WSDOT

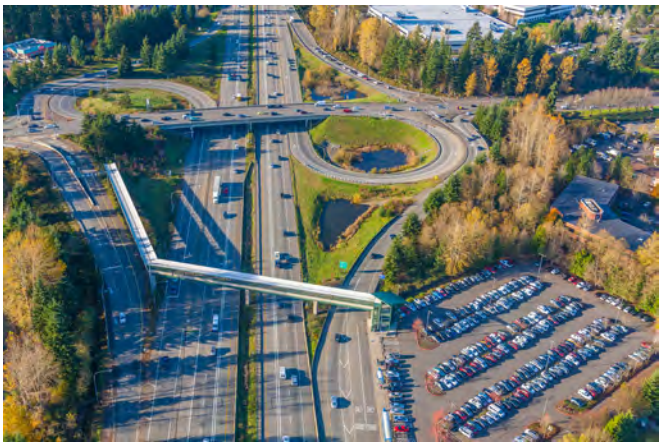
U. S. Department of Transportation
Federal Highway Administration

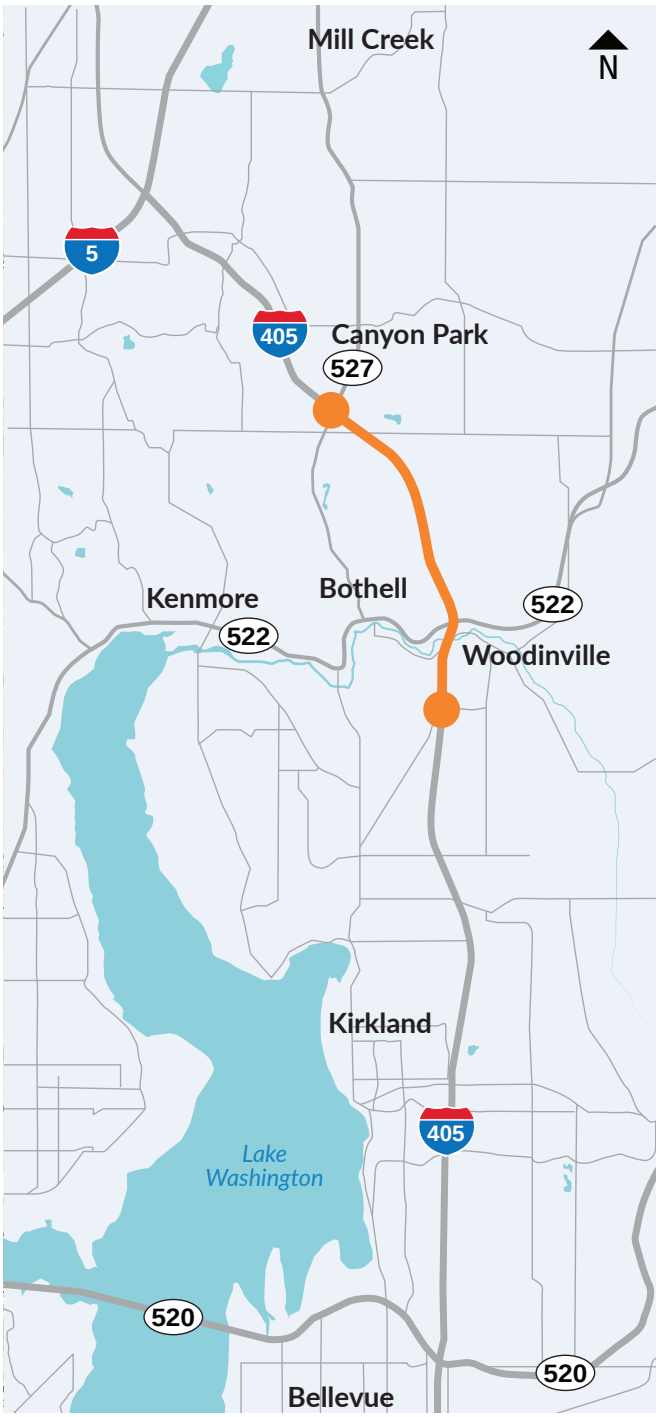
MAY 2020

ENVIRONMENTAL ASSESSMENT

Appendix J: Water Resources Discipline Report

I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project (MP 21.79 to 27.06)





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ATTACHMENTS

SECTION 1 SUMMARY

The *Water Resources Discipline Report* was prepared in support of the I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project (Project) Environmental Assessment (EA). This report evaluates the environmental effects of proposed improvements on Interstate 405 (I-405) from milepost (MP) 21.79 to MP 27.06 in support of the EA.

1.1 Purpose of the Report

To evaluate the Project's effects on water resources during construction and operation, the Interstate 405 (I-405) team used the methods described in Washington State Department of Transportation's (WSDOT) *Environmental Manual* (WSDOT 2019e). The manual provides guidance that WSDOT follows to ensure that its projects comply with local, state, and federal laws and regulations pertaining to water resources. For this Project, water resources include surface water (flow and water quality) floodplains, groundwater, and aquifers.

1.2 Existing Conditions Overview

The study area includes water resources from Water Resource Inventory Area (WRIA) 8 – Lake Washington/Cedar/Sammamish Watershed. Surface waterbodies in the study area that are affected by this Project include Stream KL14, Stream 42, Sammamish River, Par Creek, unnamed tributary (UNT) to Par Creek, Stream 25.0L, Stream 66, Stream 70, North Fork of Perry Creek, Queensborough Creek, and North Creek. Other waterbodies from the WRIA within the study area would not be affected by the Project and therefore will not be analyzed in this document.

According to the *Water Quality Atlas* (Ecology 2019a), the following waterbodies that would be affected by the Project do not currently meet state standards for the elements listed:

- Sammamish River – temperature, dissolved oxygen, bacteria.
- North Creek – dissolved oxygen, bioassessment, temperature.
- Queensborough Creek – dissolved oxygen, temperature.

Although these waterbodies currently do not meet state standards, Total Maximum Daily Loads have been developed only for North Creek: fecal coliform (King and Snohomish County) and dissolved oxygen (King County downstream of project).

Existing floodplains in the study area that are affected by this Project are associated with the Sammamish River, North Creek, and Par Creek.

1.3 Operational Effects Overview

1.3.1 No Build Alternative

With the No Build Alternative, conditions would not be improved from current conditions. The water quality and quantity retrofit proposed as a part of the Project would not be implemented,

and those benefits would not be realized. Correcting identified fish barriers would likely be delayed along with any anticipated hydrologic and habitat benefits.

1.3.2 Build Alternative

Surface Water

The Project would benefit water resources in the study area by detaining and treating more stormwater runoff.

There would be no substantial adverse effects on surface water flows from the Project. The Project would provide additional stormwater detention, which limits peak flows and velocities and helps to control flooding. Peak and base flow rates to streams and rivers and Lake Washington will be addressed in accordance with the guidelines set forth by the *Highway Runoff Manual* (HRM) (WSDOT 2019a).

There would be no substantial adverse effects on surface water quality from the Project. The Project would provide enhanced treatment for about 24 acres, which is equivalent to 100 percent of the new pollution generating impervious surfaces (PGIS) created by the Project. In addition, the Project would provide enhanced treatment for about 23 acres of existing untreated PGIS. Proposed stormwater facilities would decrease overall pollutant loading compared to existing conditions or the No Build Alternative.

Floodplains

The Project proposes very minor changes to floodplains. WSDOT and local design criteria mandate a zero rise in floodplain water surface elevations, so floodplain effects are not expected.

Groundwater and Aquifers

There would be no substantial adverse effects on groundwater from the Project. The study area does not contain wellhead protection areas or a sole-source aquifer, so the Project would not affect groundwater by contamination or reduced well capacity.

1.4 Construction Effects Overview

During construction, work crews would clear, grade, and prepare construction areas for new pavement. Constructing this new pavement would expose bare soil, which is then easily eroded by rainfall and surface water runoff. This soil erosion can create short-term effects on surface water quality. However, because the Project would follow standard BMPs for erosion control, these effects would be minimal if they occur.

Project construction would not negatively affect any of the identified floodplains in the study area because each affected area is anticipated to have sufficient capacity to convey flows without increasing flooding risks. Detention provided by the existing flow control facilities and temporary erosion and sediment controls would help prevent downstream flooding, erosion, and sedimentation during construction.

Because the study area does not contain wellhead protection areas or a sole source aquifer, there would be no groundwater effects, including contamination and/or reduced well capacity, due to construction activities.

SECTION 2 PROJECT DESCRIPTION

2.1 Proposed Project Elements

The Project begins on I-405 south of the I-405/SR 522 interchange at milepost (MP) 21.79 and continues to just north of the I-405/SR 527 interchange to MP 27.06. Exhibit 2-1 lists improvements proposed with the Project. Exhibit 2-2, Sheets 1 through 5, show the locations of the proposed improvements.

Exhibit 2-1. Improvements Proposed with the I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project

Project Element	Proposed Improvements
I-405 lanes and shoulders from SR 522 to SR 527	– Create a dual ETL system from MP 21.79 (south of the I-405/SR 522 interchange) to MP 27.06 (just north of the I-405/SR 527 interchange). • From MP 21.79 to MP 22.30: Restripe existing lanes to create a dual ETL system. • From MP 22.30 to MP 26.30: Resurface and widen I-405 to add one ETL in each direction. • From MP 26.30 to MP 27.06: Widen I-405 to construct direct access ramps and connect to the existing single ETL starting near MP 26.30.
I-405 tolling from SR 522 to SR 527	– Construct new tolling gantries to collect tolls for the ETLs and direct access ramps.
I-405/SR 522 interchange area	– Construct new direct access ramps and two inline transit stations in the I-405 median (one in each direction). Transit stations would include station platforms, signage, artwork, lighting, fare machines, and site furnishing such as shelters, lean rails, benches, bollards, bicycle parking, and trash receptacles. – Construct a bus station and turnaround loop, pick-up and drop-off facilities, and new nonmotorized connection near the SR 522 interchange. Funding and construction timeline to be coordinated with local transit agencies. – Construct new northbound bridge through the SR 522 interchange. • Reconfigure the northbound I-405 to eastbound SR 522 ramp from one lane to two lanes. – Reconfigure I-405 on- and off-ramps. • Realign the southbound I-405 to westbound SR 522 ramp. • Realign the eastbound and westbound SR 522 ramps to northbound I-405.
SR 522 roadway	– Add three signalized intersections, which would change where the freeway portion of SR 522 begins and ends. Signals would be added at the following locations: • The northbound I-405 to westbound SR 522 off-ramp and the eastbound SR 522 to northbound I-405 on-ramp. • The southbound I-405 to eastbound SR 522 ramp. • Between the above two locations where the new I-405 ETL direct access ramps connect with SR 522.
228th Street SE	– Widen the northbound I-405 bridge over 228th Street SE.

Exhibit 2-1. Improvements Proposed with the I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project

Project Element	Proposed Improvements
SR 527 interchange area	– Construct new direct access ramps to the north, south and east just south of SR 527 at 17th Avenue SE. – Construct two inline transit stations in the I-405 median (one in each direction). Transit stations would include station platforms, signage, artwork, lighting, fare machines, and site furnishing such as shelters, lean rails, benches, bollards, bicycle parking, and trash receptacles. – Reconstruct the pedestrian bridge over I-405.
17th Avenue SE, 220th Street SE, SR 527	– Reconfigure 17th Avenue SE and portions of 220th Street SE and SR 527 to include a roundabout at the Canyon Park Park and Ride, bicycle and pedestrian improvements, and improvements at the SR 527 and 17th Avenue SE intersections with 220th Street SE.
Fish barrier corrections	– Replace five fish barriers with restored stream connections at the following streams: • Par Creek (WDFWID 993083) • Stream 25.0L (WDFWID 993104) • North Fork of Perry Creek (WDFW ID 08.0070 A0.25) • Two fish barriers at Queensborough Creek (WDFWID 993084 and 993109)
Sammamish River bridges	– Remove the existing northbound I-405 to eastbound SR 522 bridge over the Sammamish River, including two bridge piers within the OHWM. – Remove the existing northbound I-405 to westbound SR 522 bridge over the Sammamish River, including two bridge piers within the OHWM. – Build a new bridge for northbound I-405 traffic over the Sammamish River. – Build a new bridge over the Sammamish River for the new direct access ramp at SR 522. – Build a new bridge over the Sammamish River for the northbound I-405 to SR 522 ramp.
Noise and retaining walls	– Construct 3 new noise walls near NE 160th Street and SR 527. See Exhibit 2-2, Sheets 1, 4 and 5. – Construct several new retaining walls. See Exhibit 2-2, Sheets 1 through 5.
Stormwater management	– Provide enhanced treatment for an area equivalent to 100 percent of new PGIS (approximately 24 acres). – Retrofit about 23 acres of existing untreated PGIS and continue to treat stormwater from the approximately 44 acres of PGIS that currently receives treatment. – Construct three new stormwater outfalls, one on the Sammamish River and two on the North Fork of Perry Creek.
Construction duration	– Construction is expected to last 3 to 4 years, beginning in 2021.

ETL = express toll lane; ID = identification number; MP = milepost; OHWM = ordinary high water mark; PGIS = pollution-generating impervious surfaces; WDFW = Washington Department of Fish and Wildlife

Exhibit 2-2. I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project, Sheet 1 of 5

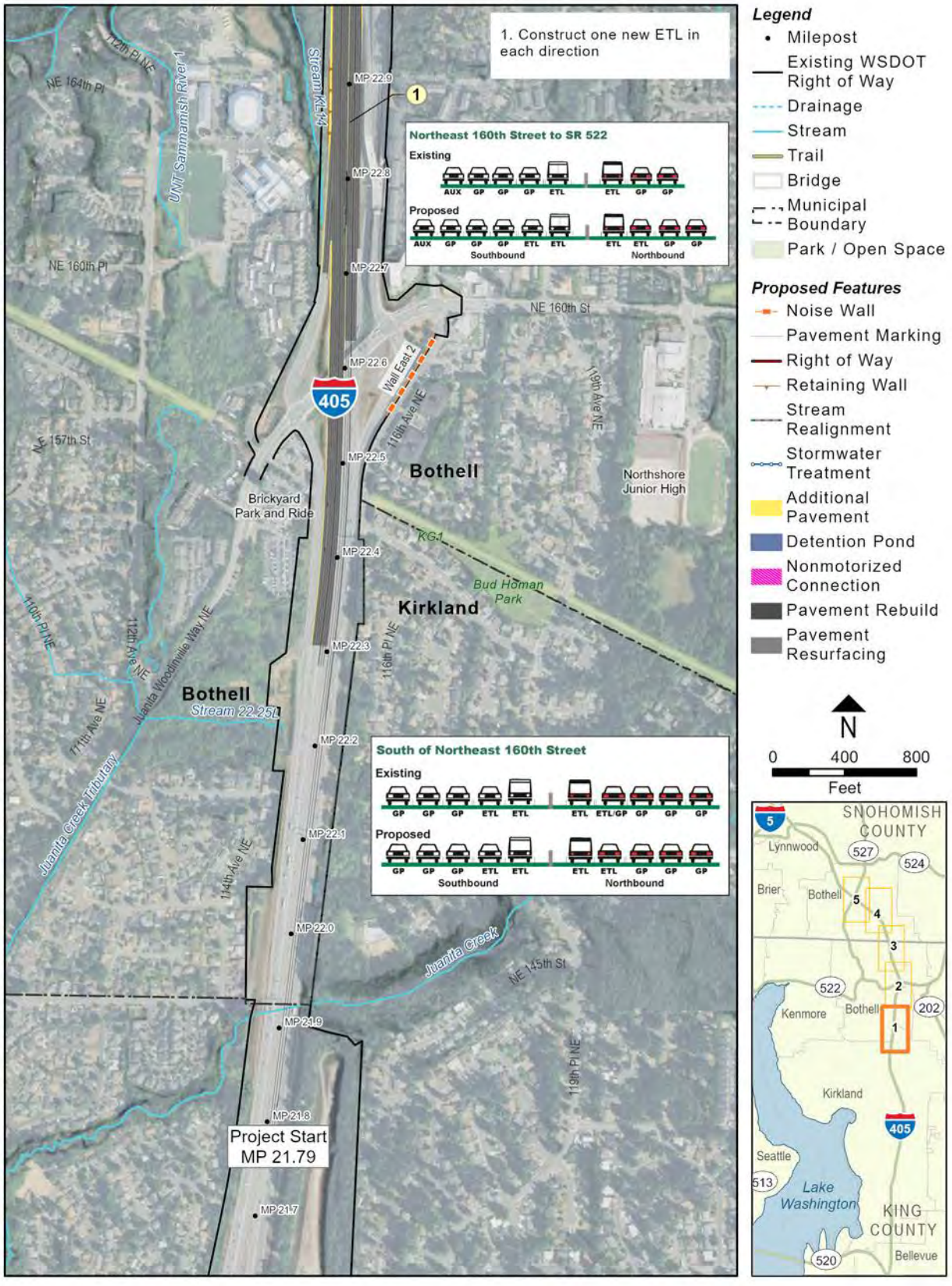


Exhibit 2-2. I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project, Sheet 2 of 5

