Council Meeting Date: July 31, 2017 **Agenda Item:** 9(c)

CITY COUNCIL AGENDA ITEM

CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	Update on Design of the 25th Avenue NE Flood Reduction Project
DEPARTMENT:	Public Works
PRESENTED BY:	Randy Witt, Public Works Director
ACTION:	____ Ordinance ____ Resolution ___ Motion __X_ Discussion ____ Public Hearing

PROBLEM/ISSUE STATEMENT:

The Lyon Creek Basin Plan identified the 25th Avenue NE Flood Reduction project as a high priority project. Since 2001 the City has received reports of Ballinger Creek flooding along 25th Avenue NE between Brugger's Bog Park and NE 195th Street on at least 16 separate occasions. Nearby public and private properties have flooded, including public rights-of-way and the City's North Maintenance Facility (NMF) site. In April 2016, Council approved a design contract with Louis Berger Group, Inc., to examine ways to reduce Ballinger Creek flooding by improving an inadequate piped stream conveyance system and installing other flood reduction and related improvements. The culverts and pipes to be addressed are located along 25th Avenue NE between Brugger's Bog Park and NE 195th Street. A new stream conveyance system would be designed to pass peak flood flows and provide other improvements as needed.

Louis Berger Group, Inc. has completed a pre-design analysis and developed conceptual design alternatives and cost estimates. Tonight, staff will report on the findings of this work and a staff recommendation.

RESOURCE/FINANCIAL IMPACT:

The adopted 2017-2022 CIP includes a total project budget of $4,145,000 for the 25th Avenue NE Flood Reduction project. Approximately $381,000 of this amount has been spent to date for pre-design efforts, with an original budget remaining balance of $3,730,000 available to move forward with completing pre-design, design, and construction. By the end of 2017, total project expenditures are expected to reach up to $512,500 to conclude the pre-design phase.

The $1,256,930 Louis Berger Group, Inc. design contract is phased and the first phase has expended $334,000 to date and includes approximately $109,000 in remaining budget to finish pre-design efforts. The second phase allocates $814,000 to complete final design (not started yet). A $472,000 King County Flood Control District Flood Reduction Grant for this project provides funding for design through completion of 60% level and permitting for up to $356,000, an amount representing approximately 68% of total expected costs for this phase.

This project is budgeted in the Surface Water Capital Fund and will be included for budgeting as recommended in all Management Strategy 6-year CIP programs discussed in the Surface Water Master Plan Update.

The estimated cost of the final design and construction of the preferred alternative (Alternative 3-2) is $6,300,000. Of this amount, approximately $2,240,000 is estimated for the portion of work within Lake Forest Park related to NE 195th Street culvert replacement. The estimated cost for the portion of work for Alternative 3-2 within the City of Shoreline is $4,060,000. Of the in-City costs, approximately $1,800,000 covers daylighting and floodplain storage work within the NMF property and the remaining $2,260,000 is for Ballinger Creek conveyance improvements along 25th Avenue NE between the NMF property and NE 195th Street.

The project budget for the 2018-2023 CIP is recommended as $2,674,000 for design and construction of daylighting and floodplain storage work within the NMF property, plus design efforts up to final design for the remaining project areas (including for replacement of the NE 195th Street culvert). This budget represents a near-term reduction of [$958,500] in project budget compared to the 2017-2022 CIP for a total project budget of $3,186,500. Budgeting for construction costs for improvements downstream of the NMF property will be delayed until a future year to be determined later.

RECOMMENDATION

Staff recommends that Council discuss the various design alternatives and select Alternative 3-2 as the best long-term, holistic approach for the 25th Avenue NE Flood Reduction Project.

Approved By: City Manager ***DT*** City Attorney ***MK***

BACKGROUND

A summary of the results of the McAleer Creek and Lyon Creek Surface Water Basin Plans were presented to Council as a discussion item on February 8, 2016. The presentation included a brief overview of flooding issues associated with 25th Avenue NE in the vicinity of Brugger's Bog Park. The staff report for this discussion can be found at the following link: http://cosweb.ci.shoreline.wa.us/uploads/attachments/cck/council/staffreports/2016/staffreport020816-9a.pdf.

On April 4, 2016, Council approved a design contract with Louis Berger Group, Inc., to examine ways to reduce the Ballinger Creek flooding by improving an inadequate piped stream conveyance system and installing other flood reduction and related improvements. The staff report for this contract award can be found at the following link: http://cosweb.ci.shoreline.wa.us/uploads/attachments/cck/council/staffreports/2016/staffreport040416-7c.pdf

The existing Ballinger Creek piped stream conveyance system downstream of Brugger's Bog Park includes 550 feet of undersized culverts and pipes along 25th Avenue NE and a 75-foot culvert crossing under NE 195th Street (ranging in size from 24- to 36-inches in diameter). Addressing the NE 195th Street culvert capacity restriction is necessary to relieve the flooding issues along 25th Avenue NE upstream of this location; this culvert is located completely within the jurisdiction of Lake Forest Park.

Louis Berger has completed an analysis of the flooding and provided a Draft Pre-Design Report with alternatives for consideration by the City. The full report is available on the Public Works page of the City website at: http://www.shorelinewa.gov/government/departments/public-works/capital-improvement-plan/25th-avenue-ne-flood-reduction-project. Attachment A provides the Executive Summary from this report, which presents a condensed version of the study's core elements, including project background, efforts to date, alternatives under consideration, and next steps.

The Draft Pre-Design Report does not include a recommended approach. Since the completion of the Draft Pre-Design Report, staff has undertaken additional assessment tasks to support development of a recommended approach; these additional tasks are discussed below.

The Draft Pre-Design Report study area (see Figure ES-1 in Attachment A) includes locations of recurring flooding and potential improvements to reduce such flooding, generally defined as the area along Ballinger Creek piped and open channel segments located between the southeast corner of Brugger's Bog Park and Ballinger Way NE approximately 300 feet south of NE 195th Street.

A portion of the study area is within the City of Lake Forest Park (south of the boundary running along the north right-of-way line of NE 195th Street). This culvert and the Ballinger Creek channel running for approximately 500 feet downstream of it are also

within the Washington State Department of Transportation (WSDOT) right-of-way associated with Ballinger Way NE/State Route 104 (SR-104).

Since 2001, the City has received reports of Ballinger Creek flooding public rights-of-way and public and private properties along 25th Avenue NE between Brugger's Bog Park and NE 195th Street on at least 16 separate occasions. Analysis of the system has indicated that the existing 25th Avenue NE Ballinger Creek conveyance system capacity is exceeded on two-year recurrence intervals (i.e., a 50% chance of flooding any given year). The last reported major flooding at this location occurred during the extreme storm event on December 3, 2007 (second-largest daily precipitation ever recorded at the Sea-Tac rain gage); four episodes of smaller, "nuisance-level" flooding have been reported in the nine years since. The lack of recent major flooding is likely due to a relative absence of high-intensity precipitation events over that time.

In 2015, the City of Shoreline's Lyon Creek Basin Plan concluded that flooding in this area was due to a lack of capacity within the existing piped stream conveyance system along 25th Avenue NE and the NE 195th Street culvert. This general finding was also confirmed by Louis Berger during pre-design analysis. In October 2016, WSDOT completed emergency repairs to a failed retaining wall at the southern (downstream) end of the NE 195th Street culvert, but did not make improvements to the culvert itself. During the emergency repairs, the WSDOT team found juvenile Coho salmon and cutthroat trout within the reach of Ballinger Creek immediately upstream of NE 195th Street.

A King County Flood Control District Flood Reduction Grant was obtained in 2016, providing up to $472,000 in funding for this project through the completion of 60% level design and permitting phase; the grant amount represents nearly half of total estimated project costs through that phase. The grant award amount is allocated such that $106,000 has already been applied to pre-design expenses, with $356,000 available for upcoming design efforts, representing funding for approximately 68% of expected costs for design through completion of 60% level design and permitting phase. The current grant agreement expires at the end of 2018, and may be extended by up to one year and no longer. The City may reapply for King County Flood Control District for grant funding for subsequent project phases, such as Final Design and Construction. The staff report to obligate funding for this grant can be found at the following link: http://cosweb.ci.shoreline.wa.us/uploads/attachments/cck/council/staffreports/2016/staffreport112116-7e.pdf.

The City is also currently evaluating a potential plan to redevelop a former King County Roads yard site within the study area, located at 19547 25th Avenue NE. This site could potentially serve as a new primary maintenance and operations center for the City, known as the North Maintenance Facility (NMF). Overlapping areas of interest shared by both the NMF and 25th Avenue NE Flood Reduction City projects will require that timing and other issues are closely coordinated as these efforts develop.

ALTERNATIVE ANALYSIS

Key findings from investigations into the existing stream conveyance system and flooding problems were considered in development and evaluation of project alternatives. A number of complex potential challenges to the project were discovered during these investigations and the development of conceptual solutions.

The project team brainstormed a list of 46 potential concepts, representing a wide range of conceivable solutions to flooding issues. A basic screening process using project objectives (see Executive Summary "Project Objectives" section for more information on objectives) narrowed the matrix of brainstormed options to seven preliminary alternatives deemed as the most feasible concepts for further consideration. These seven preliminary alternatives were evaluated in more depth than the initial 46 options, but remained at a relatively high concept level without development of detailed conceptual plans and profiles, detailed modeling, or detailed cost analysis.

Preliminary alternatives were presented to several groups of key stakeholders, and as a result of this early stakeholder outreach the preliminary alternatives received some adjustments to various concepts proposed. Two of the seven preliminary alternatives were dropped altogether from further consideration: Alternative 4 (closed conveyance improvements) and Alternative 5 (bypass improvements) were concluded to be effectively infeasible based upon comments from the regulatory stakeholders. (Because of this elimination from further consideration, Alternatives 4 and 5 are not described in the Executive Summary or this Staff Report; for more information see Section 3.1.3 in the Draft Pre-Design Report.)

The remaining five Selected Alternatives emerged from the initial investigation, conceptual development, and early vetting process as the best, most feasible candidates to potentially fulfill the project objectives. The five alternatives are briefly described below. Refer to Attachment A for a more complete description and to Attachment B (Figure ES-3 of the Executive Summary) which presents schematic alignments and extents of the five alternatives.

Alternatives 1 and 2: Daylight Ballinger Creek within the 25th Avenue NE Right-of-way and Replace the NE 195th Street Culvert

Alternative 1 proposes daylighting the creek within the west side of the 25th Avenue NE right-of-way to minimize impacts to existing roadside parking and avoid major utility conflicts (both existing parking and utilities are concentrated on the east side). The Alternative 1 daylighted channel begins near the southeast corner of Brugger's Bog and extends south along the west side of 25th Avenue NE, including alongside the existing large residential building at 19500 Ballinger Way NE, crossing 25th Avenue NE near the southern end of this building.

The Alternative 2 alignment along 25th Avenue NE matches the Alternative 1 alignment within the west side of the right-of-way for most of the length of the NMF property, then crosses to the east side of 25th Avenue NE around NE 195th Place to avoid construction adjacent to the foundation of 19500 Ballinger Way NE (built with no setback between the building foundation and the 25th Avenue NE right-of-way).

