WAC 197-11-970 Determination of Nonsignificance (DNS)

DETERMINATION OF NON-SIGNIFICANCE

Description: **Arboretum Creek Headwaters Restoration Project:** Arboretum Creek is a watercourse that flows north through the Washington Park Arboretum to Lake Washington. Seattle Parks and Recreation is proposing to undertake a series of projects to restore and reconnect springs, seeps and flows to this watercourse to provide a more consistent overall in-channel flow. The project involves intercepting flows from hillside springs that currently discharge to the combined sewer system and intercepting and treating stormwater from nearby roads and parking lots through a stormwater garden before routing these flows to the creek. Approximately 4,000 cu.yds of excavation is proposed to reroute flows, install conveyance pipes and construct the stormwater garden with a corresponding quantity of fill materials such as gravels, soils, compost and mulch. Approximately 3,000 lineal feet of stormwater pipes, in varying sizes, will be installed to capture and convey the hillside springs and stormwater runoff; approximately thirty-two (32) drainage structures, catch basins, inlets and maintenance holes will be installed as part of the project. Fill will be placed in two wetlands as part of the extension of the creek by approximately 270 linear feet, with almost 15,000 square feet of new native plantings in place of existing turf and/or ornamental shrubs. Approximately nine (9) trees will be removed during construction. Once constructed, the project will improve conditions in the creek by providing sinuosity and hyporheic exchange in the extended channel, and by providing consistent year-round flows via hyporheic discharge from the stormwater garden.

Proponent: **Seattle Parks and Recreation**

Location: **Washington Park Arboretum, 2300 Arboretum Drive East, Seattle, WA 98112**

Lead agency: **Seattle Parks and Recreation**

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.
☒ This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 14 days from the date of publication (September 10, 2026).

Written comments must be submitted by **September 24, 2026**.

Responsible official: Jessica Murphy
Position/title: Director of Operations, Planning & Capital Development Division, Seattle Parks and Recreation
e-mail: jessica.murphy@seattle.gov
Address: 300 Elliott Avenue West, Suite 100, Seattle, WA 98119

Date: 09/08/2026 Signature: Jessica Murphy (09/08/2026 16:53:58 PDT)

Please contact: David Graves, Strategic Advisor, Seattle Parks and Recreation if you have questions or written comments related to this determination.
Phone: (206) 684-7048; **e-mail:** david.graves@seattle.gov.

You may appeal this determination to **Office of the Hearing Examiner** at **PO Box 94729, Seattle, WA 98124-4729** or 700 Fifth Avenue, Suite 4000, Seattle, WA 98104 no later than **5:00 pm** on **October 1, 2026** by **Appeal Letter** and **$120.00 fee**. You should be prepared to make specific factual objection(s). Contact the Seattle Examiner to read or ask about the procedures for SEPA appeals.

City of Seattle

ANALYSIS AND DECISION OF
SEATTLE PARKS AND RECREATION

Proposal Name: **Arboretum Creek Headwaters Restoration Project**

Address of Proposal: **Washington Park Arboretum, 2300 Arboretum Drive East, Seattle, WA 98112**

SUMMARY OF PROPOSED ACTION

Arboretum Creek is a watercourse that flows north through the Washington Park Arboretum to Lake Washington. Seattle Parks and Recreation is proposing to undertake a series of projects to restore and reconnect springs, seeps and flows to this watercourse to provide a more consistent overall in-channel flow. The project involves intercepting flows from hillside springs that currently discharge to the combined sewer system and intercepting and treating stormwater from nearby roads and parking lots through a stormwater garden before routing these flows to the creek. Approximately 4,000 cu.yds of excavation is proposed to reroute flows, install conveyance pipes and construct the stormwater garden with a corresponding quantity of fill materials such as gravels, soils, compost and mulch. Approximately 3,000 lineal feet of stormwater pipes, in varying sizes, will be installed to capture and convey the hillside springs and stormwater runoff; approximately thirty-two (32) drainage structures, catch basins, inlets and maintenance holes will be installed as part of the project. Fill will be placed in two wetlands as part of the extension of the creek by approximately 270 linear feet, with almost 15,000 square feet of new native plantings in place of existing turf and/or ornamental shrubs. Approximately nine (9) trees will be removed during construction. Once constructed, the project will improve conditions in the creek by providing sinuosity and hyporheic exchange in the extended channel, and by providing consistent year-round flows via hyporheic discharge from the stormwater garden.

SEPA DETERMINATION: Determination of Non-Significance (DNS)

BACKGROUND DATA

The Washington Park Arboretum is a public park managed jointly by Seattle Parks and Recreation (SPR) and the University of Washington (UW)/Seattle Botanical Gardens. It is Washington's official State Arboretum and contains internationally recognized woody plant collections on 230 acres. SPR manages the day-to-day operations and capital improvements, and UW manages the collection trees and plants.

Arboretum Creek flows north through the Arboretum, emptying into Union Bay in Lake Washington. The headwaters of Arboretum Creek are located just to the Northeast of the Japanese Garden. Arboretum Creek flows in an open channel throughout its length (excluding 4 small bridges and where it crosses under Lake Washington Blvd) until the last reach, where it travels through a culvert before entering Union Bay. Alley Springs is a natural seep surfacing into a drainage structure referred to as a sand box at the alley entering 28th Avenue East between East Ward and East Aloha Streets. Alder Springs begins as a hillside seep at the dead-end of 26th Avenue East off of East Helen Street, flowing north downhill under the stairway, then turns to the southeast along East Prospect Street, then enters a drainage structure and flows in a pipe down the hill into the Arboretum. Pacific Connections Springs daylights to the east of Lake Washington Blvd and enters the piped drainage system flowing west towards the parking lot at the Japanese Garden. The purpose of this project is to restore the natural hydrology of the Arboretum Creek watershed by connecting Alley and Alder Springs and the Pacific Connections Springs with Arboretum Creek while also addressing localized flooding and currently untreated stormwater runoff. This project will also work in concert with other investments made to restore habitat and water quality in Arboretum Creek, including future plans to daylight the downstream reach that currently flows through a culvert to Union Bay.

The Washington Park Arboretum (WPA) contains identified Environmentally Critical Areas (ECAs) as indicated on the City's GIS database – Riparian Corridor and Wetland ECAs associated with Arboretum Creek and its tributaries; Liquefaction Prone and Peat Settlement Prone ECAs associated with soils underlying the Arboretum, particularly the north-south running Arboretum Creek corridor; Fish and Wildlife Habitat ECA associated with the relatively undeveloped and forested nature of the Arboretum and the known presence of priority species such as Bald eagles; and Steep Slope ECAs associated with the hillside areas throughout the Arboretum. Given the large size of the Arboretum, not all identified ECAs are present on the project site.

PROPOSAL DESCRIPTION

Seattle Parks and Recreation (SPR), in partnership with Friends of Arboretum Creek and UW/Seattle Botanical Gardens is proposing to restore the natural hydrology of the Arboretum Creek watershed by connecting Alley and Alder Springs and the Pacific Connections Springs with Arboretum Creek to stabilize and increase the summertime flows to the creek and treat stormwater runoff before it reaches the creek. The project includes the conveyance of Alley and Alder Springs (and the 28th Avenue East seep) into the Washington Park Arboretum and the collection and conveyance of the Pacific Connections Springs and stormwater from the parking lot near the Japanese Garden and also Lake Washington Boulevard. These flows will then enter a pre-settling pipe (to provide pretreatment) then flow into a subsurface gravel wetland, the "stormwater garden", where water quality treatment is provided. Water from the Japanese Garden Ponds ('koi ponds') enters the subsurface gravel wetland without receiving pretreatment. The subsurface gravel wetland then discharges via

groundwater/ hyporheic flow to a restored Arboretum Creek. The constructed subsurface gravel wetland provides the added benefit of extending Arboretum Creek along and on top of the subsurface gravel wetland, adding approximately 270 lineal feet of creek to Arboretum Creek, with the new headwaters at the new discharge point at the end of the new stormwater conveyance line to the facility. The Arboretum Creek Headwaters and Stormwater Garden Project Design Report, dated September 21, 2025, attached to the SEPA Checklist provides graphics and a complete description of the stormwater garden, conveyance system, pipe sizes and location of infrastructure.

As indicated in the SEPA Checklist, approximately 3,000 lineal feet of stormwater pipes, in varying sizes, will be installed to capture and convey the hillside springs and stormwater runoff; and approximately thirty-two (32) drainage structures, catch basins, inlets and maintenance holes will be installed as part of the project. Fill will be placed in two wetlands as part of the extension of the creek by approximately 270 linear feet, with almost 15,000 square feet of new native plantings in place of existing turf and/or ornamental shrubs. Approximately nine (9) trees will be removed during construction. Once constructed, the project will improve conditions in the creek by providing sinuosity and hyporheic exchange in the extended channel, and by providing consistent year-round flows via hyporheic discharge from the stormwater garden. The project will implement a temporary erosion and sediment control plan consistent with the requirements of the City's Codes. Expected construction activities include machine excavation, trenching and grading. All applicable BMP's for construction site management will be implemented during construction and disturbed areas restored.

ANALYSIS – SEPA

Initial disclosure of potential impacts from this project was made in the applicant's environmental checklist, dated August 13, 2026. The basis for this analysis and decision is formed from information in the checklist, project documents, the lead agency's familiarity with the site and experience with review of similar projects.

The SEPA Overview Policy (SMC 23.05.665) discusses the relationship between the City's code/policies and environmental review. The Overview Policy states, in part, "[w]here City regulations have been adopted to address an environmental impact; it shall be presumed that such regulations are adequate to achieve sufficient mitigation". The Policies also discuss in SMC 23.05.665 D1-7, that in certain circumstances it may be appropriate to deny or mitigate a project based on adverse environmental impacts. This may be specified otherwise in the policies for specific elements of the environment found in SMC 25.05.675. In consideration of these policies, a more detailed discussion of some of the potential impacts is appropriate.

Short Term Impacts

The following temporary or construction-related impacts are expected: hydrocarbon emissions from construction vehicles and equipment; increased dust caused by construction activities; potential soil erosion and disturbance to subsurface soils during site work; increased noise and traffic from construction equipment and personnel.

Several adopted codes and/or ordinances provide mitigation for some of the identified impacts. The Stormwater, Grading and Drainage Control Code requires that soil erosion control techniques be initiated for the duration of construction. Erosion will be prevented by implementation of a required Temporary Erosion Control and Sedimentation Plan. Best Management Practices, such as mulching and seeding will be implemented at the site to minimize erosion during construction. Puget Sound Clean Air Agency regulations require control of fugitive dust to protect air quality. The Building Code provides for construction measures and life safety issues. The Noise Ordinance regulates the time and amount of construction noise that is permitted in the city. Compliance with these codes and/or ordinances will lessen the environmental impacts of the proposed project.

The impacts associated with the construction are expected to be minor and of relatively short duration. Compliance with the above applicable codes and ordinances will reduce or eliminate most adverse short-term impacts to the environment. However, impacts from construction traffic and construction noise on the surrounding neighborhood, access/impacts to the Arboretum during construction warrant further discussion.

Construction Traffic

The site is close to an arterial street which provides convenient truck access consistent with the requirements of the Street Use Ordinance. As noted above, materials will need to be excavated, removed and/or imported and graded across the site. There will be limited construction traffic beyond materials, equipment and construction workers entering and leaving the site. The site is adjacent to Lake Washington Boulevard East, a collector arterial, which provides direct access to East Madison Street, a minor arterial. Given the proximity of City arterials, construction access and materials hauling can be accommodated consistent with City requirements and with little or no impacts to the surrounding neighborhood. As such, traffic impacts associated with the project construction are not anticipated to be significant and thus no conditioning is necessary or warranted.

Noise

Construction activities will likely be confined to weekdays. Hours of construction are limited by the Seattle Noise Ordinance, SMC ch. 25.08, to 7:00 a.m. and ten 10:00 p.m. on weekdays (SMC 25.08.425). The reality of the local construction industry is that contractors typically work from 7 a.m. to 4 p.m.; the likelihood that any construction activities will occur up to 10 p.m. is slight. The Noise Ordinance also regulates the loudness (dB) of construction activities, measured fifty (50) feet from the subject activity or

device. The City has dedicated noise inspectors to monitor construction activities and respond to construction complaints. Compliance with the City's Noise Ordinance will prevent any significant adverse short-term noise impacts and thus no further conditioning is necessary or warranted.

Recreation

The Arboretum is generally a quiet and tranquil place for passive recreation. Construction activities may disturb arboretum visitors during the early heavy construction activities. Potential visitors to the Arboretum will be alerted to the construction activities so they can choose areas of the arboretum beyond the project site that will likely be only minimally impacted by the construction noise. Construction equipment and workers may have to cross the multi-use trail that follows Lake Washington Boulevard on the east side of the boulevard. Trail users will also be alerted to any trail closures and users will be rerouted around the project site as needed. During construction, areas of the arboretum further from the construction site will retain their quieter ambiance. No construction is anticipated on weekends when the arboretum sees more visitors so other than potential access and parking challenges during construction, visitors on weekends will not experience any disruption due to noise. Since there are other recreational resources in the neighborhood, no significant adverse temporary recreation impacts are anticipated, and no mitigation is warranted or necessary.

Environmentally Critical Areas and Trees

The project will take place partially in two wetlands and Arboretum Creek. As noted in the Checklist, the majority of the project is environmental restoration. To accomplish project objectives, reconfiguration of the existing Arboretum Creek headwaters is essential. This reconfiguration is a permanent impact to two wetlands. However, post-construction, the project will have a net benefit to both Arboretum Creek and the downstream wetlands because of the year-round flows introduced to the creek, and the water quality treatment provided to those flows (including keeping the water cool, because the stormwater garden keeps flows underground, with hyporheic discharge). The proposed on-site wetland mitigation approach is for wetland mitigation to be provided by the Arboretum Creek extension called for in the design.

Approximately nine (9) trees will be removed as part of the project. The trees will be replaced consistent with City requirements. While the identified ECAs and trees will be impacted during construction, restoration and tree replacement will also occur as part of the project and thus no mitigation is warranted or necessary.

Compliance with applicable codes, ordinances and regulations will be adequate to achieve sufficient mitigation.

Long Term Impacts

Recreation

Once construction is completed and construction areas are restored, the park will return to its tranquil setting. No significant long-term adverse recreation impacts are anticipated, and no mitigation is warranted or necessary.

Arboretum Creek

Once the conveyance system and the stormwater garden are completed, the Arboretum Creek headwaters will be extended by approximately 270 linear feet, with almost 15,000 square feet of new native plantings in areas of existing turf and/or ornamental shrubs. The interaction between the designed water quality cells (planted with wetland vegetation) and the extended stream channel will provide functional lift to water quality, hydrologic, and habitat functions.

Upon completion of the project, no long term adverse environmental impacts are anticipated and thus no conditioning is necessary or warranted.

DECISION

This decision was made after the responsible official, on behalf of the lead agency, reviewed a completed environmental checklist and other information on file with the responsible department. This constitutes the Threshold Determination and final decision on application of SEPA's substantive authority and mitigation provisions. The intent of this declaration is to satisfy the requirement of the State Environmental Policy Act (RCW 43.21.C), including the requirement to inform the public of agency decisions pursuant to SEPA.

☒ Determination of Non-Significance. This proposal has been determined to not have a significant adverse impact upon the environment. An EIS is not required under RCW 43.21C.030(2)(C).

☐ Determination of Significance. This proposal has or may have a significant adverse impact upon the environment. AN EIS is required under RCW 43.21C.030(2)(C).

Signature: _____

David Graves, AICP, Strategic Advisor
Planning & Capital Development Branch
Seattle Parks and Recreation

Date: September 4, 2026

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization, or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. **You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown.** You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to **all parts of your proposal,** even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for lead agencies

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B, plus the Supplemental Sheet for Nonproject Actions (Part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in "Part B: Environmental Elements" that do not contribute meaningfully to the analysis of the proposal.

Acronyms/Abbreviations

BMP	best management practice
FEMA	Federal Emergency Management Agency
FOAC	Friends of Arboretum Creek
GIS	geographic information system
HPA	Hydraulic Project Approval
Jacobs	Jacobs Engineering Group Inc.
PGIS	pollutant-generating impervious surfaces
Project	Arboretum Creek Headwaters Project
SDCI	Seattle Department of Construction and Inspections
SDOT	Seattle Department of Transportation
SPR	Seattle Parks and Recreation

Appendices

Appendix A. Vicinity Map and Maps of Aquatic Resources

Appendix B. Updated Construction Plansets (Between 60 and 90 Percent Design); Two plansets:

- B1: Portion of the project on Seattle Parks and Recreation property (Washington Park Arboretum)
- B2: Portion of the project in the right-of-way

A. Background Find help answering background questions

1. **Name of proposed project, if applicable:** Arboretum Creek Headwaters

2. **Name of applicant:** City of Seattle Department of Parks and Recreation (SPR)

3. **Address and phone number of applicant and contact person:**

   Jonathan Pagan, Project Manager
   Planning & Capital Development Branch
   City of Seattle, Seattle Parks and Recreation
   300 Elliott Ave W, Suite 100, Seattle, WA 98119
   M: 206-880-9026

4. **Date checklist prepared:** 8/13/2026

5. **Agency requesting checklist:** City of Seattle

6. **Proposed timing or schedule (including phasing, if applicable):** The project is estimated to be constructed starting summer 2027, pending permitting and funding for construction.

7. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.** No.

8. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.**

   Jacobs, Geotechnical Report May 2024.

   Jacobs, Design Report Revised Draft dated October 2025 *(to be finalized spring of 2026)*

   Jacobs, Cultural Resource Report (*to be completed summer of 2026*)

   Jacobs, Critical Areas Report Draft dated April 2026 *(to be finalized summer of 2026)*

   The proposed project area overlaps with Steep Slope Area, Riparian Corridor, Wetland, Liquefication Prone Area, Wildlife Habitat, and Peat Settlement Prone Area.

9. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.**

   No

10. List any government approvals or permits that will be needed for your proposal, if known.

Entity	Permit/Approval
Federal	
U.S Army Corps of Engineers	Clean Water Act (CWA) Section 404 Permit
U.S Fish and Wildlife and NOAA Fisheries	Endangered Species Act
State	
Washington Department of Fish and Wildlife (WDFW)	Hydraulic Project Approval (HPA)
Washington State Department of Ecology	- Section 401 Water Quality Certification - Section 402 NPDES Construction Stormwater General Permit - Coastal Zone Management Act Consistency - Clean Water Act NPDES Municipal Stormwater Permit Coverage
Department of Archaeology and Historic Preservation	National Historic Preservation Act Section 106
Local	
City of Seattle, SDCI	- Building and Land Use Preapplication - Master Use Permit for Conditional Use - Master Use Permit for Environmentally Critical Areas (ECA) - Grading Permit
City of Seattle	Tree Removal
City of Seattle, SDOT	Street Improvement Permit (SIP)

11. Give a brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The purpose of this project is to reconnect several hillside springs proximate to the Washington Park Arboretum to Arboretum Creek, providing year-round flow (Arboretum Creek currently runs dry during the dry months of the year). Currently, these hillside springs discharge to the combined sewer system. The project also intercepts stormwater from nearby roads and parking lots. Therefore, this project also includes water quality treatment before flows enter Arboretum Creek via hyporheic discharge. This project also includes physical restoration of the upmost reach of Arboretum Creek, which in its current form is very linear and channelized.

The project will capture and treat stormwater runoff that currently causes localized flooding both in the adjacent residential neighborhoods and along Lake Washington Boulevard next to the entrance to the Seattle Japanese Garden. Currently, this stormwater runoff enters the combined sewer system, taking up capacity in the King County interceptor and contributing to downstream combined sewer overflows. Rerouting and treating these flows will benefit both people and the environment, and will help to protect the Japanese Garden and its buildings from flooding.

The Arboretum Creek Headwaters Project was first conceptualized by the Friends of Arboretum Creek (FOAC), a community organization focused on the health of Arboretum Creek. FOAC members noted the degraded, 'ditch-like' appearance of Arboretum Creek and how the creek ran dry for half or more of the year.

The primary goal of this project is to restore the natural hydrology of the area before these hillside springs were intercepted by sewer pipes and conveyed away from Arboretum Creek. The proposed design of a conveyance pipe connecting these hillside springs to Arboretum Creek does include interception of several stormwater inlets from roadways and parking lots and therefore includes water quality treatment to reduce pollutant loading to Arboretum Creek. The proposed 'stormwater garden' includes a 'subsurface gravel wetland' a stormwater treatment Best Management Practice (BMP) that is well suited to sites with a continuous baseflow. This 'stormwater garden' will also treat flows coming from the koi ponds within the Japanese Gardens, which currently discharge to Arboretum Creek with no treatment. This 'stormwater garden' will keep water cool as it is being treated (because treatment is subsurface). The 'stormwater garden' is targeting the following pollutants: TSS removal >80%, and removal of 6PPD-Q, nutrients, fecal coliform, E. Coli, petrochemicals, and dissolved metals. The project itself also includes physical restoration of the uppermost reach of Arboretum Creek, adding large wood and channel sinuosity.

FOAC volunteers have led work parties along Arboretum Creek over the last five years. Members have invested hundreds of hours and thousands of dollars. The goal is a clean and restored Arboretum Creek full of life, i.e. native birds, fish, insects and plants. This vision is depicted in an interactive artwork at www.ArboretumCreek.org.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The address for the Washington Park Arboretum is 2300 Arboretum Dr E, Seattle, WA 98112.

Section, Township, and Range: ¼ Section: SE, Section: 28, Townshop: 25N, Range: 04E

Latitude/Longitude: 47.63105 N / -122.29694 W

The tax parcel numbers are as follows: 2125049044 (Owned by Seattle Parks and Recreation) and 320430PUBL (Public Right-of-Way)

See vicinity map in Appendix A.

B. Environmental Element

1. Earth Find help answering earth questions

a. General description of the site:

The project site is in Seattle, Washington, near the Seattle Japanese Garden in the Washington Park Arboretum with the surface topography varying from approximately 70 feet to 130 feet in elevation. The site is relatively flat with the exception of the vegetated slope behind the Japanese Garden up to E Prospect Street. The site consists of existing roads, sidewalks, a parking lot, walking trails, vegetated hillside and an open lawn area.

