFM) population forecasts, which is simple mortality and migration rate data collection. This method is summarized in the section below for each respective County. The technical consultant developed a WRIA 14 Permit-Exempt Growth and Consumptive Use Summary, provided in Appendix H, which offers a more detailed description of the methods used by the counties.

Mason County Growth Projection Methodology

Mason County developed growth projections based on the Mason County Comprehensive Plan, which is based on OFM medium population growth estimates.

Mason County used the following steps to project growth of permit-exempt connections over the planning horizon:

1. Develop 20-year growth projections based on OFM medium population growth estimates, and conversion to dwelling units based on assumed people per dwelling unit.

2. Determine available land for single family domestic units and determine proportion of build-out capacity by county urban growth areas (UGAs) and rural lands.

3. Apply growth projections to buildable lands.

4. Overlay subbasins to determine new permit-exempt connections in each subbasin.

These methods were used to develop an initial projection of 3,509 new PE wells. A revised projection was developed by assuming that some permit-exempt growth will occur in water system areas, which resulted in 3,765 new PE wells. It was assumed that growth in each respective water system will be proportional to buildable parcels without water system hookups relative to parcels with water system hookups. The following methods were applied on top of the initial methods:

1. Define total buildable parcels in GIS, using Department of Health (DOH) service area polygons and county parcel data.

2. Define total approved water system connections (built out + available) and active water system connections (built out) using the DOH Sentry database (DOH 2019).

3. Buildable parcels with water system hookup equals total approved minus active water system connections.

4. Buildable parcels without water system hookup equals total buildable parcels minus total approved water system connections.

5. Define proportion of permit-exempt growth within each water system by dividing number of buildable parcels without water system hookups by total number of buildable parcels.

6. Multiply proportion of permit-exempt growth within each respective water system by total growth projected to occur in that water system.

7. Sum additional permit-exempt growth by subbasin and add to initial permit-exempt growth projection.

Thurston County Growth Projection Methodology

The Thurston County growth projection methods and results were provided by the Thurston Regional Planning Council (TRPC) and Thurston County.[30]

TRPC used the following steps to project growth of permit-exempt connections over the planning horizon:

1. Develop 20-year growth projections based on OFM medium population growth estimates, and conversion to dwelling units based on assumed people per dwelling unit.

2. Develop residential capacity estimates.

3. Allocate growth to parcels based on recent residential development and permit trends, where capacity is available.

4. Once allocated, estimate the amount of development on permit-exempt connections based on the following criteria provided by Thurston County::

    a. Located outside incorporated cities; growth in incorporated cities is assumed to connect to a municipal water system.

[30] Documentation for TRPC's housing projections is available at https://www.trpc.org/236

b. Water systems within UGAs; permit-exempt growth is assumed to occur on parcels with no sewer service.

c. Rural water systems; assumed no permit-exempt growth.

These methods were used to develop an initial projection of 497 new PE wells. A revised projection was developed by assuming that some permit-exempt growth will occur in rural water system areas, which resulted in a projection of 529 new PE wells. It was assumed growth in each respective rural water system will be proportional to buildable parcels without water system hookups relative to parcels with water system hookups. 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 Mason County and Thurston County to determine PE well growth estimates.

4.2.2 Distribution of New PE Wells

Ecology mapped potential locations of new PE wells in the watershed based on parcels available for residential development dependent on PE wells. These parcels are primarily in rural areas, but also within Urban Growth Areas that are not served by water systems, and in water systems where growth is expected to exceed available water system infrastructure. The resulting map (Figure 3) shows the most likely areas that new residential development dependent on PE wells will occur.

Ecology projects that most new PE wells will occur in and around the Shelton urban growth area, in the Oakland and Goldsborough subbasins. (Table 6 and Figure 3).

Table 6: Number of PE Wells Projected between 2018 and 2038 for the WRIA 14 Subbasins

Subbasin	Projected PE Wells
Case	512
Goldsborough	546
Harstine	143
Hood	117
Kennedy (Mason County)	59
Kennedy (Thurston County)	529
Mill	466
Oakland	1559
Skookum	363
Totals	**4,294**

Mason County projects approximately 3,765 new PE wells within its portion of WRIA 14 over the planning horizon. Thurston County projects approximately 529 PE wells within its portion of unincorporated areas of WRIA 14 over the planning horizon. The total projection for WRIA 14 is 4,294 new PE wells.

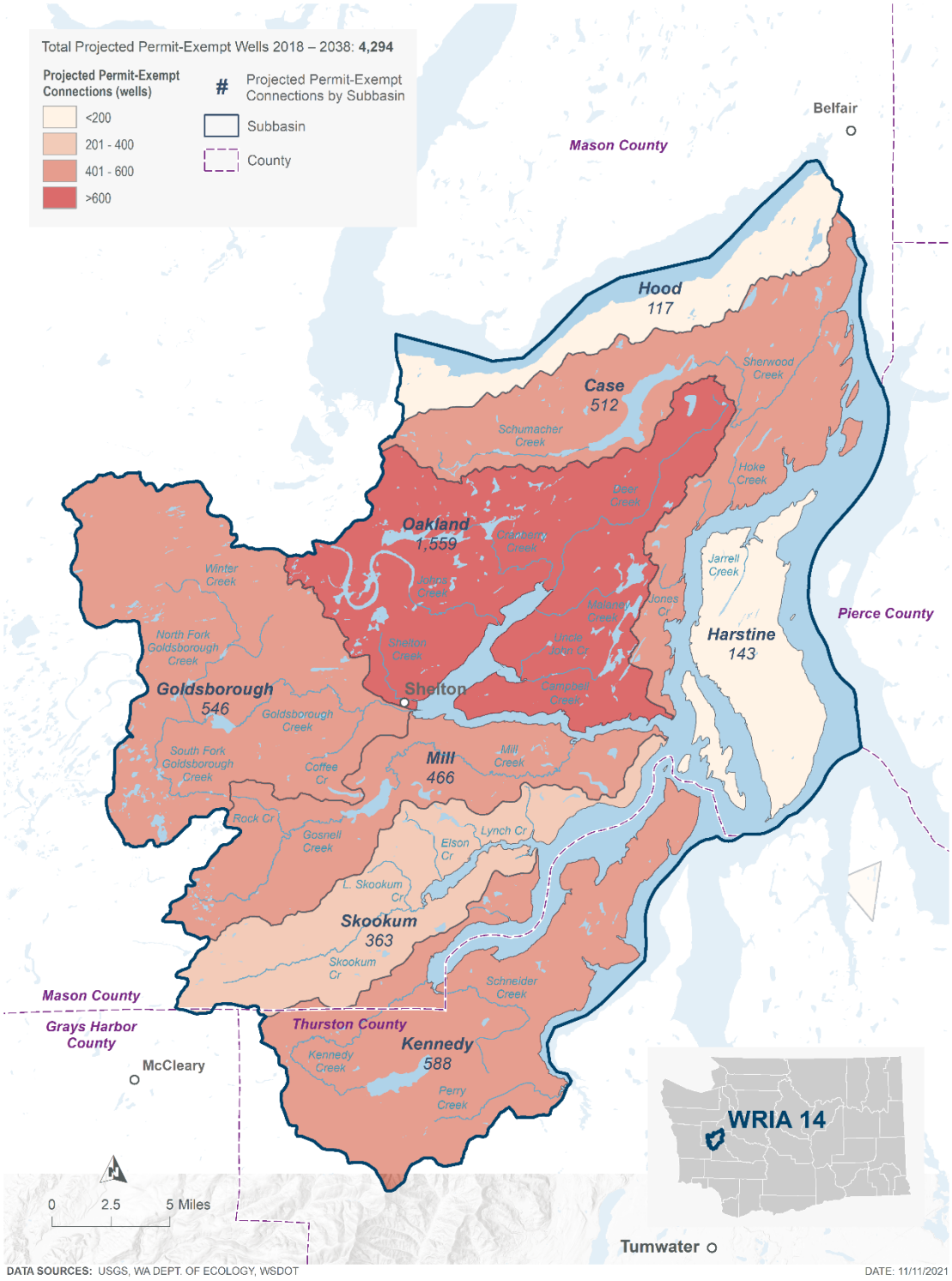

Figure 3: WRIA 14 WRE Distribution of Projected PE Wells for 2018-2038. Map prepared by GeoEngineers.

4.3 Impacts of New Consumptive Water Use

Ecology used a 20-year projection for WRIA 14 of new PE wells to estimate the consumptive water use that this watershed plan must address and offset. This watershed plan estimates 760 acre-feet per year (AFY) of new consumptive water use (consumptive use) in WRIA 14, and this section includes an overview of the methodology used to produce that estimate. The WRIA 14 Permit-Exempt Growth and Consumptive Use Summary provides a more detailed description of the analysis and alternative scenarios considered during the Committee process (Appendix H.)[31]

Consistent with the Final NEB guidance (page 8, Appendix B), Ecology assumed impacts from consumptive use on surface water are steady-state, meaning that impacts on the stream from pumping do not change over time. This assumption is based on the wide distribution of future well locations and depths across varying hydrogeological conditions.

4.3.1 Methodology to estimate indoor and outdoor consumptive water use

Appendix A of the Final NEB Guidance describes a method (referred to as the Irrigated Area Method) that assumes average indoor use per person per day, and reviews aerial imagery to provide a basis to estimate irrigated area of outdoor lawn and garden areas. Use patterns for indoor uses versus outdoor uses are different. Indoor use is generally constant throughout the year, while outdoor use occurs primarily in the summer months. Also, the portion of water use that is consumptive varies for indoor and outdoor water use. The Irrigated Area Method accounts for indoor and outdoor consumptive use variances by using separate approaches to estimate these uses.

To develop the consumptive use estimate, Ecology used the Irrigated Area Method and relied on assumptions for indoor use and outdoor use from Appendix A of the Final NEB Guidance (Ecology 2019).

