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SECTION 5 PROJECT EFFECTS

How will project construction affect water resources?

Surface Water Flow

Peak and base flow rates to streams and rivers will not be negatively altered during project construction because detention ponds will be constructed prior to the highway widening. These ponds may be used for temporary erosion and sedimentation control.

Surface Water Quality

WSDOT does not anticipate measurable effects to surface water quality because WSDOT will apply temporary erosion and sediment control measures during construction. Work crews will clear, grade, and prepare the site for new pavement. Construction activities expose bare soil that is easily eroded by rainfall and surface water runoff, which can create short-term effects to surface water quality. These effects include silt-laden, turbid water that may clog the gills of fish and bury aquatic insects. Standard construction BMPs are used to minimize erosion and sediment movement so that erosion from construction sites does not contribute solids and pollutants to nearby receiving waters. BMPs are required on all WSDOT roadway construction projects including the Tukwila to Renton Project and will be described in more detail in the Temporary Erosion and Sediment Control (TESC) Plan that WSDOT will write prior to beginning construction.

The BMPs used to protect water resources for this project will provide either sediment control or erosion control or a combination of both. Sediment control BMPs physically trap runoff until most contaminants settle out or are filtered through the underlying soils. The basic mechanisms for pollutant removal are gravity settling, infiltration of soluble nutrients through soil or filters, or biological and chemical processes. Erosion control BMPs are source control practices such as maintaining vegetated buffers and limiting actual construction to dry periods when possible. Erosion and sediment control BMPs prevent loose soil from reaching local waterbodies and keeps effects at a minimal level.

The existing highway (baseline conditions) has some permanent flow control and runoff treatment BMPs already in place. These BMPs include ponds, biofiltration swales, ecology embankments, filter strips, and a combined stormwater quality wetland and detention facility. During construction of the new roadway and new BMPs, some old BMPs (mostly ecology embankments) will be removed so that they can be replaced. WSDOT will use construction BMPs to maintain water quality during construction periods when permanent BMPs may not be functional.

Construction can also create the potential for unexpected spills of hazardous materials used during the construction process. Construction work typically uses hazardous or toxic materials such as fuel, oil, paint, and other potentially toxic liquids, which may be temporarily stored on site. These materials present the greatest risk near open waterbodies where streams and rivers pass under the highway. Where work will take place over open water, such as at the Green and Cedar Rivers, spills of concrete are a concern because concrete can raise the pH of waterbodies and potentially harm aquatic life. To prevent unexpected spills of hazardous materials to waterbodies, a Spill Prevention, Control, and Countermeasures (SPCC) Plan will be prepared before construction starts. Along with the TESC Plan, the measures provided will prevent substantial effects on water quality during construction.

Floodplains

During construction, temporary piles and falsework could be placed in the Green River, Springbrook Creek, Panther Creek, Rolling Hills Creek, and Cedar River floodplains. These structures provide work platforms and support the new roadway structures and, or, the roadway embankments, as they are built. Depending upon the length of time for construction, the bridge, some of the temporary piles, and falsework may need to remain in place through the winter, which is a concern related to higher stream flows, flood volumes, and the potential for localized scour and erosion.

What is Falsework?

Falsework is the temporary structure erected to support work during the process of construction.

Groundwater

The study area contains wellhead protection areas and a sole-source aquifer. Potential groundwater effects, including contamination and reduced well capacity will be avoided

during construction by implementing the mitigation measures described in Section 6.

How will project operation affect water resources?

Surface Water Flow

Concrete and asphalt pavement typically have higher stormwater runoff volumes and peak runoff rates than most other land covers because these surfaces are highly impervious. Surface waters are negatively affected by these changes unless they are classified in the HRM as major water bodies. Stormwater discharges to these major water bodies are exempt from flow controls. Both the Green and Cedar Rivers are classified as major waterbodies in this study area. Direct discharge will occur only to the Cedar River and will occur at existing outfall locations.

Infiltration within the study area would not be an effective method of flow control because the majority of the project is on river-valley bottom that has shallow groundwater. To minimize the negative effects of high stormwater volumes and peak runoff rates, this project will use detention ponds as the preferred flow control BMP. The Tukwila to Renton Project will also use vaults where the right-of way is limited.

