

## Technical Progress to Date

Snohomish (WRIA 7) WRE Committee

v20200219

### Background

This document provides an overview of technical work completed to support the WRIA 7 Watershed Restoration and Enhancement Committee (Committee), and the Committee's key decision points. Additional detail of technical work is documented in three technical memos developed by GeoEngineers and NHC. The Committee and its Technical Workgroup supported the development and advancement of this technical work and decision points. Detail on this process is captured in meeting summaries.

### Subbasin Delineation

The Snohomish (WRIA 7) WRE Committee and technical workgroup held initial discussions in spring, 2019 to develop subbasin delineations. The Committee and workgroup discussed the pros and cons of having few subbasins versus many subbasins delineated for the WRE Plan. Specifically, members discussed reasons for dividing the WRIA into many subbasins to reflect priorities to protect streamflows where the most growth of new domestic PE wells is projected, protect streamflows in tributaries with year-round closures, to consider complex land use patterns, historic impacts from wells, and consider ecological and biological factors. Members also discussed that too many subbasins would make planning and technical work more difficult and may not result in additional ecological benefit. Ultimately, the Committee requested information about the number and spatial distribution of new domestic PE wells and decided to delay subbasin delineation until growth projections were developed.

Snohomish County developed interim growth projections using HUC-12 subwatersheds and King County developed interim growth projections using stream basins, which the technical workgroup then used to develop a subbasin delineation proposal.

The WRIA 7 subbasin delineation combines subbasins with relatively low growth in the headwaters (Upper Snoqualmie and Upper Skykomish subbasins), and separates subbasins with relatively high growth (Tulalip, Little Pilchuck, and Quilceda/Allen). Raging River and Patterson Creek because they are closed to new water rights and have important salmon habitat. Harris Creek is also a closed stream, but was combined with Cherry Creek, since the large wetland between the two basins does not hydrologically isolate the two subbasins. The subbasin delineation splits the Snoqualmie mainstem into North and South at the Tolt River to avoid creating a large subbasin with high projected growth. Overall, the subbasin delineation aligns relatively closely with the Snohomish Basin Protection Plan, which identifies hydrological protections and actions that can be used for salmon recovery planning in the watershed.

The following subbasins were defined in the delineation:

- Upper Snoqualmie: combines the North, Middle, and South Fork Snoqualmie stream basins.
- Raging River.
- Patterson Creek.

- Snoqualmie South: combines the South Fork Tolt, North Fork Tolt, and Lower Tolt stream basins with nearby stream basins Tokul Creek, Griffin Creek, and the southern half of the Snoqualmie mainstem drainage basin.
- Snoqualmie North: Combines the northern half of the Snoqualmie mainstem drainage basin with Tuck Creek, Cathcart drainages, and Ames Lake.
- Cherry/Harris: combines Cherry Creek and Harris Creek into one subbasin.
- Upper Skykomish: combines the South Fork and North Fork Skykomish tributaries. This includes the following HUC-12 subwatersheds and drainage basins:
  - Foss River, Miller River, Tye River, South Fork Skykomish River, Beckler River, Rapid River, Upper Beckler River, Lower South Fork Skykomish River, Lower North Fork Skykomish River, Middle North Fork Skykomish River, and Upper North Fork Skykomish River.
- Lower Mid-Skykomish: combines Wallace River and Olney Creek.
- Skykomish Mainstem: combines Elwell Creek-Skykomish River and McCoy Creek-Skykomish River.
- Woods Creek.
- Sultan: combines Upper, Middle, and Lower Sultan River.
- Pilchuck: combines Upper and Lower Pilchuck River.
- Little Pilchuck.
- Quilceda-Allen: Combines the Allen Creek drainage, which is part of the Snohomish River – Frontal Procession Sound HUC-12 subwatershed, with the Quilceda Creek HUC-12 subwatershed.
- Estuary/Snohomish Mainstem: combines the Snohomish River, Evans Creek, and French Creek.
- Tulalip Creek.