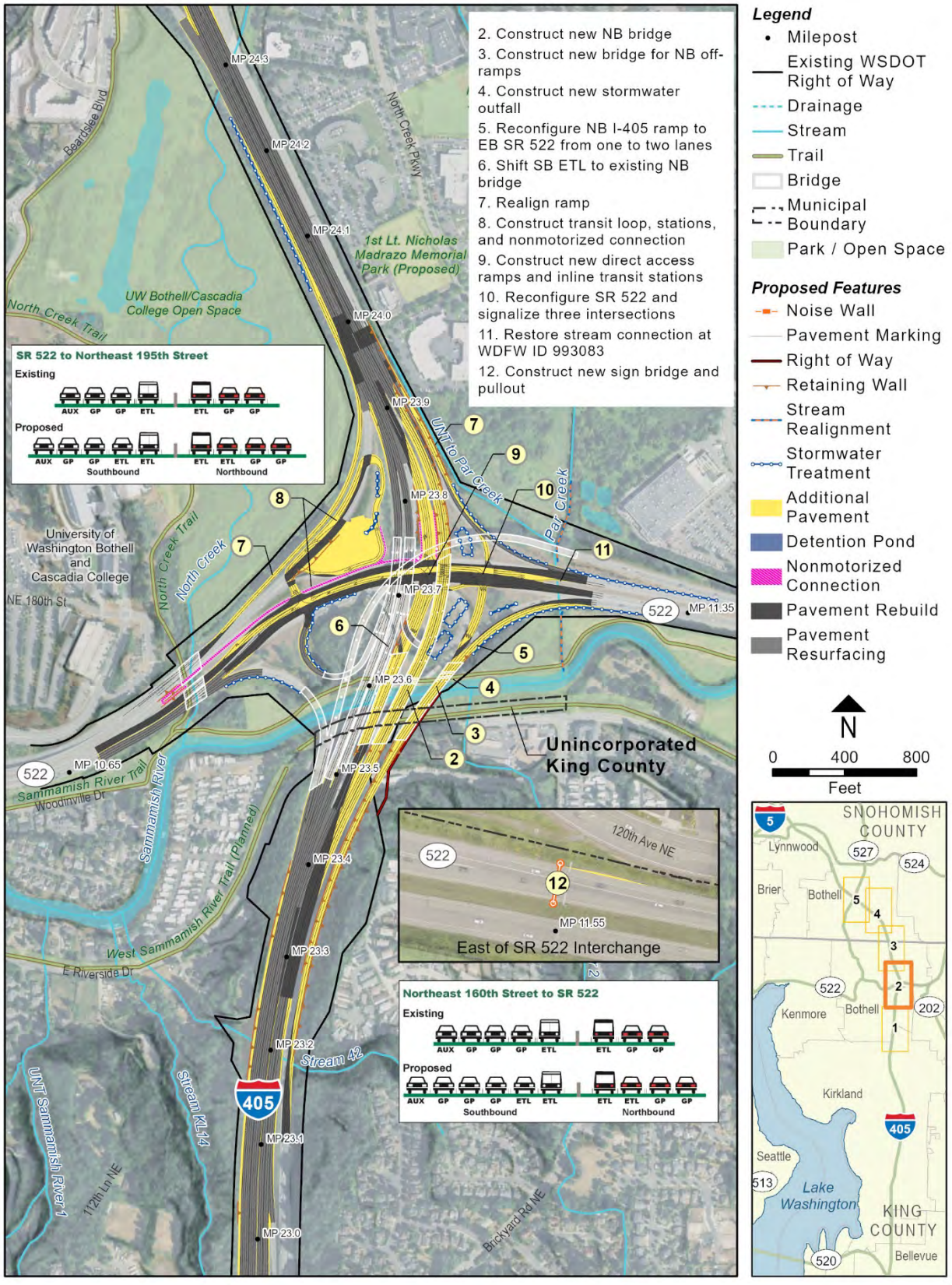


Exhibit 2-2. I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project, Sheet 3 of 5

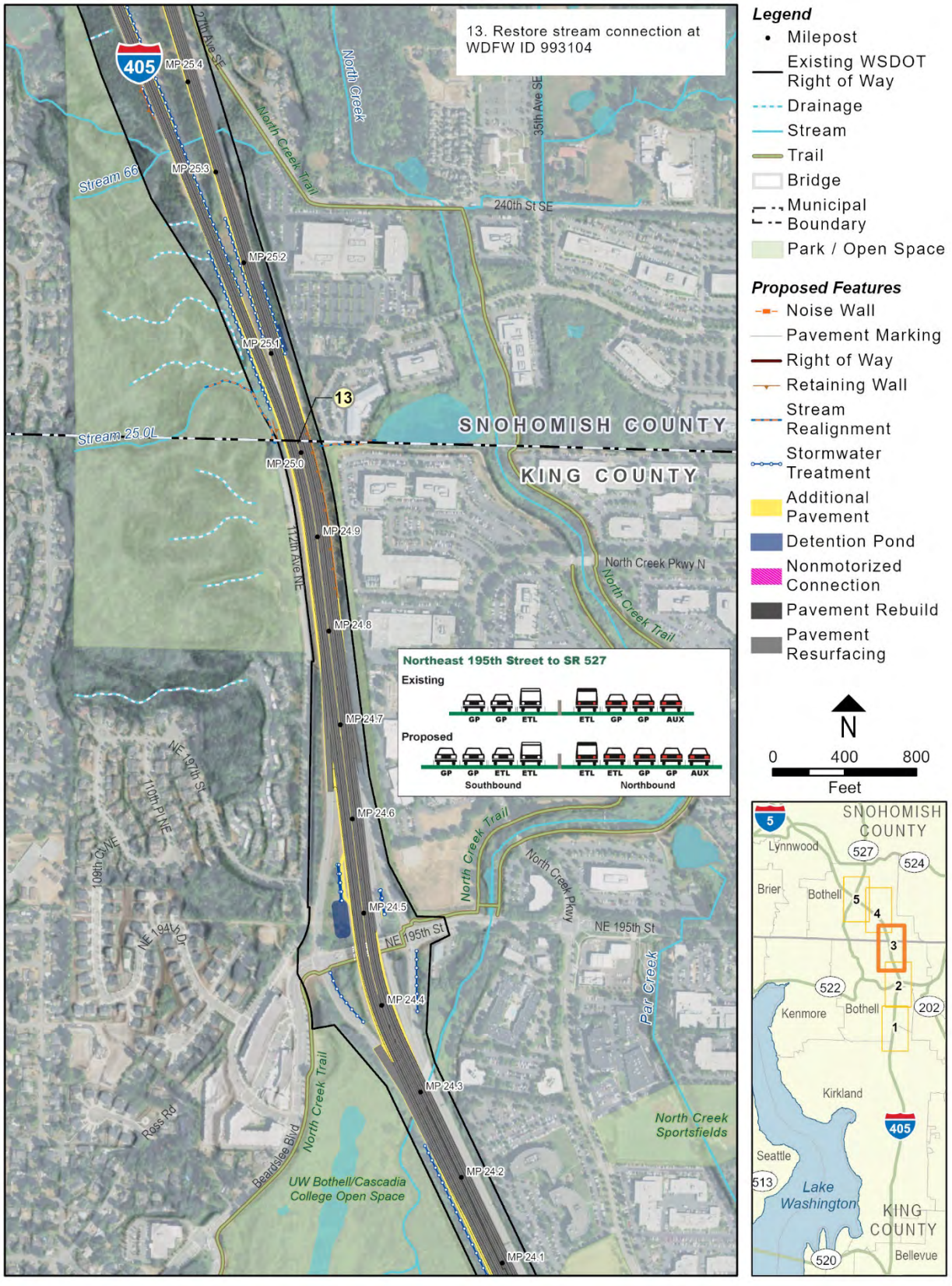


Exhibit 2-2. I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project, Sheet 4 of 5

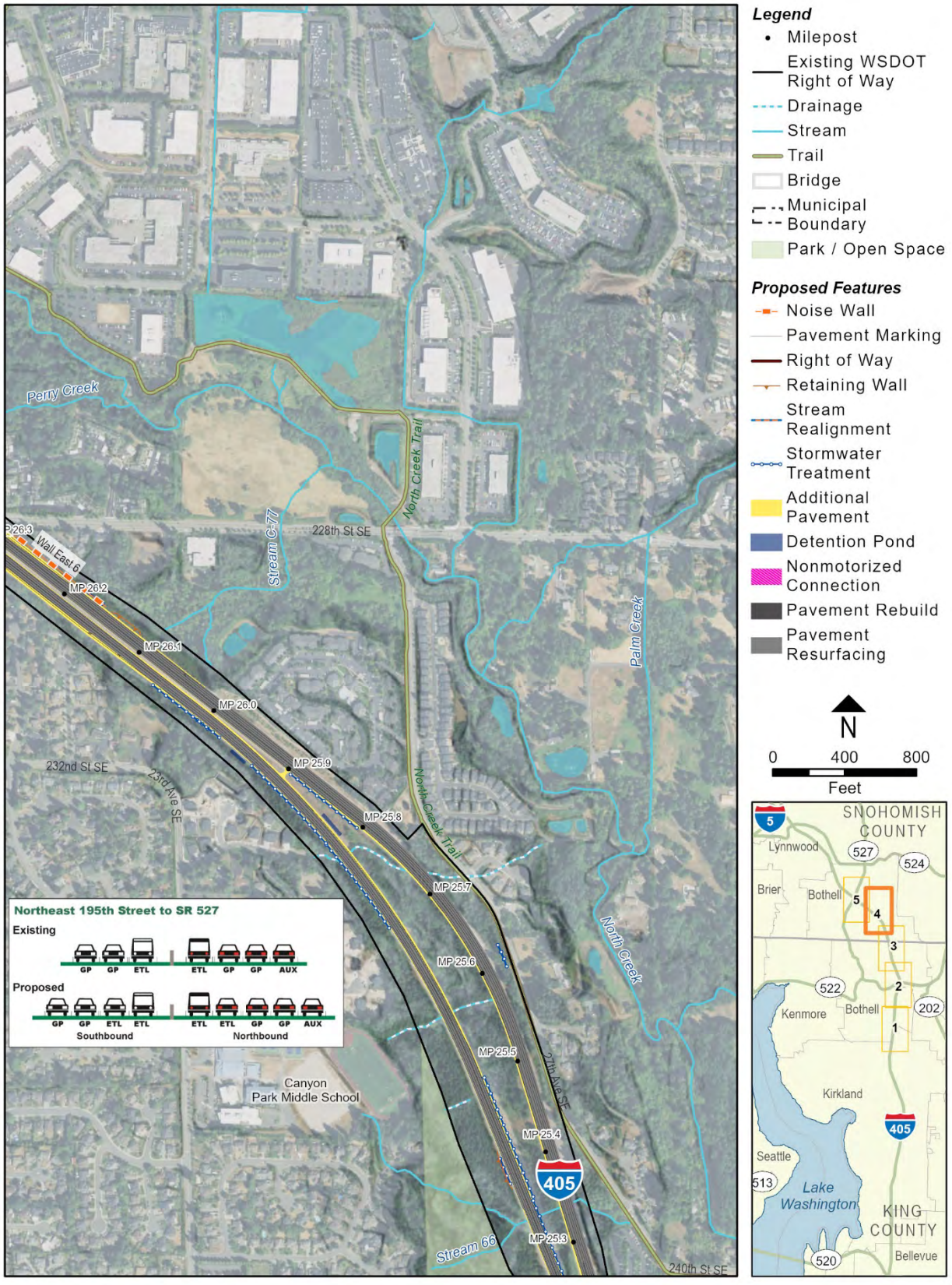
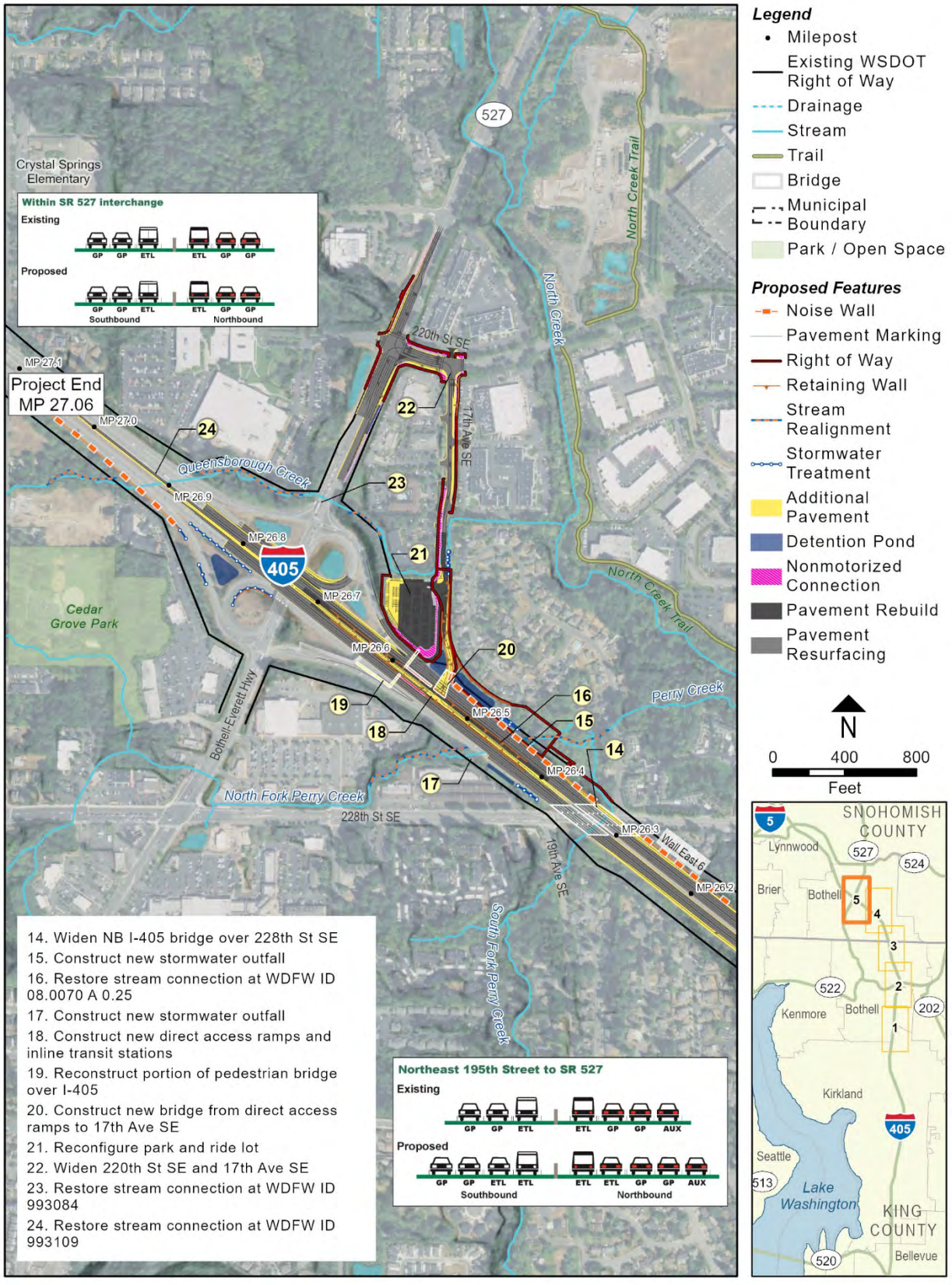


Exhibit 2-2. I-405, SR 522 Vicinity to SR 527 Express Toll Lanes Improvement Project, Sheet 5 of 5



2.2 Express Toll Lanes Overview

How do I get more information about ETLs on I-405?

https://wsdot.wa.gov/Tolling/405/

Currently, there is one ETL in each direction of I-405 between SR 522 and SR 527. WSDOT expects that the new ETL in this section would operate in the same way as the existing ETL, from 5 a.m. to 7 p.m. on weekdays. At all other times and on major holidays, the ETLs would be free and open to all without a *Good To Go!* pass. During operating hours:

- **Single-occupancy vehicles** would pay a toll to use the ETLs with or without a *Good To Go!* pass.
- **Transit, High-Occupancy Vehicles (HOV) 3+, and motorcycles** would travel for free with a *Good To Go!* flex or motorcycle pass.
- **HOV 2+** would travel for free from 9 a.m. to 3 p.m. with a *Good To Go!* flex pass. From 5 a.m. to 9 a.m. and 3 p.m. to 7 p.m. HOV 2+ would pay a toll to use the ETLs with or without a *Good To Go!* flex pass.
- **Large vehicles** over 10,000 pounds gross vehicle weight would not be able to use the ETLs at any time.

2.3 Project Construction Overview

WSDOT expects to construct the Project using a design-build delivery method, in which WSDOT executes a single contract with one entity for design and construction services. With design-build projects, contractors have the flexibility to offer innovative and cost-effective alternatives to deliver the project, improve project performance, and reduce project effects. If the contractor proposes design modifications not covered by this Environmental Assessment, additional environmental review would be conducted as needed.

Construction would generally occur between 2021 and 2025, but construction activities in some areas would be complete prior to 2025. Once a contractor is selected for the Project, they could use multiple work crews in multiple locations to reduce the overall construction period. Work would include removing existing asphalt and concrete surfaces, clearing and grading adjacent areas, laying the aggregate roadway foundation, placing new asphalt and concrete surfaces, replacing culverts, and building and demolishing bridges. Removing bridge piers from the Sammamish River could require the construction of temporary work bridges and would require in-water work, which may include temporary use of cofferdams and a work barge, depending on the contractors' chosen means and methods. Realigning the I-405 mainline would require approximately 170,000 cubic yards of excavation and 166,000 cubic yards of fill.

Construction equipment would include backhoes, excavators, front-end loaders, pavement grinders, jack hammers, trucks, vactor trucks, cranes, drilling rigs and augers, concrete pumping equipment, and slurry processing equipment. Specific haul routes and the number of construction vehicles would not be known until a construction contract is signed. When possible, the work sites would be accessed from I-405 and SR 522. Construction staging areas for employee parking, large equipment storage, and material stockpiles would be located within WSDOT and Bothell right of way to the extent possible. The contractor may also find other locations for construction staging.

SECTION 3 STUDY APPROACH

This section presents the analysis approach. Section 5, Project Effects, presents the results of the analysis.

