Attachment 11

NE 4th Street/ 120th Avenue NE Corridor Project

Water Quality Technical Report

prepared for
City of Bellevue

prepared by
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July 2011

Attachment 11

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Acronyms and Abbreviations

BCC	Bellevue City Code
BMP	best management practice
City	City of Bellevue
CSWPPP	Construction Stormwater Pollution Prevention Plan
Ecology	Washington State Department of Ecology
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GMA	Growth Management Act
I-405	Interstate 405
NAVD	North American Vertical Datum of 1988
NGVD	National Geodetic Vertical Datum of 1929
OHWM	ordinary high water mark
PGIS	pollutant-generating impervious surface
SCS	Soil Conservation Service
SPCC	spill prevention contingency and countermeasures
TDA	threshold discharge area
TESC	temporary erosion and sediment control
TSS	total suspended solids
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

Glossary

100-year floodplain	An area with a 1 percent chance of being flooded in any given year.
Alluvial sediments	Sediment is a general term for any unconsolidated particulate material that has been deposited by an agent of transport, such as water, ice, or wind. Alluvial sediment is unconsolidated particulate material that has been deposited by a river or stream.
AKART	All known, available, and reasonable methods of prevention, control, and treatment. The most current methodology that can be reasonably required for preventing, controlling, or abating the pollutants associated with a discharge. The concept of AKART applies to both point and nonpoint sources of pollution. Best management practices (BMPs) typically applied to nonpoint source pollution controls are considered a subset of the AKART requirement.
Best Management Practices (BMPs)	Physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollutant discharge.
Clean Water Act 303(d) List	Section 303(d) of the federal Clean Water Act requires Washington State to prepare a list of all surface waters in the state for which beneficial uses of the water—such as for drinking, recreation, aquatic habitat, and industrial use—are impaired by pollutants.
Construction Stormwater Pollution Prevention Plan (CSWPPP)	A stand-alone document for a construction project that describes the potential for pollution problems and defines approaches to control the identified problems. A narrative and drawings are required and must be modified as necessary as the work progresses.
Detention pond	One of the most common types of stormwater flow control facilities. A detention pond is used for temporarily holding stormwater runoff so that it can be released at a controlled rate.
Emergent wetlands	Wetlands dominated by herbaceous plants.
Endangered species	An endangered species is any species that is in danger of extinction throughout all or a significant portion of its range.
Floodway	The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base (100-year) flood without cumulatively increasing the water surface elevation more than a designated height. For the City of Bellevue, the designated height is zero feet (FEMA, NFIP Policy Index).

Flow Control	Flow control facilities or practices control the rate, frequency and flow duration of stormwater runoff. These measures can include detention ponds or pipes, infiltration facilities, constructed wetlands and bioretention facilities.
Hydrology	The science that relates to the occurrence, properties, and movement of water on the earth. It includes water found in the oceans, lakes, rivers, streams, and wetlands, as well as in upland areas, above and below ground, and in the atmosphere.
Impervious surface	A hard surface, such as a rooftop, walkway, road, parking lot, and compacted urban soils, that prevents or retards rain from passing through or penetrating and moving into soils as it would naturally.
Low Impact Development (LID)	A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation and transpiration by emphasizing conservation, use of on-site natural features, site planning and distributed stormwater management practices that are integrated into a project design. Other terms often used to describe the stormwater management practices are natural drainage or green stormwater infrastructure.
Mitigation	The measures that could be taken to lessen the negative effects predicted for each resource. These measures may include reducing or minimizing a specific negative effect, avoiding it completely, or rectifying or compensating for the negative effect.
Ordinary High Water Mark (OHWM)	A physical mark along most waterways that indicates the height normally reached during average high flow.
Pollutant	Any substance that upon reaching the environment (soil, water, or air), is degrading in effect so as to impair the environment.
Pollution Generating Impervious Surfaces (PGIS)	Impervious surfaces considered to be a significant source of pollutants in stormwater runoff. Such surfaces include those subject to vehicular use or storage or erodible or leachable materials, wastes, or chemicals, and that receive direct rainfall.
Right-of-way	Right-of-way is the land set aside for use as a highway. Rights-of-way are purchased (acquired) prior to the construction of a new road. Usually enough extra land is purchased for the purpose of providing safety clearances, building retaining walls, and implementing other mitigation features.
Riparian area	A riparian area is an area of land covered by vegetation and adjacent to and influenced by streams, lakes, and open water wetlands.
Salmonid	Belonging to the family Salmonidea, including salmon, trout, and whitefish.

Sediment	A general term for any unconsolidated particulate material that has been deposited by an agent of transport, such as water, ice, or wind.
Spill Prevention, Control, and Countermeasures (SPCC)	A SPCC plan includes site information regarding hazardous materials, spill prevention and containment methods, response procedures, and equipment and material to carry out preventive and response measures. SPCC plans ensure that all harmful and/or deleterious materials are properly stored and contained.
Stormwater runoff	Stormwater runoff is the portion of precipitation (rainwater or snowmelt) that does not naturally seep into the ground or evaporate, but flows overland via ditches, surface flow, pipes, or other features into a defined surface water or treatment facility.
Temporary Erosion and Sediment Control (TESC) plan	The TESC plans are the drawings that demonstrate how a construction project will prevent and minimize erosion and other impacts to water quality, supporting the CSWPPP narrative.
Threatened species	A threatened species is any species that is likely to become endangered within the foreseeable future.
Threshold Discharge Areas	An onsite area draining to a single natural discharge location or multiple natural discharge locations that combine within one-quarter mile downstream.

Executive Summary

The NE 4th Street/120th Avenue NE Corridor Project would increase the amount of impervious surface in the study area, however, stormwater management practices for the project would adhere to Bellevue City Code (BCC) 24.06.05, as required by the City's National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit. Stormwater management practices that would be used on the project, which include flow control and runoff treatment. These practices "are presumed to meet the technology-based treatment requirement of State law to provide all known available and reasonable methods of treatment, prevention, and control (AKART; RCW 90.52.040, and RCW 90.48.010)."

Implementation of the requirements set forth in BCC 24.06.05 is considered necessary to protect the beneficial uses of receiving waters (both surface and ground waters) in the project corridor. The project would provide flow control and treatment as required by the City of Bellevue (City) to protect Sturtevant Creek, the West Tributary of Kelsey Creek, and groundwater in the study area.

The existing culvert for the West Tributary of Kelsey Creek would be replaced as part of the project. The cross-sectional area for the culvert would be increased, which would increase the culvert's flood-carrying capacity.

The Build Alternative, in conjunction with other past, present, and reasonably foreseeable actions, would degrade surface-water resources by the incremental conversion of pervious surface and the incremental conversion of non-pollution-generating impervious surface to pollution-generating impervious surface. The majority of the landscape in the two subbasins has already been altered by the past loss of pervious surfaces, altered flow conditions, and conversion to a built environment.

The additive effects of the Build Alternative, in combination with other actions, could further degrade surface-water resources. The stormwater treatment systems that would be installed as part of the project exceed the City's treatment requirements, which comply with the State AKART requirements, any resulting degradation is considered minimal per the Washington State Department of Ecology (Ecology) standards. In addition, dilution modeling performed for the Biological Assessment shows that metal concentrations would reach background levels within a few feet of entering water bodies.

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1.0 Introduction

1.1 Purpose of this Report

This *Water Quality Technical Report* was being prepared for the City of Bellevue's NE 4th Street/120th Avenue NE Corridor Project. The project proposes to extend NE 4th Street east from its current terminus at 116th Avenue NE to a new intersection with 120th Avenue NE, and widen and realign 120th Avenue NE north from the new intersection with NE 4th Street in the south to Northup Way.

The purpose of this report is to describe the existing water quality, groundwater, surface water, and floodplains in the study area; discuss the adverse effects and benefits the project would have on those resources; and identify mitigation measures to address adverse effects, as needed.

1.2 Permits Needed

The permits required with respect to the water resources discussed in this technical report are listed in Table 1-1.

Table 1-1. Permits Required

Permit	Agency	Trigger
Clean Water Act Section 404 Permit	U.S. Army Corps of Engineers and Washington State Department of Ecology (Ecology)	All work below the ordinary high water mark (OHWM) for the culvert modification and within wetlands
Hydraulic Project Approval	Washington Department of Fish and Wildlife	Culvert modification
Clean Water Act Section 401 Water Quality Certification	Ecology	Section 404 permit
National Pollutant Discharge Elimination System Construction Stormwater Permit	Ecology	Construction stormwater discharge resulting from soil disturbance of 1 acre or more
Clearing and Grading Permit	City of Bellevue	Construction activities of clearing and grading
Building Permit	City of Bellevue	Clearing and Grading Permit
Approved Conditional Use Permit	City of Bellevue	Clearing and Grading Permit
Preliminary Plat Approval	City of Bellevue	Clearing and Grading Permit
Shoreline Approval or Exemption	City of Bellevue	Clearing and Grading Permit
Right-of-Way Use Permit	City of Bellevue	Clearing and Grading Permit
Demolition Permit	City of Bellevue	Clearing and Grading Permit
Utility Developer System Extension Agreement	City of Bellevue	Clearing and Grading Permit
Critical Area Special Condition for a Clearing and Grading Permit	City of Bellevue	Clearing and Grading Permit for culvert construction

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2.0 Proposed Project

2.1 Project Overview

The City proposes to implement arterial street transportation improvements to NE 4th Street and 120th Avenue NE in Bellevue, Washington. The improvements along the combined roadway corridors are referred to as the NE 4th Street/ 120th Avenue NE Corridor Project. The project corridor is located approximately 1 mile east of Downtown Bellevue. Major regional transportation connections and facilities in the project vicinity include Interstate 405 (I-405) to the west and State Route 520 (SR 520) to the north.

The project extends from the intersection of NE 4th Street with 116th Avenue NE eastward to 120th Avenue NE and then northward along 120th Avenue NE to Northup Way. Key project elements include—the extension of NE 4th Street from its existing terminus with 116th Avenue NE eastward to 120th Avenue NE; widening of existing 120th Avenue NE from the proposed intersection with NE 4th Street northward to Northup Way; and the realignment of a new segment of 120th Avenue NE between NE 8th Street and NE Bel-Red Road. Figure 2-1 shows the project study area.

The NE 4th Street/120th Avenue NE Corridor Project is one of a number of high priority transportation investments that make up the City of Bellevue's Mobility and Infrastructure Initiative. This initiative was formed to address unprecedented growth in Downtown Bellevue and to support planned growth in the Bel-Red, Spring District, and Wilburton areas.

Other key projects included in the initiative that would complement the proposed project include the following:

- NE 5th Street neighborhood project improvements
- NE 6th Street Extension from 112th Avenue NE to 120th Avenue NE
- NE 15th/NE 16th multi-modal corridor improvements north of NE 12th Street (also supporting Sound Transit's East Link Project)
- 124th Avenue NE improvements from NE 8th Street to Northup Way.

For each of these projects, new travel lanes, non-motorized facilities, signal enhancements, illumination, stormwater treatment and flow control, and various structure and utility relocations would be included.

Figure 2-1. Project Study Area

2.2 Project Purpose and Need

The purpose of the proposed project is to achieve the following:

- Support and accommodate the City's adopted future land use changes and resulting travel demands.
- Improve local traffic circulation.
- Bring corridor features into compliance with current and proposed design standards and guidelines.
- Prepare the project corridor to support connections to planned transit facilities, specifically Sound Transit's East Link Project light rail alignment.

Collectively, the proposed project elements (see Figure 2-2) would enhance area-wide mobility by adding capacity to support the expected growth in travel demand, constructing critical missing links in the City's traffic distribution network, and easing congestion in other travel corridors. Moreover, the project would provide planned pedestrian and bicycle facilities, as well as enhanced connections to transit facilities identified in City plans.

It would improve access for other modes to local recreational facilities, businesses, and the planned Link light rail stations at NE 8th Street and 118th Avenue NE and between NE 15th and NE 16th Streets just east of 120th Avenue NE.

In summary, the proposed project would meet the following objectives:

- To provide acceptable level of service at existing and planned study area intersections to meet anticipated long-term travel demands.
- To improve access and connectivity with the regional and local transportation networks.
- To enhance long-term traffic operations over time by incorporating design standards that serve a variety of transportation modes, including the needs of large trucks and freight vehicles, as well as buses.
- To improve quality of life by improving mobility and transportation choice, particularly for transit, bicycle, and pedestrian traffic.
- To improve the water quality by providing stormwater treatment. Although the City code only requires runoff from 2.8 acres of PGIS to be treated, the City is voluntarily providing treatment for runoff from another 1.8 acres of PGIS.

As shown in preliminary traffic analysis work for the NE 4th Street extension and the widening and realignment of 120th Avenue NE, the project elements would enhance the Wilburton/NE 8th Street and Bel-Red Subareas as well as the region in terms of travel mobility and access to neighborhoods and businesses. This is primarily the result of new and enhanced connections across the Burlington Northern Santa Fe (BNSF) corridor and NE 8th Street, respectively. The proposed

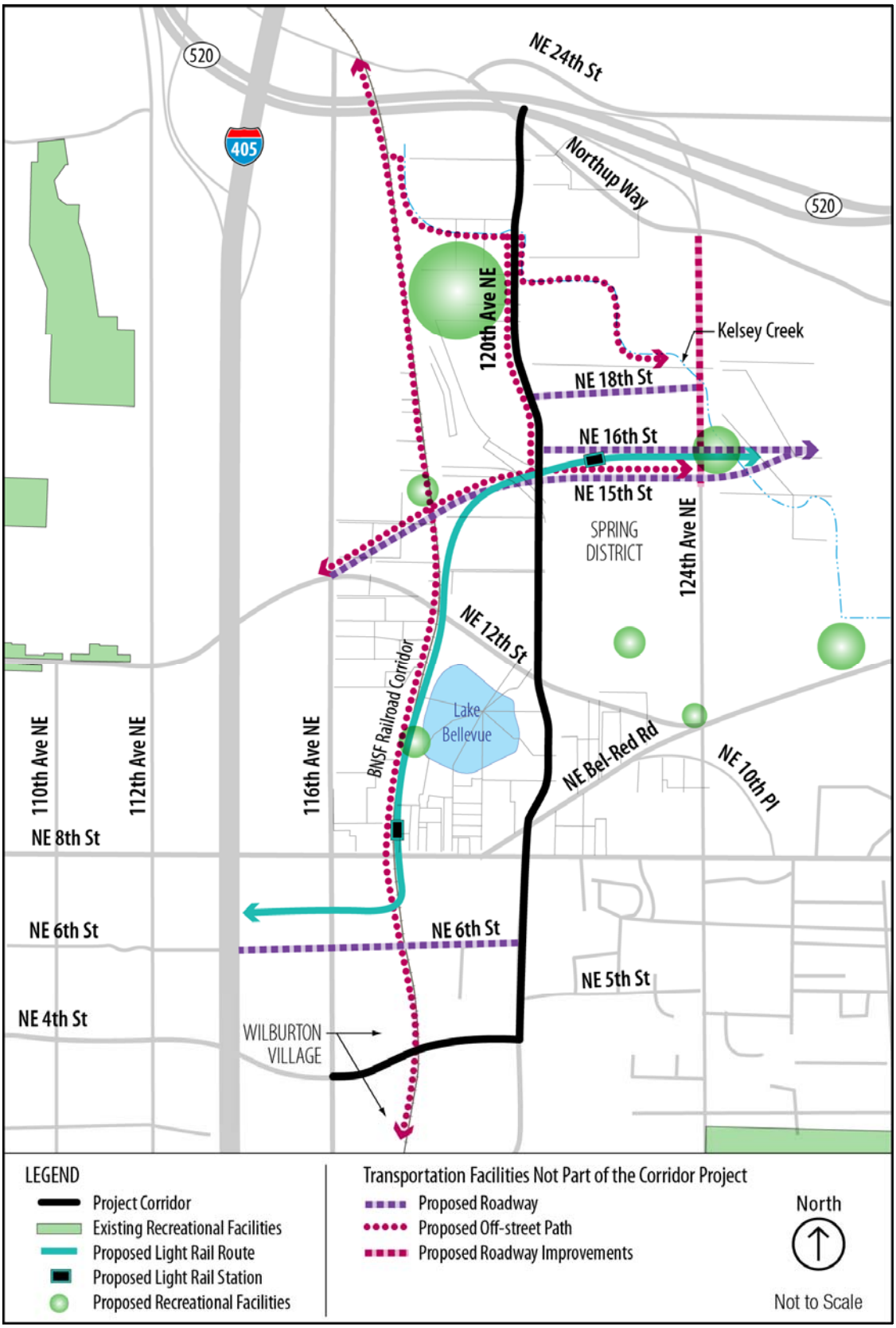

Figure 2-2. Planned Transportation Connections in the Study Area

project also provides expanded arterial street capacity and driveway consolidation along 120th Avenue NE. The project termini are logical because they bracket the extent of the expected future development in the Wilburton/ NE 8th Street and Bel-Red Subareas and would complement adjacent roadway improvements and planned light rail transit facilities.