#### Documentation

A draft subbasin delineation memo was distributed for Committee review. The memo has been finalized and will be used to develop a section of the WRE Plan. The technical memo will also be included as an appendix to the WRE Plan.

#### Recommendation/Agreement

At the October 2019 meeting, the Committee reached agreement on a recommendation from the technical workgroup to use the subbasin delineations to develop growth projections and consumptive use estimates by subbasin.

#### Permit-exempt Well Growth Projections

GeoEngineers worked with the WRIA 7 – Snohomish WRE Committee to define growth projection methods and growth projections for WRIA 7. The WRIA 7 growth projection methods included using King and Snohomish County historical building permit and year-built data to predict potential PE well<sup>1</sup> growth over the 20-year planning horizon. This methodology assumes that the rate and general location of past growth will continue over the 20-year planning horizon. GeoEngineers

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<sup>1</sup> "PE wells" is used to refer to new homes associated with new permit-exempt wells and also new homes added to existing wells, including homes on group systems relying on permit-exempt wells.

also completed an analysis of potential PE well growth within the incorporated and unincorporated Urban Growth Areas (UGAs) using Ecology’s well log database.

**GeoEngineers estimates 3,389 new permit-exempt domestic well connections in WRIA 7 over the 20-year planning horizon** (see Table 1).

#### Documentation

A draft technical memo with specific methodologies was distributed for Committee review. The technical memo will be finalized and used to develop a section of the WRE Plan. The technical memo will also be included as an appendix to the WRE Plan.

#### Recommendation/Agreement

At the September 2019 meeting, the Committee reached agreement on a recommendation from the technical workgroup to use the growth projection of 3,389 new PE wells (**see Table 1**) to develop consumptive use estimates.

**Table 1. Growth Projections for new PE wells in WRIA 7 – Snohomish 2018 to 2038<sup>2</sup>**

Subbasins	King County Past Trends <sup>1</sup>	Snohomish County Past Trends <sup>2</sup>	UGA Well Log Spot Check <sup>3</sup>	Total PE Wells <sup>4</sup> per Subbasin <sup>5</sup>
1 - Tulalip	--	468	0	468
2 - Quilceda-Allen	--	330	8	338
3 - Estuary/Snohomish Mainstem	--	322	9	331
4 - Little Pilchuck	--	289	5	294
5 - Pilchuck	--	278	2	280
6 - Woods	--	224	0	224
7 - Sultan	--	53	2	55
8 - Lower Mid-Skykomish	--	60	0	60
9 - Skykomish Mainstem	0	183	2	185
10 - Upper Skykomish	48	53	2	103
11 - Cherry-Harris	200	11	3	214
12 - Snoqualmie North	240	98	0	338
13 - Snoqualmie South	147	0	0	169
14 - Patterson	104	--	0	104
15 - Raging	73	--	2	75
16 - Upper Snoqualmie	168	--	5	151
<b>Totals</b>	<b>980</b>	<b>2,369</b>	<b>40</b>	<b>3,389</b>

Notes:

1 = Based on 20-year estimate of potential new PE wells in unincorporated King County, plus 6% error.

2 = Based on 20-year estimate of potential new PE wells in unincorporated Snohomish County using the "past trends scenario."

Assumes half of the projected growth for water service areas in the Quilceda-Allen subbasin (26) will use PE wells (part of the Quilceda area has water provided by Marysville/City of Everett.) Assumes all of the growth forecast for water service areas in the Tulalip subbasin (249) will use PE wells to account for the inability of the Seven Lakes water system to expand service at this time. The total exceeds the PE well areas, since it includes the potential for PE wells in the water service area. Includes estimate of 20 potential new PE wells on Tulalip Tribal owned lands in the Quilceda-Allen subbasin and 15 potential new PE wells on Tulalip Tribal owned lands in the Tulalip

<sup>2</sup> This corresponds to Table 1 in the WRIA 7 Growth Projections Memo.

subbasin.