Both Alternatives 1 and 2 also propose replacing the NE 195th Street culvert, which will require addressing some notable challenges, including:

- The replacement culvert needs to pass beneath an existing 66-inch diameter SPU water distribution main (Tolt Pipeline), which will require special structural and construction considerations.
- The channel downstream of NE 195th Street needs to be deepened so the culvert can fit below the water pipeline, which raises issues related to the narrow corridor available in this area. A new easement on private property (within Lake Forest Park) would likely be required to avoid this work impacting an adjoining retaining wall. This wall is owned by WSDOT and supports the SR-104/Ballinger Creek roadway embankment. The toe of this wall runs immediately adjacent to Ballinger Creek downstream of NE 195th Street and has begun to structurally fail. WSDOT has been notified of this ongoing failure and currently has no plans to repair their wall. Staff is currently coordinating with WSDOT to determine if funding could be obtained from WSDOT for repair of the SR-104 failing retaining wall, and if this funding might help to incentivize replacement of the NE 195th Street culvert, given that these efforts have an overlapping area of interest with the Ballinger Creek channel deepening required for NE 195th Street culvert replacement. WSDOT has requested a cost estimate for wall repair, which the City is providing. Replacement of the WSDOT SR-104 retaining wall is estimated to cost approximately $2,800,000.
- The condition of the NE 195th Street culvert, which is typically submerged, is a consideration as an October 2016 CCTV inspection revealed that small holes have corroded through the bottom of the corrugated metal pipe (CMP). While this culvert is not likely in imminent danger of failure, the remaining functional lifespan will lesson as corrosion worsens and the risk of failure increases over time. Lake Forest Park staff has been made aware of this finding.
- The NE 195th Street culvert is completely within the City of Lake Forest Park and also within Washington State Department of Transportation (WSDOT) right-of-way. From a responsibility perspective, the existing size of the culvert dictates that it is Lake Forest Park's responsibility to maintain and replace, and after replacement (due to significant upsizing required for fish passage) it will become WSDOT's responsibility. Neither agency currently has any plan to replace this culvert; whereas both are willing to support a City of Shoreline led and funded project to replace this culvert and address downstream issues.

Alternative 3: Daylight Ballinger Creek and Create Floodplain Storage within the NMF Property

Viability of this alternative is completely contingent upon the Public Works Maintenance Facility project team modifying their design concept in a significant manner (such as selecting an alternative Maintenance Facility project site or approach) which would, at minimum, free much of the eastern half of the NMF site to be used for surface water purposes (the Public Works Maintenance Facility design concept developed for this site would not allow implementation of Alternative 3 by any means). In addition to allowing a more naturally-meandering daylighted stream channel with sloped banks, Alternative 3 could also potentially include floodplain storage, constructed wetland, water quality enhancement, and fish habitat improvements. Daylighting within the NMF site rather

than the 25th Avenue NE right-of-way would also reduce impacts to other potential right-of-way uses (such as sidewalks, roadway lanes, and parking) and ease constructability.

However, this approach must consider the presence of soil contamination within the NMF site likely area for potential stream daylighting (within the easternmost portion of the property). Three geotechnical borings made in January 2016 were supplemented in June 2017 with 12 additional borings within the stream daylighting and floodplain storage area to provide a comprehensive assessment of contaminated soils. These investigations found petroleum-contaminated soils within two of the 15 total borings which are above cleanup levels determined by the Model Toxics Control Act (MTCA). These soils must be removed and disposed of in a manner in accordance with MTCA requirements. Soils from eight other borings revealed contaminants at levels which were detectable but below MTCA cleanup thresholds; feedback from Washington State Department of Ecology staff indicated that there would be no special removal or disposal requirements for these soils within a proposed stream daylighting and floodplain area. Using the best available information, the estimated cost for cleanup of soils contaminated above MTCA thresholds is approximately $70,000.

Downstream of NE 195th Place, Alternative 3 would follow the alignment of either Alternative 1 or Alternative 2 (identified as Alternatives 3-1 and 3-2, respectively). Costs for both variations of Alternative 3 (3-1 and 3-2) were calculated in the Draft Pre-Design Report.

As Alternative 3 also proposes replacing the NE 195th Street culvert, it will require addressing the same challenges discussed in Alternate 1 and 2 above.

Alternative 3-A: Daylight Ballinger Creek and Create Floodplain Storage within the Aldercrest Annex Property

The Alternative 3 concept within the NMF site is also roughly analogous (as a mirror image) to what the daylighting configuration could potentially look like within the southwest-most corner of the Shoreline Schools Aldercrest Annex property on the east side of 25th Avenue NE. Early contact with the School District indicated that permission for project use of this property may be difficult to obtain, so this option was not initially considered in the Draft Pre-Design Report under the five Selected Alternatives. However, following completion of the Draft Pre-Design Report, staff wished to further assess potential feasibility for this approach under the assumption that providing stormwater management for potential future redevelopment of the site could incentivize obtaining District permission. In June 2017 Louis Berger conducted a high level assessment for feasibility of daylighting Ballinger Creek within the Aldercrest Annex property (Attachment C).

Results of the assessment indicated that a combined wet pond and detention pond facility as the preferred concept for providing stormwater management facilities for potential intensive future redevelopment of the Aldercrest Annex due to minimal footprint size of this facility type compared with other options. Daylighting Ballinger Creek and the site's stormwater management facilities (sized per conservative assumptions about future redevelopment) would require 2.1 acres (or 13% of the total property). Due to spatial constraints, the size of floodplain storage for an Aldercrest

Annex daylighting site would likely be significantly smaller than the floodplain storage for the NMF site.

Providing stormwater management facilities for the School District would be expected to cost approximately $570,000 for design and construction. Some of these additional costs for Alternative 3-A Aldercrest Annex stormwater management facilities are partially offset by cost savings when compared to Alternative 3 due to the contaminated soil cleanup costs at the NMF site and other differences. Accordingly, Alternative 3-A (at Aldercrest Annex) is expected to cost a net amount approximately $300,000 more than Alternative 3-2.

Downstream of NE 195th Place, Alternative 3-A would follow the alignment of Alternative 2. As Alternative 3-A also proposes replacing the NE 195th Street culvert, it will require addressing the same challenges discussed in Alternate 1 and 2 above.

Alternative 6: "Buyout" to Acquire Frequently-Flooding Property

Alternative 6 would target the most frequently-flooding areas within private properties to be purchased by the City and converted to floodplain storage features. This is a dual approach which eliminates some of the highest-risk flood problems and provides some additional flood storage, while also potentially avoiding in the near term the many complex challenges required to replace the stream conveyance system along 25th Avenue NE and/or the NE 195th Street culvert. The area initially selected for such a buyout approach would be the western half of the property at 2518 NE 195th Street (including one four-plex multifamily residential building – the building address of which is 19510 25th Avenue NE). The existing building would be demolished with the western half of the property converted to a floodplain storage facility, allowing of a small length of channel to be daylighted. The Alternative 6 overall flood reduction effectiveness is less than Alternatives 1, 2, and 3, and it also does not address the long-term need to ultimately replace the 25th Avenue NE conveyance system (within 20 to 40 years) due to eventual pipe deterioration.

Alternative 7: Small-Scale Flood Proofing Measures

Alternative 7 would reduce the frequency and magnitude of flooding in small increments by implementing an array of lower-cost improvements. This approach avoids the cost and challenges of full system replacement. Such improvements would include repairing and extending the existing bypass system, berms, and providing better overflow pathways. The existing system floods during a 2-year storm (i.e. once every two years on average); Alternative 7 could increase the flooding interval to about a 5-year storm (i.e. once every five years on average). This approach would also attempt to improve control of floodwater pathways to minimize potential flooding damage for events when system capacity is exceeded. Alternative 7 overall flood reduction effectiveness is less than Alternatives 1, 2, 3, and 6; and (similar to Alternative 6) does not address the long-term

Summary of Alternative Comparison

A summary table of these alternatives with costs (which is also provided as Table ES-1 in Attachment A) is provided in Attachment D to this staff report. Some important considerations regarding the alternatives are noted below:

- **Alternative 3** is viable as a potential alternative only in the event that the City does not proceed with the NMF site development as previously planned. However, if the site is available, Alternative 3 would be the best long-term, holistic approach to eliminate flooding for up to the 100-year event, restore the creek, and provide an amenity to the community.
- **Alternative 3-A** may provide an attractive alternative to Alternative 3 as an optimal daylighting and floodplain location in the event that the NMF site is unavailable (or otherwise unsuitable) for daylighting and that a partnership with the School District to allow daylighting on the Aldercrest Annex property seems attainable.
- **Alternative 1 and 2** share many similarities. The key distinguishing factors are that Alternative 1 would require special construction practices (and associated costs) due to excavating the channel relatively close to the building at 19500 Ballinger Way NE; Alternative 2 avoids working in proximity to this building but instead faces challenges in the need to relocate several more major utilities and greater direct impacts to existing parking.
- **Alternative 6** provides only a modest increase in flood protection relative to Alternatives 1, 2, and 3. However, in the event that NE 195th Street culvert replacement (and associated work) is deemed too expensive and/or fraught with risks and other complexities, Alternative 6 provides a reasonable approach to reduce the impacts of flooding caused by this culvert while avoiding its replacement (because the NE 195th Street culvert is not owned by the City, there is no long-term obligation to replace it due to deteriorating pipe condition alone.) However, the 25th Avenue NE conveyance system would still continue to have capacity issues and need to be eventually replaced due to pipe condition; so upstream of the property to be acquired under Alternative 6 conveyance improvements similar to those proposed under Alternatives 1, 2, or 3 would be required in the long-term.
- **Alternative 7** provides the smallest increase in flood protection among the alternatives. However, Alternative 7 could be implemented in the near future as either (1) interim improvements installed prior to a much larger scope preferred approach which will require (at minimum) two to three years to begin construction, or (2) as effectively “standalone” improvements in the event that the City opts to delay a near-term selection of a preferred approach in order to allow for more resolution of current uncertainties (such as potential availability of the NMF and/or Aldercrest Annex sites, securing sufficient funding, viability of other property and/or easement acquisitions, etc.).

ALTERNATIVE RECOMMENDATION

Daylighting Ballinger Creek in an open channel along 25th Avenue NE with replacement and lowering of the NE 195th Street culvert is the only viable approach to “fully fix” the deficient surface water conveyance system and resulting flooding issues at this location. Only Alternatives 1, 2, 3-1, 3-2, and 3-A meet this threshold and have been supported by the regulatory agencies via early vetting. As noted above, Alternative 3-2 is the best long-term, holistic approach to eliminate flooding for up to the 100-year event, restore the creek, and provide an amenity to the community. Although this alternative uses a portion of the NMF property, in a discussion on the NMF project with the Council tonight, staff is recommending that this property be made available for alternative City uses.

With this background, staff recommends that Alternative 3-2 be the preferred alternative for advancement of design, permitting, and construction activities. Project design and construction should be phased to account for shared uses of the NMF property, grant opportunities, and to facilitate Lake Forest Park and/or WSDOT making a financial contribution to (if not taking a lead role in) the NE 195th Street culvert replacement. Specifically, this recommendation would design the drainage system improvements in the study area and phase implementation such that improvements with the City are prioritized for construction while a partnership with Lake Forest Park and WSDOT is developed to replace the NE 195th Street culvert.

This approach would involve proceeding with entire project design through 60% design level and permitting phase. Proceeding with design and permitting efforts to this level will be largely (68%) funded by the King County Flood Control District Flood Reduction Grant, would help to facilitate and expedite NE 195th Street culvert-related coordination with Lake Forest Park and/or WSDOT, and provide support additional grant funding. Completion of 60% design and permitting phase would be targeted for end of 2018, with a subsequent update to Council.

Construction of the daylighted channel and floodplain storage within the NMF property would occur in conjunction with other improvements to the NMF property. Overall phasing of conveyance improvements within the City would be tied to the needs of the stormwater system, the NMF project, and/or coordination with other projects. This recommendation assumes redevelopment of the NMF site and associated Ballinger Creek improvements within the property would occur within six years and should be included in the CIP.

COUNCIL GOAL(S) ADDRESSED

This project supports Council Goal #2 to improve Shoreline's utility, transportation, and environmental infrastructure. This project will address the Surface Water Utility's stated Goal #1, which is Flood Reduction.

RESOURCE/FINANCIAL IMPACT

The adopted 2017-2022 CIP includes a total project budget of $4,145,000 for the 25th Avenue NE Flood Reduction project. Approximately $381,000 of this amount has been spent to date for pre-design efforts, with an original budget remaining balance of $3,730,000 available to move forward with completing pre-design, design, and construction. By the end of 2017, total project expenditures are expected to reach up to $512,500 to conclude the pre-design phase.