2.3 Corridor Improvements

2.3.1 Programmed Corridor Improvements

This corridor is comprised of two projects currently listed in the regional and state transportation improvement programs. These projects are described below.

- **NE 4th Street Extension (116th to 120th Avenues NE)**—Construct a new four to five lane roadway with arterial standard curb, gutter, sidewalk (including planting strips) and five-foot bike lanes on both sides. The project includes a new signalized intersection at 120th Avenue NE and illumination, landscaping, and stormwater drainage/detention. The extension will be designed to accommodate future development and uses of the BNSF corridor.
- **120th Avenue NE Corridor—NE 4th Street to Northup Way**
  - From NE 4th to NE 18th Streets—Widen to five lanes with a two-way center turn lane; provide bike lanes along selected segments; install continuous sidewalks to arterial standards; realign the roadway between NE Bel-Red Road and NE 8th Street; and improve intersections (including additional turn lanes) at NE 8th, NE 12th, and NE 16th Streets.
  - From NE 18th Street to Northup Way—Widen to four lanes with arterial standard sidewalk and a separated multi-use path on the west side. The project will be constructed in phases. Federal funding awarded to improvements, including bike lanes, planned between NE 4th and NE 8th Streets.

This revised description was submitted to Puget Sound Regional Council (PSRC) April 8, 2011 for the June 2011 Amendment to the Statewide Transportation Improvement Program (STIP).

2.3.2 Proposed Corridor Improvements

Specific design elements include the following:

- Extend NE 4th Street as a five-lane roadway from 116th Avenue NE to 120th Avenue NE. There are two minor alignment options under consideration for this proposed roadway extension east of the BNSF corridor. Impacts of both options are considered in this analysis.
- Widen 120th Avenue NE to five travel lanes from the NE 300 block to the planned NE 15th Street intersection.

- Extend 120th Avenue NE south of NE Bel-Red Road to NE 8th Street. The existing section of NE Bel-Red Road from NE 8th Street east to 120th Avenue NE, roughly 300 feet long, would be abandoned.
- Widen 120th Avenue NE to four lanes north of NE 18th Street to just south of Northup Way with a transition section occurring between NE 15th and NE 18th Streets.
- Construct improvements that support the planned new intersections at NE 15th/16th and NE 18th Streets and Sound Transit's East Link light rail line that would pass under 120th Avenue NE.
- Install continuous sidewalks and bicycle facilities designed to arterial street standards on NE 4th Street and 120th Avenue NE north to NE 15th Street. North of NE 15th Street, a two-way bicycle trail would be located on the west side of the roadway to allow connection with planned regional trails west, north, and east of 120th Avenue NE. Sidewalks will still be present on both sides of 120th Avenue NE north of NE 15th Street.
- Install planting strip(s) on both sides of the roadways and create other green spaces where possible.
- Install stormwater conveyance, detention, water quality treatment facilities, and use natural drainage practices[1] to the extent practicable.
- Connect with and minimize effects to wetlands and open space areas, including a planned community park near Northup Way.
- Provide other project elements, including illumination, landscaping, structural retaining walls, traffic signals, and new and relocated utilities.

The five-lane roadway design is proposed for both the extension of NE 4th Street from 116th Avenue NE to 120th Avenue NE and the widening/realignment of 120th Avenue NE north to NE 15th Street. This proposed roadway cross-section is shown in Figure 2-3. The roadway would be designed to meet City standards for an urbanized arterial that has four through travel lanes—two 11-foot-wide lanes in each direction. A center 12-foot-wide, two-way, left-turn lane would allow turning movements to adjacent properties. Generally, a 5-foot-wide bike lane would be provided on each side of the roadway adjacent to the curb. A 4- to 5-foot-wide planter strip is proposed between the curb and the 8-foot-wide sidewalk. However, the size and location of the sidewalks, bicycle facilities, and planter strips vary somewhat along the corridor to accommodate natural drainage practices, retaining walls, and existing buildings.

[1] The City uses the terminology "natural drainage practices" when discussing Low Impact Development (LID) stormwater techniques.

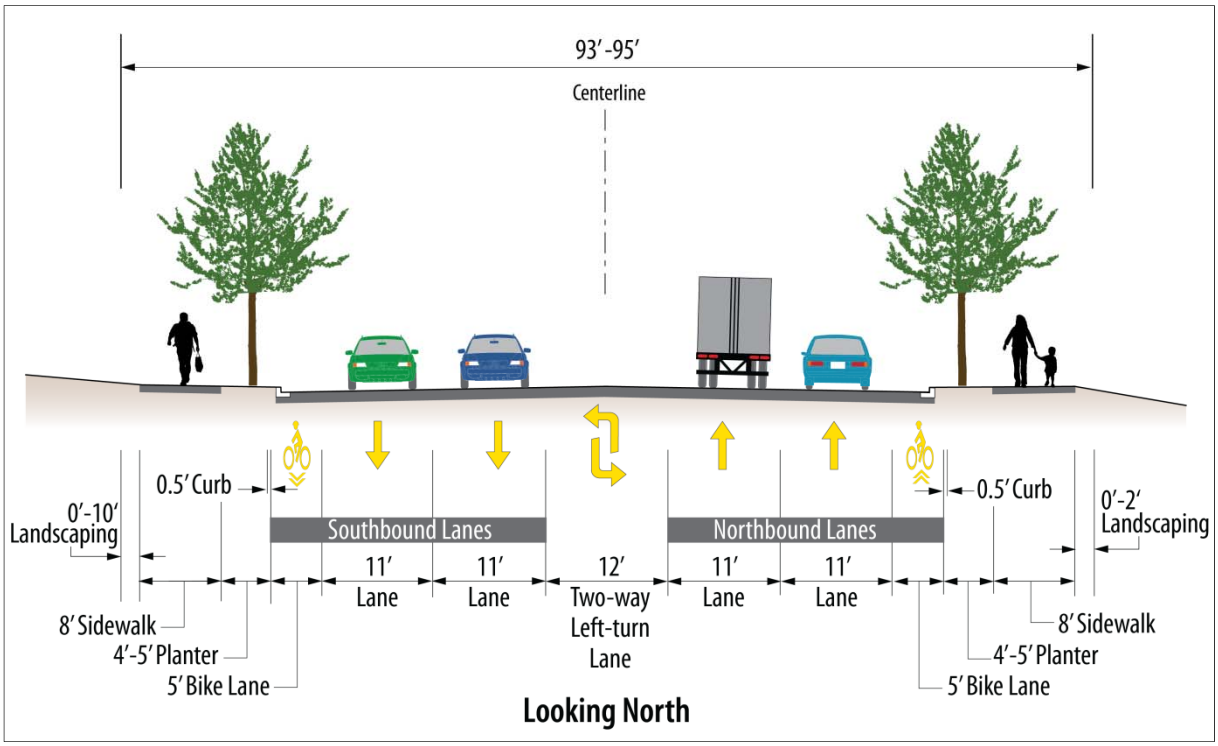

Figure 2-3. Typical Section—Five-lane Roadway Design

As mentioned earlier, this analysis addresses the potential impacts of two minor alignment options for the extension of NE 4th Street east of the BNSF corridor. The alignment for Option 1 is farther north than that of Option 2. The Option 1 alignment would require acquisition of a portion of the southern side of the Best Buy building and displace access to the loading dock located on the west side of the building. Negotiations with the property owner are ongoing and may include construction of a building addition on the north side of the existing structure and/or realignment of the loading dock access to the north of the building. Option 2, roughly 55 feet south of the Option 1 alignment, would not require acquisition of any portion of nearby buildings, but would displace a substantial amount of parking on the Home Depot property as well as displace the Best Buy building's access to the loading dock area. Again, negotiations are ongoing with the property owners and mitigation may include construction of a new loading dock access for the Best Buy property on the north side of the existing structure and/or a new parking garage on the Home Depot property. Note, the design for improvements along 120th Avenue NE south of NE 8th Street do not assume either option has been selected, but rather improvements are based on existing curb cuts for the driveway access to parking for the Best Buy and Home Depot properties.

A four-lane roadway section is proposed for 120th Avenue NE from NE 18th Street to just south of Northup Way with a transition section occurring between NE 15th and NE 18th Streets. At the intersection at Northup Way, the cross-section would again be five lanes to allow for adequate turning movement

capacity. This proposed four-lane cross-section is show in Figure 2-4. The roadway would be designed to meet City standards for an urbanized arterial that has three travel lanes—two 11-foot-wide lanes northbound and one southbound. The two directions of travel would be separated by a 12-foot-wide two-way, left-turn lane that would permit turning movements to adjacent properties. A 5-foot-wide planter strip is proposed between the curb and the 8-foot-wide sidewalk on the east side of the street. A variable-width planter strip is proposed for each side of a two-way, 10-foot-wide bike trail and 8-foot-wide sidewalk that would be constructed on the west side of the street. There would be no bike lanes in the roadway north of NE 18th Street.

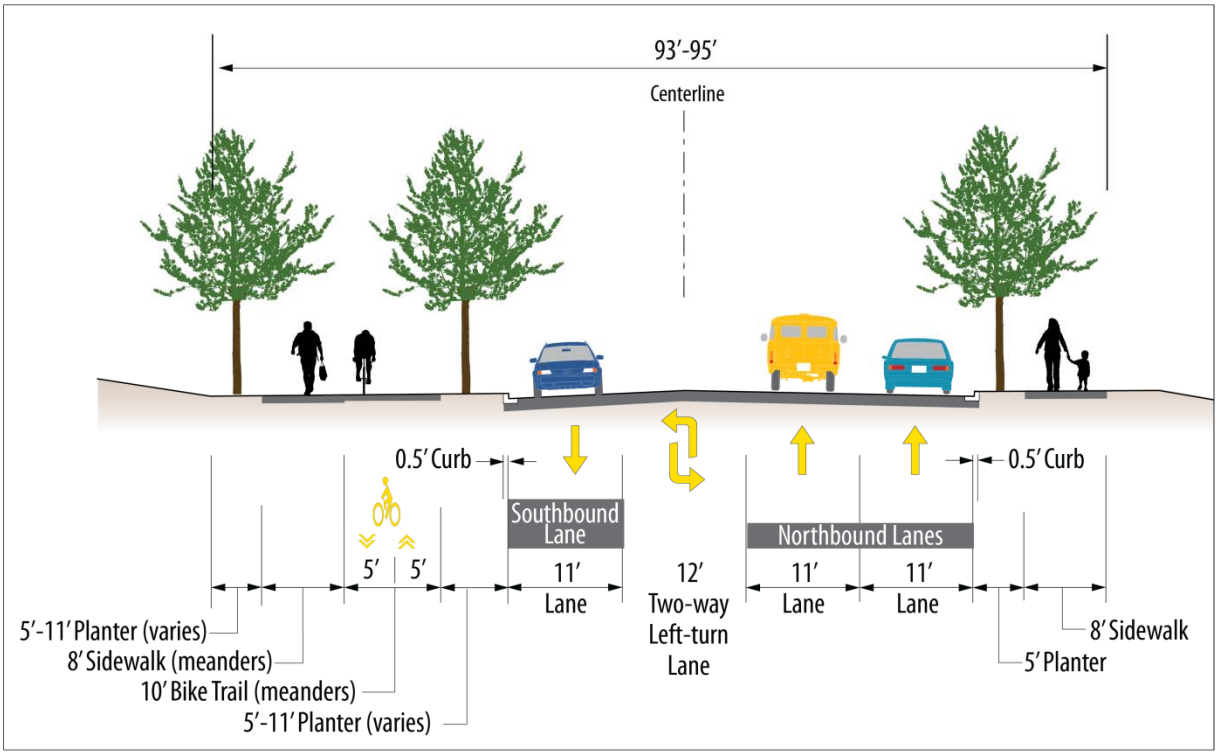

Figure 2-4. Typical Section—Four-lane Roadway Design

Both of the proposed roadway cross-sections also include the use of retaining walls, which would further increase the width of the required right-of-way beyond 95 feet. Retaining walls are proposed at numerous locations along the corridor and they would be located on both sides of the roadway. They would be used for both cut walls and fill walls. When retaining walls are required, these structures would generally be located immediately adjacent to the sidewalk. The width of the retaining walls would vary depending on the design, but would be a maximum of about 3 feet in width. To the outside of the retaining walls, the soil would be graded to a 2:1 slope. To ensure the City has access to the retaining walls for maintenance and repair, the acquired right-of-way would include the re-graded area to the outside of the retaining walls. This re-graded area would likely be a minimum of 10 feet in width. As such, the acquired right-of-way width

could be 121 feet or more where retaining walls are needed on both sides of the roadway.

Note, the term "right-of-way," as used in this report, includes both right-of-way owned by the City and permanent easements (i.e., the complete footprint of the project).

2.4 Project Construction

2.4.1 Construction Duration and Phasing

Project construction would be phased and is expected to start in early 2012. The start date for subsequent phases is unknown but will be completed to match the programming of local, state, and federal funding sources. Each phase would last approximately 12 to 15 months. The planned phases, which may be further sub-divided into construction stages, are:

- Phase 1—120th Avenue NE widening between approximately the NE 300 block north to NE 7th Street.
- Phase 2—120th Avenue NE new construction between NE 8th Street and NE Bel-Red Road, and realignment and widening between approximately NE Bel-Red Road north to NE 12th Street.
- Phase 3—NE 4th Street extension between 116th Avenue NE east to 120th Avenue NE.
- Phase 4—120th Avenue NE widening between approximately NE 12th Street north to NE 16th Street.
- Phase 5—120th Avenue NE widening between NE 16th Street north to Northup Way.

