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Memorandum

To:	Stephanie Potts, Washington State Department of Ecology
From:	Bridget August, LG, LHG and John Monahan, FP-C
Date:	February 21, 2020
File:	0504-161-00
Subject:	WRIA 8 Subbasin Delineations – Final Draft

INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) is providing technical support to the Washington State Department of Ecology (Ecology) and the Watershed Restoration and Enhancement (WRE) Committees for Water Resource Inventory Areas (WRIAs) 7, 8 and 9. This memorandum provides a summary of the deliverable for Work Assignment GEO102, Task 2, WRIA 8 Subbasin Delineations.

BACKGROUND AND CONTEXT

The Streamflow Restoration Act (SRA, Chapter 90.94 Revised Code of Washington [RCW]) specifies that by June 30, 2021, Ecology must establish a WRE Committee and adopt a WRE Plan in the Cedar-Sammamish Watershed (WRIA 8). The Cedar-Sammamish (WRIA 8) Watershed Restoration and Enhancement Plan (Plan) must address impacts on streamflows from consumptive use from new domestic permit-exempt wells (PE wells[1]) anticipated between January 19, 2018 and January 18, 2038. Dividing the Cedar-Sammamish WRIA into subbasins is an essential step in developing a plan that complies with the law. RCW 90.94.030(3)(b) states "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." The *Final Guidance for Determining Net Ecological Benefit* (Final NEB Guidance) (GUID-2094; Ecology 2019) states that, "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."

WRIA 8 includes the Cedar River, Sammamish River, Lake Washington, Lake Sammamish and associated tributaries. It also includes streams draining directly to Puget Sound between the City of Mukilteo and the City of Seattle.

The WRIA 8 WRE Committee uses the term "subbasin" as defined in the Final NEB Guidance (Ecology 2019) and not based on the scientific definition. The Final NEB Guidance defines subbasins as: "A geographic subarea within a WRIA, equivalent to the words "same basin or tributary" as used in RCW 90.94.020(4)(b) and RCW

[1] "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.

90.94.030 (3)(b). In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g. watershed divides)." The methods used to delineate subbasins in WRIA 8 are summarized below.

SUBBASIN DELINEATION METHODS

GeoEngineers worked with the WRIA 8 – Cedar-Sammamish WRE Committee to delineate subbasins for WRIA 8. The WRIA 8 WRE Committee considered existing subwatershed units to develop their subbasin delineation, including hydrologic unit codes and King County drainage basins.

- Hydrologic unit codes (HUCs) refer to the U.S. Geological Survey (USGS) delineation of watersheds into successively smaller hydrologic units (USGS 2013). The USGS uses a nationwide system based on surface hydrologic features. This system divides the country into 21 regions (2-digit), 222 subregions (4-digit), 370 basins (6-digit), 2,270 subbasins (8-digit), ~20,000 watersheds (10-digit), and ~100,000 subwatersheds (12-digit). A hierarchical HUC consisting of 2 additional digits for each level in the hydrologic unit system is used to identify any hydrologic area. HUC-12 is at the subwatershed level (12-digit) of HUCs and there are over 15 HUC-12 subwatersheds in WRIA 8.
- King County drainage basins are a boundary layer developed by King County using LiDAR technology to delineate drainage basins. There are 38 King County drainage basins in the King County portion of WRIA 8.

Subbasin Selection Considerations

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 subbasin delineations. The WRIA 8 WRE Committee used existing HUC-12s and King County drainage basins and applied the following guiding principles to develop subbasin delineations:

- Combine HUC-12s and King County drainage basins in areas of the watershed that are urbanized and have existing water service and are therefore unlikely to have new homes using PE domestic wells.
- Keep distinct subbasins for HUC-12s and King County drainage basins with higher projected growth of new homes using PE domestic wells.