New indoor consumptive water use

Indoor water use refers to the water that households use (such as in kitchens, bathrooms, and laundry), and that leaves the house as wastewater, typically into a septic system. 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):

[31] The WRIA 14 Committee considered a "most likely" and a "higher adaptive management" consumptive use estimate. The higher estimate is not presented here because Ecology considers 760 AFY a reasonable estimate of consumptive water use. Additional information is presented in the technical memorandum in Appendix H.

- 60 gallons per day (gpd) per person, as recommended by Ecology.

- 2.5 persons per household assumed for rural portions of WRIA 14[32]
- 10 percent of indoor use is consumptively used (or a consumptive use factor [CUF] of 0.10), based on the assumption that homes on PE wells are served by on-site sewage systems. On-site sewage systems return most wastewater back to the immediate water environment; a fraction of that water is lost to the atmosphere through evaporation in the drainfield.

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

60 gpd per person x 2.5 people per house x 0.10 CUF

This results in an indoor consumptive water use of 15 gallons per day per well and an annual average of 0.017 AFY.[33]

New outdoor consumptive water uses

Most outdoor water is used to irrigate lawns, gardens, orchards and landscaping, and may include water for livestock. 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 mainly through evapotranspiration (Ecology 2019).

Average outdoor irrigated area in WRIA 14 was estimated using aerial imagery to measure the irrigated areas of 80 randomly selected parcels of a stratified sample served by PE wells to develop an average outdoor irrigated area. This analysis returned a large portion of parcels with no visible irrigation, which were given irrigated area values of zero. To account for undetected irrigation or potential outdoor water use other than irrigation, Ecology directed the technical consultants to replace the zero values with a value of 0.05. Taking that assumption into account, the average irrigated area for the 80 parcels was 0.10 acres. The 0.10 acre value is used in the consumptive use calculations for WRIA 14.

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

[32] OFM information for each county:
Mason County: https://www.ofm.wa.gov/washington-data-research/county-and-city-data/mason-county
Thurston County: https://www.ofm.wa.gov/washington-data-research/county-and-city-data/thurston-county

[33] Acre-foot is a unit of volume for water equal to a sheet of water 1 acre in area and 1 foot in depth. It is equal to 325,851 gallons of water; 1 acre-foot per year is equal to 893 gallons per day.

- Crop irrigation requirements (IR) for turf grass according to Washington Irrigation Guide (WAIG) (NRCS-USDA 1997): a weighted average of 18 inches of irrigation for the Grapeview (18.8 inches), Shelton (17.8 inches), and Olympia (16.5 inches) WAIG stations. This value was used to estimate the amount of water needed to maintain a lawn.
- An irrigation application efficiency (AE) to account for water that does not reach the turf: 75 percent. This increases the amount of water used to meet the crop's irrigation requirement by 25 percent.
- Consumptive use factor of 0.8, reflecting 80 percent consumption for outdoor use. This means 20 percent of outdoor water is returned to the immediate water environment.
- Outdoor irrigated area based on existing homes using PE wells: 0.10 acres

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

$$\frac{1.5\ feet\ per\ year * 0.10\ acres * 0.80\ CUF}{0.75\ AE}$$

This results in 0.16 AF per year average outdoor consumptive water use per PE well for the WRIA. While this estimate is an average for the year, most outdoor water use will occur during the summer. Multiplying this AFY estimate per PE well by the projection of 4,294 new PE wells produces an estimate of 687 AFY for outdoor consumption by all PE wells.

4.3.2 Summary of Consumptive Use Estimates

The combined total indoor and outdoor consumptive use per PE well is 0.177 AFY (0.16 + 0.017 AFY). Multiplying this by the projected 4,294 new PE wells, the total consumptive use estimate for WRIA 14 is 760 AFY. Table 6 summarizes the estimated indoor and outdoor consumptive use by subbasin for WRIA 14. The highest consumptive uses are expected to occur in the subbasins with the most anticipated new PE wells, as presented in Figure 3: PE well growth by subbasin.

Table 6: WRIA 14 Estimated PE Well Projects and Indoor and Outdoor Consumptive Use Estimates by Subbasin, 2018-2038, in acre-feet per year[34]

Subbasin	Projected PE wells	Indoor CU (AFY)	Outdoor CU (AFY)*	Total CU/year (AFY) in 2038
Case	512	8.6	81.9	91
Goldsborough	546	9.2	87.4	97
Harstine	143	2.4	22.9	25
Hood	117	2.0	18.7	21
Kennedy	588	9.9	94.0	104
Mill	466	7.8	74.6	82
Oakland	1,559	26.2	249.4	276
Skookum	363	6.1	58.1	64
TOTAL	**4,294**	**72**	**687**	**760**

* Assumed Irrigated Acreage of 0.10 Acre

[34] 1 acre foot per year is equivalent to 0.0014 cfs, or 892.74 gallons per day

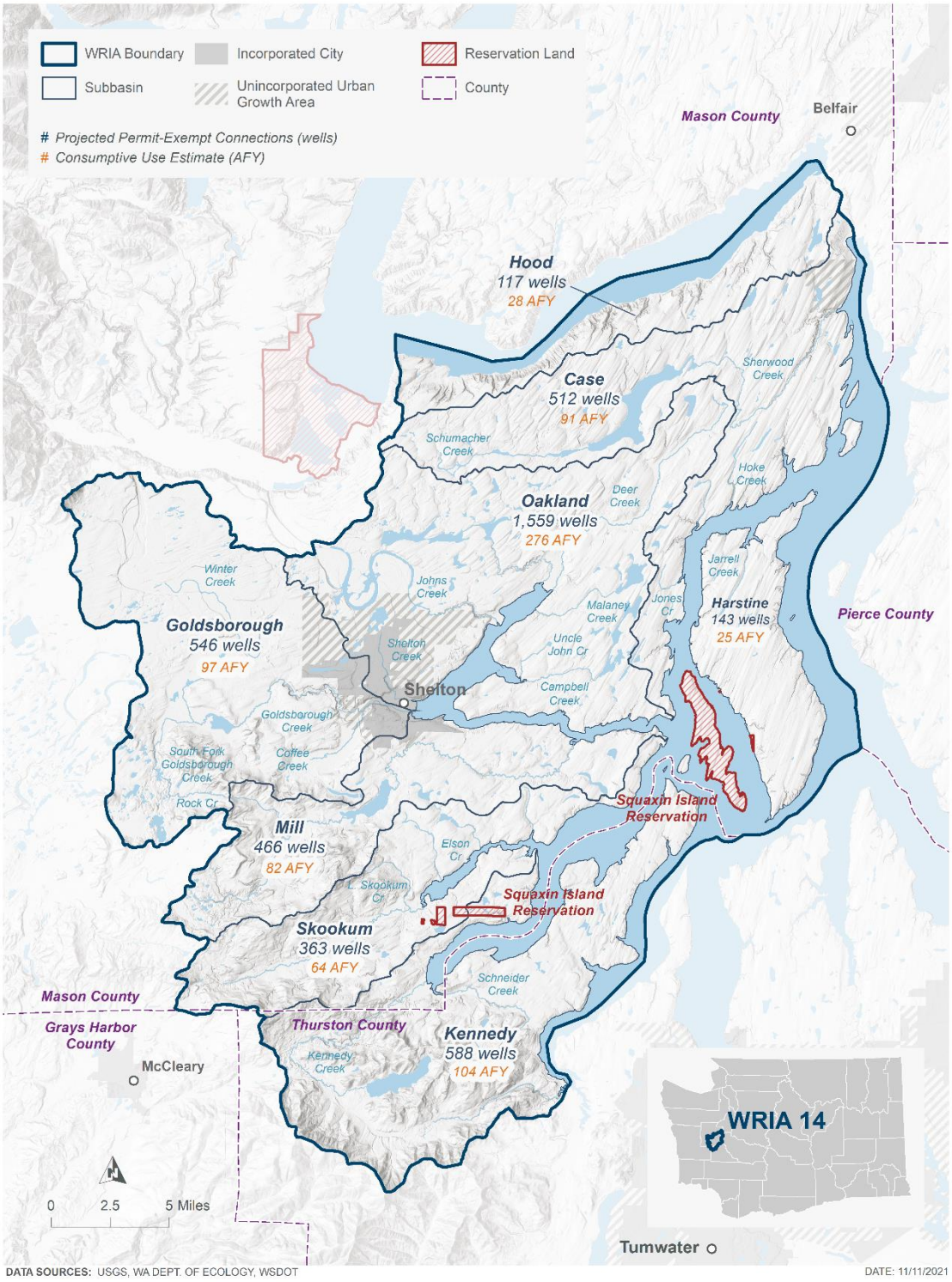

Figure 4: WRIA 14 Estimated Consumptive Use by Subbasin 2018-2038. Map prepared by GeoEngineers.

4.3.3 Assumptions for 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, so Ecology used the estimates of new consumptive water use to represent the impacts of that water use, and ultimately to determine the necessary offset amounts to cover 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 14, HDR compared the results of the analysis with similar analyses undertaken in other WRIAs (GeoEngineers and HDR 2020). The findings of the comparability study were that while the method is subject to error and results varied between the two analyses, variations were inconclusive in terms of accuracy and the differences were not large enough to warrant any revisions to the estimates. Some uncertainty associated with detection of irrigated areas in aerial photos was addressed by assigning a minimum value of 0.05 acre to the 80 parcels used to calculate the average irrigated area. When this minimum value was applied, the average irrigated area increased to 0.10 acres.

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.

Chapter Five: Projects and Actions

5.1 Description and Assessment

Watershed plans must identify projects that offset the potential impacts future PE wells will have on streamflows and provide a net ecological benefit (NEB) to the WRIA.[35] This chapter provides two types of 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 14 Committee process. Ecology and the technical consultants[36] 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 project information for some projects to build reasonable assurance for meeting offset need and NEB. Projects that did not provide a reasonable benefit for the anticipated cost or that were highly conceptual without a detailed description or project sponsor, were removed. Projects that were considered by the Committee, but that the Committee was unable to reach full support, were considered for inclusion if the streamflow benefit 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 a subset of projects determined to provide an offset benefit and contribute to streamflows. This chapter presents summaries of those projects.