Based on the Wilburton/NE 8th Street and Bel-Red Subarea Plans, it is essential that all phases of the NE 4th Street/120th Avenue NE Corridor Project be implemented in order to meet the purpose and need of the project. The City has committed to constructing all phases of the project, with cross sections appropriate to meet the multi-modal demand anticipated in the next 20 years. In addition, construction of the project phases could occur sequentially or some phases could overlap.

2.4.2 Construction Approach

The approach to project construction along the corridor differs. The following paragraphs describe the varying approaches to construction.

The improvements for NE 4th Street consist of constructing a new roadway and may involve short term work within sections of the existing operable roadway. Construction for this phase would include clearing the full roadway right-of-way; grading; installing utilities and the roadway gravel base; constructing the curb, gutter and sidewalks; paving the roadway; and installing illumination/signals and landscaping. The construction activities would not disrupt existing traffic

patterns along NE 4th Street, 116th Avenue NE, or 120th Avenue NE. However, the construction activities for NE 4th Street may temporarily extend into the existing roadways (116th and 120th Avenues NE) in order to connect new and existing pavements and existing and planned utilities at these locations.

Generally, the construction along 120th Avenue NE from the NE 300 block to NE 7th Street would widen the existing roadway on both sides of the existing centerline. Construction in this area would occur along an operational roadway. The improvements in this area would be sequenced to manage potential traffic impacts. Every effort would be made to keep one lane open for traffic in each direction along 120th Avenue NE during all construction stages. All City requirements limiting roadway construction activities (e.g., seasonal, time of day, access) would be enforced. Construction activities would be closely coordinated with adjacent property owners and businesses to minimize disruptions to the greatest extent possible.

Construction of the realignment and widening of 120th Avenue NE between the intersection at NE 8th Street and about NE 12th Street would occur along an operational roadway. Thus, the construction in this area is anticipated to occur in the following manner:

- Contractor mobilization
- Install traffic control and temporary erosion control measures
- Relocate and/or install utilities
- Roadway Side 1—retaining walls, grading, paving, signals, and illumination
- Roadway Side 2—retaining walls, grading, paving, signals, and illumination
- Construction zone landscaping, restoration, and clean up.

The corridor could not be closed during construction though both directions of travel may be constrained to perhaps only a single lane. NE Bel-Red Road between NE 8th Street and 120th Avenue NE, however, would be closed at the start of roadway construction. This road closure would affect less than 1,000 feet of NE Bel-Red Road, and with it, construction could occur unhampered for the new roadway. Parcels along this portion of the alignment would be fully acquired and construction activities would not affect adjacent businesses. Traffic on NE Bel-Red Road east of 120th Avenue NE would continue to be able to travel north on 120th Avenue NE during construction. To the north of NE Bel-Red Road, the roadway alignment is generally shifted eastward. Construction work would likely start on the eastern half of the expanded right-of-way. When completed, traffic would be shifted to the new roadway, while the western portion of the roadway is constructed. All construction sequencing would be planned to minimize impacts to traffic and adjacent businesses.

Lastly, construction along the remaining northern portion of 120th Avenue NE from NE 12th to just south of Northup Way would also widen the existing roadway on both sides of the existing centerline. The improvements along

120th Avenue NE would be sequenced to manage potential traffic impacts. Every effort would be made to keep one lane open for traffic in each direction along 120th Avenue NE during all construction stages. All City requirements limiting roadway construction activities (e.g., seasonal, time of day, access) would be enforced. Construction activities would be closely coordinated with adjacent property owners and businesses to minimize disruptions to the greatest extent possible.

2.5 Project Funding

The total cost of the proposed project improvements based on the final City Council Direction for the 2011-2017 General Capital Improvement Plan would be between an estimated $67.3 and $67.6 million, depending on the selected option for extending NE 4th Street. Construction would cost approximately $32 million and right-of-way acquisition would cost roughly $35 million.

Funding for the overall project would likely include monies from the following sources:

- Federal grants
- State Transportation Improvement Board funding
- State Local Revitalization Financing funding
- Local contributions from transportation-dedicated sources, long-term general obligation bonds, impact fees, and other private participation programs including possible local improvement districts.

The specific mix of federal, state, and local funding contributions for each construction phase could differ.

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3.0 Methods

3.1 Methods Used in this Analysis

The following methods were applied to the effects analysis contained in this report. Reasons were provided for methods that varied from Washington State Department of Transportation (WSDOT) standards.

3.1.1 Surface Water

Summary of Baseline Documentation

The study area falls within the Kelsey Creek Subarea, which is part of the larger Cedar River-Lake Washington Inventory Area (Water Resource Inventory Area (WRIA) #8).

The southern half of the project corridor lies within the Sturtevant Creek Basin. The northern portion of the project corridor lies within the West Tributary of Kelsey Creek. The southern boundary of this basin crosses the project corridor between NE 14th Street and NE 15th Street.

The surface-water body in the central portion of the project corridor is Lake Bellevue, which is the headwater of Sturtevant Creek. Sturtevant Creek discharges into Mercer Slough and ultimately into Lake Washington. The surface-water body within the northern portion of the project corridor is the West Tributary of Kelsey Creek. This tributary drains directly to Kelsey Creek, which discharges into Mercer Slough, and then joins Lake Washington.

Within the study area, no fish are documented as using Sturtevant Creek or the West Tributary of Kelsey Creek. Sturtevant Creek north of I-405 is almost entirely within a piped system. Two small dams create partial barriers to fish passage on the West Tributary of Kelsey Creek downstream of the project boundary.

Relevant Rules and Regulations

The analysis of potential effects and benefits related to stormwater runoff is necessary to complete Endangered Species Act and Essential Fish Habitat consultation. The preliminary stormwater design evaluates the stormwater quality and quantity management for the project. The preliminary stormwater analysis does not intend to address each of the nine minimum requirements in the City's Storm and Surface Water Utility Code Chapter 24.06.065G, which will be completed as part of the Final Design process.

In 1990, the Washington State Legislature passed the Growth Management Act (GMA) to provide a framework for efficient local planning to manage statewide growth at the local level and to maintain the State's quality of life. The act was passed in response to the Washington State Legislature's recognition that uncoordinated and unplanned growth posed a threat to the environment, economic development, and the health and safety of state residents. In most years since 1990, the Legislature has readopted the GMA.

The City has adopted a comprehensive plan that meets the mandates of the GMA, which is titled *The City of Bellevue, Washington Comprehensive Plan* (Bellevue, 2009a).

According to this Comprehensive Plan, the City generally prohibits most development proposed within floodplains, wetlands, and riparian corridors. Through the permitting process, however, development may be approved with special conditions in place to guide development within these sensitive areas. The City has defined a "Protection Zone" that includes a designated critical area in addition to an adjacent undeveloped buffer area. To better protect watershed hydrology, the City uses the Protection Zone in conjunction with stormwater controls and low impact development requirements. In addition, the City does not allow development within the 100-year floodplain, thus implementing more stringent guidelines than the federal government requires.

Runoff in the project corridor drains to adjacent uplands, wetlands, and streams that eventually discharge to one of two subbasins—Lake Bellevue or the West Tributary of Kelsey Creek.

Part 20.25H of the City of Bellevue Land Use Code addresses the Critical Areas Overlay Districts. Critical Areas potentially applicable to this discipline report include Streams (Part 20.25H.075), Wetlands (Part 20.25H.095), and Areas of Special Flood Hazard (Part 20.25H.175).

To protect the waterways and associated habitat value, the Streams Chapter establishes buffer widths and structure setbacks from waterways in addition to performance standards for development. Similarly, the Wetlands Chapter establishes buffer widths and structure setbacks from wetlands in addition to development performance standards.

The Areas of Special Flood Hazard Chapter is intended to protect the public health and regulate the construction and development within flood hazard areas.

The City's Clearing and Grading Codes (Chapter 23.76) and Storm and Surface Water Utility Code (Chapter 24.06) provide regulations to protect environmental resources in accordance with the City's Comprehensive Plan. The regulations require construction activities to focus on proactively preventing adverse impacts through the permitting process.

Kelsey Creek is identified as a water-quality-impaired water body (Section 303(d) of the Clean Water Act) by Ecology. Kelsey Creek has two locations downstream of the study area that are 303(d)-listed for fecal coliform and one location is listed for dissolved oxygen and temperature. Sturtevant Creek, Lake Bellevue, and the West Tributary of Kelsey Creek are not identified as 303(d)-listed water bodies. A Total Maximum Daily Load (TMDL) water cleanup plan is not published for Kelsey Creek, its tributaries, or Lake Bellevue in WRIA #8 (Ecology, 2007c).

3.1.2 Groundwater

Logs for groundwater wells and geotechnical boreholes in the study area were obtained from Ecology and reviewed to assess the affected environment for groundwater resources. Washington State Department of Health and King County records were reviewed to identify any groundwater protection areas in the study area.

3.1.3 Floodplains

Federal Emergency Management Agency Studies

Lake Bellevue is mapped within a 100-year floodplain designated by the Federal Emergency Management Agency (FEMA), within the project vicinity but not within the existing 120th Avenue NE alignment. FEMA has not designated 100- and 500-year floodplains or a floodway for the West Tributary of Kelsey Creek near the project corridor. Specifically, the West Tributary of Kelsey Creek is not delineated on the FEMA Flood Insurance Rate Map (FIRM) at 120th Avenue NE.

The currently effective FEMA Flood Insurance Study (FIS) for King County, Washington (and Incorporated Areas) is dated April 19, 2005. The study area is shown on the King County FIRM, panel 53033C0656F, dated May 16, 1995. The 100-year flood elevation for Lake Bellevue shown on the FEMA FIRM map is 138 feet National Geodetic Vertical Datum of 1929 (NGVD). The City has adopted the North American Vertical Datum of 1988 (NAVD), and the City's website contains the FEMA flood maps with the vertical datum modified to NAVD. The 100-year flood elevation for Lake Bellevue is shown as 142 feet NAVD (Bellevue, 2010e). Although the FIS is dated April 19, 2005, the hydrologic and hydraulic analyses of the West Tributary of Kelsey Creek in the FIS do not appear to have been revised since the City's FEMA contract was completed in May 1977.

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4.0 Existing Conditions

4.1 Surface Water

4.1.1 Natural Framework to Surface Water

Geologic Setting

Located within the Puget Sound Lowland, the geology of the NE 4th Street/ 120th Avenue NE Corridor Project reflects the impacts of repeated glacial scouring combined with deposition, tectonic activity, landslides, stream erosion, and human activity (Troost, 2008). The Bellevue area rests on Eocene volcanic and sedimentary rocks, which are overlain by glacial tills and interglacial unconsolidated sediment (Tetra Tech, 2006). Following the glacial activity, the area was periodically underwater with sands and gravels deposited in varying layer thicknesses and peat beds formed in wetlands.

The topography of the project corridor includes gently sloping hills that drain to the piped collection system leading to Sturtevant Creek in the southern half of the project corridor and toward the West Tributary of Kelsey Creek in the northern half of the project corridor.

Soils

The project corridor lies between the Cascade and Coast Mountain Ranges in King County. The *Soil Survey of King County Area, Washington* prepared by the U.S. Department of Agriculture Soil Conservation Service (SCS) cites the study area's soils and associated properties (SCS, 1973).

Moving generally from west to east, and then south to north through the project corridor (and ignoring recurrences of a soil type already listed), the SCS maps indicate the following seven soil types:

- **Norma sandy loam, 0 to 2 percent slopes (No)**—This soil is typified as sandy loam to 60 inches in depth. It is poorly drained, and ponding occurs frequently, generally due to its association with depressional landforms and floodplains as it has a high capacity to transmit water and moderate water capacity. The erosion hazard is considered slight.
- **Alderwood gravelly sandy loam, 6 to 15 percent slopes (AgC)**—Soil permeability is moderately rapid in the surface layer and subsoil and very slow in the substratum. Runoff is slow to medium. The erosion hazard is considered moderate.
- **Urban land (Ur)**—Extending along more than half of the project corridor, urban land describes soils modified by development through the placement of several feet of fill material. The erosion hazard is characterized as slight to moderate.

- **Bellingham Silt Loam (Bh)**—Permeability is slow and there is a seasonally high water table during the rainy season. Runoff is slow. This unit has a moderate shrink-swell potential and moderate-to-high corrosivity for uncoated steel and concrete. The seasonal high water table presents limitations for building foundations for low buildings and septic tank filter fields. Slopes for Bh soils are less than 2 percent. The erosion hazard is considered slight.
- **Tukwila muck (Tu)**—Surrounding Lake Bellevue, Tukwila muck is similar to Seattle muck with slopes of less than 1 percent and moderate permeability. Subsurface layers consist of strong brown to very dark brown muck, peaty muck, and potential layers of diatomite. The seasonal high water table is typically near or at the surface of the ground with a high available water capacity. The erosion hazard is considered slight as runoff generally ponds.
- **Seattle muck (Sk)**—Including the West Tributary to Kelsey Creek, Seattle muck generally has slopes of less than 1 percent with moderate permeability. The subsurface layers consist of stratified mucky peat, muck, and peat. The seasonal high water table is typically near or at the surface of the ground with a high available water capacity. The erosion hazard is considered slight to none as runoff generally ponds.
- **Everett gravelly sandy loam, 5 to 15 percent slopes (EvC)**—In the Everett association, the soil is typified as gravelly sandy loam 18 to 36 inches in depth, which is underlain by sand and gravel. As a result, soils are somewhat excessively drained, and runoff is slow to medium. The associated erosion hazard is characterized as slight to moderate. Soils are gently undulating with slopes predominantly between 0 and 15 percent.

The soils identified within the study area are not prone to severe soil erosion or severe slope instability.

Climate

The moderate climate in the study area is characterized by mild, wet winters and warm summers. Maritime air masses from Puget Sound generally dominate the vicinity during the year. Mean monthly high temperatures range from 45 degrees Fahrenheit to 76 degrees Fahrenheit, while mean monthly low temperatures range from 34 degrees Fahrenheit to 55 degrees Fahrenheit. The annual precipitation is slightly higher than 34 inches, with 74 percent of this total occurring between October and March. On average, less than 6 inches of snowfall occur annually (NOAA, 2010).

4.1.2 Surface-Water Resources

Basins, Subbasins, and Project Boundaries

The study area falls within the Sturtevant Creek and West Tributary Basins of the Lake Washington Watershed (WRIA #8) (Bellevue, 2009b and 2010b). These

basins are shown on Figure 4-1 and detailed information for these basins is included in Appendix C.

Lake Bellevue and the West Tributary of Kelsey Creek are the surface water bodies within the study area. Lake Bellevue is located southwest of the intersection of NE 12th Street and 120th Avenue NE in the central portion of the project corridor. Part of the headwaters for the Sturtevant Creek watershed, Lake Bellevue is a subbasin of the Lake Washington Watershed. The lake provides aquatic life habitat for fisheries and waterfowl. The lake has historically provided the hydrologic benefits of water storage and water treatment through the retention of pollutants.