WSDOT will construct stormwater facilities based on the HRM to provide treatment and detention. WSDOT is also planning to retrofit approximately 68 acres of existing impervious surfaces. The Renton Nickel Improvement Project retrofitted approximately 2 percent of currently untreated pavement. The Tukwila to Renton Improvement Project will add to this an additional 30 percent retrofit of the existing untreated pavement for a total of 32 percent retrofit since the beginning of the I-405 improvements in this area. Peak flow rates of stormwater discharged to streams and rivers are expected to be reduced from present day conditions because of this retrofit.

The size and distribution of these flow control facilities was determined by looking at the threshold discharge areas (TDAs). This project will add approximately 58 acres of new impervious surface area to the TDAs. The TDAs for the project include 481 acres and are shown in Exhibit 5-1.

How does runoff from a forest area compare with a highway?

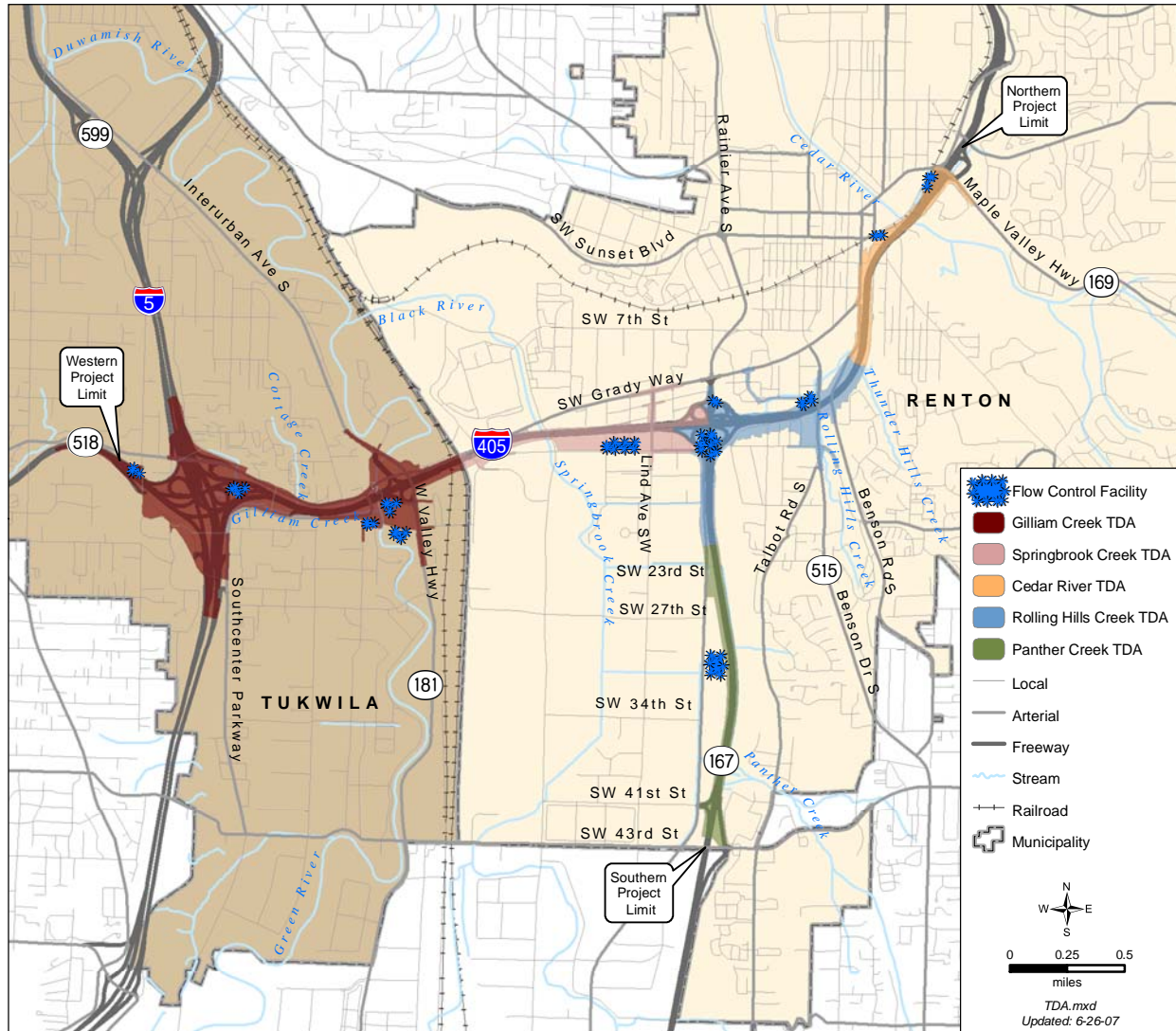
For a forested area in King County, approximately 55 percent of the rain that falls each year eventually appears as water in a stream. The remainder of the rainwater either percolates into the soil or is evaporated back into the atmosphere.

