EXHIBIT B

Brown AND Caldwell

Stormwater Master Plan

March 2024 // **FINAL**

WILSONVILLE
OREGON

Stormwater Master Plan

Prepared for
City of Wilsonville, Oregon
March 2024

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List of Abbreviations

AACE	Association for the Advancement of Cost Engineering
ac	acre
BC	Brown and Caldwell
BMP	best management practice
CB	catch basin
CCTV	closed-circuit television
cfs	cubic feet per second
COM/GOV	Commercial/Government
CIP	capital improvement program
City	City of Wilsonville
CPs	capital projects
CPP	corrugated polyethylene pipe
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
DIP	ductile iron pipe
DS	downstream
EPA	U.S. Environmental Protection Agency
E&S	Erosion and Sediment
fps	feet per second
ft	feet/foot
GIS	geographic information system
H	horizontal
H/H	hydrologic and hydraulic
HSG	Hydrologic Soil Group
IGA	Intergovernmental Agreements
in.	inch/inches
IND	Industrial
INST	Institutional
I-5	Interstate 5
LA	Load Allocation
LF	linear foot/feet
LID	low impact development
MEP	maximum extent practicable
MH(s)	manhole(s)
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resources Conservation Service
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OS	Open Space
PDR	Planned Development Residential
Plan	Stormwater Master Plan
PVC	polyvinyl chloride
PWS	Wilsonville Public Works Standards
RA	Rural Agricultural
RCP	reinforced concrete pipe
ROW	right-of-way
R/R	repair/replacement
SDC	System Development Charge
SF	square feet
SMP	Stormwater Master Plan
SOPs	standard operating procedures
SROZ	Significant Resource Overlay Zone
SSURGO	Soil Survey Geographic Database
TM	technical memorandum
TMDL	Total Maximum Daily Load
TSS	total suspended solids
UGB	Urban Growth Boundary
US	upstream
USCS	Unified Classification System
V	vertical
VAC	Vacant
WDC	Wilsonville Development Code
WLA	Waste Load Allocation
WQ	water quality

Acknowledgements

The Brown and Caldwell Team, including Waterways Consulting, Inc. and Consor (formerly Barney and Worth) would like to extend thanks to the following staff and stakeholders for assistance in completing this Stormwater Master Plan:

- Kerry Rappold, Natural Resources Manager and City Project Manager
- Andy Sheehan, Asset Management Coordinator
- Sean Shortes, Engineering Tech II

Wilsonville Internal Stakeholders

- Zach Weigel, City Engineer
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- Bill Evans, Communications and Marketing Manager

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City Planning Commission

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- Kamran Mesbah
- Kathryn Neil

Executive Summary

In 2021, the City of Wilsonville (City) initiated development of a Stormwater Master Plan (SMP or Plan) to guide capital project and program needs over the next 20-year planning period. Drivers for this SMP include the need to: 1) address changing regulatory requirements; 2) reassess the storm system based on completion of capital projects (CPs) identified in Wilsonville's previous SMP (dated March 2012), 3) accommodate new and redevelopment activities, and 4) address observed system deficiencies warranting additional study.

This 2024 SMP identifies and prioritizes projects and programs to increase system capacity, address infrastructure and maintenance needs, add or enhance water quality treatment, address natural system deficiencies, and proactively plan for future growth. The SMP development process includes the:

- Evaluation of project needs and system improvements as identified by City staff.
- Development of validated hydrologic and hydraulic (H/H) model to confirm capacity issues and to assess anticipated flooding frequency and severity.
- Assessment of stormwater system retrofit opportunities for water quality treatment and/or flow control.
- Assessment of the natural (stream) system to identify risks to infrastructure and stream stability.
- Identification of programmatic opportunities to address recurring maintenance needs and water quality issues at a citywide scale.
- Development of a comprehensive, prioritized CP list and associated costs.
- Analysis of staffing levels to meet deferred and future maintenance and regulatory requirements.

