October 1, 2020

To: Okanogan Watershed Initiating Governments:

- Okanogan County
- City of Omak
- Oroville-Tonasket Irrigation District

From: Okanogan Watershed Planning Unit

SUBJECT: Letter of Recommendation to Adopt the Okanogan Watershed Plan Addendum per RCW 90.94.020.

To Whom It May Concern:

The Okanogan Watershed Planning Unit was re-appointed and augmented to develop an addendum related to domestic permit-exempt water use for the Okanogan Watershed Plan (2009). This addendum identifies anticipated growth and increased domestic-exempt water demand, potential water off-set projects, watershed scale net ecological benefit projects, and evaluates said benefits which shows an overall net benefit for Water Resource Inventory Area (WRIA) 49. We hope you will give as much consideration and thoughtful insight into how you use this information and our recommendations as we did into the development of the plan.

Planning Unit members whose names are listed below did by voice vote at their October 1, 2020 meeting hereby agree to support this plan addendum. Members recognize and agree that each member may or may not support individual elements, decisions, or recommendations of the plan, the members below support the addendum as presented. The Planning Unit Members will continue to work with Okanogan County to work to ensure that remaining disagreements are resolved through the included adaptive management process. In addition, Okanogan County will continue to acknowledge that the Planning Unit is an ongoing entity, that will be consulted in development and implementation of comprehensive planning for water resource management in the basin.

Planning Unit members further wish to explicitly encourage the Initiating Governments to support to the extent possibly the implementation of this plan in an adaptive method to ensure water resources are protected for local domestic, agricultural, industrial, and aesthetic uses as the highest priority.

We hereby declare our support for this addendum as it is seen and adopted by the representatives who comprise the Okanogan Watershed Planning Unit on October 1, 2020. The plan we support has the October 1, 2020 date printed on each page of the plan (except appendices) so you may know that this is the supported version.

Should any section of the document be updated in the future it should bear the date it is approved and a letter similar to this signed by representatives of groups who approved said changes shall be found immediately following this letter at the beginning of the plan.

Name	Organization			
Chris Branch	Okanogan County			
Jay O'Brien	Oroville-Tonasket Irrigation District			
Todd McDaniel	City of Omak			
Chris Johnson	City of Okanogan			
Christa (Teagan) Levine	City of Tonasket			
Scott Vejraska	Okanogan County PUD #1			
Jim Soriano	Central Water Right Holder			
Rod Haeberle	South Water Right Holder			
Rob Inlow	Whitestone Reclamation District			
Jerry Barnes	Okanogan County Cattlemen's			
	Association			
Dick Lorz	Okanogan County Horticulture			
	Association			
Dick Ewing	Okanogan County Farm Bureau			
Roni Holder-Diefenbach	Economic Alliance			
Jennifer Weddle	Okanogan Highlands Alliance			
Trinity Stucker	Landowner at-large – North			
Bob McDaniel	Private Timber Management			

WATERSHED PLAN ADDENDUM Okanogan River Basin (WRIA 49)

Prepared for: Okanogan County and the WRIA 49 Planning Unit

Project No. 190259 • October 1, 2020 FINAL

Prepared by: Aspect Consulting, in partnership with Confluence Environmental





earth + water

WATERSHED PLAN ADDENDUM Okanogan River Basin (WRIA 49)

Prepared for: Okanogan County and the WRIA 49 Planning Unit

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Prepared by: Aspect Consulting, in partnership with Confluence Environmental

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Acronyms

afy	acre-feet per year
Aspect	Aspect Consulting, LLC
cfs	cubic feet per second
CTCR	Confederated Tribes of the Colville Reservation
Confluence	Confluence Environmental
Ecology	Washington State Department of Ecology
EDT	Ecosystem Diagnosis and Treatment
ESSB	Engrossed Substitute Senate Bill
GIS	geographic information systems
HSTR	Okanogan Habitat Status and Trends Report
ICF	ICF International, Inc.
gpm	gallons per minute
NEB	net ecological benefit
OBMEP	CTCR Okanogan Basin Monitoring and Evaluation Program
OFM	Office of Financial Management
OCD	Okanogan Conservation District
OTID	Oroville-Tonasket Irrigation District
RCW	Revised Code of Washington
SAEP	Small Area Estimates Program
TWRP	Trust Water Right Program
WAC	Washington Administrative Code
WRIA	Water Resource Inventory Area
WDFW	Washington State Department of Fish and Wildlife

Executive Summary

This addendum to Okanogan County's (County) 2009 watershed plan (Plan Addendum) has been prepared to meet the requirements of ESSB 6091 and Chapter 90.94 Revised Code of Washington (RCW), and to demonstrate that the County and Watershed Resource Inventory Area (WRIA) 49 stakeholders have evaluated and developed streamflow restoration strategies to offset potential exempt-well development impacts in the area over the required 20-year planning horizon (through 2038). Preparation of this Plan Addendum has been completed through a collaborative effort with the WRIA 49 Initiating Governments and Planning Unit members. The process was supported by convening the WRIA 49 Planning Unit to review technical tasks and memorandums, policy decisions, and create this Plan Addendum.

The passage of Engrossed Substitute Senate Bill (ESSB) 6091, as codified by Chapter 90.94 RCW, requires that an update to the WRIA 49 Watershed Plan be approved by the Washington Department of Ecology (Ecology) by February 1, 2021.

WRIA 49 has an instream flow rule in place governed by Washington Administrative Code (WAC) 173-549. For watersheds with existing instream flow rules and existing watershed plans, including WRIA 49, ESSB 6091 and Chapter 90.94 RCW allows wells for new domestic permit-exempt withdrawals to continue to be authorized by counties through their building permit process while a watershed plan update is developed to address future domestic permit-exempt well use and associated streamflow restoration projects. A key criterion addressed in this Plan Addendum is the Net Ecological Benefit (NEB) evaluation for WRIA 49. NEB defines the projected future water demand "offset" options sufficient to produce a net ecological benefit to aquatic habitats and species in WRIA 49.

WRIA 49 Instream Flow Rule

WRIA 49 has an instream flow rule in place governed by WAC 173-549, enacted on June 9, 1988, that established year-round minimum instream flows in four stream management units (three on the Okanogan River and one on the Similkameen River) and results in new water right appropriations provisioned to curtailment when instream flows are not met. The instream flow rule established seasonal closures from May 1 to October 1 to water right appropriations on all perennial streams in WRIA 49, except those with established minimum instream flows (limited to the mainsteen Okanogan and Similkameen Rivers). The rule also seasonally closed the Upper Okanogan stream management unit from June 15 through August 31 with the exception of single-domestic use and stockwater use.

Subbasin Delineation

The Planning Unit used the steelhead habitat restoration potential estimated using the Okanogan Ecosystem Diagnosis and Treatment (EDT) model to guide the definition of planning subbasins used in the WRIA 49 plan addendum. These results were compiled by

Hydrologic Unit Code (HUC) 12 subwatershed and grouped into subbasins based on the distribution of restoration potential. Each analysis subbasin includes at least one tributary or mainstem subwatershed with a potential restoration gain of 10 or more adult steelhead. Subbasin definition also considered the anticipated distribution of future domestic water demand and proposed streamflow restoration projects in WRIA 49.

Based on the above considerations, the Planning Unit identified the following planning subbasins for use in the Plan Addendum as shown in Figure ES-1:

- Loup Swamp (Lower Okanogan)
- Salmon Creek
- Bonaparte-Johnson (Middle Okanogan)
- Antoine-Whitestone (Upper Okanogan)
- Similkameen

By proximity, the mainstem Okanogan River is included by reference in each of the adjacent subbasins as noted above (i.e., lower, middle, upper), from the confluence with the Columbia River to the Canadian Border.

Projected Permit-Exempt Well Demand through 2038

An evaluation of future permit-exempt well demand was conducted in each subbasin following current Ecology guidance¹. There are an estimated 12,598 current total dwellings in the evaluated portion of WRIA 49 (not falling on the Confederated Tribes of the Colville Reservation (CTCR) lands) and of those dwellings, 5,777 were estimated to be potentially permit-exempt well sources i.e., self-supplied by a domestic water source and not served by a larger permitted water system.

Assuming a 10 percent growth scenario through 2038, the estimated future domestic dwelling growth in WRIA 49 subbasin watershed resulted in 578 new dwellings, which would be domestic permit-exempt well demand dwellings. This growth scenario resulted in a projected cumulative total consumptive use demand of 203 acre-feet per year in WRIA 49 (estimated through 2038).

Identified WRIA 49 Offset Projects

Beginning in December 2019, the Planning Unit and stakeholders met for four months to consider proposed water and non-water offset projects to achieve NEB for WRIA 49.

A two-tier scheme was used to distinguish projects presenting the highest potential for providing measurable streamflow restoration benefits. Tier 1 projects are those that can be used to clearly and quantitatively demonstrate benefits. Tier 2 projects provide additional ecological benefits that build on the Tier 1 project benefits. Project proposals were designated as Tier 1 or Tier 2 based on the following criteria:

1

http://leg.wa.gov/JointCommittees/WRM/Documents/EcologyFinalGuidanceForDeterminingNEB.pdf

- The projects are eligible to be counted towards NEB under Chapter 90.94 RCW, meaning they were proposed, contracted, and/or funded for construction after January 2018;
- 2. The project is likely to result in effects on aquatic habitat conditions within the WRIA 49 anadromous zone that can be estimated through modeling, and;
- 3. The project description and available supporting information are sufficient to characterize the potential effect of the proposed action using EDT model environmental input parameters.

Projects designated as Tier 1 meet all three of these criteria and were advanced for EDT modeling. Table ES-1 shows the selected projects that resulted from this process. Figure ES-1 shows the locations of the proposed projects.

Net Ecological Benefit Summary and Conclusions

A NEB evaluation was completed consistent with Ecology's Final Guidance for Determining Net Ecological Benefit. Key conclusions of the WRIA 49 NEB evaluation are as follows:

- The effects of future consumptive use impacts of permit-exempt wells, which are calculated to total 203 acre-feet (CU), are likely to be small; the EDT model predicts that future consumptive use would result in a net reduction in steelhead abundance of less than 1 adult and 52 juveniles at the WRIA level
- The EDT model predicts that future consumptive use would have no significant effect on summer/fall Chinook salmon abundance at the WRIA level (less than 1 fewer juveniles)
- The proposed Tier 1 water offset projects proposed in the Plan Addendum achieve a significant net positive streamflow benefit (up to a 2,666 acre-foot surplus) at the WRIA level, assuming all project were implemented in the planning period.
- Proposed Tier 1 water offset projects are capable of maintaining or increasing instream flows in all analysis subbasins except the Similkameen, where no Tier 1 projects are currently proposed.
- The EDT model analysis estimates that the Tier 1 projects in the Plan Addendum would produce a net increase of 119 adult and 5,850 juvenile steelhead, and 18 adult and 4,826 juvenile summer/fall Chinook salmon at the WRIA level.
- The full implementation of all Tier 1 non-water offset projects would increase habitat potential for steelhead at the WRIA level and in all analysis subbasins except the Similkameen where projected consumptive use effects are negligible
- The proposed Tier 1 projects would increase habitat potential for summer/fall Chinook salmon at the WRIA level and in all subbasins except Salmon Creek where this species does not and did not historically occur.
- Consumptive use effects in the Similkameen subbasin could be fully offset by the instream flow benefits of a proposed Tier 2 non-water offset project in Sinlahekin Creek.

• The Tier 2 Sinlahekin Creek project would also provide NEB for resident fish species, such as rainbow trout, cutthroat trout, mountain whitefish, native suckers, and sculpins.

NEB analysis results are summarized in Table ES-2. As shown, the water and tributary offset projects in the Plan Addendum fully offset future consumptive use in 4 of 5 analysis subbasins and at the WRIA level, achieving a net surplus of 2,666 acre feet/year (afy) and 3.22 cubic feet/second (cfs). The combination of water offset and other non-water offset projects fully offset projected consumptive use in every analysis subbasin.

The effects of the quantifiable water offset and non-water offset projects on habitat conditions for salmon and steelhead were evaluated using the Okanogan EDT model. The EDT NEB analysis scenario considers the net effect of future water demand and proposed water offset and non-water offset projects. The NEB analysis scenario accounts for future demand effects in each tributary where no water or non-water offset projects are proposed. EDT model results predict that the combined effects of Tier 1 water offset and non-water offset projects would generate a net increase in adult and juvenile steelhead abundance in every subbasin except the Similkameen, where insufficient information was available to model the effects of proposed projects. The EDT model also estimates that non-water offset projects would increase adult and juvenile summer/fall Chinook abundance in 4 of 5 subbasins and at the WRIA level.

In addition to projected benefits for salmon and steelhead, the projects presented in the Plan Addendum are also likely to produce benefits for resident fish species, further contributing to NEB in WRIA 49. While these species were not modeled in EDT, it is reasonable to conclude that projects that increase habitat potential for salmon and steelhead will also benefit native fish species. This qualitative conclusion applies in every tributary watershed and at the WRIA level where a net increase in steelhead abundance is predicted. In addition, a proposed Tier 2 water-offset project in the Sinlahekin Creek watershed would significantly increase instream flows during the summer baseflow period. This project would be implemented in a state wildlife refuge and designed specifically to benefit resident fish species. While this watershed is outside of the anadromous zone and the EDT model domain, it is reasonable to conclude that a project designed to improve habitat conditions for resident fish would result in long-term benefits for these species.

In summary, the water offset and non-water offset projects in this Plan Addendum provide a net surplus of water offset, tributary offset, and ecological benefit sufficient to adaptively manage future water demand and achieve NEB with a factor of safety, consistent with Chapter 90.94 RCW requirements. The proposed projects are realistic and distributed throughout WRIA 49, are in project categories that are supported by state and federal funding programs, have viable sponsors and defensible conceptual designs, and include some projects that have already been implemented. The WRIA 49 Planning Unit has reached concurrence that this Plan Addendum demonstrates that the combined components of the plan achieve NEB consistent with Chapter 90.94 RCW requirements.

This Executive Summary should only be used in the context of the full report.

