

TECHNICAL MEMORANDUM

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Subject: City of Bellevue Watershed Management Plan: Foundational Element #3 –
Watershed Prioritization

CONTENTS

Introduction.....	3
Existing Watershed Management Planning Guidance and Requirements.....	9
Puget Sound Characterization	10
Redmond Citywide Watershed Management Plan	11
Building Cities in the Rain	12
Stormwater Management Action Planning.....	13
Summary of Available Information and Data	14
City of Bellevue Watershed Prioritization Process.....	17
Guiding Principles	17
Watershed Management Strategy Categories.....	19
Watershed Prioritization Process	19
Watershed Prioritization Use and Applicability	21
References.....	22

APPENDICES

Appendix A	Summary of Existing City of Bellevue Monitoring Data
Appendix B	Open Stream Condition Assessment Data Summary
Appendix C	Geographic Information System Data Summary
Appendix D	Initial Watershed Prioritization Results



TABLES

Table 1. City of Bellevue Major Watersheds and Associated Subbasins. 19

Table A–1. Summary of Existing City of Bellevue Monitoring Data..... A-1

Table B–1. Open Stream Conditions Assessment Data Collection Summary..... B-1

Table C–1. Geographic Information System Data Summary..... C-1

Table D–1. City of Bellevue Initial Watershed Prioritization Results..... D-1

FIGURES

Figure 1. Watershed Management Plan Development Process 5

Figure 2. Conceptual Model Describing the Primary Effects of Urban Runoff on Stream Health..... 7

Figure 3. Puget Sound Watershed Characterization Management Strategy Matrix..... 11

Figure 4. City of Bellevue Main Watersheds..... 16

INTRODUCTION

Urban development in the lowland regions of the Puget Sound basin over the past 150 years has resulted in the conversion of large tracts of forested area to residential, industrial, and commercial land uses. Changing environmental conditions that resulted from this conversion have dramatically impacted the health of the region's streams, lakes, and marine water bodies. Common causes of water resource degradation from urbanization include poor water quality, loss of riparian and aquatic habitat, and stream channel erosion. In combination, these impacts have resulted in widespread disruption in the ecological function of water bodies causing sensitive aquatic life to decline in abundance or disappear completely.

The City of Bellevue (City) is committed to improving and protecting the aquatic health of water bodies within its boundaries. To that end, the City is developing a Watershed Management Plan (WMP) that will direct improvements to the health of the City's streams using a toolbox of holistic storm and surface water management practices. The WMP will direct investments to high priority watersheds providing measurable environmental benefits to stream health within shorter time frames compared to the status quo. The WMP will also help prevent further degradation in non-priority watersheds. The WMP will include an implementation plan with recommended projects, policies and operational plans to meet performance goals for Bellevue's streams, and to provide multiple benefits that help advance City objectives across departments and programs.

The City is developing the WMP using a stepwise process that builds on information obtained from each proceeding step to ensure the final plan is comprehensive, makes the most use of new and existing data and information, and reflects the community's values and goals. As shown in Figure 1, this stepwise process leading up to WMP development includes the following major components:

- **Foundational Element Memoranda** will be prepared at the onset of the WMP's development to define critical inputs to the process including the overarching framework for the plan (Foundational Element #1), the metrics that will be used to measure progress towards meeting stream health goals (Foundational Element #2), and the approach that will be used for prioritizing watersheds (Foundational Element #3).
- **Watershed Assessment Reports (WARs)** will be developed to characterize existing conditions in the City's watersheds: greater Kelsey Creek, Coal Creek, the grouping of small Lake Washington subbasins, and the grouping of small Lake Sammamish subbasins. Each WAR will include limiting factors, data gaps (if any), and identified opportunities for improving watershed health.

- **A Watershed Management Toolbox** will be prepared to identify and document the different tools (or strategies) that could be used to meet the WMP goals. These could include stormwater Best Management Practices (BMPs), policy/regulatory changes, operational strategies, engineered solutions, management strategies, etc. The toolbox will also indicate which stressors on stream health are addressed by each individual tool or management strategy.
- **Initial and revised Watershed Prioritizations** will be performed to identify which watersheds would have the quickest positive response to rehabilitation efforts, with the goal of maximizing return on the City's investments in stream health. The initial prioritization (performed before and during WAR development) will provide the technical basis for meeting regulatory requirements for watershed planning that stem from the City's Phase II Municipal Stormwater Permit (Phase II Permit). The revised prioritization (performed after the WARs are complete) will guide all subsequent phases of the WMP's development. (The City's watershed prioritization process is the topic of this memorandum.)
- **Community Metrics** will be identified based on community values and goals for quantifying additional benefits that may be realized from the WMP in addition to those related to improved stream health. For example, these metrics might quantify benefits from the plan related to increased access to open space, educational opportunities, enhanced aesthetics, and/or environmental and social justice issues.
- **Watershed Improvement Plans (WIPs)** will be prepared for each priority watershed that list and describe each of the solutions recommended for watershed improvement with associated costs and a schedule for implementation. These plans will provide details on the tools and opportunities considered for watershed improvement, provide information on how the opportunities were evaluated, and the results of those evaluations. The WIPs will focus on investments focused on stream health rather than broader community goals, which will be addressed in the WMP itself.