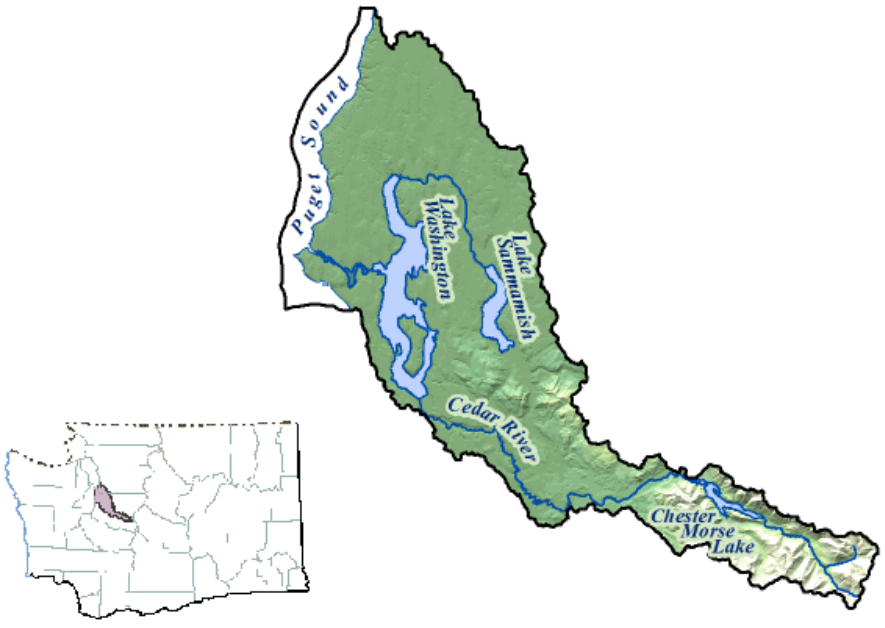
3.1 Study Area

The water resources study area includes areas where surface water (also in the form of stormwater), floodplains, lakes, wetlands, and groundwater and aquifers could be affected by the proposed improvements to I-405, SR 522, SR 527, 17th Avenue SE, 220th Street SE, and associated ramps in Kirkland and Bothell. The study area includes existing and proposed new WSDOT right of way, and extends 300 feet upstream and 1,320 feet (0.25 mile) downstream along streams and rivers to assess effects on those waterbodies.

The study area addressed in this report is located within the Water Resource Inventory Area (WRIA) 8. The study area includes three major subwatersheds: Bear Creek–Sammamish River, Lake Washington–Sammamish River, and North Creek.

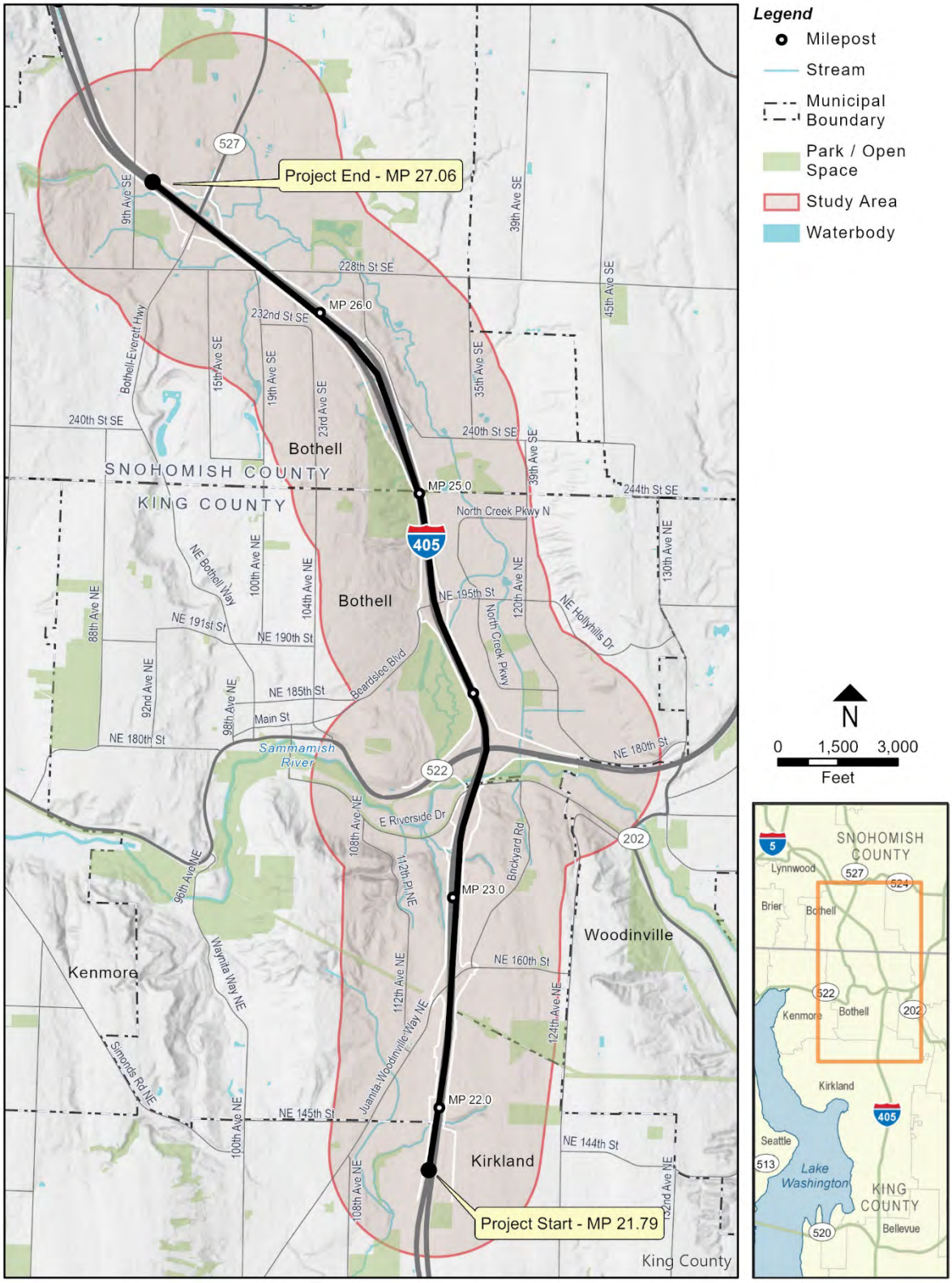
In the study area, I-405 intersects and/or discharges stormwater runoff to Juanita Creek, Stream KL14, Stream 42, Sammamish River, Par Creek, unnamed tributary (UNT) to Par Creek, North Creek, Stream 25.0L, Stream 66, Stream 70, North Fork of Perry Creek, and Queensborough Creek. The study area omits Swamp Creek and tributaries to these streams because there is no potential for impact to those basins with the Project. Exhibit 3-1 shows the extents of WRIA 8, and Exhibit 3-2 shows the water resources study area.

Exhibit 3-1. Map of Water Resources Inventory Area 8



Source: WDFW 2019

Exhibit 3-2. Map of Water Resources Study Area



3.2 Policies and Regulations

Natural water resources typically include surface water (also in the form of stormwater), floodplains, lakes, wetlands, and groundwater and aquifers. Within the study area, a wide range of these resources exists. This section lists each of the analyzed water resources elements, the policies and regulations referenced for determining the Project's effects on these elements, and the agencies with implementing authority.

The Clean Water Act (CWA) regulates discharge of pollutants into Waters of the United States and sets water quality standards for regulated contaminants in surface waters. It addresses not only the water quality of discharges from sewage plants and industrial facilities, known as point sources, but also runoff from streets and construction sites, known as non-point sources. The U.S. Environmental Protection Agency (EPA) grants a designated state agency the authority to implement the CWA. Washington State Department of Ecology (Ecology) is the designated agency in Washington.

3.2.1 General Water Resources Policies and Regulations

- National Environmental Policy Act (NEPA) – EPA
- Endangered Species Act (ESA) – United States Fish and Wildlife Service (USFWS) and National Oceanic and Atmospheric Administration (NOAA) Fisheries
- Federal Clean Water Act – Ecology and U.S. Army Corps of Engineers (Corps)
- State Environmental Policy Act (SEPA) – Ecology
- *Hydraulics Manual M 23-03.06* (WSDOT 2019b)
- *Environmental Manual M 31-11.21* (WSDOT 2019e)
- *Surface Water Design Manual* – City of Bothell (Bothell 2019)
- *Surface Water Design Manual* – King County (King County 2016)

3.2.2 Surface Water

- Water Pollution Control Act, Revised Code of Washington (RCW) 90.48
- *Highway Runoff Manual* (HRM) *M 31-16.05* (WSDOT 2019a)
- *Temporary Erosion and Sediment Control (TESC) Manual M 3109.02* (WSDOT 2019d)
- *Qualitative Procedures for Surface Water Impact Assessments* (WSDOT 2009)
- *Stormwater Management Manual for Western Washington* (Ecology 2014)
- Washington State Shoreline Management Act – Ecology
- Critical Areas Ordinance for shorelines and wetlands – King County

3.2.3 Floodplains

- *Technical Advisory T6640.8A, Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987)

- National Flood Insurance Act of 1968 and Flood Disaster Protection Act of 1973 (FEMA 1997)
- Presidential Executive Order 11988, Floodplain Management (FEMA 1977)
- Flood Control Management Act of 1935, RCW 86.16
- Title 21A of the King County Code and the Surface Water Runoff Policy in Chapter 9.04 – King County
- *King County Flood Hazard Management Plan Update and Progress Report* (King County 2013)
- Critical Areas Ordinance for floodplains – King County, City of Bothell. These floodplain ordinances include a provision that requires compensatory mitigation for flood storage that is lost due to fill in jurisdictional floodplains.

3.2.4 Groundwater and Aquifers

- Safe Water Drinking Act – EPA
- Washington State Wellhead Protection requirements outlined in Washington Administrative Code (WAC) 246-290-135(4) – State of Washington
- *Geotechnical Design Manual M 46-03.11*(WSDOT 2015)
- King County Public Water System Rules and Regulations, Chapter 12 (12.24.010) – King County

3.3 Data Sources and Information Collected

WSDOT acquired information for this report through a review of multiple sources, including:

- Multiple basin or watershed plans
- WRIA maps from Ecology
- Topographic and resource maps
- Light Detection and Ranging (LiDAR) for land elevations and topographic information
- Geographic information system (GIS) maps and databases
- Aerial photography
- Water quality studies and recent water quality data
- Agency websites
- Stormwater data provided from City of Bothell
- Site visits where experts in the fields of fisheries, wetlands, wildlife, road design, drainage design, and permitting surveyed and collected data on the natural and manmade features located within the study area.

The subsections below list resource-specific data collected for this report.

3.3.1 Surface Water

- Wetland delineations
- Review of Ecology's 303(d) list of impaired water bodies
- Review of Ecology's Total Maximum Daily Load list
- WSDOT as-built drawings, online interactive GIS map research, and field and topographic surveys to verify stormwater surface and piped system flow patterns and hydraulic connections between water resources.
- Information collected through discussions with the City of Bothell, Washington Department of Fish and Wildlife (WDFW) staff, Muckleshoot Indian Tribe, and local community members to better understand water resources issues and concerns.

3.3.2 Floodplains

- Review of Federal Emergency Management Agency (FEMA) flood floodplain designations within the study area and Flood Insurance Rate Maps (FIRMs).
- Review of past relevant floodplain restoration and mitigation studies.

3.3.3 Groundwater and Aquifers

- Information on Sole Source Aquifers and Group A and B Wellhead Protection Areas from city and county databases.
- Ecology databases on wells and water rights within the study area.
- Online critical/sensitive areas mapping research from the City of Bothell, City of Kirkland, King County, and Snohomish County data.

3.4 Evaluation of Effects

The methods described in WSDOT's *Environmental Manual* were used to evaluate Project effects on surface water flows and water quality, floodplains, and groundwater during Project construction and operations (WSDOT 2019e). The manual provides guidance to ensure that WSDOT projects comply with local, state, and federal laws and regulations. The next sections discuss the evaluation methods for each water resource in further detail.

3.4.1 Surface Water

The assessment of existing conditions included reviewing current flow patterns, land use, and peak flow conditions; steep slopes; wetlands and other water bodies; and human made drainage and/or treatment systems. Baseline or existing conditions were compared with the proposed Project drainage designs to determine the new impervious pavement distribution and the affected receiving waterbodies, including streams and rivers. The affected receiving waterbodies were determined through consultation with biologists analyzing Project effects.

As directed by WSDOT's HRM, the change in impervious area was used to calculate new runoff volumes. These volumes were used to verify the number and size of water quality and flow control treatments needed to protect the receiving waterbodies.

WSDOT will select appropriate temporary erosion and sediment control (TESC) best management practices (BMPs) to follow the guidelines in WSDOT's *TESC Manual* (WSDOT 2019d). The Project would meet the statewide stormwater pollution prevention plan (SWPPP) discharge sampling and reporting requirements in the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit.

In accordance with WSDOT's *Environmental Manual*, the annual pollutant loads were calculated using WSDOT's technical guidance, *Quantitative Procedures for Surface Water Impact Assessments,* to assess the probability of effects for pollutant loading and concentrations (WSDOT 2009; WSDOT 2019e).

3.4.2 Floodplains

The assessment of existing conditions included a review of baseline floodplain characteristics and land uses, pertinent regulations, peak flow estimates, and any historic flooding problems. Baseline conditions were compared to the proposed Project footprint to determine if construction activities would require disturbance within floodplain areas. FEMA floodplain elevation maps were used to define the volumes of cut or fill proposed within the floodplain areas. If more material would be removed than placed as fill in a floodplain area, then it was determined that the Project would not negatively affect floodplain storage capacities.

3.4.3 Groundwater and Aquifers

The proposed Project design and likely construction methods were reviewed to evaluate potential Project effects on groundwater and Aquifer Protection Areas located within the Project footprint. Evaluations were based primarily on sound engineering principles, WSDOT practices, and professional judgment. Part of WSDOT's practice is to use the *Geotechnical Design Manual*, which contains many WSDOT design and construction practices designed to minimize effects on groundwater (WSDOT 2015).

SECTION 4 EXISTING CONDITIONS

4.1 Surface Water

I-405 crosses several large and small streams and other water courses in the study area located within the Lake Washington/Cedar/Sammamish Watershed Water Resources Inventory Area (WRIA) 8. Surface waterbodies that would be affected by the proposed Project in the study area include Stream KL14, Stream 42, Sammamish River, Par Creek, unnamed tributary (UNT) to Par Creek, Stream 25.0L, Stream 66, Stream 70, North Fork of Perry Creek, Queensborough Creek, and North Creek.

In general, the surface waterbodies within the study area have been significantly altered from their natural states to accommodate urban growth. This alteration has included bank hardening, such as installing riprap and placing streams in constricted channels and pipes; reducing or removing streamside vegetation; straightening stream channels; and removing in-stream habitat. The installation of fill during land development has also reduced the historic floodplains associated with many of these waterbodies.

Exhibit 4-1, Sheets 1 through 5, shows existing streams and water courses, stormwater facilities, and floodplains in the study area.

Exhibit 4-2 shows the drainage basins near the study area.

Exhibit 4-3, Sheets 1 through 5, shows stormwater threshold discharge areas (TDAs) in the study area.

Exhibit 4-1. Existing Stormwater Treatment Facilities and Floodplains, Sheet 1 of 5

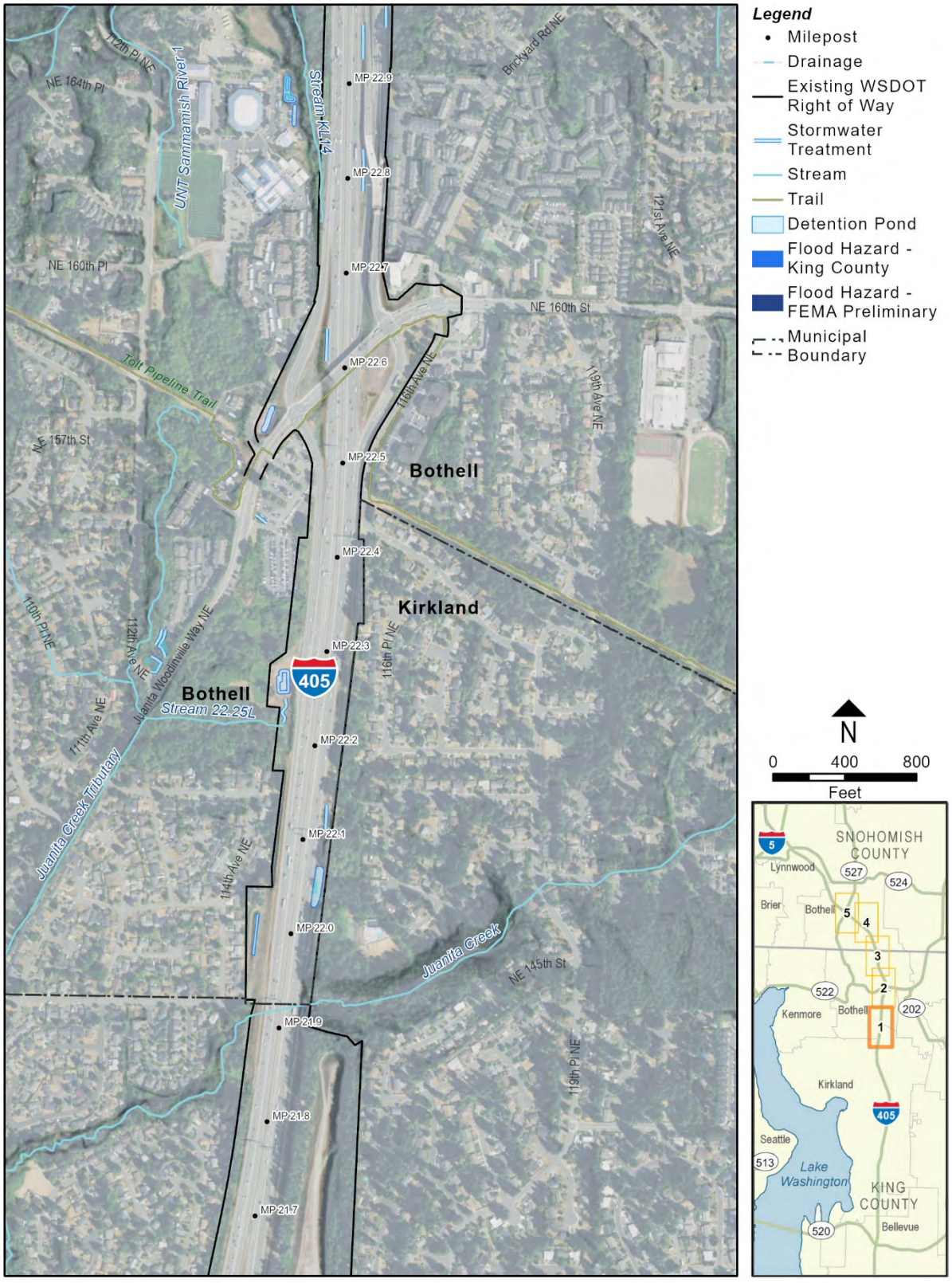


Exhibit 4-1. Existing Stormwater Treatment Facilities and Floodplains, Sheet 2 of 5