[35] 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.

[36] Technical support for projects provided by HDR, Anchor QEA, Pacific Groundwater Group and GeoEngineers.

In a separate effort, Ecology contracted with Pacific Groundwater Group (PGG) to support identification of water right acquisition opportunities for WRIA 14. PGG developed a focused list of water rights for future opportunities such as full or partial acquisition or efficiency projects; however no specific water rights were identified for acquisition. Before these rights could be acquired and placed into the Trust Water Rights Program,[37] they would need to go through a full extent and validity analysis to determine the consumptive use offset component. As that analysis could not 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 I.

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.

Ecology recognizes the importance of developing projects with climate resiliency in mind, and the need to assess how climate change may affect project effectiveness. Projects like those described below are likely to ameliorate streamflow and temperature changes and increase habitat diversity and population resilience (Beechie et al. 2013).

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.

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

5.2 Water Offset Projects

The projects presented below have quantifiable streamflow benefits associated with them, and Ecology identified these 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 offset. More information on the certainty of project implementation is described in Section 5.5.3 below. Detailed descriptions, including water offset calculations and assumptions, of each of the projects presented in this section are available in Appendix I. A summary of projects and offset benefits by subbasin are presented at the end of this section in Tables 7 - 8.

5.2.1 WRIA-wide Projects

5.2.1.1 Managed Aquifer Recharge Projects in WRIA 14

Managed aquifer recharge (MAR) projects divert, convey, and infiltrate peak seasonal river flows in engineered facilities that are in connection with the local alluvial aquifer that the donor stream or river is also in connection. To ensure that flows would be diverted in quantities that would not reduce habitat suitability for salmonids or reduce habitat forming processes, a couple different methods were used to estimates flow rates. If minimum flows have been designated, then the flow rate was estimated as two percent or less of minimum flows. However, on Kennedy Creek, where minimum flows have not been designated, a diversion of 1 cfs was used, which would be less than 2% of average wet season flows. Seepage back into the river would result in attenuation of these flows, increasing base flows across a broader time period, including the late summer and early fall, when flows are typically the lowest, and water demand for consumptive use is the highest. MAR projects are proposed for the following streams:

- Kennedy Creek
- Mill Creek
- Skookum Creek
- Goldsborough Creek
- Johns Creek
- Cranberry Creek
- Sherwood Creek

MAR projects in WRIA 14 have been identified through analysis by the technical consultants to identify potential suitable locations and are estimated to have a total potential water offset of 910 acre-feet per year (AFY). Explanation and potential offset quantities for MAR projects in each stream are described in the following subbasin sections. A detailed project description is available in Appendix I. Ecology recognizes that feasibility studies will be required to implement MAR projects, but is confident sufficient opportunities exist to produce the projected water offset benefit.

The MAR projects presented in this watershed plan are opportunities identified 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 14 partners may identify other future projects that are consistent with those presented in this watershed plan which will support offset benefits. 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.

Thurston County and Mason County have indicated that they would be the likely project sponsors of MAR projects within their respective county boundaries, in coordination with project partners and implementation groups, pending feasibility studies and subject to land ownership.

5.2.1.2 Water Right Opportunities

Ecology supports the full or partial acquisition of water rights to increase streamflows and offset the impacts of PE wells. Acquired water rights should be permanently and legally held by Ecology in the Trust Water Rights Program to ensure that the benefits to instream resources are permanent.

The effort conducted by PGG to identify potential WRIA 14 water right acquisition opportunities was guided by criteria established by the WRIA 14 Committee. This included considerations for priority subbasins, preferred sources, and purposes of use, as well as information provided by some committee members on known water rights. Subsequently Ecology has identified a focused list of water rights for potential future investigation, which can be found in Appendix I.

Water right opportunities are proposed for the following subbasins, and the amount of offset benefit by subbasin is shown based on the assumption of claiming 10% of the total Qa from the focused water rights list[38]:

[38] This assumption is based on information agreed to by the WRIA 14 Committee

- Goldsborough: 34 AFY
- Hood: 31 AFY
- Mill: 30 AFY
- Oakland: 16 AFY

Based on the focused list of water rights, Ecology estimates that future feasibility studies or acquisition and efficiency opportunities may lead to a total estimated offset of 111 AFY (Table 8).

5.2.1.3 Mason County Rooftop Runoff

Mason County has proposed a modification of the County building code to require low-impact development (LID) best management practices (BMPs) to capture of roof runoff from new rural residential (RR) development (Appendix I). Examples of LID BMPs would include dry wells, infiltration trenches, infiltration galleries, and rain gardens. The requirement would achieve 85% infiltration of runoff from a new rural residential parcel development roof for parcels on hydrologic type A and B soils (Appendix I). Parcels on hydrologic type C soils are anticipated to achieve an average of 69% infiltration of runoff from a new RR parcel development. The maximum infiltration trench size is assumed to be 620 square feet. The infiltrated runoff is assumed to be shallow groundwater recharge as an interflow contribution, with an assumed down-gradient surface water benefit to receiving waters base flow augmentation. Based on 2,766 wells apportioned to assumed full parcel buildout within the WRIA 14 project area, this project could potentially yield a water recharge offset of 224 AFY (Appendix I). The technical approach used to develop these potential water offsets and associated results were reviewed and vetted with Mason County.

For the purposes of the WRIA 14 watershed plan, the net infiltration recharge of rooftop runoff constitutes a water offset per RCW 90.94. The water offset benefits could be credited incrementally with continued rooftop runoff growth under the current Mason County NPDES program status and implemented Rooftop Runoff Infiltration Program. The Mason County rooftop runoff project is available for a quantitative offset because it is not otherwise required by law or regulation at the time of this watershed plan publication.

Projects by Subbasin

5.2.2 Case Subbasin

5.2.2.1 Managed Aquifer Recharge Project in Sherwood Creek

An MAR project (as described in the WRIA-wide Projects section above) is proposed for Sherwood Creek (Appendix I). Sherwood Creek flows from Mason Lake. Average monthly flows for Sherwood Creek at Sherwood Cr Rd. range between 79 - 144 cfs between November and April. Water could be diverted from the downstream end of Mason Lake and conveyed to an

MAR site directly downstream of the lake outlet. An MAR diversion of 1 cfs (less than 2% of the lowest minimum instream flows) is proposed over this period. At least 72 days are likely to be above minimum instream flows during this period, while still accommodating a 1 cfs diversion, resulting a potential water offset of 143 AFY.

5.2.2.2 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Case subbasin, with an estimated potential offset of 33 AFY.

5.2.3 Goldsborough Subbasin

5.2.3.1 City of Shelton Reclaimed Water

The City of Shelton (City) proposes to increase the quantity and rate of reclaimed water infiltration into the North Fork Goldsborough subbasin by increasing production of Class A reclaimed water (RW) and infiltrating this to groundwater at the City RW spray field, near the Washington Corrections Center (WCC). This project will re-direct an annual average of 560 AFY of the City's wastewater in North Shelton from the City's Wastewater Treatment Plant (WWTP) to the City's Water Reclamation Plant (WRP). The additional flow will be treated to produce 560 AFY of RW for subsequent conveyance to the existing City spray field. The following infrastructure improvements will need to occur to facilitate this project:

- Conveyance of North Shelton wastewater to the WRP.
- A storage tank (0.750 million gallons per day) to store RW at the WRP.

The conveyance of North Shelton wastewater to the WRP is currently in its design phase, and is likely to include a sewage lift station, and 18-inch sewer main that would run from West Birch Street to reclaimed water satellite plant (approximately 9,000 linear feet). The RW storage tank will buffer variable production and use of RW. RW produced from City wastewater may be used for City uses, including a backup for firefighting, and it allows strategic timing of application of reclaimed water to the ground to benefit aquifers and streams and wetlands. Streamflow restoration funds are currently supporting design options for the lift station, sewer main, storage tank, and cost estimates. The additional RW will be conveyed to the City's existing spray field near the WCC with and infiltrated to local groundwater. Assuming an infiltration efficiency of 80%, this would result in about 445.3 AFY of water being infiltrated into the local aquifer.

The second component of this project is the use of RW at the WCC. The WCC proposes to use RW to irrigate their outdoor lawn, instead of water that they currently pump from their local well. Pumping from their local well likely impacts stream flows in the North Fork Goldsborough Creek. Assuming an infiltration efficiency of 80%, this would result in about 13.4 AFY of additional RW being infiltrated to the local aquifer.

Both project components sum to a potential water offset of 459 AFY (rounded) (Tables 8 – 9).

5.2.3.2 Managed Aquifer Recharge Project in Goldsborough Creek

An MAR project (as described in the WRIA-wide Projects section) is proposed for Goldsborough Creek (Appendix I). Soils and geology are favorable for MAR sites near Goldsborough Creek at multiple locations. Average monthly flows for Goldsborough Creek at S. 7th Street (USGS gage 12076800) range between 196 – 341 cfs between November and April. An MAR diversion of 1 cfs (less than 2% of the lowest minimum instream flows) during period is proposed over this period. At least 166 days are likely to be above minimum instream flows during this period, while still accommodating a 1 cfs diversion, resulting a potential water offset of 329 AFY.

5.2.3.3 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Goldsborough subbasin, with an estimated potential offset of 17 AFY.

5.2.4 Harstine Subbasin

5.2.4.1 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Harstine subbasin, with an estimated potential offset of 15 AFY.

5.2.5 Hood Subbasin

5.2.5.1 Managed Aquifer Recharge Project in the Hood Subbasin

MAR projects (as described in the WRIA-wide Projects section) may be proposed for streams in the Hood Subbasin during plan implementation. Ecology supports MAR projects in this subbasin, if there are suitable streams and MAR infiltration basins that would benefit low seasonal flows.