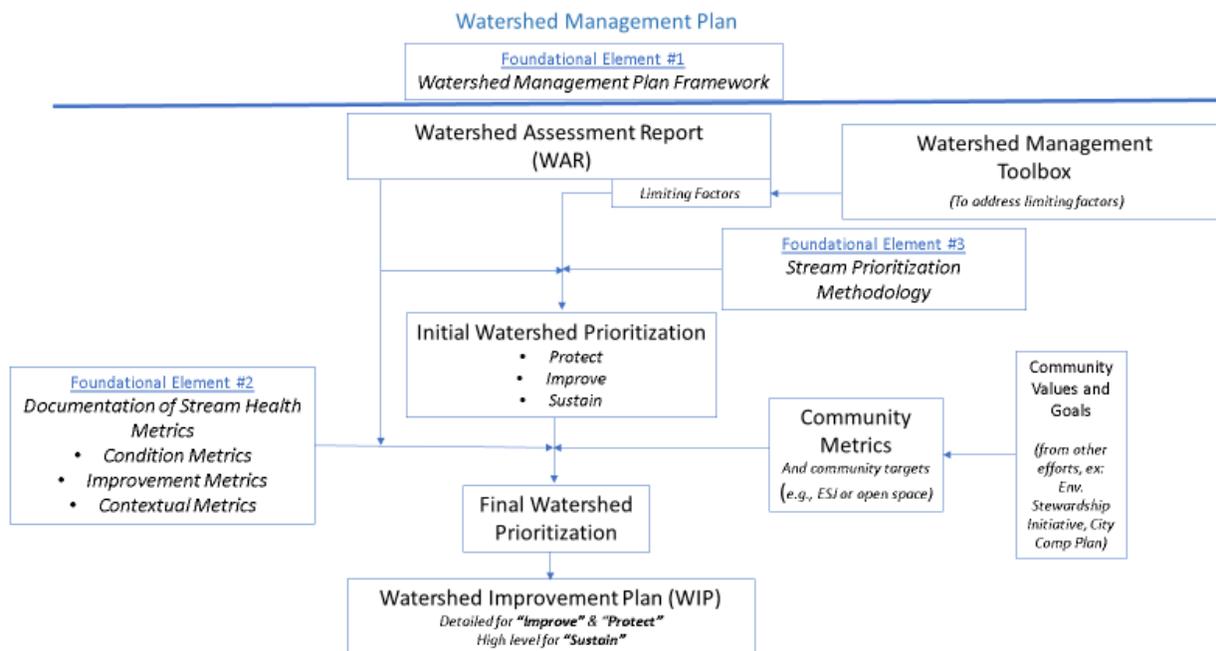


Figure 1. Watershed Management Plan Development Process.

All the work performed to develop these components of the WMP will be informed by a conceptual model (Figure 2) the City has developed that describes the primary effects of urban runoff on stream health. This model shows the linkages between specific sources of stress on stream health (e.g., stormwater runoff) and the consequences, impacts, and outcomes that collectively contribute to degraded stream health. This model will be particularly important for identifying the specific limiting factors that are responsible for impaired stream health during preparation of the WARs and the appropriate solutions for improving conditions during preparation of the WIPs.

This Foundational Element #3 memorandum documents the initial and revised approaches that will be used for prioritizing watersheds. It begins with a summary of existing guidance and requirements related to watershed management planning in the region. It then provides a high-level summary of the information and data that are available to inform the City’s watershed prioritization process. Finally, it identifies the specific steps the City will use to complete this process.