The project includes area both on SPR property (within the Washington Park Arboretum) and in the public right-of-way. The portion of the project on SPR property includes the stormwater garden and also the new drainage conveyance installed to re-route Alder Springs from the combined sewer towards the Stormwater Garden providing water quality treatment, and on to Arboretum Creek. The portion of the project area in the public right-of-way is along E Prospect St, south and west of the Washington Park Arboretum and Japanese Garden. The public right-of-way is in a residential area. A new stormwater conveyance system will be installed as part of the project to redirect both Alley Springs and roadway drainage inlets from the combined sewer towards the stormwater garden providing water quality treatment, and on to Arboretum Creek.

See Appendix A for vicinity map and aquatic resources maps.

Circle or highlight one: Flat, rolling, **hilly**, **steep slopes,** mountainous, other:

b. What is the steepest slope on the site (approximate percent slope)?

The vegetated slope behind the Japanese Garden up to E Prospect Street is up to 40%. All other parts of the project area are generally flat.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them, and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Three (3) geotechnical borings have been performed for this project. Two (2) borings were performed at the location of the Stormwater Garden and one (1) boring was performed on SPR property along E Prospect Street at the top of the slope leading down towards the Japanese Gardens. The Geotech Report dated May of 2024 contains specific information on boring locations. The subsurface soil profiles are described below based on the geotechnical data collected during the subsurface exploration.

At the two (2) borings at the Stormwater Garden site, the soils in the top 5 feet were mainly artificial fill composed of poorly graded sands (SP-SM) and silty sand (S). The soils deeper than 5 feet (up to the 21-foot depth of the borings) were lacustrine deposits, soft to stiff, lean clays (CL) and silts (ML).

The soils at the one (1) boring within E Prospect Street were as follows:

- Asphalt paving (9")
- Deposits of Pre-Fraser Glaciation Age: glacially overridden deposits of silty sand (SM) and silts (ML) below the asphalt paving. Variable sand and gravel observed within laminated silt layers. Densities ranged from dense/hard to very dense to full depth of the boring.

In addition to the three (3) geotechnical borings performed for this project, numerous other geotechnical borings have been conducted nearby for other projects. The Geotechnical report includes a description of these past investigations.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

None.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

The Project will have a combination of grading impacts to upland and surface water areas (reported in Section 3.a.3 on fill in surface water areas). The Project will impact about 150 linear feet of the existing Arboretum Creek stream channel. The existing condition of this 150 linear feet of Arboretum Creek stream channel is a grass-lined ditch. This 150 linear feet will be regraded as part of this project, with additional length added to the post-construction stream channel (approximately 200 linear feet).

Excavation will be performed of the Stormwater Garden area, then replacing that excavated material with wood chips, gravel, and topsoil that will provide water quality treatment. Imported materials

will be sourced from SPR-approved locations.

Excavation will also be performed to install the new drainage conveyance system. In general, onsite soils will be reused where possible. Imported materials will be sourced from SPR-approved locations. See Table below for estimates of total project excavation and fill by project element (totals include an additional 15% on top of calculated quantities; rounded to up to the nearest 10 CY).

Stormwater Garden	**SPR Property**	**Public ROW**	**total**
Excavation (CY, existing soil in area)	900	NA	900
Fill (CY, media for stormwater garden - woodchips, sawdust, biochar)	810	NA	810

Pipe Conveyance	**SPR Property**	**Public ROW**	**total**
Excavation (CY, existing soil in area)	2070	920	2990
Fill (CY, pipe bedding material)	2070	920	2990

f. Could erosion occur because of clearing, construction, or use? If so, generally describe.

Not likely, the majority of grading and site disturbance is in relatively flat areas within the Arboretum. There is a section of proposed conveyance off of East Prospect Street that is through a steep slope area. The project will implement a temporary erosion, a sediment control plan, and construction best management practices. Post-construction, the risk of erosion will be equivalent or less than pre-construction.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?
This Project has no new impervious surface. The replaced impervious surface identified in the table below is for replacement of pavement after installation of the new drainage conveyance system. Currently, the project site (referred to as 'Study Area' – see Appendix A) is approximately 15% impervious surfaces. Since there is no new impervious surface planned, this same percentage of impervious surface will exist after project construction.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any.
Temporary erosion-control blankets, mulch, or other industry-approved standards will be used to minimize erosion. Post-construction, erosion will be controlled through vegetation of all areas that are not active stream channel or built structures.

2. Air Find help answering air questions

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.
Air emissions during construction are restricted to heavy machinery and passenger truck exhaust. A minimal amount of construction dust emissions are expected due to following applicable BMPs. No change to existing emissions are anticipated after the Project is complete.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
There are no off-site sources of emissions or odor that may affect the Project.

c. Proposed measures to reduce or control emissions or other impacts to air, if any.
Use of properly tuned equipment could minimize any potential air quality impacts. Equipment will be turned off, rather than idle, when not in use. Effort to balance cut and fill excavation and leave material on site, rather than be hauled away.

3. Water Find help answering water questions

a. Surface Water: Find help answering surface water questions

1. **Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.**

   The project is within the Lake Washington – Sammamish River sub-basin, in the western portion of WRIA 8. Arboretum Creek, located in the project area, is a tributary to Lake Washington, with a historic watershed of 888 square miles. Arboretum Creek in the project location only flows during wet months.

   Three wetlands are located within or adjacent to the project area. Wetlands 1 and 4 are within the project footprint, Wetland 2 is located immediately adjacent off-site.

   Arboretum Creek is within the project boundary. Also, Alley Springs exists in the project area (which currently discharges to the combined sewer). Waterbodies that are adjacent to the project area include: Arboretum Creek, Japanese Garden Ponds, Alder Springs (discharges to combined sewer), and Alley Springs (discharges to combined sewer).

2. **Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.**

   Construction will occur over, in, and adjacent to Arboretum Creek. Please see Appendix B for construction plan sets reflecting between 60% and 90% design development. Note that there are two plan sets – one for the part of the project on the public right-of-way, and a second for the part of the project on SPR property (within the Washington Park Arboretum).

3. **Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.**

   The entire project is intended to benefit Arboretum Creek and its associated riparian areas. The following actions were taken to avoid and minimize impacts to wetlands from the constructed project:

   - Collaboration with project partners (Friends of Arboretum Creek, Arboretum Foundation, University of Washington Botanical Gardens, Seattle Public Utilities) on design of the

Stormwater Garden to maximize environmental benefit, including providing year-round flow to Arboretum Creek by way of hyporheic discharge from the Stormwater Garden.

- Water Quality treatment of flows from the koi ponds at the Japanese Garden ponds, which are currently discharging directly to Arboretum Creek with no treatment
- Water Quality treatment of stormwater on Lake Washington Blvd, which is currently discharging directly to Arboretum Creek with no treatment
- All temporary wetland impacts will be restored following construction activities.

Excavated materials will be disposed of, and fill brought in from off site. All imported fill will be from SPR-approved facilities and will be rock and gravel of size classes and shape typically found in Puget Sound lowland streams. Post-construction, no built structures will overlap with the relocated stream. The team will continue to evaluate ways to minimize wetland impacts, construction footprint, vegetation clearing limits, and grading limits as the design is finalized.

This is not a formal development project with standard impacts. The majority of the project is environmental restoration. To accomplish project objectives, reconfiguration of the existing Arboretum Creek headwaters is essential. This reconfiguration is a permanent impact to wetlands (Specifically – the existing Category III wetland within Arboretum Creek downstream of the project site). However, post-construction, the project will have a net benefit to both Arboretum Creek and the downstream wetlands because of the year-round flows introduced to the creek, and the water quality treatment provided to those flows (including keeping the water cool, because the stormwater garden keeps flows underground, with hyporheic discharge). Therefore, the proposed on-site wetland mitigation approach is for wetland mitigation to be provided by the Arboretum Creek extension called for in the design.

The restoration plan is intended to improve conditions in Arboretum Creek by providing sinuosity and hyporheic exchange in the extended channel, and by providing year-round flow via hyporheic discharge from the stormwater garden. Wetland #1 (with permanent impacts) will remain in the same location but will have year-round flow provided by the project. This project seeks to restore the hydrology of Arboretum Creek from before hillside springs were routed to the combined sewer.

Before development, these hillside springs emerged from the ground and made their way to Arboretum Creek. This project seeks to restore that relationship and is consistent with a watershed approach.

The unavoidable permanent impacts to Wetland 1/Arboretum Creek are related to the extension of Arboretum Creek and the construction of the stormwater garden. The headwaters of Arboretum Creek are currently a ditched, linear system with low baseflows resulting in emergent wetland conditions within the stream channel. The headwaters will be re-established as a meandering system with increased, perennial baseflows from Alley and Alder Springs, and reconnected overbank storage.

The Arboretum Creek headwaters will be extended by approximately 270 linear feet, with almost 15,000 square feet of new native plantings in areas of existing turf and/or ornamental shrubs. The interaction between the designed water quality cells (planted with wetland vegetation) and the extended stream channel will provide functional lift to water quality, hydrologic, and habitat functions.

Wetland 1 impact area will be over-excavated to accommodate new planting and stormwater garden media within the wetland boundaries. Wetland 4 impact area may be excavated up to a depth of 2 ft proximate to the existing grate inlets leading to the combined sewer. Native material would then be returned to its location. See Table below for estimates of excavation and of fill for both Wetland 1 and Wetland 4.

Wetland	Category	Cowardin Class	Excavation (cubic yards)	Fill (cubic yards)
Wetland 1	III	PEM	Up to 310 cubic yards	Up to 250 cubic yards
Wetland 4	IV	PEM / PSS	Up to 8 cubic yards	Up to 8 cubic yards

The purpose of this entire project is to improve conditions in Arboretum Creek – providing sinuosity and hyporheic exchange the extended channel, and by providing year-round flow via hyporheic discharge from the stormwater garden. This project seeks to restore the hydrology of Arboretum Creek from before hillside springs were routed to the combined sewer. The headwaters of Arboretum Creek are currently a ditched, linear system with low baseflows resulting in emergent wetland conditions within the stream channel. The headwaters will be re-established as a meandering system with increased, perennial baseflows from Alley and Alder Springs, and reconnected overbank storage.

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This project has been designed with various measures to avoid and minimize indirect impacts on the aquatic environment. BMPs will be followed to prevent the spread of invasive species, control stormwater runoff, and limit soil erosion.

4. Will the proposal require surface water withdrawals or diversions? Give a general description, purpose, and approximate quantities if known.

A temporary pumping system will be used (if needed, should wet weather occur) to pump overflows from the Japanese Garden Ponds into Arboretum Creek downstream of the project area. Since Arboretum Creek currently has no dry weather baseflow, continuous bypass pumping will not be needed.

5. Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No.

6. Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
No waste materials are expected to be discharged to surface waters.

b. Ground Water: Find help answering ground water questions

1. **Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give a general description, purpose, and approximate quantities if known.**

There are no existing wells onsite. Groundwater may be encountered and withdrawn during excavation activities. The exact quantity to be withdrawn is unknown. All groundwater will be discharged in accordance with Project permits.

2. **Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (domestic sewage; industrial, containing the following chemicals…; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.**

No waste material is expected to be discharged into the ground from septic tanks or other sources.

c. Water Runoff (including stormwater):

a) **Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

Erosion control BMPs will intercept water runoff before flowing into Arboretum Creek. Post-construction, stormwater will collect and be treated in the Stormwater Garden before discharge to Arboretum Creek.

b) **Could waste materials enter ground or surface waters? If so, generally describe.**

Construction equipment spills may occur, though appropriate BMPs will be in place to avoid and minimize spills entering groundwater or surface waters.

c) **Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.**

Yes. Instead of entering the combined sewer, stormwater will be conveyed to, and treated within, the Stormwater Garden before entering Arboretum Creek via hyporheic discharge.

d) **Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any.**

All water quality BMPs will be followed to minimize runoff water impacts and to comply with Washington Administrative Code 173-201A – Water Quality Standards for Surface Waters of the State of Washington. Monitoring will be conducted as required by Project permits. Construction equipment operating in or adjacent to streams will also be required to use biodegradable fuel.

4. Plants Find help answering plants questions

a. Check the types of vegetation found on the site:

- ☒ **deciduous tree: alder, maple, birch, hawthorn, locust, oak, horse chestnut, other**
- ☒ **evergreen tree: redwood, cedar, pine, larch, spruce, cypress, hemlock, other**
- ☒ **shrubs**
- ☒ **grass**
- ☐ **pasture**
- ☐ **crop or grain**
- ☐ **orchards, vineyards, or other permanent crops.**
- ☒ **wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other**
- ☐ **water plants: water lily, eelgrass, milfoil, other**
- ☒ **other types of vegetation**

b. What kind and amount of vegetation will be removed or altered?

Approximately 9 trees are proposed for removal for the project. Shrub and groundcover vegetation will be removed as needed with earthwork and conveyance improvements. The Project Team is working directly with the Arboretum, UW Botanical Gardens, and SPR and Project Arborist on vegetation removal, tree mitigation, and planting plans.

c. List threatened and endangered species known to be on or near the site.

No threatened or endangered plant species are known to be on or near the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any.

The project area, other than hardscaped areas, will be planted per the planting plan (see Appendix B for construction plan sets).

e. List all noxious weeds and invasive species known to be on or near the site.

Reed canarygrass (Phalaris arundinacea), Himalayan blackberry (Rubus armeaniacus), and horsetail (Equisetum arvense)

5. Animals Find help answering animal questions

a. List any birds and other animals that have been observed on or near the site or are known to be on or near the site.

Examples include:

- **Birds: hawk, heron, eagle, songbirds, other**:
- **Mammals: deer**, bear, elk, **beaver**, other: **squirrels, raccoons, moles, coyote**
- **Fish:** bass, **salmon**, **trout**, herring, shellfish, other:

b. List any threatened and endangered species known to be on or near the site.

None on site. The nearest threatened/endangered species are bull trout (Salvelinus confluentus) and Chinook salmon – Puget Sound ESU (Oncorhynchus tshawytscha) in Union Bay/Lake Washington, approximately 0.80 miles downstream of the fish barrier.

c. Is the site part of a migration route? If so, explain.

The site is within the Pacific Flyway for migratory birds. As noted, the adjacent Lake Washington is a migration corridor for trout (steelhead), Salmon and Char (Bull trout).

d. Proposed measures to preserve or enhance wildlife, if any.

The primary purpose of the Project is to restore year-round baseflow in Arboretum Creek which will benefit wildlife. During construction, SPR will attempt to limit disturbance as much as possible. For example, mature trees will be protected where possible and clearing will be limited to the minimum necessary to complete the work. In-water work will also be restricted to the U.S. Army Corps of Engineers and Washington Department of Fish and Wildlife approved in-water work window, and fish salvage activities will follow the methodologies in the most up-to-date Washington State Department of Transportation and U.S. Fish and Wildlife Service protocols.

e. List any invasive animal species known to be on or near the site.

No invasive animal species are known to be at or near the site.

6. Energy and Natural Resources Find help answering energy and natural resource questions

1. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Post-construction, the facilities onsite should not require substantial amounts of energy. SPR may need to use fuel to support small maintenance vehicles, but SDOT is uncertain of how much or how often SPR would need.

2. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

The Project will not affect the potential use of solar energy by adjacent properties. The Project area is currently largely forested and shady already, as well as mostly downslope of adjacent properties.

3. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.

During construction, gasoline will be used to fuel some equipment, trucks, and heavy machinery contained to the roadway with biodegradable fuels for equipment within and immediately adjacent to Arboretum Creek. A power generator or batteries may be used to power some equipment. Heavy equipment and trucks will not idle longer than necessary to conserve fuel.

7. Environmental Health Find help with answering environmental health questions

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur because of this proposal? If so, describe.

During construction, it is possible that there could be spills from equipment (either fueling or leaks). Possible spills will be identified in the Project spill prevention, control, and countermeasure plan, which will be developed by SDOT's selected contractor prior to the start of construction.

During operation, it is also possible for there to be fuel spills from SPR vehicles, but it is assumed that SPR has their own protocols for spill containment.

1. **Describe any known or possible contamination at the site from present or past uses.**

   Based on review of state databases and SPR records, it is unlikely the project will encounter contaminated or impacted soil. If odors or visual signs of contamination in soil are encountered during excavation and grading activities, work will stop in that area and SPR Environmental staff will be contacted.

2. **Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.**

   There are no underground liquid or gas transmission pipelines known to cross the Project location or in its vicinity. There are several subsurface sewer crossings, as well as residential natural gas mains. These will be protected in place during construction.

3. **Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.**

   During construction, vehicle fueling may occur on existing paved surfaces or offsite. SPR's contractor will be required to prepare a spill prevention, control, and countermeasure plan that will be undergo SPR approval prior to the start of construction.

   Post construction, no toxic or hazardous chemicals should be stored or produced. SPR may elect to use fuel-powered vehicles during maintenance activities (such as trash clean-up or mulch delivery), but it is assumed SPR will follow their best practices for these activities.

4. **Describe special emergency services that might be required.**

   No special emergency services are anticipated.

5. **Proposed measures to reduce or control environmental health hazards, if any.**

Construction equipment will be checked for leaks. A spill kit with oil-absorbent materials will be onsite in the event of a spill. Fueling will take place offsite or cordoned off on existing hard surfaces.

Concrete pouring will also be restricted and managed in a way to prevent spillage or leaching while the concrete cures.

b. Noise

1. **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

   None with the potential exception of road noise associated Lake Washington Blvd and 28th Ave E.

2. **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site)?**

   Noise associated with heavy equipment working during standard construction times is anticipated during the construction phase only. Post-construction no additional noise would be associated with the project.

3. **Proposed measures to reduce or control noise impacts, if any.**

   Earthwork equipment will be fitted with standard noise reducing mufflers. Post-construction noise control measures are not anticipated or needed.

8. Land and Shoreline Use Find help answering land and shoreline use questions

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe.

The project site is a public botanical garden and right of way areas. Adjacent properties are residential. The proposed project will help reduce flooding within the area.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses because of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?

No.

1. **Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how?**

No. There are no adjacent working farms or forest lands.

c. Describe any structures on the site.

There are no existing structures or buildings within the project boundary. The project is not proposing any new structures. Existing utilities include sanitary sewer, water, and natural gas mains, as well as buried power.

d. Will any structures be demolished? If so, what?

No buildings will be demolished. Portions of roadways that are torn up to build the new drainage conveyance system will be replaced. Utilities will either be protected during construction or re-routed then restored after construction. See section 16/b for quantities of removed and installed drainage utilities.

e. What is the current zoning classification of the site?

The majority of work will be within Parks property zoned Neighborhood Residential 2 (NR2). There is an area on 28th Avenue East that is zoned NR3.

f. What is the current comprehensive plan designation of the site?

Neighborhood Residential Areas.

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable, the site is not within a shoreline environment.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.

SDCI GIS mapping identifies ECA Steep Slope, Riparian Corridor, Wetland, Liquefaction Prone Area, Wildlife Habitat, and Peat Settlement Prone Areas within the project boundary.

i. Approximately how many people would reside or work in the completed project?

The Project will not construct or demolish any residential structures. No people currently live within the work limits of the Project, and the same number of City SPR staff are anticipated to work occasionally post-construction.

j. Approximately how many people would the completed project displace?

No people would be displaced by the completed Project.

k. Proposed measures to avoid or reduce displacement impacts, if any.

Not applicable as no people will be displaced.

l. Proposed measures to ensure the proposal is compatible with existing and projected land

uses and plans, if any.

The project site is owned by the City of Seattle with the intended use as a public park, which is a compatible land use within a residential zone.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any.

This is not applicable, as there are no agricultural or forest lands of long-term commercial significance overlapping with the Project area.

9. Housing Find help answering housing questions

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any.

Not applicable as no housing impacts are anticipated.

10. Aesthetics Find help answering aesthetics questions

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Not Applicable.

b. What views in the immediate vicinity would be altered or obstructed?

None.

c. Proposed measures to reduce or control aesthetic impacts, if any.

The project is being designed to provide enhancements to the overall Arboretum aesthetic and the design team is working directly with SPR gardeners, Landscape Architects, the University of Washington Botanical Gardens, and the Arboretum Foundation.

11. Light and Glare Find help answering light and glare questions

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

The Project will not produce light or glare– the project does not include any lights or lighting.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

No existing off-site sources of light or glare may affect the Project.

d. Proposed measures to reduce or control light and glare impacts, if any.

There are no proposed measures to reduce or control light and glare impacts.

12. Recreation Find help answering recreation questions

a. What designated and informal recreational opportunities are in the immediate vicinity?

There is an informal dirt path through the SPR parcels that is used by the public.

b. Would the proposed project displace any existing recreational uses? If so, describe.

During construction, the general public will temporarily be restricted from accessing the SPR-managed properties. Post construction, this access for recreational uses will be restored.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any.
No impacts to recreation.

13. Historic and Cultural Preservation Find help answering historic and cultural preservation questions

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe.

There are no places or objects listed on or proposed for national, state, or local preservation registers on or next to the site. The Cultural Resources Report will contain this information. The Cultural Resources Report is in progress, expected summer of 2026.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the

site to identify such resources.

The Jacobs cultural team reviewed the Area of Potential Effects to verify if any cultural artifacts were likely to be encountered as a result of Project activities, or if qualifying historic properties were present and could be adversely impacted. The Cultural Resources Report will contain this information. The Cultural Resources Report is in progress, expected summer of 2026.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

The Jacobs cultural team conducted a combination of desktop review and field investigations. The Cultural Resources Report will contain a summary of methods. The Cultural Resources Report is in progress, expected summer of 2026.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.

SPR's Inadvertent Discovery Protocol (IDP) will be used for the project and included in the project specifications. The Inadvertent Discovery Plan (IDP) is intended to provide clear guidance related to the management of an unexpected discovery or unearthing of cultural artifacts, archaeological features or other evidence of cultural materials and/or of skeletal material of human or unknown origin during the project.

The Project is also being designed in a manner that honors the historic character and goals of the arboretum and meets regularly with the Arboretum Foundation, University Botanical Gardens, SPR, and FOAC.

14. Transportation Find help with answering transportation questions

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.

The majority of the project site is located within the Washington Park Arboretum served by Lake Washington Blvd E. Limited temporary lane closures of Lake Washington Boulevard are anticipated while the Contractor moves equipment and/or materials, with flaggers providing traffic management. Additionally, 28th Ave E / E Prospect St would be affected during construction with partial or full closures. Parts of the parking lot south of the Japanese Garden may be used for construction staging, with use restricted to open parking stalls and driving through/access. No street, parking, or park access is anticipated to require complete closure during construction activities.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?