3 = Based on spot-check of Ecology Well Report Viewer database. Accounts for potential wells within the incorporated and unincorporated Urban Growth Areas (UGAs) over the 20-year planning period.

4 = "PE Wells" is used to refer to new homes associated with new permit-exempt wells and also new homes added to existing wells on group systems relying on permit-exempt wells.

5 = Includes redistribution of 22 wells from Upper Snoqualmie subbasin to Snoqualmie South subbasin in the King County portion of WRIA 7.

## Additional Growth Scenarios

Snohomish County completed a growth projection scenario based on their comprehensive plan and Vision 2040 growth targets. This analysis projected 1,463 new PE wells in the Snohomish County portion of WRIA 7. GeoEngineers developed an additional scenario for Snohomish County using the Office of Financial Management's "high" population forecast, which estimated 2,723 new PE wells in the Snohomish County portion of WRIA 7.

The technical workgroup recommended using the County's past trends analysis for Snohomish County projections because it was a similar method to King County's past trends analysis and it was slightly higher than the comprehensive plan scenario, which estimated 2,059 new PE wells in the Snohomish County portion of WRIA 7, accounting for potential uncertainty. The OFM "high" scenario was not selected because it has not been adopted in any comprehensive plans for cities or counties.

## Available Dwelling Units Scenario

In addition to growth projection scenarios, King and Snohomish County developed estimates of the undeveloped parcels and dwelling units likely to be served by permit-exempt wells. Snohomish County called this scenario "available capacity" and King County called this "PE potential assessment." This analysis was used to determine if there would be enough parcels to accommodate the 20-year growth projection at the WRIA and subbasin level. More information is provided in Appendix A and B of the WRIA 7 Growth Projections Memo.

GeoEngineers combined results from the King and Snohomish County available dwelling unit analysis with potential PE wells in the UGA to estimate the number of dwelling units potentially served by PE wells in each subbasin. The total available dwelling units potentially served by PE wells is 8,701 (**see Table 2**). This is a theoretical analysis that does not have a temporal scale or account for future growth management policies.

**Table 2. Available Dwelling Units Potentially Served by PE Wells by Committee Subbasins in WRIA 7 - Snohomish<sup>3</sup>**

	King County (DUs) <sup>1</sup>	Snohomish County (Available Capacity) <sup>2</sup>	PE Wells in UGA <sup>3</sup>	Total DUs likely served by PE Well Wells <sup>4</sup> per Subbasin
<b>WRIA 7 Subbasin</b>				
1 - Tulalip*	--	618	0	<b>618</b>
2 - Quilceda-Allen*	--	767	8	<b>775</b>

<sup>3</sup> This is a theoretical analysis that does not have a temporal scale or account for future growth management policies.

3 - Estuary/Snohomish Mainstem*	--	611	9	<b>620</b>
4 - Little Pilchuck	--	1308	5	<b>1313</b>
5 - Pilchuck	--	1033	2	<b>1035</b>
6 - Woods	--	698	0	<b>698</b>
7 - Sultan	--	174	2	<b>176</b>
8 - Lower Mid-Skykomish	--	277	0	<b>277</b>
9 - Skykomish Mainstem	0	674	2	<b>676</b>
10 - Upper Skykomish	227	211	2	<b>440</b>
11 - Cherry-Harris	515	35	3	<b>553</b>
12 - Snoqualmie North	362	354	0	<b>716</b>
13 - Snoqualmie South	413	0	0	<b>413</b>
14 - Patterson	125	--	0	<b>125</b>
15 - Raging	113	--	2	<b>115</b>
16 - Upper Snoqualmie	146	--	5	<b>151</b>
<b>Totals</b>	<b>1901</b>	<b>6760</b>	<b>40</b>	<b>8701</b>

<sup>1</sup> = Based on 2019 total dwelling unit (DU) estimate for PE Well sourced parcels in unincorporated King County.

<sup>2</sup> = Based on 2019 total available parcels in P-E Well Areas in unincorporated Snohomish County.