The $1,256,930 Louis Berger Group, Inc. design contract is phased and the first phase has expended $334,000 to date and includes approximately $109,000 in remaining budget to finish pre-design efforts. The second phase allocates $814,000 to complete final design (not started yet). A $472,000 King County Flood Control District Flood Reduction Grant for this project provides funding for design through completion of 60% level and permitting for up to $356,000, an amount representing approximately 68% of total expected costs for this phase.

This project is budgeted in the Surface Water Capital Fund and will be included for budgeting as recommended in all Management Strategy 6-year CIP programs discussed in the Surface Water Master Plan Update.

The estimated cost of the final design and construction of the preferred alternative (Alternative 3-2) is $6,300,000. Of this amount, approximately $2,240,000 is estimated for the portion of work within Lake Forest Park related to NE 195th Street culvert replacement. The estimated cost for the portion of work for Alternative 3-2 within the City of Shoreline is $4,060,000. Of the in-City costs, approximately $1,800,000 covers daylighting and floodplain storage work within the NMF property and the remaining $2,260,000 is for Ballinger Creek conveyance improvements along 25th Avenue NE between the NMF property and NE 195th Street.

The project budget for the 2018-2023 CIP is recommended as $2,674,000 for design and construction of daylighting and floodplain storage work within the NMF property, plus design efforts up to final design for the remaining project areas (including for replacement of the NE 195th Street culvert). This budget represents a near-term reduction of [$958,500] in project budget compared to the 2017-2022 CIP for a total project budget of $3,186,500. Budgeting for construction costs for improvements downstream of the NMF property will be delayed until a future year to be determined later.

RECOMMENDATION

Staff recommends that Council discuss the various design alternatives and select Alternative 3-2 as the best long-term, holistic approach for the 25th Avenue NE Flood Reduction Project.

ATTACHMENTS

Attachment A: Draft Predesign Report
Attachment B: Map - Alternatives Overview
Attachment C: Aldercrest Annex Daylighting Feasibility Memorandum
Attachment D: Alternative Summary Comparison Matrix

EXECUTIVE SUMMARY

Introduction

The City of Shoreline (City) has prepared this Draft Predesign Report for the 25th Avenue NE Flood Reduction Project (hereafter referred to as the project) to assess options to reduce flooding of Ballinger (West Lyon) Creek in the vicinity of 25th Avenue NE and NE 195th Street. The area has been subject to recurrent flooding of public rights-of-way and public and private property. The City retained a consulting engineering team led by Louis Berger to assist in the evaluation of the flooding problem and identify and evaluate feasible alternatives to reduce flood hazards.

This Executive Summary presents a condensed version of the study's core elements, including project background, efforts to date, alternatives under consideration, and next steps. More detailed information on pre-design efforts can be found in subsequent sections of the report.

This Draft Predesign Report does not include a recommended approach. Rather, feedback from a broad range of project stakeholders will be solicited, obtained, and weighed in the selection of a preferred approach, which will be presented in the Final Predesign Report.

Background

The study area (see Figure ES-1) includes locations of recurring flooding and potential improvements to reduce such flooding, generally defined as the area along Ballinger Creek piped and open channel segments located between the southeast corner of Brugger's Bog Park and Ballinger Way NE approximately 300 feet south of NE 195th Street.

A portion of the study area is within the City of Lake Forest Park (south of the boundary running along the north right-of-way line of NE 195th Street) because the existing Ballinger Creek culvert at NE 195th Street is undersized and contributes to upstream flooding within the City of Shoreline. This culvert and the Ballinger Creek channel running for approximately 500 feet downstream are also within the Washington State Department of Transportation (WSDOT) right-of-way associated with Ballinger Way NE (State Route 104).

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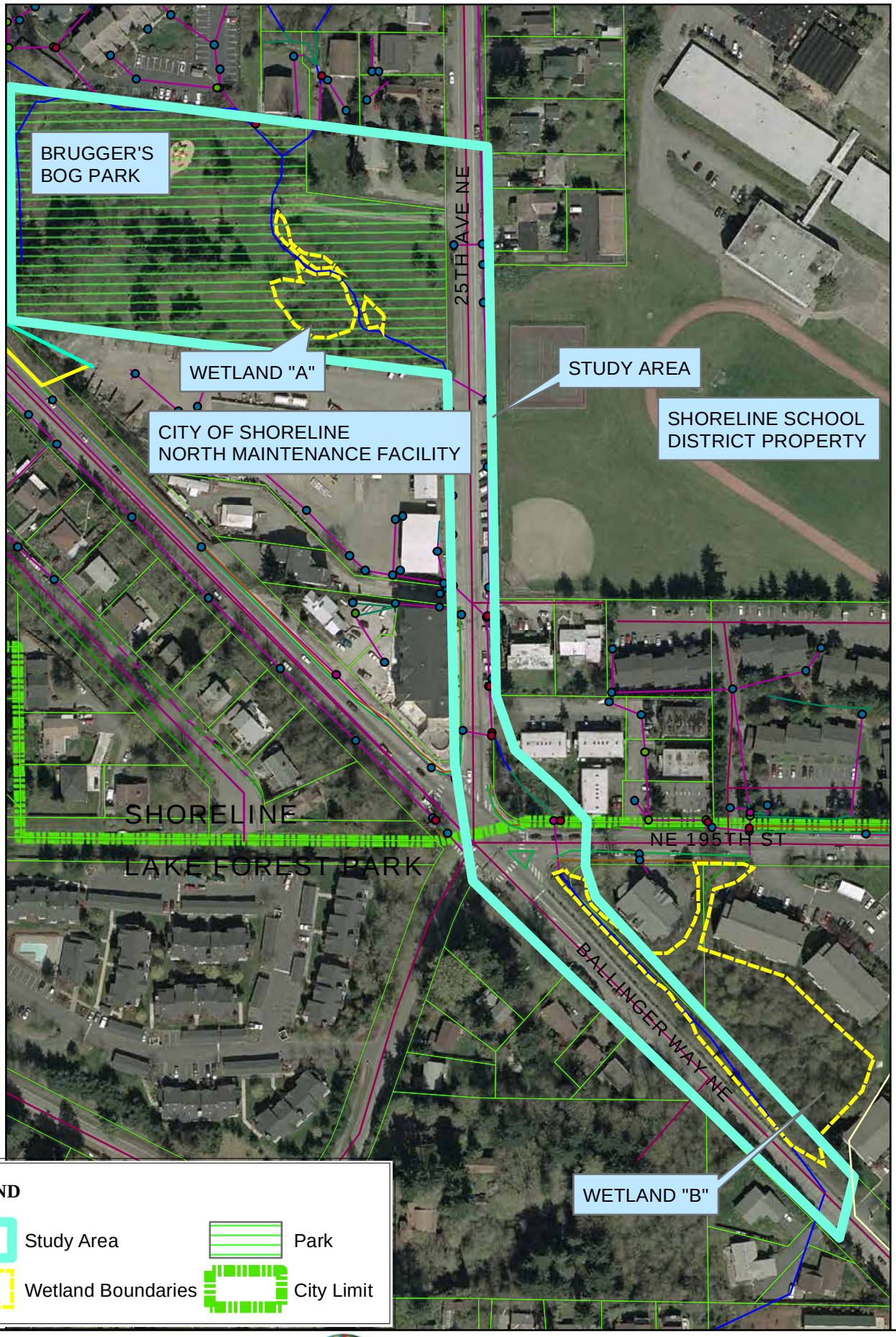

LEGEND

- Study Area
- Wetland Boundaries
- Park
- City Limit

City of Shoreline
25th Ave. NE Flood Reduction Project
Figure ES-1 -
Study Area

0 75 150 300 Feet

Date: 12/1/2016
Author: jellis

Path: P:\PROJECTS\City of Shoreline\25th Ave NE\Data Analytical\GIS\Figures\Figure 1-1 - Study Area.mxd

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Since 2001, the City has received reports of Ballinger Creek flooding public rights-of-way and public and private properties along 25th Avenue NE between Brugger's Bog Park and NE 195th Street on at least 16 separate occasions. In 2015, the City of Shoreline's Lyon Creek Basin Plan concluded that flooding in this area was due to a lack of capacity within the existing piped stream conveyance system along 25th Avenue NE and the NE 195th Street culvert. In October 2016, WSDOT completed emergency repairs to failed retaining wall at the southern end of the NE 195th Street culvert, but did not make improvements to the culvert itself.

The City is currently evaluating a potential plan to redevelop a former King County Roads yard site within the study area, located at 19547 25th Avenue NE. This site would potentially serve as new primary maintenance and operations center for the City, known as the North Maintenance Facility (NMF). Overlapping areas of interest shared by both the NMF and 25th Avenue NE Flood Reduction City projects will require that timing and other issues are closely coordinated as these efforts develop.

Project Objectives

The purpose of this study is to analyze existing flooding issues and potential solutions and recommend the best overall approach to reduce flood hazards, based primarily upon consideration of the following objectives:

- **Effective:** Proposed improvements should reduce flood risk to the maximum extent feasible.
- **Affordable:** Proposed improvements should (1) be cost effective, such that the flood reduction benefit received is maximal relative to expenditures; and (2) obtain funding from grants and other sources, if possible.
- **Acceptable:** Project team will converse with a broad collection of all interested stakeholders to gather input and help to identify the best approach. Proposed improvements should be supported by a wide selection of stakeholders.
- **Permitable**: Proposed improvements must be configured so that all required permits and approvals from regulatory stakeholders are obtainable.
- **Beneficial**: Proposed improvements should protect and enhance the environment and provide amenities to the neighborhood to the maximum extent feasible.
- **Coordinated:** 25th Avenue NE and NMF projects must work together for optimal timing and configuration of improvements.
- **Responsible:** Proposed improvements should have little to no impacts to downstream areas and minimal adverse impacts overall.

Pre-Design Process and Alternatives

Figure ES-2 presents the project's pre-design process and timeline, to illustrate a summary of study efforts to date and expected next steps.

The initial steps of the project were undertaken during the summer of 2016. To further understand the existing stream conveyance system and flooding problems, the team: (1) gathered and reviewed available information and (2) performed multiple technical investigations, including: field topographical and utility surveying; environmental critical areas assessment; geotechnical investigations; and hydrologic and hydraulic modeling.

Key findings of these investigations were considered in further development and evaluation of project alternatives. A number of complex potential challenges to the project were discovered during these investigations and the development of conceptual solutions. For the sake of brevity, such potential challenges are not described here in detail, but are summarized in Table ES-1, appear in the Selected Alternative discussion below, and are discussed in depth within the main body of the report.