Metro bus routes 980, 43, and 11 run near the Arboretum but not directly by the site.

c. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle, or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).

Private Property (Washington Park Arboretum, SPR): Currently, there are numerous parking spaces in the parking lot south of the Japanese Gardens, some of which will be required for construction staging. The Project will restore Lake Washington Blvd E and parking lot pavement above where the new drainage conveyance system is installed.

Public Right-of-Way: Currently, both sides of the roads in the right-of-way portion of the project are open to street parking. While during construction there will likely be partial lane closures for construction access and staging, all parking will be restored after construction to pre-construction levels. Roadways and sidewalks will be restored (ex: repaved) after construction.

d. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The Project will not occur in the immediate vicinity of water, rail, or air transportation.

e. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?
No additional vehicular trips will be generated by the completed Project.

f. Will the proposal interfere with, affect, or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.

This proposal will not affect the movement of agricultural or forest products, as the Project will not affect major commercial roadways or arterials.

g. Proposed measures to reduce or control transportation impacts, if any.
There are no proposed measures to reduce or control transportation impacts, because no major transportation impacts are anticipated.

15. Public Services Find help answering public service questions

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.

The Project will not result in an increased need for public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

There are no proposed measures to reduce or control direct impacts on public services.

16. Utilities Find help answering utilities questions

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other: Irrigation.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

The project will add storm drainage infrastructure in coordination with SPU, SPR and SDOT. This includes; drainage conveyance, pre-settling pipe, flow splitter, inlets, catch basins, clean outs, and a stormwater garden. See Table below for total project drainage conveyance and structures removed and installed.

Drainage Structures	SPR Property	Public ROW	Total	Notes
Pipe removed (LF, and diam/type)	0	100	100	Removal/abandonment of existing piped connections of inlets to combined sewer, size ranging from 8" to 12"
Pipe installed (LF, and diam/type)	2040	810	2850	Rounded up to the nearest 10 LF
Structures (CBs, inlets, maintenance holes) removed	0	0	0	
Structures (CBs, inlets, maintenance holes) installed	20	12	32	

C. Signature Find help about who should sign

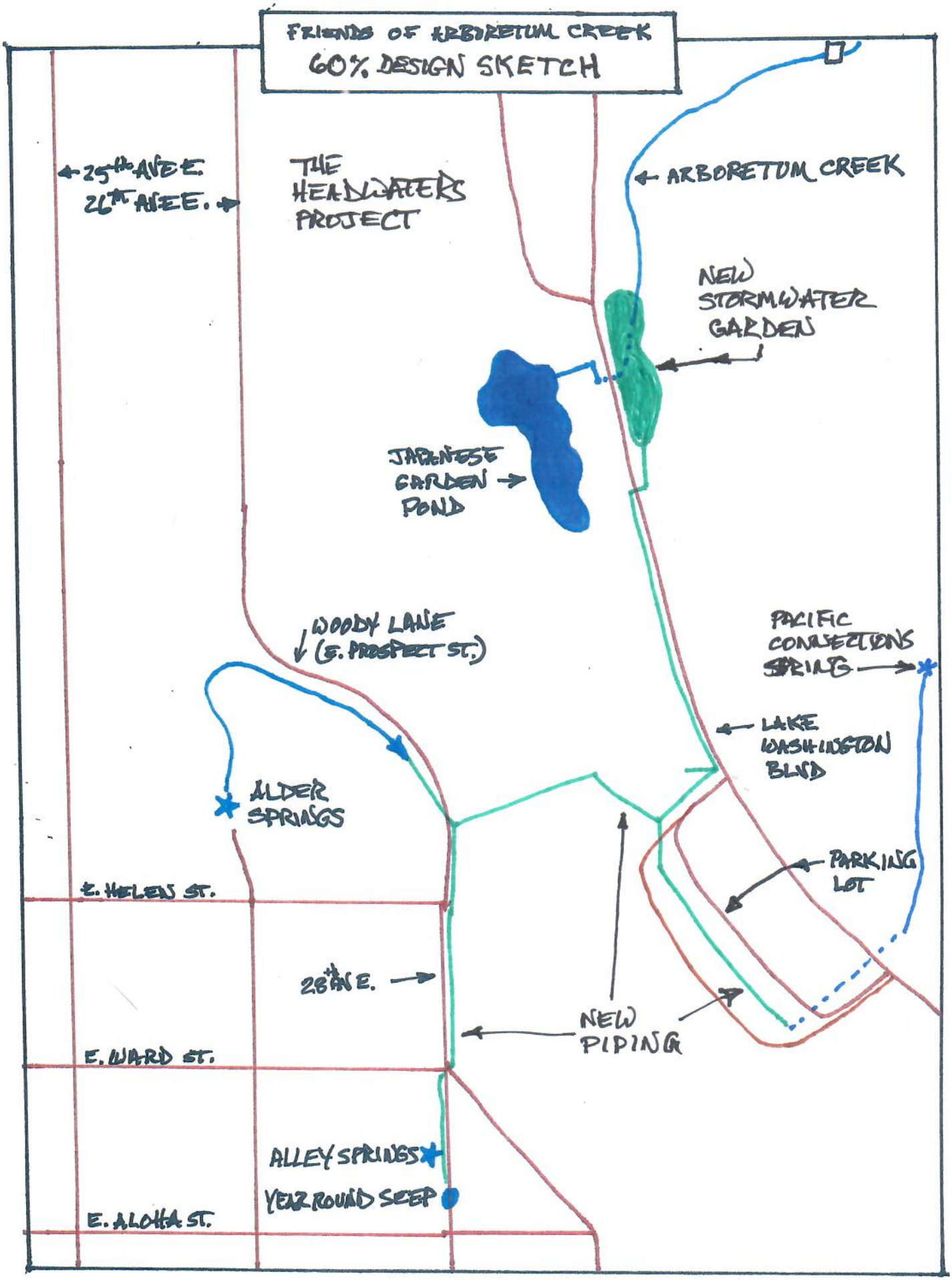
The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

X Digitally signed by Jonathan Pagan
Date: 2026.08.13 08:41:44-07'00'

Type name of signee: Jonathan Pagan

Position and agency/organization: Sr. Capital Project Coordinator / Seattle Parks and Rec

Date submitted: 8/13/2026


FRIENDS OF ARBORETUM CREEK
60% DESIGN SKETCH
25th AVE E.
26th AVE E.
THE HEADWATERS PROJECT
ARBORETUM CREEK
NEW STORMWATER GARDEN
JAPANESE GARDEN POND
WOODY LANE (E. PROSPECT ST.)
PACIFIC CONNECTIONS SPRING
LAKE WASHINGTON BLVD
ALDER SPRINGS
PARKING LOT
E. HELEN ST.
28th AVE E.
NEW PIPING
E. WARD ST.
ALLEY SPRINGS
YEAR ROUND SEEP
E. ALOHA ST.

Arboretum Creek Headwaters and Stormwater Garden Project

Design Report (REV03)

September 21, 2025

Prepared for:

Seattle Parks and Recreation

Friends of Arboretum Creek

Acknowledgements

Seattle Parks and Recreation (SPR) and Friends of Arboretum Creek (FOAC) would like to thank the following organizations for collaborating on the development of this project to date:

King County Department of Natural Resources and Parks Wastewater Treatment Division (KCWTD)

King County Flood Control District (KCFCD)

Arboretum Foundation (AF)

Washington Department of Ecology (Ecology)

University of Washington Botanic Gardens (UWBG)

Seattle Public Utilities (SPU)

Seattle Department of Transportation (SDOT)

Seattle Parks Foundation (SPF)

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Contents

Executive Summary

Friends of Arboretum Creek (FOAC) has been advocating for, coordinating, and leading restoration efforts in and around Arboretum Creek for several years. The purpose of this Alley and Alder Springs re-connection project is to re-connect these springs, and the year-round roadway seep on 28th Avenue East just south of Alley Springs, to Arboretum Creek in order to address the issue of a lack of summertime flow. This project aims to restore the natural hydrology of the Arboretum Creek watershed by connecting Alley and Alder Springs and the Pacific Connections Springs with Arboretum Creek while also addressing localized flooding and currently untreated stormwater runoff. It s envisioned that this project will work in concert with other investments made to restore habitat and water quality in Arboretum Creek, including plans to remove the culvert in the downstream reach, replacing it with an open creek channel. Efforts are also on-going to restore native vegetation along Arboretum Creek.

Arboretum Creek flows north through the Washington Park Arboretum in Seattle, Washington, emptying into Union Bay in Lake Washington. The headwaters of Arboretum Creek is located just to the Northeast of the Japanese Garden. Arboretum Creek flows in an open channel throughout its length (excluding 4 small bridges and where it crosses under Lake Washington Blvd) until the very last reach, where it travels through a culvert before entering Union Bay and Lake Washington. Alley Springs is a natural seep surfacing into a drainage structure referred to as a sand box at the alley entering 28th Ave E between E Ward St and E Aloha St. Alder Springs begins as a hillside seep at the dead-end of 26th Ave E off of E Helen St., flowing north downhill under the stairway, then turns to the southeast along E Prospect, then enters a drainage structure and flows in a pipe down the hill into Washington Park. Pacific Connections Springs daylights to the east of Lake Washington Blvd and enters the piped drainage system flowing west towards the parking lot at the Japanese Gardens.

The 90% design includes the conveyance of Alley and Alder Springs and Pacific Connections Springs into the Washington Park Arboretum and the collection and conveyance of stormwater from, 28th Ave E. (from Aloha St to Prospect St), the parking lot near the Japanese Gardens and also Lake Washington Boulevard. These flows then enter a subsurface gravel wetland where water quality treatment is provided. The effluent from the Japanese Garden Ponds enters the same water quality treatment facility. The water quality treatment facility then discharges via groundwater to a restored Arboretum Creek headwaters.

This project is a stormwater retrofit project with a subsurface gravel wetland BMP as well as a pretreatment BMP located within the parking lot of the Japanese Gardens. Discharge to Arboretum Creek is via hyporheic zone discharge. Jacobs has utilized applicable design guidance for these proposed BMPs, which provide a quantifiable water quality benefit.

This project, now named the Arboretum Creek Headwaters Project, is currently at the 90% design phase of development. Next steps include continuing coordination with stakeholders and the FOAC Advisory Group, collecting additional information, and proceeding with further design development then construction.

1. Introduction

Friends of Arboretum Creek (FOAC) is a community-driven non-profit organization with a mission to 'maximize the diversity of life in Arboretum Creek while rekindling the love affair between Seattle and nature!". FOAC has been advocating for, coordinating, and leading restoration efforts in and around Arboretum Creek for several years. One of the issues that Arboretum Creek faces is a lack of dry weather (summertime) flow that is important for stream health, specifically water quality and for aquatic and avian habitat. FOAC identified several nearby springs, Alley Springs, Alder Springs, and Pacific Connections Springs, that surface in the hillsides of the Arboretum Creek valley, as potential sources to supplement summer base flows and were historically part of Arboretum Creek watershed prior to the construction of Lake Washington Boulevard circa 1905.

The purpose of this project is to re-connect these springs to Arboretum Creek in order to address the issue of a lack of summertime flow. This project aims to restore the natural hydrology of the Arboretum Creek watershed by reconnecting Alley, Alder, and Pacific Connections Springs to Arboretum Creek and to provide water quality treatment of the spring water and also stormwater. In addition to the benefits to stream health and habitat, this project is designed to also provide benefits to people. These benefits to people include capturing and treating stormwater runoff that currently causes localized flooding both in the residential neighborhoods and proximate to the Japanese Garden entrance along Lake Washington Boulevard. Currently, this stormwater runoff enters the combined sewer system, taking up capacity in the King County interceptor which also contributes to combined sewer overflows downstream in the system. By re-routing and treating these flows, this project provides several benefits to both people and the environment and including helping to protect the Japanese Gardens and buildings from flooding. These multi-objective benefits are described in this report.

It is envisioned that this project will work in concert with other investments made to restore habitat and water quality in Arboretum Creek, including plans to remove the culvert in the downstream reach, replacing it with an open creek channel. Efforts are also on-going to restore native vegetation along Arboretum Creek.

2. Basin Description

Arboretum Creek flows north through the Washington Park Arboretum in Seattle, Washington, emptying into Union Bay in Lake Washington. The present day headwaters of Arboretum Creek is located just to the Northeast of the Japanese Garden (see Figure 1). Arboretum Creek flows in an open channel throughout its length until it enters a culvert before entering Union Bay and Lake Washington (see Figure 2).

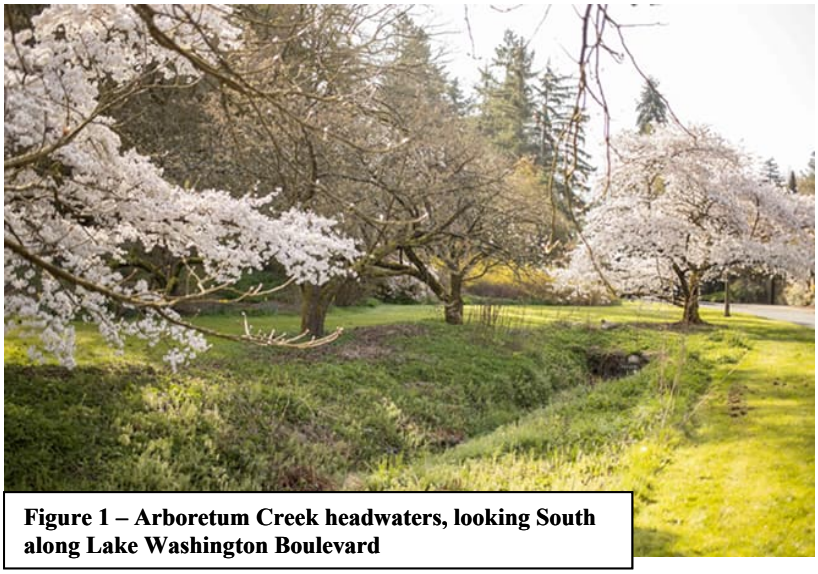


Figure 1 – Arboretum Creek headwaters, looking South along Lake Washington Boulevard

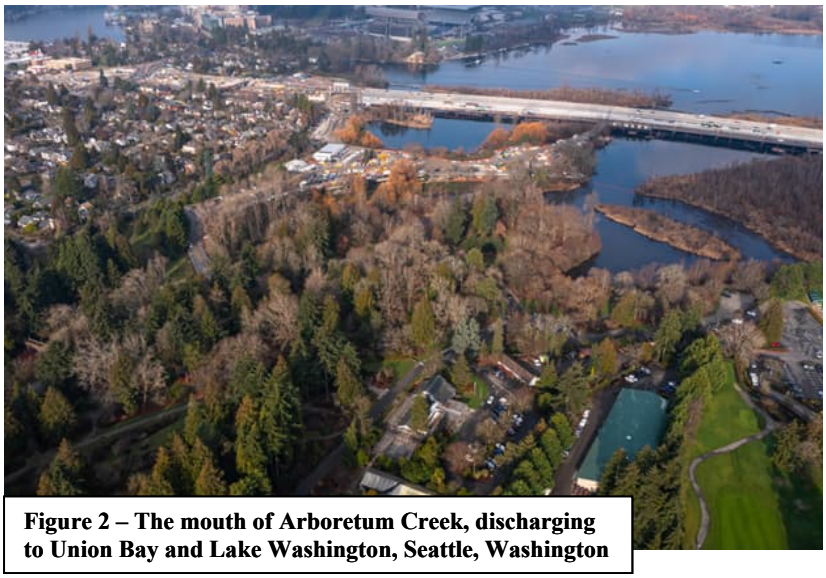
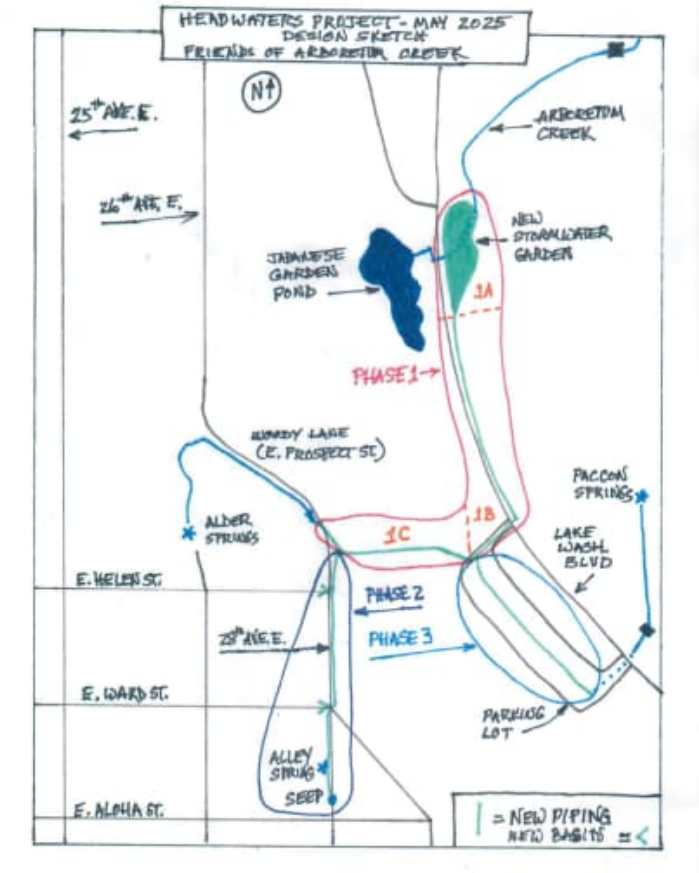


Figure 2 – The mouth of Arboretum Creek, discharging to Union Bay and Lake Washington, Seattle, Washington

3. Site Description

Washington Park is one of the City of Seattle's busiest parks, including with both park visitors and bike and vehicular users crossing the Park via Lake Washington Boulevard. The Arboretum Collections are world-renowned and attract many visitors, as do the Japanese Garden. Numerous species of wildlife and birds frequent and use this area as a protected habitat. This project provides the opportunity to improve conditions for both people and bird/wildlife users of the area.

Figure 3 – Locations of Alder, Alley, and Pacific Connections Springs, in relation to Arboretum Creek Headwaters (note that phasing is to be determined based on available construction funding)



The natural hydrology of the Arboretum Creek tributary area has been disrupted by development, occurring initially in the early 1900s. While Washington Park is mainly pervious surface, allowing rainwater to infiltrate, the rest of the Arboretum Creek tributary area is residential/commercial with streets and buildings creating impervious surface. Stormwater from the effective impervious surfaces flows to inlets and into pipes. A combined sewer trunkline pipe owned by King County parallels Arboretum Creek, accepting any and all natural spring flow and a large portion of the stormwater flowing from the Arboretum Creek tributary area, having been diverted to the combined sewer from its natural course of Arboretum Creek. Washington Park is generally flat, with steep slopes up to the surrounding tributary residential/commercial areas.

Alder Springs, Alley Springs, and the Pacific Connections Springs, once at the surface, currently flow through pipes and in roadside ditches and enter the King County combined sewer system. See Figure 3 for locations of these springs.

In the upland residential area (where Alder and Alley Springs emerge at the ground surface) there is often ponded water on the street surface on 28th Ave E near E. Helen Street and E. Ward Street during the wet season (October through April). During storms, there is often 4-6 inches of standing water on 28th Ave E in the area shown in Figure 4.

Alley Springs is a natural seep surfacing into a drainage structure referred to as a 'sand box' at the alley entering 28th Ave E between E Ward St and E Aloha St (Figure 5). Alley Springs then flows through pipes that are part of the combined sewer network, and on to the King County sewer trunk line in Washington Park. Figure 6 shows the seep along 28th Ave E. between E. Aloha St. and E. Ward St. Alder Springs begins as a hillside seep at the dead-end of 26th Ave E off of E Helen St., flowing north downhill under the stairway, then turns to the Southeast along E Prospect, then enters a drainage structure (Figure 7) and flows in a pipe down the hill into Washington Park. (This project included desktop information gathering to

verify that flow from Alley and Alder Springs do both currently enter the combined sewer system.) Based on FOAC data collection, Alley Springs has an approximate dry-weather flow of approximately 8 gallons per minute and Alder Springs has a dry-weather flow of approximately 19 gallons per minute. The base flow in both Alley and Alder Springs appears to not be influenced by extremely dry weather in that the flow continues throughout the dry season.

Figure 4 – Residential Area in the Arboretum Creek Tributary Area (Looking East up E Helen St. at 28th Ave E/E Prospect Street)

Figure 5 – Alley Springs in the 'sand box' drainage structure

Figure 6 – Seep at 28th Ave East (between E. Aloha and E Ward Streets)

Figure 7 – Alder Springs at 26th Ave E and E Prospect Street

The location of the planned stormwater garden is relatively flat (See Figure 8) and grassy. Results of the wetland delineation indicate the presence of Category III wetlands within Arboretum Creek downstream of the location of the planned stormwater garden. However, no wetlands were delineated within the footprint of the project including the stormwater garden. It is anticipated that this project will have wetland impacts (construction within the wetland buffer) but that the project will be self-mitigating in terms of those wetland impacts, meaning that the project will provide more environmental benefit than the impacts it's having on those wetlands. This self-mitigating wetlands mitigation plan will be further refined and finalized in conversations with the United States Army Corps of Engineers (USACE) who has jurisdiction over the wetlands within Arboretum Creek (See Attachment E for specific permitting requirements and approach and timeline).

Figure 8 – Existing vegetation in the area of the Planned Stormwater Garden

Much of the project area is within property owned by Seattle Parks and Recreation. A portion of the project area (including where Alley and Alder Springs need to be conveyed) is within the public Right-of-Way.

Geotechnical borings were conducted in the spring of 2024 and a Geotechnical Data Report was then developed. A deep boring to 101.5 feet was conducted along 28th Ave NE and East Helen Street. Two different relatively shallow borings (each to 21.5 feet) were conducted within the footprint of the planned stormwater garden. Figure 9 shows the locations of these borings in relation to the planned stormwater garden and existing Alley and Alder Springs. The Geotechnical Data Report summarizes soil conditions.

A certified arborist performed a tree inventory, recording diameter breast height (DBH) as well as estimated dripline and tree condition. The tree inventory is shown in the 90% design plans.

