CHAPTER 5.6 Water Resources

The Tukwila to Renton Project will add 58 acres of new impervious surface to the area. Stormwater facilities built for the project will treat approximately 154 acres of impervious surface thereby expanding treatment to areas of the highway that currently have no treatment.

WSDOT will need to add fill to some floodplains to build this project. To compensate for this fill, an equal amount of material will be removed from the same floodplains at the same elevation.

This project is not expected to negatively affect the Cedar Valley Aquifer because of the proposed construction techniques and mitigation measures. The Cedar Valley Aquifer provides drinking water for the City of Renton.

The Green River in Tukwila

Water resources are essential to maintaining human health, fish and wildlife habitat, and vegetation. These resources can be affected by roadway projects because increased impervious surfaces can lead to changes in water movement, degrade the surface waters that drain to streams and thereby affect natural habitats. These changes can also influence flooding effects and groundwater recharge.

Please refer to the Tukwila to Renton Project Water Resources Discipline Report in Appendix S for a complete discussion of the Water Resources analysis.

How did WSDOT evaluate water resources for this project?

The I-405 Team used the methods described in WSDOT's Environmental Procedures Manual (EPM) to evaluate the project's effects on surface water, water quality, floodplains, and groundwater during construction and operation. The manual provides guidance that WSDOT follows to ensure that its projects comply with local, state, and federal laws and regulations. We elaborate on the evaluation methods in the following sections.

Surface Water

To determine operational effects, the I-405 Team compared baseline conditions with the proposed project drainage designs to determine the new impervious pavement

What is MGSFlood?

MGSFlood is a model used in hydrologic analyses. The program is a general, continuous, rainfall-runoff computer model developed specifically for stormwater facility design in the lowlands of Western Washington. The program meets the requirements for the 2001 Washington State Department of Ecology Stormwater Management Manual for Western Washington.

What are best management practices?

Best management practices, referred to commonly as BMPs, are methods used to minimize or avoid construction effects to water quality such as sediment getting into streams. Examples of BMPs include installing filter fabric fence downstream of all exposed slopes, around existing drainage inlets, and along river, stream, and drainage channels near work areas to prevent sediment-laden stormwater from entering streams.

distribution and the affected streams and rivers. The WSDOT Highway Runoff Manual (HRM) requires the use of MGSFlood to calculate runoff from impervious pavement. These runoff values are used by the I-405 Team to verify the number and size of ponds needed to protect receiving waters.

Water Quality

The I-405 Team used Method 1 in WSDOT's EPM to calculate pollutant load estimates that the project will generate during operation. Method 1 is known as the WSDOT Data-FHWA method. This method estimates pollutant loads based on highway runoff data collected in western Washington since 2001. These data provide an estimate of pollutant concentrations flowing from both treated and untreated highway surfaces because they are recent and specific to WSDOT highways.

Floodplains

The I-405 Team compared baseline conditions with the proposed project to determine where construction will require fill or bridge piers to be placed in the floodplain. The I-405 Team used the floodplain elevation maps prepared by the Federal Emergency Management Agency to determine floodplain locations.

To evaluate whether the floodplain will be affected by the project, the I-405 Team compared how much material is being placed in the floodplain and how much material is being removed. If, for the same floodplain at the same elevation, more material is being removed than being placed as fill, then the project will not negatively affect floodplain storage capacity.

Groundwater

The I-405 Team reviewed the proposed project design and likely construction methods to evaluate the project's potential effects. Evaluations were based primarily on sound engineering principles, WSDOT practices, and professional judgment. Part of WSDOT's practice is to use the 2005 Geotechnical Design Manual, which contains many WSDOT design and construction practices that minimize impacts to groundwater.

What water resources are found in the study area?

Surface Water

The study area primarily includes surface waterbodies in the Green River watershed (Water Resource Inventory Area [WRIA] 9). The study area also includes surface waterbodies in the Cedar River watershed (WRIA 8). The surface waterbodies in the study area are Cottage Creek, Gilliam Creek, an unnamed tributary to Gilliam Creek, the Green River, Springbrook Creek, Panther Creek, Rolling Hills Creek, an unnamed tributary to Rolling Hills Creek, Thunder Hills Creek, an unnamed tributary to Thunder Hills Creek, and the Cedar River as shown in Exhibit 5-28.