URBAN RUNOFF PRIMARY EFFECTS ON STREAM HEALTH CONCEPTUAL MODEL

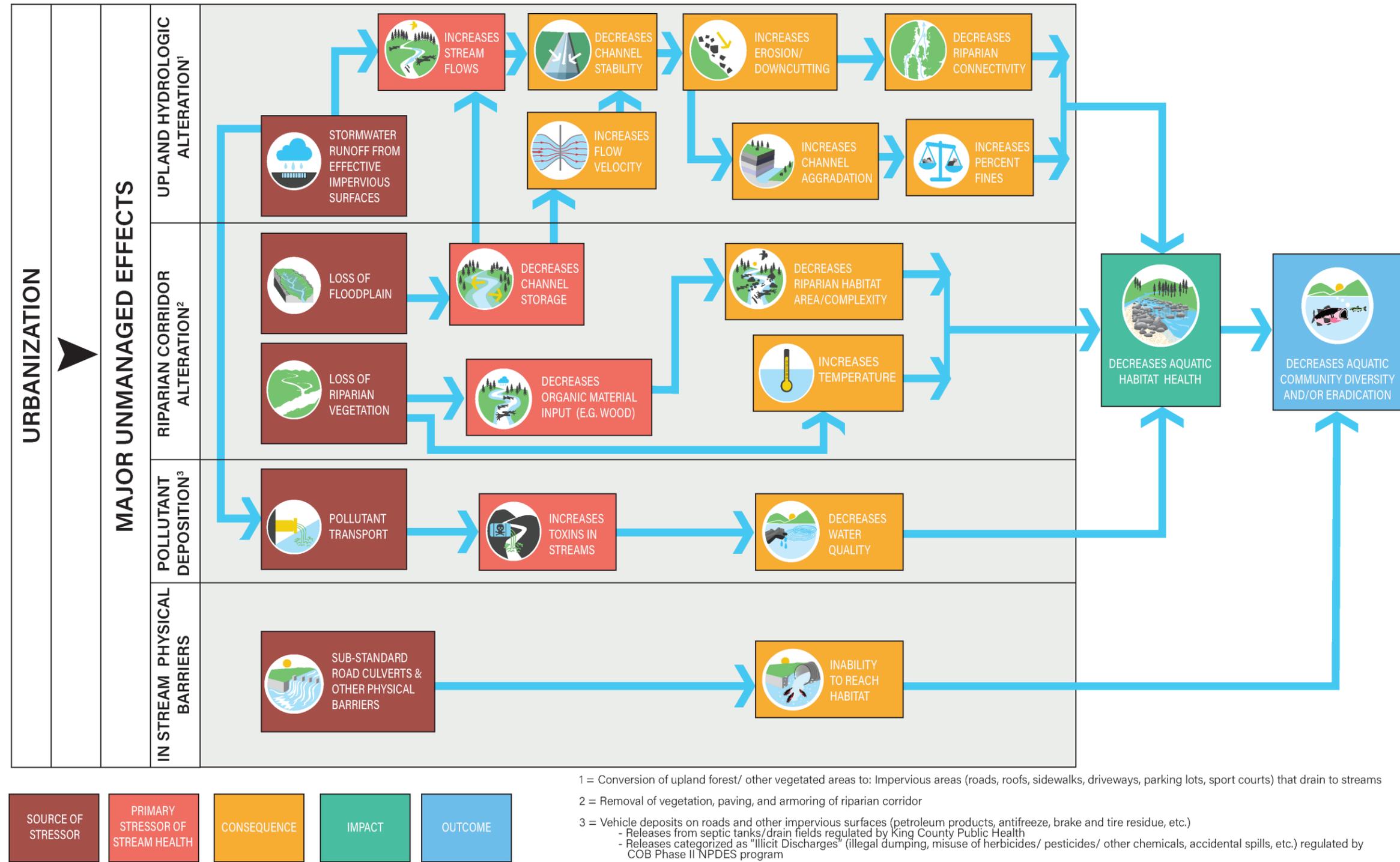


Figure 2. Conceptual Model Describing the Primary Effects of Urban Runoff on Stream Health.

EXISTING WATERSHED MANAGEMENT PLANNING GUIDANCE AND REQUIREMENTS

There are many regulations that dictate the obligations of cities, developers, landowners, and others with respect to water resource management. While each of the regulations are designed to accomplish specific water resource goals, and generally are effective at meeting their independent goals, the regulations are based on state and federal policies and guidelines, and are not always tailored to a specific watershed. The result is a shotgun approach to watershed management that directs improvements and protections based on independent, generally non-coordinated actions (e.g., when development occurs, where significant environmental degradation has been documented, or as part of broader land use planning efforts), rather than focusing efforts where they will provide the greatest environmental benefit.

To address the deficiencies of this approach, state and local jurisdictions have developed guidance and requirements for using coordinated watershed management planning to increase the effectiveness of water body rehabilitation efforts. As described in Herrera (2013) this approach looks at existing conditions within each watershed; identifies the associated needs, requirements, opportunities, and constraints; and then focuses rehabilitation efforts on priority areas and issues that have the greatest potential to protect or improve conditions in a water body. The benefits of this approach include:

- Prioritization of water resource projects where they will provide the most benefit
- Integration of interrelated regulatory requirements into a common strategy
- Realization of greater environmental improvement in a shorter period of time compared to spot improvements tied to individual development projects
- More efficient use of rehabilitation dollars through targeted projects tailored to specific watershed needs (essentially projects designed and located where the benefits can be most significant)

To support watershed management planning efforts within the region, the following guidance documents have been developed by state agencies or local jurisdictions:

- Puget Sound Characterization. Volume 1: The Water Resources Assessments (Water Flow and Water Quality) (Stanley et al. 2011)
- City of Redmond, Washington: Citywide Watershed Management Plan (Herrera 2013)
- Building Cities in the Rain: Watershed Prioritization for Stormwater Retrofits (Washington State Department of Commerce 2018)

In addition to these guidance documents, the Washington State Department of Ecology (Ecology) has established requirements for watershed management planning through the Stormwater Management Action Planning (SMAP) provision of the Phase II Permit. These requirements and the guidance documents identified above are briefly summarized in the following subsections.

Puget Sound Characterization

The Puget Sound Watershed Characterization is a set of spatially explicit water and habitat assessments that compare areas within a watershed in terms of their relative suitability and value for restoration and protection. The assessments cover water resources (both water flow and water quality) and fish and wildlife habitats in terrestrial, freshwater and marine nearshore areas over the entire drainage area of Puget Sound. Results from the assessments of water flow were used to screen watersheds within the city to identify candidate watersheds for intensive, near-term rehabilitation efforts under this WMP. The assessment for water flow combines results from different models that evaluate the “importance” and “degradation” of small watersheds, referred to as Assessment Units (AUs), with respect to the following waterflow processes:

- **Delivery** – The Delivery model assesses those physical features that control how precipitation is delivered to the landscape. This includes the quantity of precipitation, area of forest cover, and rain on snow zones.
- **Surface Storage** – The Surface Storage model assesses those features that control the movement of water at the surface, including depressional wetlands and floodplains.
- **Recharge** – The Recharge model assesses areas that control the infiltration and percolation of precipitation into groundwater.
- **Discharge** – The Discharge model assesses areas that control the movement of groundwater back to the surface, including the area of slope wetlands and floodplains with permeable deposits.

The importance and degradation rankings from these models can be integrated into a matrix that defines broad management strategy recommendations for any given AU (Figure 3). The greatest level of management action (broadly denoted “Restoration”) applies to the most important AUs with the greatest existing degradation. Conversely, areas of lower importance due to less degradation likely require a much lower level of management attention (here termed “Conservation”). Those with high importance and low existing degradation may need little or no active management but warrant a high level of protection to maintain high functional conditions (here termed “Protection”); and those with low importance and significant human impact would be lowest in priority ranking for active management. These are thus tagged “Development,” indicating that additional development in this AU will have the lowest overall impact relative to other AUs with respect to waterflow processes.