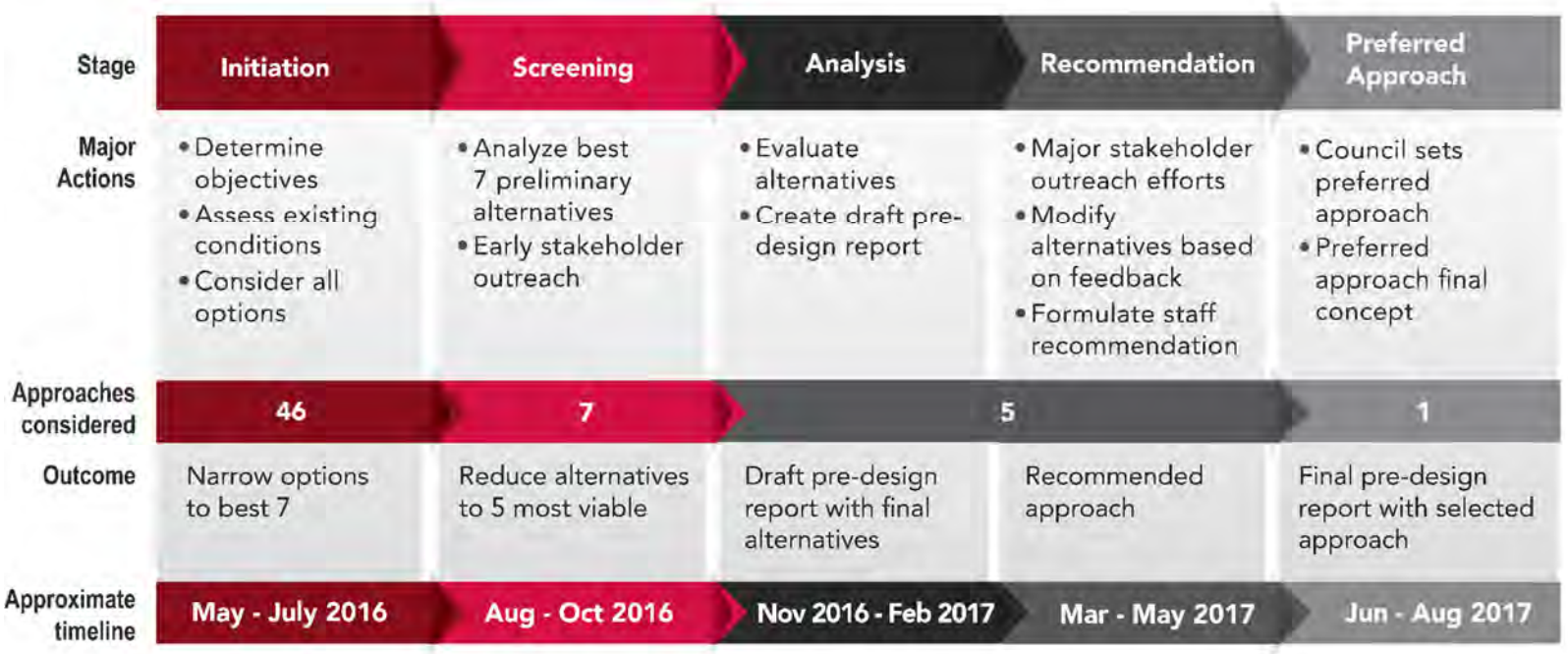
While the technical investigations were underway, the project team brainstormed a list of potential options numbering nearly 50 concepts, representing a wide range of conceivable solutions to flooding issues. A basic screening process using project objectives narrowed the matrix of brainstormed options to seven (7) preliminary alternatives deemed as the most feasible concepts for further consideration. (A full list of the initial options and screening outcome for each are summarized in Table 3-1.)

These seven preliminary alternatives were evaluated in more depth than the initial 46 options, but remained at a relatively high concept level without development of detailed conceptual plans and profiles, detailed modeling, or detailed cost analysis.

In the fall of 2016, these preliminary alternatives were presented to key stakeholders, including:

- City of Shoreline departments (in three separate meetings), with representatives from Public Works, Parks, and Planning and Community Development;
- City of Lake Forest Park departments (in a single meeting), with representatives from Engineering, Public Works, and Planning and Building; and
- Regulatory Stakeholders (in a single meeting), with representatives from U.S. Army Corps of Engineers (USACE), Washington Department of Fish and Wildlife (WDFW), and Washington Department of Ecology (Ecology). (Muckleshoot Indian Tribe Fisheries Division (MITFD) was unable to attend but was included on all meeting-related communications).
- Concept-level coordination efforts were also started with WSDOT, Seattle Public Utilities (SPU), Seattle City Light (SCL), Shoreline Public Schools, and the City's NMF project team.

Figure ES-2 Pre-Design Process Approach



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Discussion topics focused on the various areas of interest and/or expertise for these key stakeholders, so that the preliminary alternatives could be most effectively vetted for viability, feasibility, or other major concerns, which could affect the details of further development for each alternative.

Because of this early stakeholder outreach the preliminary alternatives received some adjustments to various concepts proposed. Two of the seven preliminary alternatives were dropped altogether from further consideration: Alternative 4 (closed conveyance improvements) and Alternative 5 (bypass improvements) were concluded to be effectively infeasible based upon comments from the regulatory stakeholders. *(Because of this elimination from further consideration, Alternatives 4 and 5 are not described in the Executive Summary; for more information see Section 3.1.3).*

Five Selected Alternatives

The remaining five Selected Alternatives emerged from the initial investigation, conceptual development, and early vetting process as the best, most feasible candidates to potentially fulfill the project objectives. *(More detailed alternative descriptions including plan and profile figures are provided in Section 3).* Figure ES-3 presents schematic alignments and extents of the five alternatives.

- **Alternatives 1 and 2: Daylight Ballinger Creek within the 25th Avenue NE right-of-way and replace the NE 195th Street culvert.** Alternative 1 proposes daylighting the creek along the west side of the 25th Avenue NE right-of-way to minimize impacts to existing roadside parking and avoid major utility conflicts (both existing parking and utilities are concentrated on the east side). Alternative 1 daylighted channel begins near the southeast corner of Brugger's Bog and extends south along the west side of 25th Avenue NE, including alongside the existing large residential building at 19500 Ballinger Way NE, crossing 25th Avenue NE near the southern end of this building.

  The Alternative 2 alignment along 25th Avenue NE matches the Alternative 1 alignment along the west side of the right-of-way for most of the length of the NMF property, then crosses to the east side of 25th Avenue NE around NE 195th Place to avoid construction adjacent to the foundation of 19500 Ballinger Way NE (built with no setback from the 25th Avenue NE right-of-way).

  Photo ES-1 (below) from a recent City of Bothell project with some similar concepts shows what the daylighted channel along 25th Avenue NE may look like: a daylighted stream sharing public right-of-way with other dedicated uses, utilizing traffic barrier and pedestrian railing to protect roadway and sidewalk users.

Photo ES-1. Example of 3-Sided Open Channel with Concrete Walls

Both Alternatives 1 and 2 also propose replacing the NE 195th Street culvert, which will require addressing some notable challenges, including:

- Need for the replacement culvert to pass beneath an existing 66-inch diameter SPU water distribution main (Tolt Pipeline), which will require special structural and construction considerations.
- Need to deepen the channel downstream of NE 195th Street (so the culvert can go under the water pipeline), which raises issues related to the narrow corridor available to the stream located between private property and a failing WSDOT gabion wall along the SR-104/Ballinger Way NE roadway. A new easement on private property would be required to avoid this work impacting the WSDOT wall.

- **Alternative 3: Daylight Ballinger Creek and create floodplain storage within the NMF property.** Viability of this alternative is completely contingent upon the NMF project team modifying their design concept in a significant manner (such as selecting an alternative NMF project site) which would, at minimum, free much of the eastern half of the NMF site to be used for surface water purposes; the current NMF design concept would not allow implementation of Alternative 3 by any means. In addition to allowing a more naturally-meandering daylighted stream channel with sloped banks, Alternative 3 could also potentially include floodplain storage, constructed wetland, water quality enhancement, and fish habitat improvements. Daylighting within the NMF site rather than the 25th Avenue right-of-way would also reduce impacts to other potential right-of-way uses (such as sidewalks, roadway lanes, and parking) and ease constructability. However, there is also some potential chance of contaminated soils at this location, which could add high costs to the project if encountered.

Downstream of NE 195th Place, Alternative 3 would follow the alignment of either Alternative 1 or Alternative 2 – including replacement of the NE 195th Street culvert and all associated work elements and challenges.

The Alternative 3 concept within the NMF site is also roughly analogous (as a mirror image) to what the daylighting configuration could potentially look like within the southwest-most corner of the Shoreline Schools Aldercrest Annex property on the east side of 25th Avenue NE. Early contact with the school district indicated that permission for project use of this property may be difficult to obtain so this option was not considered for further development at this time. If permission is somehow obtained in the future, the Alternative 3 concepts as presented would need to be reconfigured to account for conditions specific to the Aldercrest Annex property.

- **Alternative 6: "Buyout" to acquire frequently-flooding property.** Alternative 6 would target the most frequently-flooding areas within private properties to be purchased by the City and converted to floodplain storage features. This is a dual approach which eliminates some of the highest-risk flood problems and provides some additional flood storage, while also potentially avoiding in the near term the many complex challenges required to replace the stream conveyance system along 25th Avenue NE and/or the NE 195th Street culvert. The area initially selected for such a buyout approach would be the western half of the property at 2518 NE 195th Street (including one four-plex multifamily residential building – the building address of which is 19510 25th Avenue NE). The existing building would be demolished with the western half of the property converted to a floodplain storage facility, allowing of a small length of channel to be daylighted. The Alternative 6 overall flood reduction effectiveness is less than Alternatives 1, 2, and 3, and it also does not address the long-term need to ultimately replace the 25th Avenue NE conveyance system (within 20 to 40 years) due to eventual pipe deterioration.

- **Alternative 7: Small-scale flood proofing measures.** Alternative 7 would reduce the frequency and magnitude of flooding in small increments by implementing an array of lower-cost improvements. This approach avoids the cost and challenges of full system replacement. Such improvements would include repairing and extending the existing bypass system, berms, and providing better overflow pathways. The existing system floods during a 2-year storm (i.e. once every two years on average); Alternative 7 could increase the flooding interval to about a 5-year storm (i.e. once every five years on average). This approach would also attempt to improve control of floodwater pathways to minimize potential flooding damage for events when system capacity is exceeded. Alternative 7 overall flood reduction effectiveness is less than Alternatives 1, 2, 3, and 6; and (similar to Alternative 6) does not address the long-term need to ultimately replace the 25th Avenue NE conveyance system.

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BRUGGER'S BOG PARK

WETLAND "A"

25TH AVE NE

SHORELINE SCHOOL DISTRICT PROPERTY

19533 25TH AVE. NE

19500 BALLINGER WAY NE

2500 NE 195TH PL

2518 NE 195TH ST

NE 195TH ST

2525 NE 195TH ST.

WETLAND "B"

2609 NE 195TH ST.

BALLINGER WAY NE

BALLINGER WAY CULVERT

COLOR CODE
~~LEGEND~~

- Alternative 1 — *Daylighting Creek within 25th Ave. NE ROW (West side) and replace NE 195th Culvert*
- Alternative 2 — *Daylighting Creek within 25th Ave NE ROW (west and east side) and Replace NE 195th Culvert*
- Alternative 3 — *Daylight Creek in NFM and Transition to Alt 1 or Alt 2 (Alt 1 shown in graphic)*
- Alternative 6 — *Buy Out Alternative*
- Alternative 7 — *Flood Proofing Alternative*
- Shoreline City Limit

LINE TYPE

- Open Channel
- Closed Pipe
- Line Existing Pipe with Smooth Interior
- Berming/Raising Height of Driveway "Speed Bumps"
- Improving Conveyance of Existing Roadway Shoulder and Pipe System
- Limits of Buy-Out Property Acquisition
- Limits of Floodplain Storage

City of Shoreline
25th Ave. NE Flood Reduction Project
Figure ES-3
Alternatives Overview

0 37.5 75 150 Feet

Date: 2/2/2017
Author: James Ellis
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Detailed Alternative Evaluation

A detailed alternative analysis was performed for the five Selected Alternatives. Project objectives shaped these criteria for evaluation of alternatives:

- Project Cost (Estimated)
- Flood reduction performance
- Downstream impacts
- Fish Passage
- Impacts to Critical Areas
- Permitting Complexity
- Other Environmental Factors including Mitigation
- Constructability
- Property Impacts
- Permanent Parking Impacts
- Community Considerations (pedestrian improvements/environmental/aesthetic/ recreational)
- Property Acquisition Needs
- Maintenance
- Temporary Traffic Impacts
- Opportunities for Grant Funding

Table ES-1 summarizes the key differences between the alternatives. *See Section 3 for detailed discussion of criteria and how the various alternatives were assessed*.

Some important considerations regarding the alternatives are noted below:

- Alternative 3 is viable as a potential alternative only in the event that the City does not proceed with the NMF site development as currently planned. However, if the site is available, Alternative 3 would be the best long-term, holistic approach to eliminate flooding for up to the 100-year event, restore the creek, and provide an amenity to the community, assuming that potential risks from contaminated soil are determined to be negligible.