However, for a highly impervious area, approximately 85 to 90 percent of annual rainfall eventually appears as water in a stream, and the remaining water replenishes either the groundwater or the atmosphere. Source: King County Surface Water Design Manual 2005.

What is a Threshold Discharge Area (TDA)?

TDAs are areas of the project that drain to a single natural discharge location or multiple discharge locations that combine within one quarter-mile downstream. The Tukwila to Renton Project has five TDAs: one in the Green River Basin, three in the Springbrook Creek Basin, and one in the Cedar River Basin.

Exhibit 5-1: Threshold Discharge Areas (TDAs) and Proposed Flow Control Facilities



Flow controls in the Springbrook Creek basin will detain enough runoff from new impervious surfaces to match baseline conditions. Two options have been evaluated for the Springbrook Creek basin: 1) conventional flow control and treatment using the HRM procedures; and 2) implementation of the Panther Creek Watershed Rehabilitation Plan, which proposes a direct discharge of treated stormwater into the Panther Creek wetland complex east of SR 167. The second option will be implemented only if permits can be obtained.

Depending on the stormwater option selected for the Springbrook Basin, the conceptual design has avoided using water quality BMPs that have standing water, such as stormwater treatment wetlands. This conceptual design complies with FAA requirements to avoid using stormwater

facilities that have permanent areas of open water within 10,000 feet of the Renton Municipal Airport. If the Panther Creek Watershed Rehabilitation Plan is implemented, two ponds in the SR 167 interchange would be omitted and an open vault would be smaller within 10,000 feet of the airport.

The Cedar River is listed as a major waterbody in the HRM and is flow control exempt. For this reason, no flow control facilities are proposed for the Cedar River basin.

Surface Water Quality

Highway runoff contains several pollutants of concern: nutrients such as nitrogen and phosphorous, which generally bond to dirt particles; heavy metals such as copper and zinc; and petroleum hydrocarbons. These contaminants accumulate on the road surface and are eventually washed away by rainfall.

The total area of impervious surfaces in the study area after project completion will be approximately 301 acres. After construction of the Tukwila to Renton Project approximately 154 acres of impervious surfaces will receive enhanced water quality treatment of the runoff, which is more than twice the amount of impervious area added by the project. The enhanced water quality treatment will be provided using ecology embankments, biofiltration swales, and ponds in accordance with the WSDOT HRM. These types of BMPs are described in Section 4, Baseline Conditions.

Exhibit 5-2 shows pollutant removal efficiencies for the two BMP water quality facilities that will be used on this project.

Exhibit 5-2: Pollutant Removal Efficiencies for BMP Water Quality Facilities

Facility Type	Percent Pollutant Removal				Notes
	Suspended Solids	Total Phosphorus	Total Nitrogen	Trace Metals	
Ecology ^a Embankments	88-94	59-89	n/a	84-96 (zinc)	
Stormwater Treatment Wetlands ^b	80-100	60-80	40-60	60-80	Efficiency depends on residence time

n/a – not available

a – source: WSDOT conditional use designation memorandum, 2003.

b – source: WSDOT Environmental Procedures Manual, 2004.

What is meant by pollutant loading?

Pollutant loading is a term used to refer to the amount of a pollutant that enters a waterbody in a specified amount of time. Estimates of pollutant loads are usually given in pounds per year.

Pollutant loading for both the Build and No Build Alternatives are shown in Exhibits 5-3, 5-4, and 5-5 for the Green River, Springbrook Creek, and Cedar River basins, respectively. See Appendix C for the calculations used to generate pollutant loads. The numbers for the Build Alternative assume that the new impervious area will be addressed using BMPs described in this report and designed to specifications in the HRM. For the No Build Alternative, the numbers show pollutant loading assuming that no new impervious area would be added.