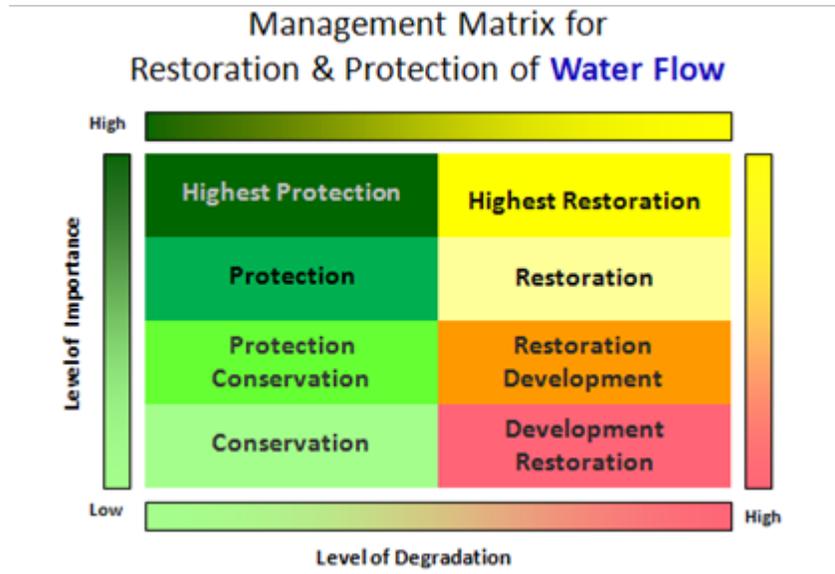


Figure 3. Puget Sound Watershed Characterization Management Strategy Matrix.

Redmond Citywide Watershed Management Plan

The “City of Redmond, Washington: Citywide Watershed Management Plan” (Redmond WMP) was developed in 2011 to establish a long-term framework for restoring surface waters in Redmond, WA using a watershed approach. To achieve this goal, the Redmond WMP included: 1) a review of existing conditions within each watershed in the city; 2) analyses to identify the associated needs, requirements, opportunities, and constraints; and 3) a strategy to focus future rehabilitation and mitigation efforts on priority watersheds where they are expected to produce the greatest potential to protect or improve conditions in a water body. In the process, the Redmond WMP identifies specific linkages between the City’s comprehensive plan and other planning activities to foster alignment towards the City’s overarching goals for watershed rehabilitation.

The Redmond WMP also outlines an alternative approach to meeting the City’s stormwater management requirements under its Phase II Permit that is designed to achieve more significant improvement in a shorter time period (and likely at reduced cost). There are two key guiding principles for this approach: 1) retain requirements to prevent new impacts from development at all sites, regardless of watershed condition or priority, and 2) transfer required project-by-project flow control or runoff treatment improvements to strategic locations in priority watersheds. This approach ensures that impacts will not increase in any watershed while also allowing for significant improvement via targeting stormwater management best management practices (BMPs) where they can be of greater benefit to receiving waters, as compared to the scattered nature of stormwater mitigation that would otherwise occur. This approach for meeting Phase II Permit requirements subsequently served as a model for guidance that was developed by Ecology (2016) for implementing stormwater control transfer programs in Western Washington.

Building Cities in the Rain

The Building Cities in the Rain guidance document was developed by the Washington Department of Commerce to describe an optional process for prioritizing watersheds for stormwater retrofits and the recovery of aquatic habitat in urban areas. It is intended to provide a tool for local governments to target investment in stormwater retrofits in a way that leverages opportunities for salmonid habitat restoration and facilitates redevelopment in urban centers. This guidance lays out the following stepwise process for prioritizing watersheds for stormwater retrofit investments:

1. Establish prioritization goals.
2. Review any regional scale information as an initial screen; this would include the Puget Sound Characterization described above.
3. Assess local, watershed specific information.
4. Actively seek input from natural resource agencies and tribes.
5. Involve the public in the prioritization process.
6. Seek approval from Ecology to establish a stormwater control transfer program.

The prioritization described in the guidance is intended to provide environmental benefits in a number of different contexts, such as:

- Informing elected officials and the general public of environmental assets in their community, and the current condition of those assets;
- Informing the needs assessment for the Capital Facilities Element of a local comprehensive plan, including the location and capacity of needed or expanded facilities to adequately control stormwater runoff from existing development;
- Targeting stormwater control investment under a structural stormwater control program required under the Phase I Municipal Stormwater Permit (Phase I Permit);
- Prioritizing project proposals for a grant from the Ecology Stormwater Financial Assistance Program to address pollution caused by existing development;
- Informing water cleanup plans (Total Maximum Daily Load); or
- Establishing a stormwater control transfer program that targets high-priority watersheds for transfer of stormwater retrofits from watersheds where local comprehensive plans encourage redevelopment and urban infill.

Stormwater Management Action Planning

In the Phase II Permit that became effective on August 1, 2019, Ecology is requiring Stormwater Management Action Planning (SMAP) be performed by all Phase II permittees in Western Washington. As described in Ecology (2019), the SMAP is focused on addressing impacts from the cumulative development in a watershed rather than on single site or subdivision impact. The ultimate goal of the SMAP is to answer the following questions:

- How can we most strategically address existing stormwater problems?
- How can we meet our future population and density targets while also protecting and improving conditions in receiving waters?

To successfully complete the SMAP process, Phase II permittees will use available information and professional judgment to:

- Assess receiving water conditions in their jurisdictions by:
 - Delineating all of the basins and identifying the receiving waters with total watershed areas between one square mile and about 20 square miles.
 - Performing a rapid assessment of existing information about conditions in receiving waters.
 - Assessing the relative current and potential influence of the permittee's MS4 on each receiving water.
 - Putting all of this information together to narrow the list of receiving waters to a list that makes sense for prioritization in a public process.
- Prioritize the narrowed list of receiving waters by gathering public input to build support for the SMAP; and select the receiving water and the subbasin or catchment area(s) where SMAP best suits the permittee's MS4.
 - Develop a SMAP for the selected catchment area by:
 - Identifying specific stormwater management actions to protect water quality in the selected receiving water, and
 - Determining an appropriate schedule and budget sources for implementing the activities and projects that have been identified.

Following this process, permittees are required to prepare a watershed inventory with a brief description of their relative conditions and contributing areas by March 31, 2022; document the prioritized and ranked list of receiving waters by June 30, 2022; and develop a SMAP for at least one high priority catchment area by March 31, 2023.