<sup>3</sup> = Based on spot check of Ecology well log database. Accounts for potential wells within the incorporated Urban Growth Area over the 20-year planning horizon. PE wells in the Urban Growth Area were not projected beyond the 20-year horizon and there is no technical basis to analyze potential capacity for PE wells in Urban Growth Areas.

<sup>4</sup> = "PE wells" is used to refer to new homes associated with new domestic permit-exempt wells and new homes added to existing wells on group systems relying on permit-exempt wells.

\*Notes: **Tulalip Subbasin:** Assumes all parcels in water service areas in Tulalip Creek - Frontal Possession Sound (379) will use PE wells to account for the inability of the Seven Lakes water system to expand service at this time. Includes an estimate of 15 potential new permit-exempt wells on Tulalip Tribal owned lands in Tulalip Creek-Frontal Possession Sound.

**Quilceda/Allen Subbasin:** Includes an estimate of 20 potential new permit-exempt wells on Tulalip Tribal owned lands in Quilceda Creek. Does not include parcels in the Allen Creek portion of the subbasin.

**Snohomish/Estuary Mainstem Subbasin:** Includes parcels in the Allen Creek subbasin.

## Consumptive Use Estimates

GeoEngineers and NHC worked with the Committee to develop consumptive use estimates and additional consumptive use scenarios for the Committee's consideration. NHC developed consumptive use estimates based on recommended assumptions and methods in Ecology's Final NEB Guidance, which involves an irrigated footprint analysis to determine average irrigated area per household.

NHC sampled 393 single-family residential building permit sites between 2006-2017 (25% of permits) and evaluated 20-30 parcels in each of the 16 subbasins with projected permit-exempt well connections. They evaluated irrigation practices at each site using Google Earth imagery and calculated average irrigated acres by subbasin. **The average irrigated footprint for the WRIA is 0.21 acres.** Some subbasins had very small irrigated yard averages (Tulalip, Quilceda-Allen, Sultan, and Skykomish subbasins) and a few subbasins had notably larger irrigated yard averages (Patterson, Raging, and Pilchuck).

NHC then calculated the indoor consumptive water use and outdoor consumptive water use based on recommended assumptions and methods in Ecology's Final NEB Guidance. **The consumptive use estimate for WRIA 7 is 797.4 acre-feet per year (see Table 3).**

## Documentation

GeoEngineers and NHC developed a draft technical memo which describes methods and results. The memo was distributed in December for Committee review. The technical memo has been finalized and will be used to develop a section of the WRE Plan. The technical memo will also be included as an appendix to the WRE Plan.

## Recommendation/Agreement

At the January 23 Technical Workgroup meeting, the Workgroup agreed to recommend the planning horizon consumptive use estimate of 797.4 acre-feet per year to the Committee. The chair proposes a formal decision on the consumptive use estimate at the March 12 Committee meeting.

**Table 3. Annual Consumptive Use for One Home with Subbasin Average Yard<sup>4</sup>**

Subbasin ID	# PE Wells Anticipated in Subbasin	Irrigated Area per Well (ac)	Per Well Consumptive Use (gpd)			Total Consumptive Use (af/yr)
			Indoor	Outdoor	Total	
Tulalip	468	0.09	16.5	94.4	110.9	58.1
Quilceda-Allen	338	0.15	16.5	147.6	164.1	62.1
Estuary/Snohomish Mainstem	331	0.29	16.5	295.7	312.2	115.8
Little Pilchuck	294	0.20	16.5	194.4	210.9	69.5
Pilchuck	280	0.37	16.5	337.3	353.8	111.0
Woods	224	0.12	16.5	109.1	125.6	31.5
Sultan	55	0.11	16.5	89.2	105.7	6.5
Lower Mid-Skykomish	60	0.14	16.5	114.1	130.6	8.8
Skykomish Mainstem	185	0.16	16.5	138.4	154.9	32.1
Skykomish	103	0.05	16.4	35.3	51.7	6.0
Cherry-Harris	214	0.16	16.4	152.2	168.6	40.4
Snoqualmie North	338	0.21	16.4	214.3	230.7	87.4
Snoqualmie South	169	0.21	16.4	196.3	212.7	40.3
Patterson	104	0.41	16.4	456.1	472.5	55.0
Raging	75	0.43	16.4	444.9	461.3	38.8
Upper Snoqualmie	151	0.23	16.4	185.8	202.2	34.2
<b>WRIA 7 Aggregated</b>	<b>3,389</b>	<b>0.20</b>	<b>16.5</b>	<b>193.6</b>	<b>210.0</b>	<b>797.4</b>

