



2023

Surface Water Master Plan



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City of Kirkland Local Land Acknowledgment

“We acknowledge that the Southern Salish Sea region lies on the unceded and ancestral land of the Coast Salish peoples, the Duwamish, Muckleshoot, Puyallup, Skykomish, Snoqualmie, Snohomish, Suquamish and Tulalip tribes and other tribes of the Puget Sound Salish people, and that present-day City of Kirkland is in the traditional heartland of the Lake People and the River People. We honor with gratitude the land itself, the First People — who have reserved treaty rights and continue to live here since time immemorial — and their ancestral heritage.”

Visit www.kirklandwa.gov/LandAcknowledgement for more information

Acknowledgements

City Council

Penny Sweet, Mayor
Jay Arnold, Deputy Mayor
Neal Black, Councilmember
Kelli Curtis, Councilmember
Amy Falcone, Councilmember
Toby Nixon, Councilmember
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Thanks for the project support from:

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Storm and Surface Water Group
Transportation Division
Capital Improvement Division
Development Engineering Group
Streets and Grounds Maintenance Division
Storm Maintenance Division

Planning and Building Department

Finance Department

Information Technology Department

Subconsultants--Parametrix, EMA, and FCS Group

Funding for this plan provided by King County Flood Control District and King County through the Subregional Opportunity Fund Grant.

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1 Introduction and Background

A photograph of a bird, possibly a shorebird, perched on a weathered wooden post. The bird has a dark cap and a long, thin beak. The background shows a body of water and a grassy or marshy area.

Introduction and Background

Kirkland's Surface Water Utility (the Utility) was formed in 1998 based on a Surface Water Master Plan that was developed in 1994/1995. Since then, two additional Surface Water Master Plans have been completed in 2005, and again in 2014. This [2023 Surface Water Master Plan Update](#) (Plan) provides a status assessment of the current program and identifies continuing commitments and new Utility priorities for the next 7 years.



Purpose and Objectives

The purpose of this Plan is to develop a guide for the Utility that outlines capital projects, strategies, and resources needed to accomplish City and Utility goals. An implementation plan and accompanying rate study provides funding options. Specifically, the following objectives were identified for the Plan:

- Identify and prioritize surface water capital projects for implementation, including emphasis on aging and failing infrastructure.
- Identify staffing and equipment needs to support both engineering and maintenance and operations of Utility infrastructure.
- Identify and incorporate Diversity, Equity, Inclusion, and Belonging principles into Utility operations.
- Identify and prioritize policies, strategies, and programmatic actions to be implemented by the Utility, especially those that can be accomplished collaboratively with other departments that have shared interests.
- Evaluate organizational and CIP delivery methods of comparable western Washington jurisdictions for a benchmarking comparison to Kirkland.
- Conduct financial analysis/rate study to inform funding options and implementation schedule of identified Utility needs.



Document Organization

This Plan is organized into the following Sections.

Section 1- Introduction and Background

An overview of the Plan document and planning process is provided in this section.

Section 2- Utility Overview

The Surface Water Utility is described in this section. Utility functions, relationships to other departments, goals, policies and procedures are outlined here.

Section 3- Surface Water Assets

Basic information about the inventory and condition of the Utility's surface water infrastructure and natural resource assets are provided in this section.

Section 4- Accomplishments

The Utility's accomplishments in the last 9 years are described in this section.

Section 5 -Regulatory Framework

The regulatory framework, including Federal, State, and Local regulations under which the Utility operates are described in this section. Relevant changes to regulations that could impact the Utility are also discussed.



Section 6- Operations and Maintenance Program

The operations and maintenance program has unique responsibilities with the management of the City's infrastructure. Challenges and opportunities in the Operations and Maintenance Program are described in Section 8.

Section 7 – Surface Water Engineering

The roles and responsibilities of Surface Water Utility Engineering Division are described in this section. Challenges and opportunities for the Surface Water Utility Engineering Division are described in Section 8.

Section 8- Challenges and Opportunities

The current challenges and opportunities of the Utility are described here. Projects and strategies to address the challenges and opportunities are also described in this section.

Section 9- Capital Improvement Program

This section describes the current status of the surface water capital program, evaluation of new capital projects, prioritization scheme, and recommended projects for the next budget cycle and beyond.

Section 10 – Programmatic Actions

Recommended programmatic project priorities are described in this section, as well as an introduction to levels of service.

Section 11- Plan Implementation and Measuring Progress

An evaluation of levels of service, rate impacts, recommended implementation, and how to measure progress are described in this section.



Planning and Review Process

This Plan was developed through the input and participation of engaged City participants from multiple departments. Staff from Public Works Transportation, Parks and Community Services, Planning, Public Works Operations and Maintenance, Public Works Development Engineering, and Public Works Capital Improvements all provided valuable input and time to the planning process through participation in City stakeholder interviews, focused team meetings, and review of relevant documents.

Public Involvement and Equity

Feedback from the public and City Council was requested and received throughout the planning process.

Equity

Public involvement efforts sought to incorporate equity in the outreach process by:

- Translating fact sheets and outreach posters into Spanish, Chinese, and Russian.
- Attending community events intended for under-served communities (i.e. Community Health Fair, City Hall for All).

Survey

Community input on the Utility's priorities was solicited through a survey distributed via direct mail (sent to randomly selected residential Kirkland addresses) and electronic communications (social media and email newsletters). 177 responses were collected from the mailer and 112 responses collected from electronic communications. A summary of survey responses and results is provided in Appendix A.

Survey respondents most value clean water, wildlife habitat and connecting with nature in Kirkland's creeks and lakes. A majority participated in recreation activities near water (walking, running, hiking, biking, etc.) in the past year.

Pollution prevention and water quality in Kirkland's creeks, lakes and wetlands was the top priority of most respondents. Survey participants provided feedback on specific program actions that are important or very important to them including the following in which more than 70% of respondents responded positively with a high degree of importance:

- Increase enforcement to prevent pollution to local waterways.
- Increase efforts to repair and replace aging and failing stormwater pipes and structures.



- Utility Goals and Actions
- Alignment with City Council Goals
- Utility Organization and Operational Relationships

Utility Overview



Surface Water Utility Overview

Kirkland's Surface Water Utility focuses on an equitable and sustainable service model to provide storm and surface water service to the Kirkland community. The Utility is committed to ensuring their work fits within the respective City and Public Works Vision Statements.

City Vision Statement

Kirkland is one of the most livable cities in America. We are a vibrant, attractive, green, and welcoming place to live, work and play. Civic engagement, innovation and diversity are highly valued. We are respectful, fair, and inclusive. We honor our rich heritage while embracing the future. Kirkland strives to be a model, sustainable city that values preserving and enhancing our natural environment for our enjoyment and future generations.

Public Works Vision Statement

We are committed to the City's vision and the Department's mission. We play a vital role in making Kirkland livable, sustainable, and connected. We are City employees who take pride in being trusted stewards of the public's resources, infrastructure, environment, and quality of life.

We are one team with specialized divisions in multiple locations, operating in varying work environments and conditions. We apply best practices and innovation to continuously learn and improve. We are recognized for going above and beyond, and we celebrate our successes. When setbacks occur, we avoid blaming and shaming, and instead focus on what we learned, how we adapted, and how we will improve.

We strive for excellence in all aspects of our work. We are well trained, well equipped, responsive, collaborative, and are skilled problem-solvers. We operate with good intentions and exercise good judgment. We are respected regionally and nationally for quality and creativity.

We attract, value and keep diverse, talented employees. We create a workplace where employees feel a sense of belonging and are safe physically and emotionally. We provide training and development opportunities and generate meaningful employee interactions. We have leaders who are appreciative and dedicated to making a positive difference through our daily interactions with each other and with the public. **We make Kirkland the best reflection of ourselves.**



Goal:

Reduce flooding in Kirkland's streets and neighborhoods.

Primary Actions:

- Maintain and improve stormwater infrastructure to convey water when it rains.
- Respond to flooding calls with emergency personnel to alleviate the problem.
- Provide educational materials to businesses and residents to help prevent flooding and prepare for when flooding does occur.
- Provide technical assistance to businesses and residents to fix drainage and erosion issues on their property.
- Design and build new stormwater facilities in coordination with the Capital Improvements Division to manage flow and help prevent flooding.



NE 116th flooding.

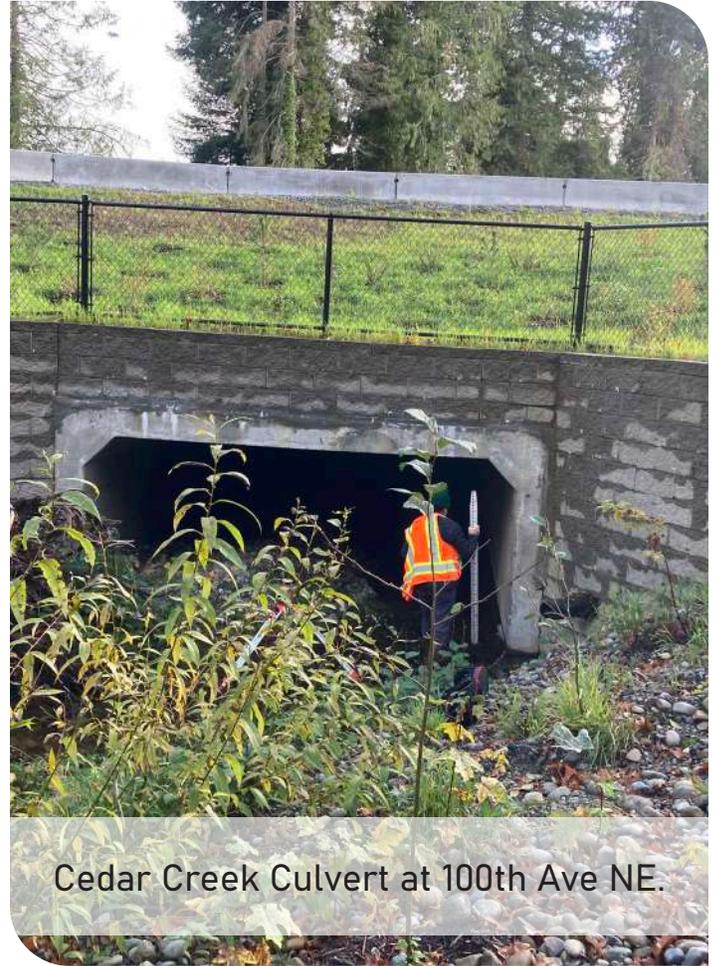


Goal:

Improve aquatic habitat conditions for fish and wildlife.

Primary Actions:

- Design and build in-stream habitat improvement projects including culvert replacements to improve fish passage and riparian restoration and management on publicly owned property to improve vegetation conditions.
- Partner with Green Kirkland Partnership to increase stewardship of open space and natural areas.
- Support urban forestry initiatives outlined in the Urban Forestry Plan.
- Monitor and assess the condition of Kirkland's streams and wetlands to understand current conditions and trends, and recommend improvements.



Cedar Creek Culvert at 100th Ave NE.

- Evaluate and purchase property with high natural resource value to enhance, preserve, and protect these resources and their buffers.
- Incentivize private property tree planting by providing rebates and certificates.



Goal:

Improve water quality in Kirkland’s creeks, lakes, and wetlands.

Primary Actions:

- Comply with the City’s National Pollutant Discharge Elimination System (NPDES) Permit, which focuses on management strategies to reduce the harmful effects of stormwater on creeks, lakes, and wetlands.
- Monitor and collect samples of water in creeks and lakes for pollutants to evaluate water quality.
- Measure biological characteristics, such as diversity and quantity of invertebrates (bugs) in creeks.
- Respond to spills to prevent pollutants from reaching the stormwater system. When pollutants do reach the stormwater system, clean the system to minimize impacts.
- Work with businesses and residents to reduce sources of pollution and prevent discharges to the stormwater system.



Sampling for bugs in Juanita Creek.

- Inspect and clean stormwater treatment facilities, catch basins, and maintenance holes so they function properly and minimize pollution.
- Plan and construct water quality treatment and flow control facilities to serve existing neighborhoods that were developed without these important protections (stormwater retrofit planning).





Goal:

Ensure proper operation of public and private stormwater infrastructure.

Primary Actions:

- Operate and maintain the City's stormwater conveyance infrastructure (i.e., pipes and ditches).
- Operate and maintain the City's stormwater treatment facilities such as ponds, vaults, rain gardens, Filterras™, and bioretention facilities.
- Design and build stormwater infrastructure projects to repair, replace, or improve infrastructure.
- Support street sweeping, detention pond maintenance, and roadwork following stormwater infrastructure repairs.
- Inspect private stormwater infrastructure and low impact development and require maintenance of these facilities when needed.
- Map new and updated stormwater infrastructure to maintain an up-to-date Geographic Information System (GIS) layer.



Looking down into catch basin structure.



Goal:

Educate and engage our community.

- Conduct surface and stormwater education and outreach.
- Support outreach and public engagement for stormwater capital projects.

Primary Actions:

- Increase awareness of surface water issues.
- Support stewardship of open spaces with the Parks and Community Services Department and Planning Department.
- Encourage behaviors that protect our surface waters.
- Collaborate with regional partners to implement Puget Sound-wide education and outreach campaigns.
- Create opportunities for community participation in stormwater management through private incentive programs and community outreach and stewardship opportunities.

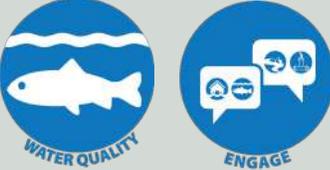


Surface water outreach booth.



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Alignment with City Council Goals

City Council Goals	Relevant Utility Goals	Example Program
Inclusive and Equitable Community		The Utility provides spill control equipment to residents and businesses who request them.
Vibrant Neighborhoods		The Utility offers natural yard care classes and incentive programs for communities to get involved.
Abundant Parks, Open Spaces, and Recreational Services		Through support of Green Kirkland Partnership and the Environmental Program Coordinator, the Utility ensures Kirkland’s open spaces and natural environment are preserved and protected for the community.
Sustainable Environment		The Utility monitors the condition and ecological health of Kirkland’s streams and wetlands.
Thriving Economy		The Utility support the business community by conducting face-to-face outreach and providing technical assistance to prevent pollution.
Dependable Infrastructure		The Utility maintains and operates stormwater infrastructure to optimize useful life.

Utility Organization and Stormwater Organizational Relationships

The Utility is located within the Public Works Department with most staff within two primary divisions highlighted in yellow in the organizational chart on the next page; Surface Water Program (also called the Engineering Division) and the Operations and Maintenance Division. These two divisions provide the majority of the storm and surface water utility functions. Learn more about these divisions in Chapters 6 and 7. The Utility also works closely with and funds positions in other City departments or work groups for activities that directly benefit surface water including:

- Streets and Grounds Division crews including but not limited to street sweeping, detention pond maintenance support, and roadwork following stormwater infrastructure repairs.
- The Environmental Program Coordinator (formerly Urban Forester) position in the Planning and Building Department to align urban forestry with surface water goals.
- A Program Coordinator position within Green Kirkland Partnership in the Parks and Community Services Department to provide stewardship of open space and natural areas.
- A Planner position that supports facilitation of land use code updates.



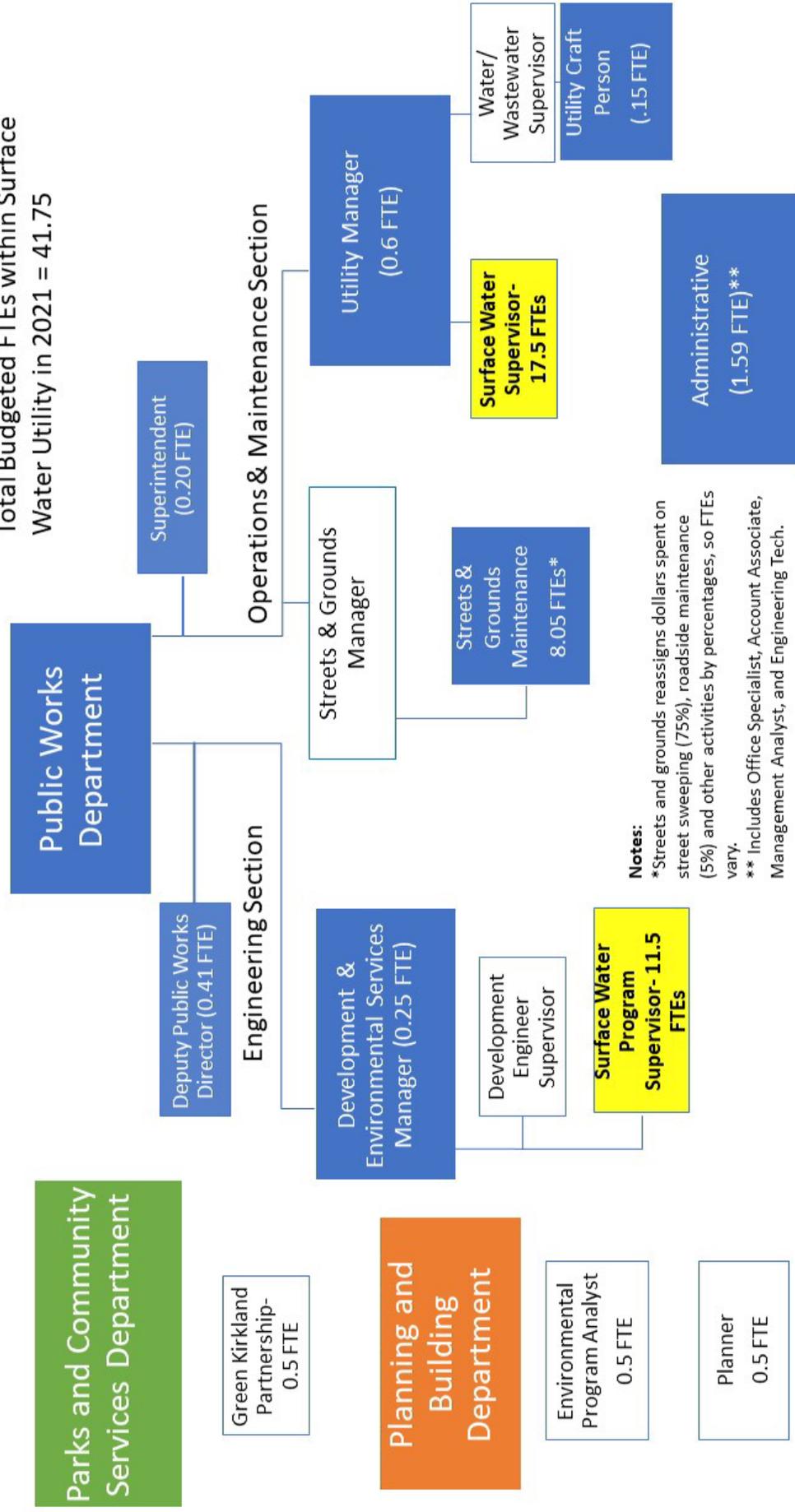
The Utility supports Green Kirkland Partnership stewardship activities.

In addition to supporting these activities, the Utility also works closely with other Divisions to provide storm and surface water functions. These include:

- Prioritizing capital projects for implementation (Capital Improvement Division) .
- Facilitating compliance with the Western Washington Phase II National Pollutant Discharge Elimination System Permit (NPDES Permit).
- Supporting review of private development for stormwater requirements (Development Group).



Total Budgeted FTEs within Surface Water Utility in 2021 = 41.75



Notes:

*Streets and grounds reassigns dollars spent on street sweeping (75%), roadside maintenance (5%) and other activities by percentages, so FTEs vary.

** Includes Office Specialist, Account Associate, Management Analyst, and Engineering Tech.



Surface Water Assets

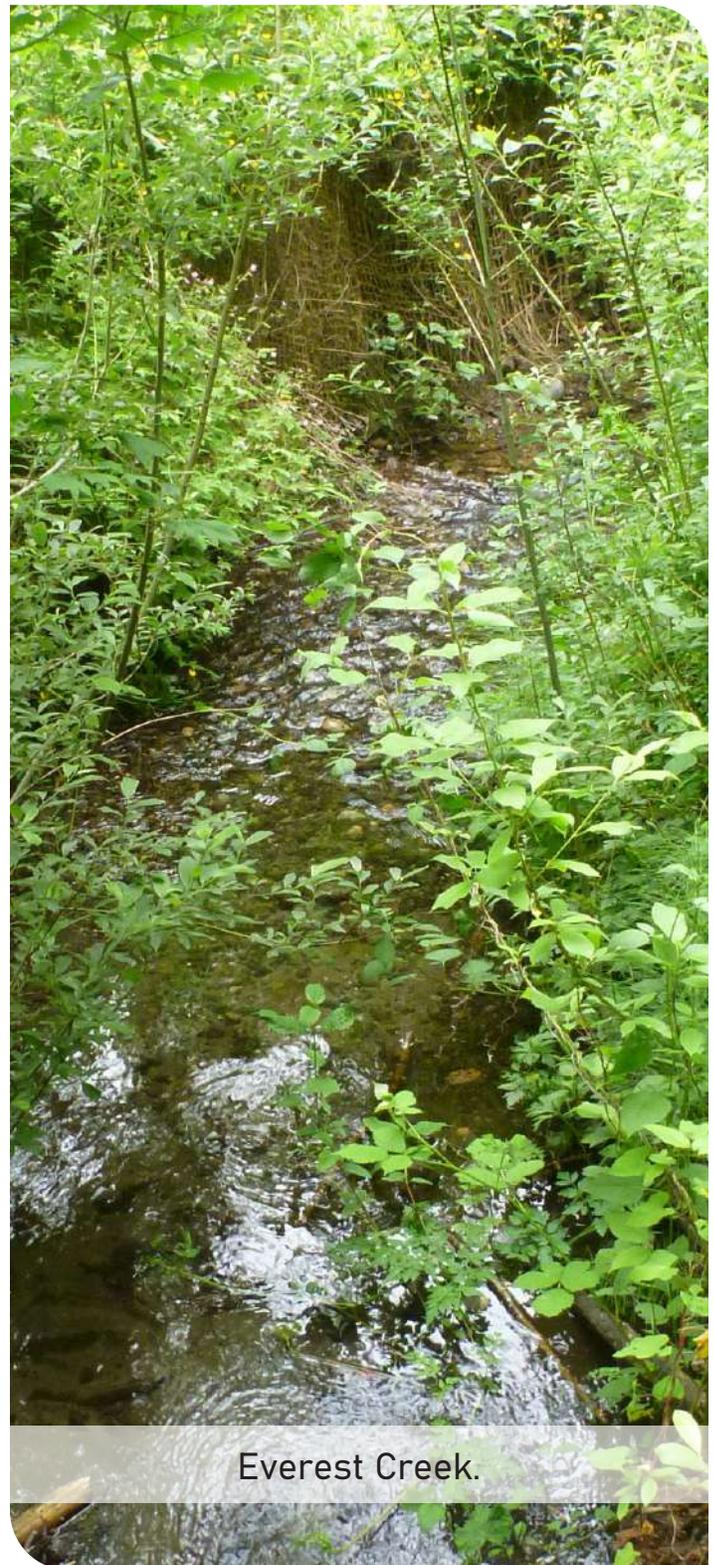
- Surface Water Drainage Basins
- Parks/Open Space
- Stormwater Infrastructure



Surface Water Assets

The Utility plans management activities for all surface water assets within Kirkland. These assets include both stormwater assets and natural features. When using the term stormwater, we are referencing the system of catch basins, vaults/tanks, low impact development, and pipes that collect and move rainwater. The natural features that receive the stormwater include wetlands, streams, or lakes. Collectively all the water is considered surface water.

The City's on-line interactive GIS mapping tool (<https://maps.kirklandwa.gov/Html5Viewer/>) provides information about City assets, including the surface water asset mentioned above.



Everest Creek.

