



Discussion Guide

Consumptive Use Estimates

WRIA 7 Watershed Restoration and Enhancement Committee Meeting

June 13, 2019

Purpose of Discussion

The purpose of this discussion is 1) to understand Ecology's recommended methods to estimate annual¹ consumptive water use and the underlying assumptions; 2) to identify any local data the Committee may want to use that could warrant making different assumptions; and 3) to prepare for a future decision on the methods and assumptions the Committee will use to estimate the amount of new consumptive uses from the 20 year timeline of new domestic permit-exempt wells.

The results of this work will be combined with estimates of the numbers of new single-family homes relying on domestic permit-exempt wells anticipated between January 19, 2018 and January 18, 2038 within each subbasin.

This discussion is based on *Recommendations for Water Use Estimates* (Ecology Publication 18-11-007). That publication will be superseded by Appendix A in Ecology's Final Net Ecological Benefit guidance document when it is released this summer, but the key parameters described in both are similar and we don't need to wait to begin the discussions.

Background and Context

What is Consumptive Use?

Consumptive water use is water that is evaporated, transpired, consumed by humans, or otherwise removed from an immediate water environment. For our planning purposes, consumptive water is water that is removed from the ground from a domestic permit-exempt well, and not replaced through the septic system, irrigation return flows, or other means.

Why Estimate Consumptive Use?

- Under RCW 90.94, plans must estimate consumptive use associated with new domestic permit-exempt wells anticipated between January 19, 2018 and January 18, 2038.
- The plans must include projects and actions that offset the estimated consumptive use.
- Ultimately, watershed plans will be judged by two tests:
 - Do the projects and actions in the plan offset the quantity of total estimated consumptive water use from new permit-exempt domestic wells on a WRIA-wide basis?
 - Will the impacts of this new use be offset by actions prescribed within the plan in a manner that collectively will result in Net Ecological Benefit (NEB) to the watershed?

¹ The Committee will estimate annual consumptive use for the number of new domestic permit-exempt wells expected by the end of the 20-year planning horizon. For example, the Committee might determine that 2,000 new wells will be constructed in the WRIA by January 18, 2038, and their collective consumptive use will amount to 750 acre-feet per year. This would be the consumptive use offset volume that projects and actions would need to address.

General Considerations about Consumptive Use

- Estimates of water use by future domestic permit-exempt wells must account for the portion of water consumptively used from indoor and outdoor water uses.
- Legally, new well users can irrigate up to ½ acre of land, and use up to an annual average of 950 gallons per day per connection.
- Ecology's *Recommendations* document identifies generally accepted and reasonable assumptions.² Committees can use different assumptions, but they must be based in realistic expectations and local data, and provide adequate justification.
- Homes supplied with municipal water pay for the use of the water. Because using more water will cost them more money, they tend to be more conservative in their water usage than people on well water. They are also more likely to be fitted with water saving appliances.
- Few permit-exempt wells are metered. Therefore, we must estimate how much water is used in these homes and then determine what portion of that use is consumptive.

Options for Committee Consideration

Committees need to consider consumptive water use at both a WRIA-wide level and by subbasin. Indoor water use and outdoor water use should be calculated separately. Annual quantities can be estimated by making a series of assumptions regarding indoor and outdoor water use and the consumptive portion of each, and then multiplying by the projected number of future domestic permit-exempt wells in each subbasin. The following describes steps to produce those estimates.

The methods described below are based on assumptions described in Ecology's *Recommendations* document. Committees can use different assumptions if technical justification is provided. However, Ecology will ultimately need to accept these results during its NEB determination. If the Committee chooses to deviate significantly from Ecology's methods or to use different parameters to perform these analyses, the chair will work with Ecology's technical team to determine how GeoEngineers will evaluate those alternative methods or assumptions.

Indoor Consumptive Use

Indoor consumptive use estimates are based on a number of generally accepted assumptions described in the *Recommendations* document:

- Studies indicate that an assumption of about 60 gallons per person per day is reasonable.
- Most homes with domestic wells are connected to septic systems, so it is reasonable to assume that indoor use is only about 10% consumptive.