Master Plan Technical Analyses

The following technical analyses were conducted to evaluate stormwater system deficiencies and define project and program needs in support of SMP development.

Project Needs Identification. Project needs were initially identified through the distribution of surveys to City staff and the public, a literature-based and Geographic Information System (GIS) data review, and site visits and staff interviews. Information collected helped to create a robust inventory of the stormwater collection system features and problem areas related to capacity, maintenance, system condition, and infrastructure needs. Locations warranting additional analyses via hydraulic modeling and/or stream assessment were defined based on results of this effort.

Stormwater Retrofit Analysis. A stormwater retrofit analysis was completed to inform potential locations for water quality improvements, erosion prevention/natural resource enhancement, and/or flow mitigation in the city. Based on the site characteristics, the continued applicability of water quality projects not implemented from the 2012 SMP, and the ability to integrate water quality into other project needs, CP and program needs were identified to expand and enhance stormwater treatment throughout the city.

Stream Assessment. A stream assessment was conducted on select reaches of Boeckman, Meridian, Arrowhead, Newland, and the unnamed tributary to the Willamette River at SW Kruse Rd. (thereby referred to as Kruse Creek for this SMP) to inform locations where stream morphology may

be or is currently impacted by changes to upstream land use, and in response to changes in flow, infrastructure, and sediment supply. The assessment included a desktop GIS analysis and stream walk (field observations) to inform capital project and ongoing monitoring needs.

Stormwater System Capacity Evaluation. The stormwater hydrologic and hydraulic (H/H) model developed for the 2012 SMP was updated to reflect changes in land use and impervious coverage and additional City-owned (public) storm pipe, culverts, and detention facilities constructed since 2012. CPs installed since 2012 were also incorporated into the H/H model, and the model was used to simulate rainfall and runoff characteristics and identify capacity limitations under both current and projected future development conditions.

Maintenance and Staffing Evaluation. Operational activities were assessed to identify staffing level needs and constraints. Information on current maintenance activities, regulatory needs, and anticipated engineering activities associated with implementation of this SMP, as well as compensation rates, were incorporated into staffing recommendations for both Public Works and Community Development/Engineering.

Project/Program Development and Prioritization. Project opportunities from the various technical evaluations were consolidated and developed into CPs and programs. CP development included conceptual design, facility sizing, and cost estimation. CPs were prioritized based on multiple criteria including system operations (capacity, recurring maintenance, safety); system condition; regulatory compliance (water quality, natural system condition, instream erosion); and other needs including project concurrence/scheduling, development drivers, and contributing drainage area. Project scoring and ranking helped designate high, medium, and lower priority projects for use in project scheduling and future stormwater funding evaluations.

General Recommendations

The following project, program, and policy actions are recommended to improve and enhance the performance of the storm drainage infrastructure throughout the city:

1. Implement CPs required to address system capacity, system maintenance, repair and replacement, water quality, instream erosion/sediment control, and new infrastructure needed to accommodate pending development. These CPs are intended to manage areas of reported deficiencies and accommodate development and growth.
2. Implement stormwater-related improvement programs to address recurring, maintenance-related system needs in an expedited manner, as well as address system condition issues in accordance with ongoing inspections and the City's asset management goals.
3. Implement stormwater retrofits both proactively and opportunistically to enhance water quality and improve natural system aesthetics and function.
4. Update policies and procedures to support public and private partnerships for new and redevelopment activities, specifically related to stormwater infrastructure replacement and stormwater fee-in-lieu payments in conjunction with the Town Center redevelopment.
5. Continue implementation of the City's Public Works Design Standards (PWDS) to address regulatory drivers, support private development activities, and protect stream health.
6. Add staff necessary to maintain compliance with the City's National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer (MS4) permit, as well as to implement recommendations outlined in this SMP.
7. Clearly document CP and program costs and schedule to inform future funding and rate analyses.