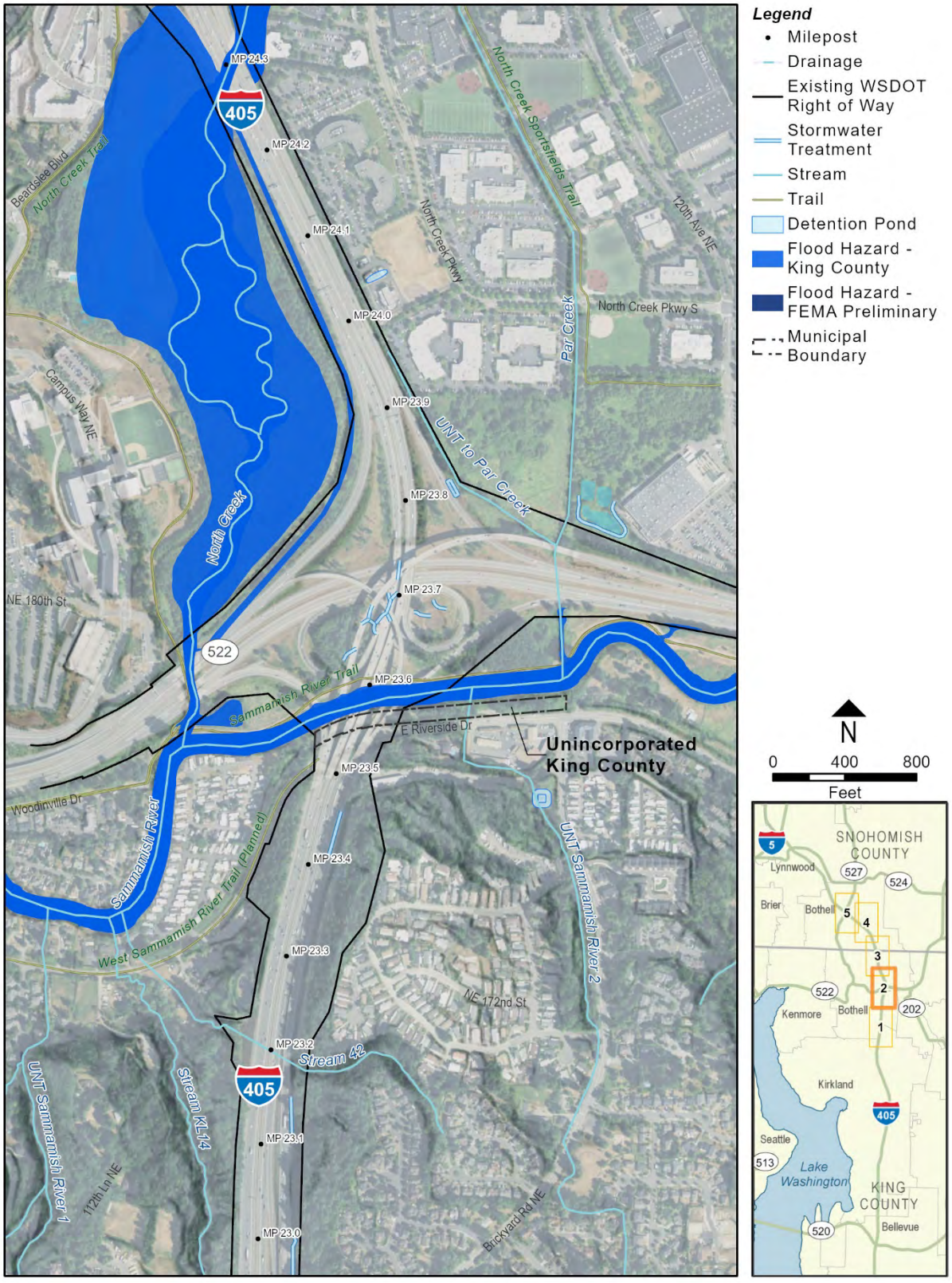


Exhibit 4-1. Existing Stormwater Treatment Facilities and Floodplains, Sheet 3 of 5

Exhibit 4-1. Existing Stormwater Treatment Facilities and Floodplains, Sheet 4 of 5

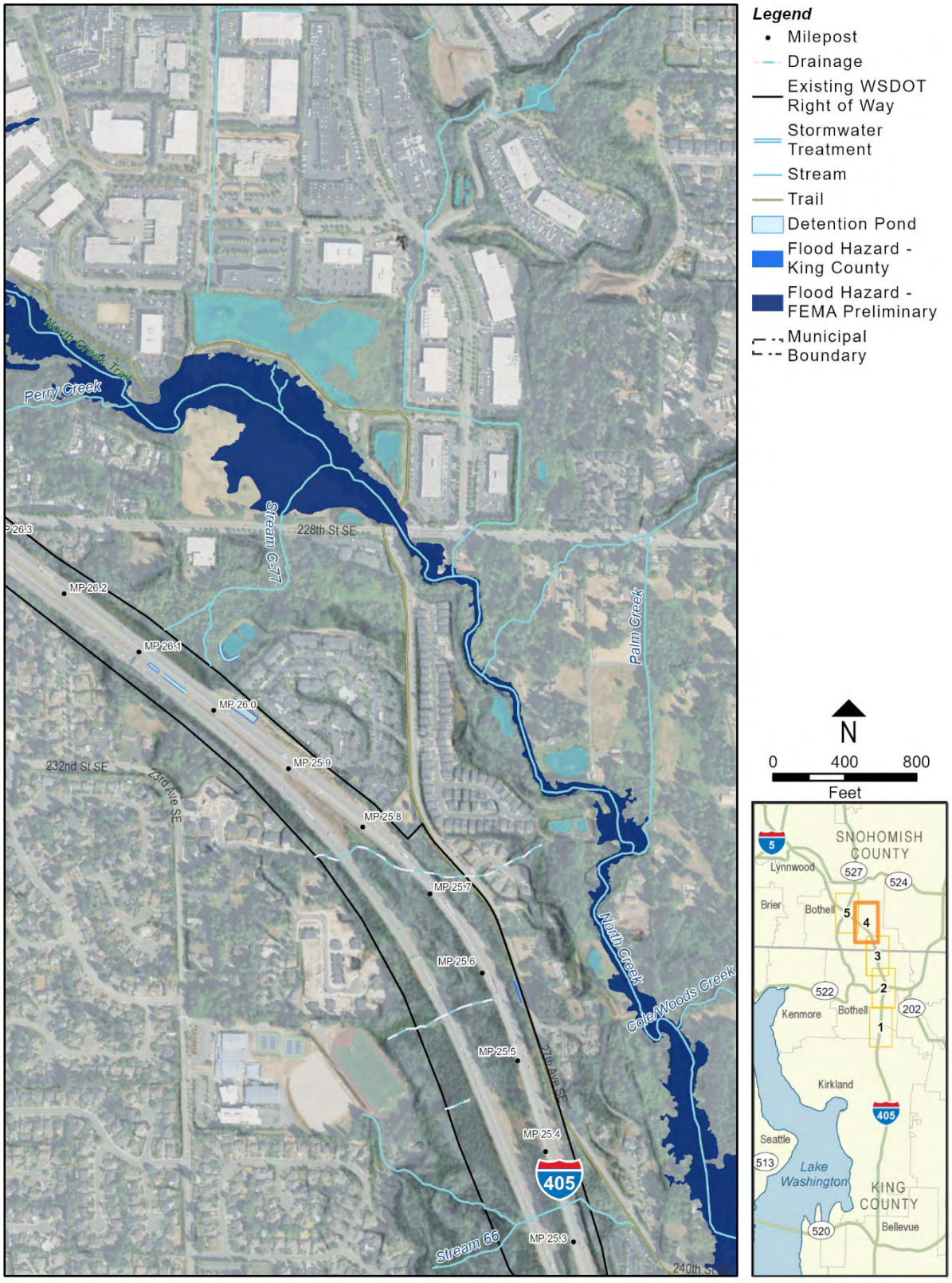


Exhibit 4-1. Existing Stormwater Treatment Facilities and Floodplains, Sheet 5 of 5

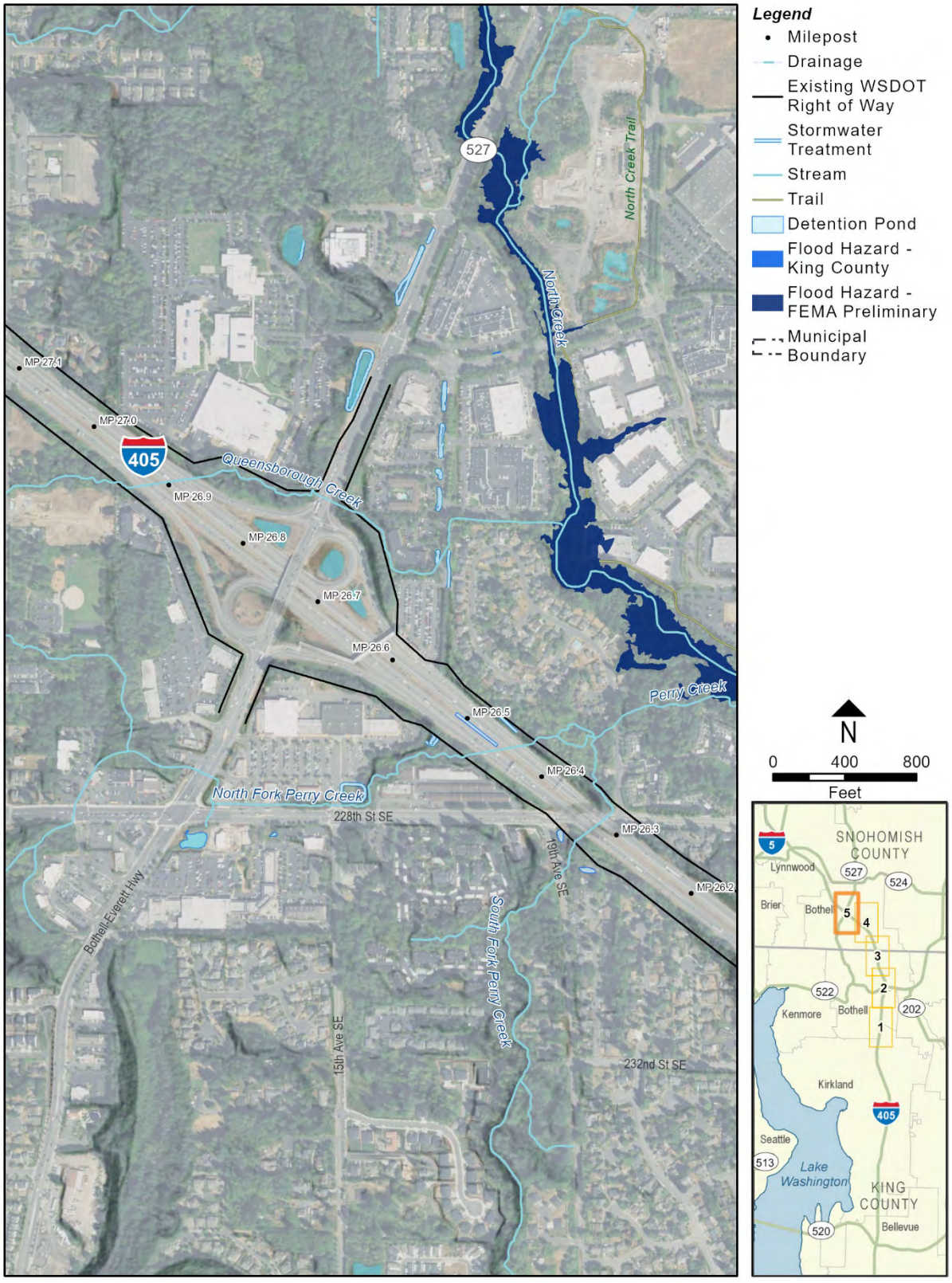


Exhibit 4-2. Drainage Basins near the Study Area

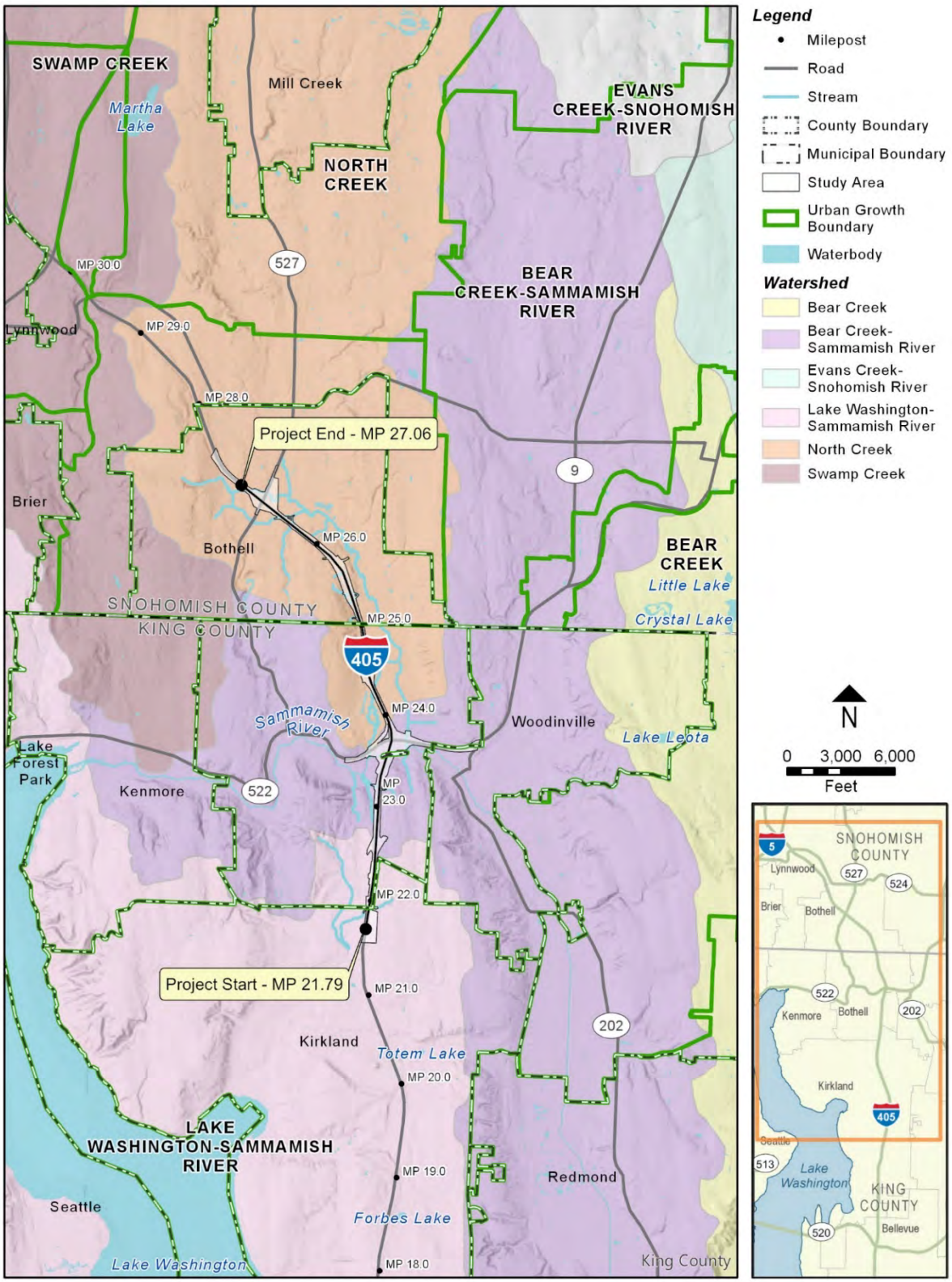


Exhibit 4-3. Stormwater Threshold Discharge Areas in the Study Area, Sheet 1 of 5