Exhibit 5-3: Pollutant Loadings for Build and No Build Alternatives in lbs/year for the Green River Basin

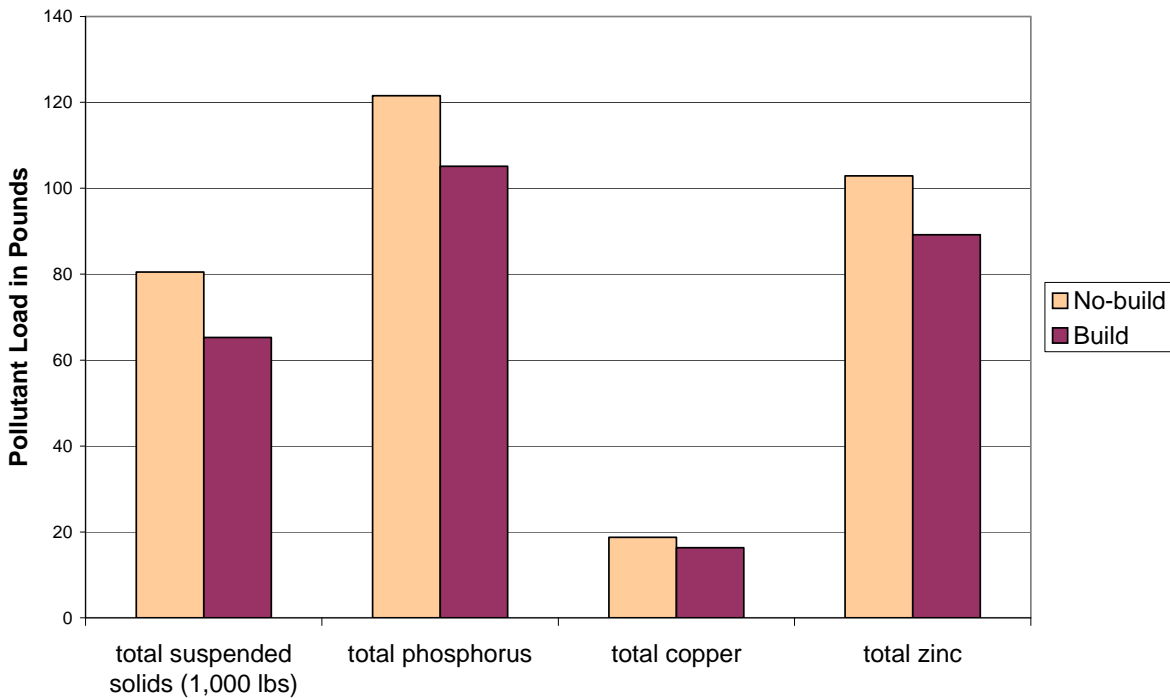


Exhibit 5-4: Pollutant Loadings for Build and No Build Alternatives in lbs/year for Springbrook Creek Basin