5.2.5.2 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Hood subbasin, with an estimated potential offset of 7 AFY.

5.2.6 Kennedy Subbasin

5.2.6.1 Managed Aquifer Recharge Project in Kennedy Creek

An MAR project (as described in the WRIA-wide Projects section) is proposed for Kennedy Creek (Appendix I). Kennedy Creek could have an MAR site(s) at near the outlet of Summit Lake or at approximately River Mile (RM) 5. Both of these areas are forested and have suitable geology and soils for infiltration. Average monthly flows near the mouth of Kennedy Creek range between 57 – 119 cfs between November and March. An MAR diversion of 1 cfs between November and March would equate to less than 2% of average wet season flows. A conservative estimate of 40 days (a third of the time) is estimated to be above these average flows, while still accommodating a 1 cfs diversion. This would result in a 79 AFY water offset.

5.2.6.2 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Kennedy subbasin, with an estimated potential offset of 4 AFY.

5.2.6.3 Summit Lake Water System

This project conceptually involves developing alternative solutions for safe water supply to the Summit Lake community. It involves a substantial portion of the lakefront residents of south shore drive along Summit Lake currently using surface water from the lake itself. An alternative water supply could supply water and reduce the use/demand for 235 homes on south Summit Lake Shore Drive South. Potential alternative sources include new source wells, and piping water from a public water system. A water offset benefit could occur by limiting irrigation for homes newly connected to water supply, and by retiring non-certificated permits and the retirement of certificated water rights into permanent trust. The first steps would be to conduct a feasibility study to determine the best option for a new Summit Lake community source and perform community outreach. Depending on the assumptions made, flow benefits in the Kennedy Creek subbasin may be on the order of 24-133 AFY. The potential offset benefit from this project is shown in Appendix I; however, due to uncertainties associated with this project and the need for feasibility and community outreach to occur, Ecology chose not to claim a water offset benefit.

5.2.6.2 Schneider Creek Source Switch

The Schneider Creek Source Switch Project would replace an agricultural surface water diversion on Schneider Creek with a groundwater source. By shifting irrigation withdrawals to a groundwater source, the effect of those irrigation withdrawals on Schneider Creek would be much less. However, by pumping groundwater as opposed to surface water, the pumping effect on Schneider Creek may affect surface flows year round. This lesser but more attenuated impact on stream flow is not currently consistent with Washington State water law. Chapter 173-514 WAC places a seasonal closure on Schneider Creek May 1 through October 31, but the existing water right specifies that all the surface water withdrawals must stop on October 1. If future groundwater pumping was to stop on that date, the effects of groundwater pumping would continue into the month of October and affect streamflow during part of the closed period. Therefore, no water offset credit is currently being claimed for this project due to uncertainties (Table 7). If this aspect of Washington State Water law could be modified during plan implementation, this project could provide a water offset.

5.2.6.4 Steamboat Middle

The Steamboat Middle project consists of expanded water storage in an existing forested/non-forested wetland. The project would expand water storage in a low-lying area between elevation of 114 and 118 ft. Some additional habitat may be created from this project as well as an expansion of wetlands as a result of additional water storage area. As this project is still in the conceptual phase, Ecology is conservatively claiming 14 AFY of offset benefit for this project (Table 8).

5.2.7 Mill Subbasin

5.2.7.1 Managed Aquifer Recharge Project in Mill Creek

An MAR project (as described in the WRIA-wide Projects section) is proposed for Mill Creek (Appendix I). Soils and geology are favorable for MAR sites immediately downstream of Isabella Lake. This location would be useful, in terms of providing cool groundwater recharge downstream of the lake. Average monthly flows for Mill creek at Highway 3 range between 81 - 153 cfs between November and April. An MAR diversion of 1 cfs (less than 2% of the lowest minimum instream flows) during period is proposed over this period. There were between 86 - 128 days when flows were above minimum instream flows, while still accommodating a 1 cfs diversion, resulting a potential water offset of 171 – 254 AFY. At least 86 days are likely to be above minimum instream flows during this period, while still accommodating a 1 cfs diversion, resulting a potential water offset of 171 AFY.

5.2.7.3 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Mill subbasin, with an estimated potential offset of 40 AFY.

5.2.8 Oakland Subbasin

5.2.8.1 Evergreen Mobile Home Estates Water Rights Acquisition

Evergreen Mobile Home Estates (Evergreen Estates) Group A water system (PWSID# 24154) has been issued a compliance order to install CT6 disinfection (i.e. chlorination) to address failing on-site wastewater systems in close proximity to its wells. As an alternative to CT6 treatment, Evergreen Estates is considering connection to the City of Shelton's (City's) water system and abandoning its existing wells. The City has been pursuing consolidating the Evergreen Estates with the City drinking water system and conducted a feasibility study to identify infrastructure improvements necessary for this to occur. The water system consolidation would result in the water rights of the Evergreen Mobile Estates Group A system no longer being used. A water offset benefit would occur if that water right was placed into permanent trust, per RCW 90.42. The City conducted a feasibility Study and estimated their likely annual water use to be 7.2 AFY. Therefore, if the City provided water to the Evergreen Estates, and the existing water right were to be placed into permanent trust, the water offset value would be 7.2 AFY (Tables 8 – 10).

The Evergreen Estates installed five new sewer septic systems and a chlorination system at the wells. The property owner has indicated that the State has accepted their plan for onsite septic and chlorination improvements and that no further action on their part is needed. However, water system consolidation could still occur, and may be incentivized if the Evergreen Estates consolidation costs were covered by others or with grant funding.

5.2.8.2 Managed Aquifer Recharge Project in Johns Creek and Cranberry Creek

MAR projects (as described in the WRIA-wide Projects section) are proposed for Johns Creek and Cranberry Creek (Appendix I). Average monthly flows for Johns Creek at Hwy 3 range

between 52-97 cfs between November and April. An MAR diversion of 0.5 cfs (less than 2% of the lowest minimum instream flows) during period is proposed over this period. At least 36 days are likely to be above minimum instream flows during this period, while still accommodating a 0.5 cfs diversion, resulting a potential water offset of 36 AFY.

Average monthly flows for Cranberry Creek at Highway 3 range between 48 - 99 cfs between November and April. An MAR diversion of 1 cfs (less than 2% of the lowest minimum instream flows) during period is proposed over this period. At least 35 days are likely to be above minimum instream flows during this period, while still accommodating a 1 cfs diversion, resulting a potential water offset of 69 AFY.

5.2.8.3 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Oakland subbasin, with an estimated potential offset of 77 AFY.

5.2.9 Skookum Subbasin

5.2.9.1 Managed Aquifer Recharge Project in Skookum Creek

An MAR project (as described in the WRIA-wide Projects section) is proposed for Skookum Creek (Appendix I). Skookum Creek has unfavorable soils for MAR infiltration along much of its stream alignment. However, there are some small areas of suitable geology and soils in the headwaters and near the confluence with Kamilche Creek. Average monthly flows at Highway 101 range between 57 – 140 cfs between November and April. Assuming that flows are similar downstream of Kamilche Creek, an MAR diversion of 0.5 cfs (less than 2% of the lowest minimum instream flows) during period is proposed over this period. Between 84 - 131 days were above minimum instream flows, while still accommodating a 0.5 cfs diversion, resulting a potential water offset of 83 – 130 AFY. Since at least 84 days are likely to be above minimum instream flows during this period, while still accommodating a 0.5 cfs diversion, the potential water offset amount was estimated to be of 83 AFY.

5.2.9.2 Mason County Rooftop Runoff

Opportunities for rooftop runoff capture (as described in the WRIA-wide section above) exist in the Skookum subbasin, with an estimated potential offset of 31 AFY.

Table 7: Water Offset Projects

Project Name	Project Description	Subbasin	Estimated Water Offset (AFY)[39]	Project Sponsor	Estimated Project Cost[40]	Readiness to Proceed
City of Shelton RW/ WCC Source Switch	Re-direct North Shelton wastewater to WRP and infiltrate Class A reclaimed water at existing spray field near the WCC	Goldsborough	459	City of Shelton	$8.8M	High
Evergreen Mobile Estates	Water system consolidation and water right acquisition	Oakland Bay	7	City of Shelton	$474,000	Low
Mason Co Rooftop Runoff	New county requirement for new rural residential building to install LID BMPs that infiltrate over 95% of rooftop runoff.	All	224	Mason County	$0[41]	High
MAR	Install managed aquifer recharge facilities	Multiple	910	Mason County/Mason PUD 1/ Thurston County/WRIA 14 Implementation Partners	$3.1 M	Low

[39] 1 acre foot per year is equivalent to 0.0014 cfs, or 892.74 gallons per day
[40] Costs are based on offset claimed by the Committee and are based on order of magnitude estimates.
[41] At this time, all estimated project costs are expected to be included in costs of construction for new homes, which would range from $3,780-$9.300 per home – a total of ~$17 million for proposed project.

Project Name	Project Description	Subbasin	Estimated Water Offset (AFY)[39]	Project Sponsor	Estimated Project Cost[40]	Readiness to Proceed
Water Right Opportunities	A focused WRIA-wide analysis on potential WR efficiencies and acquisition for future studies and implementation	Goldsborough, Hood, Mill, Oakland	111	WRIA 14 Implementation Partners	$285,000	Low
Steamboat Middle	Surface water retention and infiltration	Kennedy	14	Thurston County	$1 M	Low
Schneider Creek Source Switch[42]	Source switch from surface water ground water	Kennedy	0	Thurston County	n/a	Low
Summit Lake Water System	Future potential source switch for local domestic water supply	Kennedy	0	Thurston County	n/a	Low
WRIA 14 Total Water Offset for WRIA 14 Projects			**1,725**			
WRIA 14 Consumptive Use Estimate			**760**			

[42] The Schneider Creek Source Switch project currently conflicts with the Foster Supreme Court Decision, and would only be implemented pending legislative changes to allow for such projects to move forward; however, the Committee supports implementation of this project and has estimated the potential future offset quantity should this project be implemented.