In general, the surface waterbodies in the study area have been highly altered from their natural states to accommodate residential, commercial, and industrial land uses. This alteration has included bank hardening, such as installing riprap and placing streams in concrete channels and pipes; reducing or removing streamside vegetation; straightening stream channels; and removing in-stream habitat. The installation of levees has also reduced the historic floodplains associated with many of these waterbodies.

Water Quality

The Washington State Department of Ecology (Ecology) prepares a 303(d) list that identifies waterbodies that do not meet the state water quality standards and the reasons why. According to the most recently approved 303(d) list, published in 2004, three waterbodies within the study area do not meet the state water quality standards:

- Green River for fecal coliform bacteria, dissolved oxygen, and temperature
- Springbrook Creek for dissolved oxygen and fecal coliform bacteria
- Cedar River for fecal coliform bacteria and temperature downstream of the study area

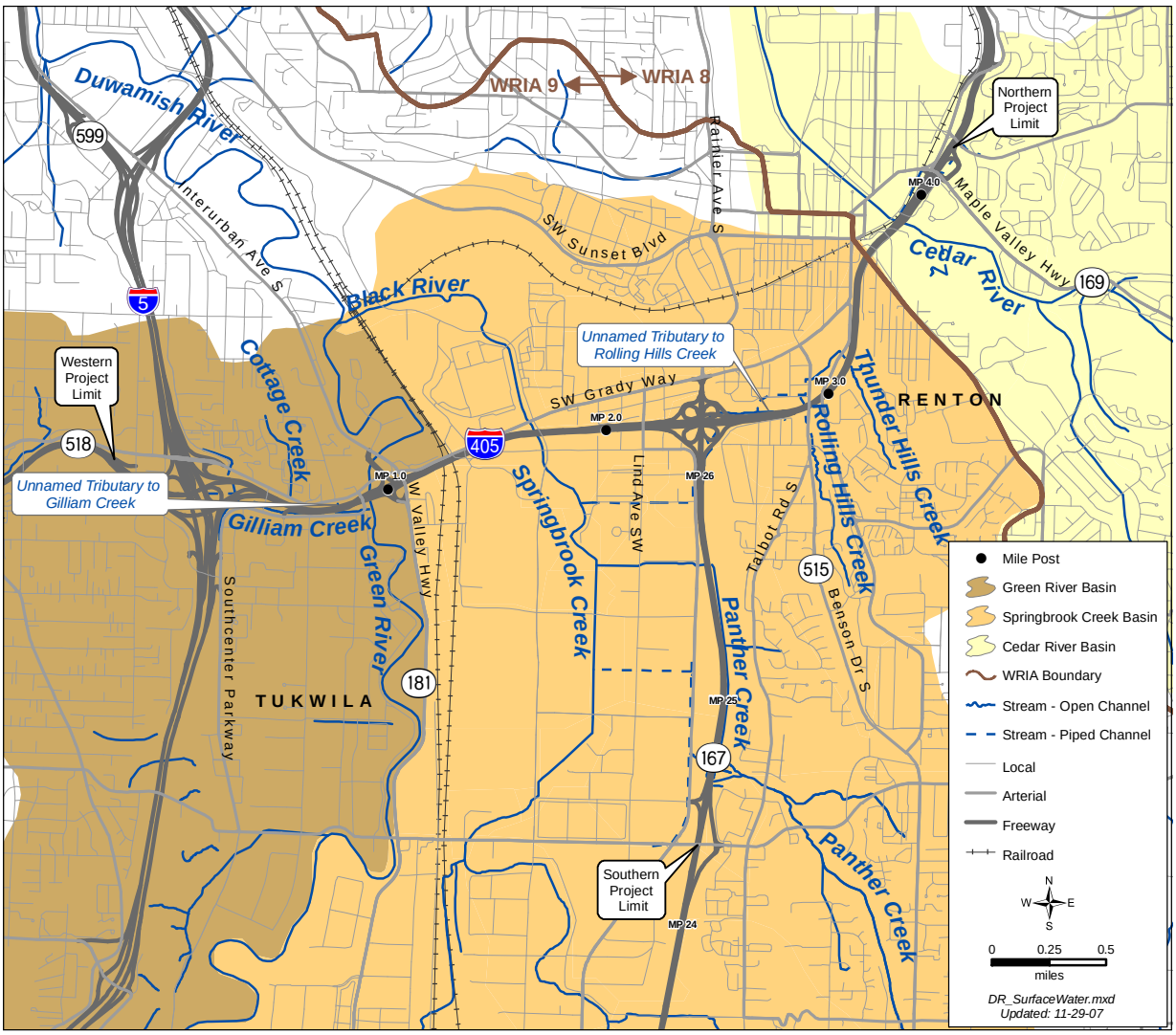
What is the Ecology 303(d) List?