SUMMARY OF AVAILABLE INFORMATION AND DATA

In general, the guidance documents described in the previous section recommend the watershed prioritization process begin with an initial screening using regional scale information (e.g., Puget Sound Characterization) which is then refined and enhanced using local, watershed specific information and data. Watershed specific information and data available to inform the City's watershed prioritization process include monitoring data collected by the City and/or King County to assess water quality, stream flows, and stream biota (e.g., macro invertebrates and resident fish). Appendix A to this memorandum provides a summary of these existing data that includes the following information:

- Period of collection
- Parameters
- Purpose
- Source
- Collection frequency
- Data format and storage location
- Data quality and condition
- Current data users

In addition, the City has or will collect new data on physical habitat conditions in the following streams (Figure 4) in the years indicated through implementation of the Open Stream Condition Assessment (OSCA) program:

- Newport Creek – 2018
- Coal Creek – 2018, 2019
- Lewis Creek – 2018, 2019
- Ardmore Creek – 2019
- Goff Creek – 2019
- Richards Creek – 2019
- Sears Creek – 2019

- Sturtevant Creek – 2019
- Sunset Creek – 2019
- Valley Creek – 2019
- Kelsey Creek – 2019, 2020
- Vasa Creek – 2020
- Lakehurst Creek – 2020
- Meydenbaurer Creek – 2020
- North Sammamish Creek – 2020
- Phantom Creek – 2020
- South Sammamish Creek – 2020
- Wilkens Creek – 2020
- Yarrow Creek – 2020

Appendix B provides a summary of the specific data that are being collected through this program.

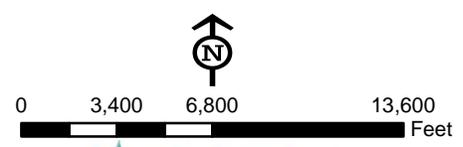
Finally, watershed attribute data (e.g., topography, land use, land cover, and soils) in a geographic information system (GIS) format are available from several sources that can be leveraged to inform the prioritization process. A partial summary of these data is provided in Appendix C.



Legend

- | | |
|---|---|
|  Subbasin |  Main Watershed Boundaries |
|  City |  Coal/Newport |
|  Waterbody |  Greater Kelsey |
|  Highway |  Small Lake Sammamish |
| |  Small Lake Washington |

Figure 4.
City of Bellevue Main Watersheds.



CITY OF BELLEVUE WATERSHED PRIORITIZATION PROCESS

This section describes the watershed prioritization process the City will implement to support the development of the WMP. It begins with a description of the guiding principles the City has established to inform this process. The watershed management strategy categories the City will use in this process are then defined. Finally, the specific steps involved in the prioritization process are enumerated with a description of the final use and applicability.

Guiding Principles

To ensure the watershed prioritization will provide the maximum benefit to streams, the City has established the following guiding principles for the prioritization process that have been adapted from the Redmond WMP (Herrera 2013):

- Prioritize watersheds with moderate levels of impairment. Watersheds with moderate levels of impairment are expected to respond most quickly to rehabilitation efforts and thus provide quicker benefit. This focus will allow a relatively large number of watersheds to be rehabilitated in a shorter amount of time (compared to the default single site regulatory approach). This approach is consistent with guidance from academic research on watershed conditions (Beechie et al. 2008; Palmer et al. 2005; Roni et al. 2002) that recommend resource managers place a high priority on preservation of remaining high quality stream riparian ecosystems, and focus stream and watershed rehabilitation efforts on streams that are degraded but likely to respond to improvements. Under an alternate approach that targets only severely impaired watersheds for rehabilitation efforts, it might take decades to see even one watershed significantly rehabilitated.
- Prioritize watersheds where regional rehabilitation efforts are also focused. There are eight salmon recovery regions in the state, each with multiple subregions called Water Resource Inventory Areas (WRIAs). The city is located within the WRIA 8 subregion and contributed to the development of and continues to collaborate on the implementation of the associated Chinook Salmon Conservation Plan (CSCP) (LWCS/WRIA 8 2005). To prioritize implementation of restoration strategies, the CSCP classifies watersheds into functional “tiers” based on watershed condition and fish use. Tier 1 areas are the highest priority habitats for protection/ restoration, and include primary spawning areas, as well as migratory and rearing corridors. Tier 2 areas are a secondary priority and include areas less frequently used by Chinook salmon for spawning, but that contribute to the overall spatial diversity of salmon populations in the watershed. Kelsey Creek is identified as a Tier 2 watershed and therefore will be given more consideration in the prioritization process to align the City’s WMP with this regional effort. In 2005, Coal Creek was classified as a Tier 3 stream in the WRIA 8 Chinook Recovery Plan, but it has recently experienced an increase in use by Chinook salmon and contains areas with somewhat higher quality

habitat compared to some Tier 2 areas. The WRIA 8 Technical Committee is monitoring its status and will consider upgrading Coal Creek to Tier 2 if adult returns continue to increase.