Table 8: Water Offsets summed by subbasin. All values are in acre-feet per year.[43]

Subbasin	WRIA 14 CU Estimate	Managed Aquifer Recharge	Water Rights	Shelton RW/WCC	Evergreen Mobile Estates	Steamboat Middle	Mason County Rooftop Runoff	Total
Case	91	143	0	0	0	0	33	176
Goldsborough	97	329	34	459	0	0	17	839
Harstine	25	0	0	0	0	0	15	15
Hood	21	0	31	0	0	0	7	38
Kennedy	104	79	0	0	0	14	4	97
Mill	82	171	30	0	0	0	40	241
Oakland Bay	276	105	16	0	7	0	77	205
Skookum	64	83	0	0	0	0	31	114
Total	**760**	**910**	**111**	**459**	**7**	**14**	**224**	**1,725**

[43] 1 acre foot per year is equivalent to 0.0014 cfs, or 892.74 gallons per day

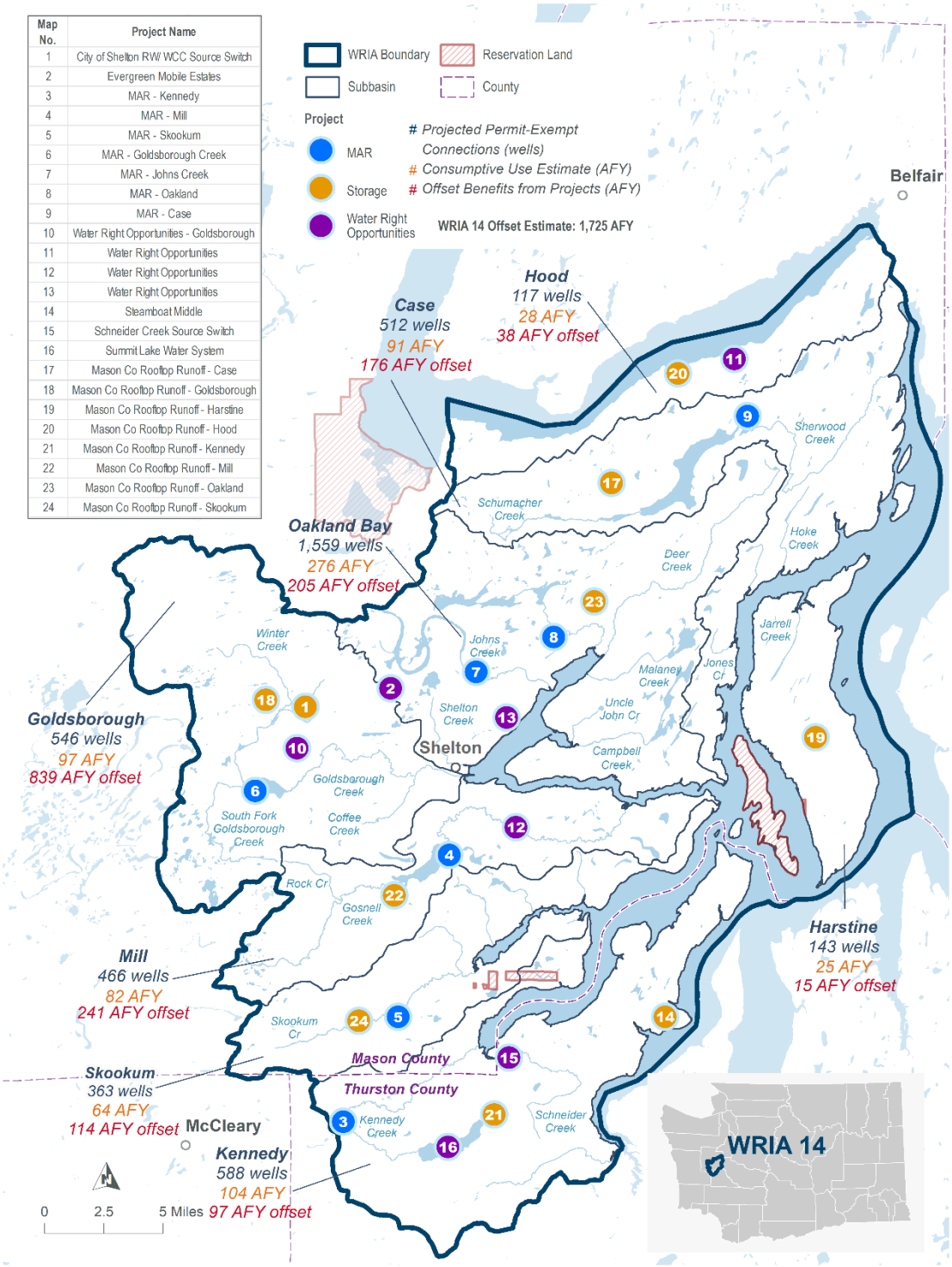

Figure 5: WRIA 14 Water Offset Projects. Map prepared by GeoEngineers.

5.3 Habitat Projects

A number of habitat restoration projects, and projects with unquantifiable streamflow benefit were identified in WRIA 14. While several of these projects may produce a marginal offset benefit by increasing seasonal storage, the benefits were too small or too complex to estimate. In general, these projects increase stream complexity, reconnect floodplains, promote fish passage, and enhance natural processes that had been lost to the benefit of salmonids and other aquatic species. Projects described below have project sponsors unless otherwise indicated and are expected to be implemented within the planning horizon. Projects are described in Table 9 and Figure 6, and some detailed project descriptions are included in Appendix I. 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.

WRIA-wide Projects

Floodplain Restoration

WRIA 14 floodplain restoration projects would address loss of groundwater storage, low flows and water quality conditions. The specific actions proposed for any given project would be specific to the restoration opportunity and habitat capacity of that location. The goal of any given project would be to rehabilitate natural hydrologic and geomorphic processes that are provided by floodplain connectivity. More detailed objectives pursuant to this goal would be specific to each respective project.

Projects will vary depending on the stream setting, habitat capacity, the impact that has occurred, and the corresponding opportunities for restoration. Potential floodplain restoration actions include the following:

- Channel re-alignment (i.e. re-meander),
- Removing bank protection,
- Installation of large wood to promote hyporheic and floodplain water storage
- Removal of fill or creation of inset floodplain (i.e. excavation of terraces),
- Side channel and off-channel feature reconnections, creation or enhancement.

Potential floodplain restoration locations were identified based on reaches being geomorphically unconfined (having wide valleys and floodplains), located within a flood zone, and being vacant. Secondary considerations were given to locations that were on public land, and near tributary inflow (and therefore potentially prone to flooding).

A detailed project description is included in Appendix I.

Table 9: Habitat Projects

Project Number	Project Name	Project Description	Subbasin	Sponsor	Estimated Cost[44]
14-C-H1	Chapman Cove Conservation, Phased approach	Conserve the highest priority habitats in and along Chapman Cove. Highest priority sites will be identified through the proposed WRIA 14 Landowner Outreach and Acquisition Project Development project.	Case	Capitol Land Trust	$900,000.00
14-C-H2	Jones Creek Fish Passage and Riparian	Remove partial and full barriers on Jones Creek, opening up 1.15 miles of fish habitat.	Case	Mason Conservation District	$172,500.00
14-C-H3	Knotweed Assessment and Treatment	Assess and treat shoreline for knotweed; priority focus on streams with Action Plans. Implement knotweed treatment plan for Mill and Goldsborough Creeks.	Case	Mason Conservation District	$80,000.00
14-C-H4	Sherwood, Deer, and Cranberry Creek Knotweed Assessment	Assess and inventory knotweed presence in Sherwood Creek, Deer Creek, and Cranberry Creek to develop treatment plan.	Case	Mason Conservation District	$75,000.00
14-WRIA-H1	Floodplain restoration	WRIA 14 floodplain restoration projects would address loss of groundwater storage, low flows and water quality conditions. The specific actions proposed for any given project would be specific to the restoration opportunity and habitat capacity of that location. The goal of any given project would be to rehabilitate natural hydrologic and geomorphic processes that are provided by floodplain connectivity.	Case, Harstine, Oakland, Mill, Skookum, Kennedy	TBD	TBD

[44] Costs are based on order of magnitude estimates

Project Number	Project Name	Project Description	Subbasin	Sponsor	Estimated Cost[44]
14-G-H1	Goldsborough Cr- Hilburn Restoration	Remove bank protection and channel fill; Increase density of large woody debris.	Goldsborough	Squaxin Island Tribe	$1,000,000.00
14-G-H2	Goldsborough Creek Acquisition	Acquire 500 acres in Goldsborough Creek watershed Acquire 500 acres in Goldsborough Creek watershed on mainstem Goldsborough Creek and tributaries.	Goldsborough	Capitol Land Trust	$300,000.00
14-G-H3	Winter Creek - Shelton Valley Road (M.P. 2.00)	Replace fish passage barrier culvert with fish passable structure.	Goldsborough	Mason Conservation District	$640,000.00
14-G-H4	Boelk Fish Passage Barrier	Replace fish passage barrier to open 2,500 ft of instream habitat upstream.	Goldsborough	Mason Conservation District	$160,000.00
14-G-H5	Winter Creek Fish Passage and Riparian Establishment	Replace fish passage barrier to open 0.75 miles of instream habitat upstream.	Goldsborough	Mason County	$130,000.00
14-G-H6	Goldsborough Creek Off-Channel Design	Preliminary designs for off-channel and wetland habitat along the Middle Segment of Goldsborough Creek, Reach G6 (EDT convention).	Goldsborough	South Puget Sound Salmon Enhancement Group	$74,000.00
14-G-H7	Targeted Riparian Restoration in WRIA 14	Plant and maintain up to 30 new acres of native trees and shrubs on priority sites identified by the riparian assessment and prioritization tool along Tier A streams. Plant up to 30 new acres of native trees and shrubs on priority sites identified by the riparian assessment and prioritization tool recently completed by the Mason Conservation District.	Goldsborough	Mason Conservation District	$265,000.00
14-K-H1	Oyster Bay CE Acquisition	Purchase a CE over a pocket estuary, marine shoreline and forested uplands.	Kennedy	Capitol Land Trust	$176,000.00