- Alternative 1 and 2 share many similarities. The key distinguishing factors are that Alternative 1 would require special construction practices (and associated costs) due to excavating the channel relatively close to the building at 19500 Ballinger Way NE; Alternative 2 avoids working in proximity to this building but instead faces challenges in the need to relocate several more major utilities and greater direct impacts to existing parking.

- Alternative 6 provides only a modest increase in flood protection relative to Alternatives 1, 2, and 3. However, in the event that NE 195th Street culvert replacement (and associated work) is deemed too expensive and/or fraught with risks and other complexities, Alternative 6 provides a reasonable approach to reduce the impacts of flooding caused by this culvert while avoiding its replacement (because the NE 195th Street culvert is not owned by the City, there is no long-term

obligation to replace it due to deteriorating pipe condition alone.) However, the 25th Avenue NE conveyance system would still continue to have capacity issues and need to be eventually replaced due to pipe condition; so upstream of the property to be acquired under Alternative 6 conveyance improvements similar to those proposed under Alternatives 1, 2, or 3 would be required in the long-term.

- Alternative 7 provides the smallest increase in flood protection among the alternatives. However, Alternative 7 could be implemented in the near future as either (1) interim improvements installed prior to a much larger scope preferred approach which will require (at minimum) two to three years to begin construction, or (2) as effectively "standalone" improvements in the event that the City opts to delay a near-term selection of a preferred approach in order to allow for more resolution of current uncertainties (such as potential availability of the NMF and/or Aldercrest Annex sites, securing sufficient funding, viability of other property and/or easement acquisitions, etc.).

Issue Draft Report

This Draft Predesign Report does not yet include a recommendation for the preferred alternative. Following issuance of this Draft Report, the City will solicit detailed input from the broad range of stakeholders; this input will be used as a key factor in evaluating the selection of the preferred approach.

Table ES-1:
Alternative Summary Comparison

Alt. No.	Brief Description	Est. Cost ($M)	Flood Reduction Benefit[1]	Fish Passage and Habitat Benefits	Permit Effort	Major Potential Challenges and Other Considerations
1	Daylight in 25th Ave ROW (west side), Replace NE 195th St Culvert	$7.2	100-year	**High:** Full fish passage, some habitat benefits	High	Proximity to "25th Place" building foundation WSDOT SR104 gabion wall protection, easement needed within LFP Culvert below SPU 66" diameter water pipeline
2	Daylight in 25th Ave ROW (west and east sides), Replace NE 195th St Culvert	$6.7	100-year	**High:** Full fish passage, some habitat benefits	High	SCL pole and other utility relocations needed on east side of 25th Ave NE WSDOT SR104 gabion wall protection, easement needed within LFP Culvert below SPU 66" diameter water pipeline
3	Daylight in NMF site, Alt 1 or Alt 2 south of NMF site, Replace NE 195th St Culvert	$6.6 (w/Alt 1) $6.4 (w/Alt 2)	100-year	**Highest:** Full fish passage, best habitat benefits	High	Only viable if NMF site is available (currently unknown) Potential contaminated soil cleanup at NMF site Proximity to "25th Place" building foundation (if Alt 1) OR SCL pole and utility relocations (for Alt 2) WSDOT SR104 gabion wall protection, easement needed Culvert below SPU 66" diameter water pipeline
6	Buyout: Obtain west half of property at 2518 NE 195th St, remove building, install floodplain storage	$1.9	8-year[2]	**Low:** No fish passage, some habitat benefits	Low	Requires property acquisition Does not address upstream 25th Ave NE capacity issues or eventual need for 25th Ave NE system replacement NE 195th St culvert replacement deferred Potential to expand effectiveness by future buyouts
7	Flood Proofing: Array of small improvements	$0.5	4-year[3]	None	Low	Does not address eventual need for 25th Ave NE system replacement Potential implementation as interim measures to support longer-term schedule for major improvements

Notes
1 Existing system provides a level of protection (LOP) against flooding of about a 2-year flood (i.e., 1 in 2 chance of flooding in any given year).
2 Provides up to about 8-year LOP for NE 195th ST and no improvement along 25th Ave NE
3 Provides up to about 4-year LOP for 25th Ave NE and reduced risk of structure flooding north of NE 195th St

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Select Preferred Approach

Following input from stakeholders, City staff and the project team will propose a recommended approach, which may or may not include nuances such an approach featuring phasing, contingencies, and/or implementation of more than one alternative. This staff recommendation will be presented to the City of Shoreline City Council for discussion and formal selection of a preferred approach, as authorized by Council. This process of selecting a preferred approach may also result in some modifications to elements of the alternative(s) included in the preferred approach.

Issue Final Report

Following City Council selection of the preferred approach, this draft report will be updated as a final pre-design report, which will serve as the basis for further project development and design leading to construction of improvements.

BRUGGER'S BOG PARK

WETLAND "A"

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City of Shoreline
25th Ave. NE Flood Reduction Project
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0 37.5 75 150 Feet

Date: 2/2/2017
Author: James Ellis
Path: P:\PROJECTS\City of Shoreline\25th Ave NE\Data Analytical\GIS\Figures\Figure 3-1 - Alternatives Overview.mxd

July 12, 2017

Mr. John Featherstone, P.E.
Project Manager
City of Shoreline
17500 Midvale Avenue North
Shoreline, WA 98133-4905

Subject: **25th Avenue NE Flood Reduction Project, Phase 1 (Pre-Design)**
Feasibility Assessment of Daylighting Ballinger Creek at Aldercrest Annex Site

Dear John:

The City requested that Louis Berger conduct a high level assessment of the additional costs and land area that would be required to daylight Ballinger Creek on the east side of 25th Avenue NE within the Shoreline School District's Aldercrest Annex Site, under the assumption that daylighting improvements constructed under the 25th Avenue NE Flood Reduction Project could also provide stormwater mitigation (detention and treatment) for future redevelopment at the Aldercrest Annex property. Inclusion of a stormwater mitigation facility under the City's project could potentially incentivize the District to allow the City to use a small portion of the western periphery of the property to daylight Ballinger Creek.

Executive Summary

A combined wet pond and detention pond facility is the preferred concept due to minimal footprint size of this facility type compared with other options. Daylighting Ballinger Creek and providing stormwater management facilities for potential intensive future redevelopment of the Aldercrest Annex site would require 2.1 acres (or 13% of the total property), allowing the remaining 14.1 acres (87% of the total property) for other uses.

Providing Aldercrest Annex Stormwater Mitigation facilities are expected to cost approximately $570,000 for design and construction. This amount is in addition to the 25th Avenue NE Flood Reduction Project regular costs, generally for daylighting Ballinger Creek and installing several box culverts.

The additional costs for Aldercrest Annex Stormwater Mitigation facilities may be offset at least partially by cost savings compared to other alternatives. For example, daylighting Ballinger Creek within the City's North Maintenance Facility (NMF) site could encounter contaminated soils and associated cleanup costs. Avoidance of such cleanup costs associated with the NMF site could make the Aldercrest Annex alternative more cost-competitive in spite of the stormwater pond costs.

Scope of Assessment

The scope of work for this assessment was approved by the City on May 12, 2017. The scope of work includes the following:

- Perform a high level analysis to estimate the cost and land area that would be required to provide stormwater mitigation for the potential future redevelopment of the Aldercrest Annex Site. The extent of potential redevelopment shall be estimated based on three comparable school district sites; (1) Shoreline Stadium at 18560 1st Ave NE, (2) Einstein Middle School, and (3) Kellogg Middle School. Shoreline Stadium was included because the District may be interested in relocating that facility due to the existing stadium's proximity to the future 185th Street Light Rail station; the two middle schools were included given that the Aldercrest Annex is a former middle school site and in the long-term future the District may presumably wish to reconstruct a similarly-sized school at this site.
- Based upon assumed future redevelopment of the Aldercrest Annex site, stormwater mitigation facilities (detention and stormwater quality treatment) shall be sized using a continuous simulation hydrologic model such as WWHM or MGSFlood per Department of Ecology requirements. Sizing analysis shall assume forested conditions for the predeveloped model (i.e., assuming that the District must comply with the City's Ecology-based site stormwater management requirements for redevelopment). Louis Berger shall consider providing the detention storage as "floodplain storage" associated with potential Ballinger creek daylighting being considered as part of the 25th Avenue Flood Reduction project if possible. Additionally, Louis Berger shall assess options for providing stormwater quality (basic) treatment of stormwater as part of the site mitigation.
- Based on the analysis results, prepare a schematic plan of the daylighted channel and stormwater mitigation facilities and cost estimate. The cost estimate should include the additional costs (calculated separately) to provide stormwater mitigation for the Aldercrest Annex site. The costs for a daylighted stream approach utilizing the Aldercrest Annex property are assumed to be generally analogous to costs developed under the 25th Avenue NE Flood Reduction Project Draft Pre-Design Report Alternative 3-2 for daylighting Ballinger Creek across the street on the west side of 25th Avenue NE within the NMF site.

Analysis and Results

Potential future redevelopment of the Aldercrest Annex site was estimated by considering a similar level of development for the three developed school district properties listed above. Based on a rough analysis of aerial imagery, the three sites were determined to have an average of approximately 60.5% percent impervious surface coverage:

Site	Total Area (ac)	Impervious Area (ac)	% Impervious
Shoreline Stadium	12.66	5.92	46.8%
Einstein MS	12.4	10.37	83.6%
Kellogg MS	20.92	10.69	51.1%
Average	15.33	8.99	60.5%

The Aldercrest Annex site has a total area of about 16.2 acres. Assuming that the Aldercrest Annex property could undergo future redevelopment at a similar density (i.e., 60.5%), the site would include an estimated 9.8 acres of impervious surfaces, with the remainder assumed to be pervious surfaces such as grass and landscaping. This appeared to be a reasonable – if somewhat conservative – estimate of the potential future redevelopment conditions at the Aldercrest Annex site. The Western Washington Hydrology Model (WWHM) was used to model the pre-developed (forested) and developed conditions in order to initially size stormwater detention volumes for the developed site. The model was also used to assess the water quality treatment requirements. Three options were generally considered as described below:

- Option 1 - Floodplain Storage Approach: Apply the required detention storage volume for the Aldercrest Annex to "floodplain storage" area adjacent to the new daylighted channel. Floodplain storage is a concept of creating new channel storage that is integrated into the creek floodplain above its low flow channel that provides attenuating storage and helps reduce downstream peak flows. Based on the WWHM modeling, approximately 5 acre-feet of detention storage would be necessary. To be effective as floodplain storage this volume would need to be integrated into the future daylighted Ballinger Creek floodplain at a relatively shallow depth (about 2.4 feet) in order to match the projected water surface elevations of the creek (i.e., equivalent storage would be provided within the range of stream elevations between the low flow and 100-year water surface elevation (WSE)). Distributing the required storage volume over this depth requires a bottom area (including the daylighted channel) of about 3 acres and a top area 3.3 acres (approximately 20% of the total property area for Aldercrest Annex). Because site runoff would also require treatment prior to entering the floodplain storage area, a separate stormwater treatment system (such as a wetpond or stormwater wetland) would be needed, requiring additional area. Combining this floodplain storage area plus a separate water quality treatment facility would take up a large percentage of the site which would presumably be undesirable to the District. Due to this apparent infeasibility, further analysis was not performed for this option to determine the additional area that would be required for treatment.
- Option 2 – Constructed Wetland and Detention Pond: Provide stormwater mitigation using a combined constructed wetland and detention pond separated from the future Ballinger Creek daylighted channel with a berm. The advantage of a separated facility (compared with Option 1 - floodplain storage) is that it allows for greater storage depth and accordingly a smaller facility footprint. Per Ecology requirements for a constructed wetland, the facility would be comprised of two cells: a pre-settling cell and a wetland cell. The pre-settling cell could have a depth of 4 to 8 feet and contain 33% of the storage volume. The wetland cell would have an average depth of 1.5 feet and account for the remaining 67% of the storage volume. An initial layout of this option was created and (while having a smaller footprint than the floodplain storage option) at 2.3 acres or 14% of the total property area, it is likely too large to be desirable to the District, assuming more compact options are available.
- Option 3 – Combined Wet Pond and Detention Pond: Provide stormwater mitigation using a combined wet pond and detention pond separated from the daylighted channel with a berm. The

combined detention pond and wet pond approach is similar to using a more conventional detention pond while providing additional "dead storage" for treatment. Dead storage is a volume of "standing water" within the facility which does not drain between storm events. The advantage of this option over the combined constructed wetland and detention pond (Option 2) it that it allows for a deeper facility and thus a more efficient use of space. The detention portion was sized assuming a 6 foot effective depth (including 1 foot of freeboard) contained within a berm. This option would have the smallest stormwater management facility footprint of about 1.8 acres (11% of the total property) and thus is the preferred option to maximize usable area of the Aldercrest Annex site.