The West Tributary of Kelsey Creek is in the northern portion of the project corridor, crossing 120th Avenue NE once. Downstream of the project boundaries, the West Tributary of Kelsey Creek joins Kelsey Creek, which continues to flow south before entering Mercer Slough. Discharge from Mercer Slough enters Lake Washington. The West Tributary of Kelsey Creek is classified as stream type "N" according to the City's Land Use Code, meaning it does not support fish or fish habitat. The waterway does not reportedly provide any habitat for salmonids or other fish species, but the receiving streams do contain fish or fish habitat. Two small dams downstream of the project corridor partially block fish passage on the West Tributary of Kelsey Creek.

The beneficial uses for the two surface water bodies near the project corridor include waterfowl and other wildlife habitat, preservation of environmental and aesthetic values, and other uses.

The total watershed sizes for Lake Bellevue and the West Tributary of Kelsey Creek are 0.14 square mile and 1.75 square miles (92.3 acres), respectively.

For Lake Bellevue, FEMA has designated a 100-year floodplain with a flood elevation of 138 feet NGVD (142 feet NAVD). FEMA has not designated 100-year and 500-year floodplains or a floodway for the West Tributary of Kelsey Creek near the project corridor.

King County has monitored the ecological health of Kelsey Creek (King County, 2010) by collecting and analyzing water, sediment, and benthic invertebrate samples; however, stream flow gage data were not located for any of the Kelsey Creek tributaries. Given the similarity of small waterways in the region, the stream flow patterns of the West Tributary of Kelsey Creek can be assumed to closely follow precipitation patterns. Consequently, stream flows, volume, and velocity would tend to be heaviest during winter and smallest during summer and early fall.

Water quality data are collected and analyzed monthly on Kelsey Creek from two sites—one near the creek's mouth (Station 0444) and the other in Kelsey Creek Park (Station D444) (King County, 2010).

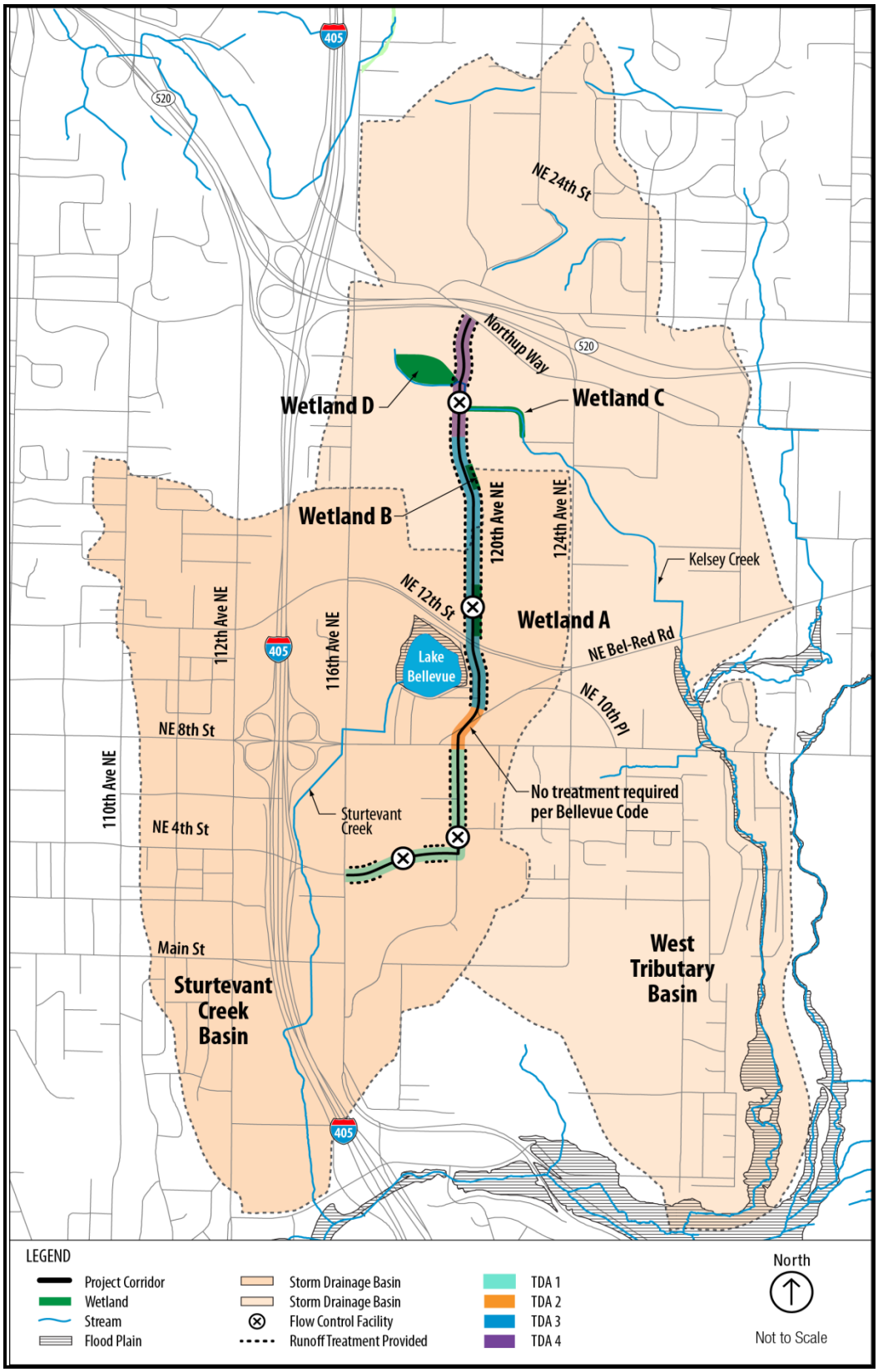

Figure 4-1. Project Area Streams, Lakes, Wetlands, Floodplains, TDAs, and Storm Drainage Basins

Aquatic habitat in Kelsey Creek was also rated very poorly based on the limited presence and abundance of benthic invertebrate samples collected and analyzed in 2002 and 2003.

Water Quality

Based on the *Lake Bellevue Water Quality Study and Management Recommendations* (Tetra Tech, 2006*),* the lake is considered "over-enriched" with phosphorus, which promotes cyanobacteria growth, such as the frequently observed blue-green algae blooms (*Aphantzomenon flos-aquae, Anabaena* spp. and *Microcystis aeruginosa*). Blue-green algae blooms reduce the lake's ability to provide suitable habitat for fisheries and waterfowl. A recommended phosphorus concentration of 20 micrograms per liter has been established by Ecology. A phosphorus concentration in excess of 40 micrograms per liter is associated with phytoplankton blooms. The phosphorus concentrations measured in Lake Bellevue exceed both limits, varying from 62 to 226 micrograms per liter (Tetra Tech, 2006).

In addition, water quality conditions are deemed impaired when the chlorophyll α levels are above 10 to 12 micrograms per liter as chlorophyll α measures the phytoplankton production. The highest measured Lake Bellevue chlorophyll α levels are 70 micrograms per liter according to the *Lake Bellevue Water Quality Study.* The study determined that 76 percent of the phosphorus in the lake occurs naturally due to lake-bottom sediments, aquatic vegetation, and plankton. The remaining 24 percent of the lake's phosphorus is transported or conveyed by stormwater runoff generated by land use activities and practices in the surrounding watershed (Tetra Tech, 2006).

The *Lake Bellevue Water Quality Study* also noted periodic oil sheens on the lake; however, some of these sheens may be attributed to decomposing algal blooms. Other possible sources that create sheens include oil releases from stormwater runoff and near shore parking areas, oil spills in the watershed, and in-lake creosote-covered pilings. However, the study did not find a direct correlation between storm runoff events and oil sheens (Tetra Tech, 2006).

The private and public property owners surrounding Lake Bellevue currently employ Best Management Practices (BMPs) for water quality. The City offers an educational program to address spill prevention, pollutant spill response, and pollution prevention. Local and state agencies also respond to spill reports within the watershed. As redevelopment occurs, many of these properties that currently do not have stormwater treatment and stormwater flow control systems will be required to provide them. This should provide for improved water quality in the City's water bodies. The City stormwater code encourages the use of Natural Drainage Practices (NDP) for meeting these stormwater requirements.

Kelsey Creek is identified as a water-quality-impaired water body (Section 303(d) of the Clean Water Act) by Ecology. Kelsey Creek has two locations downstream of the study area that are 303(d)-listed for fecal coliform, and one

location is listed for dissolved oxygen and temperature. The West Tributary of Kelsey Creek and Lake Bellevue are not identified as 303(d)-listed water bodies.

A TMDL water cleanup plan is not published for Kelsey Creek, its tributaries, or Lake Bellevue in WRIA #8 (Ecology, 2007c).

Three of the four project threshold discharge areas (TDAs) lie within the Sturtevant Creek Basin, one of which discharges directly into Lake Bellevue. Runoff from the northernmost TDA drains to the West Tributary Basin. The West Tributary of Kelsey Creek crosses 120th Avenue NE once within the project corridor. Because slope angles near stream crossings are quite low, erosion is not expected to be a problem. Potential water quality effects would be associated with stormwater runoff and temporary short-term effects associated with construction.

Existing Drainage Pathways

Stormwater runoff from the project corridor is conveyed to Sturtevant Creek, Lake Bellevue, and the West Tributary of Kelsey Creek.

Sturtevant Creek, within the project corridor, is conveyed within an underground storm pipe system. The lower half of the project corridor is collected and conveyed via a piped storm drain system to Sturtevant Creek.

Lake Bellevue receives stormwater runoff from a 42-inch-diameter pipe and multiple small catch basins in the adjacent parking lots, buildings, walkways, and roof drains. The *Lake Bellevue Water Quality Study* noted that Ecology reached an agreement with Safeway to install inserts into several of the parking lot catch basins to filter pollutants from the runoff. In addition as part of the agreement, Safeway added oil-absorbent pads into the 42-inch-diameter pipe. Lake Bellevue discharges into Sturtevant Creek.

The West Tributary of Kelsey Creek receives stormwater runoff via overland flow with no active treatment of stormwater runoff from 120th Avenue NE. Some passive treatment may occur as stormwater passes through vegetated ditches, shoulders, and wetlands in the northern portion of the project corridor. However, there is no engineered diversion of stormwater for infiltration and treatment that would prevent pollutants entrained in the runoff from reaching waterways or wetlands.

The project corridor's drainage area is divided into TDAs to serve as the basis of comparison between the existing and proposed conditions. A TDA is defined as an on-site area draining to a single natural or manmade discharge location or multiple or manmade discharge locations that combine within 0.25 mile downstream (as determined by the shortest flow path).

The TDAs for this project were delineated based upon existing contours, culverts, as-built information, and survey data. The existing drainage area was divided into four TDAs as described in Table 4-1 and shown on Figure 4-1. For the purposes of analyzing effects associated with this project, all impervious surfaces in the study area, as defined in Bellevue City Code Chapter 23.76 and 24.06, are considered to

be pollutant-generating impervious surface (PGIS). The total amount of existing PGIS in the study area is 14.1 acres.

Table 4-1. Threshold Discharge Areas in the Study Area

TDA No.	Amount of Existing PGIS (acres)	Comments
1	4.70	TDA No. 1 drains to the underground storm system located along 116th Avenue NE before discharging to Sturtevant Creek, where flow combines with TDA No. 2 and TDA No. 3, and ultimately flowing into Lake Washington.
2	1.79	TDA No. 2 discharges to the underground storm system located along NE 8th Street before combining with TDA No. 2, draining to Sturtevant Creek, and ultimately flowing into Lake Washington.
3	3.38	TDA No. 3 discharges directly to Lake Bellevue, which is the headwaters to Sturtevant Creek, and ultimately flows into Lake Washington.
4	4.23	TDA No. 4 drains to the West Tributary of the Kelsey Creek subbasin, which flows into Kelsey Creek and ultimately flows into Lake Washington.

Wetlands and Streams

A *Wetlands and Stream Delineation Technical Report* (Shannon & Wilson, 2011a) was prepared for this project. Two Category III and two Category II wetlands were identified in the project corridor. Wetland A is a Category III wetland located northeast of the intersection of 120th Avenue NE and NE 12th Street and lies entirely within the project corridor. Wetland B is also a Category III wetland located in an open roadside ditch west of 120th Avenue NE, directly south of the property at 1975 120th Avenue NE, and lies entirely within the project corridor. Wetlands C and D are associated with the West Tributary of Kelsey Creek. Wetland C is a Category II wetland located east of 120th Avenue NE, just south of the 1121 120th Avenue NE property. The wetland is part of a larger wetland system that extends east of the project corridor. Wetland D is also a Category II Wetland and is located west of 120th Avenue NE, just north of the property at 1121 120th Avenue NE.

Fisheries

A separate *Fisheries, Wildlife, and Vegetation Technical Report* (Parsons Brinckerhoff, 2011) has been prepared for this project. Although coho salmon were historically known to be present in the Sturtevant Creek system in the 1970s, the City's current records indicate that it is unlikely that they still use any areas upstream of I-405 (Bellevue, 2009b), which is well south of the project corridor. The reach of the West Tributary of Kelsey Creek is reportedly above the known fish habitat portion of the creek. A fish distribution map is included below (see Figure 4-2).