Figure 9 – Locations of Borings Performed in Spring of 2024

FOAC has been measuring water levels in Alley and Alder Springs and in Arboretum Creeks since November 2021. The Arboretum Creek monitoring location is at the Wilcox Bridge closer to the mouth of Arboretum Creek. Figures 10, 11, and 12 show this data as compared to precipitation data at the SeaTac airport precipitation gage. Alley Springs does appear to have a modest, delayed response to wet weather. The delay in response is likely due to Alley Springs emerging as a spring, with groundwater levels rising as a result of that wet weather. Alder Springs also has a modest response to wet weather, though the response is more immediate than in Alley Springs. Arboretum Creek has a larger and more immediate wet-weather response, as is expected in a larger lowland creek. The Pacific Connections Springs have not been monitored.

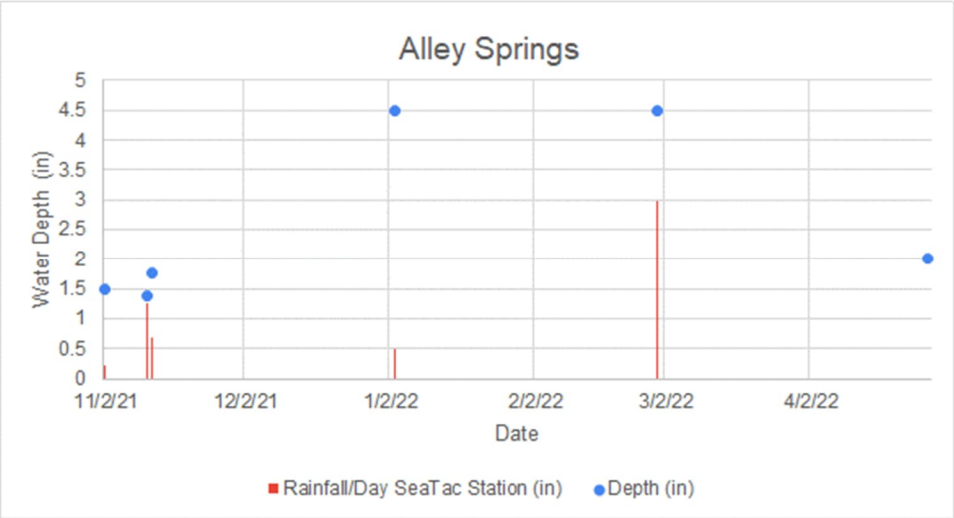


Figure 10 – Alley Springs Water Level Monitoring as Compared to Precipitation

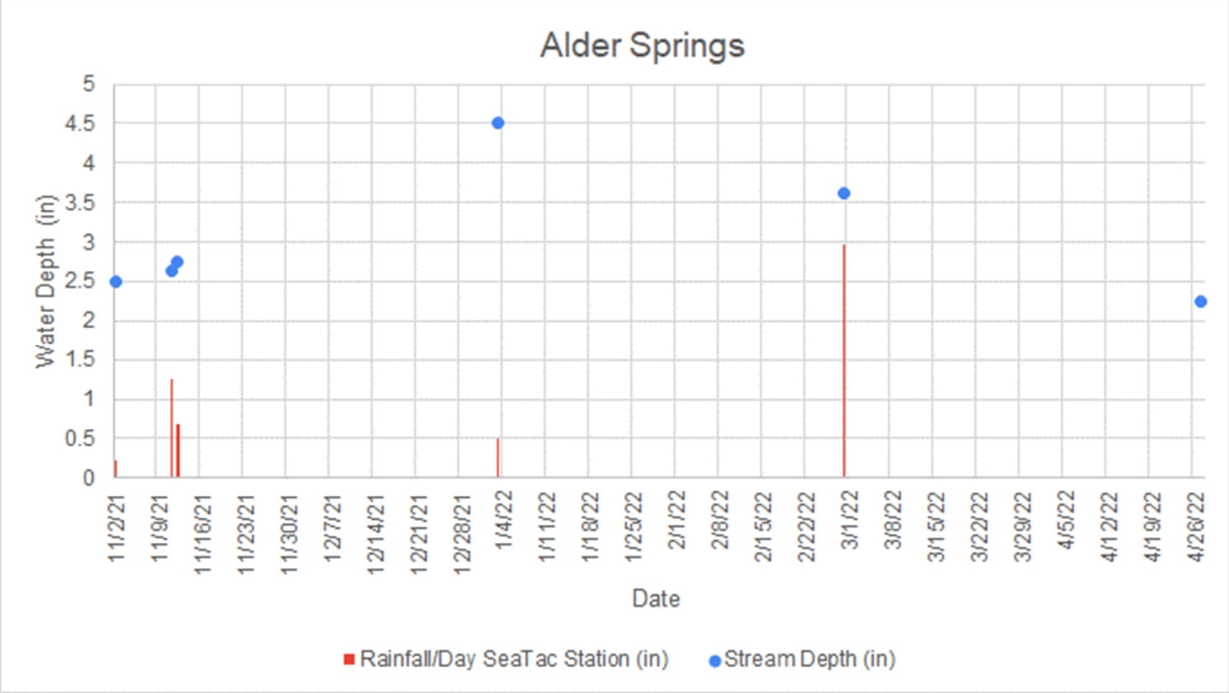


Figure 11 – Alder Springs Water Level Monitoring as Compared to Precipitation

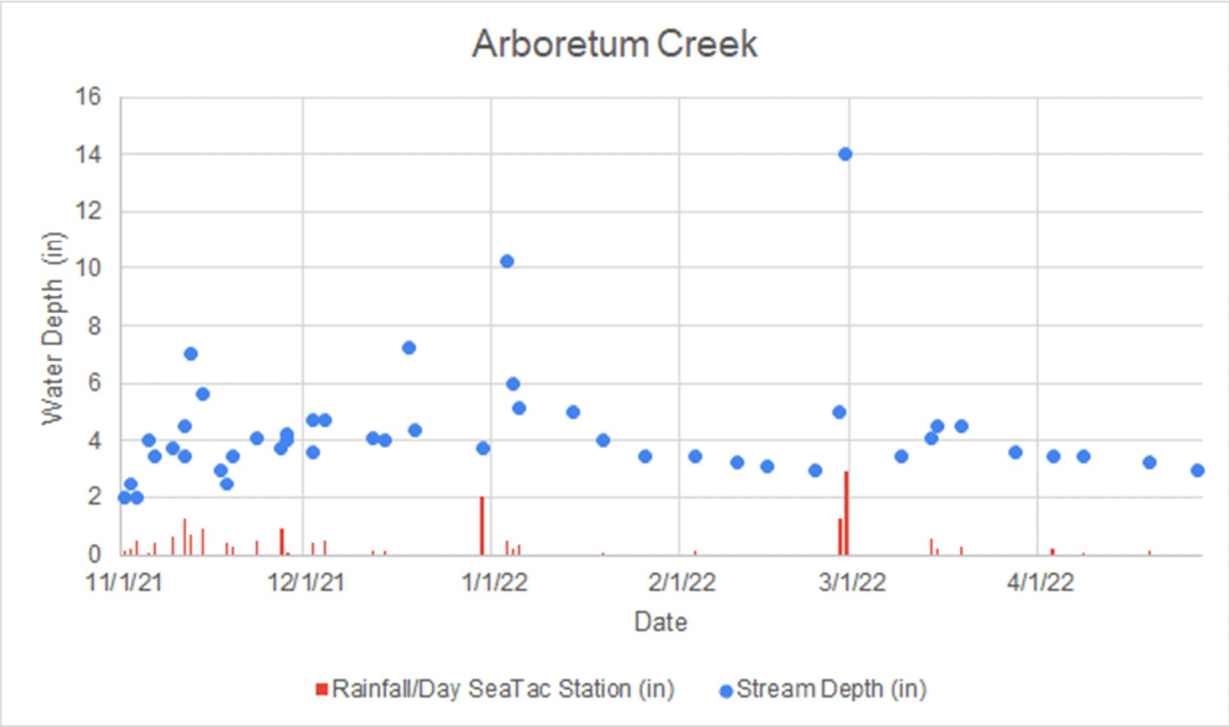


Figure 12 – Arboretum Creek Water Level Monitoring as Compared to Precipitation

There are limitations of this data, such as not having stage-discharge curves to calculate the flow, and equipment challenges with monitoring water levels with such small depths, including the 28th Ave. seep. That said, these data do help characterize the wet-weather response of Alder and Alley Springs and Arboretum Creek that will help in design development.

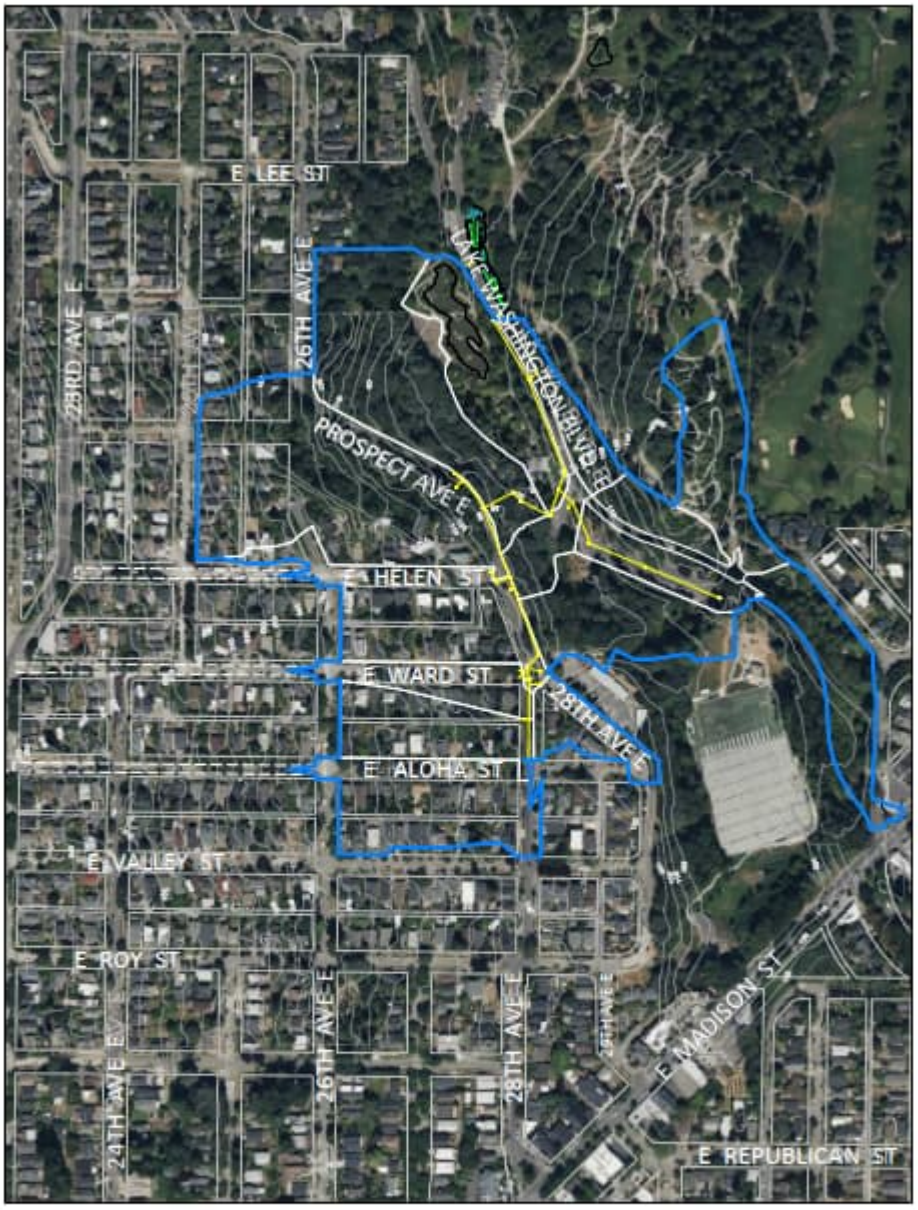
4. Minimum Requirement / Core Element Analysis

Since the project is located in the City of Seattle (COS) it is subject to the COS Stormwater Manual. Table 1 below summarizes the areas disturbed by the project and the areas tributary to the proposed water quality facility.

Table 1: Project Area Summary

New hard (impervious) surface (Ac)	0.01
Replaced hard (impervious) surface (Ac)	0.30
Total land disturbed (Ac)	0.75
Tributary Existing hard (impervious) surface (Ac)	14.06
Tributary Pollution Generating Impervious Surface (Ac)	5.78
Tributary Effective hard (impervious) surface (Ac)	6.45
Tributary Effective pervious area (Ac)	33.05
Total Tributary Area (Ac)	39.50

Since all of the new and replaced hard surface in the project is for the installation of the stormwater improvements (Water Quality BMPs and the conveyance system that will direct runoff to them) that will be funded by the grant or loan they are not included in the project level threshold calculation. Therefore, the project is a retrofit since it does not exceed any of the new/redevelopment thresholds.



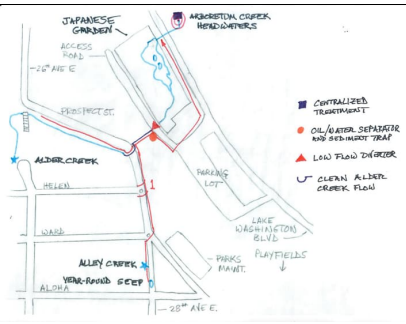
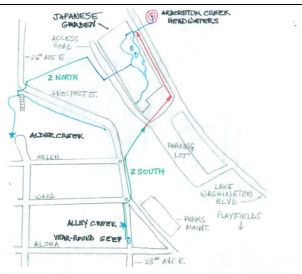
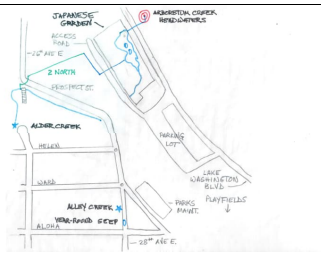
PROPOSED STORM DRAIN SYSTEM
PROJECT TRIBUTARY AREAS (DURING WQ DESIGN STORM)
ADD. TRIB. AREA (LIKELY BYPASSES EX INLETS DURING CONVEYANCE DESIGN STORM)

ARBORETUM CREEK HEADWATERS PROJECT
TRIBUTARY AREA MAP

5. Alternatives Considered

Several alternatives were considered to meet the project objectives of re-connecting hillside springs to Arboretum Creek and providing water quality treatment (Table 2). All were evaluated against potential environmental and/or cultural resource impacts including impacts to trees, wetlands, and public recreation areas. Since the project location is within the Washington Park Arboretum, impacts to the Japanese Gardens and to the University of Washington Botanical Gardens' collections (of trees). These are discussed here in this Section. Ultimately, Alternative 1 provided the maximum value in terms of meeting project objectives of restoring baseflow and providing water quality with minimal and mitigatable impacts.

Table 2: Alternatives Considered

Alternative Number	Flow path	Water Quality Treatment	Sketch
1	Conveyance of Alley Springs north along 28th to join up with Alder Springs; combined flows piped south around Japanese Garden and across Lake Washington Blvd to headwaters of Arboretum Creek	Centralized treatment at headwaters	
2	Conveyance of Alley Springs north along 28th then downhill then flow south around Japanese Gardens to headwaters of Arboretum Creek; Alder Springs conveyed downhill to Japanese Gardens	Centralized treatment at headwaters	
3	Conveyance of Alder Springs downhill to Japanese Gardens; no action on Alley Creek	Centralized treatment at headwaters	

6. Design Analysis

The 90% design includes the conveyance of Alley and Alder Springs (and the 28th Ave E. seep) into the Washington Park Arboretum and the collection and conveyance of the Pacific Connections Springs and stormwater from the parking lot near the Japanese Gardens and also Lake Washington Boulevard. These flows then enter a pre-settling pipe (to provide pretreatment) then flow into a subsurface gravel wetland (referred to in this Design Report as the 'stormwater garden') where water quality treatment is provided. The effluent from the Japanese Garden Ponds ('koi ponds') enters the subsurface gravel wetland at cell #3 (see Figure 13) without receiving pretreatment. The subsurface gravel wetland then discharges via groundwater/ hyporheic flow to a restored Arboretum Creek. An additional design element that is now possible with the subsurface gravel wetland is the added benefit of extending Arboretum Creek along and on top of the subsurface gravel wetland. This adds approximately 200 feet of creek to Arboretum Creek, with the new headwaters at the new discharge point at the end of the new stormwater conveyance line to the facility.

6.1. Alley, Alder, and Pacific Connections Springs Conveyance

Pipe sizes were selected in order to convey the 25-yr peak flow (plus the dry weather flow from the springs) at the pipe slopes that were feasible based on the site grades. The 25-yr peak flows were determined by modeling the tributary area in MGSFlood. Table 3 summarizes the peak flows used in the sizing calculation and shows the minimum slope required at the selected pipe size in order for pipe capacity to exceed the design flow. (See Attachment C for a summary of these modeled basins and modeling results.) Note that the conveyance swale planned for the west side of 28th Street was included in this sizing calculation.

Alley Springs and the 28th Ave E seep are conveyed in a new 12"/18" pipe along 28th Ave E. (New inlets intended to capture more stormwater and prevent roadway flooding are planned at E Helen Street, with additional analyses continuing during 100% design prep to maximize the flow that enters the system to reduce localized flooding risk both in the ROW and also proximate to the Japanese Gardens.)

An 18" pipe conveys Alley Springs and also additional inlets towards Prospect. Flow from Alder and Alley Springs comes together at this point along Prospect Street. An 18" diameter pipe conveys flows down the hill from Prospect Street. Then, an 18" pipe conveys the flow from there to the pre-settling structure. The pre-settling structure is made up of two maintenance holes with a large 48" diameter pre-settling pipe and is located under the parking lot of the Japanese Gardens. The pre-settling structure provides for the removal of larger trash, floatables, and solids to not send these items to the subsurface gravel wetland. After pre-settling, flow continues in a 24" pipe following Lake Washington boulevard under the sidewalk, while receiving flow from the street through inlets, and then crosses at a minimum depth of 1-foot of cover under Lake Washington Boulevard into the subsurface gravel wetland. A 24" pipe is of a sufficient size to convey all of the flows towards the subsurface gravel wetland. The 90% design calls for a flow splitter for the largest flows to be directed into the King County combined sewer. However, the design team (in coordination with King County WTD, SPU, and SPR) are considering re-thinking this approach and instead sending the highest flows to Arboretum Creek via a bypass (around the stormwater garden) rather than to the combined sewer. Further coordination will be held during 100% design preparation.

A conveyance swale is planned for 28th Ave E near Alley Springs. The purpose of the conveyance swale is to address localized ponded water that accumulates on the pavement even during dry weather. The

conveyance swale will capture that water, thereby contributing more baseflow to Arboretum Creek. The proposed swale will flow north along the west side of 28th Ave E. Beginning at the NW corner of 28th Ave E and E Aloha St, the conveyance swale will pick up flow from the intersection as well as the flow from Alley Creek. The conveyance swale will terminate into a catch basin before the corner of 28th and E Ward St which will tee into the new proposed storm drain. The conveyance swale will fit in between the existing sidewalk and roadway.

Table 3: Conveyance Calculations

MH	Pipe Diameter (in)	Min Slope (%)	Capacity (cfs)	25-Year Peak Flow (cfs)
MH-14	12	1.5	4.631	4.249
MH-13	18	1	10.5033	6.081
MH-10	18	1	10.5033	8.882
MH-9	18	1.3	11.9756	11.694
MH-5	24	0.5	15.9949	14.556
MH-4	24	0.5	15.9949	14.898
MH 9-B	12	1	3.5625	2.91
MH-17	12	1	3.5625	1.381
MH-16	12	1	3.5625	2.393

6.2. PreTreatment

The 90% design shows the use of a pre-settling pipe to provide pretreatment, removing trash and floatables from the flows ahead of the flows reaching the treatment cells of the stormwater garden. This pretreatment will remove a certain percentage of the Total Suspended Solids (TSS) and will also protect the treatment cells by removing sediment from the flows. The 90% design plans which show the more-settling pipe located within the parking lot of the Japanese Gardens. This pre-settling pipe is designed for removal of a typical 80-micron particle by settling during the residence time available for the water quality flow rate.

6.3. Stormwater Garden and Arboretum Creek Headwaters

6.3.1. Treatment Design Criteria

Stormwater that is currently partially discharged to a combined sewer and partially surface flow that enters Arboretum creek will be diverted to the subsurface gravel wetland, that has been designed with an Enhanced Wetland Treatment Process (EWTP). The EWTP will improve water quality in Arboretum creek, reduce flows that could contribute to CSO events in the combined sewer, and provide a perennial base flow in Arboretum Creek. The goal of the EWTP is to treat the maximum amount of base flow coming from Alley and Alder Springs during dry weather, as those flows are still contaminated through stormwater contamination. The next desired flow to be treated by the facility is the 24-hour water quality storm from the contributing drainage basins (6.5 acres EIA). To understand how the EWTP will function during peak storm events, the peak storm event for this project is classified as twice the volume of the 24-hour water quality storm, as opposed to a 100-year storm. The main target pollutants to be treated by the EWTP are Total Suspended Solids (TSS), total copper, total zinc, total phosphorus (P), Nitrate-Nitrogen, Ammonia (N), fecal coliform bacteria, oil and grease, and temperature.

Flows from Alley and Alder Springs were determined by field observation and collection by FOAC from the spring sources during dry weather, which results in a total of 0.039 million gallons per day (MGD). The

stormwater flows were calculated using the 2012 Western Washington Hydrological Model (WWHM), with the dry weather flows from the springs added on top. The stormwater flows from the WWHM are based on the required 24-hour water quality treatment volume, which is derived from the 2021 City of Seattle's Stormwater Manual (SSWM) 22.805.090 Minimum Requirements for Treatment and requires 91% of the total runoff volume for the 2-year 24-hour storm to be treated. Based on the treatment mechanics of the subsurface gravel wetland, the treatment performance is based on a wastewater calculation model, as opposed to traditional stormwater treatment calculations using WWHM or similar model. The flows from WWHM and data collection were put into the treatment model in terms of MGD as treatment is based on a residence time through each media cell as described in section 5.2.2 of this report. The design flows used for each model scenario are shown in Table 4 and Table 5 shows the expected concentration loading range of each target pollutant (based on values from the literature). (Note that 6-ppd quinone will be included in the list of pollutants evaluated during future design phases.)

