



CITY OF KIRKLAND

Department of Public Works

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MEMORANDUM

To: Kurt Triplett, City Manager

From: Jenny Gaus, Surface Water Engineering Supervisor
Rob Jammerman, Development Engineering Manager
Kathy Brown, Public Works Director

Date: October 3, 2014

Subject: DRAFT SURFACE WATER MASTER PLAN

RECOMMENDATION:

It is recommended that Council receives and reviews the Draft Surface Water Master Plan, so that Council members may pose questions to staff concerning the recommended program additions and capital projects, and provide input concerning the policy decisions that are summarized below.

BACKGROUND DISCUSSION:

At the September 2nd City Council Study Session ([9-2-14 Study Session - Surface Water Master Plan](#)) staff presented the Draft Surface Water Master Plan Executive Summary. The full Draft Surface Water Master Plan (Draft SWMP) is now available at: [2014 Draft Surface Water Master Plan](#). The purpose of this presentation is to solicit any additional questions arising from Council review of the Draft SWMP and to more fully address the following questions and requests from the Study Session:

What is the interaction between trees and surface water?

Maintaining native vegetation, including trees, is one of the most effective and lowest cost means of managing stormwater runoff. As noted in the *City of Kirkland Urban Forestry Strategic Management Plan*, trees slow and clean water and air, contributing to improved water quality and healthy habitat in streams. Some of the mechanisms by which trees provide this function include interception of precipitation, increased soil infiltration capacity through root growth and decomposition, reduced soil erosion, and shade that keeps streams cool.

Management of the urban forest to promote healthy and abundant tree growth is an efficient means of managing stormwater runoff in Kirkland. For this reason the Surface Water Utility currently supports the Urban Forestry Program by funding the .50 FTE Urban Forester and portions of positions in the Public Works Grounds Crew that conduct pruning and management of right of way trees. In addition to continuing this level of support, the Draft SWMP recommends funding of a right of way tree inventory to facilitate improved management of this urban forest resource.

Provide an overview of existing tree regulations: what do we require and why?

Please see the attached summary of existing tree regulations (Attachment A). The intent of tree regulations is to maintain and increase canopy cover to provide environmental benefits including water quality and stream flow, air quality, carbon storage and sequestration, energy conservation, and social and economic benefits such as increased health and well-being and increased property values.

How does the Surface Water Utility support efforts to evaluate and reduce landslide risk? Do Surface Water Utility staff pro-actively evaluate landslide risk?

Surface water can be one factor that contributes to landslides, particularly in cases where clearing or development activity alters the quantity and timing of how water moves through the landscape. The Surface Water Utility currently provides the following to assist in managing landslide risk:

- Surface water design regulations require careful study and management of runoff near steep slopes and areas of erosive soils. For example, geotechnical study is required prior to allowing construction of stormwater infiltration ponds near steep slopes.
- As a recommendation of the *2005 Surface Water Master Plan*, the Utility funded creation of an updated geologic map for the City (Attachment B). This map covers the pre-annexation areas of the city. The updated geologic map was used to develop a map of areas of the City where it may be possible to infiltrate stormwater (see Figure 4-10 of the Draft SWMP). Geologic information is combined with risk analysis to develop more detailed maps of potential landslide and erosion hazard areas.
- Utility staff inspect and maintain public stormwater infrastructure to insure that pipes or other facilities on steep slopes are in good working condition and do not concentrate water or otherwise contribute to erosion hazards.
- Capital projects are constructed to stabilize eroding and unstable ravines.
- Utility staff respond to drainage inquiries from the public, many of which involve issues with steep slopes and erosion issues. Staff provide technical assistance and resources to assist private property owners in managing landslide risk on their property.

Council will be considering a service package that funds update of the City's Critical Areas portion of the Zoning Code including landslides as part of the budget process. The package includes funding from the Surface Water Utility for geologic mapping of the annexation area and updated identification of potential landslide and erosion hazard areas.

The City Council will also be receiving a report on citywide landslide issues including hazard identification, regulation of development activity, identification of and response to hazards on public and private property, and emergency preparedness and response later this fall. Consideration of proactive landslide identification on private property would best be done in the context of this larger discussion.