Drainage Basins and Natural Resources



Surface Water Assets



2023 Surface Water Master Plan

Surface Water Drainage Basins

There are 11 primary drainage basins in the City that convey water to Lake Washington, as shown on the map on the previous page. Small portions of the City on the eastern and northern edges are tributary to the Sammamish River and the cities of Redmond, Woodinville, Bothell, and Kenmore. Watershed report cards in Appendix B describe basic conditions of each of the drainage basins. There are over 46 miles of open stream channels and 420 acres of wetlands in Kirkland.

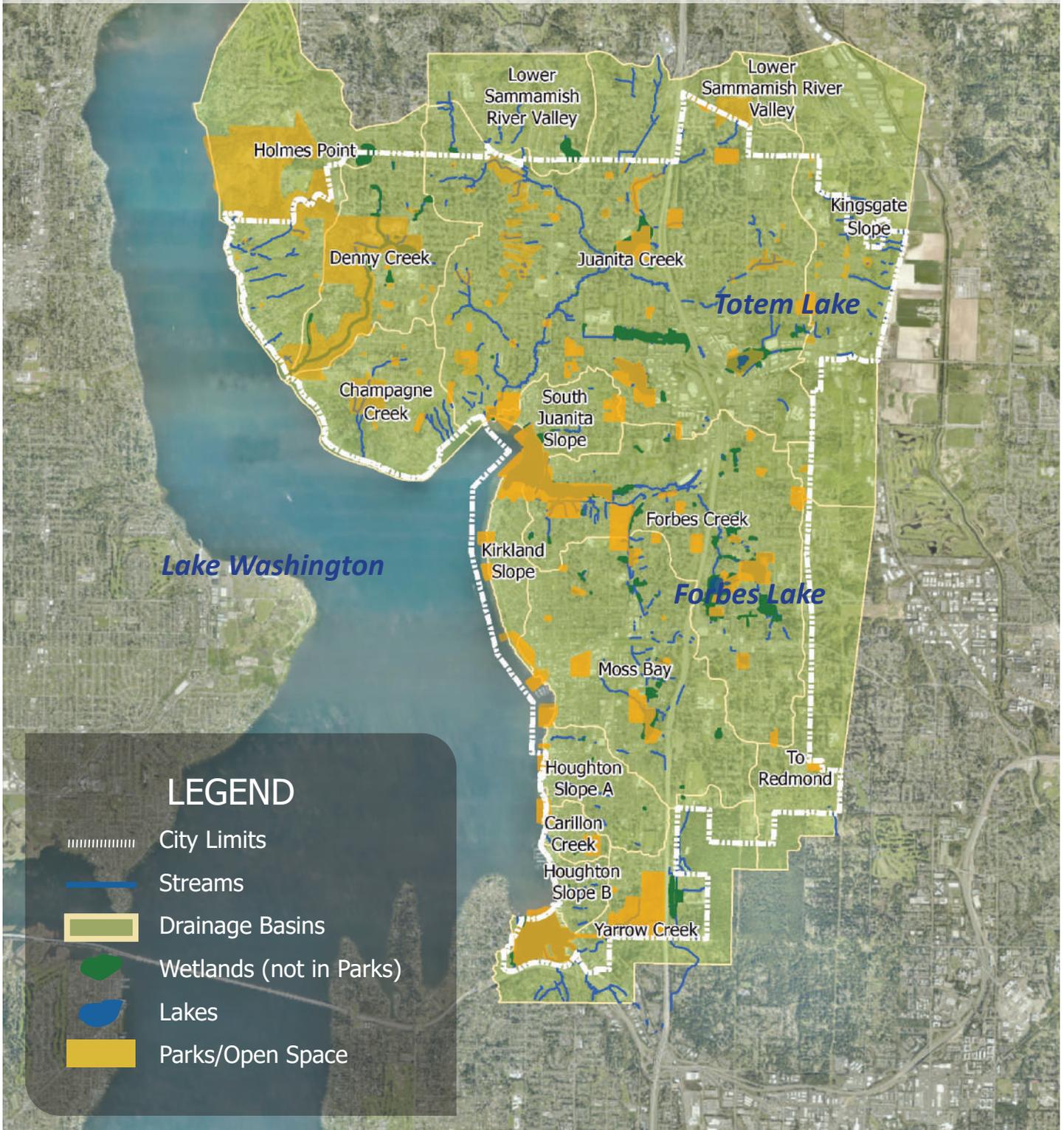


Cutthroat Trout in Juanita Creek.



Denny Creek.

Parks and Open Spaces



Surface Water Assets

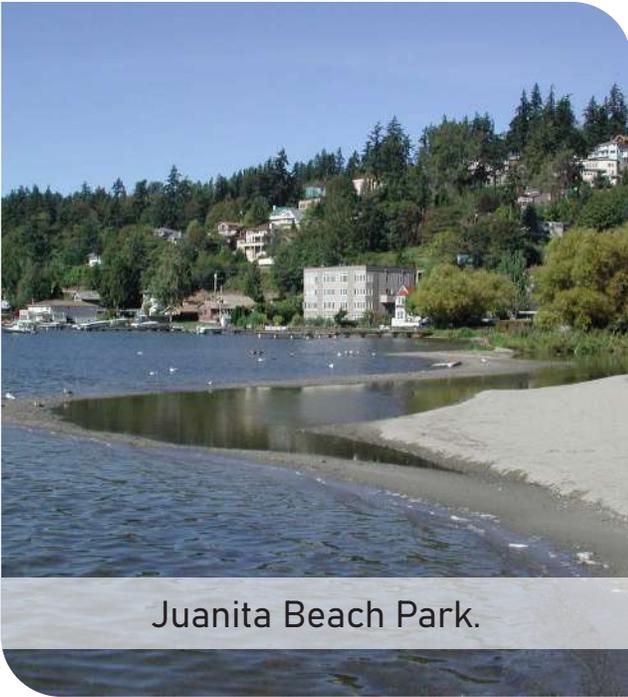


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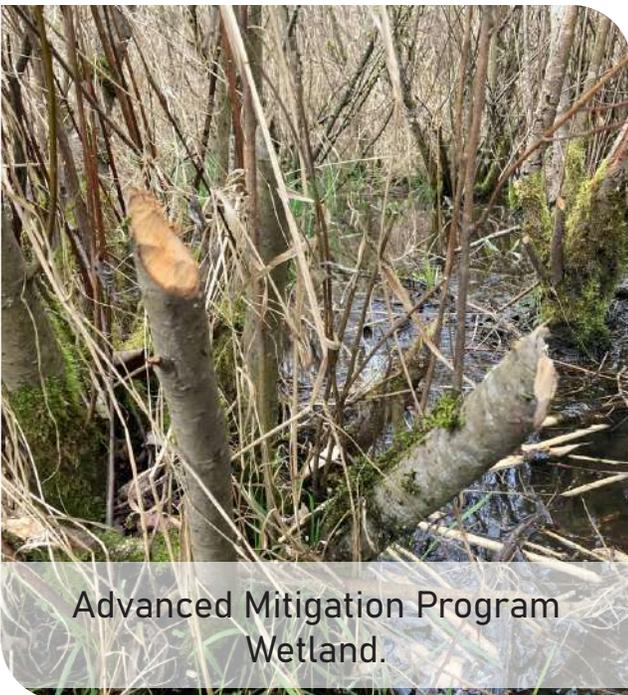
Parks/Open Space

Kirkland manages 2,012 acres of Parks and Open Space for recreation and natural resource benefits. The Utility works in partnership with other Divisions and Departments to support management of these areas. Photos on this page give examples of the varied parcels. Approximately 706 acres are not zoned as parks, but owned by the City and operated as open space or natural areas. Many of the City's streams and wetlands are protected in city-owned property as shown on the preceding map.

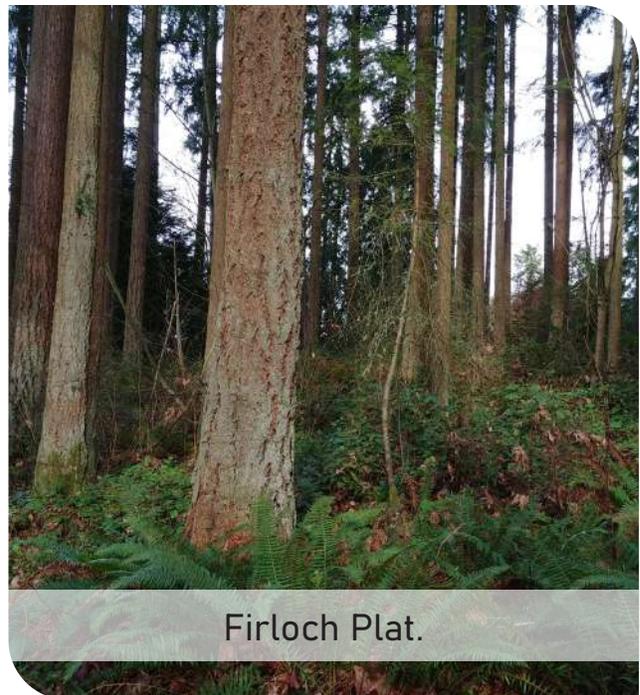
Note: most wetlands are protected in City-owned park or open space parcels and are therefore obscured by depiction of parks/open space on the preceding figure.



Juanita Beach Park.



Advanced Mitigation Program
Wetland.



Firloch Plat.

Stormwater Infrastructure

Kirkland is responsible for operation and maintenance of infrastructure owned by the City. Additionally, the Utility is responsible for private facility inspection to ensure that private facilities connected to the public system are operated and maintained in a way that doesn't negatively impact the public system.

The table below summarizes public and private stormwater assets as of 2020. Public conveyance, detention ponds, and stormwater facilities are shown in the figure on the following page.

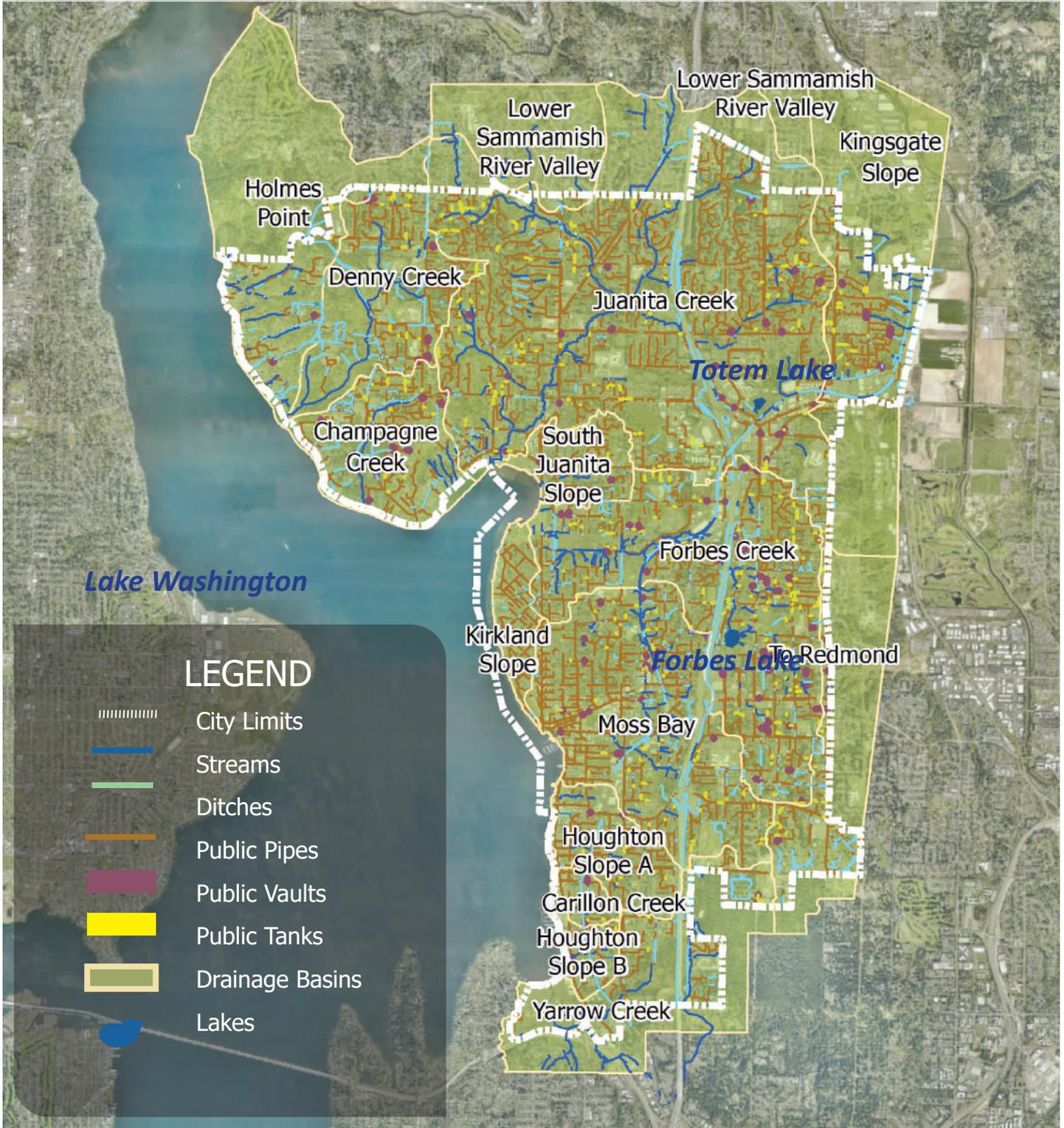
Stormwater Asset	Units	Public	Private
Catch basins and maintenance holes ¹	Structures	17,093	11,532
Stormwater facilities (tanks, vaults, Stormfilters™)	Facilities	693	908
Detention ponds	Facilities	~55	~15
Ditches and swales	Miles	34.7	27.5
Pipes and Culverts ²	Miles	266.2	120.9
Public streets	Miles	251.6	Not applicable

¹Public catch basins and maintenance holes include structures that are currently under bond but will be eventually owned and maintained by the City.

²Public pipes include pipes identified as owned by City of Kirkland, Kirkland Facilities, and Kirkland Parks. Pipes owned by other jurisdictions are not included in the total length reported.



Stormwater Assets



Surface Water Assets



Accomplishments

4

Accomplishments

- Educate and Engage our Community
- Protect Stormwater Infrastructure
- Reduce Flooding
- Improve Aquatic Habitat
- Improve Water Quality



2023 Surface Water Master Plan

Accomplishments

The Utility has accomplished a lot since the adoption of the 2014 Surface Water Master Plan. That plan focused primarily on the management of the annexation area and challenges with new infrastructure being added to the City's inventory. Since then, staff in the Engineering and Operations and Maintenance Division have worked collaboratively to meet the Utility's goals. The accomplishments highlighted in this section represent just a few of the many successes achieved.

Educate and Engage our Community



ENGAGE



HABITAT



WATER QUALITY



FLOODING

Yard Smart:

Yard Smart Rain Rewards is an exciting program that empowers Kirkland homeowners to help keep polluted rainwater runoff out of Lake Washington. In qualified locations, residents can take advantage of free technical assistance and rebates to install beautiful projects like rain gardens, native landscaping, and cisterns on their property to manage rainwater runoff. Since 2019 Kirkland has partnered with residents to install 69 projects that collectively manage almost 800,000 gallons of rainwater runoff each year.



Native Landscaping.



Pet Waste:

More than 20,000 dogs of all shapes and sizes live in Kirkland. Kirkland provides free pet waste stations for homeowner associations, neighborhood associations, and homeowners to help encourage proper disposal of pet waste. Kirkland also implements our unique pet waste flagging program when issues arise in neighborhood parks. This flagging program has reduced un-scooped pet waste in parks by 60-80%.



Flagging program at Juanita Beach Park.



Natural Yard Care:

By making some simple changes in how we care for our yards, we can have great looking landscapes that are easier to care for and healthier for families, pets, wildlife, and our environment. Kirkland offers both hands-on and lectured-based natural yard care classes for residents. In these classes, participants learn environmentally-friendly gardening and lawn care practices that reduce stormwater runoff and are better for the health of our local waterways and ourselves. This class series is offered 4-6 times throughout the year.



Protect Stormwater Infrastructure



Cross Kirkland Corridor:

This 5.75-mile trail corridor through the heart of Kirkland is lined with many miles of ditches and culverts. Managing vegetation and maintaining conveyance along the trail requires significant annual maintenance. This work allows for year-round public enjoyment of this trail.



Ditch maintenance work on the Cross Kirkland Corridor trail.

Accomplishments



2023 Surface Water Master Plan



Overlay:

The Surface Water Operations and Maintenance Division is instrumental in helping the Streets Division and Capital Improvement Division prepare for the seasonal streets asphalt overlay program. This allows the City to efficiently rehabilitate streets and prevent future patching. From 2016-2022 staff have rehabilitated 286 catch basins, 63 maintenance holes, and 36 pipes.



Continuity of Service:



As we all know, 2020 brought incredible changes. The Surface Water Operations and Maintenance Division stepped up to the challenge, rearranged their schedules and service delivery, and provided continuous service to the residents throughout the pandemic while keeping themselves and the public safe. Highlights include the inspection of over 16,000 catch basins and maintenance holes, cleaning ~1,000 of those assets per year or as inspection indicated cleaning was needed, inspection of 662 facilities every year, and seasonal weekly checks of 172 spots where debris tends to build up before and after storms in the rainy season.



Vactor truck and crew at work.

Reduce Flooding



Comfort Inn Bypass:

The City of Kirkland constructed the Comfort Inn Stormwater Bypass project to reduce flooding of Totem Lake Boulevard. The existing, undersized 12-inch diameter pipe received runoff from approximately 58 acres of contributing area. The Comfort Inn Bypass Project rerouted 40.3 acres through the newly constructed bypass system.



Comfort Inn bypass at Totem Lake.



Flood Preparedness Outreach:



Kirkland is experiencing more frequent and more intense rainstorms. In response, staff developed new flood preparedness materials in 2021. 1,500 households near areas with recent flooding issues received an educational mailer. The mailer detailed why we're seeing heavier storms and more flooding in the City, how the City is preparing for more intense storms, and described how individuals can prepare for storms to reduce flooding impacts.



Neighborhood flooding.

Accomplishments





Goat Hill Phase I:

The Goat Hill Phase 1 project constructed a reliable and safe conveyance system on the lowest portion of a steep neighborhood, known as Goat Hill. The project constructed the stormwater system near the bottom of the hill to an outfall near Lake Washington.



This appropriately sized and sited series of pipes is expected to reduce upstream erosion and reduce flooding concerns. This system was designed to receive runoff from future Goat Hill stormwater conveyance system that will move water from nearly 36.5 acres of upstream residential and right-of-way area.



Goat Hill Phase 1 project conveyance system.

Improve Aquatic Habitat



Advanced Mitigation Program:

This unique cross-departmental project supported the restoration of approximately 5 acres of wetland and stream buffer habitat in Juanita Bay Park, near the outlet of Forbes Creek. The advanced restoration of this area will improve the ecological function of this critical natural resource for the City as well as reduce the cost of mitigation for public transportation and parks projects by serving as a location where credits can be 'purchased' for construction impacts at lower functioning natural areas throughout the City in coming years.



Advanced Mitigation restoration.



Advanced Mitigation Program wetland.

Accomplishments





100th Ave and Juanita Creek Culvert Replacement:



Preceding the 100th Ave NE roadway project, Kirkland removed a fish passage barrier culvert at Juanita Creek and 100th Ave NE in 2021. This culvert was in poor condition, and presented a win-win opportunity to support

multiple Surface Water Utility goals by not only removing an aging system, but providing environmental enhancements including installation of a fish passable culvert to open 5,200 feet of stream as well as establishing 1,200 native trees and shrubs and 164 pieces of large woody debris to improve aquatic and riparian habitats.



Environmental enhancements associated with 100th Ave NE culvert replacement.



Tree Planting Rebate Program:



Trees help prevent flooding in our neighborhoods, provide shade for our homes and help filter pollutants to provide clean water for Lake Washington. The Surface Water Utility initiated



a grant funded tree planting rebate program in 2021. Kirkland provides rebates or certificates up to \$150 per tree, with a maximum total of \$500 per property. As of December 2022, the program has 106 participants who have planted 362 new trees.



New tree planted as a result of tree rebate program.



Stream Habitat Data Collection:

In 2020, Kirkland began gathering in-stream and stream buffer habitat condition data. This includes measurements for bank-full width, thalweg (deepest part of the channel) depth, woody debris, and vegetation coverage. Staff also collect observations on bank condition, habitat complexity, potential fish barriers and noxious weed presence. This data is helping provide a comprehensive snapshot of stream conditions and will support decision-making on where to focus future restoration efforts.



Collecting stream data.

Improve Water Quality



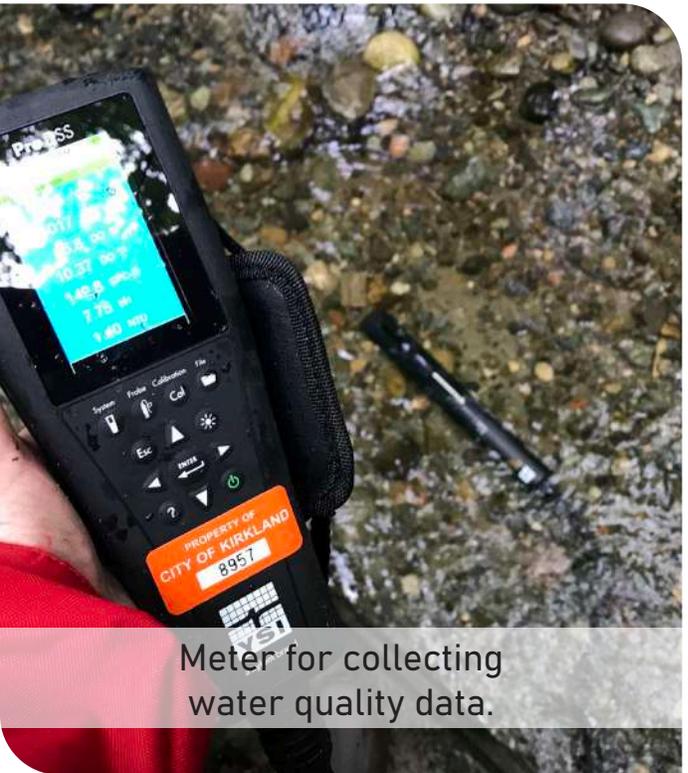
Water Quality Monitoring:

Monthly water quality monitoring at 16 permanent locations in streams throughout the city began in 2020.



Staff measure for temperature, dissolved oxygen, pH, conductivity, and turbidity. Quarterly samples are also collected for lab analysis

for nutrients and metals. This data created a baseline water quality condition for Kirkland streams and is informing our newly developed Watershed Health Dashboard.



Meter for collecting water quality data.



Accomplishments



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132nd Square Park Infiltration Vault:

The construction of a large stormwater retrofit facility and the concurrent renovation of park facilities at 132nd Square Park is an example of the collaborative potential of stormwater projects. Kirkland was successful in achieving a multi-million-dollar grant to slow down, clean, and infiltrate almost 50 acres of stormwater. This grant helped catalyze a larger construction project that will achieve amenity improvements for the park as a whole. Photos below show the project during construction. The graphic at the end of the photo sequence shows the location of the vault relative to the field.





Business Inspection through Pollution Prevention Assistance Program:

Since 2013, Kirkland has provided technical assistance and support accessing financial resources to our local business community for pollution prevention activities. This work helps prevent pollution from entering the stormwater system and supports appropriate storage and disposal of hazardous waste, which reduces risk and liability for businesses. Kirkland provides this assistance solely through a Department of Ecology grant program known as the Pollution Prevention Assistance Program, which has allowed the city to visit and support hundreds of businesses, conducting over 650 visits in that time.



Business inspection with spill kit delivery.

Accomplishments





Stormwater Design Manual Adoption:

Under the NPDES permit, the City is required to adopt a new stormwater design manual every permit cycle. Since the last Plan, the City has adopted two new stormwater design manuals. These manuals contain the design and construction standards and requirements related to surface water, as well as best management practices for reducing pollution to surface water. New versions of the manuals were adopted in 2016 and 2022. Each of these design manual adoptions have led to an increased level of environmental protection that will assist in improving water quality and stream habitat.