The federal Clean Water Act (CWA), adopted in 1972, requires states to restore their waters to be "fishable and swimmable." The Clean Water Act established a process to identify and clean up polluted waters. Every two years, all states are required to prepare a list of waterbodies that do not meet water quality standards. This list is called the 303(d) list because the process is described in Section 303(d) of the Clean Water Act.

Ecology has prepared a preliminary assessment of water quality in Washington. The assessed waters are listed in categories that describe the status of water quality. For those waters that are in the polluted category, beneficial uses—such as drinking, recreation, aquatic habitat, and industrial use—are impaired by pollution.

At the time research was conducted for the Tukwila to Renton Project, the 2006 list was not yet available.

Exhibit 5-28: Water Resources in the Study Area



What is a total maximum daily load (TMDL)?

A TMDL is part of the water clean up plan for each waterbody on Ecology's 303(d) list. It is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet State water quality standards. Percentages of the TMDL are allocated to the various pollutant sources.

Some historic pollutant sources to rivers in the study area have already been eliminated. In 1987, the outfall of King County's South Wastewater Treatment Plant was moved from the Green River to Puget Sound. Prior to moving the outfall, the treatment plant was a major source of pollution in the Green River causing increased temperature, low dissolved oxygen, and ammonia toxicity.[7] In 1992, the EPA approved a total maximum daily load (TMDL) issued by Ecology. The Green River TMDL does not allow discharge of ammonia-nitrogen into the river.

[7] *King County 2000*

No other TMDLs have been developed for the waterbodies in the study area at this time. However, as stated in the 2004 303(d) list, Ecology anticipates preparing TMDLs for both the Cedar River and Springbrook Creek in the future. The 2006 303(d) list is expected to be finalized in 2008.

Currently, King County is undertaking a major study called the Green-Duwamish Watershed Water Quality Assessment. Its goal is to develop tools to analyze current and future water quality issues, to assist with salmon recovery planning, to guide stormwater management decisions, and to provide guidance for Ecology's TMDL program.

What are Sole-Source Aquifers?

Sole Source Aquifers are EPA-designated aquifers where few or no reasonable alternatives exist for acquiring drinking water.

Floodplains

The floodplain elevation maps for the study area show floodplains associated with the Green River, Springbrook Creek, Panther Creek, Rolling Hills Creek, and the Cedar River. Exhibit 5-29 shows these floodplains.

Groundwater

The study area has two main aquifers: the Green-Duwamish Alluvial Aquifer and the Cedar Valley Aquifer, which is a sole-source aquifer.