Provide more detail on next steps regarding the \$10 million Forbes Creek Regional Detention Project. Should Council be investigating sources of State funding for this project?

The Forbes Creek Regional Detention Project has two purposes: 1) to reduce flooding beneath I-405 at the NE 116th Street interchange, and 2) to protect physical habitat in Forbes Creek by controlling the flow of stormwater. Models of the current condition show that the interchange floods during relatively small storm events (< 10-year event). The interchange has been closed several times over the last 5 years because of water ponded on the roadway, leading to public safety concerns and loss of regular access to and from Totem Lake businesses and services, including Evergreen Hospital.

WSDOT was aware of the flooding problem at the NE 116th St/I-405 interchange when upgrades to that section of the freeway were designed and built several years ago. Analysis of the problem revealed that flooding was caused by backup of water from a series of pipes to the south of the interchange that convey water between WSDOT right of way and Forbes Creek. The problem developed because of re-routing of some of these pipes, and because of upstream development in the city that pre-dated stormwater control requirements. WSDOT came to the City and noted that they could upsize pipes in WSDOT right of way to fix the problem, but that this would increase flows to the city system and to Forbes Creek: essentially it would move the problem downstream, which would likely damage Forbes Creek. The City and WSDOT then partnered to investigate solutions. WSDOT created a model of the situation and the City provided stormwater monitoring to calibrate this model. Both agencies then developed and evaluated a set of alternative solutions,

each of which involved re-routing or enlargement of pipes in the vicinity of the interchange and construction of stormwater detention facilities to control the flow of water to Forbes Creek. The Executive Summary of the resulting WSDOT Flood Study is attached (Attachment C). WSDOT and the City continue to collaborate on ways to implement this important project. The following two alternatives appeared to be most feasible for the stormwater detention portion of the project based on available land and geometry:

Alter/enlarge wetlands east of the Freeway. Enlarge two wetland areas east of I-405 to provide stormwater detention. This solution appears feasible in terms of constructability, but conflicts with current City and State and Federal regulations regarding use of wetlands for stormwater control.

Construct a detention facility beneath the Cross Kirkland Corridor. Place a concrete vault beneath the CKC to control stormwater flows to Forbes Creek. Construction costs of this alternative would be high relative to use of wetlands, but the facility would be placed on land already owned by the City and that does not contain wetlands or other critical areas that would be subject to review and permitting by State and Federal agencies.

These alternatives are at the conceptual design level; further study and analysis will be needed prior to construction. The project is placed in the Draft SWMP because of its importance to reduction of flooding in the I-405/NE 116th Street interchange and to the health of Forbes Creek. At approximately \$10 million the estimated cost of the project is large in comparison to other recommended capital projects in the Draft SWMP and so it has not been scheduled for construction. Potential next steps to further define the project and move it toward construction include the following:

- Investigate alternatives such as installation of low impact development facilities in the area upstream of I-405 that could be used to reduce the size and/or increase the effectiveness of the facility in protecting Forbes Creek.
- Evaluate the costs and benefits of placing a facility beneath the Cross Kirkland Corridor. If there is interest in placing a facility under the CKC, work to gain construction approval from Sound Transit, King County, Puget Sound Energy and other parties with easements or agreements regarding use of the corridor.
- Evaluate the costs and benefits of either purchasing property for construction of the facility or partnering with a private property owner to place the facility as part of a redevelopment project. Investigate whether Zoning Code incentives or bonuses could be used as a means of developing partnerships with private parties to place the facility on private land.
- Develop design documents to 30% level for use in applying for construction grants.

The Washington State Department of Ecology will be offering grants of up to \$250,000 (25% required match) this fall for planning and design of stormwater retrofit facilities such as this one. Staff are discussing the project with Ecology, and if appropriate will be submitting an application by the November 7, 2014 due date.

Emphasize the property and public safety protection aspects of surface water management in the Draft SMWP. Take steps to raise awareness of the importance of surface water management so that citizens know why they are paying for this service.