Dry well installation at new construction.

Regulatory Context

- NPDES Program 2019-2024 Permit
- Underground Injection Control (UIC) Program
- The Federal Endangered Species Act (ESA)
- Fish Barrier and Tribal Treaty Rights
- Land Use Policies and Regulations related to Surface and Stormwater



Regulatory Framework

The Surface Water Utility must comply with local, state, and federal regulations and permits. Some are directly applicable to the work the Utility does, and others are more tangential. This section provides an overview of updates and changes to the City’s surface water regulatory obligations, compliance approach and expected future changes. A detailed description of regulations and permits are provided in Appendix C.

NPDES Program 2019–2024 Permit

The NPDES Western Washington Phase II Permit (NPDES Permit) requires the City to develop several programs to address the variety of issues associated with stormwater runoff. The regulatory components are included within the City’s annual Stormwater Management Program Plan, a complementary plan that narrowly focuses on NPDES Permit requirements. The most recent plan, along with the most recent annual report can be found under the NPDES Stormwater Permit section on [Kirkland’s Stormwater Website](#). The NPDES Phase II Permit specifies requirements for the following:

- Stormwater planning.
- Public education and outreach.
- Public involvement and participation.
- Municipal separate storm sewer system (MS4) permit mapping and documentation.

- Illicit discharge detection and elimination (IDDE).
- Controlling runoff from new development, redevelopment, and construction sites.
- Municipal operations and maintenance.
- Source control.
- Compliance with Total Maximum Daily Load (TMDL) requirements.
- Monitoring and assessment.
- Reporting requirements.

NPDES Phase II permits are updated every 5 years. Each permit update includes new management requirements.

Underground Injection Control (UIC) Program

The UIC program is a federal program developed to protect underground sources of drinking water by regulating surface discharges to the ground. In Washington, the UIC program is administered by the Department of Ecology. [Ecology's UIC program](#) has design, registration, and maintenance requirements that impact stormwater facilities that are designed to infiltrate water. Details can be found in the [2019 Stormwater Management Manual for Western Washington](#).

Underground stormwater injection wells are increasingly being used, where feasible, as a stormwater management technique. Stormwater facilities that infiltrate must now meet certain design, registration, and inspection criteria.

Regulatory Context



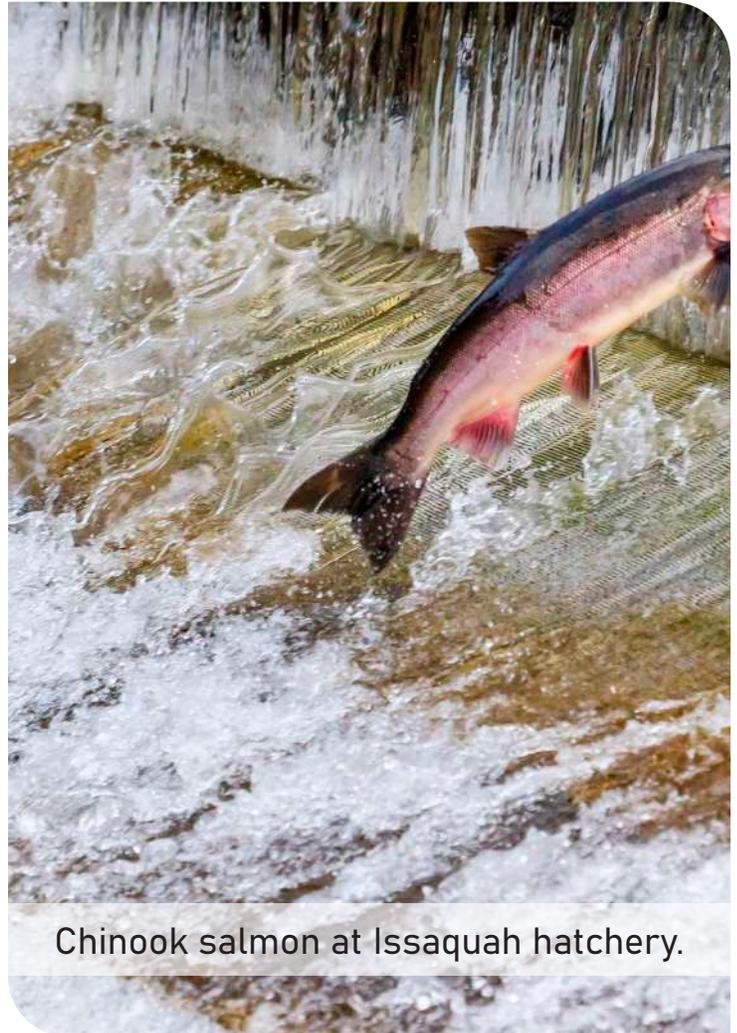
Geotechnical drilling is conducted for subsurface investigations and for underground stormwater injection well installation.



The Federal Endangered Species Act (ESA)

The ESA is intended to protect threatened or endangered species from extinction. Among many species listed under the ESA, two of them are present in watersheds in and around Kirkland. Puget Sound Chinook salmon and Puget Sound steelhead are listed as threatened species. The law requires protection for critical habitat areas, the development and implementation of recovery plans for listed species, and in no “taking” of listed species. Stormwater management activities must also comply with this law if a project triggers a federal nexus, such as a federal permitting requirement or use of Federal funds.

Kirkland participates in the Watershed Resource Inventory Area (WRIA) 8 – Lake Washington, Lake Sammamish Salmon Recovery Council as part of ESA compliance.



Chinook salmon at Issaquah hatchery.

Fish Passage Barriers and Tribal Treaty Rights

In March 2013, the U.S. District Court ruled that Washington State was not fulfilling obligations to remove barriers that impede fish movement and thus is violating Tribal treaty fishing rights. This has become known as the “culvert case,” and required the State to accelerate its program to upgrade and replace State-owned culverts. The injunction ruling only applies to State-owned or maintained barrier culverts and does not require correction of barrier culverts owned or

maintained by local governments or other public or private entities.

Kirkland has proactively assessed and prioritized most City culverts as part of the 2014 Surface Water Master Plan Update. The City continues to replace priority fish passage culverts as resources are available.

Land Use Policies and Regulations Related to Surface and Stormwater

There are multiple land use policies and regulations that intersect with surface and stormwater management.



“Smart Growth” Policy in action — Totem Lake mall redevelopment.

Growth Management Act (GMA) and Comprehensive Plan Update (Kirkland 2035 Project)

The GMA requires Kirkland to accommodate growth while developing policies and regulations that protect the functions and values of critical areas. Managing growth while protecting resources is challenging, but also represents an opportunity for the Utility to participate in area/neighborhood planning to ensure that stormwater needs are considered. The Comprehensive Plan is intended to be a 20-year document. The next plan update began in 2022 with a target horizon year of 2044 ([Kirkland 2044 Comprehensive Plan Update](#)). The Comprehensive Plan will be identifying areas to focus 2019-2044 projected



housing and job targets. In the Comprehensive Plan, Kirkland conducts neighborhood planning by using “smart growth” principles.

The City’s smart growth policies will continue to see growth concentrated in urban centers (Totem Lake, Downtown, Station Area, etc.) to preserve lower density neighborhoods, environmentally sensitive areas, and reduce greenhouse gas emissions.

Shoreline Management Program

The Shoreline Management Act requires local governments to develop shoreline management programs that protect the public interest associated with shorelines of the state while, at the same time, recognizing and protecting private property rights consistent with the public interest. City stormwater outfalls often intersect shoreline areas and trigger Shoreline Management Act considerations.

Kirkland Land Use Codes and Regulations

Land use and activities conducted in Kirkland directly affect surface water and stormwater management through the creation of impervious surfaces and expansion of pollution-generating activities. The City’s development code is designed to ensure that development is carried out in locations and methods that are safe, do not negatively impact public resources, and fit in within the overall context of the city’s neighborhoods. Surface water management design standards are included in KMC Chapter 15 in addition to the following Kirkland Zoning Code sections that also impact surface water:

- Chapter 15.52 – Surface Water Management
- Chapter 85 – Critical Areas: Geologically Hazardous Areas
- Chapter 110 – Required Public Improvements
- Chapter 90 – Critical Areas: Wetlands, Streams, Minor Lakes, Fish and Wildlife Habitat Conservation Areas, and Frequently Flooded Areas
- Chapter 95 – Tree Management and Required Landscaping
- Chapter 105 – Parking Areas, Vehicle and Pedestrian Access, and Related Improvements
- Chapter 114 – Low Impact Development



Operations and

Maintenance



Operations and Maintenance Program

Surface Water Operations and Maintenance Division Storm Crew (Storm Crew) accounts for over 40% of the full time equivalent (FTE) staff funded by the Surface Water Utility. This group includes 17.5 staff positions. Streets and Grounds staff, also in Public Works, provide additional staff resources (up to 20% of the total FTEs funded by the Utility) that contribute to the Utility operations and maintenance program. The types of activities conducted by these groups are essential for ensuring optimal functionality of the City's stormwater system and to preserve infrastructure so it lasts for its predicted lifespan.

The Storm Crew's most significant responsibilities include:

- Infrastructure inspection and cleaning.
- Ditch maintenance.
- Repair and maintenance.
- Flood response.
- Spill response.



Example of ditch maintenance work in progress.

The Storm Crew facilitates and coordinates activities with other work groups, such as cleaning and inspecting stormwater pipes ahead of street overlay work by the CIP Division. This is done to identify and fix pipe, catch basin, and maintenance hole deficiencies before street paving to avoid tearing out newly placed pavement, if infrastructure issues are identified later.

The City's NPDES Phase II Municipal Stormwater Permit requires certain activities be completed at the frequency and schedule described in the permit — including bi-annual catch basin inspection and annual city-owned stormwater facility inspection and follow-up maintenance.

The Streets and Grounds Division supports the Utility by:

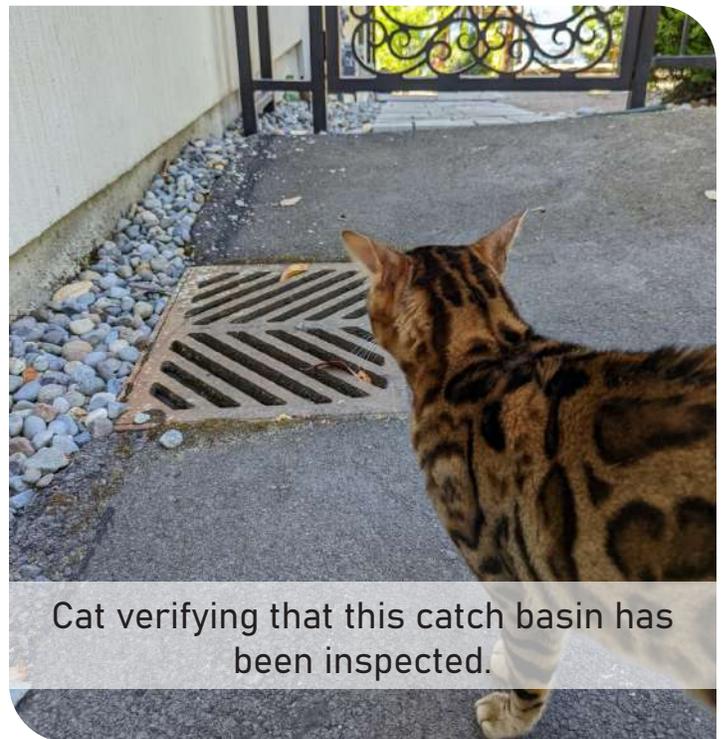
- Street sweeping.
- Road repair after stormwater infrastructure repair or replacement projects are completed.

- Inspection and maintenance of vegetated facilities such as Filterras™ and rain gardens.
- Detention pond vegetation control.
- Right-of-way tree inspection and maintenance.

Infrastructure Inspection and Cleaning

The Storm Crew conducts catch basin and maintenance hole inspection and cleaning to meet NPDES requirements. This represents a significant portion of the workload for Storm Crew staff. The workload has been increasing since NPDES requirements ramped up in 2014, and the Utility's catch basin inventory has increased (over 1,500 new city-owned catch basins added since 2014). A staffing analysis (Appendix D) was conducted to evaluate staffing needs based on historical labor hours spent on different operations and maintenance activities and workload trends. In general, the data showed increasing numbers of hours being spent on cleaning, inspection, and spill response since 2017.

The dedicated Surface Water Closed Circuit Television (CCTV) truck is rarely idle. Staff estimate that 20% of its time is spent on the pavement overlay program and the remainder of the time is spent on service requests, and infrastructure condition assessment, with about 6 - 8 % of the time being spent on unique



stormwater pipes being assessed each year. The Storm Crew also uses CCTV to investigate drainage complaints, evaluate system issues, and follow-up on repairs made by contractors.





Ditch Maintenance

Ditch maintenance tasks include inspection, mechanical and hand cleaning, and beaver dam management. Ditch inspection and maintenance has expanded in the last 8 years, since ditch maintenance was historically under-resourced, and the 2011 annexation area resulted in greater numbers of ditches being added to the City's inventory. Additionally, the condition of infrastructure in the annexed area is in worse condition than originally assessed.

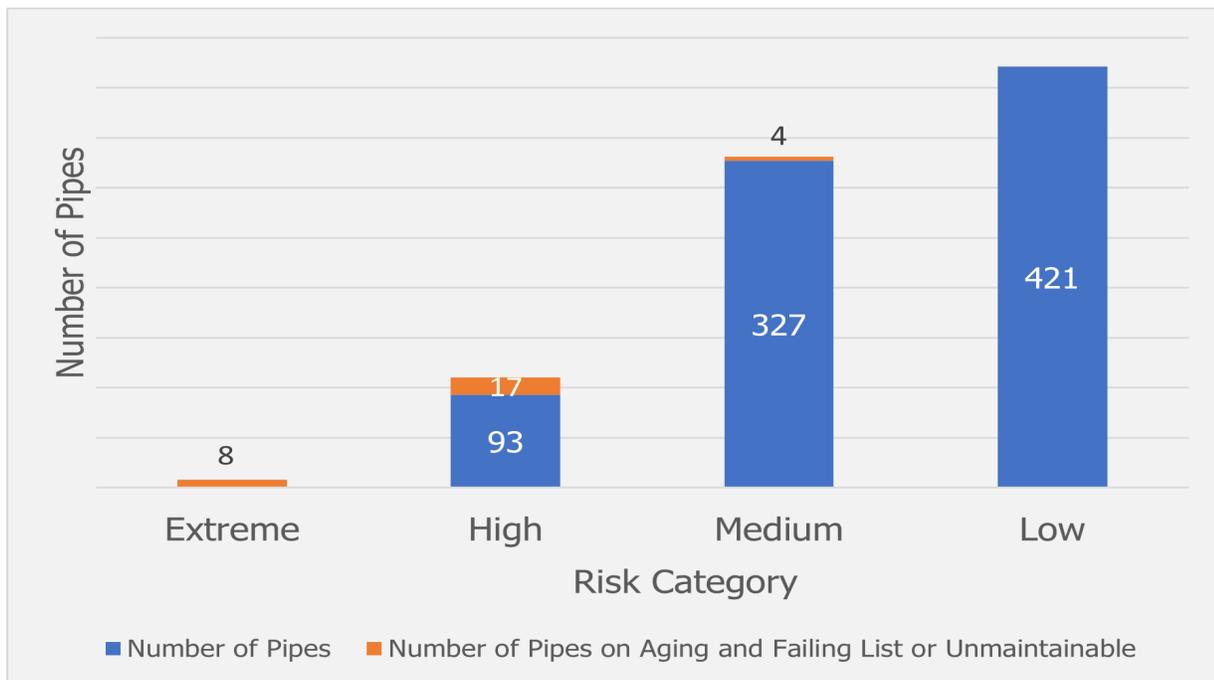




Repair and Maintenance



Repair and maintenance includes installation, repair, and rehabilitation of stormwater infrastructure. The NPDES Phase II Permit requires the Utility to fix catch basins, maintenance holes, and facilities within 6 months to 1 year if it's anticipated to cost under \$25,000. As the system continues to age, a renewed focus on infrastructure will require staff resources to oversee needed repairs and maintenance of existing stormwater assets. There are many pipes identified on the Utility's aging and failing list that require repair or replacement. In addition, other pipes were identified as potential candidates for repair and replacement due to their risk based on criticality and potential likelihood of failure in the pipe evaluation conducted during this planning process (Appendix E). The table below summarizes the condition of the public pipes that have been assessed.



Pipes identified as extreme and high risk have known defects, are on the aging and failing pipe list, or are not maintainable. These are the pipes at the top of the list for repairs.

Note: Less than 50% of the pipes have been video inspected in the last 5 years at the time of this evaluation.





Flood Response

Flood response is mostly weather-dependent. The Storm Crew has a list of 178 locations on its watch list for flood response. These locations are inspected regularly throughout the wet season and maintained or cleared of debris to allow for optimal conveyance of water. Other activities that the Storm Crew does to prepare for flooding includes additional street sweeping, setting up sand bag filling stations, and staffing a 24-hour hot line prior to predicted large storm events. It is expected that maintenance associated with flood response will increase because the frequency and intensity of storm events is increasing.



Storm Crews plan for rain events by clearing debris in advance, and responding to calls when flooding occurs.



Spill Response

Water quality calls have increased dramatically since calls started being tracked in 2009. The calls increased from 21 in 2009 to 333 in 2021. Operations and maintenance crews work collaboratively with Surface Water Engineering to address water quality complaints. The Storm Crew responds to reported spills that enter the stormwater system and cleans out pollutants from the system. Depending on the situation, spill response requires a eductor truck, street sweeper, and crews to operate.



Street Sweeping

The Utility pays for 75% of street cleaning conducted by Streets and Grounds. The labor hours for street cleaning are nearly 2 FTEs annually for the last four years on record. In addition to routine street sweeping, streets are cleaned following spills.



Street sweepers are especially helpful in the fall to keep drains clear. This is an important part of flood reduction. Kirkland residents do their part by picking up leaf litter on their properties and adjacent roads.



Fall leaves clog storm drains.





Road Repair

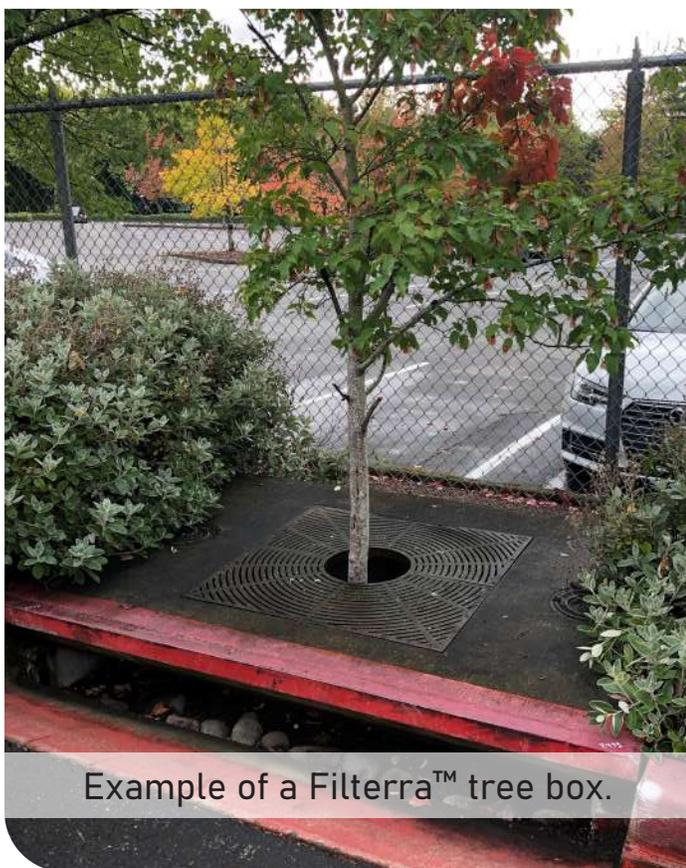
The Utility pays for street repair including hot patch, patch sealing, and saw cutting for stormwater infrastructure maintenance and repair activities.



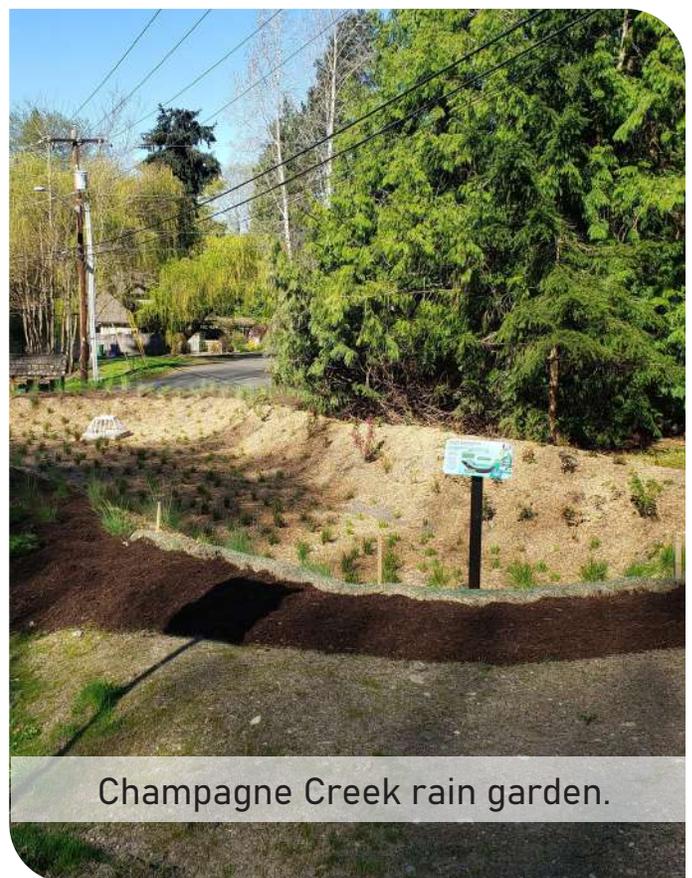
Vegetation Facility Maintenance

Streets and Grounds is responsible for maintaining vegetated surface water facilities including rain gardens (including bioswales), Filterras, and detention ponds. Kirkland has approximately 22 rain gardens, 40 Filterra™ stormwater treatment facilities, and 55 detention ponds. As the Utility continues to construct more rain gardens and vegetated facilities, additional resources and specialized skills can be expected for maintenance.

Routine detention pond maintenance, such as summer pond mowing, is conducted jointly by the Storm Crew and the Streets and Grounds Divisions. Resources and time spent on detention pond maintenance has been relatively consistent in the past several years since there have been no new detention ponds constructed.



Example of a Filterra™ tree box.



Champagne Creek rain garden.