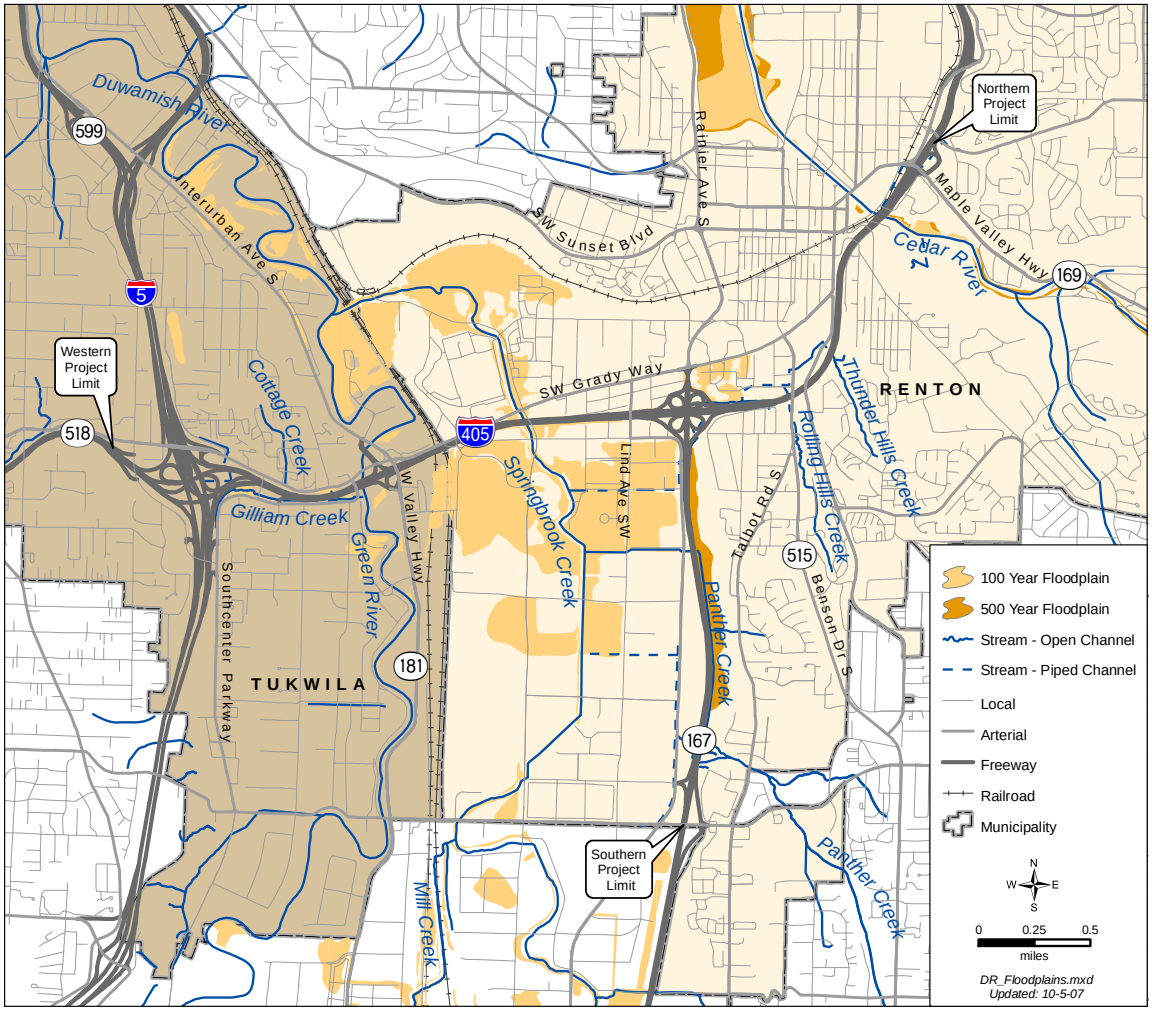
Groundwater flow in the Green-Duwamish Alluvial Aquifer is complex. Wetlands and drainage ditches locally influence groundwater flow patterns. The primary discharge is to the Green River, but some groundwater may also discharge to the Delta Aquifer subunit of the Cedar Valley Aquifer (described below) and Lake Washington. Direct infiltration from precipitation recharges the Green-Duwamish Alluvial Aquifer, but recharge can also occur from higher elevation areas within the Green-Duwamish River drainage, and from overland flow from the bordering valley hills. No groundwater supply wells are receiving water from this aquifer within 0.5 miles of the study area.[8]

What is an unconfined aquifer?

An unconfined aquifer is usually a relatively shallow aquifer that can be recharged directly by downward seepage. An unconfined aquifer is called this because the aquifer is not overlain by a thick, low permeability layer, such as a thick deposit of clay.