Based upon the Option 3 combined wet pond and detention pond concept, a preliminary sketch was developed and is attached as Figure 1. Due to the high-level nature of this assessment a number of assumptions were made in the analysis:

- Stormwater pond sizing is based on a maximum 9.8 acres of impervious future redevelopment at the Aldercrest Annex site. For any redevelopment concept with significantly less impervious surface, a significantly smaller stormwater pond could be used.
- It is assumed that the Aldercrest Annex would still need to comply with Ecology's Minimum Requirement #5 (On-site Stormwater Management) and that the District would bear this cost separately. The analysis does not account for some potential minor reductions in stormwater pond size resulting from use dispersed on-site stormwater management facilities such as LID features to satisfy MR #5.
- The analysis assumes rooftop drainage will not be separated from pollution generating impervious surfaces and water quality treatment is required for the combined flows.
- The analysis assumes an available area for daylighting the Ballinger Creek channel approximately 50 feet wide and 300 feet long between the east side of 25th Avenue NE right-of-way and the western toe of stormwater pond berm. This space would allow for some meandering and habitat features for the daylighted Ballinger Creek; however a much smaller floodplain storage area is available compared to the Alternative 3-2 concept for the NMF site.

Overall it is estimated that approximately 2.1 acres (13% of the total property) could provide sufficient space for both daylighting Ballinger Creek and providing stormwater management facilities for intensive redevelopment of the Aldercrest Annex site.

Based on the analysis and schematic of Option 3 – Combined Wet Pond and Detention Pond, a cost estimate (see attached) was developed to determine the additional cost of providing stormwater mitigation for future redevelopment of the Aldercrest Annex site as compared to daylighting and constructing floodplain storage within the NMF site (Alternative 3-2 from the 25th Avenue NE Flood Reduction Project Draft Pre-Design Report). Costs for Alternative 3-2 were updated for daylighting along east side of 25th Avenue NE within District property, and an added cost schedule was developed for the Aldercrest Annex stormwater mitigation facilities.

The costs for the Aldercrest Annex stormwater mitigation facilities include construction of the detention/ wet pond, control structure, some planting, access road, and a trail amenity which would connect the upper portions of school property to 25th Avenue NE (by going around the pond), as well as all associated costs such as design, permitting, and construction management. The cost estimate does not include land cost, assuming that the 50 foot wide daylighting area east of 25th Avenue NE would be made available to the City for creek daylighting usage in exchange for the stormwater mitigation pond.

A comparison of costs between Alternative 3-2 and the alternative of daylighting the creek within the Aldercrest Annex was then performed and is shown below:

Project Element (Schedule)	Alternative 3-2 (adjusted from Draft Pre-Design Report, see discussion below)	Alternative to daylight Ballinger Creek within Aldercrest Annex and provide stormwater mitigation for property redevelopment
Schedule A (NE 195th Street and Downstream Improvements) – [NO CHANGE]	$2.24 Million	$2.24 Million
Schedule B (25th Avenue NE Improvements)	$4.04 Million	$3.79 Million
[NEW] Schedule C (Aldercrest Annex Stormwater Mitigation)	$0 [Not Applicable]	$0.57 Million
Total	$6.3 Million	$6.6 Million

Thus, a high-level cost estimate for the net increase above Alternative 3-2 for locating the daylighted Ballinger Creek channel on the east side of 25th Avenue NE if costs are added to provide stormwater mitigation for the Aldercrest Annex site would be about $300,000.

One note about the cost comparison is that the cost estimate for Alternative 3-2 was updated from the draft Pre-design Report based upon subsequent geotechnical investigations within the NMF site. The draft Pre-design report included a cost contingency for special handling and disposal of contaminated soil because prior investigations had found some areas of contamination. The subsequent geotechnical investigations included a series of shallow borings and testing for contaminated materials. While some contaminated soils were found, it was less extensive than assumed for the cost contingency in the draft Pre-Design report. The cost estimate for Alternative 3-2 was therefore reduced to reflect an assumption that less contaminated materials would be found during excavation. The updated cost for Alternative 3-2 with this assumption is included as an attachment.

Please call if you have any questions at (206) 453-1549.

Sincerely,

Mike Giseburt, P.E.
Senior Project Manager

MSG/atoEnclosure

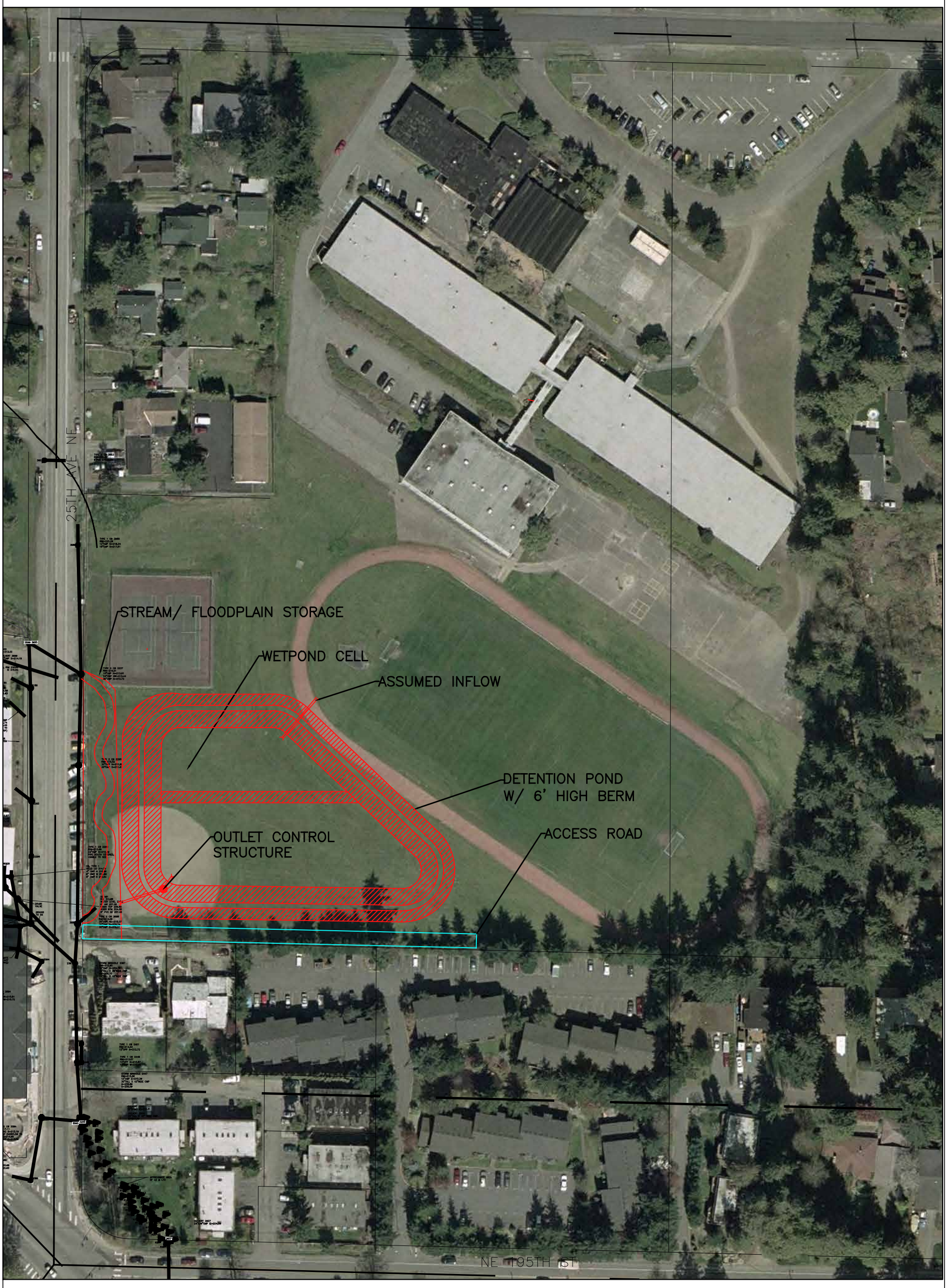

Figure 1
Combined Detention/Constructed Wetland
25th Ave. NE Flood Reduction Project
City of Shoreline

N

1"=100'