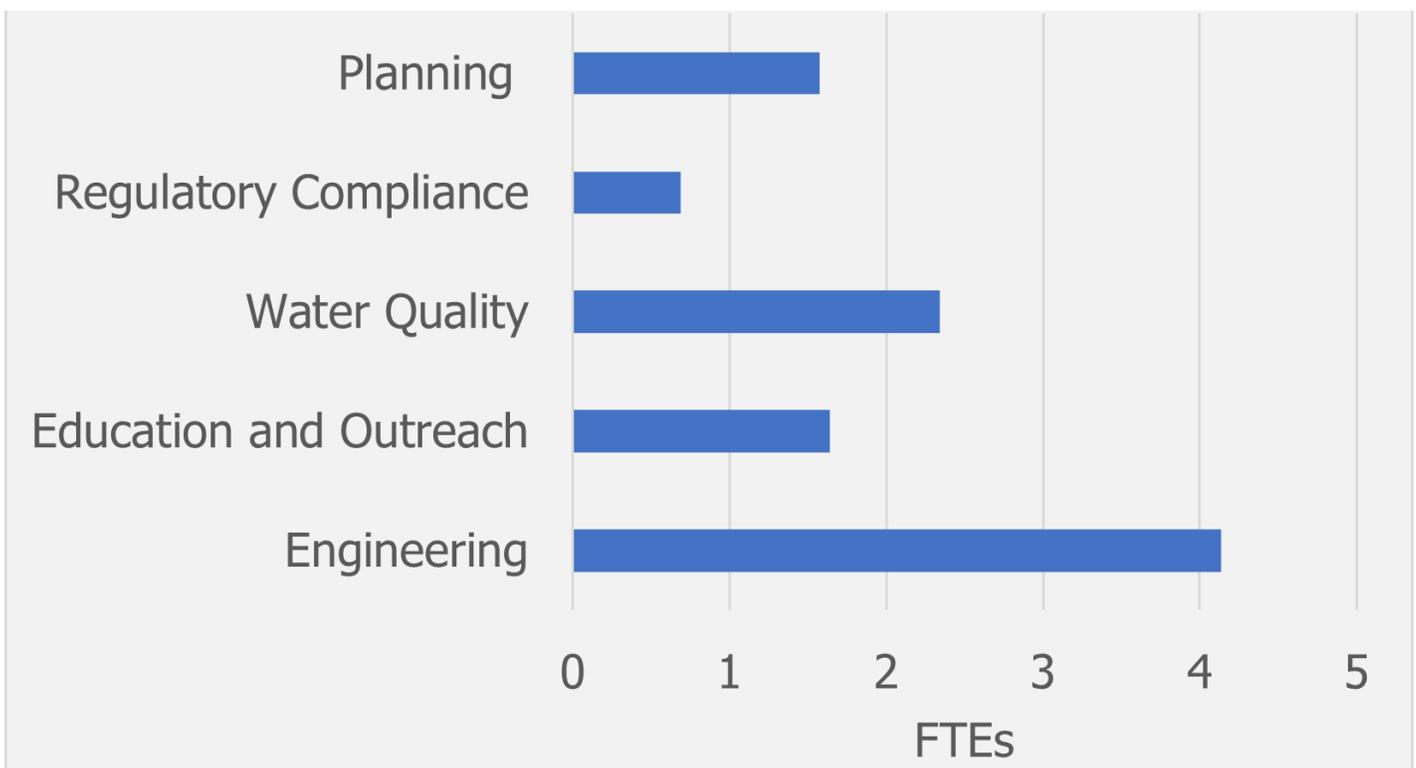


Surface Water

Engineering

Surface Water Engineering Division

The Surface Water Engineering Division, has a wide range of responsibilities and staff skill sets. This group includes 10.5 staff positions that include engineers, planners, analysts, program coordinators, water quality specialists, and education and outreach specialists that report to the Surface Water Supervisor. The Surface Water Engineering Division functions under the Development Engineering and Environmental Services Division of Public Works. The group focus is planning, engineering, water quality, education, and compliance related activities to meet the Utility's goals. The chart below shows approximate allocation of staff in full time equivalent (FTEs) to each work program element. Descriptions of current activities are provided in this section.

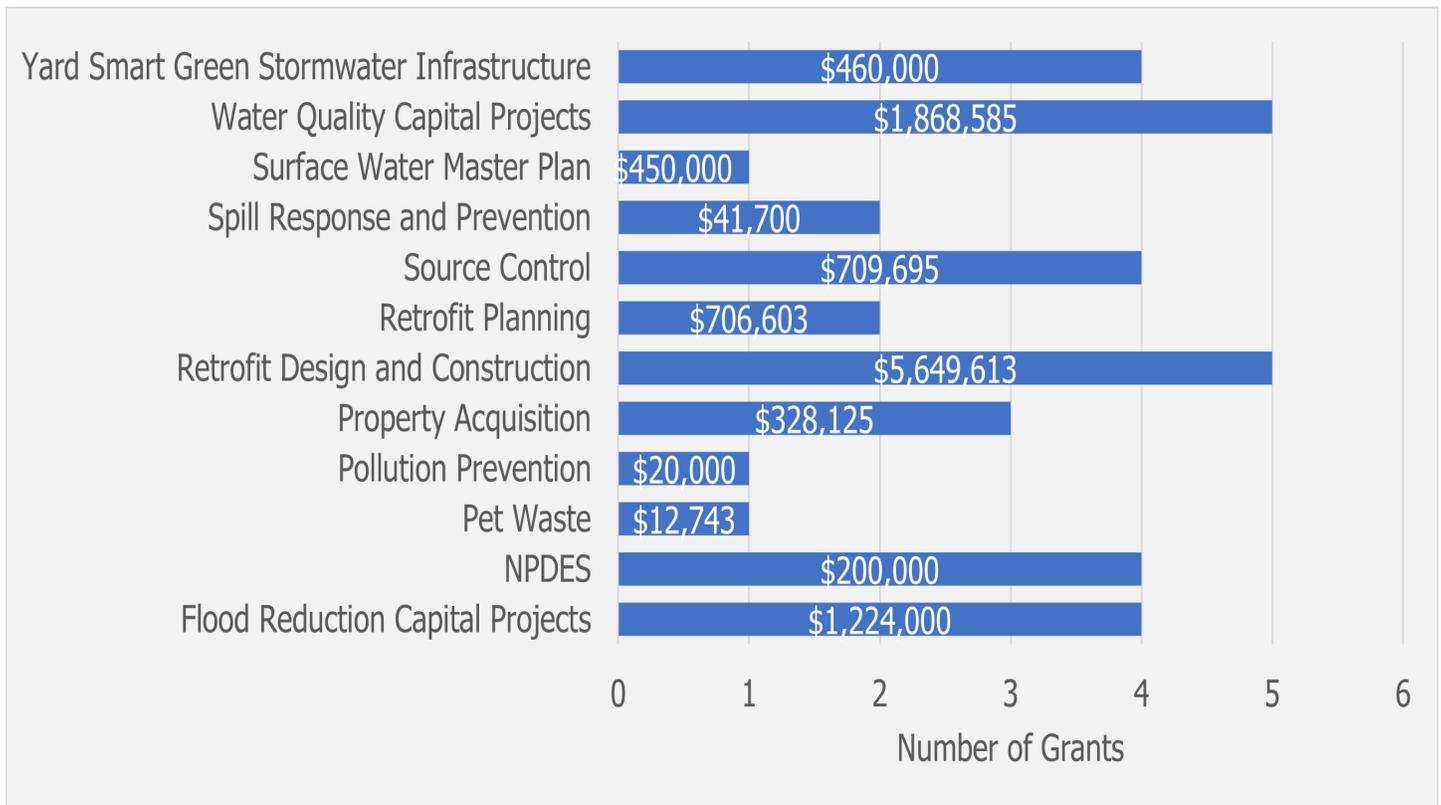


Planning



Grant Writing and Strategic Planning

The Utility has obtained over \$11,000,000 in grants since 2014 for planning, design and construction of retrofit projects, culvert replacement, education and outreach, source control, and NPDES permit implementation. The Engineering group identifies grants that fit the Utility’s needs and dedicates resources for grant proposal preparation and fulfillment of grant requirements. Grant identification and administration is an integral part of the Engineering group’s strategic planning for program funding and implementation and allows more to be accomplished than would be possible with only traditional stormwater revenue sources (i.e., rates and capital facility charges). The figure below shows the total dollar value and number of grants of each type received since 2014.

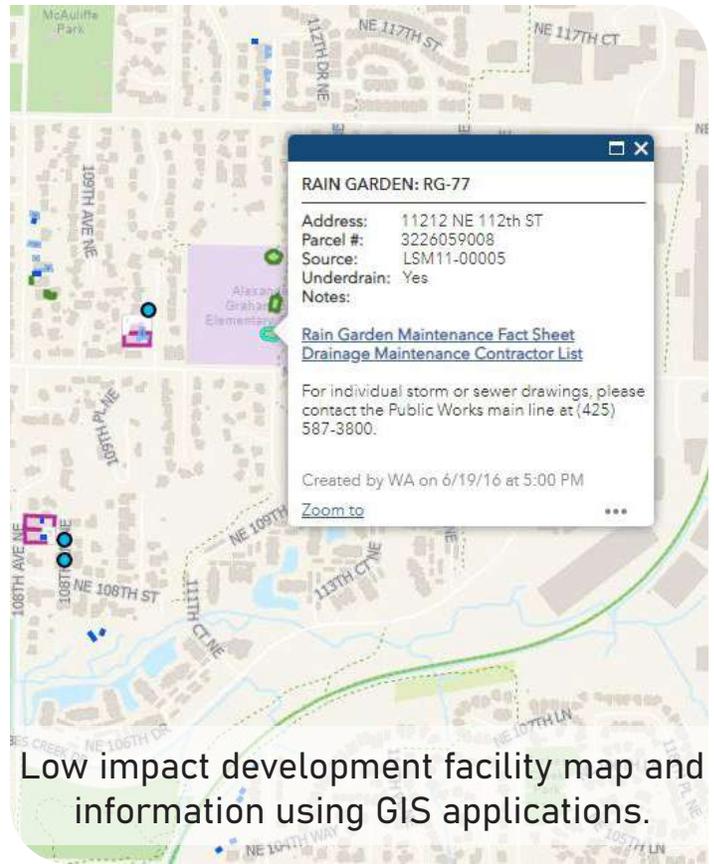




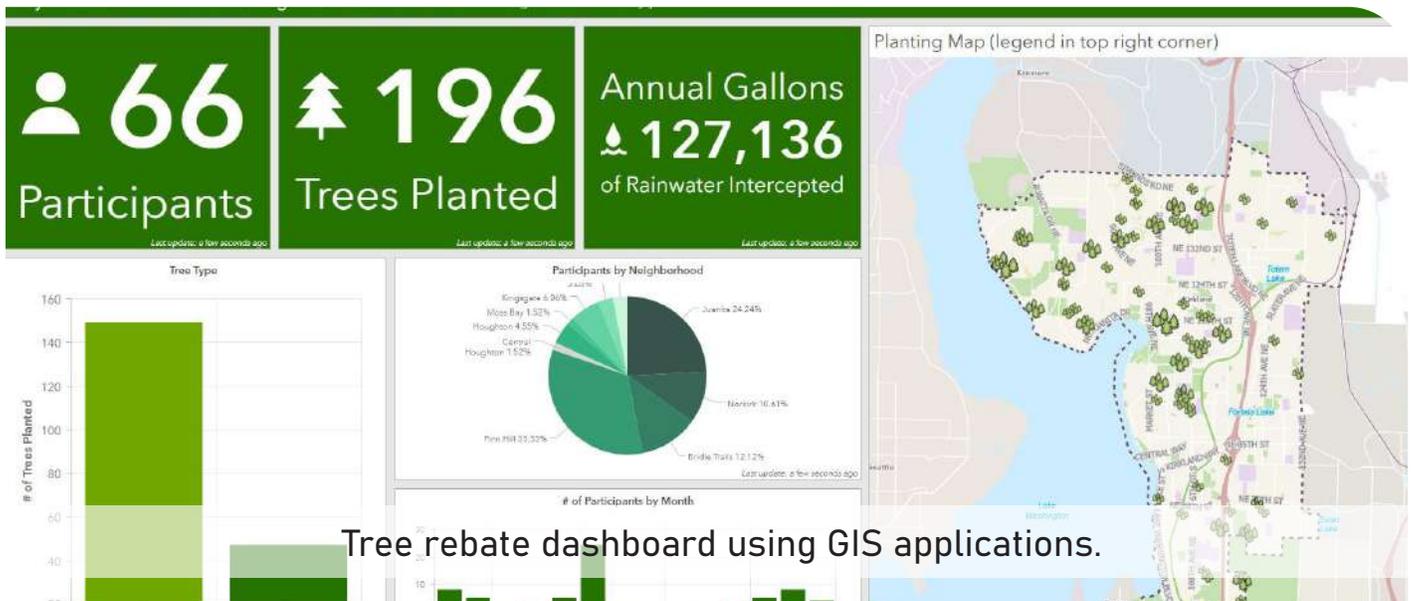
Geographic Information System (GIS) Mapping and Analysis



GIS mapping and analysis is needed to ensure that the public and private stormwater system inventory is up-to-date and accurate. On-going GIS mapping and analysis is completed, as needed, to identify low impact development facilities, drainage concerns, new infrastructure as development and capital projects are completed, catchment areas for existing stormwater treatment facilities, potential natural resource mitigation areas, and geographic-based analyses, as required. Maps are also produced in support of public engagement and outreach.



Low impact development facility map and information using GIS applications.



Tree rebate dashboard using GIS applications.



Watershed and Retrofit Planning

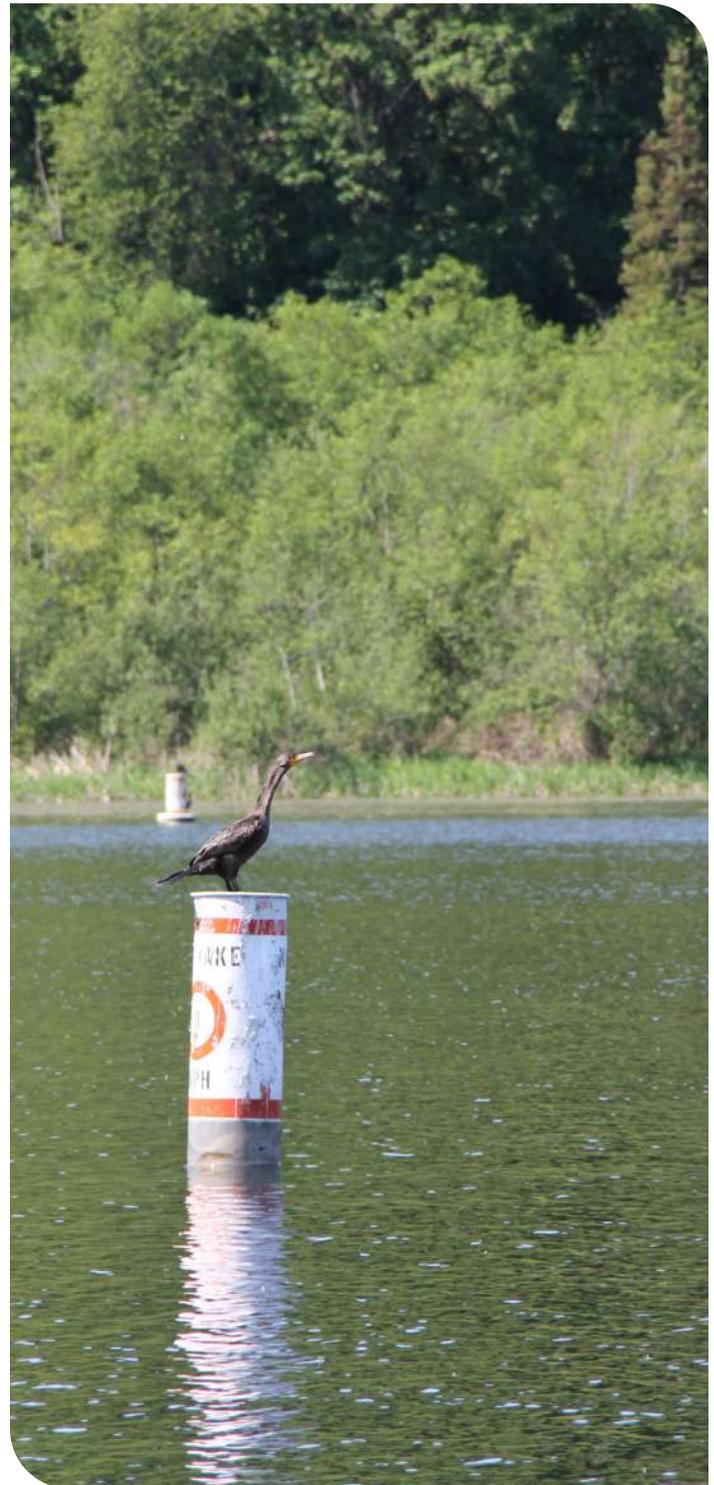
Much of Kirkland was developed prior to the realization of the need for water quality treatment and flow control of stormwater. Adding these facilities, known as stormwater retrofits, to existing neighborhoods protects streams and lakes and complements requirements that are placed on new development and redevelopment. Successful placement of retrofits requires analysis of the watershed and storm system, review of available property, investigation of the potential for collaboration with other city projects and programs, and public engagement to determine needs and interests. The City has been at the forefront of watershed and retrofit planning for several years and has identified structural stormwater projects that are in various stages of concept, design, construction, and implementation. Ecology’s recent requirement for a Stormwater Management Action Plan (SMAP), and potential future permit requirements for additional SMAPs and on-going implementation, may lead to required retrofit planning and implementation.



Schematic of 132nd Square Park Retrofit.

Regulatory Compliance

The Engineering Division has primary responsibility for the City's NPDES Phase II Permit coordination, including fulfillment of reporting requirements, administration of NPDES grants, and documentation of permit compliance. Other regulatory activities involve Endangered Species Act (ESA) compliance, participation in the Watershed Resource Inventory Area (WRIA) 8 (Lake Washington/ Cedar/Sammamish Watershed) Salmon Recovery Council, keeping City code current, and participation in the National Flood Insurance Program.



Water Quality



Chemical, Physical, and Biological Monitoring

Kirkland has expanded its monitoring capacities since the last Plan.



Ongoing work elements for the Division include:

- Monitoring for aquatic insects, known as Benthic Index of Biologic Integrity (B-IBI) monitoring.
- Stream and storm system flow monitoring.
- Coordination of stream-side restoration maintenance with Green Kirkland Partnership.
- Water quality monitoring at several locations in Kirkland.
- Stream habitat monitoring.



Illicit Discharge Detection and Elimination (IDDE) Program and Water Quality Complaints

The IDDE program has grown significantly over the last decade. This may be in part due to the increase in education and outreach about water quality, and the relationship building and communications with



internal and external customers. The success of the program has resulted in its continued growth. IDDE and water quality complaints are addressed jointly by both Engineering and the Storm Crew. Communication between the two groups are constant and on-going to discuss the growth of the program and how to adjust roles and responsibilities to fit the needs, but with continued growth, additional resources are needed to keep up with the increasing number of calls. Currently, water quality staff in the Engineering Division conduct the following:

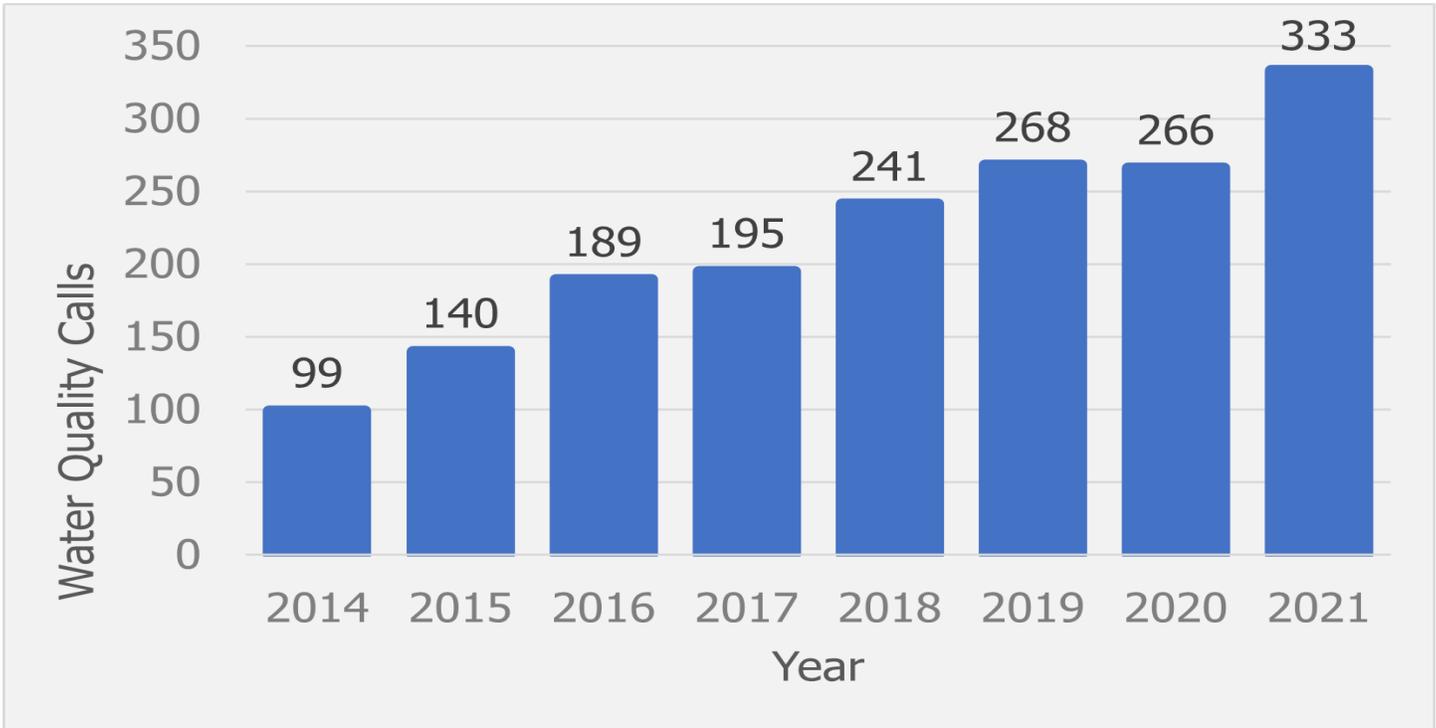
- First response to assess situation following water quality calls.



B-IBI (aquatic insect) sampling.



- Determine clean-up and source tracing needs and coordinate with Storm Crew.
- Conduct water quality sampling and track lab results.
- Conduct enforcement and cost recovery activities including tracking billing, photo documentation and responsibility, letters, follow-up, enforcement actions, and preparation for hearing examiner appeals.



Source Control

As required by the NPDES Permit, Kirkland will begin implementing a new source control program starting in 2023 and it is expected that this program will be implemented by staff in the

Engineering Division. Kirkland currently participates in the Washington State



Commercial do-it-yourself car wash facilities implement source control.

Department of Ecology’s Pollution Prevention Assistance (PPA) grant program that funds business outreach and inspection. Some of these inspections may be credited toward NPDES Phase II Permit compliance depending on the type of business and inspection conducted, but additional staff resources will be needed for this effort, especially if grant funds are not available in the future.

A potential outcome of the expanded source control program is identification of more water quality issues and spills that require action for clean-up, follow-up education and outreach, and potentially enforcement.



Source control involves safe storage of chemicals and cleaners.



Source control includes proper disposal and reuse of household products.

Education and Stewardship

The Phase II NPDES Permit has multiple education and outreach and public engagement requirements that are implemented by education and outreach staff in the Surface Water Engineering Division. The goals of this work are to raise awareness of surface water issues, to encourage behaviors that protect water quality and habitat, and to gather public interests and ideas regarding surface water priorities and programs. The need for public engagement and outreach on all projects, large and small, is increasing and the work is getting more complex as there is additional emphasis on engagement with traditionally under-served communities. The recent transition of the temporary education and outreach position to on-going positions demonstrates Kirkland's commitment to continuity of service for this important work element.



Rainworks education revealed when wet.



Outreach staff provide educational materials and organize events such as the petapalooza event to kick-off the pet waste campaign.

Engineering



Maintenance Division and CIP Support

The Engineering Division coordinates closely with the Operations and Maintenance Division for NPDES Phase II permit compliance, implementation of best management practices in the right-of-way and critical areas (i.e., streams and wetlands), prioritization of critical stormwater infrastructure for repair and replacement, and environmental permitting assistance and coordination. Additionally, engineering and low impact development maintenance support is provided as needed.