Project Number	Project Name	Project Description	Subbasin	Sponsor	Estimated Cost[44]
14-K-H2	Griggs Creek Private Fish Passage Project	Replace fish passage barrier on private road crossing.	Kennedy	South Puget Sound Salmon Enhancement Group	$170,000.00
14-K-H2	Kennedy Creek Acquisition and Restoration	Acquire remaining parcels within conservation area within Kennedy Creek natural Area Preserve and Natural Resources Conservation Area, and restore riparian/upland forest and floodplain habitat.	Kennedy	WA Department of Natural Resources	$1,800,000.00
14-M-H1	Fish Passage removal and Gosnell Cr LWD	Remove partial barrier on tributary to Gosnell creek and treat 0.5 miles of Gosnell Creek with LWD .	Mill	Mason Conservation District	$700,000.00
14-O-H1	Case Inlet Bulkhead Removal	Project identified to remove close to 100 ft bulkhead, restore creek mouth and natural delta, riparian planting.	Oakland	Mason Conservation District	$110,000.00
14-O-H2	Uncle Johns Creek (Lower) - Agate Loop Rd. (MP 1.02)	Restore 0.4 miles of fish passage and natural processes supporting fish use of habitat. T	Oakland	Mason County	$3,000,000.00
14-O-H3	East Pirates Creek Rd / Pirate Creek	Replace fish passage barrier.	Oakland	South Puget Sound Salmon Enhancement Group	$1,672,808.00
14-O-H4	West Oakland Bay Restoration_2020_2C	Remove 0.25 miles of bulkhead and enhance 17 acres of saltmarsh to promote growth of intertidal vegetation.	Oakland	Squaxin Island Tribe	$7,077,362.00
14-S-H1	Skookum Valley Ag	Channel re-alignment to increase channel length and sinuosity.	Skookum	Squaxin Island Tribe	$1,000,000.00
14-S-H2	Skookum Valley Railroad Culvert Crossings	Restore fish passage at several existing barriers.	Skookum	Squaxin Island Tribe	$5,000,000.00
14-S-H3	Little Skookum CE Acquisition	Purchase a CE over a pocket estuary, marine shoreline and forested uplands.	Skookum	Capitol Land Trust	$448,000.00

Project Number	Project Name	Project Description	Subbasin	Sponsor	Estimated Cost[44]
14-S-H4	Lynch Road/Deer Creek Culvert project	Replace fish passage barrier.	Skookum	Mason County	$8,500,000.00
14-S-H5	Skookum Creek Valley Phase 2 Conservation (Large Cap)	Purchase 322 acres in the Skookum Creek watershed to protect and enhance fish and wildlife species, including 170 acres of wetlands and 3 miles of stream.	Skookum	Squaxin Island Tribe	$2,121,095.00

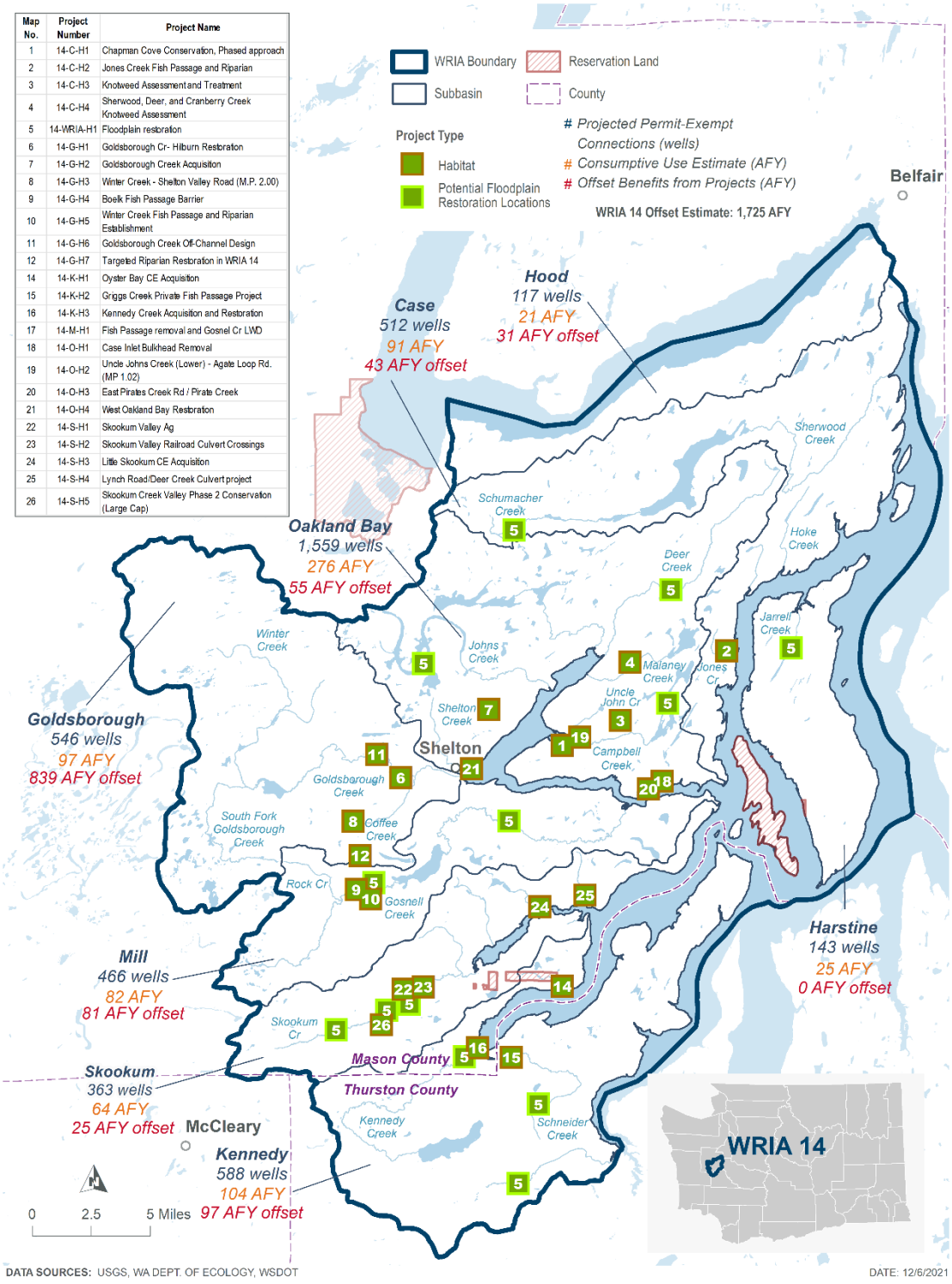

Figure 6: WRIA 14 Habitat Projects. Map prepared by GeoEngineers.

5.5 Project Implementation Summary

5.5.1 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 specified in Chapter 4, this plan aims to offset 760 AFY of consumptive use from new PE wells over the planning horizon. The projects included in Table 7 provide a total potential estimated offset of 1,725 AFY and exceed the consumptive use offset need for the WRIA.

This watershed plan also identifies habitat benefiting projects. The ecological and streamflow benefits from habitat projects are supplemental to the quantified water offsets required by RCW 90.94.030.

5.5.2 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, this plan includes planning-level cost estimates for each of the water offset projects listed in Table 7. The plan also includes costs estimates for habitat projects in Table 9 when that information was readily available. Details on known costs for individual projects are provided in the project summaries above.

The estimated cost for implementing individual water offset projects range from $285,000 for Water Right Opportunities to $8.8 million for City of Shelton Reclaimed Water. The total estimated cost for implementing the water offset projects listed and described in this chapter is $13.7 million.

The estimated cost for implementing individual habitat projects range from $75,000 to $8.5 million. The total estimated cost for implementing all of the habitat projects listed and described in this chapter is $36 million.

5.5.3 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, source switch, 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 Table10, 6 have likely project sponsors who have experience implementing these types of projects and are ready to proceed with project

development. If the water offset projects included in the plan are implemented, they will provide benefits during the planning horizon (2018-2038).

The habitat projects included in the plan, if funded, are expected to be implemented within the planning horizon. All 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 14 watershed plan's reasonable assurance in meeting NEB.

6.2 Net Ecological Benefit Analysis

The WRIA 14 watershed plan provides a path forward for offsetting an estimated 760 AFY of new consumptive water use in WRIA 14. The watershed plan primarily achieves this offset through 8 water offset projects and project types with a total estimated offset potential of 1,725 AFY. This total offset yields a potential surplus offset of 965 AFY above the 760 AFY consumptive use estimate. This plan also includes 25 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 14 into 8 subbasins (see Figure 2), then distributes the number of projected PE wells across the subbasins based on historic building trends.

This plan projects 4,294 new PE wells installed in WRIA 14 over the planning horizon. Based on this projection, the plan estimates 760 AFY of new consumptive water use from new PE wells in WRIA 14.

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-USDA 1997). Commercial turf grass irrigation rates are much higher than typical domestic applications. Therefore, Ecology considers 760 AFY a conservative estimate of consumptive water use.

6.2.2 Quantity and Spatial Distribution of Water Offset Project Benefits

Table 10 provides a summary of the 8 water offset projects and project types listed in the plan to offset consumptive use and contribute toward achieving NEB in WRIA 14. The potential water offset total of these ten projects is 1,725 AFY, a potential surplus of 965 AFY above the

consumptive use estimate. Therefore, at the WRIA scale the plan will lead to offset amounts that exceed the consumptive use impacts.