- Prioritize watersheds where the City has the most opportunity for implementing watershed rehabilitation efforts through property ownership. Watershed rehabilitation efforts on private property can be more difficult and costly due to property access, permitting, or easement issues that create barriers to implementation. Collectively, the City's Utilities, Parks and Community Services, and Transportation departments own or control a large amount of area that is more accessible relative to private property due to the absence of these barriers. These areas include facilities, easements, park land, and right-of-way. It follows that watersheds with more area under City control through property ownership will provide more opportunity for implementing watershed rehabilitation efforts; therefore, these watersheds should be given more consideration in the prioritization process. The opportunity for public-private partnerships, however, where the interests of both entities is served, is not ruled out and may be another tool to achieve the goals of this Plan.
- Prioritize watersheds with existing infrastructure that can be optimized through modifications or retrofits to improve performance. Construction of new infrastructure can be complicated or prohibitive due to issues related to technical feasibility, cost, regulatory constraints, and public acceptance. Due to this consideration, modifications or retrofits of existing infrastructure often represent a more cost-effective means of obtaining additional treatment. This could include existing infrastructure in older developments that was designed using outdated standards or newer infrastructure that is underperforming due to a known design defect. These opportunities should be identified and used to inform the prioritization process if they are concentrated in specific watersheds.
- Prioritize watersheds where there are opportunities to provide additional community benefits beyond those related to improved stream health. As noted in the Introduction to this memorandum, the WMP is being developed following a stepwise process that will involve use of community metrics for identifying benefits from the plan related to increased access to open space, educational opportunities, enhanced aesthetics, and/or environmental and social justice issues. Furthermore, guidance for the SMAP process described in the previous section indicates higher priority should be given to "basins with overburdened communities where the water quality issues and human health impacts overlap and can be addressed (at least partly) through stormwater management improvements". Given these considerations, the watershed prioritization process should be informed by known opportunities within the City to realize these objectives.

Watershed Management Strategy Categories

As noted above and shown in Figure 3, the Puget Sound Characterization established four management strategy categories for determining a watershed’s relative suitability and value for rehabilitation: Restoration, Protection, Conservation, and Development. The City will also use management strategy categories for the same purpose; however, the City refined these Puget Sound Characterization categories specific to Bellevue for use in its prioritization process:

- **Protect** – Watersheds in this management strategy category are the most pristine, and least degraded. Therefore, they require substantially less rehabilitation compared to more degraded watersheds and warrant management strategies that provide a high level of protection to maintain existing conditions.
- **Improve** – Watersheds in this category have moderately impaired water bodies but have the most potential to support all beneficial uses. Therefore, the near-term focus for these watersheds will be management strategies that emphasize rehabilitation measures such as stormwater facility retrofits and stream corridor improvements that have the potential to provide measurable benefits relatively quickly.
- **Sustain** – Watersheds in this category have water bodies with more substantial impairment and therefore are expected to require a greater rehabilitation effort with a longer response time. Therefore, the near-term focus for these watersheds will be the implementation of management strategies that prevent further impairment.

Watershed Prioritization Process

Ahead of commencing prioritization, the City defined its watersheds and subbasins, as listed in Table 1. The City will be prioritizing at the subbasin scale, of which there are 27 in the city (see Figure 4).

Table 1. City of Bellevue Major Watersheds and Associated Subbasins.			
Watersheds			
Kelsey Creek	Coal Creek	Lake Washington	Lake Sammamish
Subbasins			
Kelsey main stem	Coal main stem	Yarrow	Ardmore
Mercer Slough	Newport	Meydenbauer	Rosemont
Sturtevant		Clyde Beach	Redmond 400
West Tributary		Beaux Arts	Wilkens
Goff		Point Cities	North Sammamish
Valley		Lakehurst	Phantom
Sears			Spirit Ridge
Richards			Vasa
Sunset			South Sammamish
			Lewis

The City began the watershed prioritization process in the spring of 2020 so as to meet the SMAP requirements of the Phase II permit. The City performed an initial prioritization that will be refined later on in WMP development. Appendix D contains the results of this initial prioritization. The City's Watershed Prioritization Process is described here, with notes as to status of that particular step:

1. Initial Prioritization (performed in Spring 2020)

To the extent possible, this initial prioritization will be informed by limiting factors identified in the WARs and opportunities for rehabilitation that are identified in the Watershed Management Toolbox as shown in Figure 1. However, because of the schedule requirement in the Phase II Permit for completing the SMAP, WARs will not be completed in time for this prioritization. Therefore, this initial prioritization will be followed up by a revised prioritization after WARs are completed.

- a. **Initial Condition Rating** – The City will use the data that are available and institutional knowledge to assign one of the following preliminary 'condition ratings' to each subbasin: poor, fair, good, and great. (Process to identify the SMAP subbasin: The City will identify candidate subbasins for meeting the SMAP requirements out of the pool of subbasins that have good or fair ratings. The City will then seek input on the candidate subbasins from key City departments, external stakeholders, and the public through a process that will be defined in an Engagement, Outreach, and Communications Plan that will be developed in the summer of 2020 as a companion document to the WMP. The City will then prioritize a single subbasin for meeting its SMAP requirements based on input received through this process.)
- b. **Initial Management Strategy** – Based on the initial characterization of poor, fair, good, and great, and the water flow assessment results from the Puget Sound Characterization, the City will assign an initial management strategy (Protect, Improve, or Sustain) for each subbasin within the city.

2. Refined Prioritization (To be performed in 2021, after completion of the WARs)

The City will prepare a refined the watershed prioritization that will guide all subsequent phases of the WMP's development. As shown in Figure 1, this prioritization will be informed by limiting factors identified from the full suite of WARs and opportunities for stream improvement that are identified in the Watershed Management Toolbox. The Community Metrics described in the *Introduction* to this memorandum will also be considered in subbasin prioritization with the goal of obtaining additional community benefits. It is anticipated that the output of the refined prioritization will be refined Condition Ratings and Management Strategies for each of the 27 subbasins within the city, and not a force ranked list in priority order.

The prioritization process will generally follow the framework for prioritizing watersheds that is outlined in the Building Cities in the Rain guidance document. The City will

identify candidate priority subbasins from this process that excludes the subbasin that was already identified through the initial prioritization. The City will then seek input on subbasin condition ratings and management strategies from key City departments, external stakeholders, and the public through a process that will be defined in the Engagement, Outreach, and Communications Plan. The City will then use input received through this process to refine the watershed prioritization used in the WMP.

3. Adaptive Management

The City will establish a process for measuring the performance of the WMP against predefined performance metrics. The City will use an adaptive manage strategy to make changes to WMP if these performance targets are not being met at key milestones. Because priorities may shift as conditions improve as a result of investments made, a review and update of the City's watershed prioritization should be included in this adaptive management strategy.