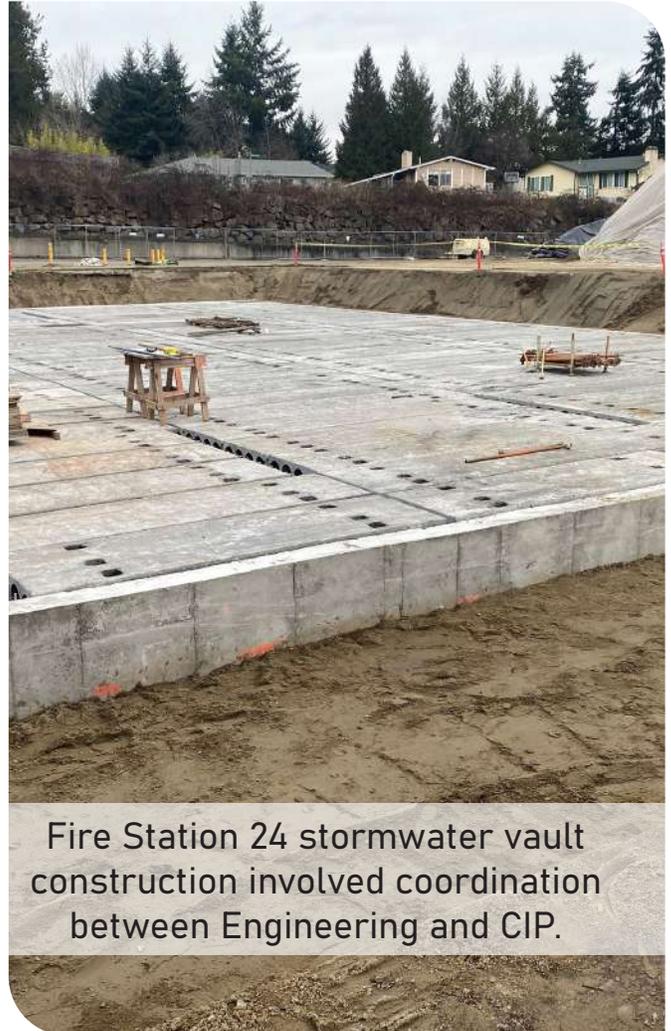


The Engineering Division also works with the Capital Improvement Division for coordination, prioritization, and implementation of surface and stormwater capital projects. Additionally, the Engineering Division assists with design review for projects triggering stormwater requirements.



Development Review

The Engineering Division interacts with the Kirkland development community through customer inquiries, private development plan review, and updating stormwater pre-approved plans and policies. Once the projects are complete, the Engineering Division confirms, maps, and documents the newly built stormwater infrastructure. They also ensure the Stormwater Design Manual, stormwater codes, and tools are current and easily accessible to the community. Engineers also are beginning to conduct pipe capacity analysis to determine development requirements for connections and upgrades to the existing stormwater conveyance system.



Fire Station 24 stormwater vault construction involved coordination between Engineering and CIP.



Private System Inspection and Drainage Complaints



The Engineering Division conducts private stormwater facility inspection and follows up on drainage complaints on private property. The number of private stormwater infrastructure facilities have increased. Excluding pipes and ditches, an average of 850 new assets per year came on-line between 2016 and 2020. Although staff have discretion and ability to reduce

inspection frequency based on previous inspection results, the expansion of the private inventory represents a significant and important part of the workload for Surface Water Engineering inspection staff. Private system inspection safeguards the public system by alerting the Utility of private system deficiencies that need to be addressed so that they do not negatively impact public investments or the environment. Drainage complaint response includes engineering technical assistance that aims to remediate drainage or flooding issues.

Private Stormwater Assets	Units	Average increase per year (2016 - 2020), except where noted	Total Change between 2016 - 2020, except where noted
Dry wells and infiltration tanks ¹	Facilities	87	261
Stormwater facilities	Facilities	31	126
Ponds ²	Facilities	-9	-38
Rain gardens and Filterrras	Facilities	26	104
Permeable pavement ¹	Facilities	80	240
Vaults and tanks	Facilities	47	189
Pipes	Miles	9	36
Catch basins and manholes	Structures	588	2355

¹Numbers for these assets are for years 2017 - 2020.

²The reduction in pond assets is because several stormwater ponds were re-classified as swales and rain gardens between 2016 and 2020.

- Utility Maturation
- Surface Water Capital Project Implementation
- Regulatory Challenges
- Aging and Failing Infrastructure
- Habitat Improvements
- Staffing
- Equipment
- Urban Forestry
- Interdepartmental Coordination
- Development Impacts

Challenges and Opportunities



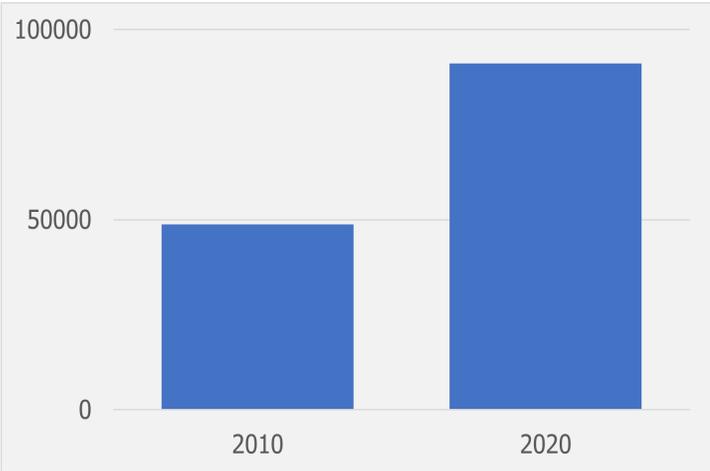
Challenges and Opportunities

Utility challenges and opportunities were identified through interviews with staff directly involved with Utility work activities (Appendix F), a staffing analysis that evaluated time spent on surface water work elements in the past 5 years and the trend for future staffing needs (Appendix D), and a benchmarking analysis that included interviews with Surface Water Managers and document review from neighboring and similarly sized jurisdictions (Appendix G).

For most challenges identified, programmatic actions were developed for augmented or new work programs, increased staff or equipment resources, and opportunities to collaborate with other departments that have mutual goals. Recommended programmatic actions are described in Section 10 and Appendix H.

Utility Maturation

Kirkland’s Surface Water Utility is over 20 years old and during the time period since its inception the City and the stormwater regulatory environment have changed substantially.



City has almost doubled in population since 2010.



Utility Structure

As scientific understanding of stormwater impacts to natural resources has evolved, stormwater regulations and water quality permits have become more comprehensive, integrating additional requirements beyond stormwater water quality treatment and flow control techniques that traditionally used engineering solutions. Education and outreach, pollution prevention, vegetation maintenance activities, and monitoring have become larger components of stormwater management programs over the past ten to twenty years. These factors have resulted in one of the primary challenges for the Utility, which is managing the depth and breadth of staff resources required for a successful stormwater management program under the same Utility organizational structure that was established over 20 years ago when City and stormwater needs were much different. A benchmarking analysis conducted for this Plan (Appendix G) compared Kirkland's Utility structure to those of similarly sized jurisdictions. An outcome of this Plan was to conduct a Utility Assessment (Appendix J). This assessment recommends both staffing and resource needs required to equip the Utility to meet the growing demands of the City and establish practices to facilitate strategic planning and coordination to set up the stormwater management efforts for future success. A more detailed review of staffing challenges is later in this section.



Vegetation maintenance is a useful skill in today's stormwater workforce.

Utility Revenue

The benchmarking analysis (Appendix G) compared Kirkland's Utility stormwater rates and capital facility charges (i.e., connection fees charged to developers) to the jurisdictions reviewed. Kirkland's capital facilities charges (CFCs) for stormwater facilities are outliers for being very low relative to other cities. CFCs were evaluated as a result of this planning process, and a programmatic action recommends that CFCs be reviewed and updated on a regular schedule (Programmatic Action Infr-05).



Surface Water Capital Project Implementation

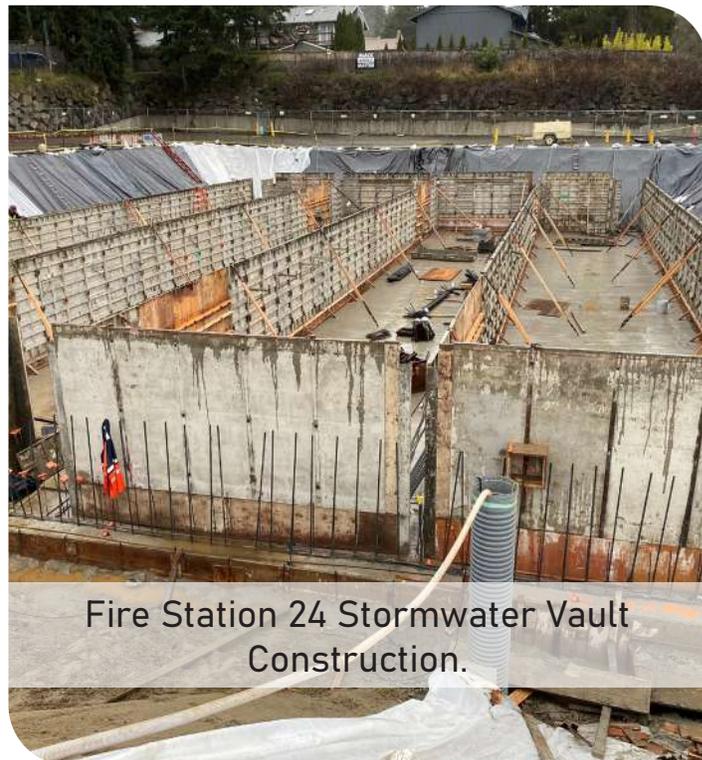
Surface water capital projects are challenging to implement because of:

- Complexity of surface water projects.
- Geographic constraints associated with lack of open space for surface water capital projects.

Complexity of Surface Water Projects

The Capital Improvement Division identified issues with past surface water projects being under-budgeted based on planning level cost estimates. To understand the causes and potential remedies from past projects, a range of completed capital projects were evaluated to apply lessons learned to new and updated capital projects for this Plan. Other jurisdictions were interviewed about their capital project delivery programs for a comparison to Kirkland and recommendations were passed on to the Capital Improvement Division. These memoranda are included in the Capital Project Evaluation Supplemental Information, Appendix I.

Implementing stormwater capital projects has been a challenge due to shifting city priorities, new stormwater projects getting added to the list and bumping previously identified projects, projects being underfunded, and permitting challenges. A new prioritization methodology was developed during this planning process in collaboration with the CIP Division that allows flexibility for adding new projects to the mix as they are identified for re-prioritization. It will also allow staff to understand and communicate which projects are being moved off the CIP list to make way for new opportunity projects that may be added and the rationale behind the decision. Additionally, the CIP prioritization methodology helps prioritize projects by category to ensure that the right mix of projects is funded to meet the Utility's goals for infrastructure improvement, flood reduction, water quality improvement, and habitat improvement. More detail is provided in the Capital Improvement Projects Section 9.



Fire Station 24 Stormwater Vault Construction.

The Utility should also consider evaluating alternative models for project delivery with the Capital Improvement Division, including how far projects should be developed in the Surface Water Engineering Division before transferring over to the Capital Improvement Division. Currently, most projects are at the conceptual design level when they are transferred to the Capital Improvement Division, however, they could be designed to 30% or greater prior to transfer to help reduce risk and provide a more detailed cost estimate if resources and processes were in place for this to happen.

Geographic Constraints and Stormwater Retrofit

Some surface water capital projects can be challenging to implement because of the lack of sufficiently large vacant land available in the locations where it is needed. Real estate prices are also an impediment for developing new surface water projects because of the inflated cost of land. While Kirkland has been active in pursuing new stormwater retrofit projects in areas that are under-treated and have high value natural resources, including Totem Lake, North Rose Hill, and Juanita Creek (Cedar Creek and High Woodlands neighborhoods), land availability and cost is often a deciding factor for which projects move forward. Additionally, supporting information needed for stormwater design, such as subsurface geotechnical mapping information, hydrologic monitoring, and or hydraulic modeling of pipe sizes is often needed and requires additional resources and time for new data collection. Programmatic actions describe new and updated strategies to address these challenges, including:

- Land acquisition policy and funding (Programmatic Action Infr-02)



Rain garden adjacent to Cross Kirkland Corridor trail.

- Partnership with the Parks and Community Services Department and Public Works Transportation Division for stormwater retrofit opportunities (Programmatic Actions WQ-01 and Infr-06).
- Partnership with private entities for stormwater retrofit (Programmatic Action WQ-05).



- Hydrologic monitoring of streams and pipes (Programmatic Action Infr-04).
- Pipe capacity evaluation by watershed (Programmatic Action Infr-11).
- Geologic map update with new geotechnical data (Programmatic Action WQ-06).
- Identifying opportunities to use un-used right-of-way for stormwater retrofit (Programmatic Action WQ-03).

Regulatory Challenges

External factors that influence project design, cost, and schedule can change over the lifetime of a surface water capital project from the time it is identified to the time of final design and construction. An example of a recent challenge facing Kirkland and the region is emerging information that 6-PPD Quinone, a by-product of a chemical used in tires, causes pre-spawn mortality in coho salmon and may be detrimental to other salmonid species as well. The research on 6-PPD removal and management strategies is rapidly advancing, but no strategy is currently formally approved in stormwater manuals. As research advances, it is expected best management practices will be updated. A programmatic action has been recommended to develop an approach for keeping abreast of current information as it becomes available and identifying projects that could be potentially impacted by added requirements.



Juanita Creek culvert.

As mentioned above, NPDES Permit compliance is a primary driver for the Utility. Each permit is active for ~5 years and is then re-issued. Re-issuance has historically involved increasing requirements for compliance. The next permit cycle will begin in 2024, with the draft permit being issued in 2023. A programmatic action is identified to review the new permit and identify resources needed for compliance (see Programmatic Action WQ-07). An additional action identified for enhanced compliance with the NPDES Permit is developing training videos for Public Works staff (see Programmatic Action WQ-08).

Aging and Failing Infrastructure



Pipe Criticality and Replacement

In recent years, the Utility has taken a proactive approach to identifying and prioritizing aging and failing stormwater pipes for repair and replacement. To further facilitate that effort, a new GIS-based pipe evaluation tool was developed during this Plan to characterize stormwater pipes in Kirkland's inventory based on risk. The risk of failure was calculated from criticality and likelihood of failure factors associated with the pipe's characteristics. These characteristics included location, size, material, and condition of the pipe (based on closed circuit television [CCTV] inspection). The pipes that have been assessed as extreme or high risk all have been assessed with CCTV and have known defects. Pipes that haven't been assessed for condition may also need repair or replacement and may eventually be determined to be higher risk once condition is known. A description of the tool and summary data from the evaluation is provided in Appendix E. Recommended capital improvement projects that address known aging and failing pipes are summarized in Section 9.

This tool, along with staff knowledge and input, will be the foundation for preparing an Aging Pipe Plan (see Programmatic Action Infr-16). This plan will develop the framework, identify the needed resources to repair or replace the most at-risk pipe infrastructure, and identify potential funding needs and sources.



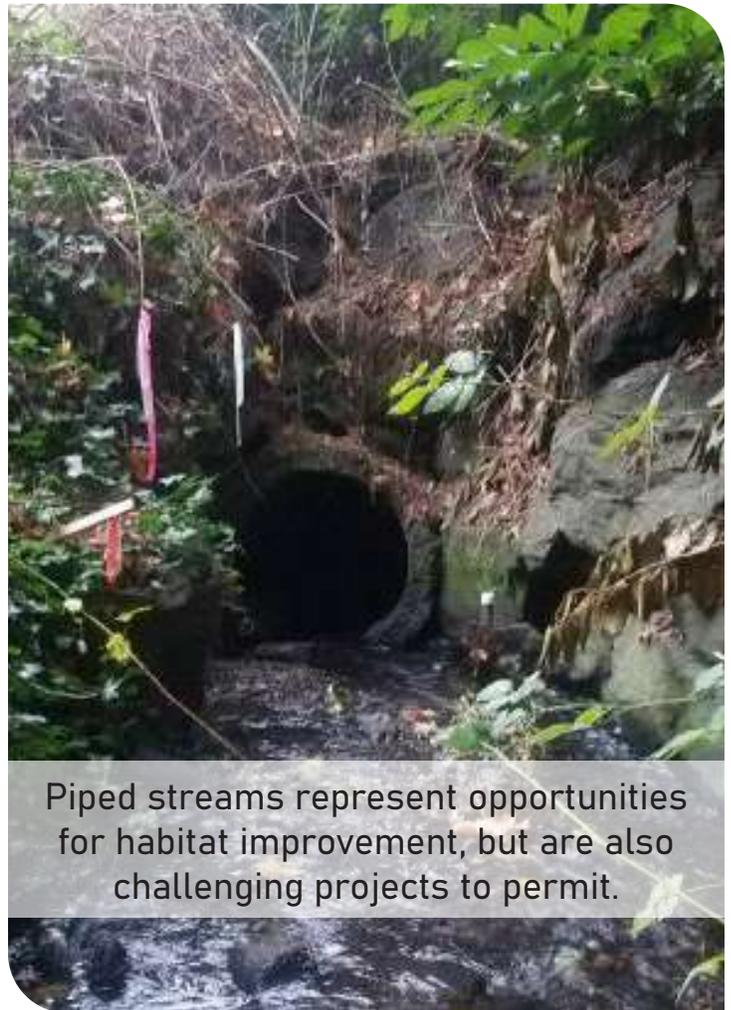
Pipe material, such as corrugated metal, is a risk consideration in the pipe evaluation tool.



Aging Assets

There are different classes of stormwater assets that are aging and may need significant investment in the near to mid-term future to ensure functionality. Programmatic projects to address aging and failing infrastructure address unique stormwater infrastructure repair and replacement challenges including:

- Aging stormwater facilities, such as those in the annexation area that are in various stages of functionality and require greater investments with diminishing returns to bring them up to full functionality. (Programmatic Action Infr-08)
- Stormwater outfalls are uniquely challenging because of their locations. (Programmatic Action Infr-01)
- Piped streams that convey surface water in addition to stormwater require additional environmental permitting considerations when addressing infrastructure needs. (Programmatic Action Infr-09)



Piped streams represent opportunities for habitat improvement, but are also challenging projects to permit.

- Development opportunity fund to support win-win opportunities with the development community on development projects impacting the rights-of-way (Programmatic Action Infr-15)



Stormwater outfalls are often in hard-to-reach locations.

Habitat Improvements



Habitat improvement projects focus on opportunities to achieve the greatest aquatic environmental benefits within the confines of Utility resources. Challenges for implementing habitat improvements are lack of clear priorities, lack of available land, and lack of resources. To be in better position

to achieve Utility habitat priorities, recommended programmatic strategies include:

- Identification of stream and wetland restoration priorities by watershed to improve habitat (Programmatic Action Hab-04).
- Windsor Vista habitat restoration on Juanita Creek (Programmatic Action Hab-05).
- Land acquisition policy and funding to prioritize property acquisition to achieve surface water goals, including habitat improvement (Programmatic Action Infr-02).
- Hydrologic monitoring for streams and pipes to support project design in support of habitat improvement projects (Programmatic Action Infr-04).



Aerial view of Yarrow Bay wetlands.

- On-call critical areas support for critical areas determinations for surface and stormwater projects (Programmatic Action Hab-03).
- Stream recognition program that recognizes private property owners that are stewards of their land and provide habitat benefits (Programmatic Action Hab-02).
- Sewer connections incentive program to improve water quality and aquatic health (Programmatic Action WQ-04).



Vegetation Management

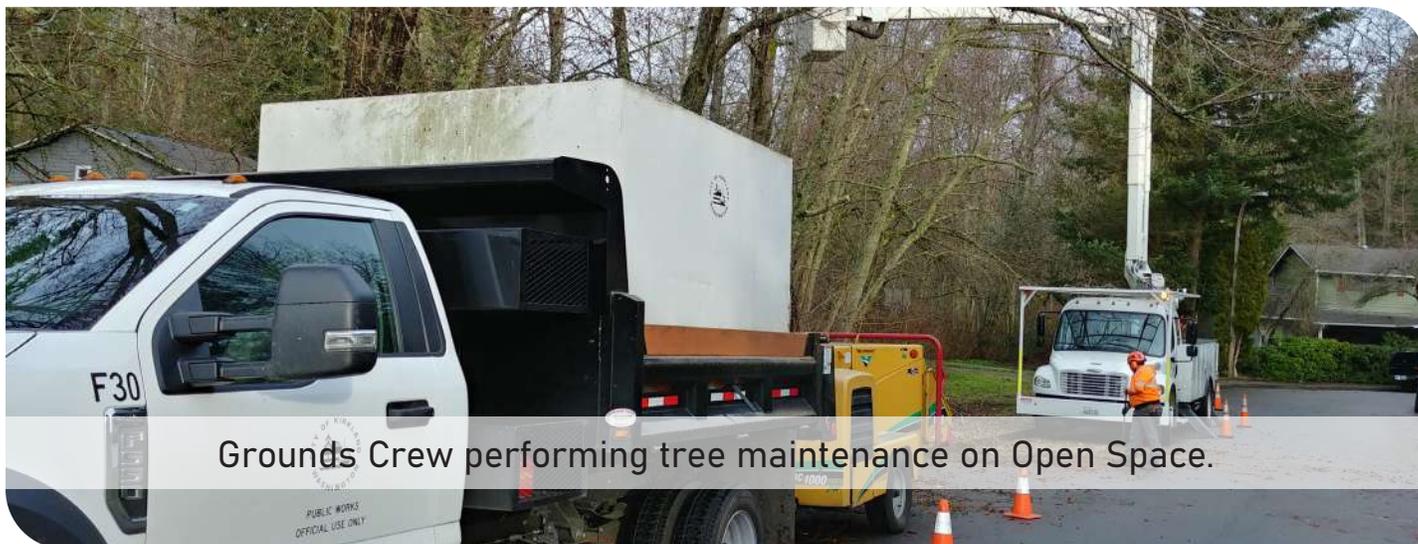


Although Public Works owns property that is considered Open Space or Natural Areas and facilitates implementation of built vegetated stormwater facilities (i.e., rain gardens, biofiltration swales, and Filterras™),

other groups are generally responsible for management and maintenance. The number of departments, divisions, and staff tasked with vegetation management represents a challenge in consistently standardizing the care for Kirkland’s parks, open spaces, right-of-way, and vegetated stormwater facilities. Alternative organizational structures are worth considering. The Utility and Streets and Grounds Division within Public Works are undergoing Utility Assessment planning. Recommendations are anticipated from this assessment process.



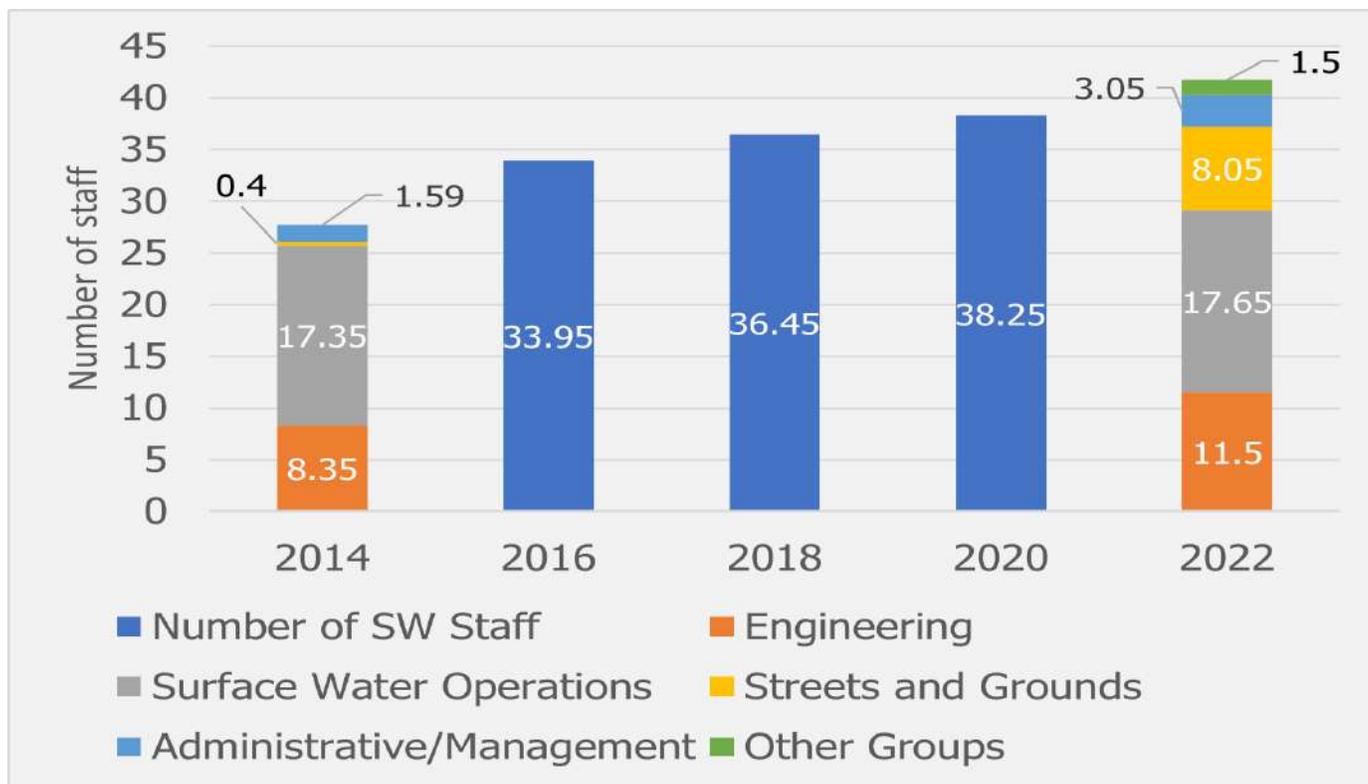
Bioswale in Peter Kirk Park.