At a subbasin scale, when comparing estimated consumptive water use to projected water offset amounts, surpluses are projected in 5 subbasins (Case, Goldsborough, Hood, Mill, and Skookum), and deficits are projected in 3 subbasins (Harstine, Kennedy, and Oakland) (Table 13). However, the projected benefit amounts are large in subbasins where projected benefits exceed projected consumptive use (50 to 742 AFY), and the deficits are generally small in subbasins where the projected benefits are less than projected consumptive use (-7 to -71 AFY, with two out of three deficits being -10 AFY or less).

The largest water offset deficit is projected for the Oakland subbasin (-71 AFY); however, the degree to which groundwater pumping will affect streamflow there is largely offset by the hydrogeology. In the Oakland subbasin most new well pumping is anticipated near Johns Creek, and previous groundwater modeling suggests that instead of reducing streamflows, PE well withdrawals there will primarily decrease submarine groundwater discharge to Oakland Bay (see Section 2.3.3), significantly reducing any streamflow impacts.

The largest water offset surplus is projected in the Goldsborough subbasin (742 AFY), which is considered a priority stream by WDFW and local biologists[45]. This subbasin has almost twice the miles of mainstem and tributary habitat for spawning and rearing of salmonids compared to the Oakland subbasin. And while the Oakland subbasin does have a significant projected deficit (-71 AFY), Johns Creek, which goes through the most populace area there, has relatively little rearing habitat. Although Johns Creek does provide abundant spawning habitat, limited rearing may explain why it is an important stream for Chum Salmon.

[45] Ecology communication by Jim Pacheco with Steve Boessow of WDFW on February 24, 2021, and Erica Marbet of the Squaxin Island tribe on February 22, 2021.

Table 10. Summary of WRIA 14 Water Offset Projects included in NEB analysis

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (AFY)
Mason County Rooftop Runoff	New county requirement for new rural residential building to install LID BMPs that infiltrate over 95% of rooftop runoff.	WRIA-wide	224
City of Shelton RW/ WCC Source Switch	Re-direct North Shelton wastewater to WRP and infiltrate Class A reclaimed water at existing spray field near the WCC	Goldsborough	459
Evergreen Mobile Estates	Water system consolidation and water right acquisition	Oakland	7
MAR	Install managed aquifer recharge facilities	Kennedy, Mill, Skookum, Goldsborough, Oakland, Case	910
Water Right Opportunities	A focused WRIA-wide analysis on potential WR efficiencies and acquisition for future studies and implementation	Goldsborough, Hood, Mill, Oakland	111
Steamboat Middle	Surface water retention and infiltration	Kennedy	14
Schneider Creek Source Switch	Source switch from surface water ground water	Kennedy	0
Summit Lake Water System	Future potential source switch for local domestic water supply	Kennedy	0
		Total	**1,725**

Table 11 provides a summary of estimated water offset and consumptive use by subbasin, including surplus and deficit amounts.

Table 11. Subbasin Water Offset Totals compared to Subbasin Consumptive Use Estimate

Subbasin	Offset Project Totals (AFY)	Consumptive Use (AFY)	Surplus/Deficit (AFY)
Case	176	91	+85
Goldsborough	839	97	+742
Harstine	15	25	-10
Hood	38	21	+17
Kennedy	97	104	-7
Mill	241	82	+159
Oakland	205	276	-71
Skookum	114	64	+50
WRIA 14 Total	**1,725**	**760**	+965

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 14 include the following:

- Mason County Rooftop Runoff, and Steamboat Middle water storage projects: capture runoff occurring during rain events, reducing flooding and erosion; augment groundwater baseflow discharge to streams, cooling surface waters during summer months and increasing summer low flows.
- Shelton Reclaimed Water project: infiltrate reclaimed wastewater to ground or use portion to replace existing groundwater uses; augment groundwater baseflow discharge to streams, cooling surface waters during summer months and increasing summer low flows.
- 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.

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).

6.2.3 Quantity and Spatial Distribution of Habitat Project Benefits

The watershed plan presents a suite of 25 habitat projects that will provide ecological benefits to the watershed beyond the flow benefits yielded by the water offset projects. 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 12.

These projects target the salmonid habitat limiting factors identified for this watershed. Benefits include increase channel length and sinuosity, protection of upland forest cover and riparian forest, restoration of floodplain and wetland habitats, removal of fish passage barriers, wood placement, and improved spawning and rearing habitat, 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 25 of the habitat projects have identified project sponsors, and if funded, are expected to be implemented within the planning horizon.

Table 12. Summary of WRIA 14 Habitat Improvement Projects included in NEB Analysis

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-C-H1	Chapman Cove Conservation, Phased approach	Conserve the highest priority habitats in and along Chapman Cove. Highest priority sites will be identified through the proposed WRIA 14 Landowner Outreach and Acquisition Project Development project.	Case	• TBD	• Channel and streambed degradation
14-C-H2	Jones Creek Fish Passage and Riparian	Remove partial and full barriers on Jones Creek, opening up 1.15 miles of fish habitat.	Case	• 6,072 feet of stream restored	• Fish passage barriers • Channel and streambed degradation

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-C-H3	Knotweed Assessment and Treatment	Assess and treat shoreline for knotweed; priority focus on streams with Action Plans. Implement knotweed treatment plan for Mill and Goldsborough Creeks.	Case	• TBD	• Degradation of shoreline habitats
14-C-H4	Sherwood, Deer, and Cranberry Creek Knotweed Assessment	Assess and inventory knotweed presence in Sherwood Creek, Deer Creek, and Cranberry Creek to develop treatment plan.	Case	• TBD	• Degradation of shoreline habitats

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-WRIA-H1	Floodplain restoration	WRIA 14 floodplain restoration projects would address loss of groundwater storage, low flows and water quality conditions. The specific actions proposed for any given project would be specific to the restoration opportunity and habitat capacity of that location. The goal of any given project would be to rehabilitate natural hydrologic and geomorphic processes that are provided by floodplain connectivity.	Case, Harstine, Oakland, Mill, Skookum, Kennedy	• 31,680 feet of stream restored • 6 miles of riparian area restored	• Channel and streambed degradation • Loss of floodplain connectivity and habitats • Loss of riparian forest

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-G-H1	Goldsborough Cr- Hilburn Restoration	Remove bank protection and channel fill; Increase density of large woody debris.	Goldsborough	• TBD	• Channel and streambed degradation • Loss of floodplain connectivity and habitats
14-G-H2	Goldsborough Creek Acquisition	Acquire 500 acres in Goldsborough Creek watershed Acquire 500 acres in Goldsborough Creek watershed on mainstem Goldsborough Creek and tributaries.	Goldsborough	• 500 acres conservation	• Channel and streambed degradation • Loss of floodplain connectivity and habitats
14-G-H3	Winter Creek - Shelton Valley Road (M.P. 2.00)	Replace fish passage barrier culvert with fish passable structure.	Goldsborough	• TBD	• Channel and streambed degradation •
14-G-H4	Boelk Fish Passage Barrier	Replace fish passage barrier to open 2,500 ft of instream habitat upstream.	Goldsborough	• 2,500 feet of stream restored	• Channel and streambed degradation • Loss of riparian forest

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-G-H5	Winter Creek Fish Passage and Riparian Establishment	Replace fish passage barrier to open 0.75 miles of instream habitat upstream.	Goldsborough	• 3,960 feet of stream restored	• Channel and streambed degradation • Fish passage barriers
14-G-H6	Goldsborough Creek Off-Channel Design	Preliminary designs for off-channel and wetland habitat along the Middle Segment of Goldsborough Creek, Reach G6 (EDT convention).	Goldsborough	• TBD	• Channel and streambed degradation • Loss of riparian forest • Loss of wetland and shoreline habitats

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-G-H7	Targeted Riparian Restoration in WRIA 14	Plant and maintain up to 30 new acres of native trees and shrubs on priority sites identified by the riparian assessment and prioritization tool along Tier A streams. Plant up to 30 new acres of native trees and shrubs on priority sites identified by the riparian assessment and prioritization tool recently completed by the Mason Conservation District.	Goldsborough	• 30 acres restoration	• Loss of wetland and shoreline habitats • Loss of riparian forest

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-K-H1	Oyster Bay CE Acquisition	Purchase a CE over a pocket estuary, marine shoreline and forested uplands.	Kennedy	• TBD	• Channel and streambed degradation • Loss of wetland and shoreline habitats • Loss of upland forest cover
14-K-H2	Griggs Creek Private Fish Passage Project	Replace fish passage barrier on private road crossing.	Kennedy	• TBD	• Channel and streambed degradation • Fish passage barriers
14-K-H3	Kennedy Creek Acquisition and Restoration	Acquire remaining parcels within conservation area within Kennedy Creek natural Area Preserve and Natural Resources Conservation Area, and restore riparian/upland forest and floodplain habitat.	Kennedy	• TBD	• Loss of riparian forest • Loss of wetland and shoreline habitats • Loss of floodplain connectivity and habitats • Loss of upland forest cover

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-M-H1	Fish Passage removal and Gosnell Cr LWD	Remove partial barrier on tributary to Gosnell creek and treat 0.5 miles of Gosnell Creek with LWD.	Mill	• 2,640 feet of stream restored	• Channel and streambed degradation • Fish passage barriers
14-O-H1	Case Inlet Bulkhead Removal	Project identified to remove close to 100 ft bulkhead, restore creek mouth and natural delta, riparian planting.	Oakland	• 100 feet of stream restored	• Channel and streambed degradation • Fish passage barriers • Loss of riparian forest
14-O-H2	Uncle Johns Creek (Lower) - Agate Loop Rd. (MP 1.02)	Restore 0.4 miles of fish passage and natural processes supporting fish use of habitat.	Oakland	• 2,112 feet of stream restored	• Channel and streambed degradation • Fish passage barriers • Loss of floodplain connectivity and habitats
14-O-H3	East Pirates Creek Rd / Pirate Creek	Replace fish passage barrier.	Oakland	• TBD	• Channel and streambed degradation • Fish passage barriers