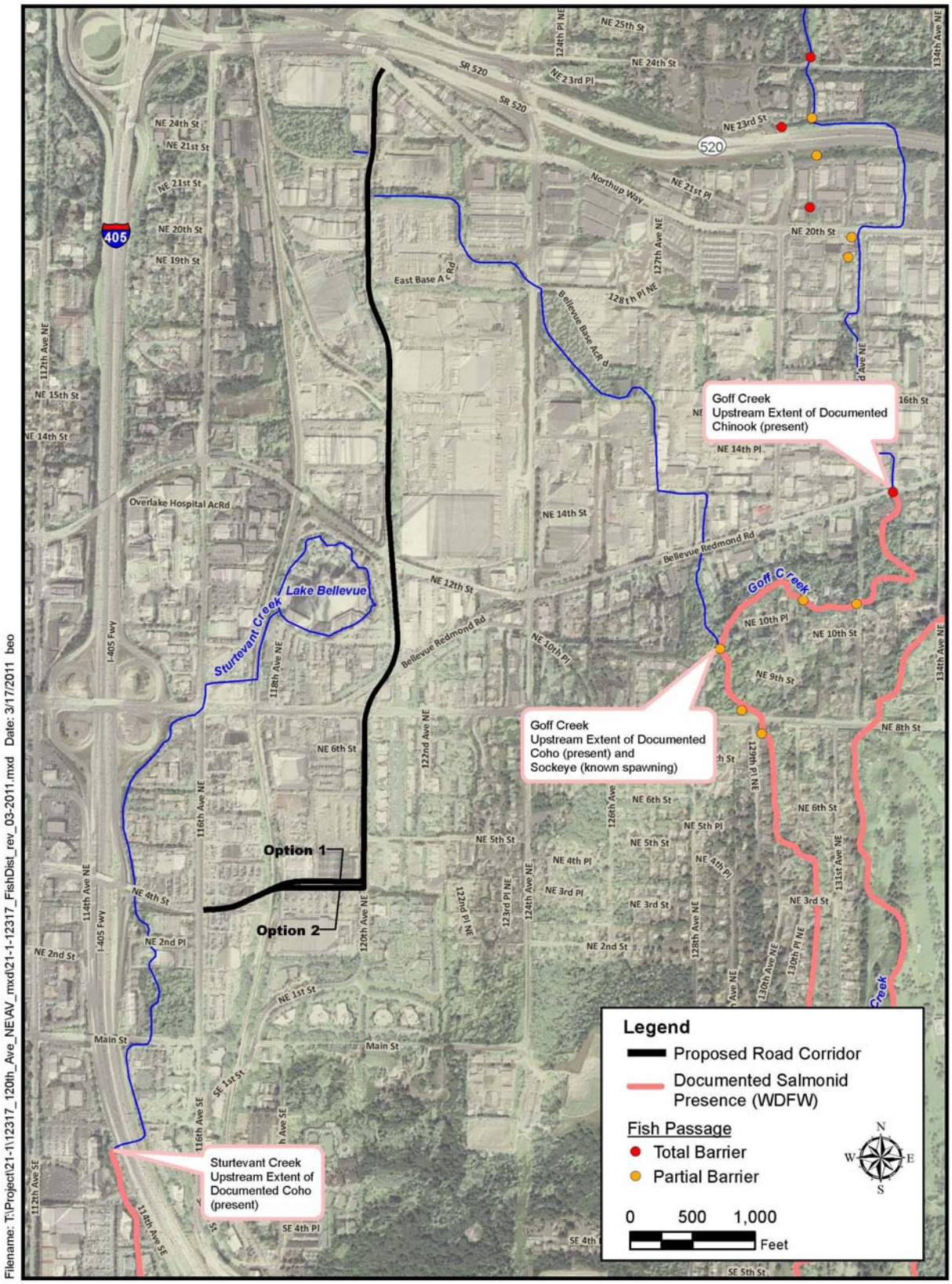

Figure 4-2. Fish Distribution Map

Sturtevant Creek originates at Lake Bellevue and flows south in a ditch adjacent to railroad tracks for approximately 600 feet before going into an underground pipe at approximately NE 8th Street. Sturtevant Creek daylights again at north of NE 4th Street and flows south to where it crosses under I-405 approximately 3,000 feet downstream of the project corridor. After it crosses I-405, Sturtevant Creek flows south to its confluence with Kelsey Creek/Mercer Slough. The I-405 is a fish passage barrier based on Washington Department of Fish and Wildlife (WDFW) SalmonScape maps (WDFW, 2010) and the City's basin map for Sturtevant Creek. Even if this fish barrier was removed, the piped portion of Sturtevant Creek would be considered another fish barrier. In 2001, the City hired The Watershed Company to electrofish Sturtevant Creek. No fish were found at NE 2nd Place (upstream of the I-405 culvert) or at Lake Bellevue. Coordination will occur with the WDFW regarding the City's proposal to include a fish-passable culvert at the West Tributary of Kelsey Creek crossing at 120th Avenue NE.

Approximately 3,500 feet downstream of the project corridor, the West Tributary of Kelsey Creek passes through an outlet-control structure and then enters a culvert where it is conveyed below ground for approximately 1,200 feet to the south of NE Bel-Red Road. This 1,200-foot underground pipe has several bends and is a fish barrier based on WDFW SalmonScape maps (WDFW, 2010) and the City's basin map for the West Tributary of Kelsey Creek. Downstream of NE Bel-Red Road, the West Tributary of Kelsey Creek joins Goff Creek, which is tributary to Kelsey Creek. Goff Creek then connects to Kelsey Creek, which drains through Mercer Slough into Lake Washington. In 2001, the City hired The Watershed Company to electrofish the West Tributary of Kelsey Creek. No fish were found at 120th Avenue NE, on either side of 124th Avenue NE, or at NE 8th Street.

Hazardous Materials

A separate *Hazardous Materials Discipline Report* (Shannon & Wilson, 2011b) has been prepared for this project. Previous releases of solvents, metals, petroleum products, and creosote have been recorded from more than 30 separate events and responsible parties within the project corridor. The impacts of the past releases on groundwater are discussed in that technical report.

4.2 Groundwater

The project corridor lies within the Puget-Willamette Trough aquifer system between the Cascade and Coast Mountain Ranges in Washington and which extends to Central Oregon. Within the Puget-Willamette Trough system, the Bellevue area is located within the Puget Sound Lowland subarea. The principal aquifers in the Puget Sound Lowland are unconsolidated deposit aquifers, which consist primarily of glacial deposits. Around Seattle, the glacial deposits can be up to 3,000 feet thick.

The most productive aquifers in the region tend to exist in the upper 200 to 300 feet of unconsolidated sand and gravel deposits left during the last period of

glaciation. The sand and gravel lenses produce strong well yields with reports of wells yielding between 8,000 to 10,000 gallons per minute along the Green River in King County. However, most of the discharge from the aquifer is not withdrawn from wells but rather conveyed by springs and seeps to streams.

A review of the well drilling logs along the project corridor did not indicate any private wells in the vicinity.

According to the Phase I Environmental Site Assessment, the depth to groundwater in the project corridor is estimated to range from approximately 5 to 23 feet below ground surface (Landau, 2010). In addition, the groundwater flow direction reportedly varies within the project boundary. Groundwater contours prepared for the existing Shell Station and Hi Tech Cleaners sites indicate flow directions to the south and west, respectively.

No sole-source aquifers were identified within the project boundary. The closest sole-source aquifer is the Cedar Valley Aquifer, located approximately 10 miles southeast of Bellevue.

King County and the Washington State Department of Health Geographic Information System database did not identify any critical aquifer recharge areas near the project corridor. In addition, the Washington State Department of Health does not identify any wellhead protection areas near the project corridor. No information was available on sanitary control areas in the project corridor.

4.3 Floodplains

4.3.1 Flood Hazard

The FEMA FIRM panel 53033C0656F shows the mapped 100-year floodplain of Lake Bellevue at the southwest corner of 120th Avenue NE and NE 12th Street. The 100-year flood elevation shown on the FEMA FIRM map is 138 feet NGVD (142 NAVD) for Lake Bellevue. The mapped 100-year floodplain area is zoned AE, which indicates that the map's boundaries were developed from the results of FEMA's detailed hydrologic and hydraulic computer modeling. The FIRM map labels Lake Bellevue as Sturtevant Lake, reflecting the lake's drainage to Sturtevant Creek.

The primary potential source of flooding along the project reach is the West Tributary of Kelsey Creek. FEMA performed a detailed study of the West Tributary of Kelsey Creek from its confluence with Kelsey Creek 1.57 miles upstream to NE Bel-Red Road, which is downstream from the project site. The FEMA detailed study provides base flood elevations and mapping of the 100-year floodplain associated with the West Tributary of Kelsey Creek; however, no base flood elevations or mapped floodplains have been prepared for the reach of the West Tributary of Kelsey Creek within the project boundary.

No mapped floodplains in the study area are associated with the West Tributary of Kelsey Creek or lie within the Sturtevant Creek Basin. As such, land within the study area is identified on the FEMA FIRM maps as Zone X, which represents

areas outside of the 500-year floodplain, areas within the 100-year floodplain with minimal flooding, where the average flood depths are less than 1 foot, and areas of 100-year flooding with drainage areas less than 1 square mile. As the drainage basin of the West Tributary of Kelsey Creek is 0.34 square mile at the confluence of the East Branch of the West Tributary of Kelsey Creek, the creek falls below the 1-square-mile drainage basin criteria for FEMA.

4.3.2 Channel Stability

The channel of the West Tributary of Kelsey Creek is not constrained near the project by levees or substantial bank stabilization projects. As such, the channel has the capacity to migrate within the study area. Whether the West Tributary of Kelsey Creek may avulse in the future near the project depends upon several factors including, but not limited to, bank stability and cohesion, channel sinuosity, deposition or erosion, water velocities, and bedload. Site photographs from August 2010 show well-vegetated banks covered with grasses, brush, and trees. Aerial photographs show that the channel of the West Tributary of Kelsey Creek has some sinuosity but lacks sharp curves in excess of 90 degrees.

From the FEMA FIS, the 100-year flood discharge of the West Tributary of Kelsey Creek is 29 cubic feet per second at the confluence with the East Branch. No estimations of the average 100-year flood velocity are available within the project boundary. Based on site photographs, the observed substrate of the West Tributary of Kelsey Creek contains gravels with fine-grained materials.

Channel avulsion is not typically an instantaneous phenomenon, with some channels taking years, decades, or longer to avulse. Prior to avulsion, the channel would likely provide some indications of future movement, such as eroding or slumping banklines, an increase in the channel's sinuosity, and changes in deposition and erosion patterns.

4.3.3 Debris

The channel of the West Tributary of Kelsey Creek contains a few pieces of large woody debris near the project corridor; however, site photographs did not indicate other debris sources.

4.3.4 Skew of Crossing

The West Tributary of Kelsey Creek crosses under 120th Avenue NE via a culvert that has negligible skew to the channel. The proposed culvert has an alignment that is skewed approximately 25 degrees to the channel.

4.3.5 Floodplain Limits

None of the sections of the project corridor that are proposed to receive fill are located within the mapped 100-year floodplain of Lake Bellevue or the mapped 100-year floodplain of the West Tributary of Kelsey Creek (see Figure 4-1). In the City, fill is not allowed within the 100-year floodplain unless compensatory storage is created. However, as no fill is being placed within adopted 100-year floodplains, compensatory storage is not a project requirement.

Watershed characteristics of the Kelsey Creek Basin were obtained from the King County Streams Monitoring Program. The Kelsey Creek Basin encompasses approximately 10,870 acres; it is characterized as having reached built-out conditions. Future projects are limited primarily to redevelopment of existing facilities. A vegetation analysis performed in 2000 delineated 7 percent of the basin with forest canopy and an additional 38 percent with green vegetation. The balance of the watershed, 55 percent, reflects the total impervious area, such as roads, buildings, and other surfaces that create runoff, including bare soils.

The creek's channels appear typical of other small waterways in the region with a pool-riffle morphology and gently sloping gradients of a few percent.

The existing culvert for the West Tributary of Kelsey Creek would be replaced, and the cross-sectional area would increase, as would the flood-carrying capacity.

Within the study area, the West Tributary of Kelsey Creek does not have an adopted regulatory 100-year flood elevation. Near the confluence with the East Branch and downstream of the project corridor, the West Tributary of Kelsey Creek has a FEMA-adopted 100-year flood elevation of 108 feet NGVD (112 feet NAVD).

The City's regulations address no reduction of existing conveyance capacity and no net loss of existing storage capacity during the 100-year flood (Part 20.25H.175). The project would comply with the City's Land Use Code through the permit process for clearing and grading in a critical area.

4.3.6 Consistency with Existing Watershed and Floodplain

Sturtevant Creek within the project corridor is a piped system and would remain so after the project is complete. The existing 120th Avenue NE spans the West Tributary of Kelsey Creek at one location in the project corridor, containing the channel within a culvert. The proposed widening and realignment of 120th Avenue NE would extend or replace the existing creek crossing such that no reduction in conveyance would occur. The runoff and flows would remain in their basin of origin for the project, thereby maintaining the integrity of the existing floodplain and watershed. No new crossings of the West Tributary of Kelsey Creek or alterations to the creek's natural channel are proposed.

4.3.7 Current/Proposed Water Resource Projects

No reservoirs or other flow regulation structures are located on Sturtevant Creek or the West Tributary of Kelsey Creek within the project corridor, and no proposed water resource projects were identified on the creek.

4.3.8 Flood History

FEMA's FIS indicates that flooding along the West Tributary of Kelsey Creek is similar to other waterways in the area. Flooding along Kelsey Creek and its tributaries was characterized as typically limited to November through February. The winter months coincide with the highest rainfall-producing storms. Major flood problems were attributed to floodwaters leaving the creek's banks and

inundating and potentially damaging adjacent properties. The highest potential for out-of-bank flooding was primarily noted along the low-gradient reaches of the waterways. The creeks may reach flood stage within 6 to 12 hours after a storm event, depending upon its intensity.

4.3.9 Existing Structures

One culvert crossing of the West Tributary of Kelsey Creek would be affected during the proposed widening and realignment. Across from Safeway, the West Tributary of Kelsey Creek is conveyed under 120th Avenue NE by a 36-inch-diameter corrugated metal pipe. The culvert does not appear to be perched (invert elevated above the natural creek bed). Based upon site visit photos, scour does not appear to pose a problem at the existing culvert. This culvert will be replaced with a larger box culvert.

4.3.10 Drainage Area

The total drainage area of Sturtevant Creek is 733 acres (see Appendix C) and discharges into Kelsey Creek near the I-90 and I-405 interchange.

The drainage area of the West Tributary of Kelsey Creek is 1,006 acres (see Appendix C) at the confluence with the East Branch of the West Tributary of Kelsey Creek, approximately 700 feet downstream of NE Bel-Red Road.

4.3.11 Potential for Watershed Changes

The Sturtevant Creek Watershed is largely developed with more than 70 percent of it composed of impervious surfaces; as a result, the likelihood of an increase in impervious surfaces in the future is low. Given the relatively small drainage basin size for the West Tributary of Kelsey Creek, the likelihood is low of potential future watershed changes significantly increasing the magnitude of flood peaks near the project corridor. The City's regulations for stormwater flow control and the preservation of flood storage capacity should minimize and potentially offset any potential future discharge increases related to development

Since no appreciable increase in discharge is expected and future developments are assumed to provide erosion and stormwater controls, the future sediment load would be expected to remain relatively consistent. There will likely be some increase in sediment loads during construction, but the project will implement erosion control measures to limit that increase.

4.3.12 Flow Patterns during Flood Events

FEMA's FIS indicates that Kelsey Creek and its tributaries flood similarly to other waterways in the area. Climatic conditions produce high flows during winter when precipitation is more frequent. Low flows occur in summer as a response to the dry warmer weather that is typical of this season in the Pacific Northwest.

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5.0 Environmental Effects

5.1 Direct Effects on Water Quality

Direct effects are caused by the action and occur at the same time and place as the project.

5.1.1 Effects during Construction

No Build Alternative

Under the No Build Alternative, the existing NE 4th Street/120th Avenue NE corridor would not be retrofitted with stormwater treatment and flow control, and runoff would continue to discharge as it does under existing conditions. No changes to the quality of groundwater resources due to roadway construction would occur. No changes to wetlands, the West Tributary of Kelsey Creek, or Lake Bellevue would occur. The existing culvert under 120th Avenue NE would not be replaced, and no work would occur below the OHWM of the West Tributary of Kelsey Creek.

Build Alternative

Surface Water

Effects of the project on water quality could occur where proposed work occurs near Lake Bellevue, the West Tributary of Kelsey Creek, and near or in wetlands.