Table ES-1. Summary of Proposed WRIA 49 Offset ProjectsWRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Project	WRIA 49 Subbasin/Stream	Tier Ranking	Sponsor	Project Type ¹	Description	Consumptive Use Offset	Instream Flow Benefit	Affected Stream Length (mi) ²	Estimated Cost	Requires O&M?
Antoine Valley Ranch (AVR) ³	Antoine-Whitestone/ Antoine Creek	Tier 1	Washington Water Trust, CTCR, Trout Unlimited	O&NEB	Conservation acquisition of 2,524-acre Antoine Valley Ranch (AVR) and senior water rights totaling 1,294 af. Includes ownership of Fanchers Dam with its related storage 500 AF capacity. Project will provide flow augmentation and retiming for summer baseflow and thermal benefits, and support future habitat restoration in a valuable spawning tributary.	Up to 1,294 afy	1.8 cfs (average)	5.4 (flow restoration may support restoring access to additional ~12 miles of habitat between AVR and Fanchers Dam)	\$7.9-\$8.5 million	Yes
Conservancy Island Side Channel Reactivation	Bonaparte-Johnson/ Okanogan River	Tier 1	City of Okanogan	NEB	Restore Conservancy Island side channel connectivity with Okanogan River, providing access to historical Chinook salmon and steelhead spawning and rearing habitat.			0.9	\$850,000	Yes
Johnson Creek Fish Passage	Bonaparte-Johnson/ Johnson Creek	Tier 1	Trout Unlimited	NEB	Package of 3 90.94-eligible fish passage restoration projects funded by the Brian Abbot (Washington State) Fish Barrier Removal Board. Provides access from mouth upstream to Duck Lake diversion.			4	\$2.7 million	No
Loup Loup Creek Diversion Improvements ³	Swamp-Loup Loup/ Loup Loup Creek	Tier 1	CTCR, Washington Water Trust	NEB&LO (O pending additional study)	Replace unlined diversion ditch with pipe to eliminate leakage and evaporation losses. Water savings will be dedicated to instream flows.	TBD	0.38 cfs (average), ~275 afy	2.17	\$1.7 million	Yes
OTID Tributary Supplementation ³	Johnson-Bonaparte/ Bonaparte Creek Antoine-Whitestone/ Siwash Creek, Antoine Creek, Whitestone Creek, Ninemile Creek	Tier 1	Oroville-Tonasket Irrigation District	NEB&LO	Use existing diversion infrastructure to provide flow augmentation in lower reaches of select Okanogan tributary streams from April 1 to October 15.	460-525 afy	1.2-1.3 cfs (Apr-Oct)	5.7	\$10,500	Yes
Pine Creek Water Right Acquisition ³	Bonaparte-Johnson (Middle Okanogan)	Tier 1	Okanogan County / OCD	0	Purchase the Pine Creek Trust Water Right (CG4-23992(A)C) from Ecology for consumptive use offset.	625.7 afy	0.86 cfs	51	\$1,300 per af	No
Salmon Creek Source Substitution	Salmon Creek	Tier 1	City of Okanogan	NEB&LO	Transfer 300 gpm municipal surface water diversion right from Salmon Creek to an existing or new groundwater well in continuity with Okanogan River.	485 afy	0.67 cfs	3.7	\$250,000, +\$10,000 annual O&M	Yes
Salmon Lake Storage	Salmon Creek	Tier 1	Bureau of Reclamation, CTCR, Okanogan Irrigation District	O&NEB	Residential infrastructure purchase or improvements to allow for full use of Salmon Lake reservoir pool. Provides increased storage for flow retiming.	~1,000 afy	2.1 cfs (average)	18.8	\$175,000 to \$652,000 depending on management option	Yes
Whitestone Creek Flow and Temperature Augmentation	Antoine-Whitestone/ Whitestone Creek	Tier 1	Whitestone Irrigation District	NEB	Improve conveyance system to increase irrigation system efficiency and reduce maintenance. Provide 1 to 1.5 cfs additional instream flow in Whitestone Creek from Apr-Oct to for flow and temperature augmentation.	425-485 afy	1-1.5 cfs inflow (Apr- Oct) at 5-7 degrees C below ambient surface water temperature	3.3	In development	Yes
Aeneas Lake Irrigation District Efficiencies	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Reduce the amount of excess water pumped from the mainstem Okanogan River. This would reduce the over- pumping and return flow to the river, which is expected to reduce turbidity in that location.			TBD	\$30,000	Yes
Conconully Dam Replacement	Salmon Creek	Tier 2	Bureau of Reclamation, Okanogan Irrigation District	O&NEB	Proposed dam replacement, with potential to increase available storage and provide fish passage to historically accessible headwaters of Salmon Creek.	Unspecified	Unspecified	TBD	Unspecified	Yes
Highlands Springs Protection and Enhancement	Bonaparte-Johnson (Middle Okanogan)	Tier 2	Okanogan Highlands Alliance	NEB	Partner with range lessees, landowners, and the U.S. Forest Service (USFS) to assess the condition of water resources, repair spring protection infrastructure, and install fencing and troughs to protect undeveloped springs.			TBD	\$20,000 + \$5,000- \$10,000 annual O&M	Yes
Irrigation Efficiency Projects	Multiple	Tier 2	OCD	O&NEB	Opportunistic irrigation efficiency projects throughout WRIA 49 reducing overall water demand. Water savings will be dedicated to instream flows.	TBD	Unspecified	TBD	Unspecified	Yes
Loup Loup Creek Channel and Riparian Improvements	Swamp-Loup Loup/ Loup Loup Creek	Tier 2	OCD	NEB	Improve instream habitat and riparian conditions along 600 feet of Loup Loup Creek, improving spawning habitat for ESA-listed steelhead. Riparian buffers will be increased from 10 feet to 30- 100 feet.			0.11	Unspecified	No
Methow Beaver Project ³	Antoine-Whitestone/ Whitestone Creek, Swamp-Loup Loup, Bonaparte-Johnson	Tier 2	Methow Beaver Project	NEB	Increase late season streamflow by adding and improving channel structure and floodplain connection to restore natural watershed functions.			TBD	\$550,000	No
Okanogan Highlands Water Riparian Restoration	Antoine-Whitestone/ Whitestone Creek	Tier 2	Okanogan Highlands Alliance	NEB	Restoration techniques will vary by site, depending on geomorphology, land use, streamflow, instream structure and roughness, etc., but will include structural adjustments to improve flow and storage, plant native species, and			TBD	\$10,000-\$65,000 + \$1,000-\$15,000 annual O&M	Yes
Okanogan River Riparian Enhancement	Antoine-Whitestone/ Whitestone Creek	Tier 2	OCD	NEB	Maintain four previously planted acres on the 2-mile long stretch of property. This will include replacement of dead plants, adaptive management for weed control, and irrigation.			2	\$55,000 + \$1,500 annual O&M	Yes
Pine Creek Riparian Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Protect riparian and wetland areas from water quality impacts from livestock using downed 'jackstraw' logs. These scattered logs mimic natural barriers to browsing and protect natural regeneration of riparian plants and new plantings.			0.13	12,000 + \$2,000 annual O&M	Yes
Salmon Creek Streambank Stabilization Projects	Salmon Creek	Tier 2	OCD	NEB	Restore and enhance riparian vegetation by planting woody shrub and tree species for the purpose of providing woody debris recruitment into Salmon Creek as a means of creating habitat for invertebrates, which will enhance food sources for			TBD	\$16,000 + \$900 annual O&M (5 years)	Yes

Table ES-1. Summary of Proposed WRIA 49 Offset Projects

WRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Sinlahekin Wildlife Area Improvement Project	Similkameen	Tier 2	Oroville-Tonasket Irrigation District, Washington Department of Fish and Wildlife	O&NEB	Impoundment and diversion system improvements to support instream flows in Sinlahekin Creek. A portion of water savings will be dedicated to instream flows.	Unspecified	Unspecified	42	\$750,000	Yes
Tunk Valley Dry Forest Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD, DNR	NEB	1,100-acre project to create long-term habitat quality and ecological integrity by moving stands back towards more dispersed, larger diameter trees at a much-reduced density.				Unspecified	Yes

1 O&NEB = consumptive use offset project with or without additional habitat restoration that contributes to NEB; NEB = streamflow and/or habitat restoration project that contributes to NEB; LO = Local Tributary Offset

2 The approximate length of tributary or mainstem reach measurably affected by the proposed non-water offset project. For the Highway 20 culvert replacement project the affected length covers the Conservancy Island side channel from its historical upstream and downstream connection points with the mainstem Okanogan River.

3 Indicates project applied for 2020 Streamflow Restoration Grant funding.

Table ES-2. Water NEB Results

WRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

	Water-for-Water Offset		Tributary Offset ¹		Net Ecological Benefit				
NEB Subbasin		Net change	Net	Net	Adult	Juvenile	Adult	Juvenile	
	Net change (ary)	(cfs)	(afy)	(cfs) ²	Steelhead Neq	Steelhead Neq	Chinook Neq ³	Chinook Neq ³	
Loup Loup-Swamp (Lower Okanogan)	-37	-0.51	275 (approx)	0.38	2	118	2	2,537	
Salmon Creek	1,000 (+988)	1.36	1,499	2.07	111	5,539			
Bonaparte-Johnson (Middle Okanogan)	626 (+626) ⁴	0.864	123	0.17	4	83	14	1,999	
Antoine-Whitestone (Upper Okanogan) ⁵	1,160 (+1,099)	1.52	2,371	3.28	2	110	1	305	
Similkameen ⁶	-10	-0.01	-	-	0	0	1	166	
WRIA 49 Total	2,786 (+2,666)	3.22	6,753	5.9	119	5,850	18	4,826	

¹ Tributary Offset is the total instream flow increase in Okanogan River tributaries that support summer steelhead, combining water-for-water offset projects and Tier 1 non-water offset projects.

² Net change (cfs) values are average over 1 year. All non-water offset projects provide flow augmentation during specific periods (e.g. April through October) to optimize habitat benefits for steelhead.

³ Chinook NEB effect from Highway 20/Conservancy Island side channel project

⁴ Pine Creek water-for-water offset applies in mainstem Okanogan only (no tributary offset or measurable NEB effect)

⁵ Tributary offset and NEB estimate include AVR project with full instream flow benefit of 1,294 afy, including additional non-water offset of 134 afy.

⁶ The Tier 2 Sinlahekin Wildlife Area Impoundments Improvement project provides sufficient potential tributary offset in the Similkameen subbasin to avoid consumptive use effects and produce additional NEB benefit for resident fish species. A net tributary offset of zero is assumed for the purpose of the NEB determination.

Confluence and Aspect Consulting

9/2/2020 V:\190259 WRIA 49 Watershed Planning Support/Deliverables\Watershed Plan Addendum\Draft Final\Tables\WRIA 49 DRAFT Tables (Revised)

Table ES-2

Watershed Plan Addendum Page 1 of 1



1 Introduction

The passage of Engrossed Substitute Senate Bill (ESSB) 6091, as codified by the Chapter 90.94 Revised Code of Washington (RCW), requires that an update to the existing Watershed Plan for Water Resource Inventory Area (WRIA) 49, the Okanogan Watershed, be approved by the Washington Department of Ecology (Ecology) by February 1, 2021.

Passage of the law followed the 2016 Whatcom County v. Hirst, Futurewise, et al. Washington State Supreme Court Decision (the "Hirst decision"). The Hirst decision shifted the burden of establishing legal water availability from Ecology to the individual counties when approving development projects supplied by permit-exempt groundwater withdrawals under RCW 90.44.050². The decision resulted in curtailment of rural development throughout much of the state.

For watersheds with existing instream flow rules and existing watershed plans, including WRIA 49, ESSB 6091 and Chapter 90.94 RCW allows for new permit-exempt wells to continue to be authorized by counties through their building permit process while a watershed plan update is developed to address future permit-exempt well use and associated streamflow restoration projects.

WRIA 49 has an instream flow rule in place governed by Washington Administrative Code (WAC) 173-549. This Watershed Plan Addendum (Plan Addendum) has been prepared to update the existing Watershed Management Plan (Watershed Plan) for WRIA 49 to address objectives of the 2018 Streamflow Restoration law(Chapter 90.94 RCW)³. The Watershed Plan was approved by the Okanogan Planning Unit (Planning Unit) in 2009 under the Watershed Planning Act (RCW 90.82).

This Plan Addendum was developed by the WRIA 49 Initiating Governments (IGs) and Planning Unit with facilitation assistance from the Okanogan Conservation District (OCD), and technical assistance from Aspect Consulting, LLC (Aspect) and their subconsultants Confluence Environmental Company (Confluence) and ICF International, Inc (ICF). The Plan Addendum was developed to meet the requirements of Chapter 90.94 RCW, with reference to Ecology's Streamflow Restoration Policy and Interpretive Statement (Ecology, 2019a) and Final Guidance for Determining Net Ecological Benefit (Ecology, 2019b). Ecology's Vanessa Brinkhuis also provided important guidance and served as liaison with the agency. In addition, periodic technical review and comment was provided by Ecology's Jim Pacheco, Tom Culhane, and Matt Rakow. This work was

 $^{^{2}}$ RCW 90.44.050 exempts certain groundwater withdrawals from the requirement to obtain a water right permit. The exemption applies to single or group domestic uses, industrial use, and irrigation of lawn or non-commercial gardens up to one-half acre provided that total withdrawals do not exceed 5,000 gallons per day and allows for an unlimited quantity for stock watering purpose

³ In January 2018, the Legislature passed the Streamflow Restoration law that is intended to help restore streamflows to levels necessary to support robust, healthy, and sustainable salmon populations while providing water for homes in rural Washington. https://ecology.wa.gov/Water-Shorelines/Water-supply/Streamflow-restoration https://ecology.wa.gov/Water-Shorelines/Water-supplicharestoration/Streamflow-restoration/Streamflow-restoration/Strea

funded by an Ecology Water Resources Streamflow Restoration Project Planning Grant (Grant) No. WRSRPPG-2018-OkanPD-00038.

1.1 Overview of Plan Addendum Requirements

Section RCW 90.94.020 of the Streamflow Restoration Act authorizes new domestic groundwater permit-exempt withdrawals in certain WRIAs, including WRIA 49, that have state-adopted instream flow rules and approved watershed plans. To support planning units in developing watershed plan updates, Ecology issued its Streamflow Restoration Policy and Interpretive Statement (Ecology, 2019a), which clarified that:

"A complete update of all the elements of the original watershed management plan is not required for WRIAs planning under RCW 90.94.020. The requirement to update an existing watershed management plan applies specifically to the objectives of the Streamflow Restoration legislation."

Requirements of RCW 90.94.020 pertaining to the watershed plan update include:

- In RCW 90.94.020(2): "the department shall work with the initiating governments and the planning units described in chapter 90.82 RCW to review existing watershed plans to identify the potential impacts of exempt well use, identify evidence-based conservation measures, and identify projects to improve watershed health"
- In RCW 90.94.020(4)(a): "In collaboration with the planning unit, the initiating governments must update the watershed plan to include recommendations for projects and actions that will measure, protect, and enhance instream resources and improve watershed functions that support the recovery of threatened and endangered salmonids. Watershed plan recommendations may include, but are not limited to, acquiring senior water rights, water conservation, water reuse, stream gaging, groundwater monitoring, and developing natural and constructed infrastructure, which includes, but is not limited to, such projects as floodplain restoration, off-channel storage, and aquifer recharge. Qualifying projects must be specifically designed to enhance streamflows and not result in negative impacts to ecological functions or critical habitat."
- In RCW 90.94.020(4)(b): "At a minimum, the watershed plan must include those actions that the planning units determine to be necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use. The highest priority recommendations must include replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary. Lower priority projects include projects not in the same basin or tributary and projects that replace consumptive water supply impacts only during critical flow periods. The watershed plan may include projects that protect or improve instream resources without replacing the consumptive quantity of water where such projects are in addition to those actions that the planning unit determines to be necessary to offset potential consumptive impacts to instream flows associated with permit-exempt domestic water use."

• In RCW 90.94.020(4)(c): "Prior to adoption of the updated watershed plan, the department must determine that actions identified in the watershed plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources within the water resource inventory area."

To support planning units in meeting the net ecological benefit (NEB) requirement, Ecology issued its Final Guidance for Determining Net Ecological Benefit (Ecology GUID 2094, 2019b). This guidance includes minimum planning requirements, which includes:

- Utilization of clear and systematic logic
- Delineation of subbasins
- Estimation of new consumptive water uses
- Evaluation of impacts from new consumptive water use
- Description and evaluation of projects and actions for their offset potential

1.2 Initiating Governments and Planning Unit Coordination

Okanogan County, the City of Omak, and the Oroville-Tonasket Irrigation District are the IGs for the Okanogan Watershed (WRIA 49). Okanogan County serves as the Lead Agency. The IGs began planning for an addendum for the Okanogan Watershed Plan in summer of 2018. During initial discussions the IGs invited the Confederated Tribes of the Colville Reservation (CTCR) to participate in the process as required under RCW 90.94.020(3). There was discussion and investigation to determine if an invitation to the Yakama Indian Nation would be appropriate but was subsequently decided the Yakama's do not have traditional or negotiated rights in the Okanogan Watershed. The CTCR chose to participate as a non-voting member of the Technical Committee only.