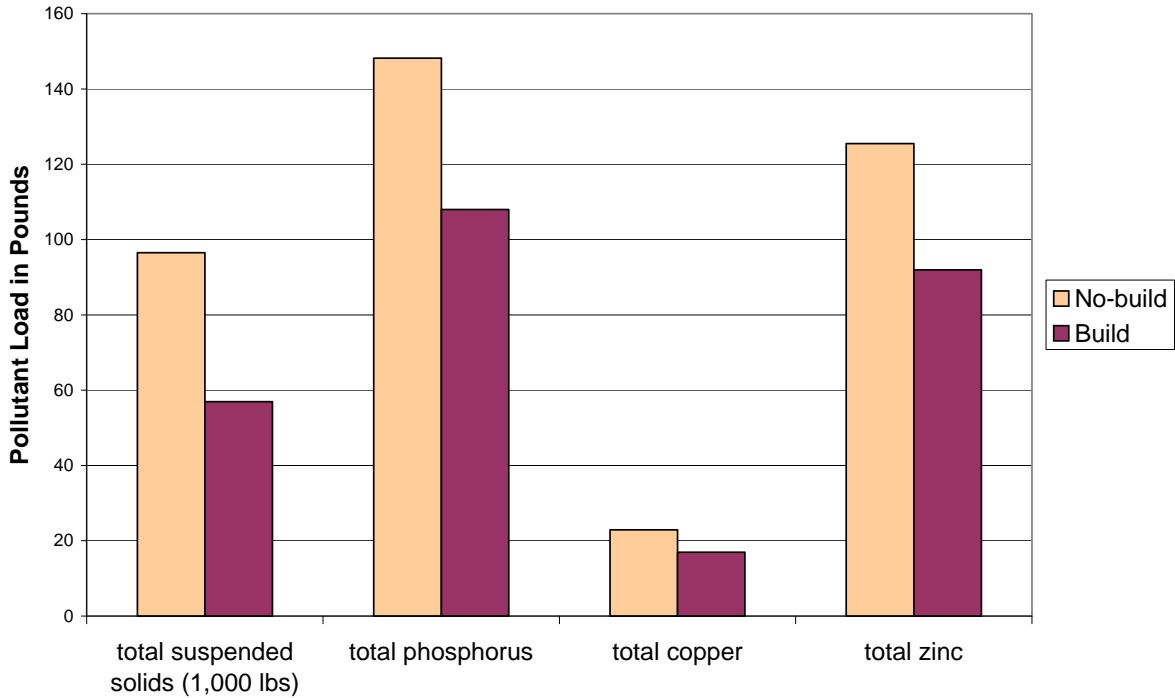
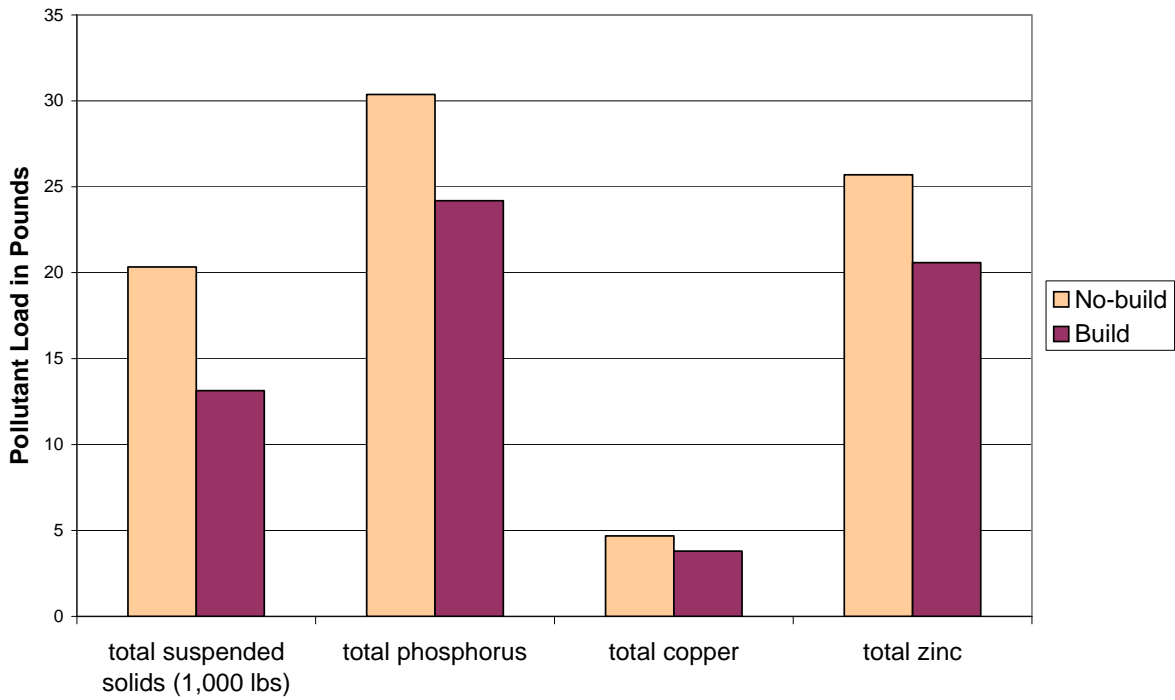


Exhibit 5-5: Pollutant Loadings for Build and No Build Alternatives in lbs/year for the Cedar River Basin



The Build Alternative has lower pollutant loads than the No Build Alternative. This indicates that the project will improve the baseline surface water quality conditions in the study area.

As shown in exhibits 5-3, 5-4, and 5-5, the total pollutant loads to the Green River, the Springbrook Creek, and the Cedar River basins will be lower under the Build Alternative than under the No Build Alternative. This is because stormwater treatment facilities planned for the Build Alternative also cover areas of the highway system that are not currently treated.