The Draft SWMP includes review of Surface Water Utility goals in relation to City Council goals. The purpose of this language is to tie surface water management to community values such as livability, economic sustainability, and financial stability. Inventory of surface water resources and stormwater assets in the City illustrates the range of issues that the Utility manages for multiple benefits.

New Surface Water Development Regulations – Approach and Process

In past Council briefings on the draft Surface Water Master Plan, Council members expressed concern about the economic impact of new, more stringent surface water development regulations on the City, and about how the development community is being involved in the process to update these regulations.

As noted in the Draft SWMP, Kirkland is required to adopt surface water design regulations equivalent to the 2012 Stormwater Management Manual for Western Washington by December 31, 2016 to maintain compliance with the Phase II NPDES Municipal Stormwater Permit. The new regulations increase the complexity and likely the cost of providing stormwater facilities for both development and redevelopment projects by requiring more stringent control of flows, by requiring the use of low impact development facilities as feasible, and by requiring detailed reporting for even small projects (2,000 square feet of new impervious). These requirements will result in increased protection for water resources in the long-term, but do more closely tie the costs of protection to those creating development impacts.

While there is no choice as to which regulations to adopt, the Draft SWMP includes the following recommendations for facilitating the transition with the development community:

- Develop an outreach plan that includes listserv, Developers Forum meetings, and other means of contacting the development community to educate them about, and to identify resources that would assist in their use of the new regulations.
- Develop tools such as feasibility maps and sizing calculators to facilitate use of low impact development methods and facilities.
- Conduct watershed planning and investigate ways to provide regional facilities to reduce the burden on individual properties or projects.

A service package that requests a 1.0 FTE Surface Water Utility Engineer will be presented to Council as part of the budget process. This request is directly related to the need to provide the types of assistance noted above.

Next Steps

The public comment period for the Draft SWMP closes on Friday, October 29th. Public comments and responses thereto will be included in an Appendix of the SWMP. The SEPA process for the SWMP is underway, and is expected to be complete by mid-November. Pending completion of the SEPA process, the final SWMP will be presented to Council for adoption at the November 18th City Council meeting.

Attachment A: Summary of Existing Tree Regulations

Attachment B: Geologic Map of the City of Kirkland, Washington

Attachment C: Executive Summary of Flood Study and selected figures from the NE 116th Street/I-405 Interchange

KIRKLAND TREE CODE SUMMARY

Kirkland Zoning Code Chapter 95 establishes a permit process and standards for the protection and replacement of trees on private and public property. The purpose of the code is to work towards a city-wide 40 percent tree canopy coverage so that the benefits of healthy trees and vegetation contribute to Kirkland's quality of life. For the purpose of this summary, "trees" are significant trees over 6" trunk diameter at 4' from the ground.

To address both the loss of canopy from tree removal and canopy loss resulting from development, the code is separated by

- Development occurring on a site where tree removal is an issue, or
- Tree removal without any associated development.

Where no development is proposed, a permit is required to remove 3 or more trees on private property within a twelve-month period. Permits are not required for the removal of up to 2 trees on private property. To encourage responsible management of trees on private property, trees that are deemed hazardous or nuisance may be removed without counting as the 2-per year allowance.

Any trees located in sensitive areas (wetland, steep slope, stream, creek and buffers), in the Holmes Point overlay area, and within shoreline jurisdictions require a permit for removal. No permits are required to prune trees on private property; however, topping is not allowed.