The Initiating Governments started the Chapter 90.94 RCW planning process with the organizations that were represented in the previous planning unit process, plus the addition of new members to broaden the Planning Unit's representation. Ultimately 27 seats were identified for the Planning Unit. Planning Unit membership is shown in Table 1. The Planning Unit designated a Technical Advisory group (TAG) to evaluate and recommend potential restoration projects to the Planning Unit. TAG membership is shown in Table 1 (attached).

The Planning Unit began meeting once per month in October 2018. During the winter of 2018/2019 the Planning Unit developed and approved operating rules, which incorporated making decisions by consensus where possible, but allowed for voting using Robert's Rules of Order if two attempts to discuss and reach consensus were to fail on given issues and decisions. This decision-making process was reconfirmed at the June 2, 2020 meeting. Agendas and minutes for Planning Unit meetings are available on the Okanogan County's website:

https://www.okanogancounty.org/planning/wria_49_plannng_unit.html

2 Project Background

This section provides background on previous watershed planning in WRIA 49, and references to the physical setting of the watershed, hydrologic and hydrogeologic conditions, and current aquatic habitat conditions with emphasis on those habitats used by anadromous salmonids, including Upper Columbia steelhead currently listed as threatened under the Endangered Species Act (ESA).

2.1 Previous Watershed Planning in WRIA 49

In 2005, the Initiating Governments selected the OCD as the lead entity to complete a watershed plan for WRIA 49 under the Watershed Planning Act (RCW 90.82). The initiating governments also selected the members of the Planning Unit, which at that time included 27 members and alternates.

The Planning Unit received technical assistance from ENTRIX, Inc. to support development of the Phase 2 Technical Report (Entrix, 2006) and associated appendices and technical documents. The watershed plan was drafted containing recommended actions in categories including water quantity, water quality, instream flows, habitat, and multi-purpose water storage. The Planning Unit unanimously adopted the WRIA 49 watershed plan in June 2009 (Okanogan Watershed Planning Unit 2009). The plan was subsequently approved by the IGs the same month and submitted to Ecology. Since approval of the watershed plan, efforts to study the hydrology and aquatic ecology of WRIA 49 have continued. The CTCR Okanogan Basin Monitoring and Evaluation Program (OBMEP) is a key contributor to these ongoing efforts. OBMEP has developed and maintained an extensive habitat status and trends monitoring network to track progress towards salmon and steelhead recovery under the Columbia Basin Fish Accords. As part of this effort, OBMEP has developed an Ecosystem Diagnosis and Treatment (EDT) Model for the Okanogan River and its tributaries, covering the majority of WRIA 49.

Along with other programs under CTCR and the State's Upper Columbia Salmon Recovery Board, the work completed since the 2009 watershed plan was adopted provided for greater opportunities to identify projects benefitting instream flow resources under this Chapter 90.94 RCW process than were previously available. The projects contemplated as recommendations in this Plan Addendum include proposals identified in the original watershed plan and new projects identified in subsequent work by others.

2.2 Physical Setting of WRIA 49

The boundaries of WRIA 49 as established by WAC 173-500-990 are shown in Figure 1. WRIA 49 encompasses the Okanogan River drainage basin within the United States including the lowermost reaches of its primary tributary, the Similkameen River, and other numerous perennial and intermittent stream drainages comprising tributaries to the Okanogan. The Okanogan River runs south from Canada through Lake Osoyoos near Oroville for approximately 70 miles through Okanogan County to the Columbia River. The Similkameen River also originates in Canada, flowing south from the border and then east from Nighthawk for approximately 20 miles to its confluence with the Okanogan River near Oroville. The mainstem Okanogan and Similkameen Rivers and

several key tributaries are designated critical habitat for ESA-listed salmonids in WRIA 49.

The WRIA is characterized by mountainous terrain, with elevations ranging from about 840 feet at the confluence of the Okanogan with the Columbia River, to 8,245 feet at Tiffany Mountain and 7,257 feet at Mount Bonaparte, the highest points on the western and eastern sides of the WRIA, respectively. Over two dozen peaks in the WRIA exceed 3,000 feet.

WRIA 49 lies within an ecologically diverse region that includes portions of three distinct Level III ecoregions and encompasses all or portions of five regionally unique Level IV ecoregions (USEPA 2010). The mainstem Okanogan River and surrounding valley (Okanogan Valley, Level IV ecoregion 10m) are part of the Columbia Plateau ecoregion while the surrounding highlands are ecologically distinct components of different mountain ranges. The western highlands are part of Level III ecoregion 10, the North Cascades, and encompass portions of Level IV ecoregions 77d and 77e, the Pasayten/Sawtooth Highlands and Okanogan Pine/Fir Hills, respectively. The eastern highlands are in Level III ecoregion 15, the Northern Rocky Mountains, and include Level IV ecoregions 15g and 15x, the Western Okanogan Semiarid Foothills and Okanogan Highland Dry Forest, respectively.

Major municipalities within WRIA 49 include Oroville, Tonasket, Omak, Okanogan, Conconully, Pateros, Riverside, and Brewster. Agriculture consisting primarily of hay and tree fruit crops, commercial timber, and cattle comprise the majority of economic activity. Irrigated agriculture is the predominant land use on the valley floors of the Okanogan River and in several tributary drainages. Irrigation water is sourced under water right authorizations from groundwater and surface water sources by private entities and nine irrigation districts, reclamation districts, or canal companies. CTCR lands comprise the southeastern portion of WRIA 49 on the east side of the Okanogan River south of Riverside.

2.2.1 Climate and Hydrology

The climate of the Okanogan River valley is generally warm and dry in the summer and cold and wet in the winter, with sub-humid mountainous climate conditions becoming more prevalent at higher elevations to the east and west. The current 30-year average annual maximum and minimum temperatures in Omak are 61.1 and 37.8°F, respectively. Temperatures above 90 and below freezing are common in summer and winter, respectively.

Average annual precipitation is 14.75 inches, occurring primarily in fall and winter as a mix of rain and snow with snow predominant at higher elevations (NCDC 2020). Most of the water flowing through WRIA 49 originates in British Columbia. The greatest snowpack accumulation occurs mostly in the western and northern portions of the basin. Precipitation varies by location, ranging from less than 10 inches at low elevation near the confluence of the Okanogan and Columbia Rivers to greater than 30 inches in the highest elevations along the western boundary of the basin.

The Okanogan and Similkameen are primarily snowmelt-driven systems with highest streamflows occurring during the freshet from April through July. Approximately 70 to

80 percent of annual average discharge occurs during the freshet period. The 30-year mean annual discharge for the Okanogan River measured in the lower portion of WRIA 49 at Malott is 3,090 cubic feet per second (cfs). Streamflows peak in early spring in smaller tributaries draining lower elevations. Flows in the mainstem Okanogan and Similkameen Rivers peak after flows in most WRIA 49 tributary streams have subsided, because the majority of their watersheds drain mountainous areas in British Columbia that retain snowpack after most snow in WRIA 49 has melted.

The lowest flows in WRIA 49 streams occur from August through October when precipitation is scarce, and during winter freeze periods in December and January. Low flows are primarily comprised of groundwater discharge reflective of baseflow conditions. Streamflows typically increase in October with the arrival of fall precipitation patterns to the region and then decrease during the winter freeze before peaking again during spring snowmelt.

2.2.2 Geology and Groundwater

The geology of WRIA 49 is characterized by igneous (mostly intrusive) and metamorphic rocks that have undergone uplift resulting from the offshore collision of tectonic plates at the Cascadia subduction zone. Tectonic uplift formed the north Cascade Mountain Range to the west and Okanogan Highlands to the east. The Okanogan River valley is a primarily structural valley that has been further shaped by erosional and depositional forces. The Okanogan lobe of the Cordilleran continental glacial ice sheet occupied the entirety of WRIA 49, approximately 10,000 to 12,000 years ago. As the ice sheet advanced and retreated, it left behind exposed bedrock or thin glacial sediments in upland regions and thick sequences of glacial sediments in valley bottoms of tributaries and in the Okanogan River valley.

Unconsolidated glacial sediments up to several hundred feet thick on the Okanogan River valley floor were incised by the downcutting Okanogan River following glacial retreat, leaving behind terraces features throughout most of the valley. The upper terraces are primarily glacial sediments and the lowest terraces nearest to the river are primarily reworked glacial sediments and alluvium from the Okanogan River and its tributaries. Tributaries flowing across the terrace surfaces from bedrock uplands have incised canyons oriented perpendicular to the Okanogan River.

Groundwater in WRIA 49 occurs primarily in three hydrostratigraphic units: Okanogan River valley glacial and alluvial sediments, tributary valley glacial and alluvial sediments, and bedrock.

Glacial and alluvial sediments consisting primarily of fine sand, silt, and layers of clay and coarse sand and gravel form the principal aquifers for groundwater storage in the basin. These aquifers provide groundwater storage feeding tributary streams and supply withdrawals for irrigation, domestic, and industrial uses. The majority of wells in WRIA 49 are completed in these glacial and alluvial sediments and most major tributaries lie within valleys having extensive glacial deposits that sustain their perennial flows. Groundwater in the glacial and alluvial sediments is recharged by rain and snow runoff from glacially scoured bedrock uplands, direct precipitation, irrigation return flows, and mountain front recharge from groundwater flowing through bedrock. Recharge derived from the Okanogan River is a major source for groundwater in thick sediments of the Okanogan River valley.

Bedrock comprised primarily of intrusive and metamorphic rocks have little or no intrinsic permeability. This limits recharge and constrains groundwater flow to secondary fractures. As a result, fewer wells are completed in bedrock and those that are generally exhibit low yields.

Two primary studies address groundwater conditions in WRIA 49. Walters (1974) characterized basin wide surface water and groundwater resources by summarizing data collected during various studies and examining drillers logs for wells in the Okanogan River valley and major tributaries. The USGS (Sumioka and Dinicola, 2009) examined groundwater-surface water interactions in four major tributaries (Tunk, Bonaparte, Antoine, and Tonasket Creeks) by measuring streamflows and hydraulic gradients at several measurement sites. Various smaller studies characterizing localized groundwater conditions and groundwater-surface water interactions have been completed, including studies completed for the CTCR and in support of water right permitting activities throughout the basin.

The body of evidence from available studies indicates the lower reaches of many WRIA 49 tributaries are hydraulically disconnected from groundwater due to streambeds that lie several tens of feet or more above the groundwater table. These stream reaches lose flow through the streambed as they traverse the coarse-grained sediments on glacial terraces before their confluence with the Okanogan River. Losing flow conditions in these streams can impact aquatic habitat and impede fish migration between the mainstem river and upper tributary reaches. Additionally, losing conditions in the lower reaches of tributaries suggest groundwater flow does not always observe topographic divides in areas having thick unconsolidated and sediments such as the Okanogan River valley floor.

2.2.3 Current Aquatic Habitat Conditions

This summary of aquatic habitat conditions in the Okanogan River system complements the description provided in the previous Okanogan Watershed Plan (Okanogan Watershed Planning Unit 2009), which is incorporated here by reference. This section summarizes the current status of aquatic habitat conditions in WRIA 49. Detailed information about habitat conditions can be obtained from the web-based Okanogan Habitat Status and Trends Report (HSTR), available at https://ecosystems.azurewebsites.net/hstr-okanogan/. The Okanogan HSTR summarizes EDT model results for Chinook salmon and steelhead and includes identification of priority habitats and limiting factors at assessment unit (subwatershed) and reach scales.

These results are based on detailed habitat monitoring data collected by the Okanogan Basin Monitoring and Evaluation Program (OBMEP).

WRIA 49 bounds the U.S. portion of the Okanogan/Similkameen 6th Field Hydrologic Unit, the largest and most complex watershed in the Upper Columbia region. The majority of watershed drainage area lies in British Columbia but the majority of accessible anadromous habitat is in WRIA 49. This creates complex management challenges requiring coordinated transboundary planning and implementation.

WRIA 49 Anthropogenic Influences

Aquatic habitat conditions in the Okanogan have been negatively impacted by a long history of resource development, beginning in the early 1800s with intensive beaver trapping. The discovery of rich fur resources attracted an influx of trappers, traders, and prospectors into the mid-1800s. The discovery of gold and subsequent hard rock mining development led to additional population growth in the latter half of the 19th century, supporting the expansion of local agricultural and livestock industries. This further accelerated resource competition during the period from the late 1800s through the 1930s when grazing allotment systems were formally instituted. Demand for surface and groundwater resources and irrigation infrastructure development increased concurrently with the development of these industries. By the early to mid-1900s several tributary streams were heavily appropriated and commonly drawn nearly or completely dry during the irrigation season.

Urban, industrial, and rural residential development continued to expand throughout the 20th century, introducing additional fish passage barriers, pollution sources, and habitat degradation. Development pressure in the Canadian portion of the subbasin has been particularly intense. The majority of the mainstem and the lower reaches of many tributaries have been channelized and diked, and all Okanagan Basin lake outlets have been hydromodified for flood control and to support agricultural and urban development. This development history has undoubtedly had negative effects on resident and anadromous fish species and other aquatic life and continue to influence habitat conditions today (RTT 2017).

The most critical issues facing the watershed are fish passage barriers, poor water quality, specifically high water temperatures, degraded channel and riparian habitat conditions, disrupted sediment transport, and low instream flows in the mainstem and tributary reaches during baseflow periods (RTT 2017). Peak summer temperatures in the mainstem and some tributary reaches regularly exceed optimal limits for salmonid spawning and rearing and periodically exceed lethal limits in some areas. These conditions are attributable to a combination of natural factors, including low channel gradient in the Okanogan mainstem, north to south watershed aspect, high ambient air temperatures, and upstream lake effects, and anthropogenic modification of the environment, including hydromodification, dam operations, irrigation withdrawals, and land management practices.

Fish passage obstructions in the form of culverts and irrigation diversions and low stream flows are significant limiting factors in key spawning tributaries for ESA-listed steelhead, including Salmon Creek and Johnson Creek.

WRIA 49 and the surrounding landscape are prone to wildfires. The watershed has experienced a series of large, ecologically damaging fires since 2000, including the 2015 Okanogan Complex and 2014 Carlton Complex fires, the first and second largest in state history in terms of area burned, respectively. Other significant wildfire events include the Virginia Lake Complex in 2001, the St. Mary's Road fire in 2012, the Tunk Grade fire in 2007, the Oden Road Fire in 2009, and the Mission Falls Fire in 2003. Wildfires have damaged riparian vegetation and disrupted the sediment transport regime in some important tributary streams, leading to loss of aquatic habitat function. Conversely, wildfires have altered the hydrographs for some tributaries causing Chiliwist Creek that has been intermittent for decades to now run perennially for several years based upon multiple eye-witness accounts.

Current WRIA 49 Aquatic Habitat

Today WRIA 49 provides aquatic habitat for a diversity of anadromous and resident fish species, including ESA-listed Upper Columbia steelhead (*Oncorhynchus mykiss*) and summer/fall run Chinook salmon (*O. tshawytscha*). A large run of sockeye salmon (*O. nerka*) migrates through WRIA 49 to access spawning and rearing habitats in the Canadian portion of the Okanogan subbasin. Spring Chinook salmon were historically present in the Okanogan system but have been extirpated since the 1930s by the combined effects of hydropower development, overfishing, and habitat degradation. The CTCR are currently attempting to reintroduce an experimental population of spring Chinook to WRIA 49 under ESA Section 10(j) (79 FR 40004).

Other native fish species documented in the watershed include resident rainbow trout, westslope cutthroat trout (*O. clarkii lewisi*), mountain whitefish (*Prosopium williamsoni*), northern pikeminnow (*Ptychocheilus oregonensis*), suckers (*Catostomus* spp.), dace and other Cyprinids, and sculpins (*Cottus* spp.). Several introduced non-native species have become established in WRIA 49, including largemouth and smallmouth bass (*Micropterus* spp.), sunfish (*Lepomis* spp.), bullheads (*Ameiurus* spp.), white crappie (*Pomoxis annularis*), and yellow perch (*Perca flavescens*) (Hughes and Herily 2012).