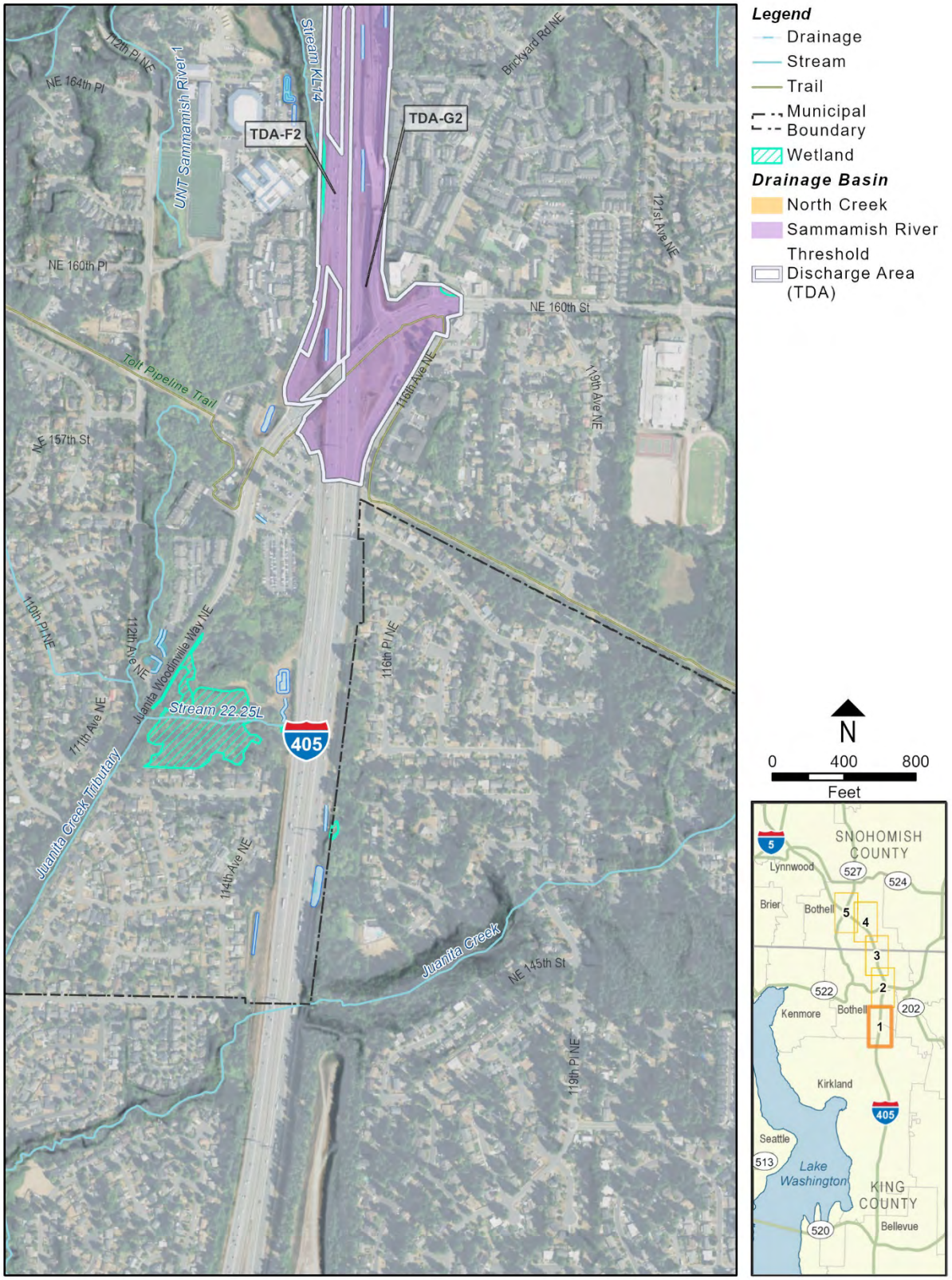


Exhibit 4-3. Stormwater Threshold Discharge Areas in the Study Area, Sheet 2 of 5

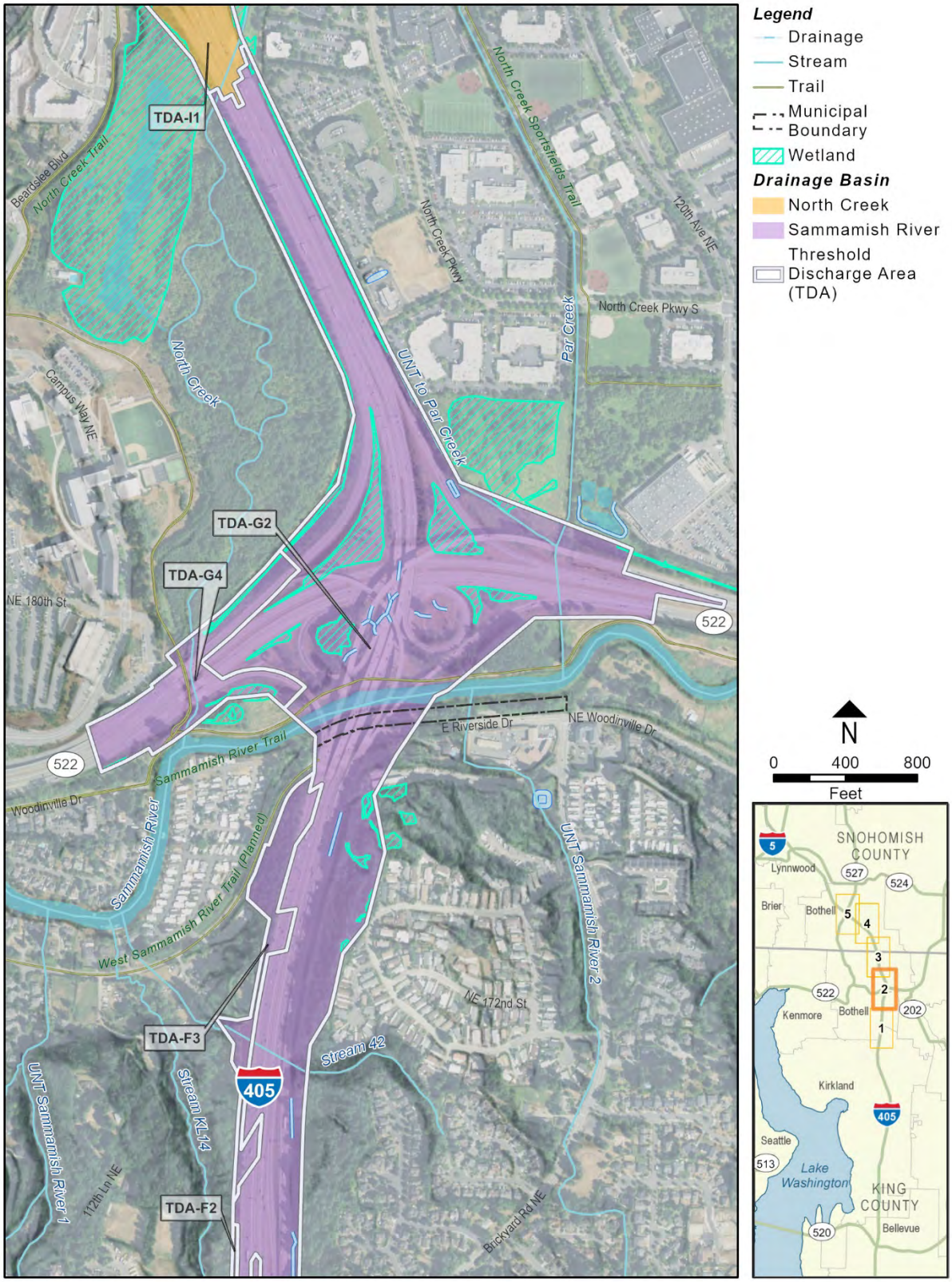


Exhibit 4-3. Stormwater Threshold Discharge Areas in the Study Area, Sheet 3 of 5

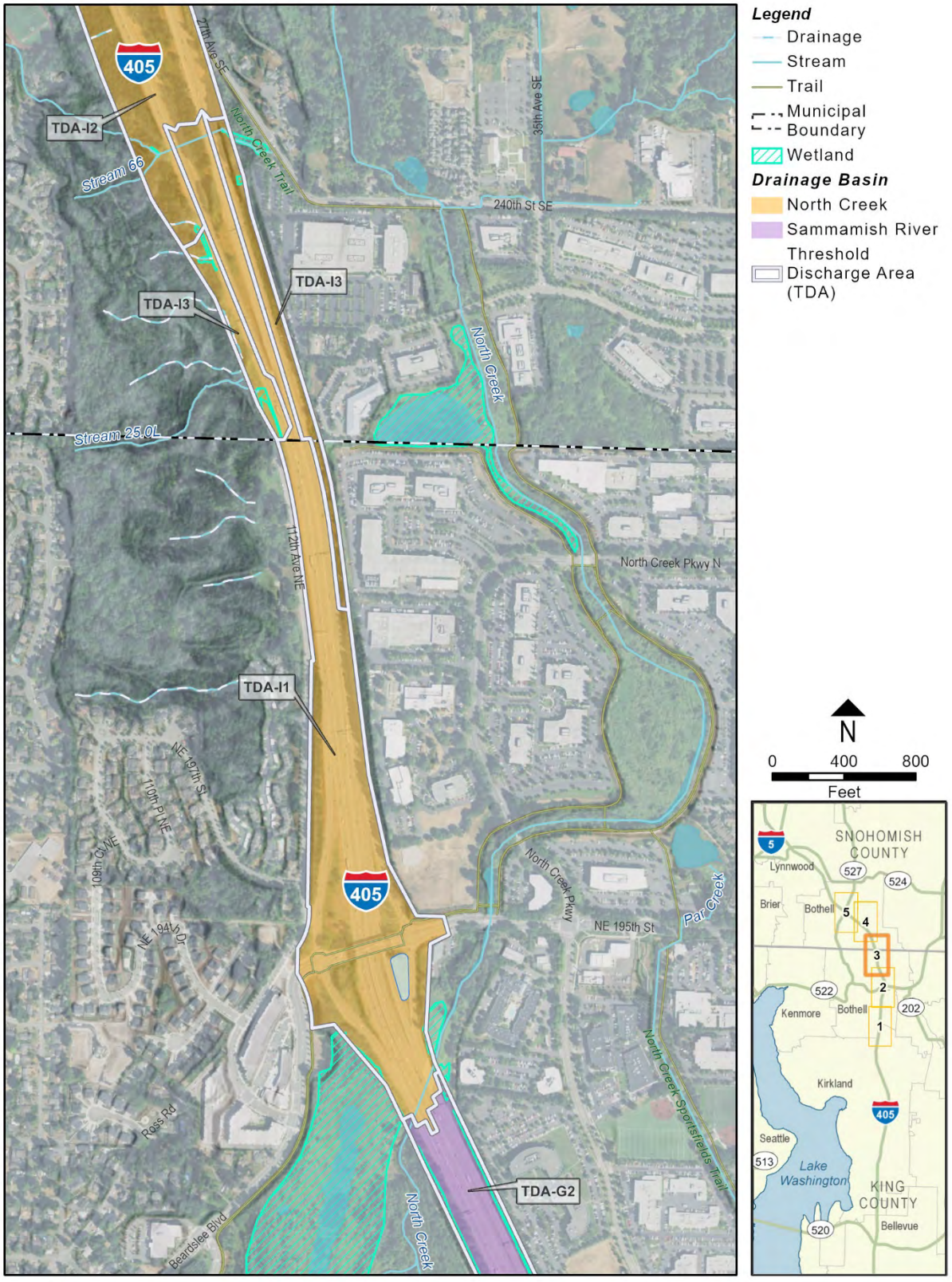


Exhibit 4-3. Stormwater Threshold Discharge Areas in the Study Area, Sheet 4 of 5

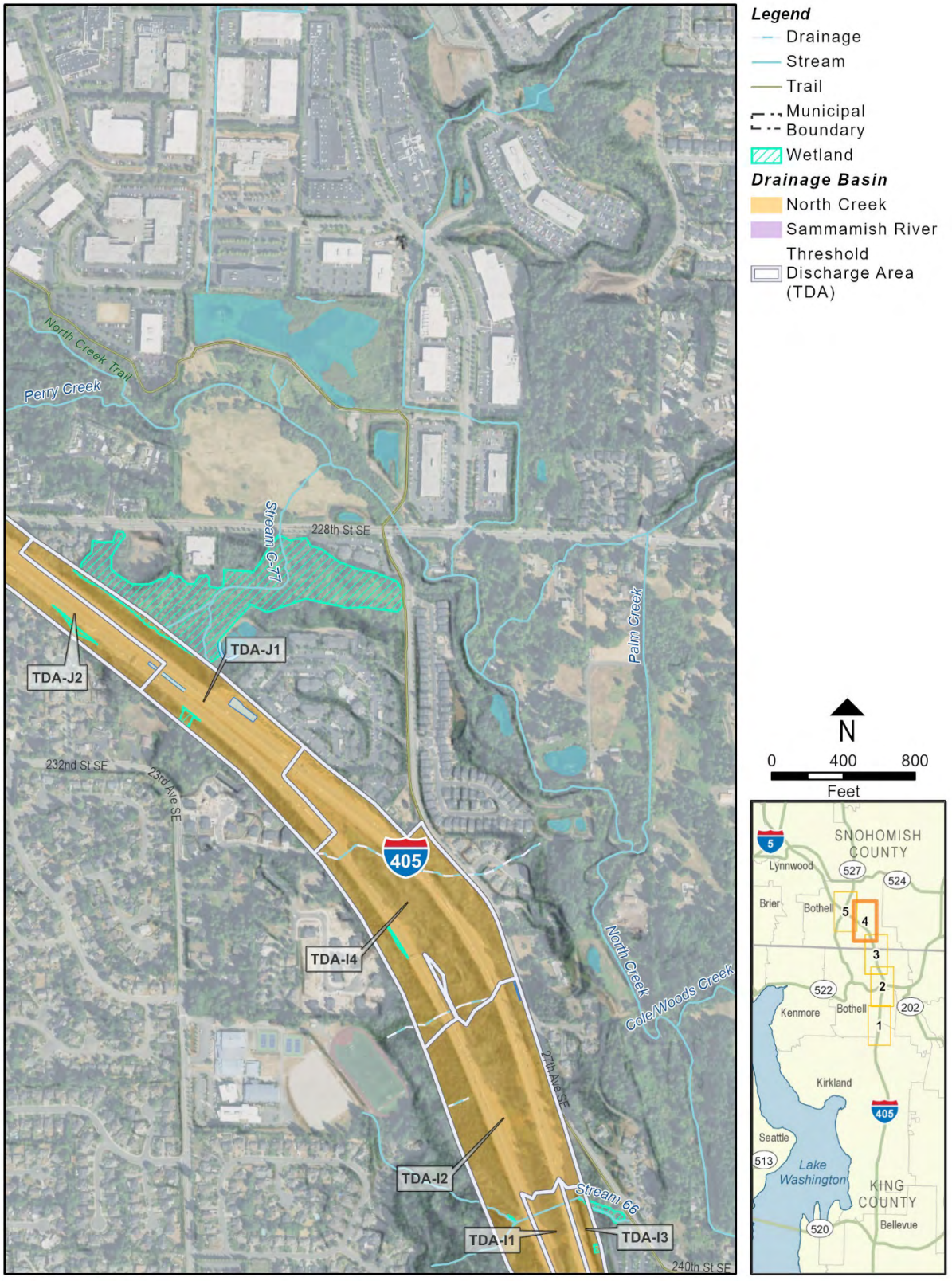


Exhibit 4-3. Stormwater Threshold Discharge Areas in the Study Area, Sheet 5 of 5

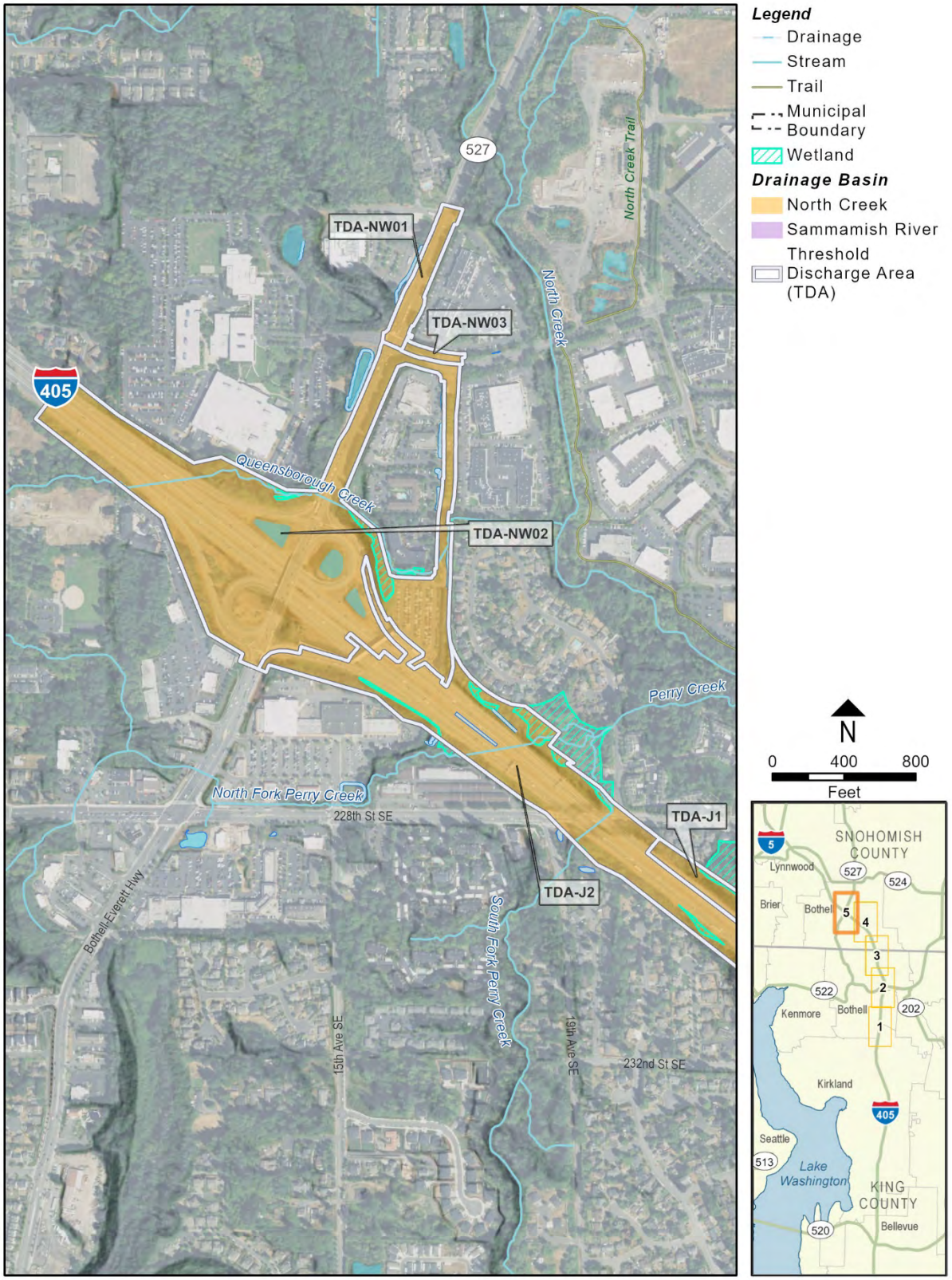


Exhibit 4-4 describes the streams and their basins within the study area, which reflect moderate to highly urbanized conditions.