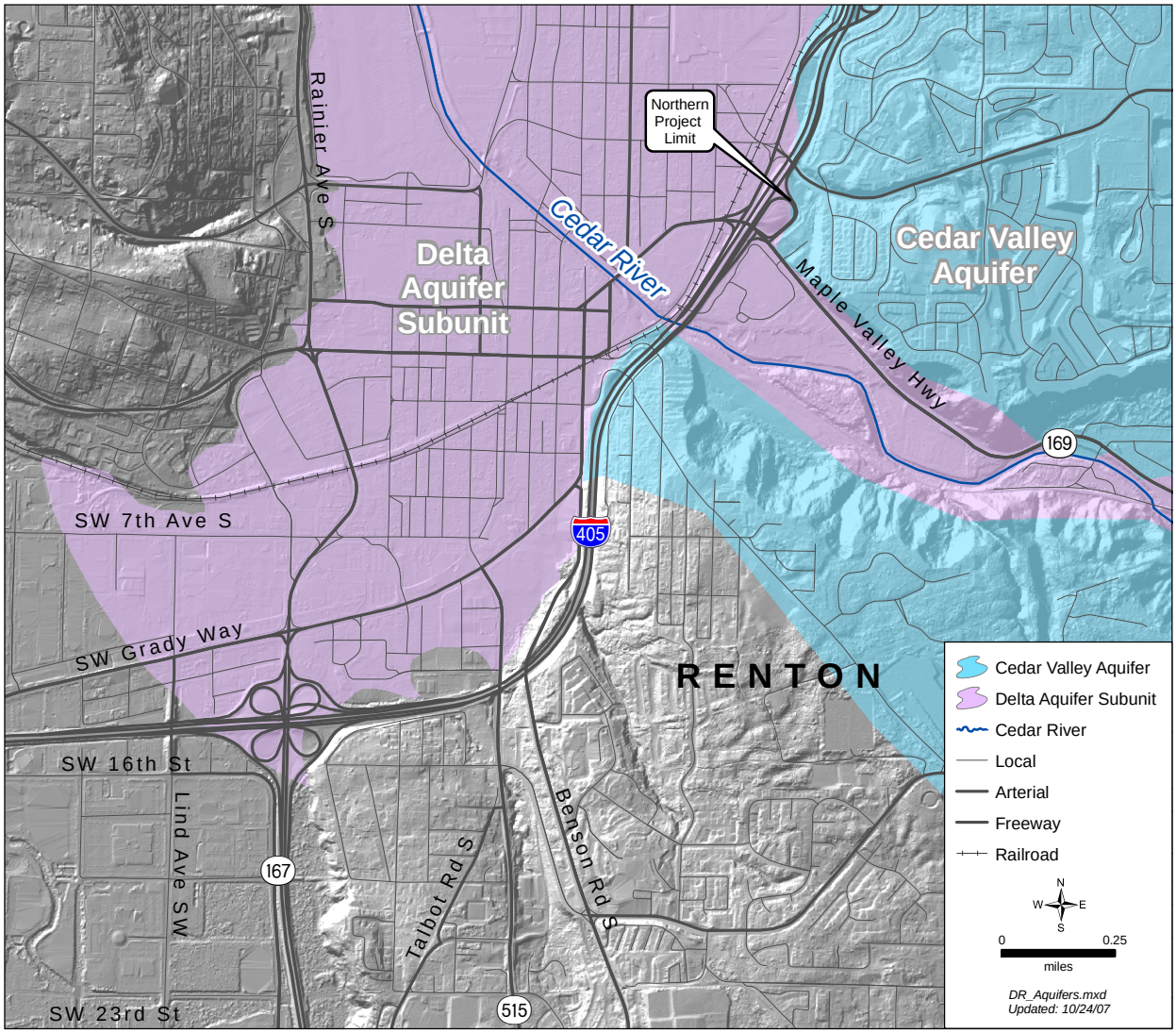
[8] *King County 2005.*

Exhibit 5-29: Floodplains in the Study Area



The Cedar Valley Aquifer is the most important aquifer in the study area as it is an EPA-designated "Sole-Source Aquifer." This aquifer has been subdivided into several smaller aquifer units. The Delta Aquifer is a subunit of the Cedar Valley Aquifer and is located along the lower drainage of the Cedar River. This aquifer is the closest to the project. The Delta Aquifer is unconfined and composed of alluvial sediments deposited by the lower Cedar River. The boundaries of the Delta Aquifer are shown in Exhibit 5-30. The City of Renton uses the Delta Aquifer as the primary source for its drinking water.