Wetlands A and B have a 60-foot buffer; Wetland C has a 75-foot buffer; and Wetland D has a 110-foot buffer. Wetlands A, B, and C have approximate wetland impacts of 0.19, 0.10, and 0.005 acre, respectively. Approximately 10 linear feet of stream will be filled, and approximately 0.82 acre of wetland and stream buffer permanent impacts are anticipated (see Figure 5-1 through Figure 5-3). Due to the highly developed nature of the project corridor, on-site mitigation is not feasible. Additional direct wetland effects may occur as the project design evolves and stormwater features are developed.

The proposed culvert replacement would impact areas below the OHWM of the West Tributary of Kelsey Creek. The proposed three-sided box culvert would include a native material/streambed gravel bottom. The culvert dimensions are being refined through the design process; however, the existing cover and utilities limit the culvert's height to approximately 4 feet. The current culvert width is designed to be between 8 and 10 feet.

Erosion from exposed soils (either disturbed soil areas or soil stockpiles) during construction could increase the amount of sediment, suspended solids, and turbidity entering the West Tributary of Kelsey Creek and adjacent wetlands. Effects due to erosion could be prevented by implementation of appropriate conservation measures in a Construction Stormwater Pollution Prevention Plan (CWSPPP) and Temporary Erosion and Sediment Control (TESC) Plan. No work is

Attachment 11

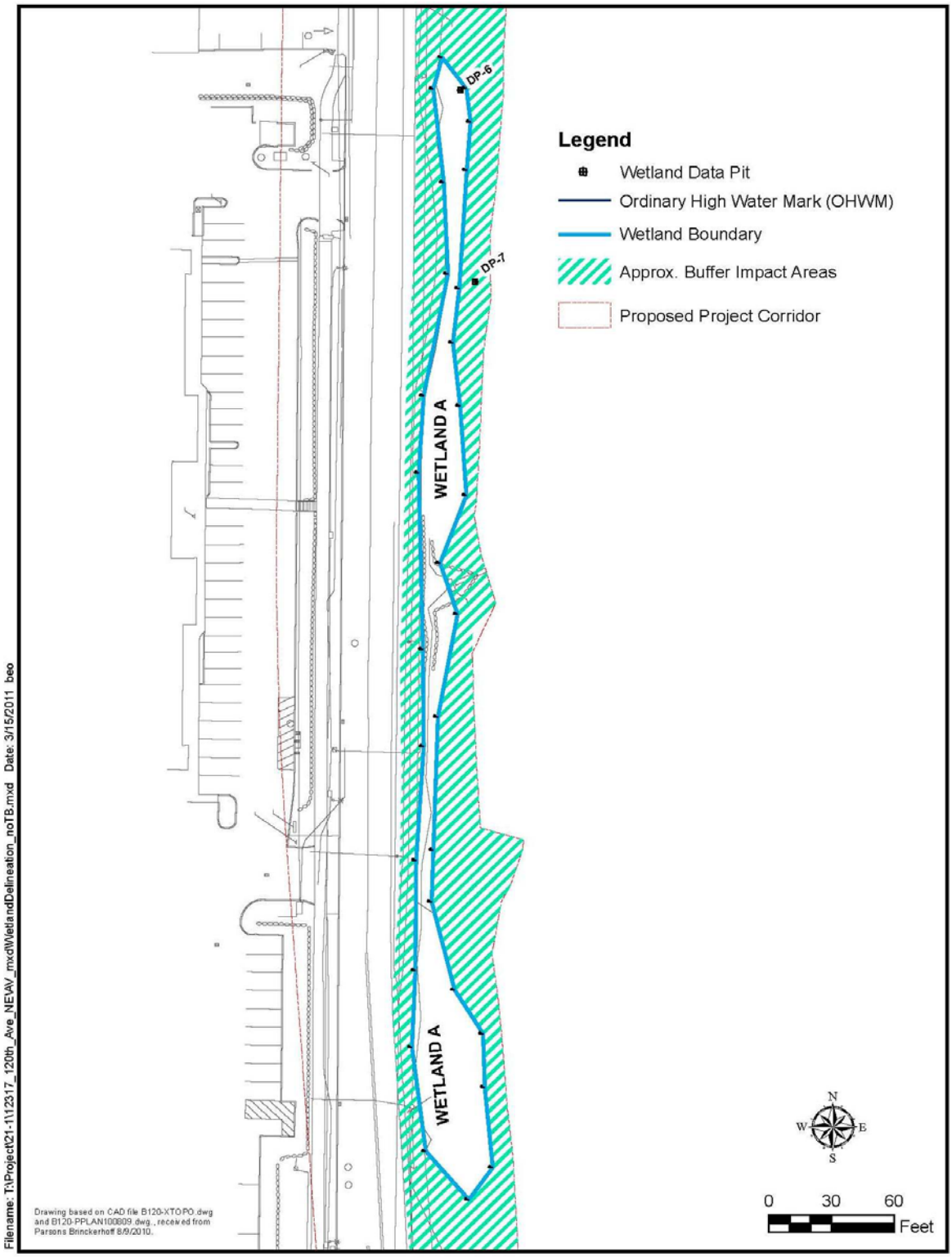

Figure 5-1. Wetland Delineation – Wetland A

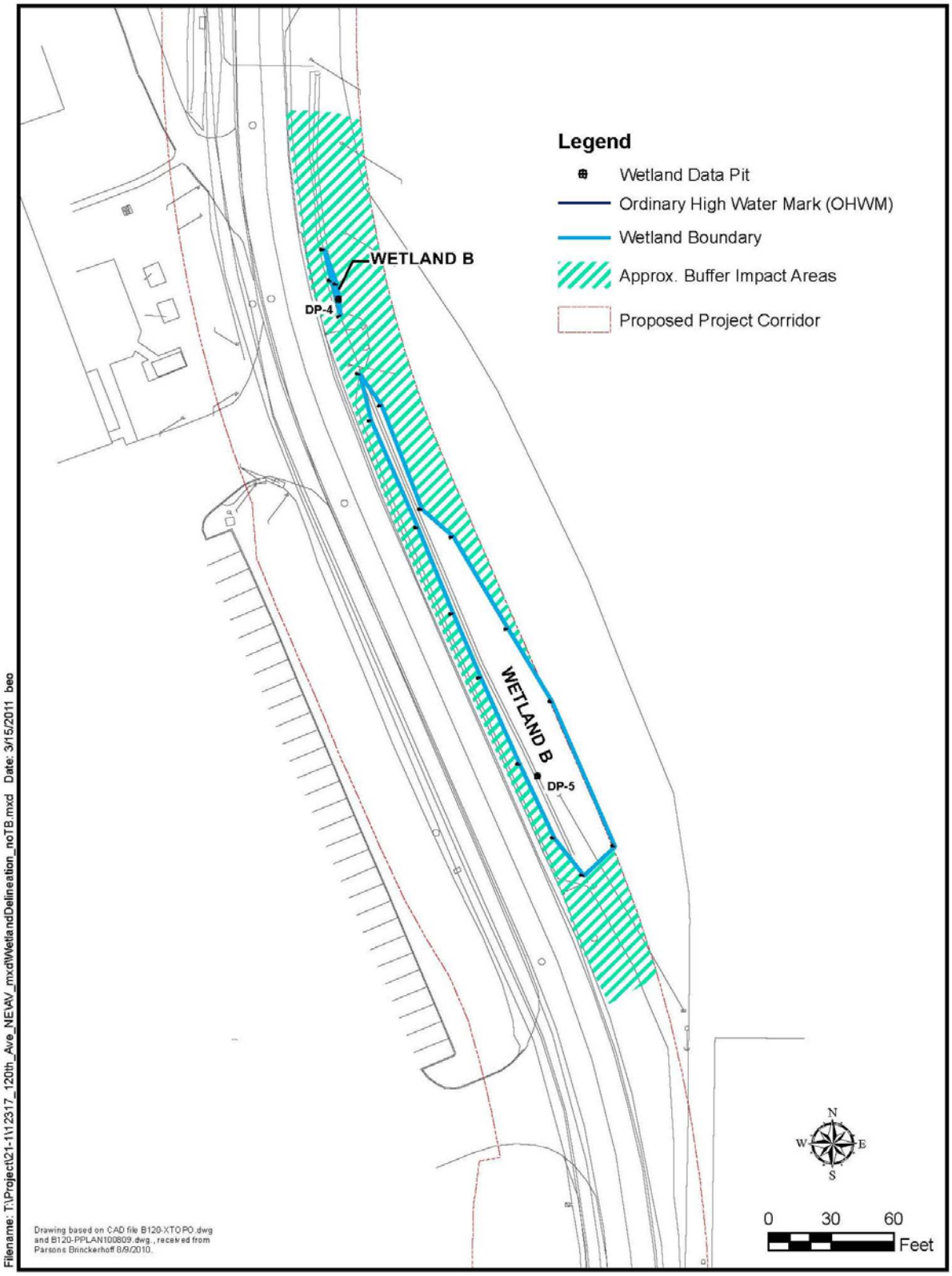

Figure 5-2. Wetland Delineation – Wetland B

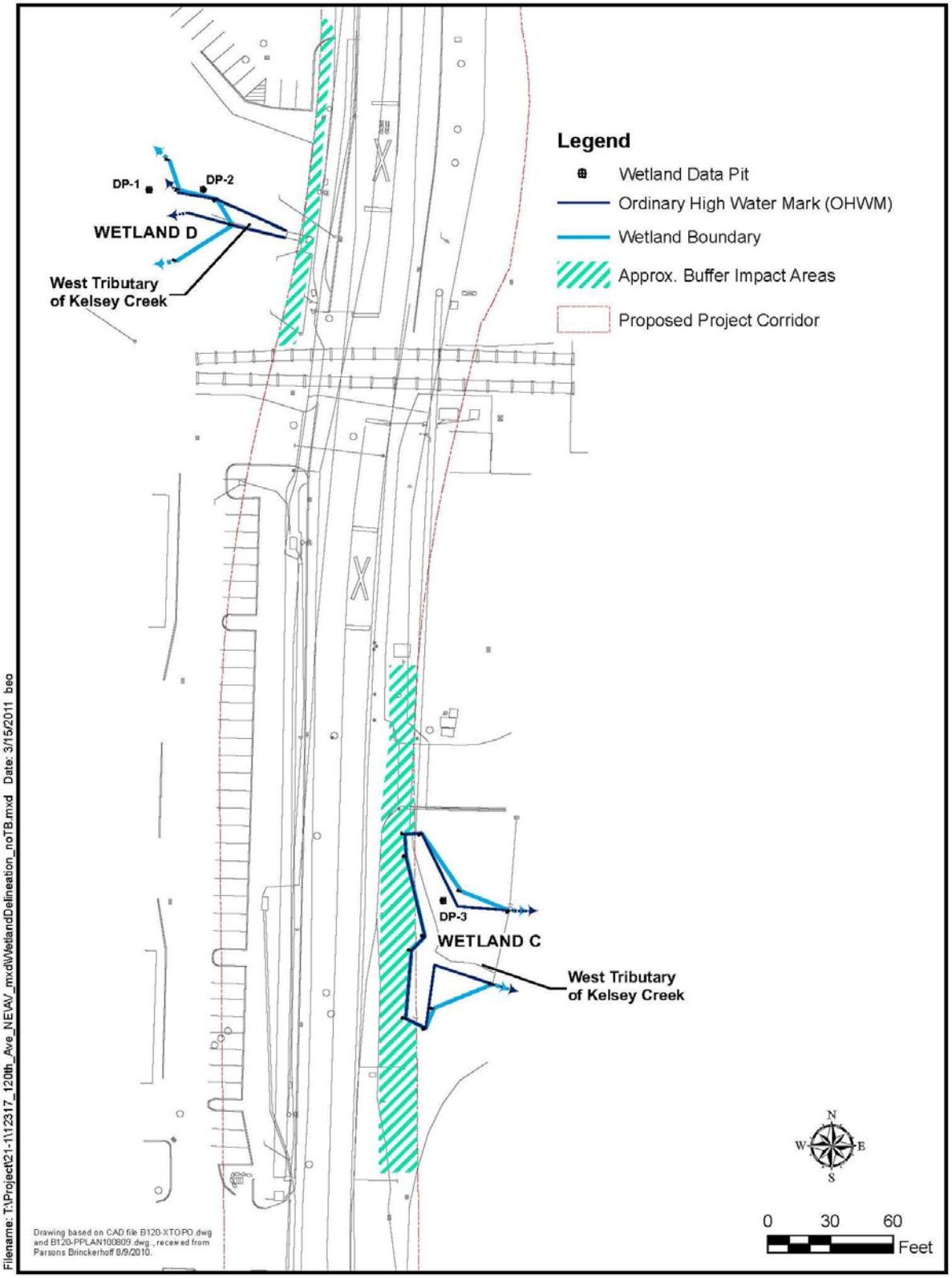

Figure 5-3. Wetland and Stream Delineation – Wetlands C and D and West Tributary of Kelsey Creek

expected in erosion hazard zones, as much of the study area is underlain by gravelly sandy loams and muck with slight-to-moderate erosion hazard.

Clearing and grading would occur in the study area as the roadways are widened and in the new segment of NE 4th Street between 116th Avenue NE and 120th Avenue NE. The newly widened areas would be the sources for any potential water quality problems, in addition to those from construction staging areas. The locations of construction staging areas are unknown at this time; however, staging areas can be sites of increased disturbance and erosion.

Stormwater runoff containing sediment from disturbed areas during construction could cause a temporary decrease in water quality in the adjacent water bodies. Stormwater runoff may also carry other contaminants, such as fuel or oil from construction operations, particularly at staging areas. Through the clearing and grading permit process, the City requires a CWSPPP for the project, which will address measures to prevent sediment and other project-related pollutants from impacting water quality outside of the project site. The CWSPPP is also a requirement of the NPDES Construction Stormwater Permit as required by Ecology.

The construction season is not defined, but construction would likely occur during summer. Because of low precipitation rates in summer, the West Tributary of Kelsey Creek would likely contain low flows. As a result, erosion or contaminants that reach the stream during summer may be more concentrated relative to other times of the year.

Spills from construction equipment at project staging areas or within the project construction limits could occur. Pouring concrete near open water would create the potential for spills. Concrete spilled into open waters can impact local pH. The CSWPPP would contain spill control measures to be implemented in the event of an incident.

Groundwater

Construction activities that require dewatering activities, vegetation clearing, soil compaction, and other practices that decrease the permeability of the ground surface and impede infiltration of rainfall could affect groundwater resources. Spills from construction equipment, if not properly contained and cleaned up, can enter and impact shallow groundwater.

Floodplains

During construction, the minor grading associated with the Build Alternative could redirect and/or obstruct the flow of runoff or floodwaters. Once grading is completed and stormwater facilities are operational, the potential temporary floodplain effects would be eliminated.

5.1.2 Effects during Operation

No Build Alternative

Under the No Build Alternative, the existing 120th Avenue NE corridor would not be retrofitted with stormwater treatment, and stormwater runoff would continue

to discharge as it does under existing conditions. No changes to the quality of groundwater resources due to roadway construction would occur. No changes in the flood storage capacity of the West Tributary of Kelsey Creek would occur.