Exhibit 4-4. Indicators of Urbanization by Waterbody Basin

Waterbody Basin	Percent Total Impervious Area in Basin	Percent of Basin Area in Urban Growth Area	Percent Total Forest Area in Basin	Benthic Index of Biotic Integrity Rating
Sammamish River	39	80	25	Poor (14-22)[1]
North Creek	41	99	24	Fair (30) to Poor (16)[2]

[1] Source: Parametrix 2005

[2] Source: Snohomish County 2002

The Washington State Department of Ecology (Ecology) prepares a 303(d) list identifying waterbodies that do not meet the state water quality standards and the reasons why. According to the *Water Quality Atlas* (Ecology 2019a), an online interactive map, the following waterbodies that would be affected by the Project do not meet state standards for the elements listed:

- Sammamish River – temperature, dissolved oxygen, bacteria.
- North Creek – dissolved oxygen, bioassessment, temperature.
- Queensborough Creek – dissolved oxygen, temperature.

Although these waterbodies currently do not meet state standards, Total Maximum Daily Loads have been developed only for North Creek: fecal coliform (King and Snohomish County) and dissolved oxygen (King County downstream of project).

Each of the receiving waterbodies has multiple discharges from the I-405 corridor. I-405 basins are evaluated by Threshold Discharge Area (TDA), which is defined as "an on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within ¼ mile downstream (as determined by the shortest flow path)" (WSDOT 2019a).

In addition to these naturally occurring streams, watercourses, and human-made drainage systems, I-405 and related facilities contribute surface runoff during storm events. The following sections describe these surface waters within the study area from south to north.

4.1.1 Juanita Creek

The main stem of Juanita Creek crosses I-405 at NE 145th Street, originates east of I-405, and flows approximately 5 miles west and south to enter Lake Washington on the west side of Juanita Beach Park (see Exhibit 4-1, Sheet 1). The watershed covers approximately 6.6 square miles (4,000 acres) and is dense with residential and commercial development.

Two primary tributaries cross I-405 and eventually flow into Juanita Creek, but they are located south of the study area. Streambank armoring has reduced channel complexity and connectivity with the Juanita Creek floodplain. Sediment deposition from the creek is evident in Juanita Bay Park at the mouth of the creek.

Within the study area, existing roadway pavement areas and stormwater facilities are not being modified by the Project; therefore, this subbasin is not discussed further in this report.

4.1.2 Sammamish River

The Sammamish River, the major outlet of Lake Sammamish, enters the north end of Lake Washington in Kenmore. The Sammamish River is a major inflow to Lake Washington, providing about 30 percent of the lake's water flow. The Sammamish River basin is approximately 212 square miles.

Land use surrounding the Sammamish River near I-405 is primarily urban and residential. Much of the floodplain is developed to within 100 feet of the river's edge, and there are several areas of impervious surface adjacent to the channel (King County and Corps 2002).

Tributaries to the Sammamish River within the project study area include North Creek, Par Creek, Stream 42, and KL14. Stream 42 originates in the area just east of I-405 and south of the interchange with SR 522 (see Exhibit 4-1, Sheets 1 and 2). A steep ravine carries seasonal flow from the upper hillsides and neighborhoods to the north and south into the channel. The channel passes under the northbound and southbound lanes of I-405 at milepost (MP) 23.2. A steep hill slope is located above the outfall, and it is assumed that the stream channel travels through a steep area. Storm events and ongoing stream slope failures have carried sediment from the hillsides down the ravine and created sand deposits along the streambanks.

KL14 originates west of I-405 at MP 22.8 and is a tributary to the Sammamish River. This stream receives flow from a series of wetlands and stormwater catch basins. King County considers the upper portion of the creek basin to be a landslide hazard.

Highway runoff to the Sammamish River occurs primarily through TDA G2, which extends along the I-405 mainline from NE 160th Street to the North Creek bridge (see Exhibit 4-3, Sheets 1, 2, and 3). Because this TDA is flow control exempt, there are no flow control facilities. Media filter drains and compost-amended biofiltration swales located along I-405 (south of the Sammamish River) and within the interchange (north of the Sammamish River) provide runoff treatment. TDAs, F2 and F3, represent portions of southbound I-405 that discharge to tributaries of the Sammamish River, Stream KL14, and Stream 42, respectively. There is no runoff treatment or flow control in TDA F2 and F3. TDA G4 is located along SR 522 west of I-405 and has an existing detention vault.

4.1.3 North Creek

The North Creek basin (Exhibit 4-2) drains approximately 28.5 square miles and discharges to the Sammamish River. The creek's headwaters originate in the Everett Mall Way area of south Everett. The creek flows to the south for 12.6 miles before discharging into the Sammamish River (Ecology 2002). The stream gradient is flat, decreasing from about 50 feet per mile in the upper basin to less than 20 feet per mile near the mouth. The watershed is nearly 10 miles long and 3 miles wide, and encompasses an area of about 19,000 acres (King County 2006).

Land use within the basin is primarily urban or suburban, with some remaining areas of rural and forested land. The basin is being developed rapidly for residential and commercial use. The

trend toward urbanization continues today, with an emphasis on commercial, light industrial, and business park uses.

Tributaries to North Creek in the project study area include Stream 66, Stream 25.0L, Stream 70, Stream C-77, North Fork Perry Creek, and Queensborough Creek. Refer to Exhibit 4-1, Sheets 3, 4, and 5, for locations of these streams and Appendix I, *Ecosystems Discipline Report,* of this Environmental Assessment (EA) for additional information on these tributaries.

The North Creek basin has the following TDAs (see Exhibit 4-3, Sheets 2, 3, 4, and 5):

- TDA I1 extends from North Creek bridge at MP 24.3 to I-405 MP 25.35 and has no existing flow control. Media filter drain best management practices (BMPs) provide runoff treatment.
- TDA I2 includes I-405 from MP 25.3 to MP 25.6 and discharges to Stream 66. A detention tank on the northbound I-405 side provides flow control, and media filter drain BMPs provide runoff treatment.
- TDA I3 includes I-405 from MP 25.0 to MP 25.3 and discharges to Stream 25.0L. A detention tank on the northbound I-405 side provides flow control, and media filter drain BMPs provide runoff treatment.
- TDA I4 includes I-405 from MP 25.6 to MP 25.9 and discharges to Stream 70. A very small detention tank on the northbound I-405 side provides flow control, and a media filter drain provides runoff treatment BMPs.
- TDA J1 includes I-405 from MP 25.9 to MP 26.2 and discharges to Stream C-77. A combined stormwater treatment wetland/detention pond provides flow control and runoff treatment. There is an additional stormwater median detention vault located at MP 26.0. A media filter drain also provides stormwater treatment.
- TDA J2 extends from MP 26.2 to the Canyon Park Park and Ride vicinity and discharges to Perry Creek. A detention tank located in the I-405 median just north of the North Fork of Perry Creek provides flow control. A biofiltration swale and wet vault provide basic runoff treatment BMPs.
- TDA NW01 is located on SR 527 north of NE 220th Street. This TDA has no existing stormwater flow control or treatment.
- TDA NW02 includes the I-405/SR 527 interchange area and extends to the northern project limit near MP 27.06. This TDA discharges to Queensborough Creek and includes flow control and some runoff treatment by a series of sediment and flow control ponds within the interchange.
- TDA NW03 is located along NE 220th Street between 17th Ave NE and SR 527. This TDA has no existing stormwater flow control or treatment.

4.2 Floodplains

The FEMA Flood Insurance Rate Map (FIRM) for the study area shows floodplains associated with the Sammamish River and North Creek (FEMA 2018). FEMA's FIRM for both crossings of the Sammamish River identifies a Special Flood Hazard Area designated as Zone AE near the I-405 crossings.

4.2.1 Sammamish River

The Sammamish River basin is approximately 212 square miles, and the floodplain varies from a width of about 1,000 feet to about 1 mile. Historically, the floodplain was a diversely vegetated wetland containing many channels, sloughs, and oxbows, and the lower half of the corridor flooded to an average depth of 2 feet. Much of the river has been dredged, straightened, and leveed for flood protection, and most of the larger riparian vegetation has been removed. In 1962, the U.S. Army Corps of Engineers (Corps) began to dredge and channelize the river, primarily as a flood control project. The Corps project deepened the river 5 feet throughout most of its length, hardened the river's banks, and dramatically decreased its remaining connection with the floodplain, cutting off most of the smaller tributaries to the river (Martz et al. 1999; Kerwin 2001).

The floodplain is contained within the channel at the I-405 crossing. The existing WSDOT bridge structures span over most of the floodplain with minor influence by piers in the shallow floodplain areas within the I-405/SR 522 interchange area. The northbound I-405 to eastbound SR 522 ramp fill area on the northern bank also has a minor influence on the edge of the floodplain. The Sammamish River modifications by the Corps included some areas of riprap protection to block flows from returning to prior meanders. These modifications have held the channel in its current alignment. In 2018, King County added large woody material along the bank in an effort to address bank scour issues and provide habitat within the channel. The channel currently appears stable with no signs of scour.

4.2.2 North Creek

The study area is located in the lower reach of the North Creek watershed, where the floodplain is relatively flat and confined by levees. The FEMA mapping notes that the North Creek valley, which is about 0.5-mile wide, is protected from floods up to 1 percent probability (100-year), but the levees are subject to failure during higher storms. The I-405 roadway embankment serves as the western boundary of the floodplain for those higher storm events. The I-405 crossings at this location are three-span bridges with piers on each bank of the creek. The piers are located within the channel section and influence the main channel flows through the structure. The bridge bends and associated roadway fill confine the floodplain through the structure. The existing channel is stable with no signs of scour.

4.2.3 Par Creek

The Par Creek channel is shown on FEMA's FIRM as a floodplain type Zone A (no base flood elevations determined). The associated valley area is similar to and down slope from the North Creek valley. Flooding is likely to spread across the 0.5-mile wide valley in the event that North Creek levees are breached by larger than a 100-year recurrence storms.

4.2.4 Tributaries of North Creek

There are no FEMA-mapped floodplains for the subject tributaries of North Creek.

4.2.5 Climate Impacts Vulnerability Assessment

All of WSDOT's major capital projects undergoing environmental review consider climate change and extreme weather events as part of the agency's 2014-2017 Strategic Plan commitment. For this Project, WSDOT examined available information about climate trends and the results of WSDOT's assessment of vulnerable infrastructure (WSDOT 2011). The assessment shows the section of I-405 in the study area to have a low level of vulnerability to climate-related threats. SR 522 and SR 527 have a moderate vulnerability to climate-related threats; however, the areas with moderate vulnerability are outside of the affected area for the Project. Therefore, climate-related risks for infrastructure in the study area are considered to be low. Climate-related threats on I-405, SR 522, and SR 527 are mostly related to increased risks for flooding on the Sammamish River and other area streams, because the study area may experience extreme wind, rain, and snow storms and more days of extreme heat as the climate changes.

The Project includes several features that would improve the resiliency of I-405, SR 522, and SR 527. These features include:

- Adding stormwater detention, which would reduce localized flooding and improve floodplain function compared to existing conditions.
- Removing four bridge piers from the Sammamish River, which would improve river and floodplain function by removing the fill material of the piers and removing a constraint in the river.
- Correcting fish barriers by replacing culverts with larger spanned structures, which would increase resilience to changes that may occur with increased severe weather and precipitation events.

4.3 Groundwater and Aquifers

Groundwater resources in the study area exist within recent and Holocene-age alluvial deposits within the North Creek and Sammamish River drainage systems and within Vashon-age and older glacial and non-glacial deposits. The study area groundwater resources are limited by underlying bedrock at an estimated depth of 100 to 300 feet below the ground surface (Yount et al. 1985).

Alluvial sediments in the study area consist primarily of clay, silt, sand, and gravel. The underlying glacial and non-glacial deposits include more permeable sand and gravel as well as lower permeability clay and silt. Consolidation from the weight of glacial ice reduces the permeability of some glacial and non-glacial deposits.

Groundwater within the study area has multiple uses, such as active groundwater wells and groundwater rights for future potential wells, as discussed in the next sections.

4.3.1 Groundwater Wells

There are three documented water supply wells within 0.5 mile of the study area (Ecology 2019c):

- Bejvl Well, identified east of the study area at 3511 240th Street NE in Bothell, was drilled in 1989 with groundwater noted at 4 feet depths with a well yield of 40 gallons per minute (gpm) in a bail test. The depth and yield of the well suggest that it produces water from high permeability alluvial and glacial deposits. It is not known if the well is still operational. North Creek acts as a groundwater divide between the study area and the Bejvl well.
- City of Bothell Well, mapped near N 200th Street and 104th Avenue NE in Bothell, was drilled in 1961 with groundwater noted at 147 feet depths with a well yield of 455 gpm. The depth and yield of the well suggest that it produced water from high permeability glacial or older interglacial deposits. Currently, the City of Bothell provides public water from surface water sources. Accordingly, WSDOT infers that this well is no longer operational. The well lies upgradient of the study area.
- Crothers Well, mapped near 219th Place SE in Bothell, north of the SR 527 interchange, was drilled in 1958 with groundwater noted at 18 feet depths with a well yield of 30 gpm. The depth and yield of the well suggest that it produced water from high permeability glacial deposits. It is not known if the well is currently being used. The well lies upgradient of the study area.

In addition, two abandoned wells are identified on the Ecology website within 0.5 miles of the study area:

- Kelly Well near NE 165th Street and 124th Avenue NE, Woodinville.
- Rafn Well near NE 162nd Street and 125th Place NE, Woodinville.

4.3.2 Groundwater Rights

Groundwater is extracted and used for water supply throughout the study area. Groundwater certificates and permits for uses that have a point of withdrawal within 0.5 mile of the study area can be researched on Ecology's Water Resources Explorer website (Ecology 2019b).

4.3.3 Aquifers

There are no named aquifers in the study area. Groundwater in the study area is part of the Puget Sound Lowland Aquifer System, a system of quaternary age alluvial, glacial, and interglacial deposits. Unnamed aquifers in the study area are:

- Alluvial deposits - Existing as an unconfined aquifer with interbedded clay, silt, organic soil, sand, and gravel of varying composition. Within the Sammamish River valley, the alluvial deposits vary from a few feet thick to an estimated 100 feet thick.
- Glacial deposits - Existing as unconfined, semi-confined, and confined aquifers, including higher permeability sand and gravel outwash deposits and lower permeability glacial till. The combined thickness of these deposits is estimated at 100 to 300 feet in the study area. The outwash is a common aquifer. Glacial till is not usually an aquifer but can produce groundwater in localized areas.
- Limited interglacial deposits - Observed in deep study area borings as relatively fine-grained deposits with low potential for groundwater production.

Groundwater is shallow in the alluvial deposits, often at less than 10 feet below ground surface, and varying considerably with surface topography and season. Groundwater levels in the glacial and non-glacial deposits are variable, estimated to range from 15 feet depth or less to greater than 50 feet depth.

Groundwater from the study area aquifers flows toward the wetlands and drainages of North Creek and the Sammamish River. In many places, the water table is at or near land surface and is hydrologically connected to wetlands and streams. Direct infiltration from precipitation recharges alluvial and glacial deposits; recharge to glacial and non-glacial deposits also occurs from overlying soils.

A study by the U.S. Geological Survey notes that the "quality of water in the aquifer system is suitable for most uses" (Vaccaro et al 1998). However, the study area is urbanized and fully served by public water utilities, so use of groundwater wells is minimal and likely limited to irrigation.

In general, groundwater in the Puget Sound region and Snohomish County area is of appropriate quality to be used for domestic supply and irrigation. Deeper groundwater, such as in the glacial and non-glacial deposits, is typically of better quality than groundwater in shallow alluvial deposits.

Critical Aquifer Recharge Areas

Critical Aquifer Recharge Areas (CARAs) are one element of the critical areas for which Washington's Growth Management Act (GMA) requires local governments to develop policies or regulations to protect their functions and values. CARAs are geographic areas that have a critical recharging effect on aquifers used for potable water (King County 2018). There are no identified CARAs in the study area.

Aquifer Protection Ordinances

There are no applicable Aquifer Protection Ordinances in the study area. However, the study area aquifers still fall under the protection of state groundwater regulations that are applicable to all groundwater.

SECTION 5 PROJECT EFFECTS

This section compares the Project effects using the evaluation criteria described in Section 3, Study Approach, for the No Build Alternative and the Build Alternative (with the Project). This section provides an assessment of operational and construction effects on surface water, floodplains, and groundwater.

5.1 Operational Effects

5.1.1 No Build Alternative

WSDOT evaluated a No Build Alternative to compare the effects of maintaining the status quo to the effects of the Project. With the No Build Alternative, only routine activities such as road maintenance, repair, and safety performance improvements would take place over the next 20 years.

Surface Water Effects

Under the No Build Alternative, conditions would not change from existing conditions. The water quality and flow control retrofit proposed as a part of the Project would not be implemented, and those benefits would not be realized. The discharge of untreated stormwater to surface waters would continue.

Addressing the identified fish barriers would likely be delayed along with any anticipated hydrologic and habitat benefits.

Floodplain Effects

The No Build Alternative would potentially change the floodplain function slightly in flow and flood elevation due to climate change. Although the annual rainfall amount is not expected to change substantially, the increased severity of storms would likely trigger changes in the dimensions of natural channels within the study area. Washington Department of Fish and Wildlife (WDFW) predicts that climate change is likely to increase the base flood flow peaks sufficiently to increase bankfull dimensions of channels in the study area by as much as 5 percent by the 2080s (WDFW 2016).

Within the study area, the Sammamish River hydrology is heavily influenced by the channel capacity near the outlet of Lake Sammamish, so the regional predictions for climate change may not apply directly there. Most likely, increases in severe weather would cause Lake Sammamish levels to fluctuate to higher elevations more often, but the restricted flow out of the lake would translate into longer durations of flow peaks in the river in the study area. Therefore, the Sammamish River and its floodplain would be less susceptible to changes that are predicted for natural channels as a result of climate change.