Exhibit 5-30: The Delta Aquifer, a Part of the Cedar Valley Aquifer



How will construction activities affect water resources?

Surface Water

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 sediment control. Measures to avoid or minimize effects are described in Section 6.

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. Constructing this new pavement area will 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.

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.

Measures to avoid or minimize effects to water quality during construction are described in Section 6.

Floodplains

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

During construction, temporary fill, piles, or 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 as they are built. Depending upon the length of time for construction, some of the temporary fill, piles, or falsework may need to remain in place through the winter, when the risk of flooding is at its highest.

Groundwater

The study area contains a sole source aquifer with wellhead protection areas. Potential groundwater effects during construction of the Tukwila to Renton Project include contamination and reduced well capacity. Implementation of the SPCC Plan and the TESC protocols and adherence to the Washington Administrative Code and the Renton Municipal Code are expected to avoid these potential construction effects to aquifers.

How will the completed project affect water resources?

Surface Water

Pavement typically has higher stormwater runoff volumes and peak runoff rates than most other land covers because these surfaces are highly impervious. Surface waters can be negatively affected by these changes unless they are classified in the HRM as a major receiving waterbody. Stormwater discharges to these major waterbodies are exempt from flow control. Both the Green and Cedar Rivers are classified as major waterbodies in this study area. Direct discharge of stormwater will occur only to the Cedar River and will occur at existing outfall locations.

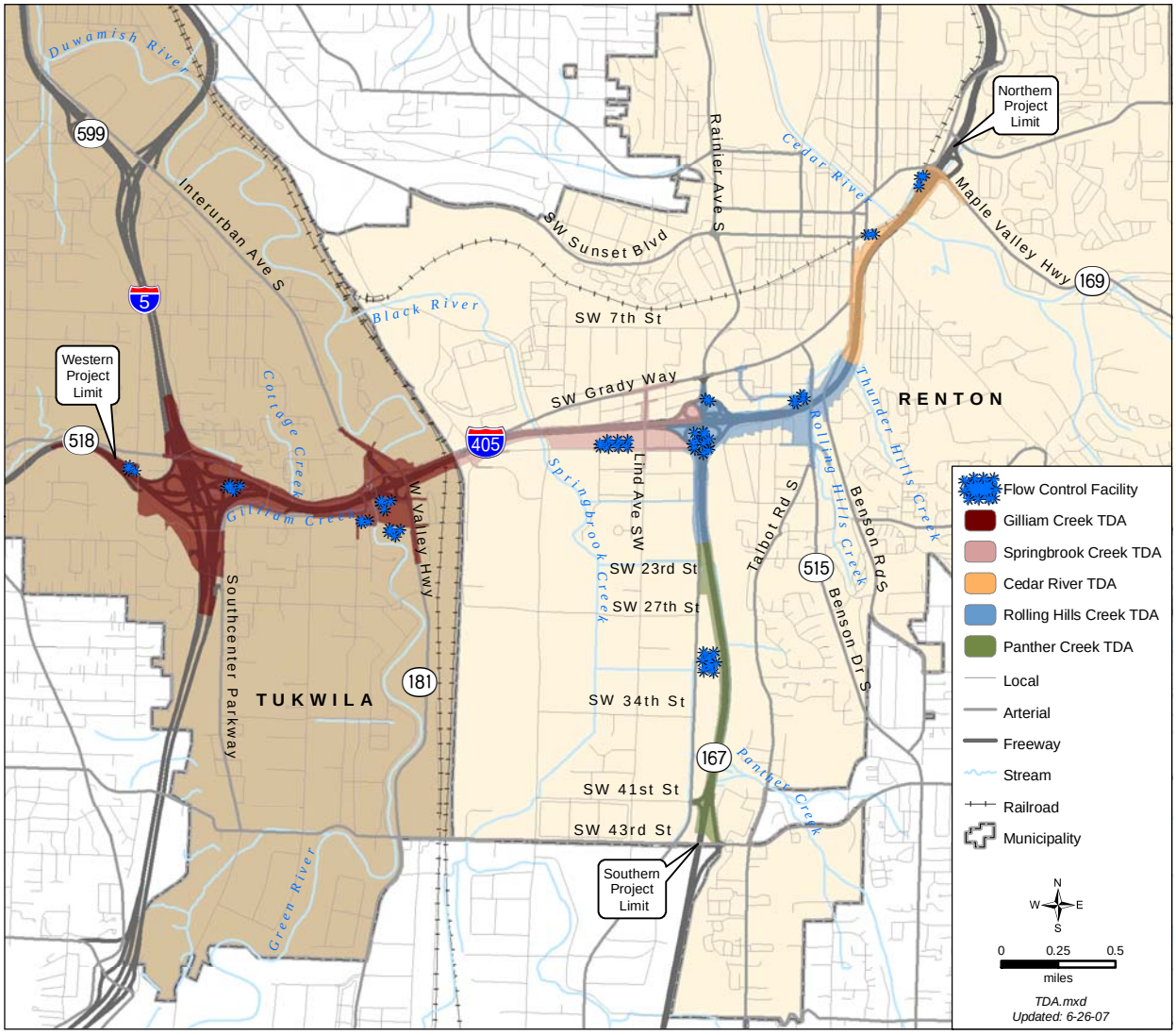
Infiltration within the study area would not be an effective method of flow control because the majority of the project is on river-valley bottom that has shallow groundwater. Detention ponds are the preferred flow control BMP for this project to minimize the negative effects of high stormwater volumes and peak runoff rates. The Tukwila to Renton Project will also use stormwater vaults where the right-of-way is limited. Exhibit 5-31 shows the proposed location for these flow control facilities along with the drainage areas (known as threshold discharge areas or TDAs).