100 50 0 100 200
Scale Feet

Louis Berger

Table 1. Planning Level Design, Permitting, and Construction Cost Estimate for Aldercrest Annex Detention Facility						
SCHEDULE A: NE 195TH STREET						
1	MOBILIZATION (10%)	1	LS	$107,000	$107,000	
2	PROJECT TEMPORARY TRAFFIC CONTROL (5%)	1	LS	$40,000	$40,000	Assume access to residences maintained during construction
3	SURVEYING	1	LS	$20,000	$20,000	
4	SPCC PLAN	1	LS	$5,000	$5,000	
5	CLEARING AND GRUBBING	1	LS	$5,000	$5,000	
6	REMOVE ASPHALT CONC. PAVEMENT	164	SY	$18	$2,952	
7	REMOVE CURB AND GUTTER	45	LF	$12	$540	
8	REMOVE SIDEWALK	35	SY	$20	$700	
9	REMOVAL OF STRUCTURE AND OBSTRUCTION	1	LS	$20,000	$20,000	
10	EMBANKMENT COMPACTION	908	CY	$4	$3,631	
11	GRAVEL BORROW INCL HAUL	908	CY	$30	$27,233	
12	CHANNEL EXCAVATION	464	CY	$25	$11,595	
13	STRUCTURE EXCAVATION CLASS B INCL. HAUL	1221	CY	$30	$36,630	
14	SHORING OR EXTRA EXCAVATION CLASS B	854	SF	$10	$8,540	
15	9' W x 3.6' H x61'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$132,000	$132,000	
16	WING WALLS	1050	SF	$50	$52,500	
17	CRUSHED SURFACING TOP COURSE	120	TN	$35	$4,199	2" FOR PAVEMENT RESTORATION
18	HMA CL. 1/2 IN. PG	24	TN	$200	$4,726	2"
19	ASPHALT TREATED BASE	18	TN	$190	$3,455	4"
20	PLANING BITUMINOUS PAVEMENT	71	SY	$15	$1,067	
21	CEMENT CONC. TRAFFIC CURB AND GUTTER	45	LF	$25	$1,125	
22	CEMENT CONC. SIDEWALK	35	SY	$100	$3,500	
23	CEMENT CONC DRIVEYWAY ENTRANCE TYPE_	0	SY	$110	$0	
24	STREAMBED SEDIMENT	458	TN	$40	$18,315	
25	WATER SERVICE RELOCATION	0	EA	$2,000	$0	
26	SEWER CASING	100	LF	$300	$30,000	PADDEN BID PRICE
27	PSIPE - 1 GAL PLANTS - RIPARIAN PLANTINGS	1,236	EA	$10.00	$12,360	4' spacing on center, includes establishment,17133 SF TRIANGLE PATTERN
28	TREE	28	EA	$1,000.00	$28,000	
29	SOD INSTALLATION	0	SY			
30	TOPSOIL	635	CY	$50.00	$31,728	
31	STREAMFLOW DIVERSION / FLOW BYPASS	1	LS	$50,000	$50,000	
32	LARGE WOODY DEBRIS	13	EA	$1,200	$15,655	FOX AND BOLTON 11 KEY PIECES PER 100M
33	EARTH ANCHORS	26	EA	$800	$20,873	
34	HANDRAIL	80	LF	$180	$14,400	
35	BEAM GUARDRAIL	80	LF	$60	$4,800	FACTORED UP FOR WALL INTEGRATION
36	ABANDON/PLUG EXISTING PIPE	0	EA	$2,000	$0	
37	HABITAT BOULDERS	25	TN	$85	$2,125	
38	EROSION/WATER POLLUTION CONTROL	1	LS	$45,000	$45,000	
39	SPECIAL HANDLING 66" DIA PIPE	1	LS	$20,000	$20,000	
40	PROTECT EXISTING UTILITIES	1	LS	$10,000	$10,000	
41	ROCK PROTECTION	617	TN	$70	$43,167	
42	EARTH FILLED GEOCELLS	500	SY	$50	$25,000	
43	GABION OUTLET PROTECTION	1	LS	$15,000	$15,000	
44	STREAM ACCESS ROAD	185	TN	$35	$6,475	
45	DEWATERING	1	LS	$40,000	$40,000	
46	RECORD DRAWINGS	1	LS	$5,000	$5,000	
SUBTOTAL SCHEDULE A CONSTRUCTION COST					$929,291	
CONSTUCTION CONTINGENCY				30.0%	$278,787	
SUBTOTAL SCHEDULE A CONSTRUCTION COST WITH CONTINGENCY					$1,209,000	
SALES TAX				9.5%	$114,860	
TOTAL SCHEDULE A CONSTRUCTION COST WITH TAX AND CONTINGENCY					**$1,323,900**	
OTHER APPROXIMATED PROJECT COSTS						
ADMINISTRATIVE COSTS				10%	$133,000	
DESIGN					$384,000	
CONSTRUCTION MANAGEMENT/CONSTRUCTION ADMINISTRATION				15%	$199,000	
EASEMENT	4500	SF	$ 30.00		$135,000	
SPECIAL TESTING AND INSPECTIONS				5%	$67,000	
TOTAL SCHEDULE A PROJECT COST					$2,242,000	
SCHEDULE B: 25TH AVENUE NE						
1	MOBILIZATION (10%)	1	LS	$175,000	$175,000	
2	PROJECT TEMPORARY TRAFFIC CONTROL (8%)	1	LS	$100,000	$100,000	Assume access to residences maintained during construction
3	SURVEYING	1	LS	$20,000	$20,000	
4	SPCC PLAN	1	LS	$5,000	$5,000	
5	CLEARING AND GRUBBING	1	LS	$5,000	$5,000	
6	REMOVE ASPHALT CONC. PAVEMENT	392	SY	$18	$7,056	
7	REMOVE CURB AND GUTTER		LF	$12	$0	
8	REMOVE SIDEWALK		SY	$20	$0	
9	REMOVAL OF STRUCTURE AND OBSTRUCTION	1	LS	$20,000	$20,000	
10	EMBANKMENT COMPACTION	2187	CY	$4	$8,747	
11	GRAVEL BORROW INCL HAUL	2187	CY	$30	$65,605	
12	CHANNEL EXCAVATION	3193	CY	$25	$79,816	
13	STRUCTURE EXCAVATION CLASS B INCL. HAUL	2086	CY	$30	$62,568	
14	SHORING OR EXTRA EXCAVATION CLASS B	311	SY	$5	$1,555	
15	9' W x 4.6' H x75'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$135,000	$135,000	
16	9' W x 4.6' H x30'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$54,000	$54,000	
17	9' W x 4.6' H x52'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$93,600	$93,600	
18	WALL	2530	SF	$50	$126,500	
19	CATCHBASIN TYPE 1	5	EA	$1,500	$7,500	
20	CORRUGATED POLYETHYLENE STORM SEWER PIPE 12 IN. DI	100	LF	$45	$4,500	
21	CRUSHED SURFACING TOP COURSE	257	TN	$35	$8,985	2" FOR PAVEMENT RESTORATION
22	HMA CL. 1/2 IN. PG	137	TN	$110	$15,083	2"
23	ASPHALT TREATED BASE	91	TN	$100	$9,139	4"
24	PLANING BITUMINOUS PAVEMENT	1567	SY	$15	$23,508	
25	CEMENT CONC. TRAFFIC CURB AND GUTTER	471	LF	$25	$11,775	
26	CEMENT CONC. SIDEWALK	419	SY	$100	$41,867	
27	CEMENT CONC DRIVEYWAY ENTRANCE TYPE_	0	SY	$110	$0	
28	STREAMBED SEDIMENT	712	TN	$40	$28,490	
29	WATER SERVICE RELOCATION	7	EA	$2,000	$14,000	
30	WATER RELOCATION 6" DIA	170	LF	$120	$20,400	Assume need to replace adjacent to culverts and wall

31	PSIPE - 1 GAL PLANTS - RIPARIAN PLANTINGS	1,070	EA	$10.00	$10,695	4' spacing on center, includes establishment,(6384-9*150)+(530-70-75-30-52)*6 SF TRIANGLE PATTERN
32	TREE MITIGATION	20	EA	$1,000.00	$20,000	
33	SOD INSTALLATION	95	SY	$30.00	$2,863	
34	TOPSOIL	250	CY	$50.00	$12,500	
35	STREAMFLOW DIVERSION / FLOW BYPASS	1	LS	$15,000	$15,000	
36	LARGE WOODY DEBRIS	10	EA	$1,200	$12,000	FOX AND BOLTON 11 KEY PIECES PER 100M
37	EARTH ANCHORS	32	EA	$800	$25,600	
38	HANDRAIL	594	LF	$180	$106,920	
39	BEAM GUARDRAIL	562	LF	$60	$33,720	FACTORED UP FOR WALL INTEGRATION
40	ABANDON/PLUG EXISTING PIPE	2	EA	$2,000	$4,000	
41	HABITAT BOULDERS	25	TN	$85	$2,125	
42	EROSION/WATER POLLUTION CONTROL	1	LS	$20,000	$20,000	
43	DEWATERING	1	LS	$100,000	$100,000	
44	RECORD DRAWINGS	1	LS	$5,000	$5,000	
	SUBTOTAL SCHEDULE B CONSTRUCTION COST				$1,515,116	
	CONSTRUCTION CONTINGENCY			30.0%	$454,535	
	TOTAL SCHEDULE B CONSTRUCTION COST WITH CONTINGENCY				$1,970,000	
	SALES TAX			9.5%	$187,150	
	TOTAL SCHEDULE B CONSTRUCTION COST WITH TAX AND CONTINGENCY				**$2,158,000**	
	OTHER APPROXIMATED PROJECT COSTS					
	ADMINISTRATIVE COSTS			10%	$216,000	
	DESIGN AND PERMITTING				$874,000	
	CONSTRUCTION MANAGEMENT/CONSTRUCTION ADMINISTRATION			15%	$324,000	
	TEMPORARY AND PERMANENT EASEMENT NEGOTIATION			5%	$108,000	
	SPECIAL TESTING AND INSPECTIONS			5%	$108,000	
	TOTAL SCHEDULE B PROJECT COST				$3,788,000	
	SCHEDULE C: ALDERCREST ANNEX DETENTION POND					
1	MOBILIZATION (10%)	1	LS	$30,000	$30,000	
2	SURVEYING	1	LS	$2,000	$2,000	
3	CLEARING AND GRUBBING	1	LS	$5,000	$5,000	
4	EMBANKMENT COMPACTION	2260	CY	$4	$9,040	
5	COMMON BORROW INCL HAUL	6780	CY	$8	$54,240	
6	EXCAVATION	2260	CY	$25	$56,500	
7	OUTLET CONTROL STRUCTURE	1	EA	$4,000	$4,000	
8	CORRUGATED POLYETHYLENE STORM SEWER PIPE 12 IN. DI	110	LF	$45	$4,950	
9	HMA CL. 1/2 IN. PG	55	TN	$110	$6,050	
10	SEEDING, FERTILIZING, AND MULCHING	2	AC	$5,500.00	$9,185	
11	EROSION/WATER POLLUTION CONTROL	1	LS	$20,000	$20,000	
12	STREAM ACCESS ROAD	185	TN	$35	$6,475	
13	QUARRY SPALLS	666	TON	$27	$17,982	
14	CRUSHED SURFACING TOP COURSE	250	TON	$35	$8,753	
15	DEWATERING	1	LS	$20,000	$20,000	
16	RECORD DRAWINGS	1	LS	$1,000	$1,000	
	SUBTOTAL SCHEDULE A CONSTRUCTION COST				$255,175	
	CONSTRUCTION CONTINGENCY			30%	$76,553	
	TOTAL SCHEDULE A CONSTRUCTION COST WITH CONTINGENCY				$332,000	
	SALES TAX			9.5%	$31,540	
	TOTAL SCHEDULE A CONSTRUCTION COST WITH TAX				**$363,500**	
	OTHER APPROXIMATED PROJECT COSTS					
	ADMINISTRATIVE COSTS			10%	$37,000	
	DESIGN AND PERMITTING			20%	$73,000	
	CONSTRUCTION MANAGEMENT/CONSTRUCTION ADMINISTRATION			15%	$55,000	
	TEMPORARY AND PERMANENT EASEMENT NEGOTIATION			5%	$19,000	
	SPECIAL TESTING AND INSPECTIONS			5%	$19,000	
	TOTAL SCHEDULE C PROJECT COST				$567,000	
				TOTAL ESTIMATED PROJECT COST SCHEDULES A, B, AND C:	**$6,597,000**	Estimate based on 2017 dollars, rounded to nearest $1000; costs will need to be adjusted for Time Value of Money (TMV) when programming funds.

Table 1. Planning Level Design, Permitting, and Construction Cost Estimate for Alternative 3 - Alternative 2 Alignment (UPDATED 7/10/17)