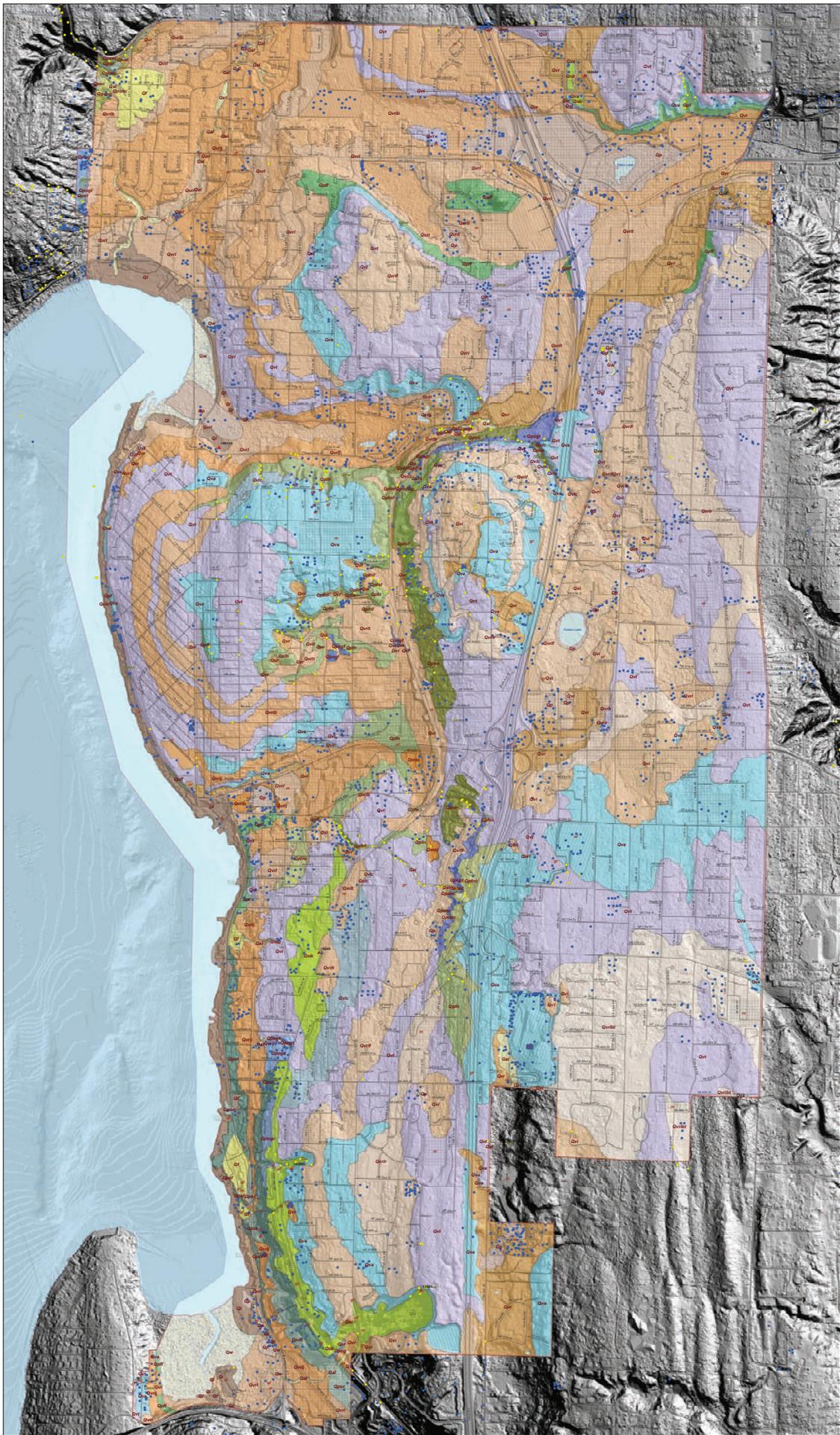
In regards to tree retention with development, the code is fairly complex. It provides sufficient flexibility for various development scenarios while intending to protect high retention value trees. *High retention value trees are healthy specimen trees or groves located within property setbacks.* If, for example a property has a rare specimen tree located within a proposed building footprint, the code does not give the City authority to retain it. However, if the tree is located within a setback, the code allows the City to require minor adjustments to retain it as a High Retention Value tree.

Data shows an increase in tree canopy within the pre-annexed city boundary from 2002 to 2010, indicating that the regulations have been effective towards reaching the City's 40% canopy goal.