What is infiltration?

The passage of water through the soil surface into the subsoil. Infiltration is one way drainage flows are controlled. If soil has a good infiltration rate, then infiltration is often integrated as part of the surface water management approach.

Peak flow rates of stormwater discharged to streams and rivers will be reduced from present day conditions because about 68 acres of existing pavement will be retrofitted for flow control and water quality treatment. The Renton Nickel Improvement Project retrofitted about 2 percent of the existing untreated pavement. The Tukwila to Renton Project will retrofit an additional 30 percent of the existing untreated pavement. Together the projects retrofit a total of 32 percent of untreated pavement since the beginning of the highway improvements in this area.

Exhibit 5-31: Flow Control Facilities Proposed for the Tukwila to Renton Project



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.

This project will add approximately 58 acres of new impervious surface. The total area of impervious surface in the study area after project completion will be approximately 301 acres. The Tukwila to Renton Project will provide enhanced water quality treatment of the runoff from approximately 154 acres, which is well over twice the amount

of impervious area added by the project. This level of water quality treatment is anticipated to be provided using ecology embankments and biofiltration swales and will be in accordance with the WSDOT HRM.

Because this project will not only treat the pavement area it is adding but will also treat areas that are currently untreated, we expect water quality from the study area to improve over baseline conditions.

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 and excavation for each subbasin (drainage area) is shown in Exhibit 5-32.

Exhibit 5-32: Floodplain Fill Volumes for each Subbasin

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

The project is not expected to have 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).[9] This compares to the potential loss of water

[9] *City of Renton, 1999*

recharge of about 70 to 80 gpm for the entire study area due to adding approximately 58 acres of impervious pavement.