This project is not expected to negatively affect the water quality parameters of the three waterbodies included on Ecology's 303(d) List in the study area:

- The Green River is 303(d) listed for dissolved oxygen, fecal coliform bacteria, and temperature.
- Springbrook Creek is 303(d) listed for dissolved oxygen and fecal coliform bacteria.
- The Cedar River is 303(d) listed downstream of the project area, but only for fecal coliform bacteria and temperature.

Temperature and dissolved oxygen in local waterbodies are seasonal concerns and can be influenced by lakes and open-water ponds.²³ Open-water ponds such as detention ponds allow runoff to be exposed to the sun and warm up a few degrees. However, the ponds for this project are small relative to the flow of the rivers to which they will discharge and they will not have wetpools. The ponds from this project will be dry during the summer when river temperatures are highest and dissolved oxygen is lowest.

Fecal coliform bacteria are typically not considered a significant concern in runoff from highways and so it is not expected that this project will affect the existing fecal coliform issue in any of these waterbodies.

Zinc is a constituent on the 303(d) list that is a primary concern for highway runoff. Zinc can be efficiently removed from highway runoff using ecology embankments or other "enhanced" BMPs. Pollutant loading for the Build and No Build Alternatives is shown using the bar graphs in Exhibits 5-3 to 5-5. The bar graphs indicate that the total input

²³ *Derek B. Booth. 2002.*

of zinc to these three impaired waterbodies will be reduced by about 52 pounds per year.

Floodplains

Building new roadway and associated embankments, new piers for bridges, direct-connector ramps, and off-ramps in the Green River, Springbrook Creek, Rolling Hills Creek, Panther Creek, and Cedar River floodplains will add approximately 33,110 cubic yards of fill. A break down of floodplain fill for each basin is shown in Exhibit 5-6. Mitigation for this floodplain fill is discussed in Section 6 of this report.

Exhibit 5-6: Floodplain Fill Volumes for Each Basin

Floodplain	Volumes (cubic yards)	
	Fill	Excavation
Green River	3,300	490
Springbrook Creek	19,300	0
Panther Creek	10,200	0
Rolling Hills Creek	300	330
Cedar River	10	10
Total	33,110	830

Groundwater

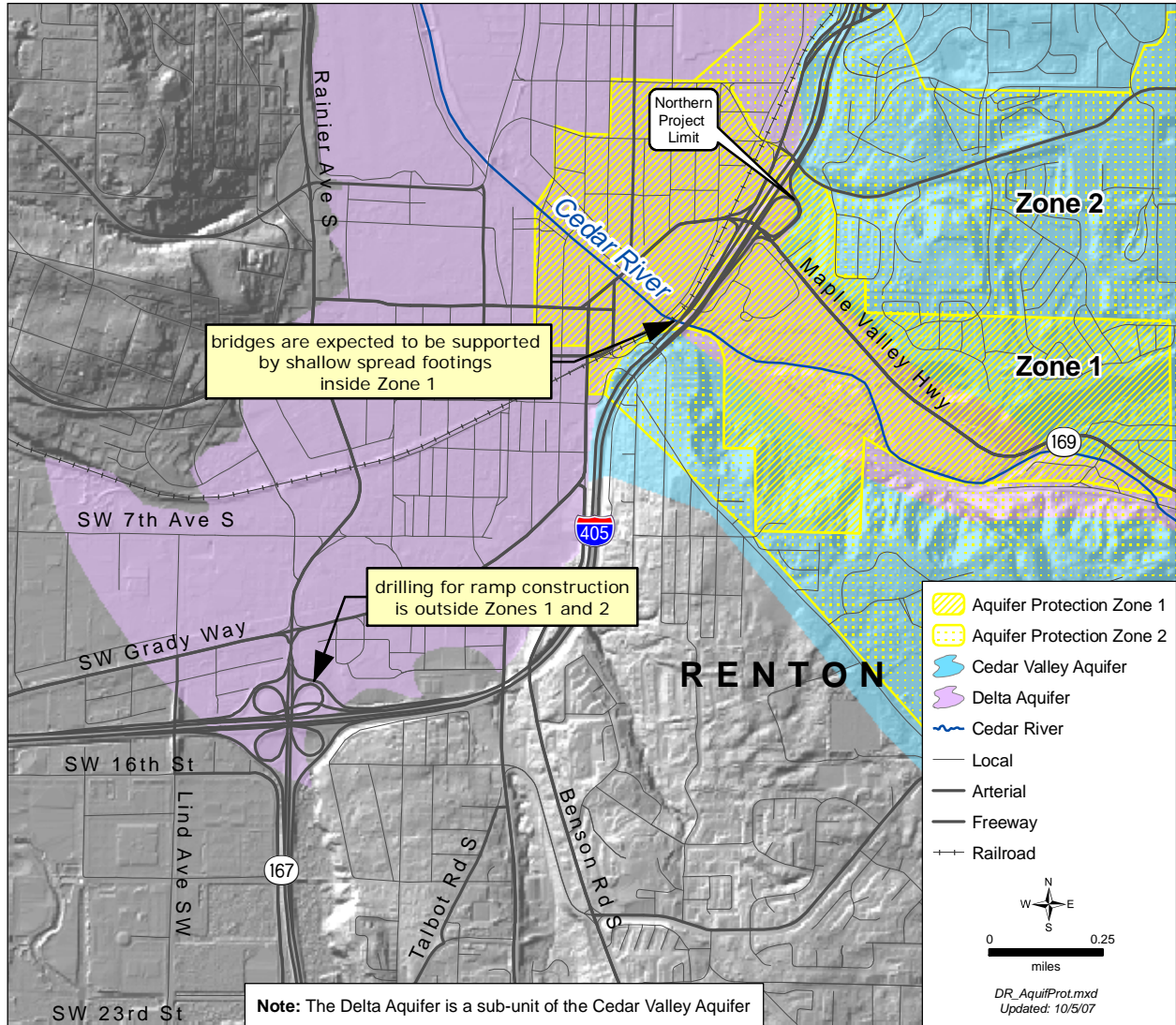
In general, operation of the project is not expected to have any adverse permanent effects related to groundwater. One issue, the increase in impervious surfaces, will not substantially affect the total amount of recharge to the shallow alluvial aquifers in the vicinity of the project, since the majority of recharge to these aquifers is derived from much larger, upgradient drainage areas that are outside the highway corridor. For example, the water yield of the Cedar Valley Aquifer is estimated at 9,000 gallons per minute (gpm).²⁴ This compares to the potential loss of water recharge of about 70 to 80 gpm for the entire study area due to adding approximately 58 acres of impervious pavement.