Kirkland Municipal Code Title 1, Chapter 1.12 describes the process to achieve code compliance and outlines monetary penalties, restoration standards and an appeals process for a violation of the City's Zoning Code regulations. If a property owner removed seven significant trees without a permit, they would be responsible for paying a fine of \$7,000 (\$1,000 per tree), restoring the site, and for \$100 per day until compliance was reached, depending on the circumstances of the tree removal.

The table below simplifies Kirkland's tree code:

| | REMOVAL SCENARIO | REVIEW OR PERMIT REQUIRED? | MISC. |
|------------------|---|---|---|
| PRIVATE PROPERTY | Remove 2 trees (regardless of condition) | No review, no permit Tree removal request recommended | Notification appreciated to avoid unnecessary Code Enforcement response |
| | Remove >3 trees Considered hazard or nuisance | No review, no permit if... | Hazard or nuisance is obvious in a photo or other documentation |
| | Remove hazard or nuisance trees in critical areas | Yes, review and permit required | Arborist report, replacements may be required |
| | Emergency/urgent tree removal | No review, no permit | Contact Planning Dept. |
| | Prune or trim trees | No review, no permit | -Property owners are responsible for tree care -No topping allowed (>50% live crown removal is same as tree removal) |
| | Tree removal with development | Yes, included with land use or development permit (BLD, SPL) | -Arborist report required for trees potentially impacted by development -Protection measures required on site |
| PUBLIC PROPERTY | Trees in ROW medians & CBD maintained by the City. Street trees are the maintenance responsibility of the adjacent property owner unless hazard conditions exist. | Yes, review and permit required | -Public Works staff may prune street trees by property owner request -Public Works staff may remove street trees at their discretion |
| | Prune or remove park trees | No permit required; review/service performed by request | -Staff may prune park trees by property owner request -Most hazard tree removal is contracted out |