Because the North Creek floodplain is generally confined by levees, it is less likely to be influenced by climate change. The recurrence or severity of levee breaches could change over time, but those changes would affect the river valley east of I-405.

Addressing the identified fish barriers would likely be delayed in the No Build Alternative along with any anticipated hydrologic benefits associated with those future stream restoration efforts.

Groundwater and Aquifer Effects

The No Build Alternative would maintain existing groundwater and aquifers.

5.1.2 Build Alternative

Surface Water Effects

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 an increase in flows unless they are classified in the *Highway Runoff Manual* (HRM) as major waterbodies that are flow control exempt. The Sammamish River is a considered major waterbody and is flow control exempt.

WSDOT reviewed infiltration potential in the study area and found that it would not be an effective method of flow control because a majority of the Project is on a river valley bottom that has shallow groundwater.

The existing highway already has some permanent flow control and runoff treatment best management practices (BMPs) in place. These BMPs include wet ponds, biofiltration swales, media filter drains, filter strips, and detention facilities. During construction of the new roadway and new BMPs, some existing BMPs would be removed and replaced.

WSDOT would construct stormwater facilities based on the HRM requirements to provide runoff treatment and detention for increased stormwater runoff. WSDOT would also provide runoff treatment retrofit for approximately 23 acres of existing pollution-generating impervious surfaces (PGIS). The Project would detain a portion of existing impervious surfaces to meet or exceed the minimum requirements. The Build Alternative would reduce peak flow rates of stormwater discharged to streams as compared to existing conditions because detention design targets pre-development conditions that mimic forested landcover for the range of storm recurrences from half of the 2-year up to the 50-year storm. This level of flow control also typically results in a significant reduction of 100-year peak flows from the area collected for detention. One exception of reducing peak flow rates is discharges to the Sammamish River, which is identified as a major waterbody and is flow control exempt.

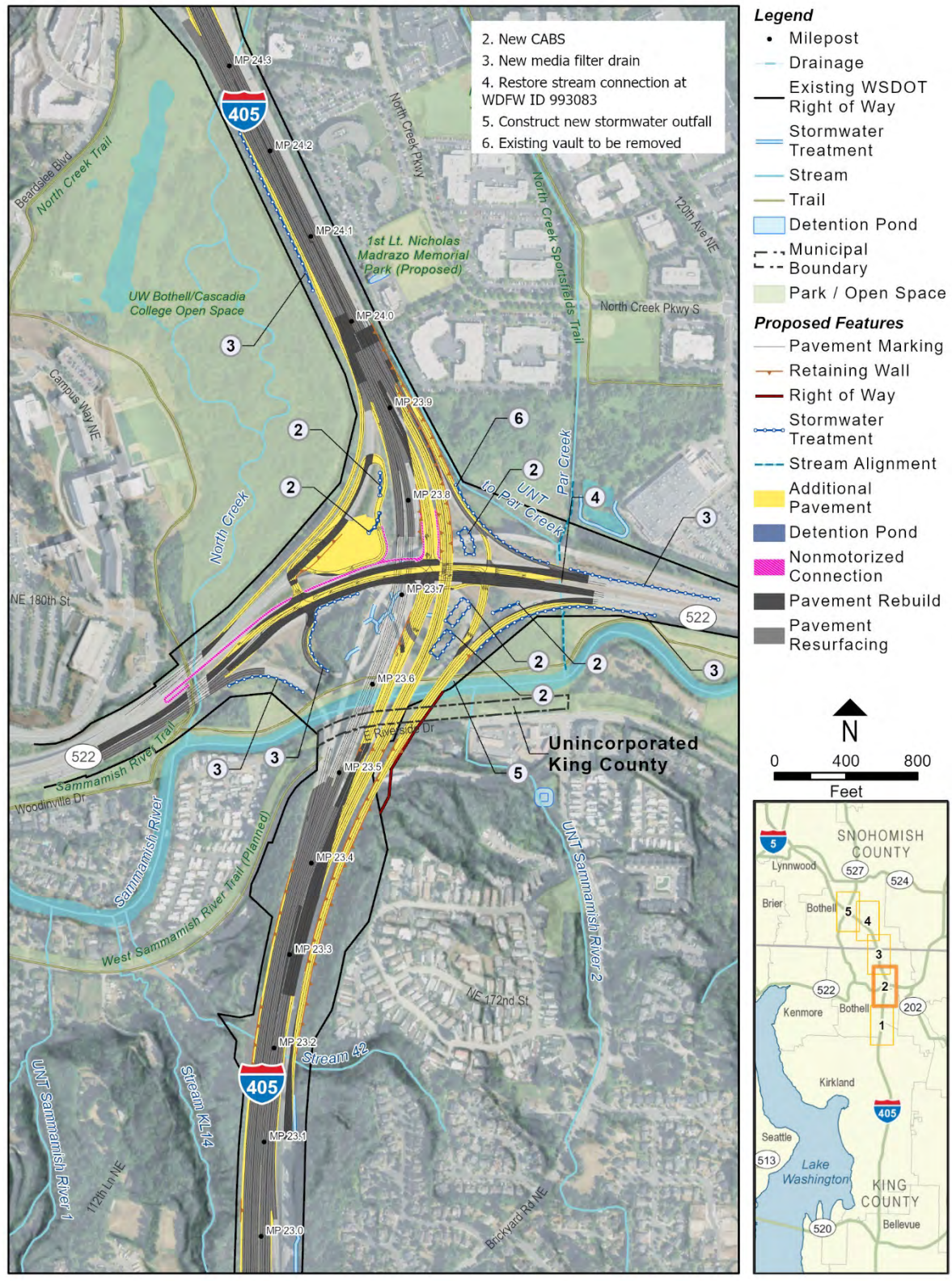
In the current Project design, the existing detention ponds would likely remain, but some of the existing detention tanks, media filter drains, and biofiltration swales would be impacted. The Project design proposes new detention and runoff treatment facilities. The conceptual stormwater design will continue to develop as the Project continues through WSDOT design-build procurement, so design optimization could change which facilities are impacted and the locations or types of new facilities.

Exhibit 5-1, Sheets 1 through 5, shows existing and proposed stormwater treatment facilities in the study area.

Exhibit 5-1. Existing and Proposed Stormwater Facilities, Sheet 1 of 5

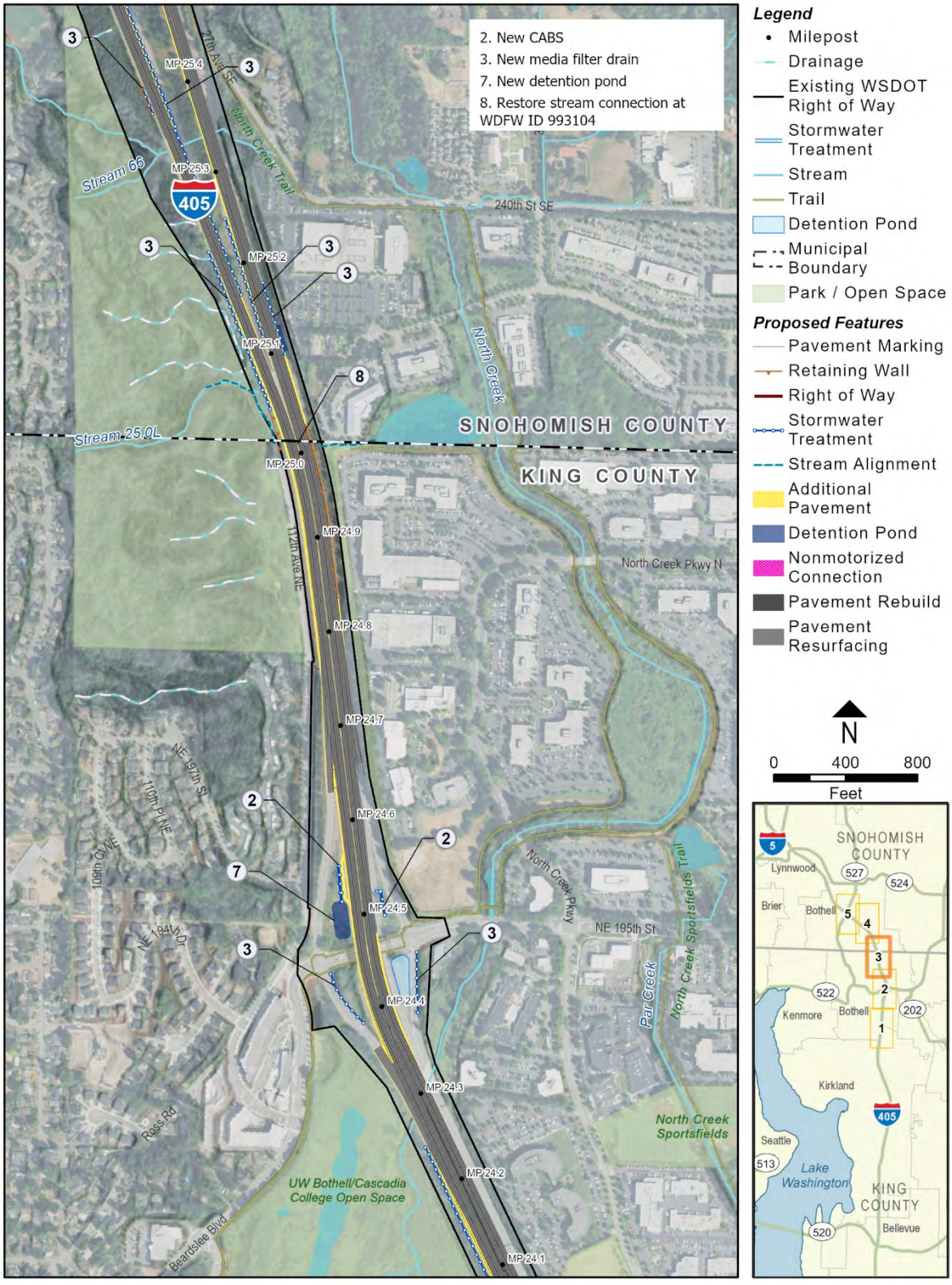
CABS = compost-amended biofiltration swales

Exhibit 5-1. Existing and Proposed Stormwater Facilities, Sheet 2 of 5



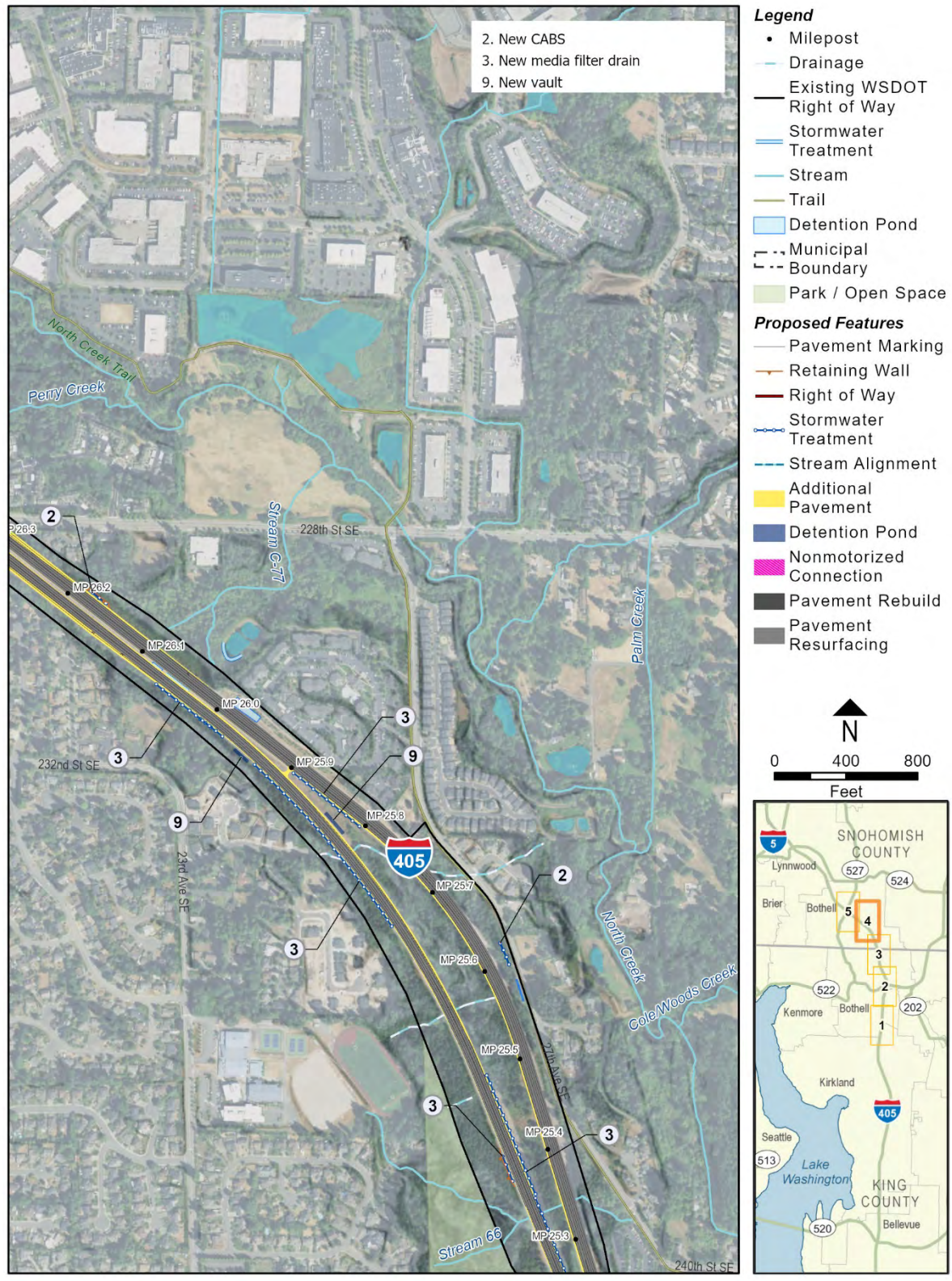
CABS = compost-amended biofiltration swales

Exhibit 5-1. Existing and Proposed Stormwater Facilities, Sheet 3 of 5



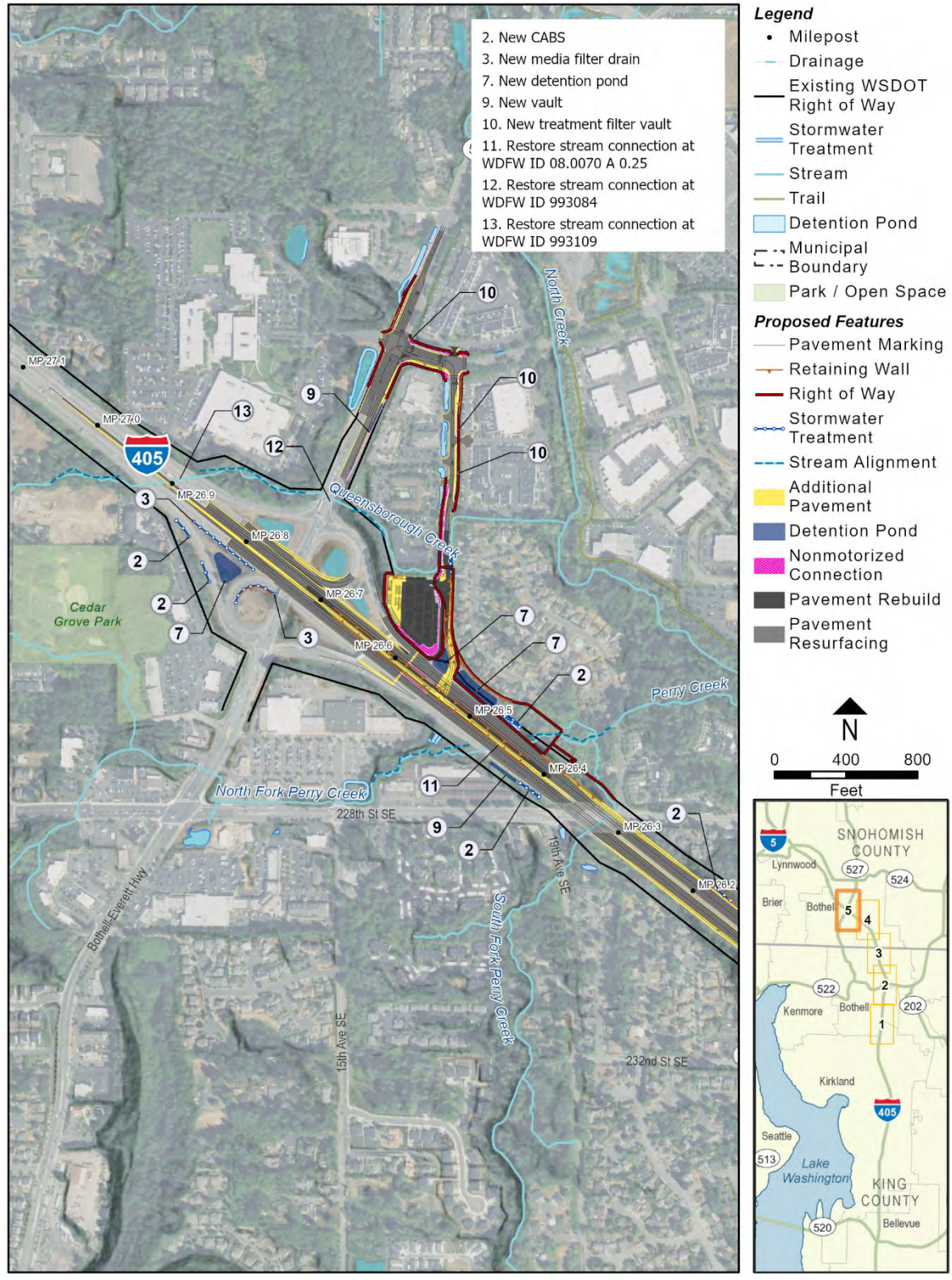
CABS = compost-amended biofiltration swales

Exhibit 5-1. Existing and Proposed Stormwater Facilities, Sheet 4 of 5



CABS = compost-amended biofiltration swales

Exhibit 5-1. Existing and Proposed Stormwater Facilities, Sheet 5 of 5



CABS = compost-amended biofiltration swales

Exhibit 5-2 summarizes the proposed runoff treatment based on the current Project design. The amounts are subject to change as the design progresses. As long as they meet these proposed enhancement treatment levels, the design-build contractor may elect to implement different stormwater treatment facilities than those specified in Exhibit 5-2.