OBMEP has prioritized aquatic habitats in the WRIA 49 based on current habitat function and restoration potential for steelhead and Chinook salmon. The highest priority subwatersheds for steelhead habitat restoration in WRIA 49 are Omak Creek, the Similkameen River, Antoine Creek, Salmon Creek, and Johnson Creek. The highest priority habitats for summer/fall Chinook salmon are located on the mainstem between Chiliwist Creek and Tunk Creek.

This prioritization is based on EDT modeling results for habitat and biological data collected from 2014-2017, the most recently completed 4-year monitoring cycle, and documented core production areas for steelhead and Chinook salmon. OBMEP uses the Okanogan EDT model to evaluate habitat restoration potential in each subwatershed in the system. These results were used to define analysis subbasins for this Watershed Plan and provide a basis for NEB evaluation using the EDT model. See the Okanogan HSTR for additional details on how habitat prioritization was conducted.

2.3 Instream Flow Rule

WRIA 49 has an instream flow rule in place governed by WAC 173-549, enacted on June 9, 1988, that established year-round minimum instream flows in four stream management units (three on the Okanogan River and one on the Similkameen River) and has resulted in new water right appropriations provisioned to curtailment when instream flows are not met.

The instream flow rule established seasonal closures from May 1 to October 1 to water right appropriations on all perennial streams in WRIA 49, except those with established minimum instream flows (limited to the mainstem Okanogan and Similkameen Rivers). Instream flow rule restrictions apply to lakes and groundwater in continuity with the rivers and streams that are subject to the rule. The rule also seasonally closed the Upper Okanogan stream management unit from June 15 through August 31 with the exception of single-domestic use and stockwater use.

Although the instream flow rule did not establish a reserve for future appropriations, Ecology's determination prior to the Washington State Supreme Court's Hirst decision allowed for permit-exempt withdrawals authorized under the authorization of RCW 90.44.050 in WRIA 49, including when instream flows were not met.

2.4 Subbasin Delineation

Ecology's GUID-2094 stipulates minimum Chapter 90.94 RCW planning requirements, including delineation of subbasins. The guidance states:

"Planning groups must divide the WRIA into suitably-sized subbasins to allow meaningful analysis of the relationship between new consumptive use and offsets. Subbasins will help the planning groups understand and describe location and timing of projected new consumptive water use, location and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects. Planning at the subbasin scale will also allow planning groups to consider specific reaches in terms of documented presence (e.g., spawning and rearing) of salmonid species listed under the federal Endangered Species Act."

To begin, the Planning Unit used the scheme employed by the U.S. Geological Survey (USGS) to classify the nation's watersheds into successively smaller units and catalog them by a unique identifier known as a Hydrologic Unit Code (HUC). Three HUC levels are important in WRIA 49: HUC-8 units include the entire Okanogan and Similkameen drainages located within Washington State, HUC-10 units include larger named tributaries to these two rivers, and HUC-12 units generally include subwatersheds of these tributaries that are often comprised of unnamed tributaries and intermittent streams.

As presented in Appendix B, the Planning Unit considered several factors when selecting planning subbasins, including previous subbasins defined the 2006 Water Plan, suitability of using topographic divides for subbasin delineation, and habitat potential and EDT modeling considerations, and EDT Neq results.

Ultimately, the Planning Unit used the EDT estimated restoration potential by HUC12 subwatershed to guide the definition of planning subbasins used in the WRIA 49 plan addendum⁴. Each analysis subbasin includes at least one tributary or mainstem subwatershed with a potential restoration gain of 10 or more adult steelhead. Subbasin definition also considered the anticipated distribution of future domestic water demand and proposed streamflow restoration projects in WRIA 49.

⁴ OBMEP has defined Assessment Units (AUs) based on HUC 12 subwatersheds, the EDT model generates results by reach and AU that can be compiled at the WRIA 49 subbasin level.

2.4.1 WRIA 49 Planning Update Subbasins

Based on the above considerations (and as described in Appendix B), the Planning Unit identified the following planning subbasins for use in the Plan Addendum as shown in Figure 1:

- Loup Swamp (Lower Okanogan) This subbasin consists of two adjacent HUC-10 watersheds: Loup Loup Creek and Swamp Creek. These watersheds contain smaller creeks draining the region west of the mouth of the Okanogan River and south of the City of Okanogan.
- Salmon Creek This subbasin consists of the HUC-10 Salmon Creek watershed, a tributary to the Okanogan River that drains the region west of the City of Okanogan and Omak. Salmon Creek discharges to the Okanogan River at Okanogan.
- **Bonaparte-Johnson (Middle Okanogan)** This subbasin consists three HUC-10 watersheds including the Okanogan River and several steelhead-bearing tributary streams located on opposite sides of the mainstem. Bonaparte Creek drains the region east of Tonasket and discharges to the Okanogan River at Tonasket. Tunk Creek drains the region east of the Okanogan River and north of Riverside and the Omak Creek drainage. Tunk Creek discharges to the Okanogan River north of Riverside. Johnson Creek drains the region east of Salmon Creek and west of the Okanogan River. Johnson Creek discharges to the Okanogan River at Riverside.
- Antoine-Whitestone (Upper Okanogan) This subbasin consists of three HUC-10 watersheds that include the mainstem Okanogan River and several steelhead bearing tributaries located on opposite sides of the river. Antoine and Siwash creeks drain the region east of the Okanogan River and north of Tonasket and discharge to the river north of Tonasket. Tonasket Creek and Ninemile Creek drain the region east of the Okanogan River at Lake Osoyoos and discharges to the lake at and near Oroville, respectively. Whitestone and Aeneas creeks drain to the west side of the Okanogan River to the north and south of the City of Tonasket, respectively.
- Similkameen This subbasin consists of the HUC-8 Similkameen River that originates in Canada and drains the Sinlahekin Creek region located north of the Salmon Creek drainage and west of the Whitestone drainage. The Similkameen discharges to the Okanogan River at Oroville.

By proximity, the mainstem Okanogan River is included by reference in each of the adjacent subbasins as noted above (i.e., lower, middle, upper), from the confluence with the Columbia River to the Canadian Border. Figure 1 also shows the anadromous fish zone and EDT model domain.

3 Projected Permit-Exempt Well Demand

This section summarizes the projected permit-exempt well⁵ demand for WRIA 49, as is required under ESSB 6091. Further detail of the permit-exempt well demand methodology for WRIA 49 is discussed in Appendix A.

Section 202 of ESSB 6091, which is applicable to WRIA 49, contains several provisions regarding how updated watershed plans are to offset or account for projected water use. Specifically, Section 202(4)(b) states, in part:

"At a minimum, the [watershed] plan must include those actions that the planning units determine to be necessary to offset potential impacts to instream flows associated with permit exempt domestic water use. The highest priority recommendations must include replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary."

In July 2019, Ecology issued "*Final Guidance for Determining Net Ecological Benefit*", which included Appendix A titled, "*Recommendations for Water Use Estimates*" (Ecology, 2019b) for ESSB 6091 that provides guidance on evaluation of future exempt well demand. This guidance document is the methodological basis of the permit-exempt well demand forecast for WRIA 49. Fundamentally it involves two main elements:

- 1. Growth projections for new domestic permit-exempt well connections (self-supplied residential development) within WRIA 49; and
- 2. An estimate for average consumptive water use (indoor and outdoor) associated with each new permit-exempt well connection.

The estimates presented in this section generally exclude two areas of WRIA 49: the reservation lands of the CTCR, which are outside the jurisdiction of Chapter 90.94 RCW and the Duck Lake Aquifer Groundwater Area, which has been the subject of a previous water right adjudication and where mitigation is currently available through the Okanogan Irrigation District.

3.1 Growth Projections for New Domestic Permit-exempt Well Connections

The forecast of new permit-exempt well connections involves two parts:

- 1. An estimate of which parcels (in which subbasins) are currently served by permitexempt wells.
- 2. A review, comparison, and selection of growth rate forecasts used to extrapolate the current estimate of permit-exempt wells forward to 2038.

⁵ A permit-exempt well is defined as a well that withdraws less than 5,000 gallons per day of groundwater for small domestic (and other non-commercial) uses such as a single home or small group of homes. Chapter 90.94 RCW now limits maximum annual average withdrawals to 3,000 gallons per day per connection within WRIA 49.

Based primarily on the Okanogan Parcel GIS data and the Okanogan County's Building Permit Database each parcel was flagged as being developed or undeveloped, whether it was/is developed as a residence, and (in some cases) how many residential units it contains. In total, this yielded an estimate of 12,598 total dwellings in the portion of WRIA 49 not falling on CTCR lands.

Next, GIS was used to evaluate whether each given parcel is served (or not) by a permitted (water right) source of domestic water such as a Group A or Group B public water system. Parcels falling outside the boundaries of these water systems or water-right-places of use were assumed to be self-supplied with a permit-exempt well. Of the 12,598 total dwellings, 5,957 are estimated to be self-supplied.⁶

To forecast the 20-year increase from this present-day estimate, a range of potential growth rates were considered. The primary sources for this analysis were estimates/data from the Washington State Office of Financial Managements (OFM), including data from the Small Area Estimates Program (SAEP), and an analysis of Okanogan County building permits trends by the County's Office of Planning and Development. Analysis and review of the various datasets, yielded the following growth rate-based "scenarios":

• Low-growth scenario: 6 percent

Based on OFM's SAEP estimate for WRIA 49 total population change (5.7 percent) and on the OFM/Okanogan County medium growth scenario for population change for all of Okanogan County from 2019 to 2038 (7.2 percent), rounded to reflect uncertainty.

• Medium-growth scenario: 10 percent

Based on the trend suggested by Okanogan County's building permit analysis (10 percent), the 2010 to 2019 OFM SAEP housing unit growth trends for WRIA 49 (9.6 percent), rounded to reflect uncertainty. This is the growth rate suggested for the purposes of quantifying forecasted impacts on instream flows associated with permit-exempt well growth and the identification of water and non-water offset requirements.

• High-growth scenario: 30 percent

Based on OFM's high growth scenario population projections through 2038 for all of Okanogan County (29.3 percent) as well as the maximum subbasin-specific 20-year SAEP-based block group-based estimate (29.4 percent, for Antoine-Whitestone-Upper Okanogan), rounded to reflect uncertainty.

⁶ 5,777 would be the total if parcels in the Duck Lake Groundwater Aquifer Area were excluded. Selfsupplied residences in Duck Lake Groundwater Aquifer Area still rely on what would be considered permit-exempt wells, which is why they are included in the *current* estimates presented here (see Table 2). However, because of the previous water right adjudication and the fact that mitigation is available through the Okanogan Irrigation District, *future* permit-exempt well connections in the Area are excluded from the subsequent 20-year forecasts (see Table 3).

Subbasin	Estimated <u>Current</u> Number of Permit- Exempt Well	6% Growth Scenario: New Permit- Exempt Well Connections	10% Growth Scenario: New Permit- Exempt Well	30% Growth Scenario: New Permit- Exempt Well
Loup Loup-Swamp (Lower Okanogan)*	1,058	63	106	317
Salmon Creek	324	19	32	97
Bonaparte-Johnson (Middle Okanogan)*	2,559	154	256	768
Antoine-Whitestone (Upper Okanogan)	1,730	104	173	519
Similkameen	286	17	29	86
Total*	5,957	357	596	1,787

Table 2. Estimated Number of New Permit Exempt Well Connections by GrowthScenario

Notes: *excluding areas in CTCR lands

3.2 Permit-Exempt Well Connection Consumptive Use Estimates

Following Ecology's guidance in Recommendations for Water Use Estimates (Ecology, 2019b), estimates for per-well connection indoor and outdoor consumptive water use impacts are as follows:

• **Outdoor water use:** 299 gpd/0.34 afy consumptive (373 gpd/0.42 afy total), based on an estimated average outdoor irrigated area of 0.14 acres for WRIA 49 and a pasture/turf net irrigation water requirement of 26.89 inches per year (Washington Irrigation Guide, Appendix A, Omak station).

The estimate of 0.14 acres for average outdoor domestic irrigation in WRIA 49 is based on a GIS-based, multi-year aerial photo analysis of 508 parcels, evenly distributed across the WRIA 49 subbasins. These 508 parcels represent approximately 18% of all estimated permit-exempt well parcels *without* a separate source of irrigation (e.g. irrigation district). See Appendix A for details on this analysis.

• Indoor water use: 15 gpd/0.017 afy consumptive (153 gpd/0.17 afy total), from Ecology guidance of 60 gpd total use per person (Ecology, 2018). Using the US Census Bureau's estimate of 2.55 persons per household (2014-2018) for Washington State, this equates to 153 gallons per day of total indoor water use (0.17 afy). This also assumes that homes with permit-exempt wells are also on septic systems, with 90 percent return flow to the ground via septic systems and 10 percent consumptive use.

3.3 Projected Consumptive Use Impacts

Table 3 (below) shows the estimated consumptive use impacts in each WRIA 49 subbasin for the three selected growth scenarios over the 20-year planning horizon (through 2038). Figure 2 shows the locations of projected consumptive use impacts by subbasin. The range of estimated impacts is between 122 afy (0.168 cfs) and 607 afy (0.837 cfs) additional consumptive water use from new permit-exempt well connections in WRIA 49 (excluding the Duck Lake Aquifer Groundwater Subarea and CTCR reservation lands).

	6% 0 (Low S	Growth cenario)	10% (Medium)	Growth Scenario)	30% Growth (High Scenario)	
Subbasin	New Permit- Exempt Well Connections	Consumptive Water Use Impact (afy) ¹	New Permit- Exempt Well Connections	Consumptive Water Use Impact (afy) ¹	New Permit- Exempt Well Connections	Consumptive Water Use Impact (afy) ¹
Loup Loup-Swamp (Lower Okanogan) ²	63	22.2	106	37.3	317	111.0
Salmon Creek	19	6.7	32	11.2	97	34.0
Bonaparte-Johnson (Middle Okanogan) ²	143	50.3	238	83.7	714	249.9
Antoine-Whitestone (Upper Okanogan)	104	36.6	173	60.9	519	181.7
Similkameen	17	6.0	29	10.2	86	30.1
TOTAL ²	346	122	578	203	1,733	607

Table 3. Total Consumptive Water Use Impact by Growth Scenario

¹Based on a per-permit exempt well connection consumptive water use estimate of 0.35 afy ²Excludes CTCR reservation lands **and** the Duck Lake Aquifer Area

For the purposes of quantifying forecasted impacts on instream flows associated with permit-exempt well growth and the identification of water and non-water offset projects for Chapter 90.94 RCW offset, **the Medium-growth scenario has been adopted as the primary planning number**. The Medium scenario rate of 10 percent is consistent with the overall average of all growth rates reviewed (see Appendix A). Table 4 provides a detailed breakdown of the total and consumptive use associated with the 20-year Medium-growth scenario by subbasin.

	10% Growth (Medium Scenario)										
		Total	Water Use (a	nfy)²	Consum	ptive Water U	se (afy) ³				
Subbasin	New Permit- Exempt Well Connections	Indoor (0.17 afy per dwelling)	Outdoor (0.42 afy per dwelling)	Total	Indoor (0.017 afy per dwelling)	Outdoor (0.335 afy per dwelling)	Total				
Loup Loup-Swamp (Lower Okanogan)	106	18.0	44.5	62.5	1.8	35.5	37.3				
Salmon Creek	32	5.4	13.4	18.8	0.5	10.7	11.2				
Bonaparte-Johnson (Middle Okanogan) ¹	238	40.5	100.0	140.5	4.0	79.7	83.7				
Antoine-Whitestone (Upper Okanogan)	173	29.4	72.7	102.1	2.9	58.0	60.9				
Similkameen	29	4.9	12.2	17.1	0.5	9.7	10.2				
TOTAL	578	98.2	242.8	341	9.7	193.6	203				

Table 4. Water Use Impact Detail – Medium Growth Scenario

¹ Excludes CTCR lands and the Duck Lake Aquifer Area.