Build Alternative

Surface Water

Per the City Utilities Department's Storm and Surface Water Engineering Standards and BCC 24.06, the project is required to comply with nine minimum requirements (MR), as applicable. These requirements include runoff treatment (MR6) and flow control (MR7). Flow control is both a flood protection and water quality protection requirement.

Currently, no stormwater treatment is provided for impervious surfaces within the study area. The project would provide stormwater treatment for 2.84 acres of new PGIS and 1.81 acres of existing PGIS for a total of 4.65 acres of PGIS (see Table 5-1). These quantities may change as design progresses. Where runoff treatment is provided, enhanced treatment measures would be used.

Table 5-1. Threshold Discharge Areas Build Alternative Modifications

TDA	Amount Existing Impervious (acres)	Increase in Impervious due to Build Alternative (Net New) (acres)	Total Impervious Proposed to be Untreated (acres)	Amount Total Impervious Treated by Bioretention BMPs (acres)
TDA 1	4.70	0.83	4.71	0.82
TDA 2	1.79	0.01	1.80	0.00
TDA 3	3.38	0.95	1.55	2.78
TDA 4	4.23	1.05	4.23	1.05
TOTALS	**14.10**	**2.84**	**12.29**	**4.65**

Note: These quantities are approximate and may change as design progresses.

With the stormwater treatment measures being designed for this project corridor, there would be an approximate 10 percent decrease in total suspended solids (TSS) and an increase in dissolved metals. Dissolved zinc and copper would increase by approximately 3.5 percent and 7.5 percent, respectively (see Table 5-2). The detailed pollutant loading calculations per TDA are included in Appendix B. Based on dilution modeling conducted for the project, background levels of dissolved metals would be reached within a few feet of entering the project corridor's water bodies (Sturtevant Creek, Lake Bellevue, and the West Tributary of Kelsey Creek) and these discharge locations are several thousand feet upstream of any native fish habitat.

Table 5-2. Pollutant Loading Summary

Project Total	TSS	Zinc		Copper	
		Total	Dissolved	Total	Dissolved
Annual effluent load from existing impervious surfaces prior to project (lbs)	7,967	15.51	5.64	2.82	0.75
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	7,153	14.82	5.85	3.76	0.81
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	-813	-0.69	0.21	0.94	0.07

While the results show a slight increase in dissolved metals and total suspended solids, the project is complying with the City's codes and standards for stormwater treatment. The project will also voluntarily treat runoff from an additional 1.8 acres of pavement above that which is required for the project. The City's stormwater standards were based upon Ecology's Stormwater Management Manual (Ecology SWMM). As a condition of approval of the City's NPDES Phase II State Waste Discharge Permit, the City's stormwater manual was required to match or be more restrictive than those requirements in the Ecology SWMM. The manual provides guidance for a municipality to develop a stormwater management strategy to apply that will bring it in compliance with all state and federal water quality requirements. The Ecology SWMM also recognizes that future degradation of our water bodies may continue even with the application of these requirements, but the use of stormwater management practices should minimize the damage.

Bioretention (bioretentoin planters) and proprietary bioretention systems (Filterra) would be used to provide runoff treatment within planting areas. It is not known at this time what portion of the project area would be treated by bioretention planters and what portion would be treated by Filterra units but both systems would be designed to provide the same level of treatment. Flow control would be provided using natural drainage practices[2] (porous concrete sidewalks, bioretention systems) and underground stormwater storage systems (detention vaults and/or pipes).

The preliminary stormwater design for the project corridor contains details regarding the proposed locations of the water treatment and flow control BMPs and the specific stormwater management requirements. Background levels for pollutants in Sturtevant and the West Tributary of Kelsey Creek are included in Appendix D.

[2] The City uses the terminology "natural drainage practices" when discussing Low Impact Development (LID) techniques.

Groundwater

The net increase in impervious surface would reduce groundwater infiltration and increase flow to surface waters for portions of the project corridor. However, implementation of bioretention/infiltration facilities should help offset this potential reduction in aquifer recharge.

Floodplains

No fill is proposed within the mapped 100-year floodplain of Lake Bellevue, thereby preserving the floodplain functions of the lake.

Similarly, no fill is proposed within the West Tributary of Kelsey Creek. A three-sided box culvert is proposed to replace the existing 36-inch corrugated metal pipe culvert under 120th Avenue NE. The proposed box culvert would be 4 feet high and approximately 8 to 10 feet wide. Its dimensions will be refined as the final design progresses. However, the final culvert would create a larger opening than the existing culvert and consequently increase the tributary's flood-carrying capacity. The proposed culvert is not expected to modify the floodplain functions of the West Tributary of Kelsey Creek.

5.2 Indirect Effects on Water Quality

Indirect effects are associated with a project and occur later in time or farther removed in distance, but they are still reasonably foreseeable (e.g., induced land development from highway projects). The indirect effects to surface waters in the project corridor are limited.

Because the project corridor is highly urbanized and developed, the proposed widening is not expected to substantially improve surface water quality. The built-out level of development also suggests that long-term changes to non-point source water quality problems are unlikely.

For the proposed culvert replacement under 120th Avenue NE for the West Tributary of Kelsey Creek, the increased culvert cross-sectional area would increase the culvert's flood-carrying capacity, potentially increasing water velocities downstream of the culvert. An increase in stream velocities may destabilize existing vegetation and erode the creek's banks or bed.

5.3 Cumulative Effects on Water Quality

Cumulative effects result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable actions, regardless of the agency or person initiating the other actions. Construction of the Build Alternative would result in direct effects to surface-water resources. The Build Alternative, in conjunction with other past, present, and reasonably foreseeable actions, would degrade surface-water resources by the incremental conversion of pervious surface to impervious. The majority of the landscape in the two subbasins is already altered by past loss of pervious surfaces, altered flow conditions, and conversion to the built environment. The additive effects of the Build Alternative in combination with other actions could further degrade

surface-water resources, if not properly mitigated. Assuming other types of projects are constructed and placed in operation, the cumulative effects on surface water resources would be as described above.

5.4 Mitigation Measures

Conservation measures are required activities or standard practices that are routinely employed on projects to avoid or minimize effects on water quality and quantity. Mitigation measures are those activities that need to be taken to reduce the effect that remains despite implementing the required conservation measures. Mitigation measures would reduce effects and restore or replace environmental resources.

5.4.1 Conservation Methods for Temporary Effects

The following conservation measures will be employed individually or together, where appropriate and feasible, to minimize temporary disturbances during construction:

- A CSWPPP with TESC drawings will be prepared prior to the start of construction and adhered to throughout the construction process in compliance with the City's clearing and grading permit requirements and Ecology's requirements for a Construction Stormwater NPDES. All reasonable measures will be used to ensure that construction activities comply with the City's and Ecology's standards.
- During project construction, all erosion and stormwater control measures will either meet or exceed the City's requirements as defined in its Clearing and Grading Code (Chapter 23.76) and Storm and Surface Water Utility Code (Chapter 24.06).
- The CSWPPP will include measures to address spill control as well as erosion and water quality. This plan will guide actions that control pollutants throughout construction work areas. The CSWPPP components could include, but are not limited to, staging, storage, maintenance, refueling areas, and waste sites. It will be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to surface waters, wetlands, and soils. In addition, the project sponsor and its contractors will structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. Construction monitoring will follow the City's requirements. The CSWPPP will mitigate for potential contaminant spills that could affect groundwater.
- The project will follow spill prevention and response procedures that meet the requirements of state and federal agencies. It will be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental

exposure of fuels or hazardous materials to waterways, wetlands, or groundwater. In addition, the project sponsor and its contractors will structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials.

- Proper storage, containment facilities, and spill control BMPs, including those defined in the CSWPPP, will be used during construction to minimize the effects of a spill. Specific spill control BMPs can be found in the City's Chapter 24.06 Storm and Surface Water Utility Code.

5.4.2 Mitigation Measures for Temporary Effects

No mitigation measures are proposed for the project's temporary effects to water resources.

5.4.3 Conservation Methods for Long-Term Effects

The following conservation measures will be employed individually or together, where appropriate and feasible, to minimize operational and maintenance disturbances:

- Stormwater treatment and flow control will be part of the corridor improvements. The proposed water quality, water quantity BMPs for roadway runoff, and stormwater management requirements are described in the preliminary stormwater design for the project.
- All stormwater facilities will undergo routine inspection and maintenance and will be designed to facilitate these activities. Maintenance will be conducted based on regular inspections and will follow the City's standards for protecting roads and the environment.
- To comply with the City's floodplain criteria, the replacement culvert under 120th Avenue NE will not reduce the flood-carrying capacity of the West Tributary to Kelsey Creek relative to existing conditions.

5.4.4 Mitigation Methods for Long-Term Effects

The following mitigation measures will be employed individually or together, where appropriate and feasible, to restore or replace riparian and wetland vegetation and function that are lost due to the project:

- Wetland mitigation will likely involve a combination of wetland re-establishment, creation, rehabilitation, and/or enhancement. The *Wetland and Stream Delineation Technical Report* (Shannon & Wilson, 2011a) discusses the City's baseline replacement ratios for wetland mitigation and the acreage of mitigation that would likely be required under each scenario. Additionally, buffer impacts will be mitigated at a one-to-one ratio. The exiting culvert under 120th Avenue NE will be replaced with a fish-passable culvert, and approximately 150 feet of the West Tributary of Kelsey Creek will be daylighted by the project. Disturbed riparian areas will be seeded and planted, with a preference for

native woody vegetation, to provide in-stream shading and prevent sediment loading to water bodies within the study area.

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Appendix A
List of Baseline Documentation

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Attachment 11

LIST OF BASELINE DOCUMENTATION

Several studies, analyses, and technical memoranda were prepared for the City of Bellevue for the NE 4th Street/120th Avenue NE Corridor Project. These documents support the environmental evaluation presented in this technical report and include the following:

- *NE 4th Street/120th Avenue NE Corridor Project, NE 4th Street Extension Phase 2, 60% Storm Drainage Report* (Draft) (Parsons Brinckerhoff, June 2011)
- *NE 4th Street/120th Avenue NE Corridor Project, NE 7th Street to NE 12th Street, 60% Storm Drainage Report* (Draft) (Parsons Brinckerhoff, April 2011)
- *120th Avenue NE Phase I (300 block to 700 block), Surface Water Management Report, 60% Preliminary Design* (INCA, April 2010)
- *NE 4th Street/120th Avenue NE Corridor Project, Wetland and Stream Delineation Technical Report* (Shannon & Wilson, June 2011)
- *NE 4th Street/120th Avenue NE Corridor Project, Biological Resources Technical Report* (Shannon & Wilson, June 2011)
- *NE 4th Street/120th Avenue NE Corridor Project, Hazardous Materials Discipline Report* (Shannon & Wilson, July 2011)

Other technical reports and resources used include the following:

- *Soil Survey of King County Area, Washington,* prepared by the United States Department of Agriculture's Natural Resources Conservation Service in 1973
- Federal Emergency Management Agency *Flood Insurance Rate Maps for King County, Washington* prepared in 1995
- *Focused Phase I Environmental Site Assessment of 120th Avenue NE, Bellevue, Washington* prepared by Landau Associates in 2010.

In addition to these technical reports, the following web-based resources from governing agencies were also used:

- *WSDOT Quantitative Procedures for Water Quality Impact Assessment,* http://www.wsdot.wa.gov/NR/rdonlyres/4A1328B5-0B23-4E78-9E5A-790E12A80843/0/QuantitativeProcedures.pdf
- Washington Department of Ecology, http://www.ecy.wa.gov/programs/eap/env-info.html
- United States Geological Survey, http://waterdata.usgs.gov/nwis/sw

Field reconnaissance and site visits confirmed data obtained from the above sources. Site photographs, aerial photographs, and maps were also reviewed.

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Attachment 11

Appendix B
Pollutant Loading Calculations

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Attachment 11

POLLUTANT LOADING CALCULATIONS

Data Entry Table—Breakdown by Project

Project	TDA No.	Amount Existing Impervious (acres)	Increase in Impervious due to Build Alternative (net new) (acres)	Total Impervious Proposed to be Untreated (acres)	Amount Total Impervious Treated by Bioretention BMPs (acres)
NE 4th St.	1	2.15	0.28	2.15	0.28
120th Ave. NE Segment 1	1	1.94	0.44	1.84	0.54
120th Ave. NE Segment 2	1	0.61	0.11	0.72	-0-
120th Ave. NE Segment 2	2	1.79	0.01	1.80	-0-
120th Ave. NE Segment 2	3	1.83	0.18	-0-	2.01
120th Ave. NE Segment 3	3	1.55	0.77	1.55	0.77
120th Ave. NE Segment 3 Segment 4	4	4.23	1.05	4.23	1.05

- NE 4th Street Extension—Values were taken from the *30% Storm Drainage Report* prepared by Parsons Brinckerhoff in March 2010.
- 120th Avenue NE—Phase 1 values were taken from the *Surface Water Management Report 60% Preliminary Design* prepared by INCA Engineers, Inc. in April 2010.
- 120th Avenue NE—Phase 2 values were taken from the Draft *60% Storm Drainage Report* prepared by Parsons Brinckerhoff in April 2011.
- 120th Avenue NE—Phase 3 and Phase 4 values were taken from the Draft *60% Storm Drainage Report* prepared for Phase 3 by Parsons Brinckerhoff in December in 2010.