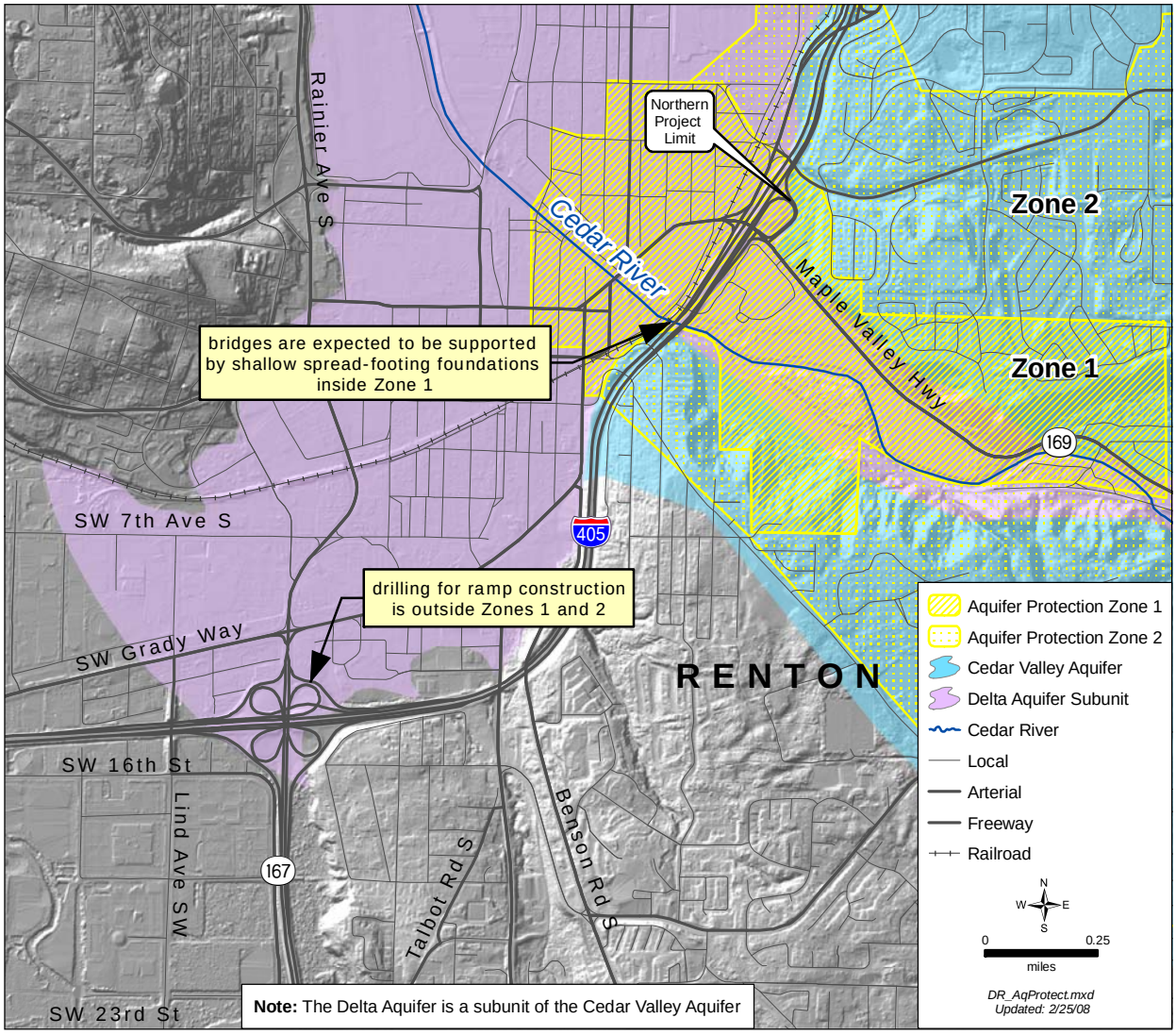
Detention ponds in the study area are shallow and will not reach below shallow groundwater levels. Except within the sole-source aquifer protection zones, most of these ponds will not be lined, so some infiltration may occur at those facilities.

Construction is not expected to affect the Cedar Valley Aquifer in Aquifer Protection Zone 1 or Zone 2. New piers for the bridges over the Cedar River are expected to have shallow spread-footing foundations that will not penetrate the aquifer. Thus this project should have no effects on the aquifer. Several piers for the direct-connector ramps in the SR 167 interchange will penetrate the edge of the Cedar Valley Aquifer. However, these piers are outside of the protection zones and are not expected to affect the water quality of the aquifer (Exhibit 5-33).

What would happen to water resources if WSDOT did not build this project?

Effects of construction on the study area will not occur under the No Build Alternative. A beneficial aspect of the Tukwila to Renton Project is the retrofitting of existing impervious surfaces with proposed stormwater flow control and treatment facilities. As previously mentioned, retrofit will occur on about 30 percent of existing impervious surfaces under the Build Alternative. With the No Build Alternative, these benefits would not be realized.

Exhibit 5-33: The Aquifer Protection Zones for the Delta Aquifer



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