² Total Water Use (i.e., quantity withdrawn from a permit-exempt well) equals consumptive

use + return flow.

³Consumptive Water Use is the quantity of water lost to indoor evaporation and outdoor evapotranspiration and water evaporated during irrigation applications.

3.4 Evaluation of Impacts from New Consumptive Use

Wells associated with permit-exempt development will be completed in all hydrogeologic units present in WRIA 49 at various depths. While water use and pumping associated with residential development has a seasonal increase during the summer months, this impact will be attenuated by the distance from surface water both laterally and vertically. The distribution of wells and attenuation of changes in pumping rates creates an impact of equal magnitude throughout the year, or a "steady state" impact.⁷

⁷ This approach to assessing impacts from new consumptive use is consistent with Ecology's interpretation provided in Appendix B of GUID-2094: *Final Guidance for Determining Net Ecological Benefit (Ecology, 2019b)*

[&]quot;The conclusion of this appendix is that in most instances pumping impacts associated with new permit-exempt domestic withdrawals will be quite small, well dispersed, and nearly steady- state with respect to streams. Also, in general it will not be possible and is unnecessary to evaluate the impacts of pumping at individual locations. Planning groups can assume the impacts from new permit-exempt domestic withdrawals over the planning horizon will be steady-state."

While consumptive use impacts are steady state, they represent the greatest percentage of surface flow during the low flow periods of late summer and early fall. Several water offset projects are included in this Plan Addendum that focus on providing the greatest benefit during low flow periods (discussed in Section 4).

4 Identified Offset Projects

This section of the Plan Addendum provides descriptions of identified water and nonwater offset projects that support the required NEB evaluation presented in Section 6.

4.1 Technical Process Overview and Project Selection

The Planning Unit used technical information developed through presentations and memorandums to estimate permit-exempt consumptive water use impacts and ultimately to select recommended actions for inclusion in the Plan Addendum. The general planning process taken by the Planning Unit consisted of the following five step process:

- 1. Define the 20-year exempt well consumptive use impacts
- 2. Define water offset projects at the watershed scale
- 3. Define offset gaps in time and space at the subbasin scale
- 4. Define non-water offset projects in support of NEB
- 5. Conduct NEB evaluation and reach consensus recommendations on Plan Addendum content and Initiating Government approval

Throughout the planning update process, a number of technical presentations were provided to the Planning Unit. The TAG presented information from the CTCR Fish and Wildlife Department, Ecology, Okanogan County Planning, and TAG members throughout the planning process. Topics included projected growth rates, domestic indoor and outdoor water use rates, NEB guidelines, water offset projects and non-water (habitat) projects. Other technical presentations by Aspect and Confluence included permit-exempt well domestic consumptive use projections, subbasin delineation alternatives, EDT model capabilities and limitations for evaluating NEB, and findings of the EDT NEB analyses for recommended projects. Vanessa Brinkhuis (Ecology) provided the Planning Unit with a presentation summarizing the Streamflow Restoration legislation and related Ecology guidance, and Tom Culhane (Ecology) presented hydrogeologic considerations for the Planning Unit.

Several technical memos document evaluations and processes forming much of the basis for the Planning Unit's selection of actions and projects included in the Plan Addendum. These include:

- Evaluation of Future Exempt Well Demand (Appendix A)
- Technical Memorandum on Identified Projects and Subbasins (Appendix B)
- Summary of NEB analysis methods and results used for WRIA 49 Watershed Planning (Appendix C)
- Hydrology and Hydraulics Input to EDT Modeling (Appendix D)

Recommended actions evaluated and ultimately selected by the Planning Unit for inclusion in the Plan Addendum were drawn from various sources. The Planning Unit first considered recommendations listed in the approved WRIA 49 watershed plan, but most of the recommended actions in the Plan Addendum originated from technical study work completed in WRIA 49 following adoption of the watershed plan. Project proposals for inclusion in the Plan Addendum were solicited from Planning Unit and TAG members over four months beginning in December 2019. Over 30 project proposals were received. Several of these proposals were evaluated at a 2-day TAG workshop in January 2020 and the balance were evaluated as they were received. The two-day TAG workshop was an open meeting for members of the TAG and Planning Unit. The group was attended by a broad range of interests, including representatives from the County, Ecology, non-governmental organizations (NGOs), irrigation districts, landowners, and non-profit groups, such as the Farm Bureau.

A two-tier scheme was used to distinguish projects presenting the highest potential for providing measurable streamflow restoration benefits. Tier 1 projects include both water-for-water offset and non-water offset that are sufficiently well defined to:

- 1. Quantify a consumptive use offset;
- 2. Estimate a net effect on instream flow and/or;
- 3. Estimate an effect on aquatic habitat conditions (e.g. habitat area, fish passage, water temperature conditions, etc.).

Tier 2 projects include those projects that are likely to provide future water-for-water and non-water offset benefits but the current proposals are not well defined enough to quantitatively estimate their effects. We are relying exclusively on the Tier 1 projects to demonstrate that the Plan Addendum offers sufficient resources to fully offset future consumptive use and achieve NEB at the WRIA level. The Tier 2 projects are additional resources that can be adaptively managed to achieve Plan Addendum objectives and Chapter 90.94 RCW requirements as they are more fully defined. These projects also provide an additional factor of safety if one or more Tier 1 projects cannot be implemented as planned.

The Planning Unit elected to use the Okanogan EDT Model, previously developed for anadromous reaches of the mainstem and tributaries to the Okanogan River, as the primary method to quantitatively evaluate the effects of proposed water offset and nonwater projects on NEB in WRIA 49. The NEB effects of Tier 2 water offset and nonwater offset projects were evaluated qualitatively.

The identified water offset and non-water offset Tier 1 and 2 project suite, relative ranking, and recommendation for adaptive management was formally adopted by the Planning Unit at the May 7, 2020 Planning Unit meeting, and later reaffirmed following adoption of this Plan Addendum and supporting technical documents.

A subset of the proposed Tier 1 projects were selected for EDT modeling based on the following criteria:

- 1. The projects are eligible to be counted towards NEB under Chapter 90.94 RCW, meaning they were proposed, contracted, and/or funded for construction after January 2018;
- 2. The project is likely to effect aquatic habitat conditions within the WRIA 49 anadromous zone that can be estimated through modeling, and;

3. The project description and available supporting information are sufficient to characterize the potential effect of the proposed action using Okanogan EDT model environmental input parameters.

The subset of Tier 1 projects advanced for EDT modeling and the ecological parameters used to model these projects are described by tributary watershed in Section 6 of this Watershed Plan and in greater detail in Appendix C).

4.2 Water Offset Projects

The WRIA 49 Planning Unit considered 26 restoration projects identified by several different sponsors for consideration in the Plan Addendum. These included water offset projects, projects that contribute to NEB, and projects that fall into both categories. Each project was designated as either Tier 1 or Tier 2 based on the level of information and specificity provided in the proponent description, and through review and discussion in the January 2020 TAG workshop and subsequent Planning Unit meetings.

Projects are designated Tier 1 if they are well defined, quantifiable, have known costs, and are feasible. Tier 2 projects are also potentially valuable but are not fully defined or quantified, and/or may have feasibility challenges in the near term. All Tier 1 water-for-water offset projects except for the Pine Creek Water Right Acquisition were advanced for EDT modeling. This water right acquisition project is in an intermittent watershed that is inaccessible to salmon and steelhead and outside of the EDT model domain. Any instream flow benefits resulting from the project would accrue through subsurface flow to the mainstem Okanogan. These effects cannot be quantified for EDT modeling purposes.

A summary of the proposed water offset projects is provided in Table 5 (attached), and approximate project locations are shown in Figure 3. Detailed project descriptions, a review of the project identification and selection process, and copies of proposals received from project sponsors are provided in Appendix B.

4.3 Streamflow and Habitat Restoration Projects Contributing to Net Ecological Benefit

The Planning Unit selected a suite of potential non-water offset projects for consideration in the WRIA 49 Plan Addendum. Each non-water offset project was designated as either Tier 1 or Tier 2 based on the level of information and specificity provided in the proponent description, per the criteria described in Section 4.1. The designation criteria were reviewed and discussed in the January 2020 TAG workshop. Project designations were assigned at the TAG workshop and subsequent Planning Unit meetings depending on when project submittals were received.

Because these projects are water budget neutral at the WRIA-scale, they are not counted toward the Chapter 90.94 RCW offset requirements but are considered to help provide offset of tributary impacts in individual subbasins for the purpose of the NEB evaluation. These projects provide additional instream stream flows in key tributaries by either substituting a tributary water supply source with a source from the mainstem Okanogan River, improving irrigation efficiency to reduce the amount of water diverted from the tributary, or through direct supplementation of flows by pumping water from the mainstem and discharging to the tributary (before flowing down the tributary and rejoining the mainstem). This instream flow benefit contributes to the 'tributary offset'⁸ results calculated at the subbasin and WRIA level. The tributary offset is the total tributary instream flow effect used to model NEB effects in EDT. Several submitted nonwater offset project proposals met the first Tier 1 evaluation criterion (i.e., they are Chapter 90.94 RCW eligible) but did not meet conditions 2 or 3 and are therefore designated as Tier 2. These projects are likely to contribute to positive NEB but insufficient information is available to quantify their effect on the environment at this time.

Some of the non-water offset projects provide significant instream flow benefits in tributaries, while allowing for some portion of that water to be withdrawn from the Okanogan mainstem. Relocating water withdrawals from tributaries to the mainstem would contribute to NEB because steelhead and resident fish rely on these tributary habitats, and the proposed Tier 1 water offset projects would negate any resulting mainstem flow deficit.

All non-water offset projects selected for consideration by the Planning Unit are summarized in Table 5 and presented in Appendix B. The projected effects of Tier 1 nonwater offset projects on the environment and the associated ecological parameters used to model these effects in EDT are described in Appendix C. In addition, Appendix C provides clear and systematic rationale how each project provides water offset or contributes toward NEB. The projected effects of all modeled Tier 1 projects on aquatic habitat conditions for Okanogan steelhead, summer/fall Chinook salmon, and resident native fish are presented with the NEB evaluation in Section 6.

4.4 Opportunistic Projects

This Plan Addendum includes the opportunistic pursuit of future project opportunities, recognizing that additional resources for adaptively managing Chapter 90.94 RCW requirements are likely to emerge over time. These pursuits can be linked with increases or decreases in actual versus currently estimated new exempt well demand, which would potentially shift appropriate offset project needs. As described above, several types of opportunistic projects have been identified, including the Irrigation Efficiencies Grant Program, which provide water and non-water offset value, bank stabilization, and riparian planting projects. Additional opportunistic projects are expected to be identified and completed over the planning horizon as they are identified, landowner permission is granted, and funding is obtained. Opportunistic projects will be reviewed and vetted by the lead entity and Planning Unit to ensure they are appropriate for helping meet water offset and/or NEB and incorporated into the plan through adaptive management as discussed in the sections below.

⁸ Tributary offset is the total projected instream flow increase in Okanogan River tributaries that support summer steelhead, combining water-for-water offset projects and Tier 1 non-water offset projects.

5 Plan Implementation and Adaptive Management

This section provides a framework for successful implementation of the projects and actions provided in this Plan Addendum. An adaptive management strategy is also included to address changing conditions during the 20-year planning horizon. Both the implementation and adaptive management of the projects identified in this Plan Addendum are prioritized and will be managed consistent with local values and basin-specific considerations. In Ecology's GUID-2094: *Final Guidance for Determining Net Ecological Benefit* (Ecology, 2019b), Ecology has suggested that planning groups consider the role of adaptive management in plan implementation to provide reasonable assurance that NEB will be achieved following adoption of the Plan Addendum by Ecology.

Ecology's GUID-2094 includes the following definition of reasonable assurance:

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

This Plan Addendum provides descriptions of proposed water and non-water offset projects to offset projected exempt well demand in WRIA 49. In addition, the Plan Addendum demonstrates that when successfully implemented, the offset projects, or a subset thereof, can meet the goal of attaining sufficient water offsets on a watershed-wide basis. The inclusion of non-water offset projects provides additional support for establishing NEB through habitat improvements. In combination, these offset projects meet and exceed the requirements of Chapter 90.94 RCW because:

- On a watershed basis, the water offset projects far exceed the total projected permit-exempt well demand over the required 20-year planning horizon.
- Offset projects have been included in this Plan Addendum within each subbasin in WRIA 49 to prioritize local offset co-located with demand.
- Tier 1 subbasin-specific or basin-wide water offset projects are distributed throughout most subbasins; however, in only one subbasin (Similkameen) water offsets do not meet projected demand. In this subbasin, and in other subbasins in WRIA 49, Tier 2 water offset and/or additional non-water offset projects are included to support and enhance attainment of NEB.
- The projects are realistic and consist of project types regularly funded by state and federal funding programs, including the Streamflow Restoration Grant program.

The WRIA 49 Initiating Governments and Planning Unit recognize that flexibility needs to be incorporated into ongoing plan implementation, with consideration to available offset project funding and implementation, opportunities for modifying and enhancing the project list based on landowner and stakeholder interest, and the progression of actual exempt well demand each year. Successful plan implementation will also require ongoing sources of program management funding, and operation and maintenance funding.

This plan implementation and adaptive management approach has been developed to reflect the strong local values expressed by both the Initiating Governments and Planning Unit members. Specifically, retention of water rights for both current and future out-of-stream uses is a top priority. In addition, the Planning Unit seeks to protect and improve the quality of life for all inhabitants, which means protecting water quality and quantity for farmers, native tribes, families, wildlife, and recreation. The water offsets and projects contributing to NEB presented in this plan will be managed to meet Chapter 90.94 RCW plan requirements, while maximizing the amount of water available for future water needs, both out-of-stream and in-stream uses.

5.1 Plan Implementation Framework

Implementation of the WRIA 49 Watershed Plan Update will be achieved through the efforts of multiple Planning Unit member organizations in the watershed but will require ongoing management by a lead entity (Okanogan County). Tasks envisioned over the 20-year implementation period include:

- Water and non-water offset project development and implementation including:
 - Prioritization of projects based on tributary and/or mainstem offset and NEB requirements, while maintaining or enhancing current reliability, instream flows, and future agricultural uses;
 - Identification of funding sources for projects identified in this plan;
 - Securing funding;
 - Project design and project construction; and
 - Development of new opportunistic offset project ideas and concepts as part of adaptive management.
- Water and non-water offset project operation and maintenance, including associated monitoring
- Coordination and tracking of projects implemented to achieve NEB over the planning horizon including:
 - Tracking and documenting locations of projects;
 - Current project status (i.e. proposed, in design, under construction, operational); and
 - Quantity of water offset provided and/or habitat improvement achieved compared to the existing EDT model predications.
- Tracking WRIA 49 permit-exempt demand including number of permit-exempt wells authorized each year using a County-based water accounting software based on a review of new building permits.
- Regular reporting of actual permit-exempt well demand, offset project status, offset surplus/deficit tracking, and changes in plan implementation. Every five years, a summary of plan implementation and adaptive management tasks and status will be prepared for submittal to Ecology.
- Communication with Planning Unit members and the public regarding offset project sponsorship, project coordination, plan implementation and associated NEB status.

5.2 Roles and Responsibilities

Implementation of this Plan Addendum and associated project implementation, operation and maintenance, monitoring, tracking and reporting will require proactive involvement and management from the WRIA 49 Initiating Governments and other members of the Planning Unit.