WRIA 8 Subbasin Delineation

The WRIA 8 subbasin boundaries are based on HUC-12 subwatersheds in the Snohomish County portion of the watershed and King County drainage basin boundaries in the King County portion of the watershed. GeoEngineers used existing HUC-12 shapefiles from the USGS (USGS 2016) and drainage basin shapefiles from King County (King County 2018) to develop a map and GIS shapefile for the WRE Committee's subbasins. The WRIA 8 subbasin delineations are shown on Figure 1.

WRIA 8 Subbasins

- **Seattle/Lake Union**: Middle Puget Sound - Seattle Lower, Elliot Bay, and Lake Union drainage basins are combined into one subbasin.
- **Puget Sound Shorelines**: The Pipers Creek, Middle Puget Sound – Seattle Upper, Boeing Creek, and Middle Puget Sound – Shoreline drainage basins (King County) are combined with the Shell Creek Frontal Puget Sound HUC-12 (Snohomish County) to form one subbasin.
- **Swamp/North**: Swamp Creek and North Creek HUC-12s (Snohomish County) are combined with the Swamp and North Creek drainage basins (King County) to form one subbasin.
- **Little Bear**: The Bear Creek - Sammamish River HUC-12 (Snohomish County portion only) is combined with the Little Bear Creek drainage basin (King County) to form one subbasin.
- **Sammamish River Valley**: The Sammamish River drainage basin is one subbasin.
- **Bear/Evans**: Bear Creek and Evans Creek drainage basins (King County) are combined with the Bear Creek HUC-12 (Snohomish County) to form one subbasin.
- **Greater Lake Washington**: East Lake Sammamish and Lake Washington Creeks are combined into one subbasin. This includes the following HUC-12 subwatersheds and drainage basins:
  - Lake Washington – Sammamish River HUC-12; and
  - East Lake Washington (ELW) Kenmore North, ELW Kenmore South, ELW Bellevue North, ELW Renton, Lyon Creek, McAleer Creek, Thornton Creek, West Lake Washington (WLW) Lake Forest Park, WLW Seattle North, WLW Seattle South, Juanita Creek, Juanita Bay, Forbes, Creek, Kelsey Creek, Mercer Slough, and Mercer Island drainage basins.
- **May/Coal**: Coal Creek and May Creek drainage basins are combined into one subbasin.
- **Lake Sammamish Creeks**: East Lake Sammamish, West Lake Sammamish and Tibbets Creek drainage basins are combined into one subbasin.
- **Issaquah:** Issaquah Creek drainage basin is one subbasin.
- **Lower Cedar**: Lower Cedar River drainage basin is one subbasin.
- **Upper Cedar**: Upper Cedar River drainage basin is one subbasin.

NEXT STEPS

- The WRIA 8 WRE Committee agreed to use 12 subbasins to estimate PE well growth and consumptive use by subbasin. The Committee can revisit the subbasin delineations later in the planning process, if needed.

REFERENCES

Department of Ecology (Ecology), 2019. Final Guidance for Determining Net Ecological Benefit, GUID-2094 Water Resources Program Guidance. Washington State, Department of Ecology, Publication 19-11-079, p. 131.