Grounds Crew performing tree maintenance on Open Space.

Staffing

There are 41.75 positions funded by the Surface Water Fund as of December 2021.



Source of historical and current Surface Water Fund position allocations: Kirkland budget documents.

The staffing analysis completed for this Plan (Appendix D) evaluated operations and maintenance and surface water engineering work programs and labor hours in the City’s work management program (Lucity) or estimates provided by staff (Surface Water Engineering Division) against the current and future anticipated needs to meet National Pollutant Discharge Elimination System (NPDES) Phase II Permit Municipal Separated Storm Sewer conditions (Section 5) and Utility goals.

Operations and Maintenance

Staffing challenges stand out for the Surface Water Operations and Maintenance Division. As shown in the above figure, the number of staff in Storm Crew has not increased substantially since 2014.



However, the number of staff funded by the Utility for operations and maintenance has increased, with additional positions in Streets and Grounds. This model of funding positions within different work groups is challenging to manage because of reporting structures and accountability.

The Storm Crew is needed to lead and conduct operations and maintenance work, including having the right mix of staff with specialized skills for operating equipment. Factors that have impacted this include:

- Span of control issues for the Leadperson.
- Workload balance between tasks.

Additionally, a recent issue has been the ability to hire and retain staff because of current economic conditions and employment climate. This is a universal issue that is affecting a variety of businesses and work sectors and is not limited to the City of Kirkland.

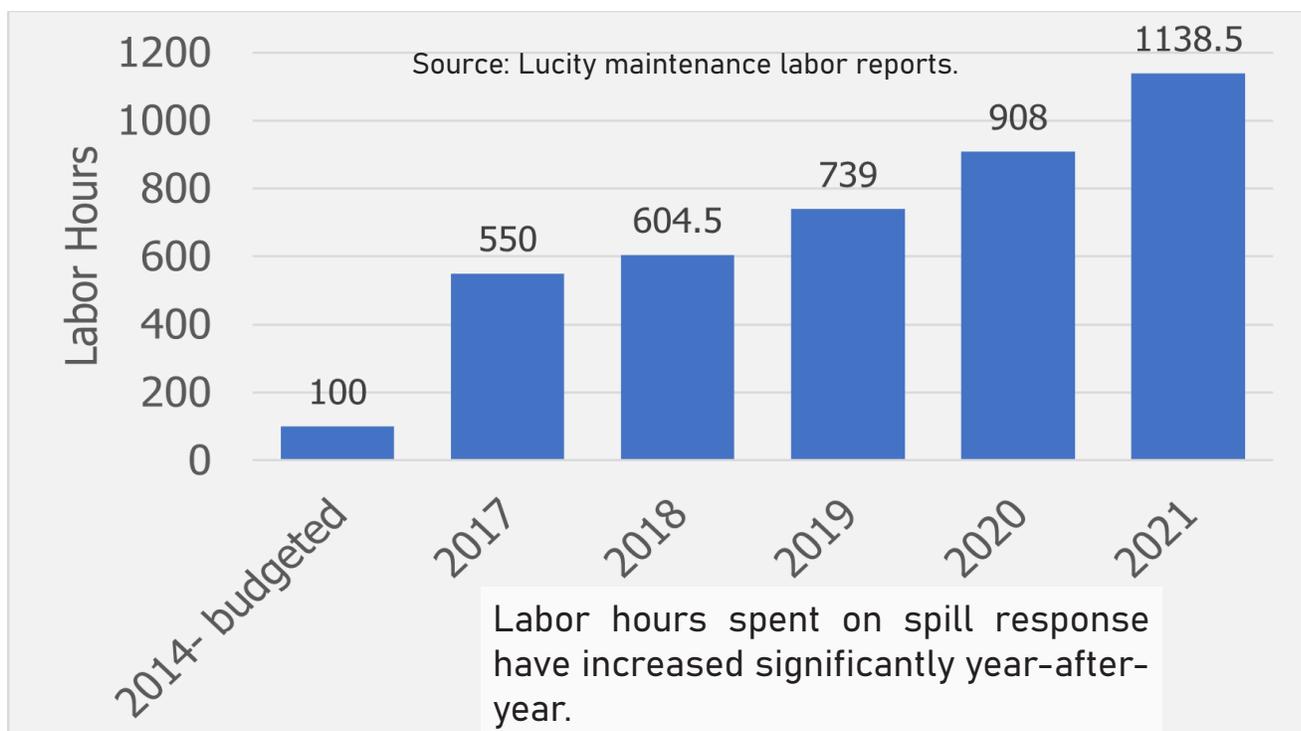
Span of Control

The Storm Crew is over-booked with managing routine activities such as scheduling crews and equipment, managing equipment repairs, responding to emergencies, and addressing requests from other departments such as CIP and Development. Another Leadperson would allow more time to perform existing work plans and be able to proactively plan and develop crews. The current Leadperson oversees 15.5 staff (see Utility Assessment, Appendix J).

Workload Balance

Compliance obligations have increased and the stormwater system inventory has grown, resulting in more time needed for catch basin inspection and cleaning. At the same time, customer expectations for spill response and CCTV inspection in advance of pavement overlay has grown as these programs have expanded. This has resulted in challenges for the crew to balance remaining workload that is not focused on compliance or customer service. Disruptions to work flow is also a common occurrence when equipment or crews are needed for time-sensitive work, such as responding to spills. The figure on the next page shows the year over year increase of labor hours for spill response.

Over 1,500 new city-owned catch basins were added to the surface water inventory between 2016 and 2020. These catch basins require bi-annual inspection and cleaning, as needed, for NPDES permit compliance.



Operations and Maintenance Staffing Recommendations

Additional staff are recommended to address operations and maintenance challenges. One FTE Leadperson is recommended in Operations and Maintenance to alleviate workload. Additionally, staff are recommended with new equipment to address specific resource needs and to gain efficiencies. Those staff and equipment needs are discussed below.

The detailed staffing analysis is in Appendix D.

Surface Water Engineering

Like Operations and Maintenance, Surface Water Engineering is also challenged by staffing needs. Factors that have influenced this are:

- Span of control issues.
- NPDES permit compliance, including spill response, source control, and private drainage inspection.
- Increasing and varied programmatic demands of the division.



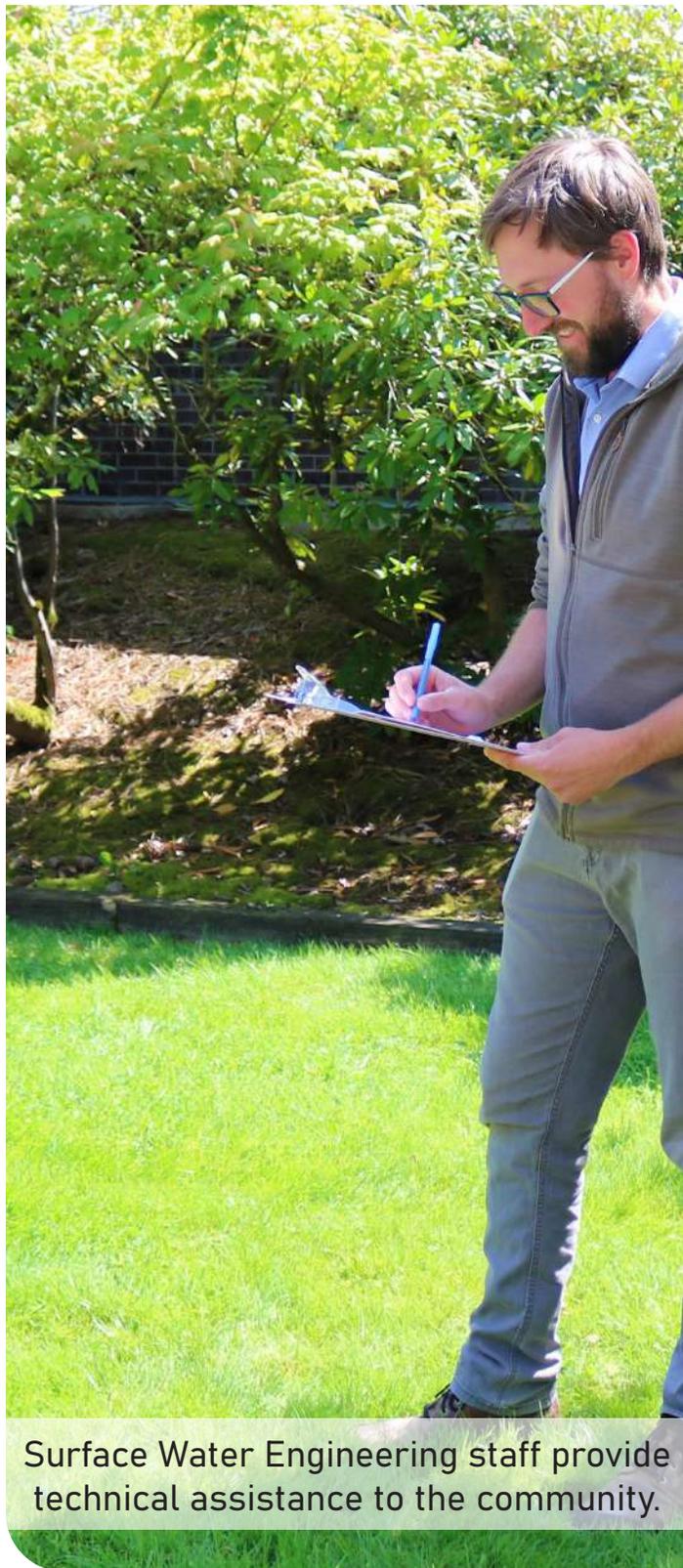
Span of Control

One of the main challenges in the Surface Water Engineering Division is the management structure for a group of its size and breadth of skill sets. The supervisory model is not sufficient to adequately address leadership needs and workload, conduct management responsibilities expected with peers in Public Works and other Departments, and accomplish project work. An organizational review of the Utility occurred (Appendix J) and recommended the City create a Surface Water Program Manager position to oversee the Surface Water Engineering Division.

NPDES Permit Compliance

NPDES Phase II permit compliance is an ongoing challenge as each successive permit brings new conditions that require additional staff resources. The next permit cycle will begin in 2024, with the draft permit being issued in 2023.

Like Operations and Maintenance, spill response and other NPDES permit requirements require more time from Engineering staff. There has been an increase in number and complexity of water quality calls received and staffing adjustments are needed in one or both groups to continue the level of service that Kirkland residents have come to expect. Additionally, when water quality calls are the result of repeat offenses or negligence on the part of the polluter, code enforcement is activated, requiring time to build cases and achieve cost recovery for clean-up activities conducted by the City.



Surface Water Engineering staff provide technical assistance to the community.

NPDES permit requirements for private system inspection and source control have impacts on Engineering Division staff. The source control program will begin in 2023 and is required to provide approximately 180 site visits annually. As private stormwater assets are added to the City, there is a greater need for staff to conduct system inspections.

Conversion of Positions to Permanent

During this planning process, 2.5 temporary full-time equivalent (FTE)s funded by Surface Water were converted to permanent FTEs in the Surface Water Engineering Division. These positions will alleviate the staffing need for critical work elements in the Division, including education and outreach, stormwater retrofit planning, and stormwater engineering support.

Surface Water Engineering Staffing Recommendations

The recommended staffing improvements and associated programmatic actions in parentheses for the Engineering Division include:

- Create a Surface Water Program Manager position.
- Add 1 FTE to implement the Source Control Program and support the Illicit Discharge Detection and Elimination (IDDE) Program (Programmatic Actions WQ-09 and WQ-10).

Equipment

Along with staffing issues, the other primary challenges facing the Storm Crew is having the right equipment and time to continue providing excellent customer service while meeting compliance obligations and stormwater system operation needs. Factors that have contributed to current challenges include:

- Maintenance yard size and location.
- Competing needs for equipment.
- Travel time to north-end stormwater (time to do work).

Maintenance Yard

As the City has grown, so has the number of employees in Public Works that share the maintenance yard including:



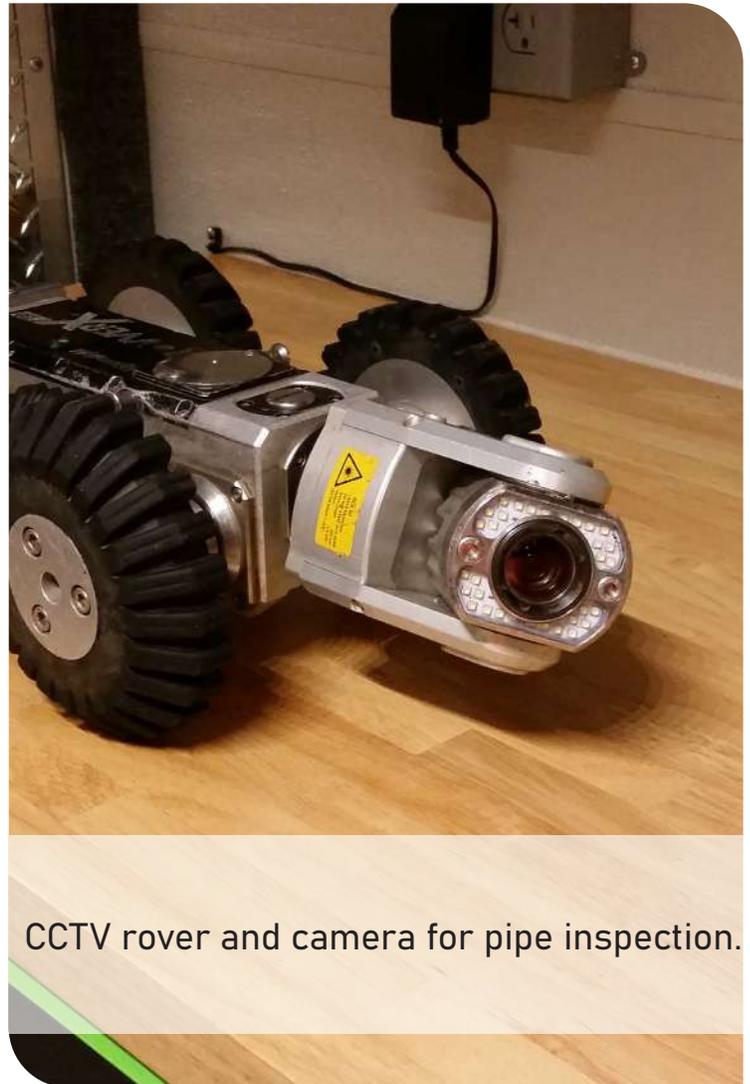
- Surface water crews and equipment.
- Fleet.
- Signals and signs.
- Decant facility.
- Streets and Grounds.
- Water and Wastewater.
- Storage for materials such as gravel, asphalt, and trees.

Staff report that the yard is not functional because there is so little space to maneuver around, the decant facility takes up a lot of the space, and there is no storage for larger quantities of bulk materials that are used often, such as topsoil. Additionally, the yard is not easily accessible to the north end.

Competing Equipment Needs

CCTV

Road overlay and stormwater pipe inventory assessment requires a CCTV truck and crew. The CCTV truck is also used to investigate drainage complaints and other system problems. It has been challenging for crews to have access to the CCTV truck to conduct condition assessment of the stormwater pipe inventory, because it is often tied up with other work.



CCTV rover and camera for pipe inspection.

The 2014 Plan recommended inspecting 10% of the stormwater pipe inventory every year through CCTV to have a complete assessment of the full system by year 2024. To date, less than 50% of the system has been assessed at least once, although CCTV is conducted on at least 10% of the stormwater pipes annually. Many pipes require multiple inspections due to

problematic conditions which results in fewer unique pipe inspections. To have a complete understanding of the system needs and future repair or replacement costs, condition assessment of the entire inventory should be conducted.

Several high priority stormwater pipes have been identified on the aging and failing or unmaintainable pipe list as well as in the pipe evaluation tool and have been identified for repair and/or replacement. Additional resources need to be allocated to accomplish this work, including an additional CCTV truck and crew dedicated to condition assessment, so that the existing CCTV truck can continue to be used for pavement overlay, investigation of drainage complaints, and follow-up for contractor-related repairs. Complementary equipment needed for CCTV work includes a new camera and wheel sets.

Eductor Truck

An eductor truck is used for routine cleaning, spill response, and for cleaning ahead of pipe inspection. Spill response work is disruptive because the work is unplanned, and the magnitude of effort required for the response is unknown until each call is assessed. Spills require eductor trucks and crews to respond in a timely manner, regardless of the other work being disrupted. A new small eductor truck and crew to operate is needed for



Kirkland eductor trucks are rarely idle, with crews out in the community conducting infrastructure cleaning and spill response.

spill response and could also be used for other small projects such as pot-holing and cleaning in hard to access locations.



Other Equipment

As discussed previously, the Storm Crew is challenged by being short-staffed, managing aging infrastructure, and competing for equipment. Several pieces of equipment were identified as being necessary to improve work efficiencies, including an asphalt hot-box, a concrete mixer, and a skid steer. Both the asphalt hot-box and concrete mixer were identified as high priority equipment needs. The asphalt hot box would allow the crew to eliminate a step in the process for patching asphalt and would reduce the waste-stream associated with cold-patch asphalt repairs. This is a piece of equipment that could be shared by all Public Works Maintenance Divisions. Similarly, the concrete mixer could be shared by maintenance divisions and would reduce the labor associated with hand-mixing concrete in small batches for sidewalk, curb, gutter, and pipe installations.

Equipment Recommendations

The recommended programmatic actions that include equipment and staff to operate are:

- CCTV Pipe Inspection, including one FTE Senior Maintenance Worker and one FTE Utilityperson and an additional CCTV truck (Programmatic Action Infr-13).
- IDDE Program, including one 0.5 FTE Senior Maintenance Worker and one 0.5 FTE Utilityperson and a small eductor truck (Programmatic Action WQ-09).

Stand-alone equipment recommendations to make work more efficient include:

- Hook Lift Asphalt Hot Box (Equipment Sheet 2002-03).
- Hook Lift Concrete Mixer (Equipment Sheet 2002-04).

- CCTV Camera and Crawler (Equipment Sheet 2022-01).

- Skid Steer (Equipment Sheet 2022-02).

Equipment summary sheets are provided in Appendix H.

Time To Do Work

Since annexation of the northern part of the City in 2011, the Storm Crew has faced additional challenges with accomplishing work in these areas because of the time it takes to travel back and forth from the maintenance center. The extra travel time reduces the efficiency of stormwater asset inspection and cleaning in the north part of the City. As the Utility and Public Works outgrows the current maintenance center, consideration should be given to establishing a satellite location in the north part of the City or entering into a cooperative agreement with a neighboring jurisdiction to the north to share space.

Urban Forestry

The City and Utility are challenged with how to integrate Kirkland's Urban Forestry Program and Plan with the Surface Water Utility.

The Urban Forestry Plan identified several components to be implemented and/or funded by the Surface Water Utility. A crosswalk evaluation was completed for this Plan to identify inter-related surface water elements in other City Plans to ensure collaboration and cooperation. A summary of the crosswalk analysis is provided in Appendix K.

Other jurisdictions also struggle with the question of how to integrate urban forestry. The benchmarking analysis conducted for this Plan (Appendix G) asked other jurisdictions how they manage urban forestry in the context of Surface and Stormwater Management, and the responses ranged from no connection at all to full integration and funding.

A recommended programmatic action (Programmatic Action Hab-01) will help Kirkland navigate the policy questions around urban forestry and stormwater while keeping up with the latest understanding of the effects of urban forests on stormwater.



Urban forestry is a City and Council priority.



Interdepartmental Coordination

Surface and stormwater goals, objectives, and projects intersect with those of other departments and City Plans. A crosswalk of several City Plans was conducted to evaluate the points of mutual interest and opportunity, including:

- 2015 Comprehensive Plan.
- 2021 Urban Forestry Plan.
- 2015 Transportation Master Plan.
- 2015 Parks Master Plan (PROS Plan).
- 2020 Sustainability Master Plan.



Cross Kirkland Corridor and rain garden.

- 2021 NE 85th Street Station Area Plan (in progress).

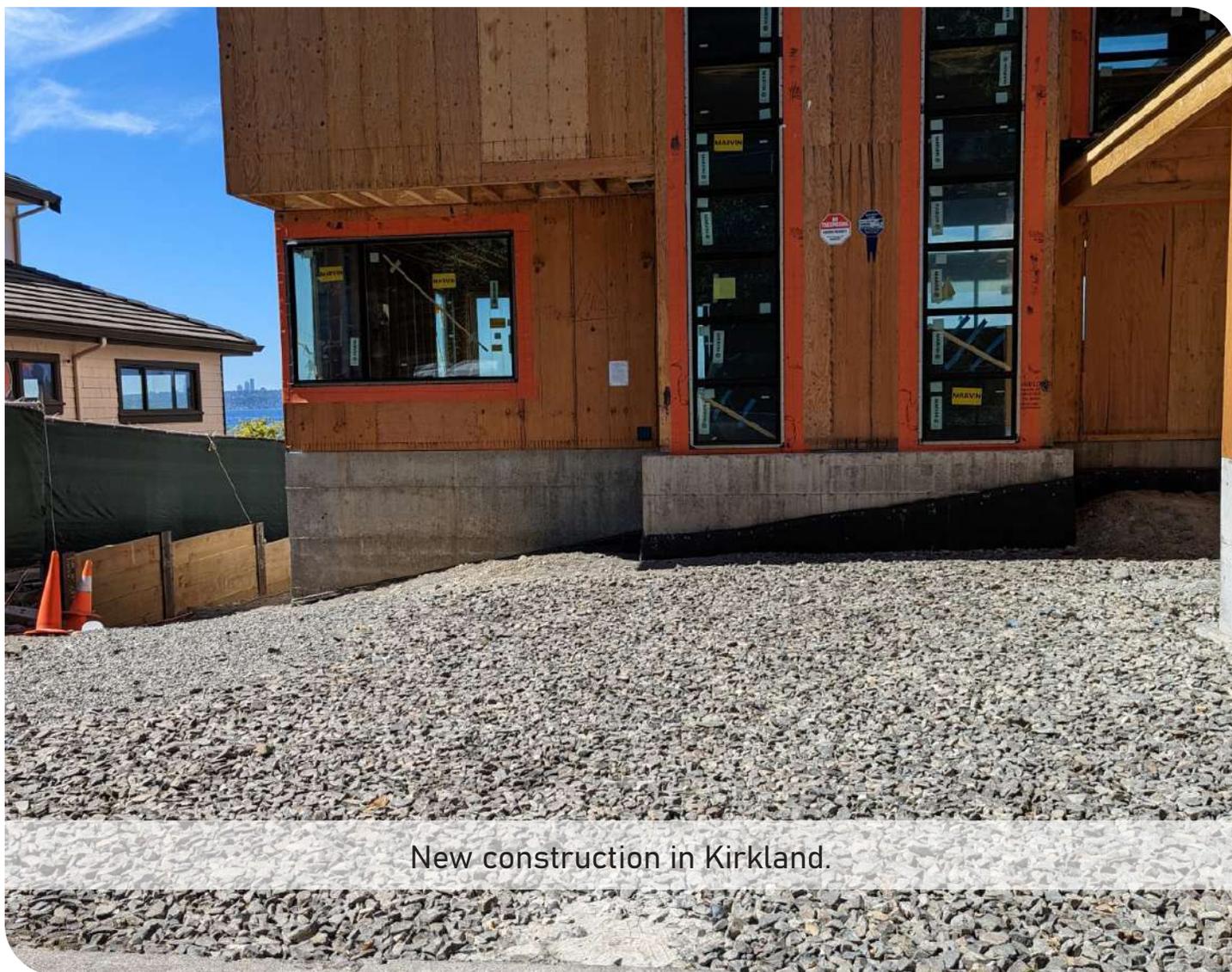
A summary of the crosswalk discussion and results is provided in Appendix K. Specific recommended programmatic actions that involve interdepartmental coordination with other Plans include:

- 85th Station Subarea Area Stormwater Design Support (Programmatic Action Infr-10).
- Cross Kirkland Corridor Plan Review (Programmatic Action Infr-06).
- Prioritization of Parks and surface water retrofit opportunities in the PROS (Parks, Recreation, Open Space) Plan (Programmatic Action WQ-01).