Watershed Prioritization Use and Applicability

How will the prioritization be used, and when?

It is anticipated that the output of the refined prioritization will be refined Condition Ratings and Management Strategies for each of the 27 subbasins within the city, and not a force ranked list in priority order.

These condition ratings and management strategies will inform where individual investments are made, with those subbasins in the 'improve' management strategy getting the largest portion of the financial investment because it is in those subbasins that the benefits are anticipated to be the greatest for each dollar spent. Investments will be made in the 'protect' and 'sustain' subbasins, but to a lesser degree.

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APPENDIX A

Summary of Existing City of Bellevue Monitoring Data

Table A-1. Summary of Existing City of Bellevue Monitoring Data.							
Period	Parameters	Purpose	Source	Frequency	Data Format and Storage Location	Data Quantity/Condition	Current Data Users
Routine Monitoring							
1997–2018	Macroinvertebrates (B-IBI and beyond)	Planning: stream health indicator and CIP stream improvement evaluation	Taxonomist (Rhithron)	2–5 sites annually	Puget Sound Stream Benthos, regional database (PSSB)	22 years, 2–5 sites with replicates. Other agency data also available in PSSB. Site names and positions have moved within stream reach	COB Environmental Scientist and Stream Team; COB Environmental Stewardship Initiative; COB Finance; Puget Sound Partnership; regional scientists
1996,1997,2002,2010 – 2018	Resident fish	Planning: stream health indicator and CIP stream improvement evaluation	Bellevue staff	2–3 sites annually	Individual excel spreadsheets	14 years, 3–5 sites per year	COB Environmental Scientist and Stream Team; regional scientists
2000–2018	Salmon spawner surveys	Planning: Salmon Recovery and fish passage evaluation	WDFW	Annually	State database, excel spreadsheets	4 tributaries (partial) weekly records Sept – Dec (typically) starting 2000–2019	COB Environmental Scientist and Stream Team, WRIA 8 salmon recovery, WDFW, tribes, regional scientists
Varies by site	Flow	Management/Planning: regional pond function evaluation, CIP support, basin study support, emergency response	Bellevue/King County	Continuous	SCADA, excel; now moving most onto regional database at King County Hydrologic Information Center	Huge data files	COB Planning; Design engineers; COB O&M, outside consultants
Varies by site	Rainfall	Planning/Management: Required for evaluation of stream flow and flooding conditions	Bellevue	Continuous	SCADA telemetry: now moving some onto regional database at King County Hydrologic Information Center	Huge data files	COB Planning; Design engineers; COB O&M, outside consultants
2005–2019	Peamouth	Outreach: general interest, Stream Team support, citizen involvement	Bellevue	Annually	Paper, annual excel spreadsheets	Annual spreadsheet of observations; 2005–2019 (annual number of observations varies, generally increasing over time)	COB Environmental Scientist and Stream Team
Special Projects							
2001	Temperature	Special Project: stream health concern, summer stormwater impact assessment	Bellevue	Special project	Individual excel spreadsheets	Atream temp/rainfall –10 sites (2001), 14 (2002)	State of System; COB Environmental Scientist
2002, 2017	Diatoms (2002, Newcastle 2017)	Special Project: stream health indicator, Newcastle Tributary water quality	Taxonomist USGS/Ecology	Special project	Individual excel spreadsheets; Ecology database	19 sites (2002), 8 sites (2017)	COB Environmental Scientist; Ecology

B-IBI: Benthic Index of Biotic Integrity
 CIP: Capital Investment Program
 COB: City of Bellevue
 Ecology: Washington Department of Ecology
 USGS: Unites States Geological Survey
 PSSB: Puget Sound Stream Benthos database

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APPENDIX B

Open Stream Condition Assessment Data Summary

Table B–1. Open Stream Conditions Assessment Data Collection Summary.			
Characteristic		Metrics(s)	
Channel Morphology and Riparian Corridor		Wetted and bank full widths. Average and maximum wetted and bank full depths. Residual pool depth. Habitat unit composition and length. Riparian corridor vegetation to be assessed using GIS.	
Habitat Unit Composition and Off-Channel Habitat		Detailed assessment of habitat composition and complexity used to describe reach level characteristics. Quantified to compare with regional pathways and indicators for properly functioning condition.	
Large Woody Debris		Quantified to compare with regional recommendations for recovery.	
Substrate		Ocular estimate of substrate composition (sand, gravel, cobble, boulder, bedrock).	
Instability and Disturbance		Linear feet of erosion and undercut banks; and linear feet of armoring or bioengineered streambank protection.	
Fish Habitat and Passage Barriers		Fish habitat: a combination of veg cover, instream cove (LWD)and pool/riffle/glide; Barriers: jump height (water surface elevation delta) for both natural and artificial barriers. For artificial barriers in culverts: Is it a maintenance issue?	
Assessment	Scale	Fish Use	Summary
Level 1	Habitat Unit	F/PF	Full inventory at the habitat unit level for habitat and substrate composition; unit length, width, depth; bank instability/armoring; LWD; photo documentation; and reference points.
Level 2	Reach	F/PF/NF	Simplified inventory at the reach scale. Includes quantification of LWD, armoring, bank instability with data for pool and side channel habitat types and basic channel profile data. Documentation of tributaries and off-channel areas.
Level 3	Reach to Basin	Primarily NF	Consists of primarily spot checks with alerts, photo documentation and general qualitative observations.