The treatment flow rate (See Table 4) of 2.83 cfs is significantly lower than the peak flow rate (See Table 3) of 14.9 cfs. Currently, this 90% design does not have a flow splitter to bypass larger peak flows directly to Arboretum Creek without going through the water quality treatment cells. The design of the stormwater garden is such that forces those largest flows up to the surface into a formed stream channel on top of the treatment cells. To the observer, these flows will appear as a creek running through the stormwater garden. This provides a bypass of these largest flows without having to install a flow splitter, using green approaches instead of grey approaches to achieve the same desired outcome.

We understand that this BMP is a proven treatment for wastewater but not for stormwater and therefore the BMP's ability to treat stormwater will need to be evaluated. Limited performance data exists for this BMP type for stormwater. See Attachment D for data sources we have identified.

Table 4: Design Flows to the Stormwater Garden

Source of Flow	Description (and Area, if applicable, in acres)	Mechanism of conveyance towards stormwater garden	Dry Weather Flow (MGD)	WQ Flow Rate (MGD)	Peak Flow Rate (MGD)
Alder Springs	baseflow; fluctuation observed with wet weather	via conveyance pipe around Japanese Gardens then crosses Lake Washington Blvd. in new culvert	0.0274	0.03	0.035
Alley Springs	baseflow; fluctuation observed with wet weather	via conveyance pipe around Japanese Gardens then crosses Lake Washington Blvd. in new culvert	0.0115	0.015	0.02
Pacific Connections Springs	Baseflow; unknown if fluctuation occurs with wet weather	Via conveyance pipe around Japanese Gardens then crosses Lake Washington Blvd. in new culvert	0.01	0.010	0.01
28th Ave E Seep	Baseflow; anecdotally, assumed increased with wet weather	via conveyance pipe around Japanese Gardens then crosses Lake Washington Blvd. in new culvert	0.005	0.008	0.010
Stormwater Runoff - Upland residential area	land use is single family residential (3.91 acres EIA)	via conveyance pipe around Japanese Gardens	0.000	0.22	1.02

Stormwater Runoff – Paved Trails, Parking Lot and Lake Washington Blvd.	Parking lot and paved trails (1.34 acres EIA) and Lake Washington Blvd (1.19 acres EIA)	via conveyance pipe around Japanese Gardens (1.75 prior to pre-settling and 0.25 acres downstream of pre-settling)	0.000	0.12	0.58
Japanese Garden ponds	no effluent during dry months; approximately 25-50 koi (area 0.46 acres)	via new culvert under Lake Washington Blvd	0.000	0.04	0.17
Totals	**6.91 acres EIA**	-	**0.04**	**0.43**	**1.83**

Table 5: Estimated Pollutant Concentrations* for each source of flow to the Stormwater Garden

Drainage Basin	TSS (mg/L)	total copper (ug/L)	total zinc (ug/L)	Total P (ug/L)	Nitrogen (mg/L)	fecal coliform bacteria (cfu/100ml)	Oil and Grease (mg/L)
Alder Springs	130[1] 15-23[9]	0[3]	0[3]	0[4] 60-91[9]	9.5 (nitrate-N)[5] 1.9-2.6 (nitrate-N)[9]	0[6] 4-8[9]	0[7,8] 6.5[9]
Alley Springs	130[1] 4-5[9]	0[3]	0[3]	0[4] 85-119[9]	9.5 (nitrate-N)[5] 2.2-2.5 (nitrate-N)[9]	0[6] 26-410[9]	0[7,8] 3.2[9]
28th Ave E Seep	130[1]	0[3]	0[3]	0[4]	9.5 (nitrate-N)[5]	0[6]	0[7,8]
Stormwater Runoff - Upland residential area	93.12[2]	9.0-19.0[2]	47-129[2]	97-343[2]	0.083-0.151 (Ammonia N)[2]	1184-30106[2]	2.27-5.89[2]
Stormwater Runoff - Parking Lot	106.28[2]	21-44[2]	124-204[2]	93-330[2]	0.127-0.311 (Ammonia N)[2]	4068-32323[2]	2.87-9.50[2]
Stormwater Runoff - Lake Washington Blvd.	106.28[2]	21-44[2]	124-204[2]	93-330[2]	0.127-0.311 (Ammonia N)[2]	4068-32323[2]	2.87-9.50[2] 1.8-2.5[9]
Japanese Garden ponds	100.0[10] 37[9]	20[10]	70[10]	0.2[10] 0.2[9]	10[10] 3.1[9]	2500[10] 17[9]	1.5[10] 3.3[9]

*Estimated based on these information sources:

1. https://pubs.usgs.gov/wri/1996/4312/report.pdf
2. https://www.seattle.gov/Documents/Departments/SPU/Documents/AppendicesofItegratedPlan.pdf, Table 3-7,pg 3-14
3. https://www.pca.state.mn.us/sites/default/files/copper7.pdf
4. https://pubs.usgs.gov/fs/2012/3004/#:~:text=Phosphorus%20is%20largely%20retained%20in,or%20downward%20to%20an%20aquifer.
5. https://www.sciencedirect.com/science/article/pii/S0048969721047070
6. https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-wells/coliform020715_fin2.pdf
7. https://files.dep.state.pa.us/environmentalcleanupbrownfields/LandRecyclingProgram/LandRecyclingProgramPortalFiles/CSSAB/2004/fprg_chap3.pdf
8. https://pubs.usgs.gov/sir/2005/5104/PDF/SIR20055104.pdf
9. FOAC local data 2018-2020; Technical Memoranda #2-#4 (available from FOAC: galvind53@gmail.com)
10. From database maintained internal to Jacobs Engineering, for use in evaluating the water quality treatment effectiveness of subsurface gravel wetlands (unpublished)

6.3.2. Function (How it WORKS)

See Attachment A for a summary of the results of the water quality benefit calculation.

The EWTP consists of four (4) treatment cells in series and an extension of Arboretum Creek alongside and over the cells. Treated water will discharge to Arboretum Creek both by surface discharge and hyporheic discharge as springs and seeps. The EWTP design includes features to increase groundwater discharge to Arboretum Creek within the footprint of the new creek extension and into the existing creek bed downstream of the new construction.

As shown in Figure 13, Cell 1 has a primary focus of coarse filtration, settling, and absorption of oil and grease and organic compounds that can bond to available carbon in a wood chip media. Cell 1 provides a peaking buffer to damping stormwater surges and will distribute flow uniformly throughout the depth of the treatment media. Cell 1 will have an aerobic component that supports bacteria to convert ammonia nitrogen to nitrate and nitrite nitrogen.

Cell 2 and Cell 3 are anaerobic biochemical reactors with an organic media blend designed to absorb metals, and support growth of bacteria that convert nitrate and nitrite nitrogen to nitrogen gas which will vent to the atmosphere. A gravel berm separates Cells 2 and 3 and has a membrane liner on the upstream face to force water to well up and over the berm.

The sub-surface water elevation in Cells 1 and 2 is at elevation 62.5 and in Cells 3 and 4 the water surface elevation is at 60.5, with the assumption that existing groundwater is at elevation 56.0 (based on the geotechnical exploration). An additional flow stream enters cell 3 from the overflow of the Japanese garden Koi pond in a pipe with invert elevation 60.7 feet. Note that this current design does not provide pretreatment to the water entering cell #3 from the koi pond. Assessment of the need and benefits of an additional pretreatment BMP there on the koi pond effluent will occur during preparation of the 100% design of this project. The design team has designed both Cells 3 and 4 to address the pollutants we would anticipate encountering coming in from the koi ponds, which means that target pollutant removal is addressed in those flows even though those flows from the koi ponds don't go through cells 1 and 2.

Cell 4 is a subsurface horizontal flow treatment cell with gravel media to remove biomass from bacteria living and consuming or converting nutrients in the upstream cells. Cell 4 will infiltrate treated water through hyporheic flow into groundwater and into the new extension of Arboretum Creek. Cell 4 will also have surface water discharge of treated water into the extension of Arboretum Creek during high flow events.

The surface of the 4 treatment cells will be planted with wetland plants and trees that can survive with their roots in saturated soil conditions. The EWTP surface area is essentially a hydroponic garden with water flowing through a non-soil subsurface media. A layer of dry wood chips and gravel will be placed above the water surface elevation in each cell and will have a variable depth above water level to create a variable unsaturated root zone for the target plant species. Several areas will have depressions in the treatment media that are below the water surface elevation to create small open water areas with emergent wetland vegetation. Plant roots are part of the treatment process since they feed and harbor bacteria, fungi, and micro-organism that increase treatment capacity. Plants also remove nutrients from the water that flows through their root zone.

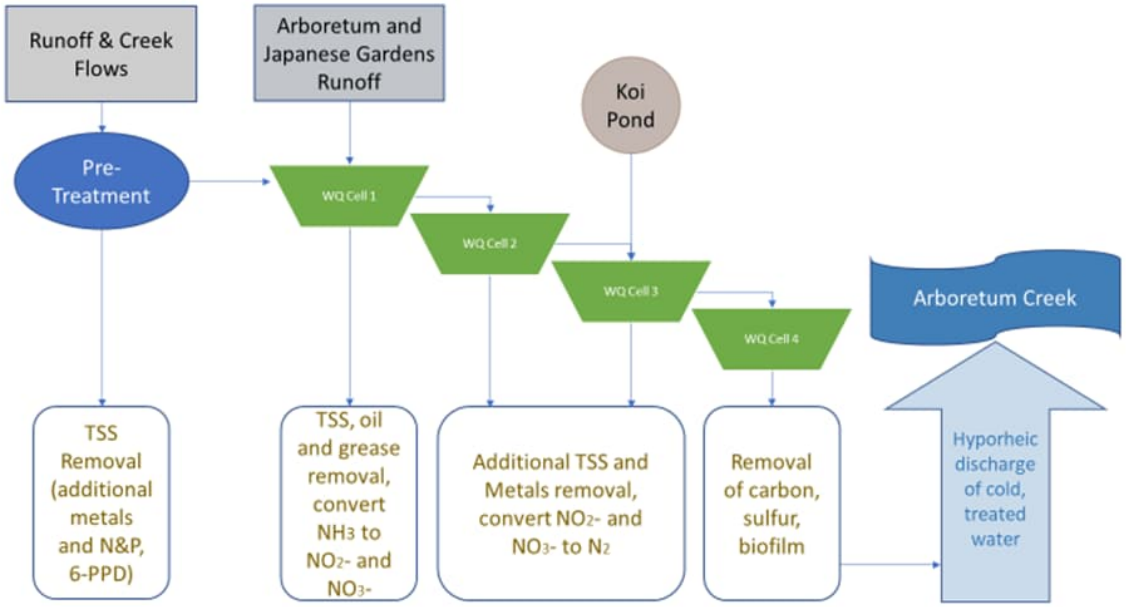


Figure 13 – The 'Treatment Train' providing Water Quality Treatment in the Stormwater Garden

Pretreatment and Cell 1

A water quality treatment (also known as 'pretreatment') maintenance hole structure ('pre-settling pipe') with oil water separator, trash screening, and heavy sediment settling capabilities will be located in the Japanese gardens parking lot near the location where the stormwater will be diverted from the combined sewer to the EWTP. (See Attachment B for specifics of this pretreatment BMP.)

A new 24" diameter ductile iron pipe cross under Lake Washington Boulevard to discharge at invert elevation 62.7' into an open water pool. The water surface level of the splash pool will be 62.5'.

Storm water that flows down Lake Washington Boulevard will enter a new stormwater inlet structure at the north curb near the splash pool and will be piped to the splash pool at the same location. A pile of 12" minus riprap at the end of both pipes will be placed so that it covers the pipes from view and creates an aeration splash feature.

Cell 1 of the EWTP contains the splash pool at the southern end and screened 1/2" to 2" average diameter wood chips that are screened to remove sawdust and fines. cell has a sloped bottom that starts at elevation 61.0' and slopes down to elevation 57' which is a minimum of 1' above the assumed regional groundwater elevation of 56'. This cell with course wood chips will absorb oil and grease, settle out heavy solids, and screen out debris that could lead to partial plugging the finer organic media used for treatment in Cells 2 and 3. The aerobic portion of Cell 1 will convert ammonia to nitrate and nitrite through nitrification mediated by bacteria.

Cell 1 will dampen peak flows and help convey the stormwater to a depth that causes it to be uniformly distributed throughout the media in downstream cells. The soil in the excavation area has a high clay content, as indicated by nearby borings, and will have a relatively low rate of transmissivity. Cell 1 is not intended to discharge to groundwater. The new extension of Arboretum Creek will extend across Cell 1 all the way to the open water splash pool. The invert of the creek extension will be above the normal water

level in the treatment cells so the creek bed will be dry in all but peak storm events when the creek extension will flow full length to help divert peak event flows around the subsurface gravel wetland. High flow bypass should only occur for brief periods during the peak runoff of one or two largest storms per year.

It is anticipated that Cell 1 will remove 6-ppd quinone from the flow through the facility via removal of TSS. The next phase of this project will include an analyses based on available literature.

Cell 2 and Cell 3 Biochemical Reactors

After passing through pretreatment and Cell 1, the storm water flows underground to Cell 2 of the wetlands system. Cell 2 consists of a subsurface flow-based, anaerobic biochemical reactor (BCR) to remove nitrogen via denitrification.

Wetland Cell 2 has a water surface elevation of 62.5. The water surface steps down in elevation through the process train with gravity flow between Cells 2 and 3. The berm that separates Cells 2 and 3 is designed with crushed ¾" gravel and a membrane liner over the upstream face. The top edge of the liner is at elevation 62.5 so that water from Cell 2 will spill over the top of the lined face of the berm and cascade through the gravel berm material down to elevation 60.5'. The cascading will occur over the full width of the berm at the level top edge of the liner which acts as a "long crested weir" approximately 30 feet long. The thin film of water spilling over the berm will entrain air in the cascade as water trickles in a thin film over the 2-foot depth by approximately 30 wide section of wet, but not saturated, gravel. This aeration zone will convert remaining ammonia to nitrate and nitrite. Nitrite and nitrate produced in Cell 2 will be removed through coupled nitrification and denitrification in the biologically active media in the berm and Cell 3.

Cell 2 has a sloped bottom from elevation 57' to elevation 53' so part of the cell bottom is below the regional groundwater elevation. Cell 2 will have some interaction with groundwater and will provide an increased head on the groundwater surface that will prevent groundwater from entering the cell and will cause some treated stormwater from the downstream end of Cell 2 to discharge into groundwater that will surface in Arboretum Creek immediately downstream of the EWTP. Cell 3 has a bottom elevation of 53' and will also contribute flow of treated stormwater to groundwater that will surface again in seeps and springs in Arboretum Creek.

Water from Cell 2 treatment media is collected from the width of the bottom and side slopes in infiltrators, slotted stormwater drainage arches that form a void or drainage conveyance channel on the wetland cell bottom liner. A similar infiltrator drainage channel is located in the upstream edge of Cell 3 at the base of the gravel berm to help distribute flow from Cell 2 uniformly throughout the media of Cell 3. The resistance to flow through the media will cause it to naturally seek the path of least resistance. The mass of media and labyrinth of micro-pore passageways through it ensures a relatively uniform plug flow throughout the media as long as surface flooding is prevented.

Cell 2 and Cell 3 are anaerobic BCR cells consisting of a media of saturated organic matter (65 percent wood chips, 10 percent grass hay, and 25 percent sawdust) The nearly constant year-round level of natural heat in the groundwater, soil, and below ground media will be conserved with the dry insulation layer of wood chips and organic media above the water surface to reduce the potential for freezing in winter and to increase temperature sensitive biological activity throughout the wetlands. As water moves through the wetland media, it will lose heat in summer and gain heat in the winter.

Cell 2 and Cell 3 will provide passive biological pH reduction; sorption of metals to organic surfaces; and anaerobic degradation. Oxidized nitrogen (i.e., NO_2-N, NO_3-N) will be removed through biological denitrification to innocuous nitrogen gas. Incidental removal of organic compounds is anticipated through physical adsorption to organic matter surfaces.

Cell 4 Vegetated Subsurface Flow Wetland

Cell 4 is a vegetated, subsurface flow wetland for polishing with horizontal flow in gravel media that improves removal of nitrogen. Excess carbon, oxygen-demanding substances (e.g., biochemical oxygen demand [BOD] and chemical oxygen demand [COD]), and any sulfur or biofilm produced from Cells 2 and 3 will be subject to biological degradation and passive oxidation. The surface of the wetland will be planted with trees and wetland plants so roots can extend almost completely through the rock media. Plants will add organic detritus to the wetland surface and to the pore spaces in the media. Plants will remove nutrients from the water for growth. Water passes through the gravel root zone in Cell 4 and then flows by gravity through a hyporheic transition zone to allow continuous flow to Arboretum Creek.

Cell 4 Hyporheic Discharge and Surface Discharge to Arboretum Creek

Cell 4 treated water will discharge to Arboretum Creek by both hyporheic flow and surface flow. During dry weather it is anticipated that all treated water will discharge to Arboretum Creek by hyporheic flow. Cell 4 has a bottom elevation of 53′ and will contribute flow of treated stormwater to groundwater that will surface again in seeps and springs in Arboretum Creek which has an invert elevation of 56′ just downstream of the EWTP.

The extension of Arboretum Creek rises in elevation as it passes beside Cell 4 but the creek extension invert is below the water level in Cells 3 and 4. The berm that separates the creek extension and the treatment cells will include native clay soil but will be modified with addition of sandy loam soil to have a higher permeability. The permeability can be engineered to allow a desired rate of discharge through the soil berm into the creek extension channel.

It is currently envisioned that all dry weather flow will discharge through the bottom of the treatment cells into groundwater and surface in existing natural springs and seeps in the existing channel of the creek immediately downstream of the EWTP. The creek extension is anticipated to capture hyporheic flow of about 10% to 20% of the additional flow above dry weather flow that occurs during average wet weather. All flow above this rate would discharge by surface flow into the creek extension from a depressed section of the perimeter of Cell 4 in the NW corner adjacent to the creek extension which will serve as an overflow spillway.

An infiltrator drainage channel is located in the bottom of Cell 4 at the base of the terminal berm to help collect flow from near the bottom and bring it to near the top of the cell for surface discharge. The upper ends of the infiltrator system will be 2 feet below the top of the gravel media. The depressed area at the overflow spillway would have an invert of 60.5′ so that as the flow into the treatment cells increases and hyporheic capacity is exceeded, the water level in Cells 3 and 4 would rise until it overflows this outlet spillway section and flows into the creek extension. The channel from the overflow spillway to the invert of the creek extension will be lined with a geotextile to prevent erosion and will be covered in 12″ minus angular riprap to create an aeration cascade.

The extension of Arboretum Creek beside and downstream of Cell 4 has an invert that slopes at about 6% to create a rapid flow section that will also be lined with riprap to aerate the water before it enters the natural channel of Arboretum Creek. The target DO for surface discharge water is 6 mg/L.

6.3.3. Form (How it LOOKS)

Figure 14 shows a rendering of what the Arboretum Creek Headwaters and subsurface gravel wetland will look like once constructed. Figure 15 shows the proposed planting zones, with a detailed planting plan still in development (in coordination with the University of Washington Botanical Gardens and also SPR). Generally, each cell will have a zone of plantings suitable to the subsurface material, when topped with soil for plantings. As presented to SPR Proview on 6/14/22, this planting plan is a place to begin a more detailed study and collaborative design process on how this facility will look and what plants will be planted at the site.

Some trees will be removed to construct the facility (see plans), however, new trees such as different willow varieties that are more suitable for wet root conditions will be planted. The existing Azalea bushes could be salvaged and replanted in support of the historical Azalea Way.

Figure 14 – Visualization of Proposed Arboretum Creek Headwaters and the Water Quality Treatment within the Stormwater Garden

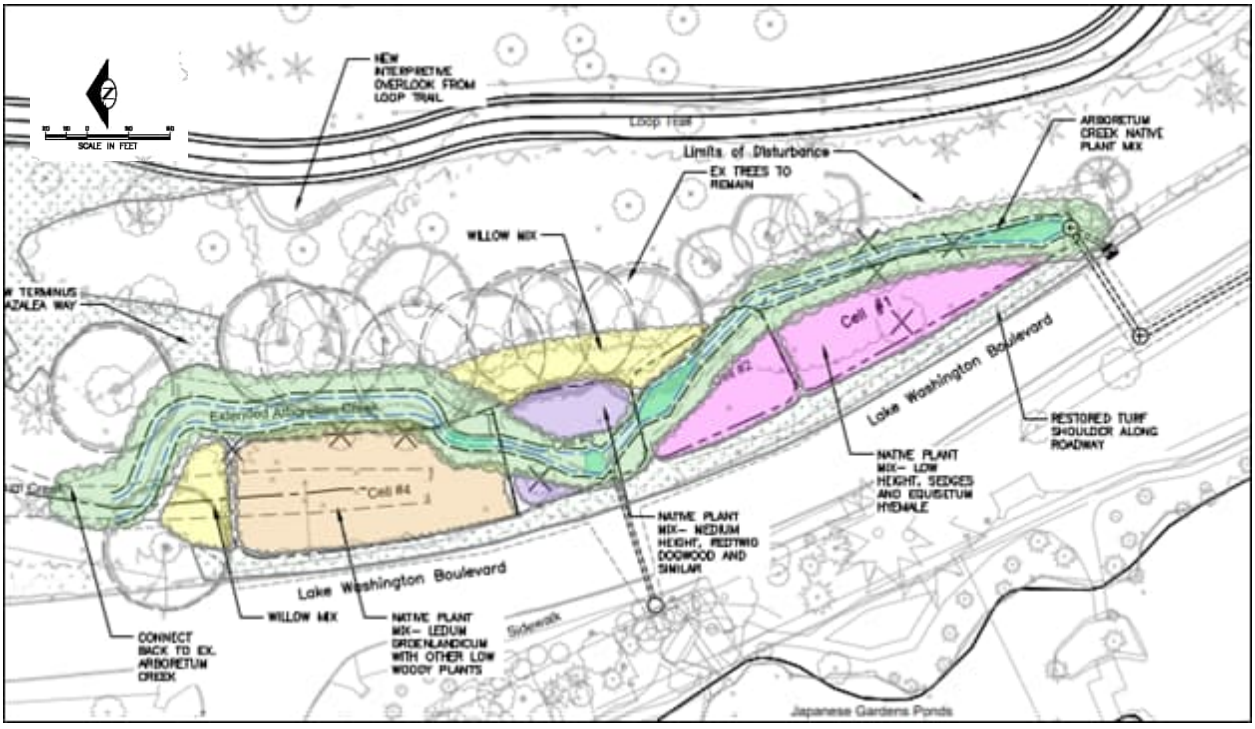


Figure 15 – Proposed Planting Plan for the Arboretum Creek Headwaters and Subsurface Gravel Wetland

6.3.4. Maintenance Requirements

The below-ground four-cell enhanced passive wetland process requires little maintenance. The operating water level in each cell is fixed to get the greatest hydraulic retention time (HRT) in the space available. A sample can be collected from the discharge weir structure and at the outlet end of each cell to track the cell's treatment performance.