Additionally, the Utility should continue coordinating and supporting the Urban Forestry Plan and the Sustainability Master Plan. The Utility should also consider formalizing a process to coordinate projects and priorities across departments, similar to another jurisdiction interviewed in the Benchmarking Analysis (Appendix G).

Development Impacts

A potential challenge for the Utility is the impact of infill development and unintended consequences to the stormwater system. As discussed in Section 4, the Utility is actively pursuing stormwater retrofit in areas of the City that are under- or un-treated. At the same time, the City is rapidly re-developing. While most redevelopment requires new stormwater treatment, some falls under the minimum thresholds. The cumulative impacts of these areas could result in undersized pipes or facilities. A programmatic action (Programmatic Action Infr-03) recommends review of potential for developable property to impact the stormwater system.



New construction in Kirkland.

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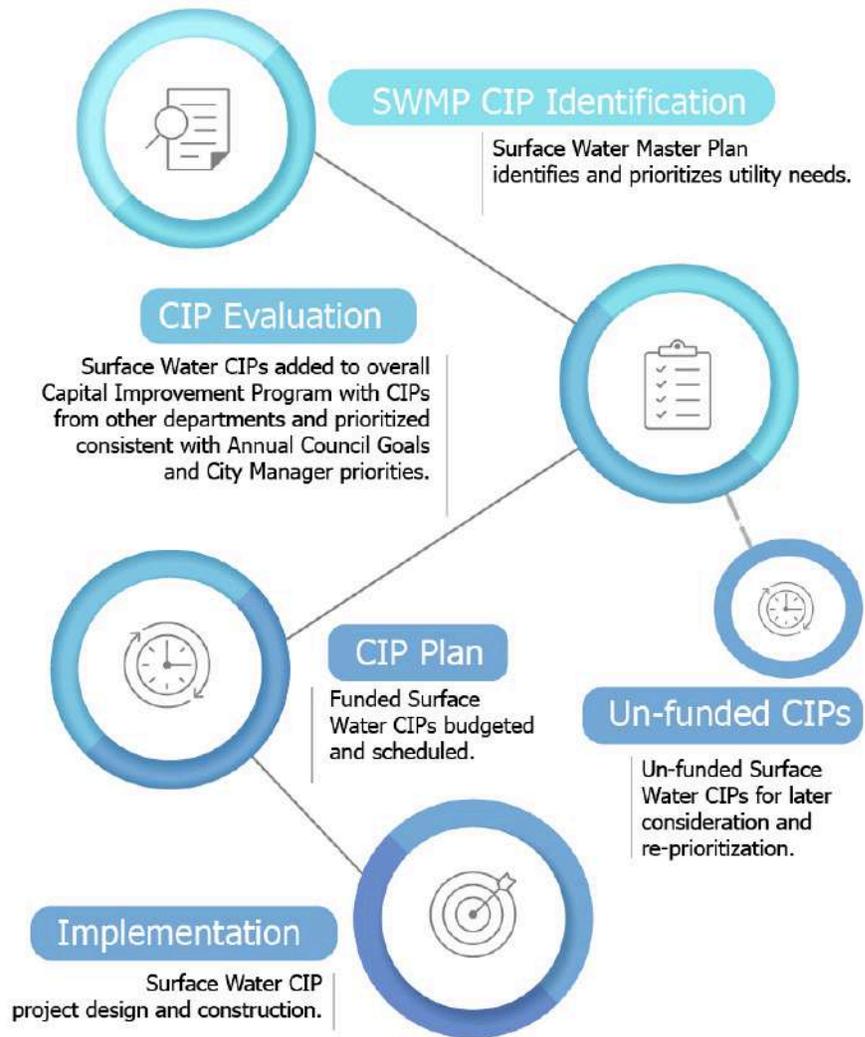
Capital Improvement Program

- CIP Prioritization
- Recommended CIPs
- Surface Water CIP Implementation



Capital Improvement Program

The Capital Improvements Division is within the Public Works Department. They implement City projects, including surface water projects. The Utility funds capital projects that improve the City's surface water management system. Many of these projects are identified through a planning process, such as this Surface Water Master Plan, but others are initiated outside of that process as opportunities come up or during emergency situations. The flow chart at right shows the simplified process of surface water capital project implementation.



CIP Prioritization

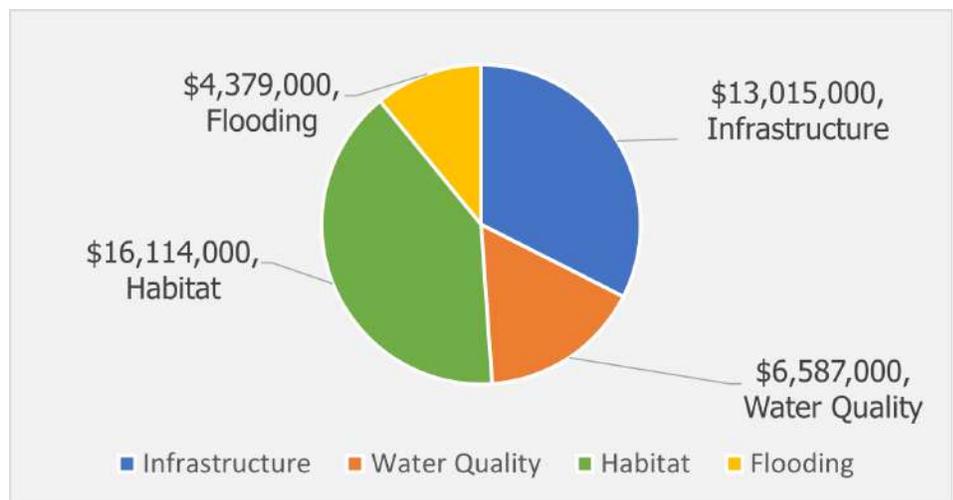
There are more surface water capital project needs than resources available to deliver. Many recommended projects from previous Surface Water Master Planning cycles have remained unfunded or bumped from funded to the unfunded list due to more urgent priorities. The CIP prioritization methodology was updated so staff and City decision makers have greater flexibility in funding the highest value projects that address different Utility goals and so that informed funding decisions can be made and adjusted for un-planned opportunities or emergencies.

Utility capital projects were prioritized against one another according to the primary goal they are designed to address: habitat, flooding, infrastructure, or water quality. Prioritization criteria included goal-specific criteria and general criteria, including consideration of equity criteria.

The entire portfolio of capital projects, including funded, unfunded, and newly identified projects were evaluated and prioritized using the updated methodology, which is described in detail along with the full results in Appendix H.

The top 1/3 ranked projects in each category were considered high priority projects. These projects were developed into new or updated Utility capital improvement project sheets with planning level cost estimates in 2022 dollars (Appendix K). The total cost of the high priority projects in 2022 dollars is approximately \$40 million (figure at right); double the surface water capital project funding allocated for the next 6 years (see financial analysis, Appendix L).

The table below shows the number of projects distributed



High Priority project funding needs (Total = ~\$40,000,000) categorized by Utility goal.

by Utility goal for the \$40 million estimated capital project cost and the draft recommended capital project spending for each goal for the next 6 years. By prioritizing projects against one-another by the type of goal addressed, the Utility has an opportunity to demonstrate to the public how funding is distributed and the associated benefits for those capital dollars.

The right two columns on this table represent the new capital projects that are recommended for funding. As mentioned previously in the plan, a strong focus for capital projects in the next 6-year CIP is to accelerate the replacement of aging and failing infrastructure. Significant investment in improving water quality and habitat occurs through non-capital projects and programs (see Sections 6 and 7). As priorities change, the Utility may choose to do more projects or spend money on capital projects that achieve different goals. CIP project lists are reviewed and adopted every 2 years.

While there are no new projects identified under water quality and habitat, multiple projects are currently underway related to those goals. More detail on the financial distribution of projects by goal of past, current, and planned future projects can be found on page 92.

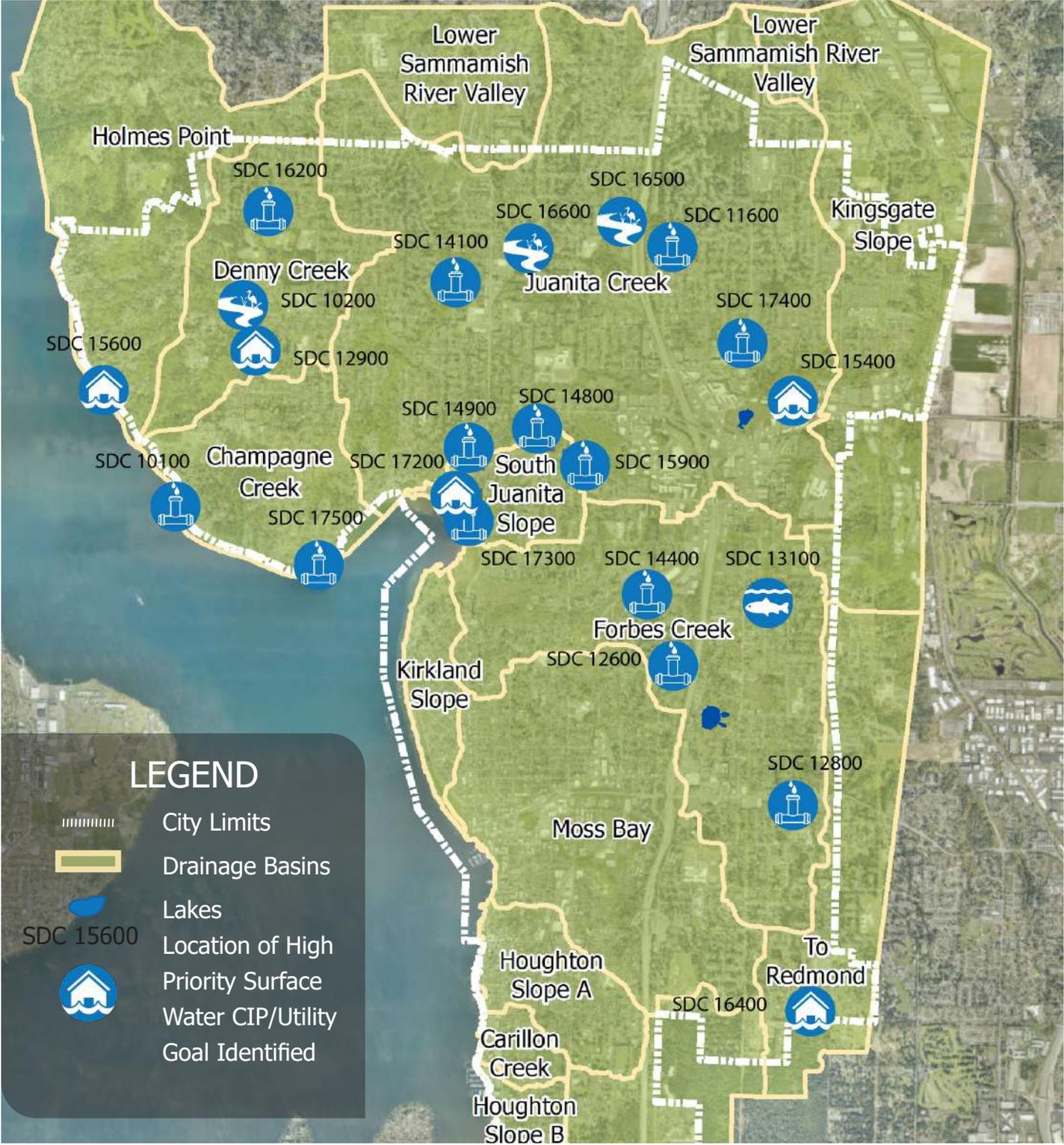
Goal	Number of High Priority Projects	Total High Priority Project Cost Estimate ¹	Number of High Priority Projects on 6-year Draft Recommended CIP ²	Estimated Cost of Projects on 6-year Draft Recommended CIP ³
Habitat Improvement	3	\$16,114,000	0	0
Water Quality	2	\$6,587,000	0	0
Infrastructure	12	\$13,015,000	6	\$7,023,321
Flooding	5	\$4,379,000	3	\$4,245,339
		\$40,095,000		\$11,268,660

¹Cost estimates for high priority projects are in 2022 dollars. When these projects are recommended in the funded CIP, the cost is inflated to the year of funding.

²Final 6-year recommended CIP includes continuation of 10 projects that have already been started and will be completed, and one medium priority surface water project whose priority was elevated so that it could be completed in conjunction with a high priority water project in the same vicinity.

³Total final 6-year recommended Surface Water CIP budget is approximately \$20 million. Estimated cost shown is only for high priority projects on the recommended CIP. The estimated cost is adjusted from 2022 dollars inflated to the year anticipated for implementation.

Capital Improvement Project Locations



LEGEND

-  City Limits
-  Drainage Basins
-  Lakes
-  Location of High Priority Surface Water CIP/Utility Goal Identified



2023 Surface Water Master Plan

Recommended CIPs

Surface Water capital project utility needs were prioritized within this planning process (see CIP Prioritization Section below), and then re-prioritized for funding and implementation within the context of the [entire CIP](#) over the next 6 years. The figure on the preceding page and the table below shows the location, description, and estimated costs of the high priority Utility needs. Projects prioritized for the final 2023 - 2028 CIP are indicated on the table. Surface Water CIP Project summary sheets are in Appendix L.

In addition to the projects identified below in the 6-year CIP, the City also has two on-going allocations of funding towards infrastructure improvements: \$500,000 towards aging and failing infrastructure and \$500,000 towards replacement of stormwater assets in association with transportation projects. These contributions are continuously evaluated to identify the need and adjusted through the CIP update to accommodate those needs.

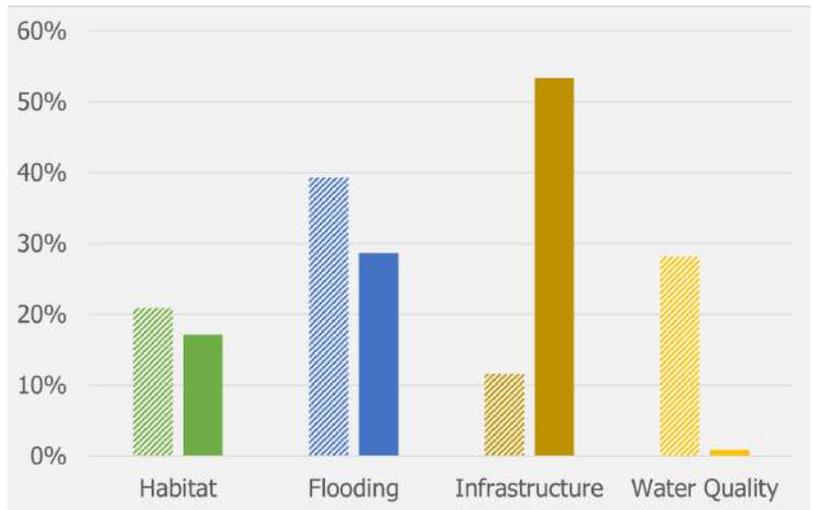
Project Number ¹	Description	Utility Goal	Total Cost ²
SDC 10100*	Holmes Point Pipe Replacement at Champagne Creek Basin	Infrastructure	\$1,323,750
SDC 10200	Juanita Drive at Denny Creek Culvert Replacement	Habitat	\$3,436,000
SDC 11600*	NE 140th Street Pipe Replacement	Infrastructure	\$977,357
SDC 12600	Spinney Homestead Retrofit	Water Quality	\$5,400,000
SDC 12800*	NE 85th Street/122nd Avenue NE Stormwater Improvements	Infrastructure	\$739,000
SDC 12900*	NE Juanita Drive Storm Failure Near 86th Avenue NE	Flooding	\$632,500
SDC 13100	NE 107th Pl Retention Pond Retrofit	Water Quality	\$1,187,000
SDC 14100*	Storm Line Rehabilitation on NE 136th Street	Infrastructure	\$2,392,066
SDC 14400	116th Avenue Storm Facility	Infrastructure	\$3,558,000
SDC 14800	105th Pl NE Pipe Replacement	Infrastructure	\$430,000
SDC 14900*	NE 119th Court Storm System Improvement	Infrastructure	\$499,125
SDC 15400	Stream Restoration at 128th Lane NE	Flooding	\$919,000
SDC 15600*	Holmes Point Drive NE Pipe Installation	Flooding	\$1,861,639
SDC 15900*	108th Avenue NE Pipe Installation	Infrastructure	\$1,092,023

Project Number ¹	Description	Utility Goal	Total Cost ²
SDC 16200	NE 141st St Flow Control Conveyance System	Infrastructure	\$671,000
SDC 16400*	Silver Spurs Storm System Upgrade	Flooding	\$1,751,200
SDC 16500	NE 141st St Culvert Replacement	Habitat	\$3,396,000
SDC 16600	Woodinville-Juanita Drive and Juanita Creek Culvert Replacement	Habitat	\$9,282,000
SDC 17200	98th Ave NE and NE Juanita Drive	Flooding	\$90,000
SDC 17300	NE 116th St and 99th Pl NE Pipe Replacement	Infrastructure	\$939,000
SDC 17400	NE 132nd St Pipe Replacement (Kingsgate)	Infrastructure	\$1,382,000
SDC 17500	NE Juanita Dr Pipe Replacement (Finn Hill)	Infrastructure	\$742,000
Total Cost			\$42,720,660

¹Projects identified by an asterisk (*) are on the final 2023 - 2028 CIP, however the CIP goes through a major update every 2 years and projects may change.

²Total Cost is in 2022 dollars except for projects on the final 2023 - 2028 CIP, which have been adjusted for the year they are anticipated to be implemented.

The City needs to make progress on all Utility goals; capital project delivery is one tool to achieve those goals. In previous years there has been greater focus on flooding and water quality projects (see hatched bars in figure below), and less on infrastructure, resulting in deferred stormwater infrastructure improvements. The next 6 years will emphasize infrastructure projects (see solid bars in figure below) and catch up on some of the most critical needs.



Hatched bars show completed and current CIP projects (2013 - 2022). Solid bars show planned CIP allocation (2023- 2028).

Projects were categorized according to their primary goal. However, most projects achieve more than one utility goal. For example, a flooding project that upsizes a pipe is also improving stormwater infrastructure. So, while projects are categorized according to their primary goal, keep in mind that often more than one goal is being advanced per project.



Surface Water CIP Implementation

Elements that are important for successful surface water capital project delivery include:

- Sufficient funding to design and build projects.
- Staff resources to manage the design and construction of projects.
- Pre-project planning to understand risks, feasibility, and costs.
- Coordination with stakeholders.

CIP delivery processes have improved to alleviate project delays and budget over-runs that have sometimes occurred during past surface water CIP implementation. The Capital Improvements Division has developed a process flow chart to evaluate projects and carry them forward for funding and adoption in the CIP. The Capital Improvement Division flow chart and memoranda describing the evaluation of CIP delivery and lessons learned from previous Surface Water CIP implementation are in Appendix I.





Programmatic Actions 10

- Recommended Programmatic Actions
- High Priority Programmatic Actions
- Medium Priority Programmatic Actions
- Low Priority Programmatic Actions



Programmatic Actions and Recommendations

Programmatic actions are recommended program strategies to address Utility goals through means other than capital construction projects. Programmatic actions were identified through City Council and Director priorities, staff interviews, regulatory requirements, public input, and challenges and opportunities identified during this planning process. The actions were categorized by the Utility goal addressed and prioritized by staff according to whether the action is needed to fulfill regulatory requirements, is needed for other critical work program efforts, or is identified as a Council priority. Planning level cost estimates for each action, including estimates of one-time and annual staff resource needs, one-time and annual consultant or contractor resource needs, and other direct costs were developed in project summary sheets provided in Appendix H. Implementation of the programmatic actions is discussed in Section 11, Plan Implementation.

Implementation of the right suite of programmatic actions to meet the desired service level will be determined based on staffing, rates, and priorities. The highest priority programmatic actions can be accomplished with existing staff due to the recent conversion of temporary staff positions to full-time positions. This gives the Surface Water Engineering Division greater opportunity to accomplish needed work program elements.



Recommended Programmatic Actions

The table below lists programmatic actions recommended for implementation in the next 6 – 8 years to accomplish Utility goals, including staffing needs, estimated costs, and priority (indicated by color, green= high, yellow = medium, red = low).

Implementation of the programmatic projects, including staffing and funding is described in Section 11, Plan Implementation.