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|--|---|---|--|--|--|
| <p>Units</p> <p>Non Glacial Deposits (Holocene)</p> <ul style="list-style-type: none"> Qa1 - Alluvial deposits Qa2 - Recent alluvial deposits Qa3 - Recent alluvial deposits (fine sand) Qa4 - Recent alluvial deposits (fine sand) Qa5 - Recent alluvial deposits (fine sand) Qa6 - Recent alluvial deposits (fine sand) Qa7 - Recent alluvial deposits (fine sand) Qa8 - Recent alluvial deposits (fine sand) Qa9 - Recent alluvial deposits (fine sand) Qa10 - Recent alluvial deposits (fine sand) Qa11 - Recent alluvial deposits (fine sand) Qa12 - Recent alluvial deposits (fine sand) Qa13 - Recent alluvial deposits (fine sand) Qa14 - Recent alluvial deposits (fine sand) Qa15 - Recent alluvial deposits (fine sand) Qa16 - Recent alluvial deposits (fine sand) Qa17 - Recent alluvial deposits (fine sand) Qa18 - Recent alluvial deposits (fine sand) Qa19 - Recent alluvial deposits (fine sand) Qa20 - Recent alluvial deposits (fine sand) | <p>Younger Glacial Deposits / Fraser Glaciation, Pleistocene</p> <ul style="list-style-type: none"> Qb1 - Recent ice margin deposits Qb2 - Recent ice margin deposits Qb3 - Recent ice margin deposits Qb4 - Recent ice margin deposits Qb5 - Recent ice margin deposits Qb6 - Recent ice margin deposits Qb7 - Recent ice margin deposits Qb8 - Recent ice margin deposits Qb9 - Recent ice margin deposits Qb10 - Recent ice margin deposits Qb11 - Recent ice margin deposits Qb12 - Recent ice margin deposits Qb13 - Recent ice margin deposits Qb14 - Recent ice margin deposits Qb15 - Recent ice margin deposits Qb16 - Recent ice margin deposits Qb17 - Recent ice margin deposits Qb18 - Recent ice margin deposits Qb19 - Recent ice margin deposits Qb20 - Recent ice margin deposits | <p>Older Glacial Deposits / Fraser Glaciation, Pleistocene</p> <ul style="list-style-type: none"> Qc1 - Recent ice margin deposits Qc2 - Recent ice margin deposits Qc3 - Recent ice margin deposits Qc4 - Recent ice margin deposits Qc5 - Recent ice margin deposits Qc6 - Recent ice margin deposits Qc7 - Recent ice margin deposits Qc8 - Recent ice margin deposits Qc9 - Recent ice margin deposits Qc10 - Recent ice margin deposits Qc11 - Recent ice margin deposits Qc12 - Recent ice margin deposits Qc13 - Recent ice margin deposits Qc14 - Recent ice margin deposits Qc15 - Recent ice margin deposits Qc16 - Recent ice margin deposits Qc17 - Recent ice margin deposits Qc18 - Recent ice margin deposits Qc19 - Recent ice margin deposits Qc20 - Recent ice margin deposits | <p>Other Geologic Units</p> <ul style="list-style-type: none"> Qd1 - Recent ice margin deposits Qd2 - Recent ice margin deposits Qd3 - Recent ice margin deposits Qd4 - Recent ice margin deposits Qd5 - Recent ice margin deposits Qd6 - Recent ice margin deposits Qd7 - Recent ice margin deposits Qd8 - Recent ice margin deposits Qd9 - Recent ice margin deposits Qd10 - Recent ice margin deposits Qd11 - Recent ice margin deposits Qd12 - Recent ice margin deposits Qd13 - Recent ice margin deposits Qd14 - Recent ice margin deposits Qd15 - Recent ice margin deposits Qd16 - Recent ice margin deposits Qd17 - Recent ice margin deposits Qd18 - Recent ice margin deposits Qd19 - Recent ice margin deposits Qd20 - Recent ice margin deposits | <p>Modified level</p> <ul style="list-style-type: none"> M1 - Modified level M2 - Modified level M3 - Modified level M4 - Modified level M5 - Modified level M6 - Modified level M7 - Modified level M8 - Modified level M9 - Modified level M10 - Modified level M11 - Modified level M12 - Modified level M13 - Modified level M14 - Modified level M15 - Modified level M16 - Modified level M17 - Modified level M18 - Modified level M19 - Modified level M20 - Modified level | <p>Other Symbols</p> <ul style="list-style-type: none"> F - Fault W - Water S - Shoreline R - Road T - Tunnel B - Bridge C - Contour E - Elevation D - Datum N - North Arrow M - Mile K - Kilometer |
|--|---|---|--|--|--|



FLOOD STUDY

Eastside Corridor Program

CONGESTION RELIEF AND BUS RAPID TRANSIT PROJECTS

NE 116th Street Interchange Vicinity MP 19.85

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

Northwest Region,

I-405 Corridor Program Office

Bellevue, WA

September 2013



1 Executive Summary

NE 116th Street experiences flooding within the I-405 interchange area. The frequency of flooding, public safety issues, and property damages have prompted an investigation of the storm drainage systems. What we found is that the flooding condition is regional in nature and complex. This document summarizes the City of Kirkland and WSDOT joint effort to analyze various conveyance and regional detention pond alternatives to meet three minimum objectives:

- Address flooding/closure of NE 116th Street
- Protect Forbes Creek from flow increases due to this effort
- Address risk for property damages during a 100-year recurrent storm event

This study utilized WSDOT “MGSFlood” continuous hydrologic model to approximate the drainage system network crossing I-405 between mile post (MP) 19.2 and MP 19.8 [roughly from the Forbes Creek crossing to NE 116th Street]. Monitoring data was collected in 2010-2011 in order to calibrate the model. Within this section of I-405, there are three cross culverts that convey City of Kirkland and WSDOT runoff from east to west across the highway corridor. The early focus was on the NE 116th drainage system that passed under I-405 and then turns south along the WSDOT right-of-way approximately 2,100 feet before leaving WSDOT right-of-way. There are two other culvert connections to this system before connecting to closed systems in 120th Avenue NE, to a private drainage system that continue to railroad ditches, and eventually to Forbes Creek. Refer to Figure 2.1 for an illustration. System capacities appear to be adequate on the east side of I-405, but the systems within the WSDOT right-of-way and downstream appear to be significantly undersized. These capacity deficiencies result in flooding within NE 116th Street Interchange and restrict flows downstream.