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-O-H4	West Oakland Bay Restoration	Remove 0.25 miles of bulkhead and enhance 17 acres of saltmarsh to promote growth of intertidal vegetation.	Oakland	• 1,320 feet of stream restored • 17 acres wetland restoration	• Channel and streambed degradation • Loss of floodplain connectivity and habitats • Loss of wetland and shoreline habitats
14-S-H1	Skookum Valley Ag	Channel re-alignment to increase channel length and sinuosity.	Skookum	• 610 feet of stream restored	• Channel and streambed degradation
14-S-H2	Skookum Valley Railroad Culvert Crossings	Restore fish passage at several existing barriers.	Skookum	• 27,600 feet of stream restored	• Channel and streambed degradation • Fish passage barriers

Project Number	Project Name	Project Short Description	Subbasin	Benefits with Quantifiable Metric	Habitat Limiting Factor(s) Addressed
14-S-H3	Little Skookum CE Acquisition	Purchase a CE over a pocket estuary, marine shoreline and forested uplands.	Skookum	• TBD	• Channel and streambed degradation • Loss of wetland and shoreline habitats • Loss of upland forest cover
14-S-H4	Lynch Road/Deer Creek Culvert project	Replace fish passage barrier.	Skookum	• TBD	• Channel and streambed degradation • Fish passage barriers
14-S-H5	Skookum Creek Valley Phase 2 Conservation (Large Cap)	Purchase 322 acres in the Skookum Creek watershed to protect and enhance fish and wildlife species, including 170 acres of wetlands and 3 miles of stream.	Skookum	• 15,840 feet of stream restored • 322 acres of wetlands and riparian area restored	• Channel and streambed degradation • Loss of floodplain connectivity and habitats • Loss of riparian forest

The listed habitat projects have the potential to protect 906 acres of wetland, floodplain area, and other habitats for fish and wildlife. Also, over 94,000 feet along the streams will potentially be protected or restored. Protects will restore riparian areas and other habitats, and improve water quality. 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.

The habitat projects and benefits are well distributed throughout the watershed and will contribute to improving conditions for multiple salmonid species. Projects are proposed in 7 of the 8 subbasins, with the Hood subbasin not having any sponsored projects at the time of this watershed plan development. Three of the subbasins with proposed habitat projects (Harstine, Kennedy, and Oakland) are projected to experience water-offset deficits. Contributions toward ecological health during key seasonal periods from habitat projects at these locations will partially compensate for the predicted PE well-pumping effects in those subbasins.

Table 13. Summary of Habitat Projects by Subbasin

Subbasin	**Habitat Projects**	**Benefiting Streams**
Case	14-C-H1, 14-C-H2, 14-C-H3, 14-C-H4, 14-WRIA-H1	Jones Creek, Mill Creek, Sherwood Creek, Deer Creek, Cranberry Creek
Goldsborough	14-G-H1, 14-G-H2, 14-G-H3, 14-G-H4, 14-G-H5, 14-G-H6, 14-G-H7	Goldsborough Creek, Winter Creek,
Harstine	14-WRIA-H1	Chambers Creek, Sherwood Creek
Hood	n/a	n/a
Kennedy	14-K-H1, 14-K-H2, 14-K-H3, 14-WRIA-H1	Griggs Creek, Kennedy Creek
Mill	14-M-H1, 14-WRIA-H1	Gosnell Creek
Oakland	14-O-H1 14-O-H2, 14-O-H3, 14-O-H4, 14-WRIA-H1	Uncle Johns Creek, Pirate Creek
Skookum	14-S-H1 14-S-H2, 14-S-H3, 14-S-H4, 14-S-H5, 14-WRIA-H1	Skookum Creek, Little Skookum Creek, Deer Creek

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 7 shows the project locations with respect to the freshwater habitat index in WRIA 14. 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 5 and 6, with circles indicating water offset projects listed in Tables 10 and squares indicating habitat projects listed in Table 12.

As is evident on Figure 7, this watershed plan's water offset and habitat projects are 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.

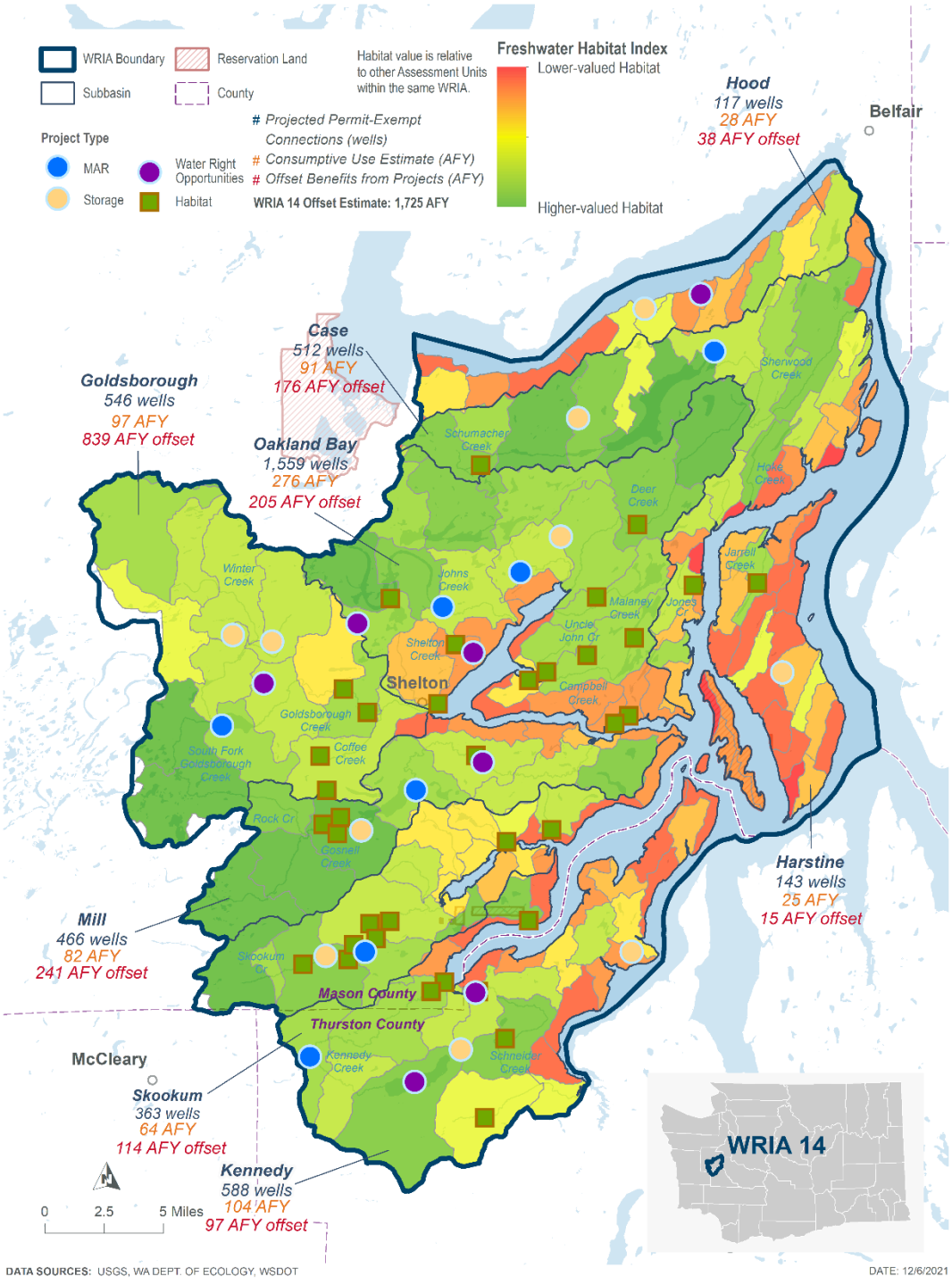

Figure 7. Map of Plan Project locations overlain on WDFW Assessment Unit Habitat Indices. Map prepared by GeoEngineers.

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 the projected 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; and
- 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 14 Committee process, the Committee proposed a number of recommendations for adaptive management, which are provided for reference purposes in Appendix F.

6.4 NEB Determination

This watershed plan identifies 8 projects and project types to offset 760 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 potential surplus of 965 AFY in water offset benefits from 8 water offset projects and project types.

Although only four of the subbasins are projected to experience water-offset surpluses, overall the distribution of benefits provided by water-offset projects under the plan outweigh the

detriments produced by new PE wells. The largest water offset deficit is projected for the Oakland subbasin, and groundwater modeling suggests that instead of reducing Johns Creek flows groundwater withdrawals there will primarily decrease submarine discharge to Oakland Bay. Furthermore, the Goldsborough subbasin surplus is much larger than the deficit in the Oakland subbasin (+742 AFY as opposed to -71 AFY), which is significant since Goldsborough has almost twice the miles of mainstem and tributary habitat for spawning and rearing of salmonids compared to Oakland.

Twenty-five 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.

There is uncertainty associated with all of the analyses presented in the plan. However, due to the large surplus in projected water offsets, if some projects are not developed or benefits are less than expected, a subset of these will still provide sufficient water to offset the estimated new consumptive use.

Based on the information and analyses summarized in this plan, Ecology finds that this WRIA 14 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).

Appendices

WRIA 14 Kennedy - Goldsborough Watershed

The following appendices are linked to this report as an Appendices file at:

https://apps.ecology.wa.gov/publications/SummaryPages/2211016.html

Appendix A – References

Appendix B – Glossary

Appendix C – Committee Roster

Appendix D – Final Meeting Summary of the WRIA 14 Watershed Restoration and Enhancement Committee

Appendix E – Regional Aquifer Units within WRIA 14

Appendix F – Policy, Regulatory, and Adaptive Management Recommendations Proposed by the WRIA 14 Committee

Appendix G – Subbasin Delineation Memo

Appendix H – Permit-Exempt Growth and Consumptive Use Summary Technical Memo

Appendix I – Detailed Project Descriptions

Appendix J – HDR Project Technical Memos