Vegetation management will include removal of invasive plants and replanting as necessary throughout the year to maintain good plant density. The wetland bottom infiltrators have cleanouts that allow jet rodding if reduced flows indicate partial plugging. The organic media and woodchips will decay very slowly in the saturated conditions similar to what exists in peat bogs. The dry organic matter above the water level in each cell will decay more rapidly. If the finish elevation of the surface changes to a point that additional open water areas are visible additional organic media should be added.

It is anticipated that approximately 4-6" of additional arborist wood chips will be needed every 2 years. These would be placed on top of the facility with no excavation required. The submerged organic media should not have to be replaced in the future so long as the pre-treatment elements are in use and effective. (Estimated costs of maintenance are shown later in this report in the section on cost. Note that the Jacobs team recommends an additional 1.0 FTE for vegetation maintenance to both care for this facility and also address the staffing shortages in this location.) Soil and debris should not be placed over the organic or gravel media unless the media is separated from the soil by a membrane layer to prevent soil from filling the void spaces in the media and reducing flow capacity.

6.4. New Drainage and Water Quality Assets

As this project developed, several new drainage and water quality assets will be added to SPR property and the public ROW. This primarily includes drainage conveyance pipes and structures and the stormwater garden treatment cells. As the progress progresses, property owners (SPR and the City of Seattle ROW) are discussing maintenance requirements and responsibilities. These discussions will inform decision making and agreements about ownership and maintenance responsibilities of these new assets.

6.5. Permitting Needs

Attachment E identifies the specific permits and regulatory processes identified as required for this project at the federal, state, and local levels based on the current (90%) design. The current project schedule assumes receipt of permits within 12 months of permit application submittal (projected to be late fall of 2025, with receipt of permits in late fall of 2026). There is some uncertainty as to how long permits will take, but we think 12 months is a reasonable estimate based on experience on other projects with similar permit requirements. Attachment E includes assumptions on duration and timeline for each applicable permitting process and entity.

7. Water Quality Benefit Characterization

The anticipated benefits provided by this project include providing stormwater treatment, re-connecting natural springs to Arboretum Creek to provide year-round baseflow, reduce temperatures in the receiving waters, treatment of Japanese Garden koi pond outflow, reduction in Combined Sewer Overflows (CSOs), and less flow volume to the King County combined sewers. This project is re-connecting springs that historically drained to Arboretum Creek and currently drain to the combined sewer system. This project reconnects natural hillside springs with Arboretum Creek, providing year-round baseflow. The subsurface gravel wetland provides water quality treatment and at the same time keeps waters cool by keeping the water subsurface. A flow control ratio was not calculated since the re-routing of these flows provides flow control to the combined sewer system and restores the natural hydrology of Arboretum Creek.

The BMP proposed for water quality treatment is a subsurface gravel wetland. This BMP is effective at providing treatment with baseflow present (without warming the runoff). Discharge to Arboretum Creek will be via hyporheic discharge, which is anticipated to provide additional treatment effectiveness. This BMP looks natural at the surface, which is key for implementation in the middle of the Washington Park Arboretum. The subsurface gravel wetland and the hyporheic zone together are referred to as a, 'stormwater garden' by the project team, with stormwater park another term that can be used to describe the project once constructed.

SPR, FOAC, and Jacobs recognize that this subsurface gravel wetland BMP is not currently approved by Ecology and therefore will require extra effort to demonstrate water quality treatment effectiveness specific to stormwater. Limited performance data exists for this BMP type for stormwater. See Attachment D for data sources we have identified. We anticipate needing to proceed through the TAPE process to evaluate effectiveness of this BMP and look forward to sharing this data as part of the first step of that TAPE process.

The anticipated water quality benefits from the subsurface gravel wetland have been characterized using an MS Excel-based model developed by Jacobs that Jacobs has utilized in characterizing treatment effectiveness for numerous treatment wetlands across the Country. SPR, FOAC, and Jacobs anticipate post-construction monitoring will be required to demonstrate actual water quality treatment effectiveness. In addition, pre-construction monitoring of temperature could be helpful in assessing effectiveness post-construction, as the MS Excel-based model does not characterize benefits to temperature.

The project is a retrofit and therefore will be designed to maximize water quality and flow control benefits within the available space in the Washington Park Arboretum. SPR, FOAC, and Jacobs anticipate implementing a water quality monitoring program to demonstrate the effectiveness of a subsurface gravel wetland, with sampling, measurement, and laboratory analysis of multiple parameters. SPR, FOAC, and Jacobs anticipate collaborating with Ecology on the list of parameters to be measured. This list is likely to include: temperature, 6PPD-Q, nutrients, fecal coliform, E. Coli, petrochemicals, and dissolved metals.

This project is expected to contribute to CSO reduction efforts by King County for their Montlake CSO outfall location. Preliminary evaluation shows that this project, when implemented, may reduce the control volume required to control the CSO outfall at Montlake by 5%. Coordination is ongoing with King County Wastewater Treatment Division (WTD) to further characterize this benefit to inform WTD's next steps to control the CSO outfall at Montlake.

The water quality benefits from the subsurface gravel wetland have been estimated using an MS Excel-based model developed by Jacobs that Jacobs has utilized in characterizing treatment effectiveness for numerous treatment wetlands across the Country. See Table 7. Per those model results, the subsurface gravel wetland is close to meeting the City of Seattle target removal thresholds for TSS (of over 80% removal). However, the model shows that the target removal thresholds are not met for the water quality

storm. That said, the model does not consider the pre-treatment prior to the subsurface gravel wetland nor the treatment provided in the hyporheic discharge zone into Arboretum Creek. Therefore, the model is conservative, and the project as a whole is likely to meet the TSS removal threshold for the water quality storm.

Benefits to temperature were not characterized in the MS-Excel based model. Keeping the flows subsurface until hyporheic discharge to Arboretum Creek will keep temperatures cooler as compared to a traditional open water facility.

The project design calls for hyporheic discharge of treated water. This design was prepared by Jacobs in collaboration with Katherine Lynch of Seattle Public Utilities (SPU) and Paul Bakke of The Science of Rivers, leveraging Katherine and Paul's experience on the Kingfisher site in the Thornton Creek basin in North Seattle, discussed here in this peer-reviewed paper: https://researchoutreach.org/articles/engineering-nature-innovative-streambed-restoration-seattle/

This project will also allow further research on the treatment potential of bioretention BMPs to remove 6PPD-Q particles from stormwater following the guidance provided by Ecology's report on Stormwater Treatment of Tire Contaminants. Stormwater retrofits that utilize a bioretention soil mix placed in an existing detention pond have demonstrated that 6PPD-Q adheres to organic particles or organic matter, thus remaining fixed in the media as stormwater filters through.

6PPD-Q is an emerging contaminant and there are still many unknowns about the measurement and methods of quantifying loads and removal of 6PPD- Q in the environment. Few studies have examined the fate and transport of 6PPD-Q under environmental conditions other than wet weather events. Existing research suggests that areas with high average daily traffic (ADT), numerous parking lots, stop signs, and traffic signals produce the most 6PPD-Q due to the correlation between tire degradation during stops, starts, turns, and slow speeds. These are characteristics shared by the project area.

Seattle Parks and Recreation (SPR) and Friends of Arboretum Creek (FOAC) will follow the best practices identified in the June 2022 report prepared for Ecology ("Stormwater Treatment of Tire Contaminants and BMP Effectiveness") compiling and synthesizing current knowledge of 6PPD and 6PPD-Q, including physicochemical properties, sources, and fate and transport within the built environment, as well as a sampling regime that captures different storm events and seasons. Based on the data presented, Lethal Concentration 50 (LC50) that is toxic to salmon = 0.1 ug/L. SPR and FOAC will coordinate with Ecology on the status of the 6PPD-Q test method(s), detection limits, and appropriate baseline to use to quantify benefits.

Table 7: EWTP Treatment Results for Target Pollutants for Each Flow Scenario

Flow Scenario	Dry Weather Flow (0.044 MGD)			Water Quality Storm (0.43 MGD)		
Facility Performance	Influent Con-centration	Percent Removal	Effluent Con-centration	Influent Con-centration	Percent Removal	Effluent Con-centration
TSS (mg/L)	130.0	96%	5.0	101.0	75%	24.8
total copper (ug/L)	0.0	n/a	0	25	18%	20
total zinc (ug/L)	0.0	n/a	0	134	17%	111
Total P (ug/L)	0.0	n/a	0	82	1.1%	81
Nitrate-Nitrogen (mg/L)	9.5	86%	1.3	2.62	30%	1.83
Ammonia- N, (mg/L)	0.01	100%	0.00	0.113	42%	0.065
fecal coliform bacteria (cfu/100ml)	0	n/a	0	12169	17%	10132
Oil and Grease (mg/L)	0	n/a	0	2.6	79%	0.55

8. Engineer's Opinion of Probable Construction Costs

The estimate of total capital costs is shown in Table 8 below, which is an Association for the Advancement of Cost Engineering (AACE) Class 2 Estimate of Construction Cost (with a +20%/-15% accuracy). The Included in total capital cost is an estimate of construction costs plus soft costs, property costs, and construction management costs.

Table 8 - Estimate of Total Capital Cost at 90% Design Level of Development

Element of Total Capital Costs	Description	Estimated Amount (and accuracy range)
Estimate of Construction Costs	Association for the Advancement of Cost Engineering (AACE) Class 2 Cost Estimate, with accuracy of +20%/-15%. This Class 2 Cost Estimate includes sales tax and escalation/inflation, but no construction contingency.	**$3,200,000** (accuracy of -15%/ +20%)
Soft Costs	Soft costs include: Information Gathering (ex: survey, geotechnical data collection, critical areas delineation, traffic analysis), Design, Stakeholder Engagement, Coordination with Permitting entities as well as preparation and submittal of permit applications, Public Engagement, Project Administration (by administering entity), and Construction Management) In the infrastructure and environmental restoration field, soft costs are typically estimated, for planning purposes, at between 60-80% of construction costs depending on project complexity and administrating entity. Shown here is a range of soft costs based on 70% of construction costs. As this project progresses, this estimate of soft costs can and should be further refined. (Note that these soft costs are intended to be inclusive of all such costs, from project planning through construction, and so therefore a portion of these soft costs have already been incurred and paid.	**$2,240,000** (estimated as 70% of construction costs)
Property	Estimated as 0% of construction costs; currently, no property costs are anticipated (though subject to change as the project evolves)	**$0**
Estimated Total Capital Costs		**$5,440,000**

9. Proposed Schedule

The proposed milestone shown below has anticipated dates for design completion and completion and submittal of permit applications, a 12-month permit application review period by the regulatory entities, then final design through construction. Construction is expected to take approximately 12 months over one dry-weather season. It is anticipated that this project will have post-construction monitoring requirements. While it is not yet known the duration of required monitoring, a period of 5 years is typical though it may be as long as 10 years. The project schedule is shown below and is subject to change based on permitting, design/construction funding, and stakeholder coordination:

- Fall 2025 – 90% Design completion
- Fall 2025-Spring 2026 – SPR's 90% ProViewTech Process and Feedback
- Fall of 2026 – 100% Design completion
- December 2026 – Receipt of Permits (anticipated, depends upon review duration and reviewer comments)
- January 2027 – Construction Project is Advertised
- Spring 2027 – Construction begins
- Summer/Fall 2028 – Construction complete
- Summer/Fall 2028 – TBD – Beginning of post-construction monitoring

10. References

Anchor QEA 2014. Geotechnical Engineering Design Report Washington Park Arboretum Multi-Use Trail and Bridge Project. May 2014. Prepared by Anchor QEA for The Berger Partnership.

Friends of Arboretum Creek (FOAC) 2021. Alder Creek to Arboretum Creek Reconnection Conceptual Design Report. May 19, 2011. Prepared by Jacobs and Berger, funded by the King County Wastewater Treatment Division with support from The Seattle Parks Foundation.

Friends of Arboretum Creek (FOAC) 2024. Arboretum Creek Headwaters Project Geotechnical Data Report. Prepared by Jacobs, funded by the King County Wastewater Treatment Division with support from The Seattle Parks Foundation and Seattle Parks and Recreation.

A. Water Quality Benefit Calculation

ARBORETUM CREEK - STORMWATER

FLOW CONTROL RATIO

		Legend
CALCS BY:	CM	Input
DATE:	9/6/2025	Calculated

Purpose: Determine flow control ratio of proposed retrofit BMP to the size of a BMP designed to meet new/redevelopment criteria

STORMWATER GARDEN WATER QUALITY TREATMENT VOLUME

WQ CELL	TOP AREA (SF)	BOTTOM AREA (SF)	AVG EFF DEPTH (FT)	VOL (CF)	VOID SPACE VOL (CF)	VOID SPACE VOL (AC FT)
Cell 1	2285	815	4	5458.608	1637.582	0.038
Cell 2	1540	616	7.5	7304.861	2191.458	0.050
Cell 3	1448	314	7.5	5057.203	1517.161	0.035
Cell 4	3170	1227	7.5	14791.533	4437.460	0.102

FLOW CONTROL RATIO

VOL AT OVERFLOW PROPOSED BMP (AC FT)	0.225	Total void space vol
VOL AT OVERFLOW BMP TO MEET CRITERIA (AC FT)	12.056	From WWHM Model
FLOW CONTROL RATIO	0.019	

$$\text{Ratio}_{\text{WFC}-1} = \frac{\text{Volume at overflow of proposed Flow Control BMP}}{\text{Volume at overflow of Flow Control BMP to meet new/redevelopment criteria}}$$

$$If\ \text{Ratio}_{\text{WFC}-1} > 1, then\ set\ \text{Ratio}_{\text{WFC}-1} = 1$$

Dept of Ecology Stormwater Design Deliverables Guidance pg. 8

ARBORETUM CREEK - STORMWATER

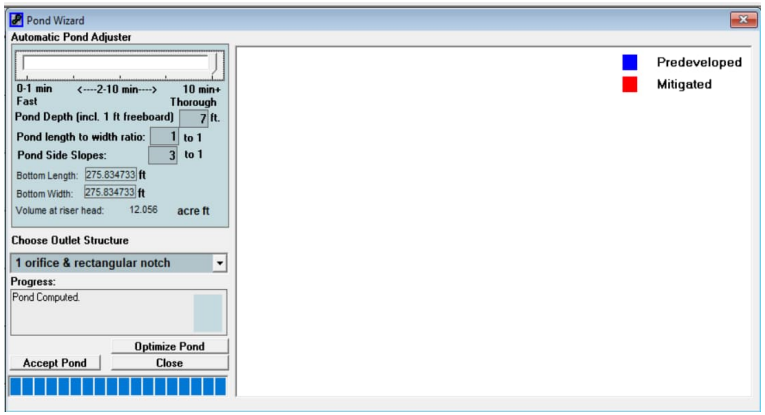
RUNOFF TREATMENT RATIO

CALCS BY:	CM	**Legend**
DATE:	9/6/2025	Input
		Calculated

Purpose: Determine runoff treatment ratio of proposed retrofit BMP to the size of a BMP designed to meet new/redevelopment criteria

RUNOFF TREATMENT RATIO

PROPOSED DESIGN TSS REMOVAL (%)	75	75% removal estimate is from the excel-based tool developed by Jacobs and discussed in detail in the Design Report
TARGET TSS REMOVAL (%)	80	BMP TSS removal goal
RUNOFF TREATMENT RATIO	0.938	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Automatic Pond Adjuster
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<----2-10 min---->
10 min+ Thorough
Pond Depth (incl. 1 ft freeboard) 7 ft.
Pond length to width ratio: 1 to 1
Pond Side Slopes: 3 to 1
Bottom Length: 275.834733 ft
Bottom Width: 275.834733 ft
Volume at riser head: 12.056 acre ft
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1 orifice & rectangular notch
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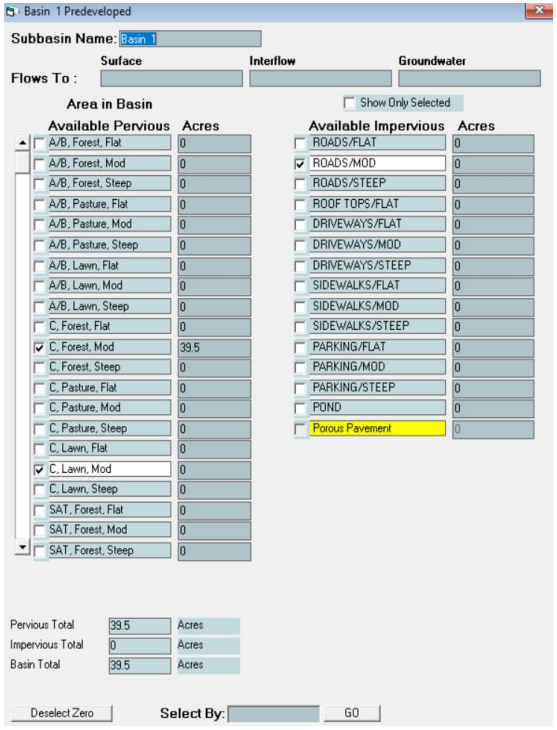
Pond Computed.
Optimize Pond
Accept Pond
Close
Predeveloped
Mitigated


Basin 1 Predeveloped
Subbasin Name: Basin 1
Surface
Interflow
Groundwater
Flows To :
Area in Basin
Show Only Selected
Available Pervious
Acres
Available Impervious
Acres
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A/B, Forest, Mod 0
A/B, Forest, Steep 0
A/B, Pasture, Flat 0
A/B, Pasture, Mod 0
A/B, Pasture, Steep 0
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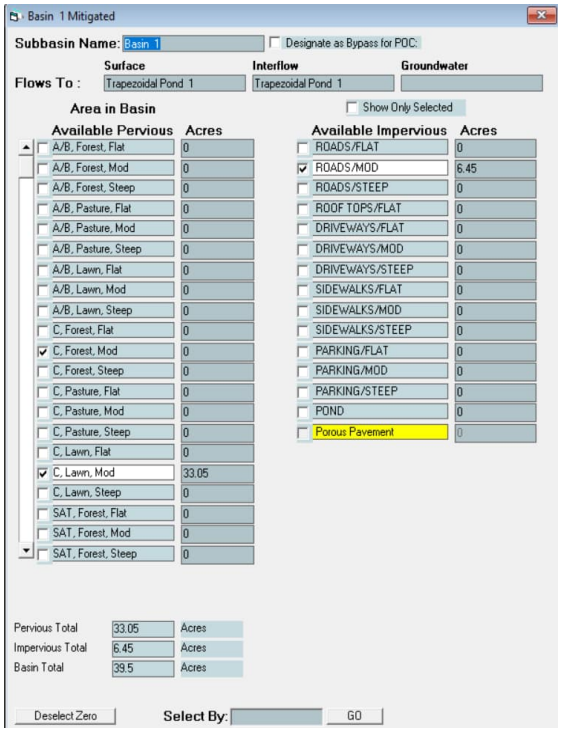
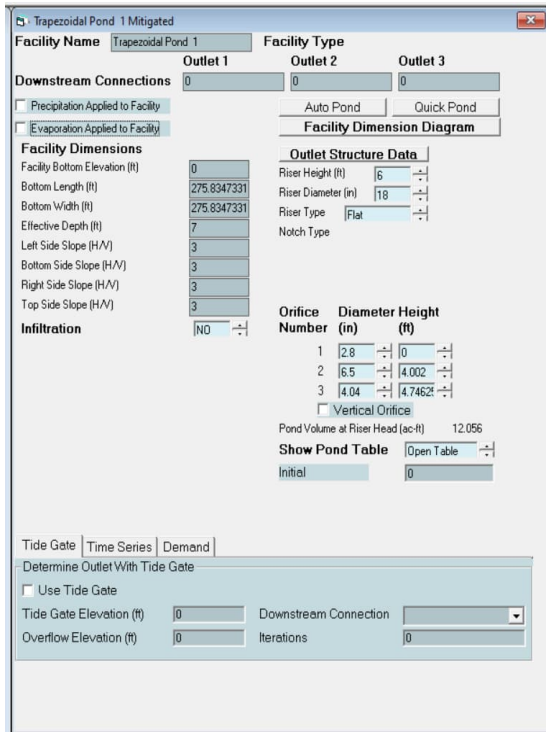
A/B, Lawn, Mod 0
A/B, Lawn, Steep 0
C, Forest, Flat 0
C, Forest, Mod 39.5
C, Forest, Steep 0
C, Pasture, Flat 0
C, Pasture, Mod 0
C, Pasture, Steep 0
C, Lawn, Flat 0
C, Lawn, Mod 0
C, Lawn, Steep 0
SAT, Forest, Flat 0
SAT, Forest, Mod 0
SAT, Forest, Steep 0
ROADS/FLAT 0
ROADS/MOD 0
ROADS/STEEP 0
ROOF TOPS/FLAT 0
DRIVEWAYS/FLAT 0
DRIVEWAYS/MOD 0
DRIVEWAYS/STEEP 0
SIDEWALKS/FLAT 0
SIDEWALKS/MOD 0
SIDEWALKS/STEEP 0
PARKING/FLAT 0
PARKING/MOD 0
PARKING/STEEP 0
POND 0
Porous Pavement 0
Pervious Total 39.5 Acres
Impervious Total 0 Acres
Basin Total 39.5 Acres
Deselect Zero
Select By:
GO