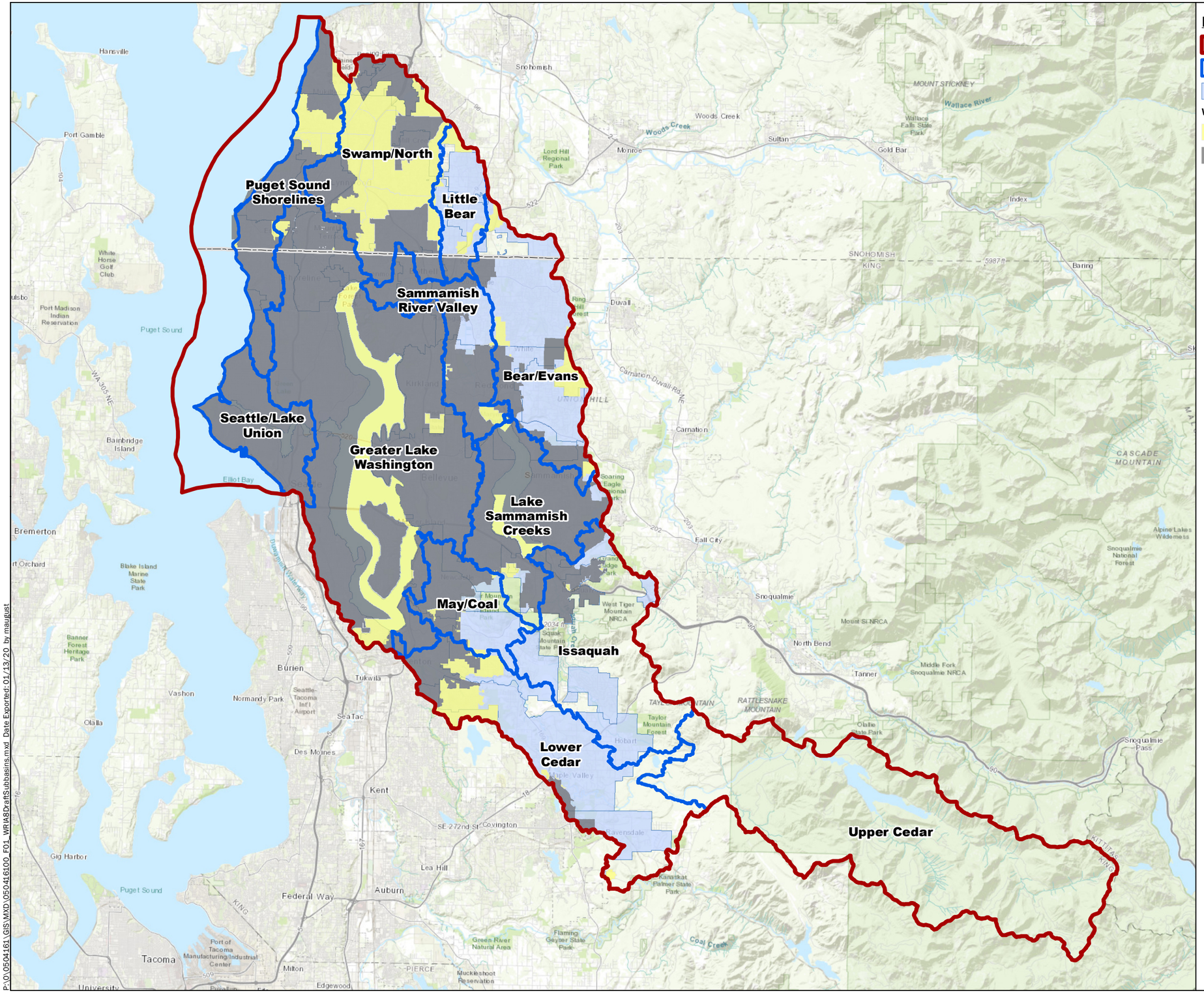
King County, 2018. GIS Open Data, *Basin boundaries derived from terrain data, King County only / topo basin kc area*. https://gis-kingcounty.opendata.arcgis.com/datasets/basin-boundaries-derived-from-terrain-data-king-county-only-topo-basin-kc-area, December 3, 2018.

U.S. Geological Survey (USGS) and U.S. Department of Agriculture, Natural Resources Conservation Service, 2013. Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD) (4 ed.). U.S. Geological Survey Techniques and Methods 11-A3, 63 p.

U.S. Geological Survey (USGS), 2016. USGS National Hydrography Dataset (NHD) Downloadable Data Collection - National Geospatial Data Asset (NGDA) National Hydrography Dataset (NHD): USGS - National Geospatial Technical Operations Center (NGTOC): Rolla, MO and Denver, CO. http://nhd.usgs.gov, http://viewer.nationalmap.gov/.

BA:JTM

Attachment:
Figure 1. WRIA 8 Subbasin Delineations



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI Topographic Map Base

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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WRIA 8 Subbasin Delineations

Watershed Restoration and Enhancement Plan
King and Snohomish Counties, Washington

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Figure 1

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