Okanogan County will take the lead role in plan implementation with primary support from City of Omak and Oroville-Tonasket Irrigation District (OTID). All three IGs shall participate as members of the Planning Unit, and as necessary work together to assist Okanogan County with the Plan Addendum implementation and monitoring. In addition, support will be needed from other agencies and tribes to ensure successful plan implementation. Proposed roles and responsibilities are outlined below:

- Okanogan County will serve as the lead agency for plan implementation. This work may include:
 - Developing and implementing a funding strategy for Okanogan County's portion of costs associated with implementation program management and operation and maintenance of water offset projects
 - Tracking of exempt well demand throughout WRIA 49
 - Tracking of water offset surpluses/deficits relative to demand on a basinwide and subbasin scale
 - Tracking of overall offset project target list and implementation status.
 - Ongoing canvassing and tracking of new offset project opportunities
 - Seeking grant funding opportunities for implementation, including preparation of grant applications
 - Compiling 5-year reports on the status of plan implementation
 - Communications with Ecology, the Initiating Governments, and Planning Unit members on the status of plan implementation
 - Updates to and maintenance of County webpage on plan implementation
- **Oroville-Tonasket Irrigation District** will support Okanogan County with plan implementation in its role as an Initiating Government. Responsibilities include:
 - Serving as lead proponent for the OTID Tributary Supplementation project, including securing of funding, implementation, operation and maintenance, and sharing of information with Okanogan County necessary for project tracking and reporting
 - Participating in communications among the Initiating Governments
- **The City of Omak_**will support Okanogan County with plan implementation in its role as an Initiating Government. Responsibilities include:
 - o Participating in communications among the Initiating Governments

Several Planning Unit entities will serve as lead entities for implementation of both water offset and Tier 1 projects contributing to NEB. Based on the non-water offset projects included in this Plan Addendum these currently include Okanogan Conservation District, Whitestone Irrigation District, CTCR, City of Okanogan, and WDFW. Additionally,

Okanogan County, IGs, or other Planning Unit entities may contract with outside parties to facilitate project implementation.

Responsibilities include:

- Serving as lead proponent for their proposed projects, including securing funding, implementation, operation and maintenance, and sharing information with Okanogan County necessary for project tracking and reporting
- Tracking of new non-water offset project opportunities and notifying Okanogan County of identified potential projects

Other Planning Unit members, NGOs, and agencies may be added to this list if they become lead proponents for new offset projects as plan implementation progresses. This includes the numerous Tier 2 projects identified in this plan and future opportunistic projects.

5.3 Funding

Implementation of the WRIA 49 Watershed Plan Update will require funding for capital projects, project operation and maintenance, and ongoing program management. The following section provides an overview of funding mechanisms authorized through ESSB 6091 and Chapter 90.94 RCW, potential new funding mechanisms, and options for funding plan implementation.

ESSB 6091 authorized \$300 million in capital funds to be dispersed between 2018 to 2033 to incentive local implementation of plans, including but not limited to the following uses:

- Implement watershed restoration and enhancement projects developed under RCW 90.94.020 and 90.94.030
- Collect data and complete studies necessary to develop, implement, and evaluate watershed restoration and enhancement projects

In 2019, Ecology adopted a rule to establish process and criteria for prioritizing and approving funding applications. Chapter 173-566 WAC. Under Ecology's rule, projects located in watersheds planning under RCW 90.94.020, such as WRIA 49, and included in watershed plans adopted under RCW 90.94.020 will be given "added priority", (WAC 173-566-150).

The projects identified for this Plan Addendum were evaluated based on a collaborative approach of the Planning Unit. The entities that have proposed projects contained in this Plan Addendum have a long history of successfully implementing similar projects. The Planning Unit recognizes there is an active, knowledgeable base of local entities to implement projects. As each project is funded, implementation of that project will include funding to ensure long-term success and consistency with other water resource protection measures. In addition to the Streamflow Restoration Grant program there are other applicable state and federal grant programs, including:

- Bureau of Reclamation WaterSmart Programs (e.g. Drought Resiliency, Water Efficiency, and Water Market programs)
- Ecology Office of Columbia River grant program

- Ecology Water Quality Program grants
- Various habitat restoration grant programs

The funding mechanisms established through ESSB 6091 did not, however, address ongoing implementation of this Plan Addendum. Ecology has indicated that under the current statutory framework for streamflow restoration, state funding will not be available to support ongoing implementation and offset project operations and maintenance. In the absence of state funding for this purpose, each project proponent would need to develop a funding source for operation and maintenance of their offset projects.

5.4 Adaptive Management

Given the length of the planning horizon, adaptive management will be an important component of successful plan implementation. Ecology's Final Guidance for Determining Net Ecological Benefit (Ecology, 2019a) defines adaptive management as:

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

Ecology has not identified adaptive management as a required plan element, but suggests that:

An adaptive management component of the plan helps demonstrate the watershed planning group's intent that the plan will be implemented, thereby bolstering the plan's reasonable assurances.

Adaptive management is included in this Plan Addendum to clearly indicate the Planning Unit's goal of successful plan implementation, to the extent possible based on available future offset project funding from Ecology and from other sources. Adaptive management will add flexibility to the implementation process, allowing adjustments based on actual exempt well demand, offset project status, and new, opportunistic projects that are identified following adoption of this Plan Addendum.

Implementation of the Plan Addendum is expected to require a level of effort over a 20year planning horizon and its success will depend both on the County's ability to maintain fiscal and technical support for the identified water offset and NEB projects and the ability for the County and the watershed Committee members to track implementation and need through an adaptive management process. In order to achieve the Plan Addendum's objective of securing NEB, it will be necessary for the County to track both the number of permit-exempt wells permitted during the planning period and the progress towards implementation of the identified offset projects, while maintaining a high level of landowner engagement and trust.

To secure this trust, the County will be responsible to develop a forum to ensure that acknowledges the benefits of community cooperation through the Planning Unit, and provides a forum for assessment of project implementation after the plan has been adopted.

The Plan Addendum proposes to achieve this through periodic updates to each of the Implementing Governments and a requirement to reconvene the entire planning unit on a minimum five-year interval to review the accuracy of the Plan Addendum's initial projections for growth and offset project implementation and a commitment to make periodic updates as needed. The Planning Unit believes that without such commitment to consistent engagement and participation, the addendum holds little promise of achieving the plans long-term objective of predictable continued growth.

Adaptive management was discussed in a June 11, 2020 WRIA 49 Planning Unit meeting. Several potential components were presented to the Planning Unit, including:

- Projects presented in the plan shall be considered a "menu" of options to meet the requirements Chapter 90.94 RCW and the 20-year exempt well demand identified in this plan. Identification of a particular project does not obligate the Planning Unit to implement the project and/or dedicate available water offset, in whole or part, or associated NEB benefits to the Chapter 90.94 RCW process.
- A 5-year cycle for reviewing the status of the WRIA 49 Watershed Plan Addendum and associated actions was proposed.
- Several variables to consider for review and associated actions were proposed:
 - Status of actual exempt well demand: Periodic evaluation of actual new exempt well demand relative to estimates included in this Plan Addendum.
 - Status of project funding and implementation: Review the water and nonwater offset projects that have been implemented to date, offset totals, and the availability of project funding for implementation of proposed offset projects.
 - Availability of opportunistic water and non-water offset projects: Update the offset project list to incorporate new projects that have been identified by Planning Unit members following approval of this Plan Addendum, and to remove projects included in this addendum that no longer appear likely to be implemented or are no longer consistent with local values. Opportunistic projects can stem from a variety of sources, including future landowner interest in applicable projects and future studies.
 - Coordinate with County Comprehensive Plan Updates to ensure those efforts are aligned with the WRIA 49 Watershed Plan Update
- Opportunities to accelerate or add offset projects if the magnitude of 20-year exempt well demand incorporated into this Plan Addendum is lower than actual demand. Similarly, projects may be delayed, substituted, or removed if the estimated demand was higher than actual demand.
- Opportunities to receive credits for water offsets in excess of 20-year exempt well demands, in the event a subsequent mitigation requirement is launched in the future.
- Opportunities to use eligible quantities of water in excess of the 20-year water offset requirement that will be protected from relinquishment and available for other out-of-stream uses (i.e., water bank). The Planning Unit understands the eligibility requirements under Ecology's Water Resource Program Final

Guidance (GUID-2094) for Determining Net Ecological Benefit and will work with Ecology to make sure those are satisfied.

• Opportunities to use water protected in tributaries that contribute toward subbasin-specific NEB in excess of the required offset to be eligible for offset of mainstem other out-of-stream uses.

At the June 11, 2020 meeting, the Planning Unit reached concurrence that adaptive management should be included as a component of this Plan Addendum. The management of projects consistent with local values, and the opportunity statements above to not only protect water, but make eligible water in excess of the minimum Chapter 90.94 RCW planning requirements available for other out-of-stream uses was key in reaching Planning Unit approval on the approach, prioritization of projects to provide increased certainty, and overall projects list, especially those projects that may provide a higher or increased future offset and/or mitigation opportunity in the WRIA.

Adaptive management provisions of the Plan Addendum include:

Review of Actual Exempt Well Demand

On a 5-year basis in support of adaptive management and reporting, Okanogan County will tally and summarize actual exempt well demand by subbasin, with a comparison to the estimates presented in this plan. This information will be shared with the Initiating Governments, Planning Unit, Ecology, and the public by reconvening of the Planning Unit. These data will be compared to the projected annual growth rates incorporated into the permit-exempt well demand analysis presented in this Plan Addendum (Appendix A). The County has secured an additional grant from Ecology and is currently developing software to track exempt well demand by subbasin. Based on the January 2021 start date, 5-year progress reports would be due in December 2026 and every five years thereafter.

Review of Water and Non-Water Offset Project Status

On a five-year basis, in support of adaptive management and reporting, Okanogan County will review the status of water offset projects throughout WRIA 49. Water offset projects that have been implemented will be tallied and compared to actual exempt well demand on a subbasin and watershed basis. Surpluses and deficits in the water offset totals compared to actual demand will be noted. Potential changes to the overall water and non-water offset project list presented in this Plan Addendum will be considered based on any new, opportunistic projects that have been identified. Offset projects incorporated into this Plan Addendum that no longer appear to be feasible for implementation based on additional information, such as landowner interest or the inability to obtain funding, may be removed from the target project list.

In addition, and consistent with the Planning Unit's stated values and desire to protect local agriculture, the County, in consultation with the Planning Unit, will manage water offset projects to meet the 20-year exempt well impacts, while retaining excess water for future uses, when appropriate. Specifically, the Planning Unit recommends the following considerations for management of the Tier 1 water offset projects:

• Antoine Valley Ranch – The Planning Unit understands acquisition of the land and water right associated with the ranch is pending negotiation and funding. The Planning Unit also understands that this is a transaction between willing

buyers and sellers. In addition, the buyers have applied for funding from the Streamflow Restoration grant program. Therefore, while the Planning Unit does not have consensus agreement of the project concept, it is an opportunistic project that would more than satisfy the 20-year permit-exempt well offset, and the Planning Unit recognizes its responsibility to maximize local benefit of the basin resources, even if it may conflict with group values, and would count available offset toward the 20-year exempt well impacts.

- **Pine Creek Water Right Acquisition** Ecology's Office of Columbia River • (OCR) has water available for immediate purchase. The land has already been fallowed, and the water right is currently protected from relinquishment in the State's Trust Water Right Program (TWRP). The water right has 625.7 acre-feet of consumptive use available for mitigation downstream of Janis Rapids on the mainstem Okanogan River, of which 225.7 acre-feet are only available for mitigation within Okanogan County. The remaining 400 acre-feet of consumptive use may be used further downstream out of the County. The mitigation suitability of the water right provides for year-round uses in continuity with the mainstem Okanogan River. However, under the Chapter 90.94 RCW process, the water right only provides for water offset, and does not significantly contribute toward NEB in tributary subbasins. Therefore, the Planning Unit views the Pine Creek water as having a greater long-term mitigation potential beyond Streamflow Restoration. However, it is identified as a highly reliable option that is immediately implementable and has been included in the plan to provide certainty.
- Salmon Lake Storage The project would increase the storage capacity of • Salmon Lake. The Draft Environmental Impact Statement (DOE, 2004) indicates that it is not necessary to alter the height of the dam to increase water storage but structures and infrastructure around the lake would need to be relocated to prevent inundation. Relocating 12 cabins, approximately 2,000 feet of septic pipe and 8 septic tanks would make approximately 1,000 acre-feet of storage capacity available for flow retiming. The additional volume would contribute to the 3,600 ac-ft. dedicated to provide perennial flow downstream of the Okanogan Irrigation District diversion dam. This additional volume would augment or extend the duration of migration flows, augment summer baseflow, and augment winter base flow as needed to increase over-winter survival of steelhead, resulting in significant NEB. It is the Planning Unit's expectation that, in addition of the significant contribution to NEB in Salmon Creek, if constructed, the Salmon Lake Storage project would also provide for greater irrigation reliability both in Salmon Creek (although some quantities would be protected instream) and stored water would be available for additional out-of-stream uses from sources in continuity with the mainstem Okanogan River within WRIA 49.

Additional Tier 2 projects are also available to ensure that the minimum 20-year consumptive use offset set under the Chapter 90.94 RCW requirements are fully satisfied. Two of the Tier 2 projects (Sinlahekin Wildlife Area Improvement Project and Conconully Dam Replacement) have the potential to satisfy a significant portion (if not

all) of the 20-year permit-exempt well offset. However, specific design details necessary to evaluate project feasibility and cost are pending additional study, including an ongoing appraisal study by Reclamation for the Conconully Dam replacement alternatives. Conversely, the Irrigation Efficiency Projects are regarded as opportunistic throughout the life of the plan, and will be completed as identified, following landowner agreement and funding. For these reasons, these projects were regarded as Tier 2.

5-Year Review and Reporting

The proposed 5-year report will incorporate a summary of plan implementation and adaptive management tasks, including:

- Status of actual exempt well demand by subbasin with a comparison to the estimates presented in this plan.
- Status of water offset projects implemented or in progress, combined with a tally of instream flow benefits by subbasin and for the whole watershed relative to actual exempt well demand.
- Status of non-water offset projects implemented or in progress.
- Comparison of completed projects with the water budget offset requirements and EDT modeling results supporting the NEB determination. Updated EDT modeling results may be used to support an updated suite of projects to demonstrate continued NEB at the WRIA scale.
- Modifications, if any, to the offset project list based on inclusion of new, opportunistic projects and removal of projects, with a description of the rationale for changes to the list.
- Operation and maintenance status active projects, including identification of any concerns and/or corrective actions required.
- Status of offset project capital and O&M funding.

The 5-year report will be submitted to Ecology and posted online to the County's webpage and associated online reporting tool.

5.5 Policy Decisions

RCW 90.94.020(4)(d) notes that the watershed plan may include:

- Recommendations for modification to fees established under this subsection
- Standards for water use quantities that are less than authorized under RCW 90.44.050 or more or less than authorized under subsection (5) of this section for withdrawals exempt from permitting
- Specific conservation requirements for new water users to be adopted by local or state permitting authorities
- Other approaches to manage water resources for a water resource inventory area or portions thereof

The WRIA 49 Planning Unit does not make any recommendations under RCW 90.94.020(4)(d).

6 Net Ecological Benefit Evaluation

As required by RCW 90.94.020.4(b) and 4(c), this Plan Addendum must include actions sufficient to offset projected future water demand and provide habitat benefits sufficient to produce NEB. Ecology (2019b) established policy guidance for conducting NEB evaluations. The guidance states that the NEB analysis should consider the impacts of projected future water demand, identify projects and actions that provide additional benefits to instream resources above and beyond those provided by consumptive use offsets, and present a clear statement of findings that the proposed actions will or will not achieve NEB.