Spec Section	Bid Item Description	Quantity	Unit	Unit Cost	Amount	Assumptions/Notes
SCHEDULE A: NE 195TH STREET						
1	MOBILIZATION (10%)	1	LS	$107,000	$107,000	
2	PROJECT TEMPORARY TRAFFIC CONTROL (5%)	1	LS	$40,000	$40,000	Assume access to residences maintained during construction
3	SURVEYING	1	LS	$20,000	$20,000	
4	SPCC PLAN	1	LS	$5,000	$5,000	
5	CLEARING AND GRUBBING	1	LS	$5,000	$5,000	
6	REMOVE ASPHALT CONC. PAVEMENT	164	SY	$18	$2,952	
7	REMOVE CURB AND GUTTER	45	LF	$12	$540	
8	REMOVE SIDEWALK	35	SY	$20	$700	
9	REMOVAL OF STRUCTURE AND OBSTRUCTION	1	LS	$20,000	$20,000	
10	EMBANKMENT COMPACTION	908	CY	$4	$3,631	
11	GRAVEL BORROW INCL HAUL	908	CY	$30	$27,233	
12	CHANNEL EXCAVATION	464	CY	$25	$11,595	
13	STRUCTURE EXCAVATION CLASS B INCL. HAUL	1221	CY	$30	$36,630	
14	SHORING OR EXTRA EXCAVATION CLASS B	854	SY	$10	$8,540	
15	9’ W x 3.6’ H x61'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$132,000	$132,000	
16	WING WALLS	1050	SF	$50	$52,500	
17	CRUSHED SURFACING TOP COURSE	120	TN	$35	$4,199	2" FOR PAVEMENT RESTORATION
18	HMA CL. 1/2 IN. PG	24	TN	$200	$4,726	2"
19	ASPHALT TREATED BASE	18	TN	$190	$3,455	4"
20	PLANING BITUMINOUS PAVEMENT	71	SY	$15	$1,067	
21	CEMENT CONC. TRAFFIC CURB AND GUTTER	45	LF	$25	$1,125	
22	CEMENT CONC. SIDEWALK	35	SY	$100	$3,500	
23	CEMENT CONC DRIVEYWAY ENTRANCE TYPE_	0	SY	$110	$0	
24	STREAMBED SEDIMENT	458	TN	$40	$18,315	
25	WATER SERVICE RELOCATION	0	EA	$2,000	$0	
26	SEWER CASING	100	LF	$300	$30,000	PADDEN BID PRICE
27	PSIPE - 1 GAL PLANTS - RIPARIAN PLANTINGS	1,236	EA	$10.00	$12,360	4' spacing on center, includes establishment,17133 SF TRIANGLE PATTERN
28	TREES	28	EA	$1,000.00	$28,000	
29	SOD INSTALLATION	0	SY			
30	TOPSOIL	635	CY	$50.00	$31,728	
31	STREAMFLOW DIVERSION / FLOW BYPASS	1	LS	$50,000	$50,000	
32	LARGE WOODY DEBRIS	13	EA	$1,200	$15,655	FOX AND BOLTON 11 KEY PIECES PER 100M
33	EARTH ANCHORS	26	EA	$800	$20,873	
34	HANDRAIL	80	LF	$180	$14,400	
35	BEAM GUARDRAIL	80	LF	$60	$4,800	FACTORED UP FOR WALL
36	ABANDON/PLUG EXISTING PIPE	0	EA	$2,000	$0	
37	HABITAT BOULDERS	25	TN	$85	$2,125	
38	EROSION/WATER POLLUTION CONTROL	1	LS	$45,000	$45,000	
39	SPECIAL HANDLING 66" DIA PIP	1	LS	$20,000	$20,000	
40	PROTECT EXISTING UTILITIES	1	LS	$10,000	$10,000	
41	ROCK PROTECTION	617	TN	$70	$43,167	
42	EARTH FILLED GEOCELLS	500	SY	$50	$25,000	
43	GABION PROTECTION	1	LS	$15,000	$15,000	
44	STREAM ACCESS ROAD	185	TN	$35	$6,475	
45	DEWATERING	1	LS	$40,000	$40,000	
46	RECORD DRAWINGS	1	LS	$5,000	$5,000	
SUBTOTAL SCHEDULE A CONSTRUCTION COST					$929,291	
CONSTRUCTION CONTINGENCY				30%	$278,787	
TOTAL SCHEDULE A CONSTRUCTION COST WITH CONTINGENCY					$1,209,000	
SALES TAX				9.5%	$114,860	
TOTAL SCHEDULE A CONSTRUCTION COST WITH TAX					**$1,323,900**	
OTHER APPROXIMATED PROJECT COSTS						
ADMINISTRATIVE COSTS				10%	$133,000	
DESIGN AND PERMITTING					$384,000	
CONSTRUCTION MANAGEMENT/CONSTRUCTION ADMINISTRATION				15%	$199,000	
EASEMENT		4500	SF	$30	$135,000	
SPECIAL TESTING AND INSPECTIONS				5%	$67,000	
TOTAL SCHEDULE A CONSTRUCTION COST					$2,242,000	
SCHEDULE B: 25TH AVENUE NE						
1	MOBILIZATION (10%)	1	LS	$190,000	$190,000	
2	PROJECT TEMPORARY TRAFFIC CONTROL (5%)	1	LS	$70,000	$70,000	Assume access to residences maintained during construction
3	SURVEYING	1	LS	$20,000	$20,000	
4	SPCC PLAN	1	LS	$5,000	$5,000	
5	CLEARING AND GRUBBING	1	LS	$5,000	$5,000	
6	REMOVE ASPHALT CONC. PAVEMENT	309	SY	$18	$5,562	
7	REMOVE CURB AND GUTTER		LF	$12	$0	
8	REMOVE SIDEWALK		SY	$20	$0	
9	REMOVAL OF STRUCTURE AND OBSTRUCTION	1	LS	$20,000	$20,000	
10	EMBANKMENT COMPACTION	2056	CY	$4	$8,225	
11	GRAVEL BORROW INCL HAUL	2056	CY	$30	$61,686	
12	CHANNEL EXCAVATION	5887	CY	$25	$147,173	
13	CHANNEL EXCAVATION WITH SPECIAL DISPOSAL[1]	388	CY	$100	$68,849.68	See Note [1]
14	STRUCTURE EXCAVATION CLASS B INCL. HAUL	2820	CY	$30	$84,600	
15	SHORING OR EXTRA EXCAVATION CLASS B	350	SY	$5	$1,750	
16	9’ W x 4.6’ H x70'L CONCRETE BOX CULVERT STRUCTURE	0	EA	$126,000	$0	
17	9’ W x 4.6’ H x75'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$135,000	$135,000	
18	9’ W x 4.6’ H x30'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$54,000	$54,000	
19	9’ W x 4.6’ H x52'L CONCRETE BOX CULVERT STRUCTURE	1	EA	$93,600	$93,600	
20	WALL	2,530	SF	$50	$126,500	
21	CATCH BASIN TYPE 1	3	EA	$1,500	$4,500	
22	CORRUGATED POLYETHYLENE STORM SEWER PIPE 12 IN. DI	60	LF	$45	$2,700	
23	CRUSHED SURFACING TOP COURSE	419	TN	$35	$14,678	2" FOR PAVEMENT RESTORATION
24	HMA CL. 1/2 IN. PG	84	TN	$110	$9,197	2"
25	ASPHALT TREATED BASE	72	TN	$100	$7,202	4"
26	PLANING BITUMINOUS PAVEMENT	816	SY	$15	$12,240	
27	CEMENT CONC. TRAFFIC CURB AND GUTTER	471	LF	$25	$11,775	
28	CEMENT CONC. SIDEWALK	419	SY	$100	$41,867	
29	CEMENT CONC DRIVEYWAY ENTRANCE TYPE_	0	SY	$110	$0	

30	STREAMBED SEDIMENT	712	TN	$40	$28,490	
31	WATER SERVICE RELOCATION	6	EA	$2,000	$12,000	
32	WATER RELOCATION 6" DIA	170	LF	$120	$20,400	Assume need to replace adjacent to culverts and wall
33	PSIPE - 1 GAL PLANTS - RIPARIAN PLANTINGS	1,236	EA	$10.00	$12,360	4' spacing on center, includes establishment,17133 SF TRIANGLE PATTERN
34	TREES	20	EA	$1,000.00	$20,000	
35	SOD INSTALLATION	0	SY	$30.00	$0	
36	TOPSOIL	250	CY	$50.00	$12,500	
37	STREAMFLOW DIVERSION / FLOW BYPASS	1	LS	$15,000	$15,000	
38	LARGE WOODY DEBRIS	16	EA	$1,200	$19,035	FOX AND BOLTON 11 KEY PIECES PER 100M
39	EARTH ANCHORS	32	EA	$800	$25,380	
40	HANDRAIL	594	LF	$180	$106,920	
41	BEAM GUARDRAIL	562	LF	$60	$33,720	FACTORED FOR WALL INTEGRATION
42	ABANDON/PLUG EXISTING PIPE	2	EA	$2,000	$4,000	
43	HABITAT BOULDERS	25	TN	$85	$2,125	
44	EROSION/WATER POLLUTION CONTROL	1	LS	$20,000	$20,000	
45	STREAM ACCESS ROAD	185	TN	$35	$6,475	
46	DEWATERING	1	LS	$100,000	$100,000	
47	RECORD DRAWINGS	1	LS	$5,000	$5,000	
SUBTOTAL SCHEDULE B CONSTRUCTION COST					$1,644,511	
CONSTRUCTION CONTINGENCY				30%	$493,353	
TOTAL SCHEDULE A CONSTRUCTION COST WITH CONTINGENCY					$2,138,000	
SALES TAX				9.5%	$203,110	
TOTAL SCHEDULE A CONSTRUCTION COST WITH TAX					**$2,341,100**	
OTHER APPROXIMATED PROJECT COSTS						
ADMINISTRATIVE COSTS				10%	$235,000	
DESIGN AND PERMITTING					$874,000	
CONSTRUCTION MANAGEMENT/CONSTRUCTION ADMINISTRATION				15%	$352,000	
TEMPORARY AND PERMANENT EASEMENT NEGOTIATION				5%	$118,000	
SPECIAL TESTING AND INSPECTIONS				5%	$118,000	
TOTAL SCHEDULE B CONSTRUCTION COST					$4,039,000	
TOTAL ESTIMATED PROJECT COST SCHEDULES A AND B:					**$6,281,000**	Estimate based on 2016 dollars, rounded to nearest $1000; costs will need to be adjusted for Time Value of Money (TMV) when programming funds.

[1]Assumes approximately 7% material exceeds MOTCA standards and requires special disposal, plus additional $30k for sediment sampling and monitoring. This allowance does not cover full site clean up if required.

ALTERNATIVE SUMMARY COMPARISON MATRIX

Alt. No.	Brief Description	Est. Cost ($M)	Flood Reduction Benefit[1]	Fish Passage and Habitat Benefits	Permit Effort	Major Potential Challenges and Other Considerations
1	Daylight in 25th Ave ROW (west side), Replace NE 195th St Culvert	$7.2	100-year	High: Full fish passage, some habitat benefits	High	• Proximity to "25th Place" building foundation • WSDOT SR104 gabion wall protection, easement needed within LFP • Culvert below SPU 66" diameter water pipeline
2	Daylight in 25th Ave ROW (west and east sides), Replace NE 195th St Culvert	$6.7	100-year	High: Full fish passage, some habitat benefits	High	• SCL pole and other utility relocations on east side of 25th Ave NE • WSDOT SR104 gabion wall protection, easement needed within LFP • Culvert below SPU 66" diameter water pipeline
3	Daylight in NMF site, Alt 1 (3-1) or Alt 2 (3-2) south of NMF site, Replace NE 195th St Culvert	$6.5 (Alt 3-1) $6.3 (Alt 3-2)	100-year	Highest: Full fish passage, best habitat benefits	High	• Only viable if NMF site is available (currently unknown) • Contaminated soil cleanup at NMF site • Proximity to "25th Place" building foundation (if Alt 1) OR SCL pole and utility relocations (for Alt 2) • WSDOT SR104 gabion wall protection, easement needed • Culvert below SPU 66" diameter water pipeline
3-A (NEW)	Daylight in Aldercrest Annex site (School District property), Alt 2 southwards, Replace NE 195th St Culvert	$6.6	100-year	Higher: Full fish passage, high habitat benefits	High	• Only viable if access to Aldercrest Annex site is available (currently unknown); possible need to provide stormwater management for future redevelopment of District property in order to obtain permission • SCL pole and utility relocations • WSDOT SR104 gabion wall protection, easement needed • Culvert below SPU 66" diameter water pipeline
6	Buyout: Obtain west half of property at 2518 NE 195th St, remove building, install floodplain storage	$1.9	8-year[2]	Low: No fish passage, some habitat benefits	Low	• Requires property acquisition • Does not address upstream 25th Ave NE capacity issues or eventual need for 25th Ave NE system and NE 195th St culvert replacement • Potential to expand effectiveness by future buyouts
7	Flood Proofing: Array of small improvements	$0.5	4-year[3]	None	Low to none	• Does not address eventual need for 25th Ave NE system replacement • Potential implementation as interim measures to support longer-term schedule for major improvements

Notes

1 Existing system provides a level of protection (LOP) against flooding of about a 2-year flood (i.e., 1 in 2 chance of flooding in any given year).

2 Provides up to about 8-year LOP for NE 195th St and no improvement along 25th Ave NE

3 Provides up to about 4-year LOP for 25th Ave NE and reduced risk of structure flooding north of NE 195th St