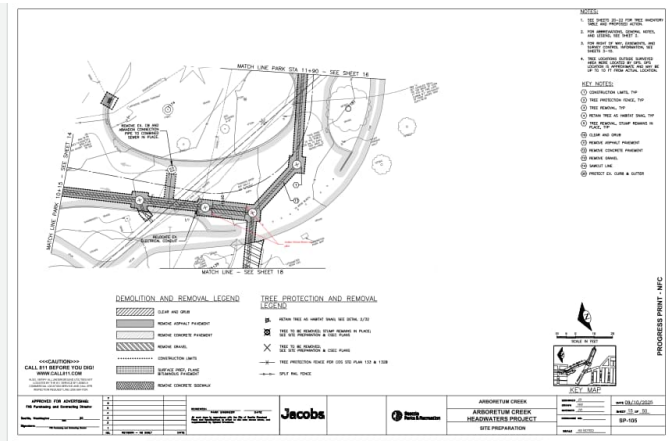

Basin 1 Mitigated
Subbasin Name: Basin 1
Designate as Bypass for POC
Surface
Interflow
Groundwater
Flows To :
Trapezoidal Pond 1
Trapezoidal Pond 1
Area in Basin
Show Only Selected
Available Pervious
Acres
Available Impervious
Acres
A/B, Forest, Flat 0
A/B, Forest, Mod 0
A/B, Forest, Steep 0
A/B, Pasture, Flat 0
A/B, Pasture, Mod 0
A/B, Pasture, Steep 0
A/B, Lawn, Flat 0
A/B, Lawn, Mod 0
A/B, Lawn, Steep 0
C, Forest, Flat 0
C, Forest, Mod 0
C, Forest, Steep 0
C, Pasture, Flat 0
C, Pasture, Mod 0
C, Pasture, Steep 0
C, Lawn, Flat 0
C, Lawn, Mod 33.05
C, Lawn, Steep 0
SAT, Forest, Flat 0
SAT, Forest, Mod 0
SAT, Forest, Steep 0
ROADS/FLAT 0
ROADS/MOD 6.45
ROADS/STEEP 0
ROOF TOPS/FLAT 0
DRIVEWAYS/FLAT 0
DRIVEWAYS/MOD 0
DRIVEWAYS/STEEP 0
SIDEWALKS/FLAT 0
SIDEWALKS/MOD 0
SIDEWALKS/STEEP 0
PARKING/FLAT 0
PARKING/MOD 0
PARKING/STEEP 0
POND 0
Porous Pavement 0
Pervious Total 33.05 Acres
Impervious Total 6.45 Acres
Basin Total 39.5 Acres
Deselect Zero
Select By:
GO

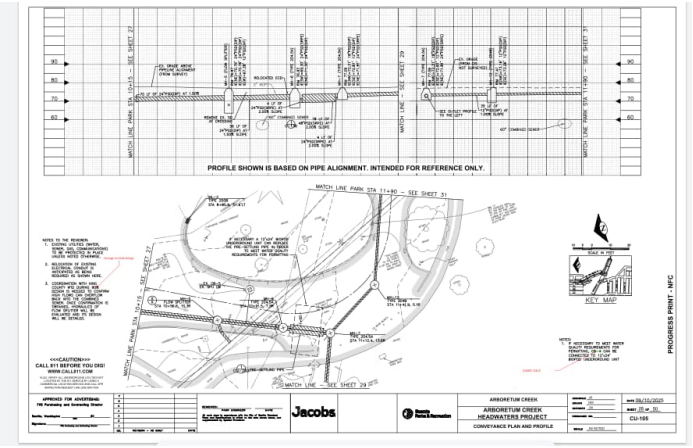

Trapezoidal Pond 1 Mitigated
Facility Name Trapezoidal Pond 1
Facility Type
Outlet 1
Outlet 2
Outlet 3
Downstream Connections 0 0 0
Precipitation Applied to Facility
Evaporation Applied to Facility
Auto Pond
Quick Pond
Facility Dimension Diagram
Facility Dimensions
Outlet Structure Data
Facility Bottom Elevation (ft) 0
Bottom Length (ft) 275.8347331
Bottom Width (ft) 275.8347331
Effective Depth (ft) 7
Left Side Slope (H/V) 3
Bottom Side Slope (H/V) 3
Right Side Slope (H/V) 3
Top Side Slope (H/V) 3
Riser Height (ft) 6
Riser Diameter (in) 18
Riser Type Flat
Notch Type
Infiltration NO
Orifice Number
Diameter (in)
Height (ft)
1 2.8 0
2 6.5 4.002
3 4.04 4.7462
Vertical Orifice
Pond Volume at Riser Head (ac-ft) 12.056
Show Pond Table
Open Table
Initial 0
Tide Gate
Time Series
Demand
Determine Outlet With Tide Gate
Use Tide Gate
Tide Gate Elevation (ft) 0
Overflow Elevation (ft) 0
Downstream Connection
Iterations 0

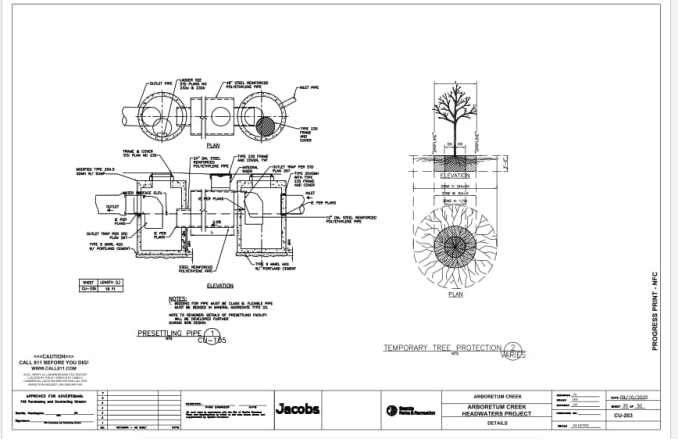
B.Pretreatment BMP

Pretreatment via ‘pre-settling pipe’ BMP

See images below showing the design (in progress) of the pre-settling pipe (site prep, conveyance plan and profile, and details, respectively). This BMP is intended to provide pretreatment to keep larger materials out of the individual treatment cells of the subsurface gravel wetland.







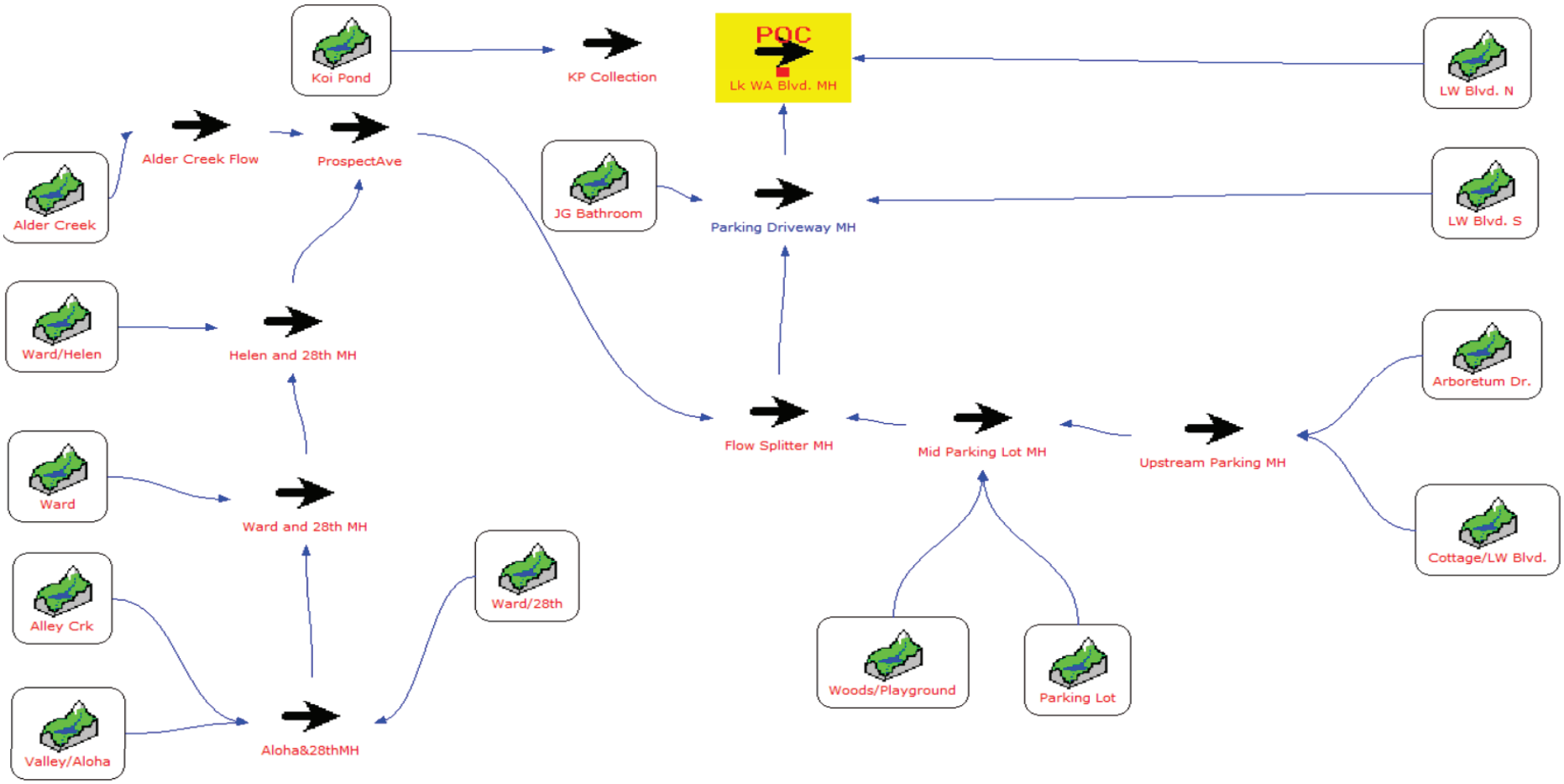
C.Hydrologic Modeling Results

Conveyance Capacity Summary Table

MGSFlood Link	MH	Pipe Diameter (in)	Min Slope (%)	Capacity (cfs)*	25-Year Flood Peak (cfs)
Aloha & 28th MH	MH-14	12	1.5	4.63	4.249
Ward & 28th MH	MH-13	18	1	10.50	6.081
Helen & 28 MH	MH-10	18	1	10.50	8.882
Prospect Ave	MH-9	18	1.3	11.98	11.694
Parking Driveway MH	MH-5	24	0.5	15.99	14.556
Lake WA BLVD	MH-4	24	0.5	15.99	14.898
Alder Creek	MH 9-B	12	1	3.56	2.91
Upstream Parking M	MH-17	12	1	3.56	1.381
Mid Parking Lot MH	MH-16	12	1	3.56	2.393

*Capacity Calculation asumes a full pipe with 0.013 roughness coefficient

MGS Flood Model Schematic Layout



MGS FLOOD
PROJECT REPORT

Program Version: MGSFlood 4.58
Program License Number: 200710001
Project Simulation Performed on: 08/08/2023 5:58 PM
Report Generation Date: 08/08/2023 5:59 PM

Input File Name: TotalConveyance.fld
Project Name: WPAAC - Total
Analysis Title: Hydrographs
Comments:

PRECIPITATION INPUT

Computational Time Step (Minutes): 5

Extended Precipitation Time Series Selected

Full Period of Record Available used for Routing

Climatic Region Number: 32
Precipitation Station : 99003805 Seattle 38 in_5min 10/01/1939-10/01/2097
Evaporation Station : 991038 Seattle 38 in MAP

Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : Ecology Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** WATERSHED DEFINITION **********

Predevelopment/Post Development Tributary Area Summary

	Predeveloped	Post Developed
Total Subbasin Area (acres)	40.870	40.840
Area of Links that Include Precip/Evap (acres)	0.000	0.000
Total (acres)	40.870	40.840

----------SCENARIO: PREDEVELOPED
Number of Subbasins: 3

Subbasin : Lower Park Areas

	Area (Acres)
C, Forest, Mod	12.330
Subbasin Total	12.330

- --------- Subbasin : Upland ----------

	-------Area (Acres) --------
C, Forest, Mod	20.480
Subbasin Total	20.480

---------- Subbasin : Koi Pond ----------

	-------Area (Acres) --------
C, Forest, Mod	8.060
Subbasin Total	8.060

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 14

---------- Subbasin : Valley/Aloha ----------

	-------Area (Acres) --------
C, Lawn, Steep	2.530
ROADS/FLAT	0.090
ROADS/STEEP	1.240
Subbasin Total	3.860

---------- Subbasin : Ward ----------

	-------Area (Acres) --------
C, Lawn, Steep	1.050
ROADS/STEEP	1.070
Subbasin Total	2.120

---------- Subbasin : Ward/Helen ----------

	-------Area (Acres) --------
C, Lawn, Steep	2.820
ROADS/FLAT	0.240
ROADS/STEEP	1.070
Subbasin Total	4.130

---------- Subbasin : Ward/28th ----------

	-------Area (Acres) --------
C, Lawn, Mod	0.850
ROADS/FLAT	0.120
ROADS/MOD	0.360
Subbasin Total	1.330

---------- Subbasin : Alder Creek ----------

	-------Area (Acres) --------
C, Forest, Steep	2.400
C, Lawn, Steep	4.180
ROADS/MOD	0.820

-- ----------
Subbasin Total 7.400

---------- Subbasin : JG Bathroom ----------

	-------Area (Acres) --------
C, Forest, Steep	0.720
ROADS/FLAT	0.190
Subbasin Total	0.910

---------- Subbasin : Parking Lot ----------

	-------Area (Acres) --------
C, Forest, Steep	0.230
C, Lawn, Flat	0.440
PARKING/MOD	0.620
Subbasin Total	1.290

---------- Subbasin : LW Blvd. S ----------

	-------Area (Acres) --------
C, Forest, Steep	0.870
ROADS/MOD	0.280
Subbasin Total	1.150

---------- Subbasin : LW Blvd. N ----------

	-------Area (Acres) --------
C, Forest, Steep	0.930
ROADS/MOD	0.250
Subbasin Total	1.180

---------- Subbasin : Cottage/LW Blvd. ----------

	-------Area (Acres) --------
C, Forest, Steep	1.560
ROADS/MOD	0.710
Subbasin Total	2.270

---------- Subbasin : Koi Pond ----------

	-------Area (Acres) --------
C, Forest, Steep	5.210
C, Lawn, Mod	2.080
SIDEWALKS/MOD	0.310
POND	0.460
Subbasin Total	8.060

---------- Subbasin : Woods/Playground ----------

	-------Area (Acres) --------
C, Forest, Steep	2.230

, Lawn, Flat	0. 90
Subbasin Total	2.820

---------- Subbasin : Arboretum Dr. ----------

	-------Area (Acres) --------
C, Forest, Steep	2.280
C, Lawn, Mod	0.170
ROADS/MOD	0.220
Subbasin Total	2.670

---------- Subbasin : Alley Crk ----------

	-------Area (Acres) --------
C, Lawn, Steep	1.520
ROADS/STEEP	0.130
Subbasin Total	1.650

********** **LINK DATA** **********

----------SCENARIO: PREDEVELOPED
Number of Links: 4

Link Name: Park C&G Outflow
Link Type: Copy
Downstream Link Name: Wetland Flow

Link Name: Upland Collection
Link Type: Copy
Downstream Link Name: Wetland Flow

Link Name: Pond
Link Type: Copy
Downstream Link Name: Wetland Flow

Link Name: Wetland Flow
Link Type: Copy
Downstream Link: None

********** **LINK DATA** **********

----------SCENARIO: POSTDEVELOPED
Number of Links: 9

-- ----------

Link Name: KP Collection
Link Type: Copy
Downstream Link: None

Link Name: LK. WA BLVD MH
Link Type: Copy
Downstream Link: None

Link Name: Aloha&28thMH
Link Type: Copy
Downstream Link Name: Ward and 28th MH

Link Name: ProspectAve
Link Type: Copy
Downstream Link Name: Pre-Settling MH

Link Name: Pre-Settling MH
Link Type: Copy
Downstream Link Name: LK. WA BLVD MH

Link Name: Parking Driveway CB
Link Type: Copy
Downstream Link Name: Pre-Settling MH

Link Name: Upstream Parking MH
Link Type: Copy
Downstream Link Name: Parking Driveway CB

Link Name: Ward and 28th MH
Link Type: Copy
Downstream Link Name: Helen and 28th MH

Link Name: Helen and 28th MH
Link Type: Copy
Downstream Link Name: ProspectAve

**********FLOOD FREQUENCY AND DURATION STATISTICS**********

----------SCENARIO: PREDEVELOPED

Number of Subbasins: 3
Number of Links: 4

----------SCENARIO: POSTDEVELOPED
Number of Subbasins: 14
Number of Links: 9

********** Link: Aloha&28thMH ********** Link Outflow
1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.569
5-Year	2.553
10-Year	3.324
25-Year	4.249
50-Year	5.883
100-Year	6.175
200-Year	6.374
500-Year	6.639

********** Link: Ward and 28th MH ********** Link Outflow
1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	2.319
5-Year	3.640
10-Year	4.596
25-Year	6.081
50-Year	8.110
100-Year	8.636
200-Year	8.938
500-Year	9.339

********** Link: Helen and 28th MH ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	3.359
5-Year	5.278
10-Year	6.659
25-Year	8.882
50-Year	11.771
100-Year	12.686
200-Year	13.157
500-Year	13.778

********** Link: ProspectAve ********** Link Outflow 1

Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	4.335
5-Year	6.941
10-Year	9.030
25-Year	11.694
50-Year	16.406
100-Year	16.894
200-Year	17.614
500-Year	18.582

********** Link: Pre-Settling MH ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	5.613
5-Year	8.830
10-Year	11.410
25-Year	14.556
50-Year	20.469
100-Year	21.500
200-Year	21.549
500-Year	21.585

********** Link: Parking Driveway CB ********** Link Outflow 1
Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.290
5-Year	1.898
10-Year	2.308
25-Year	2.954
50-Year	3.582
100-Year	3.870
200-Year	4.840
500-Year	6.145

********** Link: Upstream Parking MH ********** Link Outflow
1 Frequency Stats
Flood Frequency Data(cfs)
(Recurrence Interval Computed Using Gringorten Plotting Position)

Tr (yrs)	Flood Peak (cfs)
2-Year	1.024
5-Year	1.522

10-Year	1.871
25-Year	2.393
50-Year	2.856
100-Year	3.164
200-Year	3.927
500-Year	4.952

***********Groundwater Recharge Summary **************

Recharge is computed as input to Perlnd Groundwater Plus Infiltration in Structures

Total Predeveloped Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin:	Lower Park Areas	2013.670
Subbasin:	Upland	3344.684
Subbasin:	Koi Pond	1316.316
Link:	Park C&G Outflow	Not Applicable
Link:	Upland Collection	Not Applicable
Link:	Pond	Not Applicable
Link:	Wetland Flow	0.000
Total:		6674.670

Total Post Developed Recharge During Simulation

Model Element		Recharge Amount (ac-ft)
Subbasin:	Valley/Aloha	284.383
Subbasin:	Ward	118.024
Subbasin:	Ward/Helen	316.980
Subbasin:	Ward/28th	98.945
Subbasin:	Alder Creek	854.995
Subbasin:	JG Bathroom	115.544
Subbasin:	Parking Lot	88.161
Subbasin:	LW Blvd. S	139.615
Subbasin:	LW Blvd. N	149.244
Subbasin:	Cottage/LW Blvd.	250.344
Subbasin:	Koi Pond	1078.210
Subbasin:	Woods/Playground	426.587
Subbasin:	Arboretum Dr.	385.677
Subbasin:	Alley Crk	170.854
Link:	KP Collection	Not Applicable
Link:	LK. WA BLVD MH	0.000
Link:	Aloha&28thMH	Not Applicable
Link:	ProspectAve	Not Applicable
Link:	Pre-Settling MH	Not Applicable
Link:	Parking Driveway CB	Not Applicable
Link:	Upstream Parking MH	Not Applicable
Link:	Ward and 28th MH	Not Applicable
Link:	Helen and 28th MH	Not Applicable
Total:		4477.563

Total Predevelopment Recharge is Greater than Post Developed Average Recharge Per Year, (Number of Years= 158)

Predeveloped: 42.245 ac-ft/year, Post Developed: 28.339 ac-ft/year

************Water Quality Facility Data **************

----------SCENARIO: PREDEVELOPED

Number of Links: 4

********** Link: Wetland Flow **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 3474.65
Inflow Volume Including PPT-Evap (ac-ft): 3474.65
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 3474.65
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

----------SCENARIO: POSTDEVELOPED

Number of Links: 9

********** Link: LK. WA BLVD. MH **********

Infiltration/Filtration Statistics----------
Inflow Volume (ac-ft): 7066.60
Inflow Volume Including PPT-Evap (ac-ft): 7066.60
Total Runoff Infiltrated (ac-ft): 0.00, 0.00%
Total Runoff Filtered (ac-ft): 0.00, 0.00%
Primary Outflow To Downstream System (ac-ft): 7066.60
Secondary Outflow To Downstream System (ac-ft): 0.00
Volume Lost to ET (ac-ft): 0.00
Percent Treated (Infiltrated+Filtered+ET)/Total Volume: 0.00%

*************Compliance Point Results ***************

Scenario Predeveloped Compliance Link: Wetland Flow
Scenario Postdeveloped Compliance Link: LK. WA BLVD MH

***** Point of Compliance Flow Frequency Data *****
Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.908	2-Year	5.774
5-Year	1.453	5-Year	9.042
10-Year	1.880	10-Year	11.691
25-Year	2.469	25-Year	14.898
50-Year	2.856	50-Year	20.883
100-Year	4.167	100-Year	21.966
200-Year	6.926	200-Year	22.065
500-Year	10.613	500-Year	22.164

D.Stormwater Performance Data for the proposed Treatment BMP

Performance Data from using a Subsurface Gravel Wetland for Stormwater Treatment

The BMP proposed for water quality treatment is a subsurface gravel wetland. This BMP is effective at providing treatment with baseflow present (without warming the runoff). Discharge to Arboretum Creek will be via hyporheic discharge, which is anticipated to provide additional treatment effectiveness.

SPR, FOAC, and Jacobs recognize that this subsurface gravel wetland BMP is not currently approved by Ecology and therefore will require extra effort to demonstrate water quality treatment effectiveness specific to stormwater. Limited performance data exists for this BMP type for stormwater. The data this team was able to find is summarized here. We anticipate needing to proceed through the TAPE process to evaluate effectiveness of this BMP and look forward to sharing this data as part of the first step of that TAPE process.