Exhibit 5-2. Summary of Existing and Proposed Pollution-Generating Impervious Surfaces

Sub-watershed	Receiving Waterbody	TDA	Existing I-405 PGIS (acres)	Existing Type of Facility	Existing I-405 PGIS Treatment (acres)	Build Alternative Proposed New PGIS in TDA (acres)	Build Alternative Proposed Type of Facility	Build Alternative Proposed Treated PGIS (acres)
Sammamish River	Stream KL14	F2	4.11	None	0	0.06	None	0
	Stream 42	F3	1.40	None	0	0	None	0
	Sammamish River	G2	52.98	CABS	10.65	15.75	CABS	45.19
				MFD	3.02			
				Wet Vault	3.30		MFD	4.28
	North Creek Confluence	G4	4.85	None	0	0	MFD	0.43
North Creek	North Creek	I1	21.36	MFD	3.52	1.88	MFD	2.27
							CABS	3.62
	Stream 66	I2	3.76	MFD	0.55	0.46	MFD	0.63
							CABS	1.03
	Stream 25.0L	I3	2.61	MFD	0.91	0.41	MFD	1.85
	Stream 70	I4	4.51	MFD	1.26	0.75	MFD	1.51
							CABS	1.47
	Stream C-77	J1	4.01	MFD	1.21	0.70	MFD	1.67
							CABS	0.50
				CSW	0.89		CSW	0.89
	Perry Creek	J2	10.50	Bioswale	2.16	1.43	CABS	11.51
				Wet Vault	4.45			
	North Creek	NW01	1.92	None	0	0.11	None	0

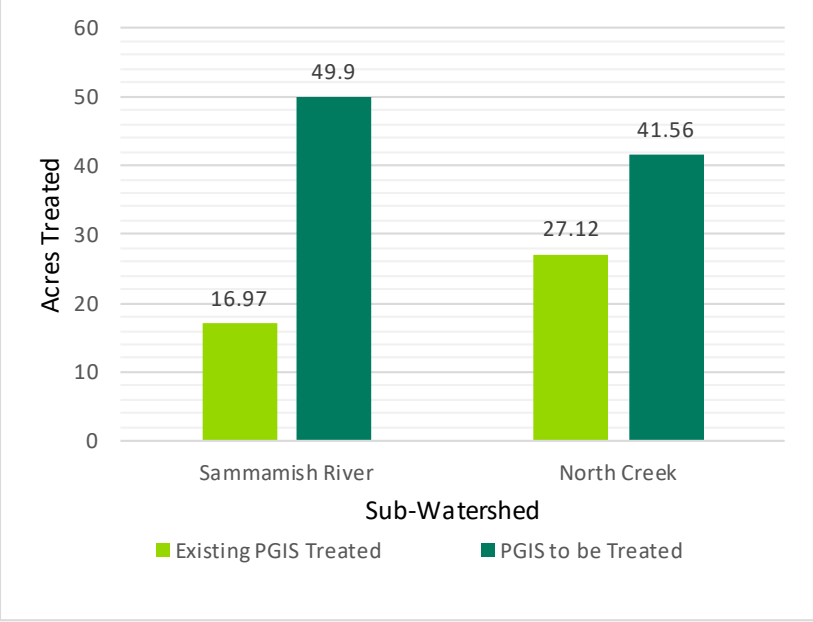
Exhibit 5-2. Summary of Existing and Proposed Pollution-Generating Impervious Surfaces

Sub-watershed	Receiving Waterbody	TDA	Existing I-405 PGIS (acres)	Existing Type of Facility	Existing I-405 PGIS Treatment (acres)	Build Alternative Proposed New PGIS in TDA (acres)	Build Alternative Proposed Type of Facility	Build Alternative Proposed Treated PGIS (acres)
North Creek	Queensborough Creek	NW02	19.86	Wet Pond	9.35	2.36	Wet Pond	8.14
				MFD	0.37		CABS	4.89
				Bioswale	2.45		MFD	0.82
							MF	0.76
	North Creek	NW03	0.39	None	0	0.11	None	0
		Totals	132.26		44.09	24.02		91.46

CABS = compost amended biofiltration swale; CSW = constructed stormwater wetland; MF = media filter; MFD = media filter drain; PGIS = pollution-generating impervious surface; PS = Puget Sound; TDA = threshold discharge area

Exhibit 5-3 summarizes the differences in runoff treatment before and after the Project.

Exhibit 5-3. Comparison of Existing and Build Alternative Runoff Treatment



PGIS = pollution-generating impervious surface

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.

WSDOT's *Quantitative Procedure for Surface Water Impact Assessments* provides guidelines for evaluating likely effects for pollutant load as a percent change for the five key pollutants: total suspended solids (TSS), total and dissolved copper (TCu and DCu), and total and dissolved zinc (TZn and DZn) (WSDOT 2009). This guidance looks at average annual pollutant loading and compares the change in treated highway PGIS to untreated highway PGIS in the study area, as summarized in Exhibit 5-4.

This pollutant loading assessment is a planning tool designed to identify a project's likelihood to have an effect on chronic issues that trigger Section 303(d) listings where state water quality standards are not met. If streams and rivers have capacity to assimilate pollutant loads, the state water quality standards are met. By checking TSS, TCu, DCu, TZn, and DZn loads, WSDOT can draw conclusions about the likelihood for the Project to have an effect for the full range of pollutants set by state water quality standards.

Exhibit 5-4. Changes in Pollutant Loading by Threshold Discharge Area

Basin	Receiving Waterbody	TDA	Total Suspended Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
Sammamish River	KL14	F2	2%	2%	2%	2%	2%
	Stream 44	F3	0%	0%	0%	0%	0%
	Sammamish River	G2	-45%	-32%	7%	-35%	-14%
	North Creek Confluence	G4	-8%	-7%	-2%	-7%	-5%
North Creek	North Creek	I1	-1%	1%	6%	0%	3%
	Stream 66	I2	-16%	-11%	5%	-12%	-4%
	Stream 25.0L	I3	-23%	-15%	7%	-17%	-5%
	Stream 70	I4	-23%	-15%	8%	-17%	-5%
	Stream C-77	J1	-7%	-1%	13%	-2%	6%
	Perry Creek	J2	-63%	-41%	2%	-46%	-18%
	North Creek	NW01	6%	6%	6%	6%	6%
	Queensborough Creek	NW02	2%	5%	10%	4%	8%
	North Creek	NW03	28%	28%	28%	28%	28%
Overall			-24%	-16%	7%	-18%	-6%

TDA = threshold discharge area

Source: WSDOT conceptual design as of February 2020

Overall, the assessment shows that the Build Alternative would reduce stormwater total suspended solids, total copper, total zinc, and dissolved zinc pollutant loading compared to existing conditions. There would be an increase in dissolved copper. Because total copper would decrease, the change in the amount of the dissolved copper is more than compensated by the reduction in the non-dissolved copper.

Most of the discharge locations for specific TDAs have a similar finding: a reduction in total pollutants and an increase in dissolved copper and zinc. The assessment also found that some discharges would experience an increase in total and dissolved loads for each of the pollutants evaluated.

When considering these model results, it is important to note that this the model is a rough estimating tool to evaluate average annual discharges based on generalized information. The model treats all runoff treatment the same based on data for both basic and enhanced runoff treatment BMPs. The model does not account for the added benefit of WSDOT's requirement for enhanced runoff treatment BMPs and does not consider that some of the proposed BMPs would have additional pollutant losses through infiltration.

Total pollutant loads are also relevant to the consideration of overall health of a waterbody. As discussed in Section 4, receiving waterbodies in the study area do not meet state water quality standards for certain pollutants or conditions not associated with highway runoff, including dissolved oxygen, bacteria, temperature, bacteria, and bio assessment. Impacts for suspended solids, copper, zinc, and other pollutants associated with highway runoff are not indicated at this time. Therefore, the proposed Project would likely not have an effect on the receiving waterbody's ability to continue meeting state water quality standards.

Exhibit 5-5 and Exhibit 5-6 show the change in total pollutant loading with the proposed Project as compared to the No Build Alternative for the five key pollutants assessed.

Exhibit 5-5. Comparison of Total Suspended Solids

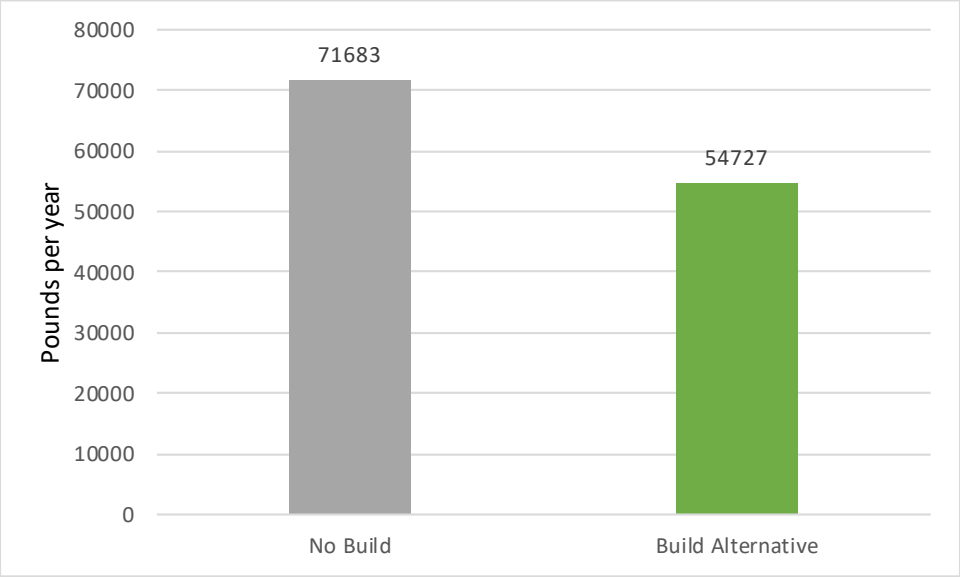
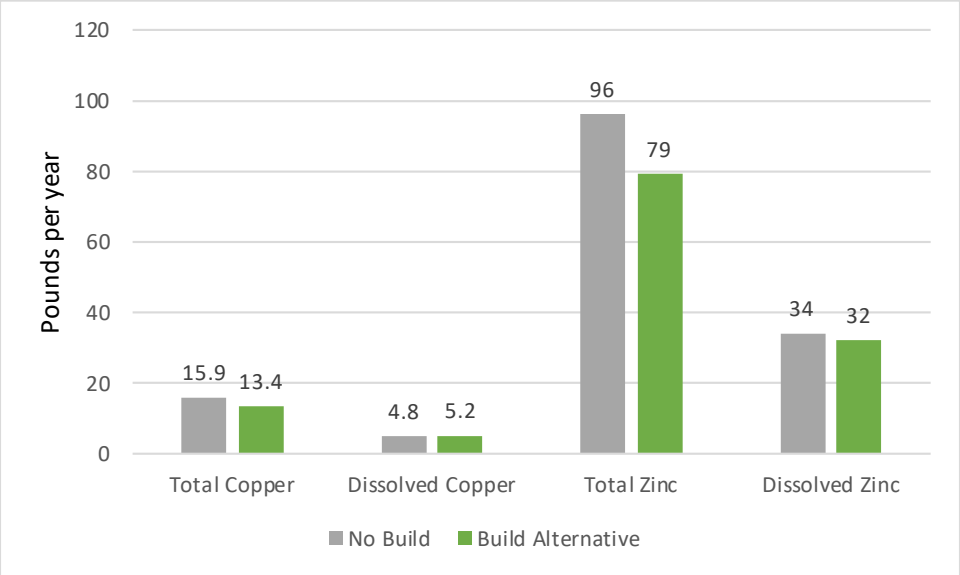


Exhibit 5-6. Comparison of Total Copper and Zinc and Dissolved Copper and Zinc



Floodplain Effects

The Build Alternative proposes very minor changes within floodplains in the study area. WSDOT and local design criteria mandate zero rise in the floodplain water surface elevations and compensatory excavation to address any floodplain volume losses within the floodplain, so floodplain effects are not expected. This Project proposes to remove four bridge piers out of the Sammamish River. All new bridge piers would be placed outside of the ordinary high water mark, with up to six bridge piers (two per proposed bridge) placed within the 100-year floodplain. Although this change would increase effects on the floodplain, the removal of the piers out of the Sammamish River would decrease the likelihood of backwater effects. Therefore, by design, the Project would have no effect on hydraulics or hydrology within the study area.

The Build Alternative would be no different than the No Build Alternative with respect to regulated floodplain changes related to climate change.

The Project's new restored stream connections would make the Project more resilient to future changes in the 100-year flood condition on the smaller streams. Those restored connections would provide enough room for the natural stream processes that would adjust to changes in severity and frequency of storms in the future.

Groundwater and Aquifer Effects

The study area does not contain wellhead protection areas or a sole source aquifer, so the Build Alternative would not have any potential groundwater effects, such as contamination and/or reduced well capacity.

5.2 Construction Effects

Without proper controls and/or measures to minimize effects, facility construction can have adverse effects on water quantity and quality in receiving waterways. Such effects would result

from site clearing and subsequent earth-moving and excavation activities in which vegetation and other naturally occurring, soil-stabilizing materials are removed from the construction site. The exposed surface areas, slopes, and stockpiles of soil created by freeway construction would be subject to erosion until the earthwork is completed and a protective vegetative cover is restored, or the surface is artificially stabilized (Barrett et al. 1995).

Although freeway construction would create adverse, short-term effects in surface waters, such effects would be minimized through implementation of the erosion control and sedimentation BMPs that will be used for the Project.

5.2.1 No Build Alternative

With the No Build Alternative, construction effects to surface water, floodplains, or groundwater would be limited to short-term effects during ongoing activities to maintain I-405 in the study area.

5.2.2 Build Alternative

Surface Water

The existing highway 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 existing BMPs would be removed so that they can be replaced. WSDOT would use construction BMPs to maintain water quality during construction periods when permanent BMPs may not be functional.

Floodplains

The Sammamish River, North Creek, and the smaller receiving waters and drainage systems in the study area would each receive only a small percentage of total flow from construction areas. Each receiving water body is anticipated to have sufficient capacity to convey the flow without increasing the existing flood risk. Detention provided by the existing flow control facilities and temporary erosion and sediment controls would help prevent downstream flooding, erosion, and sedimentation during construction.

New cross-culverts would typically be constructed in the dry, although there could be in-water work associated with some culvert replacements. Existing streams and watercourses would be conveyed under I-405 via existing cross-culverts until the new cross-culverts and associated channel modifications are completed. This approach would maintain existing conveyance across I-405 during construction.

Groundwater and Aquifers

The study area does not contain wellhead protection areas or a sole source aquifer, so there would be no potential groundwater effects, including contamination and/or reduced well capacity due to construction activities. The contractor will be required to prepare and actively maintain a spill prevention control and countermeasures plan to ensure that groundwater is protected during all stages of construction.

5.3 Indirect Effects

Driscoll et al. reported that surrounding land use is the most important general factor influencing pollutant loads on highways (Driscoll et al. 1990). In general, highways in heavily developed areas have greater pollutant loads.

Although the Project would add more highway surface area, the overall total pollutant load would be decreased because the Project would treat an area equal to the new additional pavement area plus another 26 percent of the existing untreated highway runoff.

The watersheds in the study area are already developed. Future development would be required to comply with applicable regulations protecting surface waters, floodplains, groundwater, and aquifers in the area. Therefore, streamflow and wetland conditions within the study area watersheds would be likely to remain the same or decrease.

SECTION 6 MEASURES TO AVOID OR MINIMIZE EFFECTS

The Project will mitigate for impacts during and after construction using the strategies described in this section.

6.1 Operational Mitigation

- Follow the WSDOT *Maintenance Manua*l when construction is complete (WSDOT 2019c).
- Control stormwater so that peak and base flows of receiving waters are not adversely affected by treated stormwater discharge from additional pollution-generating impervious surface areas created by the Project.

6.2 Construction Mitigation

- Protect groundwater with the use of standard best management practices (BMPs).
- Prepare and implement a temporary erosion and sediment control plan and a spill prevention control and countermeasures plan.
- Locate spill response equipment at regular and specified intervals along the Project alignment.

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ATTACHMENT A - ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
ADA	Americans with Disabilities Act
BMP	best management practice
CABS	compost-amended biofiltration swale
CARA	critical aquifer recharge area
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CWA	Clean Water Act
DCu	dissolved copper
DZn	dissolved zinc
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
ETL	express toll lane
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	flood insurance rate map
GIS	geographic information system
GMA	Growth Management Act
GP	general purpose
HOV	high-occupancy vehicle
HPA	Hydraulic Project Approval
HRM	Highway Runoff Manual
I-405	Interstate 405
LiDAR	light detection and ranging
MFD	media filter drain
MP	milepost

NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OEO	Office of Equal Opportunity
PGIS	pollutant-generating impervious surface
RCW	Revised Code of Washington
RM	river mile
ROD	Record of Decision
SEPA	State Environmental Policy Act
SPCC	Spill prevention, control, and countermeasures
SR	State Route
SWPPP	stormwater pollution prevention plan
TCu	total copper
TDA	threshold discharge area
TESC	temporary erosion and sediment control
TSS	total suspended solids
TZn	total zinc
UNT	unnamed tributary
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resources Inventory Area
WSDOT	Washington State Department of Transportation