Committees will need to identify the average number of people per home in the watershed or subbasin from the Washington Office of Financial Management (OFM) or other population information.

Outdoor Consumptive Use Methods

Outdoor consumptive use depends on a number of factors: the size of the watering area, the efficiency of the irrigation delivery, the type of crop/plant being watered, and that crop's irrigation requirement. We can make generally accepted assumptions for some of these factors, but others will be WRIA or subbasin specific. For instance, homes in the upper subbasins will have significantly different

² According to Ecology's [Recommendations for Water Use Estimates](#) (Publication 18-11-007), reasonable assumptions for indoor and outdoor consumptive use is 10% and 80%, respectively.

precipitation patterns, might have smaller lawns and more forest, and therefore do less outdoor watering.

General assumptions:

- The *Recommendations* document states that a reasonable assumption is about 80% of irrigation water is consumed.
- Some water is lost during the application process, for instance watering the sidewalk instead of the grass. Irrigation efficiency of 75% is a reasonable assumption.³
- Different crops require different amounts of water during the summer. Outdoor watering of turf grass is a reasonable assumption for crop type.

The following describes the steps and methods to estimate outdoor consumptive use:

1. Estimate the average outdoor watering area in each subbasin.
 - Use GIS and/or satellite imagery to estimate average outdoor watering area for recently built existing homes on domestic permit-exempt wells by subbasin, if feasible.
2. Use an assumed crop type (e.g. pasture/turf grass) and rely on crop use estimates⁴ to estimate the amount of water that crop requires per year.
3. Multiply the crop irrigation requirement by the assumed outdoor watering area, as well as factors to account for both irrigation inefficiency and the amount of water that is unused and returns to the ground.

Committees may supplement or replace portions of the method with locally available data, however Committees need to estimate consumptive use using rigorous methods and assumptions based on realistic expectations. One example would be actual water use data for small- to medium-sized water systems within a county. Committees may use the data to either verify or modify the above estimates. However, one caution is that water system estimates may be low if users pay fees that include built in incentives to conserve water. Committees may also consider a scenario of one-half acre of outdoor watering area associated with every future domestic permit-exempt well.

In all instances, any significant variances from the above methods need to be well documented and justified.

Putting It All Together

Once the Committee has estimated the indoor and outdoor water use per home, they can estimate the annual subbasin- and basin-wide consumptive use:

[# projected new PE well uses] x [annual indoor consumptive water use + annual outdoor consumptive water use]

What is Needed from the Committee:

Here is a summary of the input needed from the Committee:

1. What assumptions should be used in determining indoor consumptive use?
 - The number of people per home: using OFM or other population data.

³ Based on the efficiency for a residential pop-up sprinkler system from the Water Resources Program Guidance 1210, "[Determining Irrigation Efficiency and Consumptive Use](#)".

⁴ Appendix A or B in the Washington Irrigation Guide (WAIG) (U.S. Department of Agriculture, 1997)

- The amount of water used per person: use 60 gallons per person per day or develop another assumption.
 - How much water is consumed versus returned to the aquifer via septic systems: a common assumption is 10% consumption, assuming most areas with wells also have septic systems.
2. What assumptions should be used in determining outdoor consumptive use?
- The size of the average outdoor watering area: determined by the consultant team based on a GIS analyses or develop another methodology.
 - The crop type for the outdoor watering: different crops will use different amounts of water. Grass/turf is a reasonable assumption.
 - The average crop irrigation requirements (CIR): derived by consultants per subbasin based on extrapolating the CIR data from available stations in the Washington Irrigation Guide for the appropriate crop type and rainfall patterns, and other factors.

Questions for Committee Discussion

- What questions do you have about the assumptions discussed above?
- What do you think are the pros and cons of each assumption?
- What available local information could help us to refine these assumptions?
- Are there particular areas in the watershed where soil types or geologic conditions might significantly impact indoor and outdoor consumptive use calculations (particular soil types that may affect septic system efficiencies or irrigation return flows, etc.)?
- What data source does the Committee prefer for estimates for number of people per home?