Action Number	Utility Goal	Description	Staff Resources Needed (FTEs)		Estimated Contractor or Equipment Costs	
			One-time	Annual	One-time	Annual
Infr-05	Infrastructure	Evaluate Capital Facility Charges	0	0.01	0	\$3,000
Infr-08	Infrastructure	Evaluate Aging Stormwater Facilities	0.69	0	0	0
Infr-10	Infrastructure	85th Street Station Area Stormwater Design Support	0	0.07	0	0
Infr-15	Infrastructure	Development Opportunity Fund				\$75,000
Infr-16	Infrastructure	Aging Pipe Plan	0.31	0.03		
Hab-01	Habitat	Urban Forestry and Stormwater	0.12	0	0	0
WQ-01	Water Quality	Mutual Benefits for Parks and Surface Water	0.18	0	0	0
WQ-02	Water Quality	6PPD Quinone	0	0.11	0	0
WQ-07	Water Quality	NPDES Permit Gap Analysis	0	0.06	0	0

Programmatic Actions



Action Number	Utility Goal	Description	Staff Resources Needed (FTEs)		Estimated Contractor or Equipment Costs	
			One-time	Annual	One-time	Annual
2022-01	Infrastructure Equipment	CCTV Camera and Crawler			\$55,000	
2022-03	Infrastructure Equipment	Hook Lift Asphalt Hot Box			\$180,000	
Infr-01	Infrastructure	Stormwater Outfalls	0.35	0	0	0
Infr-02	Infrastructure	Land Acquisition Prioritization	0.12	0	0	0
Infr-03	Infrastructure	Minor Development Evaluation	0.38	0	0	0
Infr-04	Infrastructure	Hydrologic Monitoring Program	0.19	0.27	\$30,000	\$5,000
Infr-06	Infrastructure	CKC Review	0.37	0.07	\$50,000	0
Infr-07	Infrastructure	Improve Stormwater System Continuity	0.86	0	\$100,000	0
Infr-09	Infrastructure	Strategy for Repair and Replacement of Piped Streams	0.52	0	0	0
Infr-11	Infrastructure	Basin Pipe Capacity Analysis	0	0.65	0	0
Infr-12	Infrastructure	Trenchless Pipe Repair Program	0	0.29	0	\$300,000
Infr-13	Infrastructure	Closed Circuit Television (CCTV) Pipe Inspection	0	2.0	\$500,000	0

Programmatic Actions

Action Number	Utility Goal	Description	Staff Resources Needed (FTEs)		Estimated Contractor or Equipment Costs	
			One-time	Annual	One-time	Annual
Infr-14	Infrastructure	In-house Completion of Small CIP Projects	0	0.15	0	\$50,000
Hab-04	Habitat	Wetland and Stream Restoration	0.34	0	0	0
WQ-03	Water Quality	Streets for Retrofit	0.22	0	0	0
WQ-08	Water Quality	NPDES and Other Surface Water Training	0.38	0	\$3,000	0
WQ-09	Water Quality	Illicit Discharge Detection and Elimination (IDDE) Program Augmentation	0	1.2	\$400,000	0
WQ-10	Water Quality	Source Control Program	0	0.9	0	0
Hab-02	Habitat	Streamside and Lakeside Recognition Program	0.19	0.17	0	\$10,000
Hab-03	Habitat	On-Call Critical Area Determination Support Services	0	0.01	0	\$10,000
Hab-05	Habitat	Juanita Creek near Windsor Vista Park Restoration Plan	0.05	0	\$242,000	0



Action Number	Utility Goal	Description	Staff Resources Needed (FTEs)		Estimated Contractor or Equipment Costs	
			One-time	Annual	One-time	Annual
WQ-04	Water Quality	Sewer Connection System Incentives	0.13	0.19	0	\$80,000
WQ-05	Water Quality	Public/Private Retrofit Opportunities	0.22	0	0	0
WQ-06	Water Quality	Geotechnical Map Update	0.16	0	\$92,000	0
WQ-11	Water Quality	Juanita Beach Water Quality	0.1	0	\$92,000	0
2022-02	Infrastructure Equipment	Skid Steer			\$300,000	0
2022-04	Infrastructure Equipment	Hook Lift Concrete Mixer			\$175,000	0
Total			5.88	6.18	\$2,153,500	\$533,000

High Priority Programmatic Actions

The high priority programmatic actions represent a mix of infrastructure, water quality and habitat projects that were identified as Council priorities, regulatory requirements, and necessary to ensure continued operation and functionality of stormwater assets. These actions, along with the current Surface Water Utility Engineering and Operations and Maintenance Division work programs described in Sections 6 and 7 are recommended as the minimum level of service for the next 6 to 8 years.

Most high priority programmatic actions will be completed by the recent conversion of temporary to permanent staff in the Engineering Division.



Habitat Projects

Urban Forestry and Stormwater Programmatic Action Hab-01

This action involves conducting a literature review of the current state of knowledge on the effects of urban forests on stormwater reduction and management and evaluating current City urban forest strategies under the lens of surface and stormwater benefits to determine if current practices should be augmented, discontinued, or continued as-is. It is expected that a funding and policy recommendation will result from this action.



Water Quality Projects

Programmatic Action WQ-01 Mutual Benefits for Parks and Surface Water

An analysis of site-specific opportunities for potential stormwater retrofit with planned field upgrades or other park improvements and an identification of pocket park opportunities in watersheds where stormwater retrofit is prioritized.

Identifying opportunities for mutually beneficial Parks and Surface Water Utility objectives is a key City Council priority.

Programmatic action WQ-02 6PPD Quinone

Engage in regional conversations and share with Kirkland staff as the research and regulations around this byproduct chemical used in tires evolves.

Programmatic Action WQ-07 NPDES Permit Gap Analysis

This action consists of a step-by-step review of the next Phase II Permit conditions to identify resource needs and schedule for permit compliance.



Infrastructure Projects

Programmatic Action Infr-05 Evaluate Capital Facility Charges (CFCs)

CFCs were evaluated during this planning process and Programmatic Action Infr-05 recommends bi-annual review and update to keep current. Results of that analysis are provided in the Financial Analysis Report, Appendix M.

Programmatic Action Infr-08 Evaluate Aging Stormwater Facilities

Replacing or repairing aging facilities that are near the end of their useful lifespan could result in significant financial outlay for Kirkland. Programmatic Action Infr-08 includes development of a plan for how and when older facilities are replaced and upgraded to help the Utility budget for the eventual needs.

Programmatic Action Infr-10 85th Street Station Area Stormwater Design Support

The 85th Street Station Area Plan is a major Kirkland initiative in which staff were given



direction from City Council and the Planning Commission to develop a “bold vision for open space, parks and green infrastructure...” Programmatic Action Infr-10 allocates Surface Water Engineering Division staff time to participate in project planning, design, and evaluation.

Programmatic Action Infr-15 Development Opportunity Fund

This action will establish an opportunity fund to allow the City to replace aging stormwater infrastructure in concert with private development projects that impact City rights-of-way.

Programmatic Action Infr-16 Aging Pipe Plan

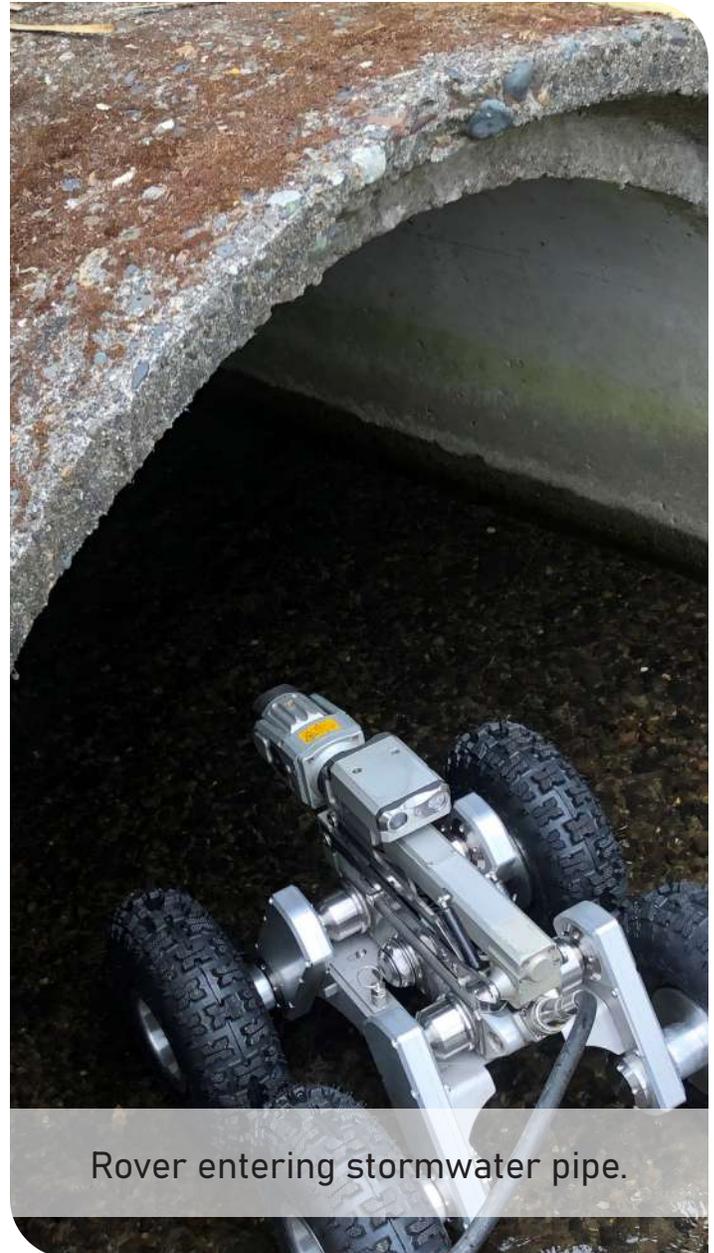
A plan is needed to address aging pipe infrastructure. This plan will build on the pipe evaluation tool developed during this Surface Water Planning effort and further develop a framework for repairing and replacing the most at-risk pipe infrastructure. Potential funding sources and approaches will be evaluated. Programmatic Action Infr-16 Aging Pipe Plan

Infrastructure Equipment 2022-01 CCTV Camera and Crawler

This piece of equipment will replace rapidly aging inspection equipment. It will support the on-going evaluation of stormwater pipes and facilities.

Infrastructure Equipment 2022-02 Hook Lift Asphalt Hot Box

This asphalt hot box for use with a hook lift will improve efficiency in asphalt use and reduce

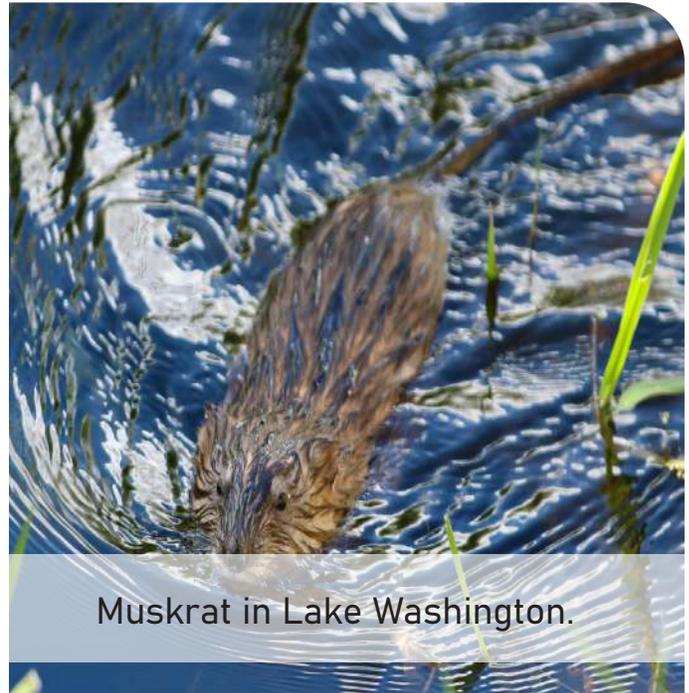


Rover entering stormwater pipe.

waste. Asphalt can remain ready to use inside this box for multiple days allowing for more flexibility in project installation and reduce pick up trips.

Medium Priority Programmatic Actions

The medium priority programmatic strategies are recommended within the increased level of service, as described in the Plan Implementation, Section 11. These actions are not required by the City's NPDES Phase II permit, nor are they critical for providing a baseline of service. However, each of these recommended actions adds value by proactively prioritizing surface water project opportunities, acquiring and collecting data, evaluating alternative strategies for existing ways of doing work, enhancing existing work programs, or addressing a stormwater challenge in a new innovative way. Appendix H provides details for medium priority programmatic actions.



Muskrat in Lake Washington.

Low Priority Programmatic Actions

There are 6 low priority water quality and habitat programmatic actions are also recommended within the increased level of service as described in the Plan Implementation, Section 11.

Low priority projects may elevate to a higher priority over the life of this planning period if conditions change including Council priorities and/or need. Details are provided in Appendix H.



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Plan Implementation and Measuring Progress

- Current Level of Service
- Future Levels of Service
- Evaluation of Service Levels
- Utility Rates
- Recommended Level of Service
- Funding
- Measuring Progress



2023 Surface Water Master Plan

Plan Implementation

Implementation of Capital Projects, Programmatic Actions, and Equipment Needs recommended in this Surface Water Master Plan require staffing and funding resources and decisions about how staff should be allocated to accomplish existing and recommended Utility projects to meet Utility and City goals. As mentioned in the Programmatic Actions Section 10, programmatic actions were prioritized into high, medium, and low categories that align with alternative future levels of service beyond the current level of service provided by the Utility. The future levels of service described in this section were evaluated for potential rate impacts in the context of overall Utility rates and the City budget. The Financial Analysis is provided in Appendix M with the Final Plan. High priority capital projects were prioritized and scheduled for the 6-year CIP within the overall CIP program in coordination with the Capital Engineering Division and the available capital project funding.

Current Level of Service

Sections 6 and 7 describe the current work programs for the two primary Divisions within the Surface Water Utility— Operations and Maintenance and Engineering, which is considered the Utility’s current, or baseline level of service. All of the Utility’s current work programs are necessary to continue making progress on the Utility’s goals, while meeting regulatory obligations, and ensuring that infrastructure and natural resources are managed in an equitable and sustainable way. The alternative future levels of service address changing needs beyond the current work program and represent resource needs to meet current and future challenges and opportunities identified in this planning process.



Future Levels of Service

Programmatic projects, staffing recommendations, capital investments, and equipment were packaged into two service levels to compare potential impacts to rates. The table on the next page shows the grouping of these recommendations. Future levels of service were identified for evaluation in the Financial Analysis (Appendix M) and considered for implementation over a 6 - 8 year period of time. The Financial Analysis describes the alternative funding scenarios and summarizes potential rate impacts for the different levels of service. The analysis showed minimal change between the two future levels of service (noted as moderate and enhanced in the financial analysis). These levels of service were combined into one increased level of service. It is expected that programmatic actions may be re-prioritized per Council direction and adjusted into different services levels every 2 years as priorities change.

Capital Costs

Two alternatives for additional capital funding — \$500,000 per year annually, or \$1 million per year, annually, were evaluated and assumed to start in year 2025 assuming 2022 dollars, 15% inflation, and 5% annual construction cost inflation thereafter. Capital funding could be added to any level of service and each of the potential scenarios and rate impacts were evaluated. The average estimated cost of the recommended high priority capital projects is between \$1 million and \$1.8 million in 2022 dollars. An additional \$500,000 per year over the 6-year CIP could allow the Utility to fund an additional 1 - 2 projects. An additional \$1 million per year, could result in an additional 3 - 6 projects funded over the 6-year CIP.

Service Level Definitions

Minimum Level of Service

The minimum level of service is needed to fulfill regulatory requirements, meet Council priorities, and have sufficient staff and resources to more efficiently meet the current level of service.

Increased Level of Service

The increased level of service includes projects and increased capital funding that are recommended to advance Utility priorities and to prepare the Utility for the future. This level of service is additive to the minimum level of service. This service level includes proactive actions that enhance existing work programs and sets the Utility up for more efficient delivery of projects.

Service Level	Item	Title (Number)	Objective
Minimum	Staff/ Equipment	Storm Crew Leadsperson and Vehicle (Utility Assessment)	Hire additional O&M Leadperson to reduce span of control for current Leadperson.
Minimum	Staff	Program Manager (Utility Assessment)	Hire Utility Manager to remediate management span of control and bandwidth issues in Engineering Division.
Minimum	Project	Development Opportunity Fund (Infr-15)	Establish opportunity fund to partner with development community to replace aging City stormwater infrastructure when private development projects impact City right-of-way.
Minimum	Project	Aging Pipe Plan (Infr-16)	Establish plan for funding and scheduling necessary pipe repairs and replacements.
Minimum	Project	Hydrologic Modeling (Infr-04) Pilot Program: Windsor Vista only	Pilot program to collect data to support needed surface water analyses in Windsor Vista.
Minimum	Project	Urban Forestry and Stormwater (Hab-01)	Clarify the benefits of tree canopy and urban forest retention for stormwater management.
Minimum	Project	Mutual Benefits for Parks and Surface water (WQ-01)	Identify WIN-WIN opportunities for parks and water quality.
Minimum	Project	6PPD-Quinone (WQ-02)	Develop strategy for managing new information surrounding 6PPD-quinone.
Minimum	Project	Evaluate Capital Facility Charges (Infr-05)	Ensure Kirkland collects appropriate fees to fund capital facility improvements.
Minimum	Project	Evaluate Aging Stormwater Facilities (Infr-08)	Develop plan for replacing or improving aging stormwater facilities.
Minimum	Project	NPDES Permit Gap Analysis (WQ-07)	Identify program needs associated with next NPDES Phase II Permit (Effective August 1, 2024 and expected August 1, 2029).
Minimum	Project	85th Street Station Area Stormwater Design Support (Infr-10)	Support stormwater design and environmental strategies in 85th Street Station Area Plan.

Service Level	Item	Title (Number)	Objective
Minimum	Equipment	CCTV Camera and Crawler	Purchase CCTV Camera and Crawler
Minimum	Equipment	Hook lift Asphalt Hot Box	Purchase asphalt hot box for hook lift truck.
Increased	Project	Wetland and Stream Restoration (Hab-04)	Prioritize wetland and stream restoration opportunities to improve habitat.
Increased	Staff/ Equipment	Source Control (WQ-09)/IDDE (WQ-10) and Vehicle	Hire FTE to coordinate Source Control Business Inspection Program and support IDDE response.
Increased	Project	Streets and Retrofit (WQ-03)	Prioritize un-used ROW for stormwater retrofit.
Increased	Project	Stormwater Outfalls (Infr-01)	Improve maintenance and operations of stormwater outfalls in Lake Washington.
Increased	Project	Land Acquisition Prioritization (Infr-02)	Develop surface water prioritization goals for property acquisition.
Increased	Project	Minor Development Evaluation (Infr-03)	Identification of potential surface water implications associated with minor development and recommendations for mitigation.
Increased	Project	Hydrologic Monitoring Program (Infr-04)	Collect data to support needed surface water analyses.
Increased	Project	CKC Review (Infr-06)	Identify CKC stormwater needs and opportunities for collaboration in advance of project design and implementation.
Increased	Project	Improve SW System Continuity (Infr-07)	Prioritized plan and conceptual designs for conveyance system improvements where formal system is lacking.



Service Level	Item	Title (Number)	Objective
Increased	Project	NPDES and Other Surface Water Training (WQ-08)	Enhance existing Surface Water training programs, including NPDES-required activities and tracking mechanisms.
Increased	Project	Strategy for Repair and Replacement of piped Streams (Infr-09)	Strategy for repair and replacement of piped streams.
Increased	Project	Basin Capacity Analysis (Infr-11)	Identify and plan for potential system upgrades to address current system issues and future impacts due to climate change.
Increased	Project	In-house Completion of Small CIP Projects (Infr-14)	Implement in-house delivery of small stormwater CIP projects to reduce costs and expedite repair and replacement schedule for aging and failing stormwater pipes.
Increased	Project	Trenchless Pipe Repair (Infr-12)	Conduct trenchless pipe repair to address aging and failing pipes (pilot program).
Increased	Project/ Equipment	CCTV Pipe Inspection (Infr-13) Vehicle and Staff	Expand CCTV program to complete inspections of full stormwater pipe inventory and continue at recommended frequency.
Increased	Project/ Equipment	IDDE (WQ-10) Small Eductor Truck and Staff	Continue to respond to water quality concerns and spills in a timely manner and follow-up with appropriate actions.
Increased	Capital Projects	Additional CIP Funding	Complete additional capital project construction.
Increased	Equipment	Concrete mixer	Purchase concrete mixer for hook lift truck.
Increased	Equipment	Skid steer and attachment	Purchase skid steer and attachments.
Increased	Project	Stream and Lakeside Recognition Program (Hab-02)	Better stewardship and engagement with private property owners that will provide habitat benefits for City watersheds.

Service Level	Item	Title (Number)	Objective
Increased	Project	On-call Critical Area Determination Support Services (Hab-03)	Provide on-call support, as-needed, for critical areas determinations necessary for surface and stormwater projects.
Increased	Project	Sewer Connection System Incentives (WQ-04)	Reduce water pollution from failing septic systems by connecting systems to the public sewer system.
Increased	Project	Public/Private Retrofit Opportunities (WQ-05)	Process to highlight potential target areas for public-private partnerships for stormwater retrofit that can be identified early in the development process.
Increased	Project	Geotechnical Map Update (WQ-06)	Updated geologic and infiltration potential mapping.
Increased	Project	Juanita Creek near Windsor Vista Park Restoration Plan (Hab-05)	Restore Windsor Vista reach of Juanita Creek.
Increased	Capital Projects	Additional CIP Funding	Complete additional capital projects.
Increased	Project	Juanita Beach Water Quality (WQ-11)	Evaluate options to improve water quality at Juanita Beach.



Utility Rates

The Surface Water Utility rates are reviewed and adopted by City Council on a 2-year budget cycle, comprehensively with other Utility rates (i.e. sewer, water, and solid waste). Adoption of this Plan does not mean adoption of any future utility rate. Projects and programs recommended through this plan will be considered for rate impacts through the CIP and budget processes.

Baseline Level of Service Rates:

Each biennium budget process includes an analysis of current service level and evaluates if rates need to increase to sustain the current level of service. The current level of service makes up the baseline rate. Drivers that can impact the baseline rate are inflation of cost of goods or cost of living increases. For 2023 and 2024, the baseline rate increase is 5%. The table below are the estimated baseline rate increases from 2023 to 2030.



Other factors, such as the quantity of reserve funds, may still impact these future rate proposals. These rates will go through the budget process and be considered for adoption every biennium.

2023	2024	2025	2026	2027	2028	2029	2030
5.0%	5.0%	5.0%	5.0%	5.0%	2.5%	2.5%	2.5%

Minimum Level of Service Rates:

When staff propose an increase to the baseline level of service, those are considered through the budget process as a service package. Service packages approved by the City Manager and City Council are incorporated into the proposed 2-year budget and are incorporated in the rates for the biennium. All proposed staff, equipment, and programs considered as the Minimum Level of Service within this Plan were incorporated into service packages for the 2023—2024 budget cycle and approved through the budget process.

Increased Level of Service Rates:

The proposed increased level of service, as described above, was reviewed for rate impacts with three levels of CIP funding. If this level of service were to be adopted, this would increase the baseline rate annually beginning in 2025.

The table below shows how implementing the entire increased level of service would impact the cost of the average monthly residential rate.

Level of Service	Average Extra Cost Per Month	Average Extra Cost Per Year	Average Incremental Percent Increase
Increased	~\$4.84 to \$6.91	~\$58.00 - \$82.92	3 - 4% each year

Recommended Level of Service

Council has adopted the budget for 2023-2024, which includes items within the minimum level of service. Staff will propose increased level of service staff, equipment, and projects during each budget cycle for consideration.

Funding

The 2023 – 2024 Surface Water Utility rates have been adopted and include the minimum level of service. Funding increased levels of service will be determined every 2 years through the City’s budget process and can be re-adjusted if priorities change. Additionally, Capital Facility Charges were evaluated and have been updated from \$508 to \$1,556 per equivalent service unit for 2023. It is recommended that these charges are evaluated every 2 years, based on the Financial Analysis (Appendix M) to fund surface water capital improvement projects and keep pace with the cost of asset repairs and replacement.



2023 Surface Water Master Plan

Measuring Plan Success

The 2014 Surface Water Master Plan Update identified several performance measures for which to evaluate utility projects and programs. In retrospect, there were too many performance measures, and their definitions of success were too vague- this made it challenging to produce a useful or comprehensive performance report.

Considering these lessons learned, the Utility decided to take a different approach for how to gauge success. It is clear from the accomplishments (Section 4), that the Utility has many things to be proud of and that progress is being made toward Utility goals. Challenges and opportunities were identified in this planning process, with staffing, equipment, projects, and actions recommended for funding and implementation. Success is about outcomes.

Measuring Progress

Surface Water Utility goals are broad, and progress towards them is incremental, takes many years, and may involve factors beyond the Utility's control. This makes measuring results relative to Utility goals challenging.

Kirkland is making important cumulative progress on all of its goals. Each project or program is a drop in a very large budget, and thus its impact may be hard to measure. Over time, however, these projects will add up to improved conditions. The Utility recognizes that the timescale needed for change is long and funding needs are large. Spending needs requires a balance with other community goals and broader economic trends. For example, in 2012, King County and Kirkland completed a study of water quality treatment and flow control measures that could be used to restore habitat and water quality in Juanita



Creek. The set of measures that was most successful at restoring habitat and water quality included providing facilities to treat water and control the flow of water from 80% of existing impervious surfaces, at an estimated cost of \$1.4 billion (in 2012 dollars - costs would be much higher today).

Although progress toward long-term goals is hard to track in the short-term, especially for results that may not be realized for years, it is possible to provide accountability to Utility rate payers. It is recommended that the Utility provide a report every two years to rate payers that summarizes overall accomplishments and highlights the previous two years' activities and projects. Additionally, a new interactive on-line dashboard will be launched in the fall 2022 to provide information on watershed health, including water quality and habitat data collected by the Utility. These are important metrics that indicate trends toward achieving Utility goals.