This study shows that increasing the pipe capacities would impact Forbes Creek, so various scenarios were developed to identify regional detention options that would address the capacity issues without increasing existing peak flows.

Two solutions were identified:

- Utilize surplus WSDOT property near NE 116th Street plus additional undeveloped commercial property near Culvert 22 to add regional detention upstream of I-405. At a cost of \$5.19 Million, this is the lowest cost of the two scenarios. This proposal conflicts with current City Code, so the associated wetland impacts would need to be justified, and appropriate off-site mitigation areas would need to be identified.
- Utilize surplus WSDOT property near NE 116th Street to add regional detention upstream of I-405 plus additional conveyance system improvements to divert Culvert 22 flows to a new regional detention vault to the west of I-405. The \$10.03 Million estimate assumes that the vault would be located within the City owned rail/trail (former BNSF) corridor.

The City of Kirkland will continue the effort by verifying/validating that the lower cost option is justifiable based on a watershed analysis of benefits to Forbes Creek. To support that effort, WSDOT reviewed the wetland hydrology by comparing the existing levels of inundation relative to post-project conditions. The models show that the wetland hydrology is generally maintained in the NE 116th Street vicinity pond. The wetland area would have similar hydrology, but this would significantly increase in size (4.5 times larger). The model shows that the proposal would result in wetland enhancement rather than impact at this location. In contrast, the Culvert 22 vicinity wetland hydrology would be significantly modified, so impacts would be likely without acquiring additional land and expanding the work to maintain the existing wetland hydrology. Refer to Attachment 10.4 for additional detail.

When reviewing the model information for possible cost split information, it was noted that the City of Kirkland runoff dominates in the system. WSDOT represents approximately 20% of the basins area contributing to the conveyance systems in WSDOT right-of-way with a portion of that detained in flow control facilities. Based on the Baseline Calibration model, we estimated that WSDOT contributes 6% to the peak flows in the NE 116th Street drainage system and 14% of flows leaving the WSDOT right-of-way at 120th Avenue NE.

2 Overview

NE 116th Street experiences frequent flooding within the I-405 interchange area. The frequency of flooding, public safety issues, and property damages have prompted an investigation of the storm drainage systems. Preliminary investigations into the cause and potential solutions to the problem revealed that the hydrologic conditions and hydraulic systems affecting the flooding condition are regional in nature, complex, and incompletely understood. The City of Kirkland and WSDOT have initiated a joint effort to obtain data necessary to better understand the system, develop and calibrate a better model of the system, and using that model to analyze various regional alternative designs.

The existing NE 116th Street drainage system consists of a 24-inch pipe conveying flows from east to west through the I-405 interchange. The pipe conveyance system turns south at the NE 116th Street on-ramp to southbound I-405 and continues along the WSDOT right-of-way approximately 2,100 feet before leaving WSDOT right-of-way. Before leaving WSDOT right-of-way, there are two tributary connections through WSDOT's Culvert 21 (C21) and Culvert 22 (C22). Flow continues west through a 24 and 36-inch pipe system connecting under 120th Avenue NE and private properties to outfall into railroad ditches and private drainage systems that eventually connect to Forbes Creek. Refer to the Vicinity map for an illustration of this conveyance system.

The storm drainage system within WSDOT right-of-way conveys a total of 209 acres of contributing area including WSDOT and the surrounding City of Kirkland developments. That area breaks down as:

1. City runoff from three areas east of the I-405 corridor:
 - a. NE 116th Street storm drainage system conveys runoff from 73.5 acres.
 - b. Culvert 22 conveys runoff from 62 acres
 - c. Culvert 21 conveys runoff from 36 acres
2. WSDOT right-of-way makes up 36 acres of the study area = 17.2 %.
3. Basin areas on the west side of the I-405 Corridor were included for downstream analyses