APPENDIX C

Geographic Information System Data Summary

Table C–1. Geographic Information System Data Summary.		
Data Layer	Source	Description/Location
Bellevue Topography (contours, lidar, elevation models)	City of Bellevue 2018	"Contours" shapefile available for download on portal 2 ft internal and 10 ft interval.
	City of Bellevue 2018	Contours shapefile available 10 ft interval.
Bellevue soils	City of Bellevue 2018	Available for download on portal.
Storm Drainage Basins	City of Bellevue 2020	Boundaries of storm drainage basins and areas in the Bellevue service area.
Creeks	City of Bellevue 2018	Available for download on portal.
Wetlands	NWI Wetlands 2019	Wetland data available HEC files.
	King County 2019	Wetland data from Critical Area Ordinance HEC files.
	King County 2020	Wetland data HEC files.
Lakes	City of Bellevue 2018	"Lakes" shapefile available for download on portal.
Critical Aquifer Recharge Areas	King County 2019	"Critical Aquifer Recharge Area" available for download on portal.
Bellevue Land Cover	MRLC 2016	Coarse landcover raster data available to turn into polygons for analysis.
	City of Bellevue 2018	"Cover Classes" shapefile of cover classes only within parks available for download on portal. Additional areas would require a request from Bellevue, but it's not clear if Bellevue has this data.
Bellevue Land Use	King County 2018	Comprehensive plan land use.
	City of Bellevue 2018	"Zoning" shapefile available for download on portal. Boundaries of Bellevue's zoning areas.
Bellevue impervious surface	King County 2009	King County total impervious area layer.
	MRLC 2016	Impervious surface raster that can be converted to polygons but provides the percentage of impervious of each pixel
	City of Bellevue 2018	Can combine downloadable ROW shapefiles and building shapefiles from Bellevue portal for impervious surface estimate.
Bellevue stormwater infrastructure	City of Bellevue 2018	"Storm System" shapefile available for download on portal. Includes access points, inlets, discharge points, fittings, valves, weirs, clean outs, detention vaults and ponds, pipes, open drains, casings, repairs, and culverts.
	City of Bellevue 2018	"Storm Drainage App" may include storm drainage basins, and marker status. Not available for download on portal.
Pipes	City of Bellevue 2019	"Storm System" shapefile available for download on portal. Includes access points, inlets, discharge points, fittings, valves, weirs, clean outs, detention vaults and ponds, pipes, open drains, casings, repairs, and culverts.
		Water and Sewer System also available.

Table C–1 (continued). Geographic Information System Data Summary.		
Data Layer	Source	Description/Location
Facilities	City of Bellevue 2019	"Storm System" points available for download on portal. Includes access points, inlets, discharge points, fittings, valves, weirs, clean outs, detention vaults and ponds, pipes, open drains, casings, repairs, and culverts.

Table C-1 (continued). Geographic Information System Data Summary.		
Data Layer	Source	Description/Location
Outfalls	King County 2019	Wastewater Combined Sewer Overflow (CSO) outfalls available on portal.
Bellevue roads	City of Bellevue 2018	"Public Right-of-Way (ROW)" shapefile available for download on portal.
	City of Bellevue 2018	Streets available on portal/HEC files.
	King County 2019	Roads available for download on portal.
Fish passage barriers	WSDOT Service	WSDOT Fish Passage Inventory (corrected and uncorrected); Fish Passage Correction Plan (1 in city); appears only on state owned roads.
	City of Bellevue 2018	Barriers on City-owned roads
Stream flow gauge locations	King County 2019	Hydrological Monitoring Gauge, stream gauge/Water temperature gauge.
Aquatic species presence and extent maps – fish primarily	Department Fish and Wildlife 2018	Statewide Washington Integrated Fish Distribution; fish species presence.
	King County 2019	Chinook distribution in King County.
Invasive species maps	City of Bellevue	
	King County 2019	Noxious Weeds available for download.
	City of Bellevue 2018	"New Zealand mud snail" app map on website but not available on portal.
	City of Bellevue 2018	Aquatic Invasive species map on website but not available on portal.
CIP and Restoration project locations maps	City of Bellevue 2018	East Link Transit-Oriented district and surrounding areas. Available as an app map but not downloadable on portal.
	City of Bellevue	
	City of Bellevue 2018	The projects In Your Neighborhood map provides details about Capital Projects that the City is working on or recently completed: available for download from portal.
Habitat assessment extents map	ArcGIS 2017	Habitat fragments minimally disturbed natural area, smaller than 100 acres https://greeninfrastructuremapsdev.arcgis.com/arcgis/services
	ArcGIS 2017	Landscape connectivity modeling. It reflects the relative ease of movement for terrestrial species taking into account several factors including: NLCD landcover classes, slope, proximity to water, and habitat core score.
	King County 2019	Small habitat restoration project as point data.
	King County 2019	Areas of critical environmental sensitivity.
Maps/datasets showing water quality issues/violations (303d listing, King County water quality index results, other mapped water quality issues)	City of Bellevue	
	Ecology GIS Portal	303(d) and TMDL boundaries (TMDL is outside city limits).
	King County	King County Water Quality Index.
	City of Bellevue	

Table C-1 (continued). Geographic Information System Data Summary.		
Data Layer	Source	Description/Location
Groundwater contaminant data	King County 2019	Areas susceptible to groundwater contamination areas.

APPENDIX D

Initial Watershed Prioritization Results

Table D–1. City of Bellevue Initial Watershed Prioritization Results.

Subbasin	Draft Condition Rating
Coal main stem	Great
Lewis	Good
Newport	Good
Ardmore	Fair
Goff	Fair
Kelsey main stem	Fair
Mercer Slough	Fair
North Sammamish	Fair
Phantom	Fair
Redmond 400	Fair
Richards	Fair
Rosemont	Fair
South Sammamish	Fair
Spirit Ridge	Fair
Sunset	Fair
Valley	Fair
Vasa	Fair
West Tributary	Fair
Wilkens	Fair
Yarrow	Fair
Beaux Arts	Poor
Clyde Beach	Poor
Lakehurst	Poor
Meydenbauer	Poor
Point Cities	Poor
Sears	Poor
Sturtevant	Poor