## Additional Consumptive Use Scenarios

The Committee requested that technical consultants develop additional consumptive use scenarios for the Committee's consideration (see Table 4). Technical consultants developed the following scenarios in a spreadsheet calculator, where inputs can be changed to test sensitivity of results and build alternative scenarios.

<sup>4</sup> This corresponds to Table 4 in the WRIA 7 Consumptive Use Memo

- **Scenario 1:** assumes 60 gpd per person indoor use per person and an average irrigated lawn area, based on irrigated footprint.
  - The consumptive use estimate for scenario 1 is 797.4 acre-feet per year.
- **Scenario 2:** assume 60 gpd per person and ½ acre irrigated lawn area
  - Consumptive use result is 1,885 acre-feet per year (2.6 cfs).
- **Scenario 3:** assume 950 gpd annual average. Assumes indoor use of 60 gpd per person indoor use and the rest for outdoor use.
  - Consumptive use result is 2,448 acre feet per year (3.38 cfs).
- **Scenario 4:** provides a comparison to average household water use for a local water purveyor (Snohomish PUD)
  - Consumptive use result is 261.6 acre-feet per year (0.36 cfs).
- Summer Consumptive Use Scenarios calculate the portion of water use in June, July and August for scenarios 1 through 4<sup>5</sup>
  - Consumptive use result for scenario 1 is 641 acre-feet.
  - Consumptive use result for scenario 2 is 1,556.9 acre-feet.
  - Consumptive use result for scenario 3 is 617 acre-feet.

Table 4. Comparison of Consumptive Water Use Scenarios<sup>6</sup>

Scenario (Indoor / Outdoor)	Annual Consumptive Water Use Estimate (acre-feet per year)
60 gpd pp / measured irrigated footprint	797
60 gpd pp / 0.5-acre irrigated yard	1,885
950 gpd (legal limit averaged over the year)	2,448

Snohomish PUD and Covington Water District (WRIA 9) provided water use data. These comparisons are total water use, not consumptive water use; the water purveyors do not measure consumptive use. NHC determined the indoor use fraction of purveyor data based on winter water use. The remainder of purveyor data total use is assumed to be outdoor use. Results show that the indoor use is very similar to NHC calculated indoor water use. For outdoor use – NHC estimates are much higher – 4-5X higher (see Table 5).

<sup>5</sup> The summer scenario instantaneous rate (cfs) calculation does not take into account local geology or the time it would take consumptive use impacts to reach a stream. This scenario is for comparison.

<sup>6</sup> This table summarizes information provided in Table 8 in the Consumptive Use Estimates memo.

**Table 5. Metered Water Use Compared to PE Well Scenarios**

	Indoor Use per Household (gpd)	Outdoor Use per Household (gpd)	Total Use per Household (gpd)
<b>Water Purveyor Data</b>			
Snohomish PUD	170	65 <sup>†</sup>	235
Covington Water District	150	50 <sup>‡</sup>	200
<b>Calculated PE Well Scenarios</b>			
1 home, subbasin average yard	165	242	407
1 home, 0.5 ac yard	165	600	765
1 home using 950 gpd (annual average)	165	785	950

<sup>†</sup>Annualized water use. Average summer usage rates on the order of 150-200 gpd.

<sup>‡</sup>Annualized water use. Average summer usage rates on the order of 120-200 gpd.

Note: Reported values are total water use, not consumptive use.

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