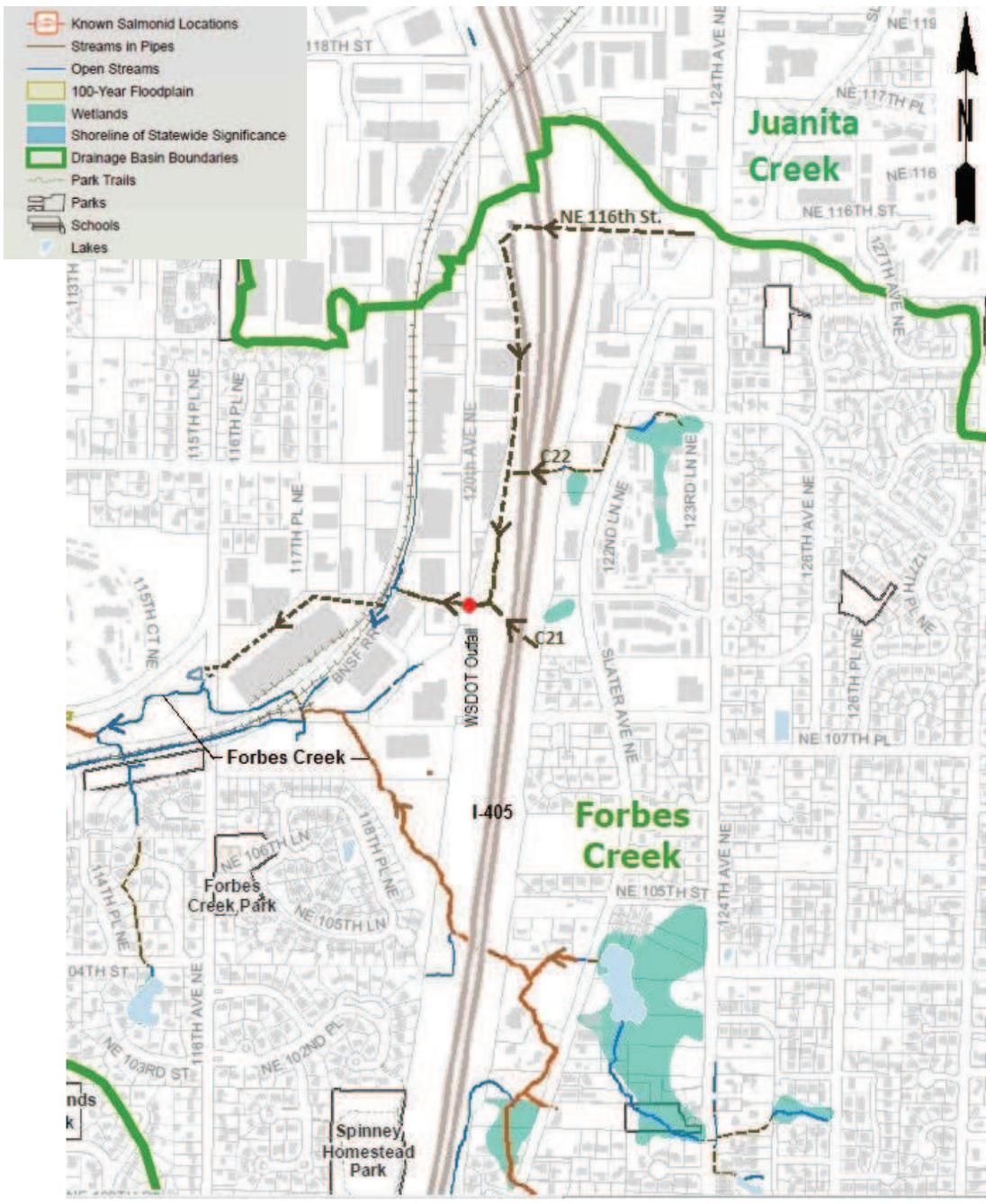


Figure 2.1 Vicinity Map

Source: City of Kirkland Sensitive Areas Map
 Note: See Figure 4.1 for more detail on basins

Potential Locations of Stormwater Storage for the Forbes Creek Regional Detention Project

(simplified figure produced by Kirkland staff)