Data/Information:

- A presentation from NC State University, displayed a range of performance data and insights into treatment effectiveness (*should link not work: https://bae.ncsu.edu/wp-content/uploads/sites/3/2020/06/Subsurface-Gravel-Wetlands.pdf*):
    - For stormwater applications à Total Phosphorus (TP): 54% removal, Total Suspended Solids (TSS): 99% removal
    - NH3 , Nitrate, and OrthoP all show lower concentration in the underdrain compared to the influent. Total Kjeldahl Nitrogen(TKN) and TP show reductions. TSS drops significantly – strong sediment removal.
    - Monthly treatment efficiency (%) from November to February: TSS consistently 80-90% removal, others show moderate to high efficiency with seasonal variability à nutrient removal may require optimization or be more sensitive to environmental conditions.
    - Provides current design guidance for gravel wetlands and proposed changes to NEST program
- This paper from the University of New Hampshire evaluated two stormwater retrofit systems with a subsurface gravel wetland being one of them. Its key findings are as follows *(should link not work:*

https://www3.epa.gov/region1/npdes/stormwater/research/unh-sc-swc-small-design-2017.pdf):

  - TSS: 75% median removal
  - Total Zinc: 75% median removal
  - Total Phosphorus: 53% median removal
  - Total Nitrogen: 23% removal, median effluent TN concentration = 1.4 mg/L
  - Data from this study indicates that the benefits from opportunistic sizing exceed linearly scaled performance expectations of appropriately sized SCMs.

- This paper also from UNH presents data from 12 years of field monitoring of subsurface gravel wetland systems constructed in the northeast US *(should link not work: https://scholars.unh.edu/cgi/viewcontent.cgi?article=1069&context=stormwater):*
  - For a full-sized system
    - TSS: 96% removal
    - Total Petroleum Hydrocarbons – Diesel (TPH-D): 98% removal
    - Total Zinc: 90% removal
    - TN: 54% removal
    - TP: 58% removal
  - Summer removal rates were generally higher than winter
  - Pollutant removal efficiencies are some of the highest, with a significant component being microbially-mediated in the low dissolved oxygen gravel layers

E.Permitting Requirements, Approach, and Anticipated Timeline

Arboretum Creek Headwaters Project

Summary of Required Permits
Last Updated: June 2025
(Note: this is a 1-page summary of permit requirements for this project. See the following sheets for additional detail.)

SPR and Jacobs see the Clean Water Act (CWA) Section 404 process as the critical path, with a review timeline of 9 months to up to 2 years. Note that our project schedule assumes submittal of the permit application by 12/31/25 with receipt of the permit by 1/1/27 for construction in 2027. See subsequent pages for more details behind each of these regulatory processes and required permits.

Federal Regulatory Process	**Permitting Agency**	**Estimated Permit Review Timeline**
Clean Water Act, Section 404	USACE	9 mo to 2 years (NOTE: Schedule assumes receipt of this permit in 12 months +/-; submittal by 12/31/25, with receipt by 1/1/27, for construction in 2027)
Clean Water Act, Section 401	Ecology, as authorized by the EPA	1 year
Clean Water Act, National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit Coverage	Ecology, as authorized by the EPA	Individual permit: 6+ months General permit: immediately
Clean Water Act, NPDES Municipal Stormwater Permit Coverage	Adminstrated by City of Seattle (SPU), as approved by Ecology, as authorized by the EPA	Individual permit: 6+ months General permit: immediately
Coastal Zone Management Act Consistency	Ecology, as authorized by the EPA	Must be submitted at least 90 days prior to final approval of federal agency activity. Ecology has 60 days to issue its decision.
National Historic Preservation Act, Section 106	DAHP	Part of Clean Water Act Section 404 timeline
Endangered Species Act	USFWS and/or NOAA Fisheries	Part of Clean Water Act Section 404 timeline Informal Consultation: 3-6 months Formal Consulation: 6 months - 2+ years
Migratory Bird Treaty Act (MBTA)	USFWS	Formal consulation may last up to 90 days.
Bald and Golden Eagle Protection Act	USFWS	-
National Environmental Policy Act	Lead Agency - USACE	Part of Clean Water Act Section 404 timeline
Floodplain Review	*SDCI Floodplain Administrator, as authorized by FEMA*	-
State Regulatory Process	**Permitting Agency**	**Estimated Permit Review Timeline**
State Environmental Policy Act (SEPA) Environmental Review and Determination	City of Seattle (SPR), as authorized by Ecology	TBD; 2-4 months? Depending on comments
Hydraulic Project Approval (HPA)	WDFW	45 days from the date of receiving a complete application
Local Regulatory Process	**Permitting Agency**	**Estimated Permit Review Timeline**
Building and Land Use Preapplication (required) and pre-submittal conference (optional)	City of Seattle, SDCI	Preliminary Application Report received in 2-3 weeks
Master Use Permit for Conditional Use	City of Seattle, SDCI	5-8 months
Master User Permit for Environmentally Critical Areas (ECA)	City of Seattle, SDCI	5-8 months
Grading Permit	City of Seattle, SDCI	4 months
Tree Removal	City of Seattle	1-3 months
Street Improvement Permit (SIP) (not for Lake WA Blvd - Parks owns and maintains. Will need for neighborhood streets)	City of Seattle, SDOT	3 months

Note: This draft was prepared based on understanding of the project and professional knowledge at the time of preparation. This table should be revisited and revised throughout the project as design progresses or as regulations change.

Arboretum Creek Headwaters Project

Permit Matrix Prepared by: Rose Whitson, Jacobs
Last Updated: June 2025

Last updated: June 2025

Funding: Grants, from King Co FCZD and Water Works and from Wa Dept of Ecology (note: will need to update/review this should federal funds be obtained/utilized)

Federal Regulatory Process	Permitting Agency	Trigger	Process	Application and Supporting Technical Documentation	SPR Responsibility	Jacobs Responsibility	Estimated Submittal Date	Actual Submittal Date	Estimated Permit Review Timeline	Permit/Approval Received Date	Permit Considerations and Issues
Clean Water Act, Section 404	USACE	Dredge or fill impacts to Waters of the US (WOTUS). Arboretum Creek, Alder Creek, Alley Creek, and associated wetlands are presumed WOTUS	Early coordination with USACE to confirm conditions and if NWP or IP is likely. Permit review process is initiated through the submittal of the Joint Aquatic Resources Permit Application with: - wetland and stream existing conditions report (including delineation), assessment of impacts, and proposed mitigation - permit-level design (typically 60pct design for stream restoration) - JARPA drawings to USACE standards, showing existing, proposed impacts, and future condition - approvals and/or permits associated with related federal permit processes (see below) USACE will initiate reviews as needed with other federal agencies to fulfill federal requirements.	• Pre-Construction Notification • JARPA form • JARPA Attachment, Property Owners Signatures and/or Easments Acquisition • Photos of Project Area • Vicinity Map • Project Drawings • Wetland Determination Report • Cultural Resources Report • Biological Assessment • Hazardous Materials Assessment (ESA Phase 1 or Desktop) • Mitigation Plan • CZMA Form	Review Supporting Documentation Obtain property owner signatures and/or easement acquisition if needed Sign and Submit Application	Prepare Technical Materials and Permit Application	tbd	tbd	9 mo to 2 years	tbd	A Nationwide Permit (or multiple) should take less time than an Individual Permit. NWP 7 - Outfall Structures and associated intake structures would be a candidate. Others under consideration include NWP 33 - Temporary Construction, Access, and Dewatering. USACE is currently understaffed, with even Nationwide Permits taking upwards of 9 months to process. David Graves/SPR will be the applicant, no authorized agent (for all permits, though Jonathan would likely be applicant for SDCI and SIP) For wetland losses <1/10 ac and losses of streambed <3/100 ac, USACE has the discretion to waive compensatory mitigation if there are minimal adverse env effects Mitigation must provide minimum riparian width to address water quality or aq habitat loss concerns (eg address potential for indirect impacts)
Clean Water Act, Section 401	Ecology, as authorized by the EPA	Required because a federal permit (CWA Sec 404 permit) is required. Regulates traceable discharges (subsurface and surface) to WOTUS	Applicants must submit a pre-filing request form, 30 days prior to requesting a water quality certification. At least 30 days after submitting a pre-file request, applicants may submit the entire Section 401 request. For all projects requiring a federal permit, a copy of federal permit must be submitted as well. Supporting information for request: -JARPA form -Status of SEPA determination -Project location -BMPs -Construction methodologies -wetland delineations, ratings, and mitigation plan	For Individual WQC • Ecology Pre-File Form • Water Quality Certification Request Form • SEPA Determination • Project Location Map and Drawings • BMPs • Construction Methodologies • JARPA • WQMPP with TESC Plan and SWPPP • Wetland Delineation Report • Mitigation Plan • Stream isolation and/or diversion plan • Groundwater and Surface Water dewatering plan	Prepare Pre-file Form Prepare WQC Form Review Supporting Documentation Sign and Submit Application	Provide supporting technical information			1 year		Because the proposal affects stormwater, Ecology may require individual permit during the NWP 404 WQC Review. If so, Individual WQC application and materials will be required. When combined with NWP 404, WQC Review required to determine if an individual WQC is warranted for: - projects that could cause or contribute to an exceedance of a state water quality or sediment standard - projects discharging to 303(d) waters - activities affecting high-value or rare-characteristic wetlands, including Cat II wetlands with habitat scores equal or greater than 8pts - loss of more than 300 linear ft of streambed (inc jurisdictional ditches that qualify as a (3) waters)
Clean Water Act, National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit Coverage	Ecology, as authorized by the EPA	Under the CWA, no discharge from a point source into WOTUS is permitted. In WA, Ecology is approved to administer the NPDES program and requires coverage under the Construction Stormwater General Permit if: - disturbing one acre or more of land (clearing, grading, stockpiling fill material) - smaller than one acre, but part of a lager development plan that will ultimately disturbe more than one acre - sites of any size discharging to WOTUS that are determined to be a significant contributor of pollutants - sites of any size that could reasonably be expected to cause a violation of a water quality standard - if there is possibility that water could run off the site or enter a conveyance that leads to surface waters.	Note - General Permit expires in 2025 and is in the process of renewal Apply using the Ecology Water Quality Portal using information similar to Sec 404 permit and updated plan sets; provide public notices at relevant times, at least 60 days prior to construction.	• Water Quality Portal Application • Stormwater Pollution Prevention Plan prior to Construction • Construction Plans • Notice of Information	Prepare application Submit Application on the WQ Portal	Provide supporting technical information			Individual permit: 6+ months General permit: immediately		
Clean Water Act, NPDES Municipal Stormwater Permit Coverage	Administrated by City of Seattle (SPU), as approved by Ecology, as authorized by the EPA	While the construction stormwater general permit coverage is used during construction, separate coverage is required for permanent operation of a new permanent stormwater discharge outlet. This project would need to confirm coverage under the City of Seattle municipal permit or apply for new coverage with Ecology.	Updates needed based on design evolution To be confirmed with Seattle Utilities NPDES coordinator and/or Ecology	• Notice of Intent	Verify applicability Complete documentation and permitting	TBD			Individual permit: 6+ months General permit: immediately		Need SPU to weigh in on if proposal fits under existing municipal stormwater permit or if a separate Ecology discharge permit is required: - would hyporheic discharge as part of the stormwater garden qualify as an outfall? - does reconfiguring an outfall change requirements?
Coastal Zone Management Act Consistency	Ecology, as authorized by the EPA	Required for projects requiring federal permits and occuring in a coastal county, like King County.	The federal agency prepared a Consistency Determination, with recommendation to consult with Ecology prior to submittal. Once Ecology receives the CD, the 60-day review al process begins. Ecology then makes a federal consistency decision on the project.	• Certification of Consistency Form • Project Location Map • Site Plans • Supporting documentation as identified in the form	Prepare Form Submit application as part of USACE Sec 404 packet	None			Must be submitted at least 90 days prior to final approval of federal agency activity. Ecology has 60 days to issue its decision.		

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Arboretum Creek Headwaters Project

Permit Matrix Prepared by: Rose Whitson, Jacobs
Last Updated: June 2025

National Historic Preservation Act, Section 106	DAHP	Required when a federal agency determines that it has an undertaking that could affect historic properties. An undertaken includes any project, activity, or program with federal agency involvement, including projects requiring a federal permit, license, or approval. The lead agency must enter a consultation with a federally authorized state representative, in WA this is the State Historic Preservation Officer at the WA State Department of Archaeology and Historic Preservation.	Consultation Letter from the lead federal agency APE Concurrence from DAHP and affected Tribes Assessment of Adverse Effects Resolution of Adverse Effects	• Cultural Resources Report	Review Supporting Documentation prior to submittal as part of the USACE Section 404 packet	Prepare Technical Materials			Part of Clean Water Act Section 404 timeline		This process should be started as early as possible and ideally before any earthwork, including geotechnical exploration or other pre-design existing conditions surveys. Comparable state and local cultural reviews would be required, if federal permitting or other federal nexus were somehow avoided.
Endangered Species Act	USFWS and/or NOAA Fisheries	Potentially critical path right now Required for projects that required a federal permit, receive federal funding, or will occur on federal land - conducted by a federal agency, requiring federal approvals or permits, or receiving federal funding. For this project, federal nexus in the need for other federal permits and approvals.	Biological Assessment, for anticipated impacts to listed species associated fish salvage needed for in-water work if directly impacting Arboretum Creek. Permit-level design and impact calculations required.	• Biological Assessment	Review Supporting Documentation prior to submittal as part of the USACE Section 404 packet	Prepare Technical Materials			Part of Clean Water Act Section 404 timeline Informal Consultation: 3-6 months Formal Consulation: 6 months - 2+ years		The Services have been experiencing staffing shortages and taking longer than "usual" to process applications.
Migratory Bird Treaty Act (MBTA)	USFWS	No longer applicable to xyz based on the restoration of Solicitor's Opinion M-37050 on April 11, 2025. Applicable to all activities conducted within the US. Migratory bird take is not allowed unless permitted. Occupied migratory bird nests may not be disturbed without a permit. Unoccupied bird nests that are not eagles or species protected by the Endangered Species Act may be removed without a permit. FAQs here: https://www.fws.gov/policy/724fw2.html#:~:text=The%20MBTA%2C%20applies%20to%20activities,local%2C%20State%20or%20Federal%20agency.	Apply BMPs during design, construction, and operation as follows: Document migratory bird habitat existing conditions during design. Avoid and minimize tree removal during design and through construction sequencing. Avoid activities during nesting season. If activities cannot be avoided during nesting season, coordinate with WDFW and/or USFWS to develop appropriate BMPs, consider nest surveys and monitoring during contruction, and apply for a take permit if necesary.	• Habitat Assessment and Bird Survey Exisiting Conditions Report	Review Supporting Documentation prior to submittal as part of the USACE Section 404 packet	Prepare Technical Materials			Formal consulation may last up to 90 days.		Take permit may not be required, depending on existing conditions, as well as on how project is designed, constructed, and operated. Some opt to hire subcontractors who have active take permits if nest salvage and/or relocation ends up being needed.
Bald and Golden Eagle Protection Act	USFWS	No one may pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb bald or golden eagles without a permit. "Disturb" includes activities that, based on best scientific information, could cause injury to an eagle, decrease its productivity, or substantially interfere with normal breeding, feeding, or sheltering behaviour. Could apply if a bald or golden eagle nest is determined to be either within or near the construction site. Examples include potential impacts to known feeding grounds and/or presence of nests (occupied or unoccupied) within the project site and/or presence of occupied nests within the construction noise attenuation zone to background levels.	Similar to MBTA provisions, except typically applied more stringently.	• Habitat Assessment and Bird Survey Exisiting Conditions Report	Review Supporting Documentation prior to submittal as part of the USACE Section 404 packet	Prepare Technical Materials			-		Take permit may not be required, depending on existing conditions, as well as on how project is designed, constructed, and operated. Some opt to hire subcontractors who have active take permits if nest salvage and/or relocation ends up being needed.
National Environmental Policy Act	Lead Agency - USACE	Federal agencies must complete environmental reviews for all undertakings, including for projects requiring federal permits.	Typically conducted by lead federal agency with little input from applicant on a small project like this. Additional materials like an EIS or technical memorandums for things like noise impact or environmental justice could be needed if there was a determination of potential extreme impact.	No new materials anticipated	N/A	N/A			Part of Clean Water Act Section 404 timeline		With no federal funding or blended state/federal funding, the federal nexus is USACE permitting. Additional NEPA technical reports not required.
Floodplain Review	*SDCI Floodplain Administrator, as authorized by FEMA*	*Not Applicable - No special flood hazard areas are mapped. Typically for activities within special flood hazard areas shown within FEMA Flood Insurance Rate Maps.*							-		
State Regulatory Process	**Permitting Agency**	**Trigger**	**Application Process**	**Application and Supporting Technical Documentation**	**Responsible Party**		**Estimated Submittal Date**	**Actual Submittal Date**	**Estimated Permit Review Timeline**	**Permit/Approval Received Date**	**Permit Considerations and Issues**
State Environmental Policy Act (SEPA) Environmental Review and Determination	City of Seattle (SPR), as authorized by Ecology	Required for all projects and policy proposals, unless they fit categorical exemption criteria. The project itself is unlikely to meet a categorical exemption. Under Exemption #17, basic data collection, research, and resource evaluation is exempt.	SEPA Checklist submitted typically as part of local jurisdiction land use review.	• SEPA Checklist • Vicinity Map • Supporting documentation	Finalize checklist Submit and obtain determination	Prepare draft checklist			tbd		SPR intends to be the SEPA authority, not SDCI
Hydraulic Project Approval (HPA)	WDFW	Required for all hydraulic projects. A hydraulic project is defined as the construction or performance of work that will use, divert, obstruct, or change the natural flow or bed of any salt or freshwaters of the state. This project fits criteria due to proposed impacts to creeks and associated wetlands that are considered waters of the state.	Early coordination with WDFW and affected Tribes on proposed aquatic resource impacts and restoration or mitigation. Submit similar information to JARPA as part of the WDFW APPS system. SEPA determination required for a complete application.	• General Application Information for online submittal • SEPA Determination • Consent of Property Owners • Project Plan drawings • Supporting documentation	Prepare application Submit and obtain permit	Technical support			45 days from the date of receiving a complete application		
Local Regulatory Process	**Permitting Agency**	**Trigger**	**Application Process**	**Application and Supporting Technical Documentation**	**Responsible Party**		**Estimated Submittal Date**	**Actual Submittal Date**	**Estimated Permit Review Timeline**	**Permit/Approval Received Date**	**Permit Considerations and Issues**
Building and Land Use Preapplication (required) and pre-submittal conference (optional)	City of Seattle, SDCI			• Pre-Application Form online • Site Plan (30pct design) • ECA Exemption Request Letter(s)	Prepare ECA Exemption Request Letter Prepare application Submit preapplication request	Technical support			Preliminary Application Report received in 2-3 weeks		MUP Timeline provided in Tip 201
Master Use Permit for Conditional Use	City of Seattle, SDCI	TBD - see notes	TBD	TBD	TBD				5-8 months		The Arboretum and adjacent neighborhood are Neighborhood Residential. Parks are a principal use outright (SMC 23.44.006.D). Whether or not our project is considered part of typical park facility will determine if the project is outright permitted. If changing existing stormwater facilities are not part of the typical maintenance and management plan for Arboretum, then we may be bumped into needing a conditional use permit for MUP for either SMC 23.44.026 - Use of landmark structures or sites or SMC 23.44.036 - Public Facilities. SPR to confirm

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Arboretum Creek Headwaters Project
Permit Matrix Prepared by: Rose Whitson, Jacobs
Last Updated: June 2025

Master User Permit for Environmentally Critical Areas (ECA)	City of Seattle, SDCI	Work in designated critical areas	Submit preliminary application process Pre-Submittal Conference Early Guidance Process, if applicable MUP Application (public notice and 14-day comment period) Review by SDCI/Corrections by Applicant SDCI Review and Decision Publish MUP Decision Appeal Hearing (if applicable) Issue MUP	• DCI Environmental Critical Areas Checklist • Anticipated supporting documentation, to be confirmed during pre-submittal • SEPA Checklist • 60 Percent Design (including Licensed Survey and Tree Vegetation Plan) • ECA Restoration Plan Application (Tip 331) • Environmental Critical Areas Site Plan • Geotechnical Report • Wetland, Stream, and Habitat TM	Prepare permit application Submit and obtain permit	• 60 Percent Design (including Licensed Survey and Tree Vegetation Plan) • Environmental Critical Areas Site Plan • Geotechnical Report • Wetland, Stream, and Habitat TM • ECA Restoration Plan Application (Tip 331)			5-8 months		Not needed if SDCI accepts Exemption documentation.
Grading Permit	City of Seattle, SDCI	Land disturbance		• Pre-Application Site Visit • Stormwater and Grading Checklist with: • 60 Percent Design (Site Plan, Grading Plan), meeting the Grading Plan Standards • Construction Stormwater Control Plan and Soil Management Plan • Drainage and Wastewater Control Plan • Drainage Report • Geotechnical Report • Construction Easements • Infiltration Test Checklist • On-Site Stormwater Management Calculator Work Book • Memorandum of Drainage Control	Prepare permit application Submit and obtain permit	Prepare Technical Materials			4 months		Tip #502 – Grading Permit Submittal Requirements
Tree Removal	City of Seattle	Land disturbance	TBD	• Statement of Financial Responsibility Form • Site Plan (Tip 103) • Arborist Report • Basic Tree Risk Assessment Form if applicable • Photos of tree(s) • Restoration Plan	Prepare permit application, including materials not listed as Jacobs responsibility Submit and obtain permit	• Arborist Report • Basic Tree Risk Assessment Form if applicable • Photos of tree(s) • Restoration Plan			1-3 months		Can be a stand-alone permit. SDCI will likely allow this to be combined with the Grading Permit.
Street Improvement Permit (SIP) (not for Lake WA Blvd - Parks owns and maintains. Will need for neighborhood streets)	City of Seattle, SDOT	Work within City right-of-way, if applicable		Online Application Via Seattle Services Portal Anticipated Materials: • Right-of-way Impact Plan with details per CAM 2116 • Site Plan • Traffic Control Plan per CAM 2111	Prepare permit application Submit and obtain permit	Prepare Technical Materials			3 months		

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