Load Calculations

	TSS	Zinc		Copper	
		Total	Dissolved	Total	Dissolved
Load Rates					
Mean annual load from untreated surfaces (lbs/acre)	565	1.1	0.4	0.2	0.053
Mean annual load from treated surfaces (lbs/acre)	45	0.28	0.2	0.065	0.035
Project Total					
Annual effluent load from existing impervious surfaces prior to project (lbs)	7,967	15.51	5.64	2.82	0.75
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	7,153	14.82	5.85	3.76	0.81
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	-813	-0.69	0.21	0.94	0.07
TDA Breakdown					
TDA 1					
Annual effluent load from existing impervious surfaces prior to project (lbs)	2,656	5.17	1.88	0.94	0.25
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	2,698	5.41	2.05	1.00	0.28
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	43	0.24	0.17	0.06	0.03
TDA 2					
Annual effluent load from existing impervious surfaces prior to project (lbs)	1,011	1.97	0.72	0.36	0.09
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	1,017	1.98	0.72	1.36	0.10
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	6	0.01	0.00	1.00	0.00
TDA 3					
Annual effluent load from existing impervious surfaces prior to project (lbs)	1,910	3.72	1.35	0.68	0.18
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	1,001	2.48	1.18	0.49	0.18
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	-909	-1.23	-0.18	-0.19	0.00
TDA 4					
Annual effluent load from existing impervious surfaces prior to project (lbs)	2,390	4.65	1.69	0.85	0.22
Annual effluent load from new and existing impervious surfaces after project (lbs) with treatment	2,437	4.95	1.90	0.91	0.26
Net change in pollutant loads between pre- and post-project conditions (lbs) with treatment	47	0.29	0.21	0.07	0.04

Attachment 11

Appendix C
Detailed Information for the West Tributary and Sturtevant Creek Drainage Basins

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Attachment 11

West Tributary Basin

Lake Washington Watershed (WRIA 8)
State Stream #08-0264

LAND CHARACTERISTICS

Basin Area: 1,006 Total Acres (5% of the City)
Drainage Jurisdiction(s):
1,005.8 Acres - in Bellevue

Highest Elevation: 496 Ft
Lowest Elevation: 26 Ft

Total Length of Open Channel: 15,430 Ft
Total Length of Storm Drainage Pipes: 86,842 Ft
Built Rain Storage Volume per Acre of Impervious Surface: 1.2 Inches

SALMON PRESENT in BASIN

Chinook*+
Sockeye
Migratory & resident cutthroat trout
Coho+

* Listed Federal Endangered Species
\+ City Species of Local Importance (Bellevue Land Use Code 20.25H.150A)

POPULATION

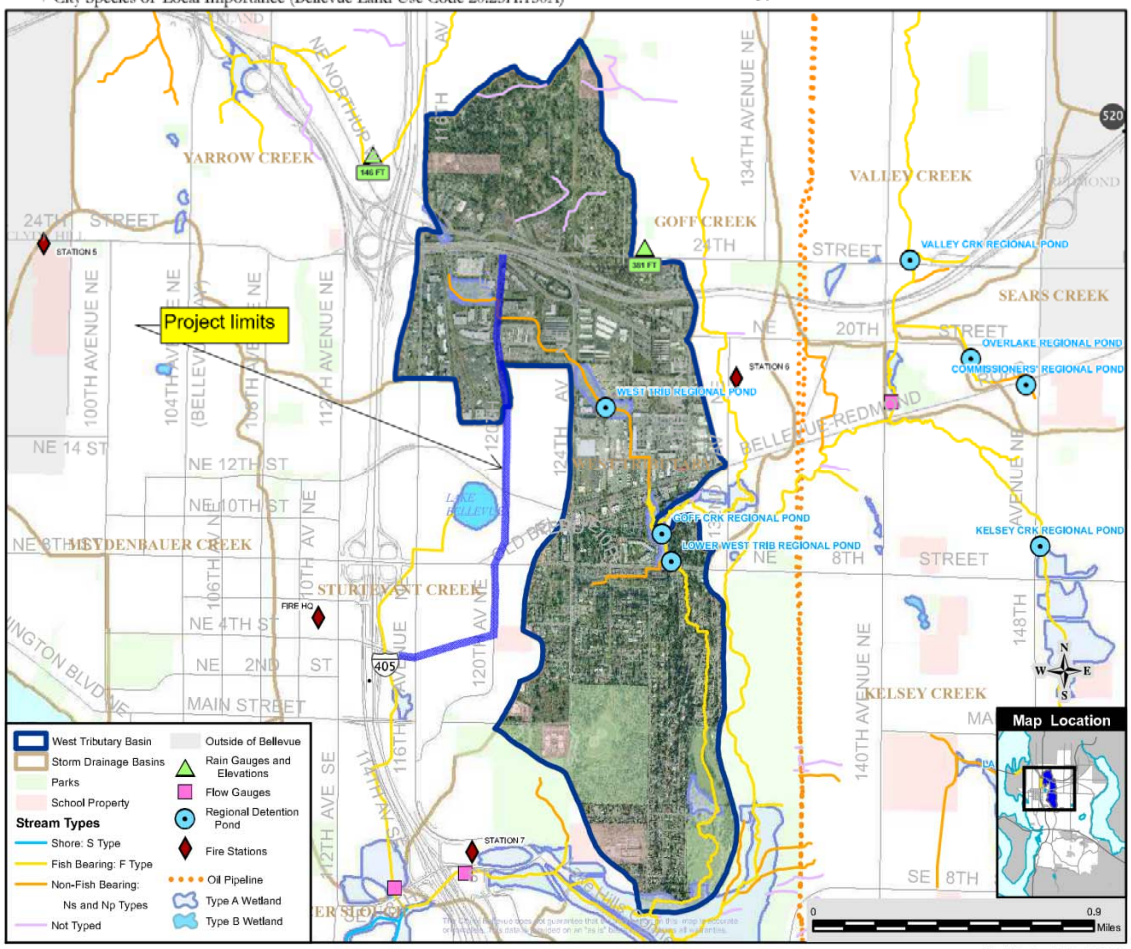
City Basin Population (2000): 3,329 (3.0% of the City)
Basin Population Density: 2,118 People/Square Mile
Number 7 of 26 Basins (One is the lowest density)

LAND USE (within Bellevue city limits)

Public Right of Way:	16.18%	162.73 Acres
Commercial/Office:	9.03%	90.9 Acres
Industrial:	15.09%	151.8 Acres
Institutional/Government:	4.62%	46.5 Acres
Mixed Use/Misc:	4.54%	45.7 Acres
Multi-Family Residential:	4.84%	48.7 Acres
Open Space/Park:	12.46%	125.3 Acres
Single Family Residential:	29.34%	295.1 Acres

LAND COVER

Impervious:	46%
Tree Canopy:	34%
Impervious in 100 Ft Stream Buffer:	28%
Tree Canopy in 100 Ft Stream Buffer:	49%



Source: City of Bellevue (Bellevue). 2010b. Drainage Basin Maps, West Tributary Basin. Found at URL: http://www.bellevuewa.gov/drainage_basin_maps.htm. Plot date July 27, 2010.

Attachment 11

Sturtevant Creek Basin

Lake Washington Watershed (WRIA 8)
State Stream #08-0260

LAND CHARACTERISTICS

Basin Area: 773 Total Acres (4% of the City)
Drainage Jurisdiction(s):
773.0 Acres - in Bellevue

Highest Elevation: 248 Ft
Lowest Elevation: 19 Ft

Total Length of Open Channel: 4,037 Ft
Total Length of Storm Drainage Pipes: 90,833 Ft
Built Rain Storage Volume per Acre of Impervious Surface:
Less than 0.5 Inches

POPULATION

City Basin Population (2000): 2,182 (1.9% of the City)
Basin Population Density: 1,806 People/Square Mile
Number 2 of 26 Basins (One is the lowest density)

LAND USE (within Bellevue city limits)

Public Right of Way:	24.80%	191.68 Acres
Commercial/Office:	35.64%	275.5 Acres
Mixed Use/Misc:	8.21%	63.5 Acres
Industrial:	7.19%	55.6 Acres
Institutional/Government:	4.04%	31.2 Acres
Multi-Family Residential:	2.71%	20.9 Acres
Open Space/Park:	3.34%	25.8 Acres
Single Family Residential:	8.02%	62.0 Acres

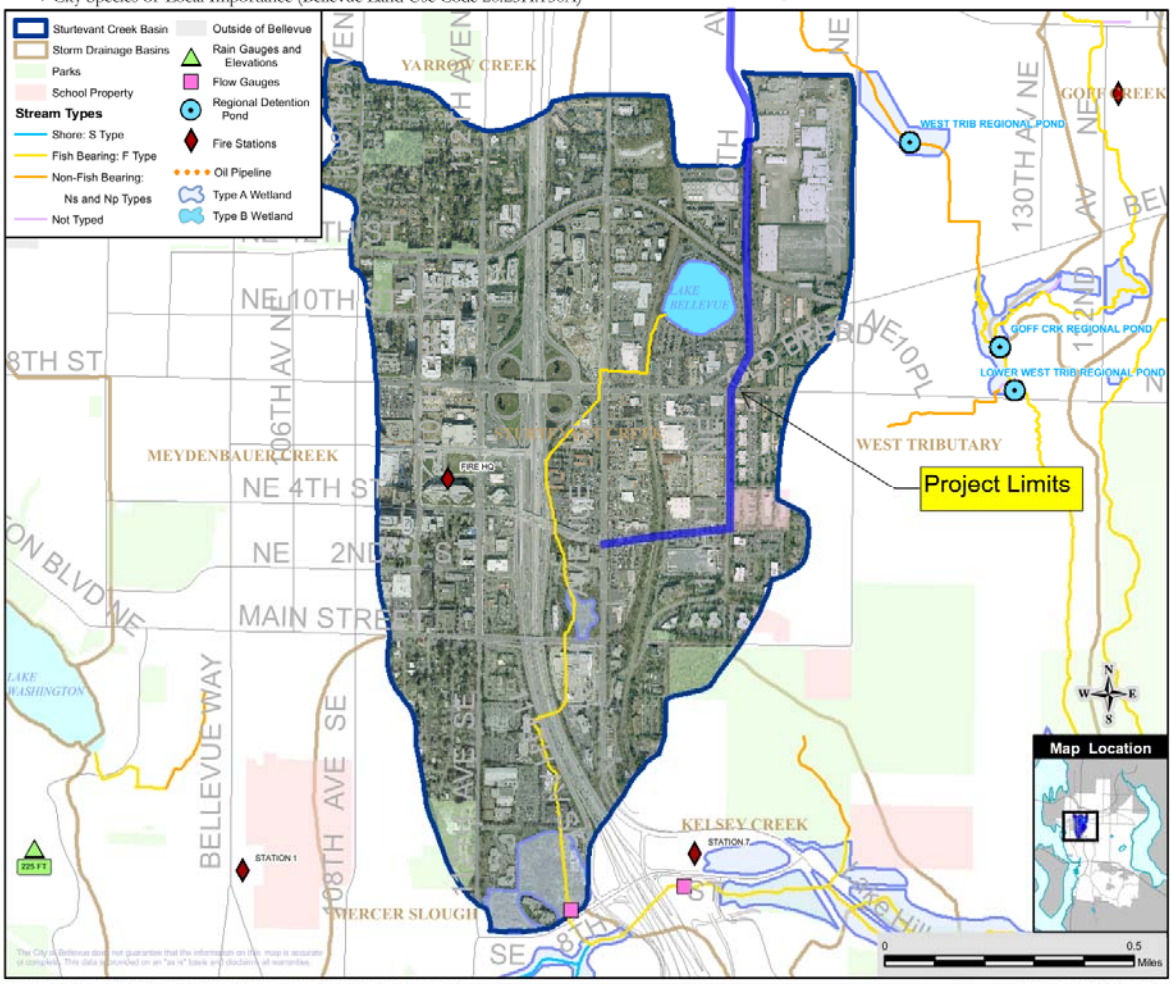
SALMON PRESENT in BASIN

Chinook*+
Coho+
Cutthroat trout
Sockeye

* Listed Federal Endangered Species
\+ City Species of Local Importance (Bellevue Land Use Code 20.25H.150A)

LAND COVER

Impervious:	71%
Tree Canopy:	18%
Impervious in 100 Ft Stream Buffer:	62%
Tree Canopy in 100 Ft Stream Buffer:	23%



Source: City of Bellevue (Bellevue). 2009b. Drainage Basin Maps, Sturtevant Creek Basin. Found at URL: http://www.bellevuewa.gov/drainage_basin_maps.htm. Updated February 26, 2009.

Attachment 11

Appendix D
Storm and Surface Water Comprehensive Plan - Water Quality Data

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Attachment 11

Appendix 6-6. Water Quality of Bellevue Streams from 1988 to 1993.

Stream water quality data from the late 1980s and early 1990s was used by the City of Redmond and the Department of Ecology to estimate how much pollution is found in urban runoff (Whiley 2009). Impervious area is an indicator of the type of land use in the catchment area; higher proportions of impervious area generally indicate more commercial or industrial land uses. For most constituents sampled (total suspended solids, turbidity, fecal coliform bacteria, nutrients such as phosphorus, nitrate-nitrite, ammonia, chemical oxygen demand, and dissolved metals including lead, zinc, cadmium, chromium, nickel and copper), concentrations increased with increased flows during rain events. Conductivity, hardness and pH were lower with increased flows, probably due to the effects of dilution.

The amount of stream flow during rain events changed with the amount of impervious surface area (buildings, roads, parking lots, etc.) in the drainage basin, adjusted by basin area. Storm event flow increased in basins with more than 40 percent impervious area (Figure A). This is due to less infiltration and faster surface runoff via the built collection and conveyance system (e.g., gutters, drains, and pipes). On the other hand, base flows in streams were lower in basins with more impervious area because less water flows into the streams between rain events from groundwater (Figure A). Lower base flows can be bad for aquatic life such as migrating salmon, because passage can be more difficult.

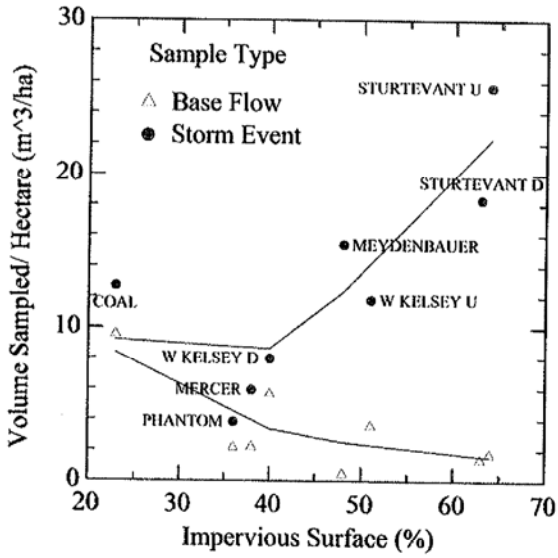

Figure A. The amount of surface runoff (Volume Sampled/Hectare) during base flow and storm events normalized by drainage basins area compared to the amount of impervious area in the drainage basin. Base flows are lower and storm flows are higher in basins with more impervious area.

Attachment 11

Appendix 6-7. Median concentrations (ug/L) and annual yields (kg/ha-yr) for various metals analyzed at Bellevue monitoring locations during the first six hours of storm events, 1988-1993, as calculated by Whiley (2009).

Stations	Lead		Cadmium		Zinc		Nickel		Chromium		Copper	
	Median Conc.	Yield	Median Conc.	Yield	Median Conc.	Yield	Median Conc.	Yield	Median Conc.	Yield	Median Conc.	Yield
W. Kelsey U	35.0	0.062	0.70	0.0012	179	0.318	11.0	0.020	>30% nd	==	33.5	0.06
W. Kelsey D	14.0	0.017	0.67	0.0008	84	0.101	5.5	0.007	>30% nd	==	22.0	0.026
Mercer	>30% nd	==	>30% nd	==	46	0.041	>30% nd	==	>30% nd	==	15.0	0.013
Coal	>30% nd	==	>30% nd	==	54	0.097	>30% nd	==	>30% nd	==	20.5	0.037
Meydenbauer	>30% nd	==	>30% nd	==	170	0.394	>30% nd	==	>30% nd	==	28.0	0.065
Sturtevant U	23.0	0.089	>30% nd	==	127	0.492	>30% nd	==	>30% nd	==	23.0	0.089
Sturtevant D	27.5	0.076	0.85	0.0023	140	0.386	9.0	0.025	>30% nd	==	20.0	0.055
Wilkins	>30% nd	==	n<4	==	49	==	>30% nd	==	12.5	==	15.5	==
Phantom	n<4	==	n<4	==	15	0.009	n<4	==	>30% nd	==	10.0	0.006

Shaded data: >30% of reported observations less than detection limit, table value is median of concentrations above detection limit.
<4: Reported observations number less than 4.
= = Yield not calculated.