Detention ponds in the study area are shallow and will not reach below shallow groundwater levels. Except within the sole-source aquifer protection zones, most ponds will not be lined, so some inadvertent infiltration may occur at those facilities (see Exhibit 5-7). Given the high groundwater,

²⁴ *City of Renton, 1999*

infiltration is considered to be negligible as a factor for the flow control design, but groundwater recharge will likely occur at each of the pond locations. Direct discharge to the Cedar River will be to existing outfall locations.

Exhibit 5-7: Boundaries of the Cedar Valley Aquifer in the Vicinity of the Study Area and Aquifer Protection Zones 1 and 2.



Potential groundwater contamination effects will be avoided during operation through implementation of the special mitigation measures as defined in Section 6.

Does the project have other effects on water resources that may be delayed or distant from the study area?

Indirect effects are defined in the WSDOT Environmental Procedures Manual as the “effect caused by the proposed action that is later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.”

Indirect effects typically associated with road projects are changes in land use that happen because accessibility to local areas becomes improved. If urbanization increases because of a road project, this can affect stormwater drainage and local stream flow. The Renton and Tukwila areas are already very highly urbanized and so we do not expect that this project will significantly alter land use in the study area. Therefore, no indirect effects to surface waters, water quality, floodplains, or groundwater are expected because of this project.

Were potential cumulative effects for water resources considered?

Cumulative effects for surface water and water quality are evaluated in a separate Cumulative Effects Analysis Technical Memorandum. That report also discusses cumulative effects for this project in the areas of Air Quality, Aquatic Resources (fisheries and aquatic habitat), and Wetlands. Cumulative effects for other disciplines were determined to be unnecessary for this project.

What effects will occur under the No Build Alternative?

Effects of construction on the study area will not occur under the No Build Alternative. A beneficial aspect of the project is the retrofitting of existing impervious surfaces with proposed stormwater flow control and treatment facilities. As previously mentioned, retrofit will occur on about 32 percent of highway impervious surfaces that existed prior to the construction of the Renton Nickel Improvement Project and Tukwila to Renton Improvement Project. Under the No Build Alternative, these benefits would not be realized.