The Ecology guidance further stipulates that the NEB evaluation must consider the extent of aquatic habitat affected; the presence, distribution, and life stage requirements of important fish species; and ecosystem structure, function, and composition. The guidance places emphasis on improving conditions for Pacific salmonid populations listed under ESA requirements, followed by other native anadromous and resident fish species. Elements of the NEB analysis may be conducted at the individual subbasin level, but the final determination is made on the net effect of all proposed actions at the WRIA scale.

6.1 Okanogan Ecosystem Diagnosis and Treatment Model

The WRIA 49 Planning Unit elected to use the Okanogan EDT model to conduct the NEB analysis. EDT is a life cycle-based habitat model that synthesizes data and information about fish habitat conditions into quantitative metrics that describe habitat potential. Access to the Okanogan EDT model is being provided by OBMEP. OBMEP developed the Okanogan EDT model to support long-term habitat status and trends monitoring and restoration planning under the Columbia Basin Fish Accords, which provide federal funding to state and tribal governments to promote the conservation and recovery of salmon and steelhead populations listed under the ESA. OBMEP, the CTCR Okanogan Subbasin Habitat Improvement Program (OSHIP), and other subbasin stakeholders use Okanogan EDT results to help identify and prioritize habitat protection and restoration actions. As such, the Okanogan EDT model implicitly incorporates the large body of knowledge about the Okanogan River system, watershed ecology, and the biology of anadromous and resident fish to evaluate projects and actions described in this plan. The quantitative methods and assumptions used in the application of the model apply the same clear and systematic logic as other existing local plans being developed and implemented in WRIA 49. This statement is further supported by the sections below.

The Okanogan EDT model is an ideal tool for supporting the WRIA 49 NEB analysis because:

- EDT is a life cycle-based model with a spatial and temporal dispersal component that emulates the full range of life history expression for the target species;
- The Okanogan model covers over 180 miles of mainstem and tributary stream reaches in WRIA 49, including all currently accessible anadromous habitat and nearly all tributaries likely to be affected by future consumptive use demand;

- It characterizes the environment using over 40 attributes with unique values assigned to each reach in the model network by month, and;
- It is based on over 15 years of habitat data collected by OBMEP as part of longterm habitat status and trends monitoring.

Okanogan EDT currently includes model populations for summer steelhead and summerfall Chinook salmon. The Planning Unit selected Okanogan steelhead as the primary indicator species for the WRIA 49 NEB analysis, because this population is listed under the ESA and its distribution includes most of tributary streams likely to be affected by future water demand. Okanogan Chinook are currently found only in mainstem habitats and are unlikely to be measurably affected by consumptive use impacts on tributaries. However, Okanogan Chinook were modeled in EDT to evaluate the effects of one nonwater offset project that would specifically improve habitat conditions on the mainstem. While not ESA-listed, Okanogan Chinook salmon are an important anadromous species relied on by the CTCR and others for subsistence, commercial, and recreational harvest. Figure 4 shows the EDT model habitat reaches in WRIA 49.

The EDT model generates an array of results useful for describing habitat potential for salmon and steelhead and identifying protection and restoration priorities. The EDT-supported NEB analysis relies on a single reporting metric, equilibrium abundance, also referred to as Neq. Neq is the theoretical population size that a given quantity and quality of habitat can support over time. The effects of projected exempt well water demand combined with proposed water and non-water offset projects are being measured using the net effect on juvenile and adult Neq, specifically the number of juvenile steelhead or Chinook salmon leaving WRIA 49 as smolts and the number of adults returning to the watershed to spawn. Consistent with NEB guidance (Ecology 2019), this analysis considers both future water demand and the beneficial effects of Tier 1 non-water offset projects advanced for consideration by the Planning Unit.

In addition to projected benefits for salmon and steelhead, the projects presented in the Plan Addendum are also likely to produce benefits for resident fish species, contributing to NEB in WRIA 49. While these species were not modeled in EDT, it is reasonable to conclude that projects that increase habitat potential for salmon and steelhead will also benefit native fish species. The rationale for this conclusion is that native species that coevolved and share habitat with steelhead and Chinook salmon are similarly adapted to cold water environments and similarly sensitive, to varying degrees, to the negative effects of habitat degradation. These species are also likely to benefit, on balance, from actions that improve habitat conditions for keystone species. Therefore, resident fish are likely to benefit in every subbasin where EDT predicts that proposed projects would increase habitat performance for salmon and steelhead.

Resident fish are also likely to benefit from projects that increase instream flows in stream reaches that are above the anadromous zone. For example, a proposed Tier 2 water offset project in the Sinlahekin Creek watershed would significantly increase instream flows during the summer baseflow period. This project would be implemented in a state wildlife refuge and designed specifically to benefit resident fish species. While this fish watershed is outside of the anadromous zone and the EDT model domain, it is reasonable to conclude that a project designed to improve habitat conditions for resident

fish would benefit these species. Likewise, the proposed irrigation efficiency project in Loup Loup Creek would increase instream flows both within and upstream of the anadromous zone, benefitting resident fish throughout the watershed.

6.2 EDT Model Analysis Approach

The baseline condition (BASE scenario) used for the Okanogan EDT model analysis is the OBMEP 2017 habitat status and trends monitoring scenario. This scenario is based on habitat monitoring data collected by OMBEP from 2014 through 2017 and provides a useful representation of average habitat conditions over this recent four-year period. Where appropriate, BASE scenario conditions were modified in specific tributaries to reflect habitat actions that occurred after 2017 but are Chapter 90.94 RCW ineligible. All BASE scenario modifications are described in Appendix C.

The Planning Unit used a sensitivity analysis approach to evaluate the impacts of future consumptive use on aquatic habitat performance in WRIA 49. The sensitivity analysis used a conservative overestimate of demand effects on wetted channel width under low flow conditions to provide a factor of safety for demonstrating NEB. The sensitivity analysis approach and results are summarized in Section 7.1, and are described in detail in Appendix C.

The NEB analysis scenario maintains the sensitivity analysis effect in all tributaries where no Tier 1 water offset or non-water offset projects are proposed. In tributaries where flow restoration of some type is proposed, either water-for-water or tributary instream flow offset, the NEB scenario considers the net effect of the projected change in streamflow on baseflow channel width as well as other potentially beneficial effects, such as improved habitat composition, reduced low flow variability, improved fish passage, and reduced water temperatures. The intent of this approach is to conservatively overestimate the potential effects of future water demand to provide a factor of safety for the NEB evaluation. The sensitivity analysis approach and results for the consumptive use impact analysis are summarized in Section 6.3. The water-for-water and non-water offset projects used in the NEB evaluation are described in Sections 4.2 and 4.3, respectively. The results of the NEB evaluation are provided in Section 6.4. Detailed descriptions of proposed streamflow and habitat restoration projects used in the NEB evaluation and the EDT analysis parameters used to represent the predicted effects of these projects on the environment are provided in Appendix C.

6.3 Future Consumptive Use Impact Analysis

As discussed in Section 3 of this Plan Addendum, consumptive use in WRIA 49 is projected to increase by an estimated at 203 afy in WRIA 49 over the 20-year Chapter 90.94 RCW planning horizon. This increase in demand is distributed disproportionately over the four planning subbasins considered in the Plan Addendum, ranging from a low of 10.2 afy in the Similkameen subbasin to a maximum of 83.8 afy in the Bonaparte-Johnson (Middle Okanogan) subbasin. This translates to a steady state reduction in streamflow ranging from -0.014 to -0.116 cfs, respectively (Table 6 below).

The ultimate distribution of these streamflow effects will depend on the number of tributary streams in each subbasin and where future development takes place. In the

Salmon Creek subbasin there is only one major tributary so the projected loss of 0.016 cfs in instream flows is assumed to occur within this one tributary. In contrast, the Bonaparte-Johnson subbasin includes four steelhead-bearing tributaries (Johnson Creek, Tunk Creek, Aeneas Creek, and Bonaparte Creek) as well as 32.7 miles of Okanogan mainstem habitat. The projected loss of 0.116 cfs in instream flows would be distributed across these different streams based on where future development occurs. A portion of this 0.116 cfs is attributable to development likely to occur on the valley floor adjacent to the Okanogan River. As discussed in the hydrogeologic section above, any associated domestic wells completed in the mainstem valley aquifer would likely be in continuity with the Okanogan River, and would be expected to have a negligible effect on tributary flows.

The WRIA 49 Planning Unit used a sensitivity analysis approach to estimate the effect of future consumptive use on habitat performance for steelhead. The sensitivity analysis assumed that future consumptive use would reduce baseflow channel width in all Okanogan tributary streams used by steelhead by 0.5 percent during low flow months. Tributary channel dimensions in the EDT sensitivity analysis scenario were reduced by 0.5% relative to BASE conditions from July-September and December-March. Peak tributary flows in WRIA 49 typically occur during the snowmelt period from April through early June, and any water demand effects on surface flows during this period are likely to be unmeasurable and insignificant. See Appendix C for additional details. The sensitivity analysis was not applied to the Okanogan River mainstem reaches in EDT. When distributed across subbasins, this flow effect is a fraction of intra-seasonal and inter-annual mainstem flow variability and the associated effect on wetted channel width would be effectively unmeasurable.

The results of the consumptive use impact sensitivity analysis are presented in Table 6. As shown, the EDT model predicts that a 0.5 percent reduction in baseflow wetted width would have slightly reduced steelhead habitat potential in WRIA 49. Adult steelhead *Neq* decreases by 1 and juvenile *Neq* decreases by 53 under the sensitivity scenario relative to BASE conditions. The reduction in tributary baseflow width had no effect on Chinook salmon adult and juvenile Neq.

Because the distribution of future instream flow effects cannot be predicted with certainty, the sensitivity analysis scenario intentionally overestimates likely effects on tributary habitat conditions. This is demonstrated by case studies of sensitivity analysis assumptions in four steelhead-bearing tributary drainages (Loup Loup Creek, Bonaparte Creek, Antoine Creek, and Ninemile Creek). The decrease in instream flows required to reduce wetted channel width in each of these systems by 0.5 percent ranges from 4 to over 1,000 times greater than the predicted consumptive use effect on streamflow, varying by month (sensitivity analysis methods and results are presented in detail in Appendix C). Given these findings, the actual effect on adult and juvenile steelhead *Neq* would be smaller than predicted here. This demonstrates that the Plan Addendum impact analysis provides a conservative overestimate of future consumptive use effects on aquatic habitat conditions in WRIA 49.

NEB Subbasin	Estimated Self-	New Well	Consump	tive Use	Sensitivity Analysis Effect on Steelhead <i>Neq</i> (change from BASE conditions)		
	Supplied Parcels	Dwellings	afy ²	cfs	Adult	Juvenile	
Loup Loup-Swamp (Lower Okanogan)	1,058	106	37.3	0.052	19 (0)	1,069 (-3)	
Salmon Creek	324	32	11.3	0.016	120 (-1)	8,944 (-36)	
Bonaparte-Johnson (Middle Okanogan) ⁴	2,379	238	83.8	0.116	32 (0)	1,908 (-5)	
Antoine-Whitestone (Upper Okanogan)	1730	173	60.9	0.084	62 (0)	3,756 (-8)	
Similkameen	286	29	10.2	0.014	51 (0)	2,056 (0)	
TOTAL	5,777	578	203	0.281	304 (-1)	18,875 (-52)	

 Table 6. Estimated increase consumptive use in WRIA 49 and projected sensitivity

 analysis effects on adult and juvenile steelhead Neq using the Okanogan EDT model

¹Based on a per-residence total water use estimate of 0.59 afy

² Based on a per-residence consumptive water use estimate of 0.35 afy

³ Subbasin is located entirely on CTCR lands, no parcels under Chapter 90.94 RCW jurisdiction.

⁴ Excludes the Duck Lake Aquifer Area

6.4 Net Ecological Benefit Analysis Results

The results of the Okanogan EDT model analysis will be used to evaluate whether the proposed water and non-water Tier 1 projects in WRIA 49 can achieve NEB at the WRIA scale and in all Okanogan subbasins. Supporting Okanogan EDT model results for the NEB analysis are discussed in Appendix C and summarized below:

- **BASE and NEB Scenario Results (Table 7).** EDT model results for the revised BASE and NEB project scenarios by analysis subbasin, and net effect of Tier 1 water offset and non-water offset NEB-contributing projects on adult and juvenile steelhead and Chinook salmon *Neq*. These results indicate that the streamflow and habitat benefits of proposed offset and non-water offset projects will demonstrably increase habitat potential for anadromous species at the WRIA level and in four out of five analysis subbasins.
- Water NEB Results (Table 8). NEB analysis results summary, including water offset balance, total tributary offset balance, and the estimated beneficial effect of Tier 1 streamflow and habitat restoration projects on salmon and steelhead resources in WRIA 49. These results indicate that the proposed water offset projects will achieve sufficient water offset to compensate for exempt well demand with a factor of safety at the WRIA level. Non-water offset projects will provide additional instream flow restoration sufficient to achieve a net increase in tributary instream flows in all but one analysis subbasin. Collectively, the water

offset balance and EDT analysis results demonstrate that the WRIA 49 Plan Addendum can achieve NEB with a wide factor of safety.

6.5 Conclusions on Achievement of NEB in WRIA 49

As demonstrated by the water-for-water offset analysis, EDT model results, and supporting qualitative assessment of beneficial habitat effects, the Tier 1 proposed in the Plan Addendum can achieve NEB at the WRIA level with a wide factor of safety. The only subbasin where positive benefits for ESA-listed steelhead are not convincingly demonstrated is in the Similkameen, which currently has no Tier 1 NEB projects proposed. However, this subbasin has the smallest projected increase in consumptive use and a proposed Tier 2 non-water offset project that would provide significant benefits for resident fish species. The additional Tier 2 projects included in the Plan Addendum would also contribute to NEB, providing an additional factor of safety at the WRIA level when added to the Tier 1 actions. These findings demonstrate that the Plan Addendum provides sufficient resources for the WRIA 49 Planning Unit to adaptively manage future water demand and achieve NEB consistent with Chapter 90.94 RCW requirements.

The conclusions of the WRIA 49 NEB evaluation are as follows:

- The effects of future consumptive use impacts of permit-exempt wells of 203 acre-feet (CU) are likely to be small; the EDT model predicts that future consumptive use would result in a net reduction in steelhead abundance of less than 1 adult and 52 juveniles at the WRIA level (Table 6)
- The Tier 1 projects proposed in the Plan Addendum achieve a significant net positive streamflow benefit (up to a 2,666 acre-foot surplus) at the WRIA level (Table 8).
- Water offset and non-water offset projects are distributed throughout WRIA 49 including in the upper portions and/or targeted tributary reaches in the basin providing instream flow and habitat benefits to over 100 river miles on the mainstem Okanogan and its tributaries.
- Proposed Tier 1 projects are capable of maintaining or increasing instream flows in all analysis subbasins except the Similkameen, where no Tier 1 projects are currently proposed (Tables 7 and 8).
- The EDT model analysis estimates that the Tier 1 projects in the Plan Addendum would produce a net increase of 119 adult and 5,850 juvenile steelhead, and 18 adult and 4,826 juvenile summer/fall Chinook salmon at the WRIA level (Tables 7 and 8)
- EDT results indicate that habitat potential would increase for steelhead in all analysis subbasins except the Similkameen where projected consumptive use effects are will be negligible, habitat potential for summer/fall Chinook salmon would increase at the WRIA level and in all subbasins except Salmon Creek where this species does not and did not historically occur (Tables 7 and 8).
- Resident fish species are likely to benefit from improved habitat conditions at the WRIA level and in every analysis subbasin, with specific benefits likely to occur

where the EDT model predicted improved habitat performance for steelhead and Chinook salmon.

- Consumptive use effects on steelhead in the Similkameen subbasin were not modeled because the sensitivity analysis assumptions were not applied to mainstem reaches, however any incremental effect on steelhead or other aquatic species could be fully offset by the instream flow benefits of a proposed Tier 2 non-water offset project in Sinlahekin Creek.
- The Tier 2 Sinlahekin Creek project would also provide habitat benefits for resident fish species, such as rainbow trout, cutthroat trout, mountain whitefish, native suckers, and sculpins.
- Based on the quantitative benefits to steelhead and Chinook salmon from Tier 1 projects demonstrated by EDT at the subbasin and WRIA level, the qualitative benefits to resident fish provided by these projects, and the additional benefits and factor of safety provided by Tier 2 projects, the Plan Addendum can achieve NEB at the subbasin and WRIA level.
- The water offset and non-water offset projects in this Plan Addendum would provide a net surplus of water offset, tributary offset, and ecological benefit sufficient to adaptively manage for future water demand and meet Chapter 90.94 RCW requirements with a factor of safety.
- The proposed projects are realistic, are in project categories that are supported by state and federal funding programs, have viable sponsors and defensible conceptual designs, and include some projects that have already been implemented.
- The WRIA 49 Planning Unit has reached concurrence that this Plan Addendum demonstrates that the combined components of the plan achieve NEB consistent with Chapter 90.94 RCW requirements.

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Limitations

Work for this project was performed for the Okanogan County (Client) on behalf of the WRIA 49 Planning Unit, and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

TABLES

Table 1. WRIA 49 Planning Unit and Technical Advisory Group MembersWRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Organization	Representative	Initiating Government	Planning Unit Member	Participation
Okanogan County	Chris Branch	X		Yes
OTID	Jay O'Brien	x		Yes
City of Omak	Todd McDaniel	X		Yes
Water Right Holders (Government)			Į	
Coville Tribe	Charles Brushwood			Yes
Wasington State Department of Ecology	Vanessa Brinkhuis			Yes
Washington Department of Fish and Wildlife	Connie Iten			Yes
City of Okanogan	Christopher Johnson		х	Yes
City of Tonasket	Christa Levine		X	Yes
City of Oroville	Jon Neal			No
Town of Conconully				No
Town of Riverside	Sharma Dickinson		х	Yes
City of Brewster	Lee Webster			No
Water Right Holders (Private)				
North	Nicole Kuchenbuch		Х	No
Central	Jim Soriano		X	Yes
South	Rod Haeberle		X	Yes
Irrigation Districts				
Aeneas	-			No
Alta Vista	-			No
Aston	-			No
Brewster Flat	-			No
Crumbacher	-			No
Helensdale	-			No
Okanogan	-			No
Pinecrest	-			No
Pleasant Valley	-			No
Sun Crest	-			No
Westview	-			No
Whitestone	Rob Inlow		х	Yes
Other Organizations				
Okanogan Conservaiton District	Amy Martin			Yes
Okanogan PUD No. 1	Scott Verjraska		Х	Yes
Okanogan County Cattlemen's Association	Jerry Barnes		Х	Yes
Well Drillers	Chester LaFountaine		Х	No
Okanogan County Horticulture Association	Dick Lorz		Х	Yes
Realtors	Rocky Devon		Х	Yes
Okanogan County Farm Bureau	Dick Ewing		Х	Yes
Economic Alliance	Roni Holder-Diefenbach		Х	Yes
Okanogan Land Trust	Stacy Shutts		Х	Yes
Okanogan Highlands Alliance	Jennifer Weddle		Х	Yes
Columbiana	Rick Gillespie		Х	Yes
Landowner at-large - North	Mike Kelly		Х	Yes
Landowner at-large - Central	Jim Utt		Х	Yes
Landowner at-large - South	Tory Wulf		х	No
Trout Unlimited	Jacquelyn Wallace			Yes
Washington Water Trust	Greg McLaughlin			Yes
Private Timber Management	Bob McDaniel		X	Yes

Table 5. Summary of Proposed WRIA 49 Offset Projects WRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Project	WRIA 49 Subbasin/Stream	Tier Ranking	Sponsor	Project Type ¹	Description	Consumptive Use Offset	Instream Flow Benefit	Affected Stream Length (mi) ²	Estimated Cost	Requires O&M?
Antoine Valley Ranch (AVR) ³	Antoine-Whitestone/ Antoine Creek	Tier 1	Washington Water Trust, CTCR, Trout Unlimited	O&NEB	Conservation acquisition of 2,524-acre Antoine Valley Ranch (AVR) and senior water rights totaling 1,294 af. Includes ownership of Fanchers Dam with its related storage 500 AF capacity. Project will provide flow augmentation and retiming for summer baseflow and thermal benefits, and support future habitat restoration in a valuable spawning tributary.	Up to 1,294 afy	1.8 cfs (average)	5.4 (flow restoration may support restoring access to additional ~12 miles of habitat between AVR and Fanchers Dam)	\$7.9-\$8.5 million	Yes
Conservancy Island Side Channel Reactivation	Bonaparte-Johnson/ Okanogan River	Tier 1	City of Okanogan	NEB	Restore Conservancy Island side channel connectivity with Okanogan River, providing access to historical Chinook salmon and steelhead spawning and rearing habitat.			0.9	\$850,000	Yes
Johnson Creek Fish Passage	Bonaparte-Johnson/ Johnson Creek	Tier 1	Trout Unlimited	NEB	Package of 3 90.94-eligible fish passage restoration projects funded by the Brian Abbot (Washington State) Fish Barrier Removal Board. Provides access from mouth upstream to Duck Lake diversion.			4	\$2.7 million	No
Loup Loup Creek Diversion Improvements ³	Swamp-Loup Loup/ Loup Loup Creek	Tier 1	CTCR, Washington Water Trust	NEB&LO (O pending additional study)	Replace unlined diversion ditch with pipe to eliminate leakage and evaporation losses. Water savings will be dedicated to instream flows.	TBD	0.38 cfs (average), ∼275 afy	2.17	\$1.7 million	Yes
OTID Tributary Supplementation ³	Johnson-Bonaparte/ Bonaparte Creek Antoine-Whitestone/ Siwash Creek, Antoine Creek, Whitestone Creek, Ninemile Creek	Tier 1	Oroville-Tonasket Irrigation District	NEB&LO	Use existing diversion infrastructure to provide flow augmentation in lower reaches of select Okanogan tributary streams from April 1 to October 15.	460-525 afy	1.2-1.3 cfs (Apr-Oct)	5.7	\$10,500	Yes
Pine Creek Water Right Acquisition ³	Bonaparte-Johnson (Middle Okanogan)	Tier 1	Okanogan County / OCD	0	Purchase the Pine Creek Trust Water Right (CG4-23992(A)C) from Ecology for consumptive use offset.	625.7 afy	0.86 cfs	51	\$1,300 per af	No
Salmon Creek Source Substitution	Salmon Creek	Tier 1	City of Okanogan	NEB&LO	Transfer 300 gpm municipal surface water diversion right from Salmon Creek to an existing or new groundwater well in continuity with Okanogan River.	485 afy	0.67 cfs	3.7	\$250,000, +\$10,000 annual O&M	Yes
Salmon Lake Storage	Salmon Creek	Tier 1	Bureau of Reclamation, CTCR, Okanogan Irrigation District	O&NEB	Residential infrastructure purchase or improvements to allow for full use of Salmon Lake reservoir pool. Provides increased storage for flow retiming.	~1,000 afy	2.1 cfs (average)	18.8	\$175,000 to \$652,000 depending on management option	Yes
Whitestone Creek Flow and Temperature Augmentation	Antoine-Whitestone/ Whitestone Creek	Tier 1	Whitestone Irrigation District	NEB	Improve conveyance system to increase irrigation system efficiency and reduce maintenance. Provide 1 to 1.5 cfs additional instream flow in Whitestone Creek from Apr-Oct to for flow and temperature augmentation.	425-485 afy	1-1.5 cfs inflow (Apr- Oct) at 5-7 degrees C below ambient surface water temperature	3.3	In development	Yes
Aeneas Lake Irrigation District Efficiencies	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Reduce the amount of excess water pumped from the mainstem Okanogan River. This would reduce the over- pumping and return flow to the river, which is expected to reduce turbidity in that location.			TBD	\$30,000	Yes
Conconully Dam Replacement	Salmon Creek	Tier 2	Bureau of Reclamation, Okanogan Irrigation District	O&NEB	Proposed dam replacement, with potential to increase available storage and provide fish passage to historically accessible headwaters of Salmon Creek.	Unspecified	Unspecified	TBD	Unspecified	Yes
Highlands Springs Protection and Enhancement	Bonaparte-Johnson (Middle Okanogan)	Tier 2	Okanogan Highlands Alliance	NEB	Partner with range lessees, landowners, and the U.S. Forest Service (USFS) to assess the condition of water resources, repair spring protection infrastructure, and install fencing and troughs to protect undeveloped springs.			TBD	\$20,000 + \$5,000- \$10,000 annual O&M	Yes
Irrigation Efficiency Projects	Multiple	Tier 2	OCD	O&NEB	Opportunistic irrigation efficiency projects throughout WRIA 49 reducing overall water demand. Water savings will be dedicated to instream flows.	TBD	Unspecified	TBD	Unspecified	Yes
Loup Loup Creek Channel and Riparian Improvements	Swamp-Loup Loup/ Loup Loup Creek	Tier 2	OCD	NEB	Improve instream habitat and riparian conditions along 600 feet of Loup Loup Creek, improving spawning habitat for ESA-listed steelhead. Riparian buffers will be increased from 10 feet to 30- 100 feet.			0.11	Unspecified	No
Methow Beaver Project ³	Antoine-Whitestone/ Whitestone Creek, Swamp-Loup Loup, Bonaparte-Johnson	Tier 2	Methow Beaver Project	NEB	Increase late season streamflow by adding and improving channel structure and floodplain connection to restore natural watershed functions.			TBD	\$550,000	No
Okanogan Highlands Water Riparian Restoration	Antoine-Whitestone/ Whitestone Creek	Tier 2	Okanogan Highlands Alliance	NEB	Restoration techniques will vary by site, depending on geomorphology, land use, streamflow, instream structure and roughness, etc., but will include structural adjustments to improve flow and storage, plant native species, and			TBD	\$10,000-\$65,000 + \$1,000-\$15,000 annual O&M	Yes
Okanogan River Riparian Enhancement	Antoine-Whitestone/ Whitestone Creek	Tier 2	OCD	NEB	Maintain four previously planted acres on the 2-mile long stretch of property. This will include replacement of dead plants, adaptive management for weed control, and irrigation.			2	\$55,000 + \$1,500 annual O&M	Yes
Pine Creek Riparian Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Protect riparian and wetland areas from water quality impacts from livestock using downed 'jackstraw' logs. These scattered logs mimic natural barriers to browsing and protect natural regeneration of riparian plants and new plantings.			0.13	12,000 + \$2,000 annual O&M	Yes
Salmon Creek Streambank Stabilization Projects	Salmon Creek	Tier 2	OCD	NEB	Restore and enhance riparian vegetation by planting woody shrub and tree species for the purpose of providing woody debris recruitment into Salmon Creek as a means of creating habitat for invertebrates, which will enhance food sources for			твр	\$16,000 + \$900 annual O&M (5 years)	Yes

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Table 5. Summary of Proposed WRIA 49 Offset ProjectsWRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Sinlahekin Wildlife Area Improvement Project	Similkameen	Tier 2	Oroville-Tonasket Irrigation District, Washington Department of Fish and Wildlife	O&NEB	Impoundment and diversion system improvements to support instream flows in Sinlahekin Creek. A portion of water savings will be dedicated to instream flows.	Unspecified	Unspecified	42	\$750,000	Yes
Tunk Valley Dry Forest Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD, DNR	NEB	1,100-acre project to create long-term habitat quality and ecological integrity by moving stands back towards more dispersed, larger diameter trees at a much-reduced density.				Unspecified	Yes

1 O&NEB = consumptive use offset project with or without additional habitat restoration that contributes to NEB; NEB = streamflow and/or habitat restoration project that contributes to NEB; LO = Local Tributary Offset

2 The approximate length of tributary or mainstem reach measurably affected by the proposed non-water offset project. For the Highway 20 culvert replacement project the affected length covers the Conservancy Island side channel from its historical upstream and downstream connection points with the mainstem Okanogan River.

3 Indicates project applied for 2020 Streamflow Restoration Grant funding.

Table 7. BASE and NEB Scenario Results

WRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

Analysis Subbasin	Species	Current Condition Proposed (BASE Scenario) (NEB S			d Condition Scenario)	Change	
		Adult	Juvenile	Adult	Juvenile	Adult	Juvenile
Loup Loup Creek	Steelhead	19	2,133	21	2,251	2	118
Salmon Creek	Steelhead	125	18,587	236	24,126	111	5,539
Bonaparte-Johnson (Middle Okanogan)	Steelhead	32	3,807	36	3,890	4	83
Antoine-Whitestone (Upper Okanogan)	Steelhead	62	7,491	64	7,601	2	+110
Similkameen	Steelhead	51	2,052	51	2,056	0	0
W/BIA 49 Total	Steelhead [‡]	309	19,244	433	25,094	119	5,850
	Chinook [§]	12,977	1,464,798	12,996	1,468,550	19	4,826

* Loup Loup results reflect assumption that 23% of irrigation canal losses used for instream flow augmentation in Loup Loup Creek, and post-fire recovery to 2013 habitat conditions

 $^{\$}$ Chinook NEB effect from Highway 20/Conservancy Island side channel project, Okanogan Mainstem

[‡] Totals include steelhead production in Okanogan Reservation tributaries Omak Creek and Wanacut Creek

Table 8. Water NEB Results

WRIA 49 RCW 90.94 Streamflow Restoration Plan Addendum (190259)

NEB Subbasin	Water-for-Wat	Tributary Offset ¹		Net Ecological Benefit					
	Net change (afy)	Net change (cfs)	Net change (afy)	Net change (cfs) ²	Adult	Juvenile	Adult	Juvenile	
					Steelhead Neq	Steelhead Neq	Chinook Neq ³	Chinook Neq ³	
Loup Loup-Swamp (Lower Okanogan)	-37	-0.51	275 (approx)	0.38	2	118	2	2,537	
Salmon Creek	1,000 (+988)	1.36	1,499	2.07	111	5,539			
Bonaparte-Johnson (Middle Okanogan)	626 (+626) ⁴	0.864	123	0.17	4	83	14	1,999	
Antoine-Whitestone (Upper Okanogan) ⁵	1,160 (+1,099)	1.52	2,371	3.28	2	110	1	305	
Similkameen ⁶	-10	-0.01	-	-	0	0	1	166	
WRIA 49 Total	2,786 (+2,666)	3.22	6,753	5.9	119	5,850	18	4,826	

¹ Tributary Offset is the total instream flow increase in Okanogan River tributaries that support summer steelhead, combining water-for-water offset projects and Tier 1 non-water offset projects.

² Net change (cfs) values are average over 1 year. All non-water offset projects provide flow augmentation during specific periods (e.g. April through October) to optimize habitat benefits for steelhead.

³ Chinook NEB effect from Highway 20/Conservancy Island side channel project

⁴ Pine Creek water-for-water offset applies in mainstem Okanogan only (no tributary offset or measurable NEB effect)

⁵ Tributary offset and NEB estimate include AVR project with full instream flow benefit of 1,294 afy, including additional non-water offset of 134 afy.

⁶ The Tier 2 Sinlahekin Wildlife Area Impoundments Improvement project provides sufficient potential tributary offset in the Similkameen subbasin to avoid consumptive use effects and produce additional NEB benefit for resident fish species. A net tributary offset of zero is assumed for the purpose of the NEB determination.

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FIGURES





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