Capital Project Summary

Individual and city-wide CPs, as well as stormwater programs, were developed to address the following objectives:

- Increase **system capacity** to address existing and potential future deficiencies (i.e., flood control).
- Install **water quality** treatment and address instream **erosion and sediment control (E&S)** to meet regulatory drivers including the City's NPDES MS4 permit and total maximum daily load (TMDL) obligations.
- Address recurring **maintenance** and **infrastructure needs** (i.e., lack of maintenance access, add infrastructure to address localized drainage issues).
- Address system condition through **repair & replacement (R&R) needs**.

Table ES-1 summarizes the identified 15 CPs (representing 20 individually costed project phases) and 4 city-wide planning projects, including conceptual cost estimates and respective priorities. Figure ES-1 shows CP locations by primary objective.

Table ES-1. Capital Project Costs and Schedule

Project Number [a]	Project Name	Objectives Addressed [b]	Estimated Cost	% Related to Growth [c]	Implementation Schedule		
					Near-term (2024-28)	Mid-term (2029-33)	Long-term (2034-43)
Capital Projects							
BC-1	Library Pond Retrofit	• **Capacity** • Water Quality • Infrastructure Need	$1,880,000	11%	X		
BC-2	Ash Meadows Flow Mitigation	• **Capacity** • Water Quality	$2,940,000	27%	X		
BC-3-Phase 1	Wiedemann Ditch and Canyon Creek Park Retrofit, Phase 1	• **Capacity** • Water Quality	$4,860,000	19%			X
BC-3-Phase 2	Wiedemann Ditch and Canyon Creek Park Retrofit, Phase 2	• **Capacity** • Water Quality	$7,210,000	19%			X
BC-4	Boeckman Creek Stabilization at Colvin Lane	• **Erosion/Sediment Control** • Repair/Replacement • Maintenance	$410,000	19%	X		
BC-5	Memorial Park Swale Retrofit	• **Water Quality** • Erosion/Sediment Control • Maintenance	$910,000	2%			X
BC-6	Gesellschaft Water Well Channel Restoration	• **Erosion/Sediment Control** • Maintenance	$400,000	1%	X		
CLC-1-Phase 1	Day Road Stormwater Improvements, Phase 1	• **Repair/Replacement** • Capacity	$8,020,000	38%	X		
CLC-1-Phase 2	Day Road Stormwater Improvements, Phase 2	• **Capacity**	$3,930,000	38%		X	

Table ES-1. Capital Project Costs and Schedule

Project Number [a]	Project Name	Objectives Addressed [b]	Estimated Cost	% Related to Growth [c]	Implementation Schedule		
					Near-term (2024-28)	Mid-term (2029-33)	Long-term (2034-43)
CLC-2	Arrowhead Creek Culvert Replacement at Arrowhead Creek Trail	• **Repair/Replacement** • Maintenance	$290,000	6%		X	
CLC-3	Garden Acres Pond Retrofit	• **Capacity** • Water Quality	$3,780,000	35%		X	
NC-1	Frog Pond East and South Conveyance Pipe Installation	• **Infrastructure Need**	$4,090,000	79%	X		
WR-1-Phase 1	SW Willamette Way/Morey's Landing Stormwater Improvements, Phase 1	• **Capacity** • Water Quality	$2,310,000	2%		X	
WR-1-Phase 2	SW Willamette Way/Morey's Landing Stormwater Improvements, Phase 2	• **Capacity**	$1,080,000	2%			X
WR-2-Phase 1	Miley Road Stormwater Improvements, Phase 1	• **Repair/Replacement** • Erosion/Sediment Control • Maintenance	$820,000	--		X	
WR-2-Phase 2	Miley Road Stormwater Improvements, Phase 2	• **Repair/Replacement** • Maintenance	$10,510,000	--			X
WR-3	Rose Lane Culvert Replacement	• **Capacity** • Maintenance	$200,000	10%	X		
WR-4-Phase 1	Charbonneau East Stormwater Improvements, Phase 1	• **Capacity** • Repair/Replacement	$600,000	--			X
WR-4-Phase 2	Charbonneau East Stormwater Improvements, Phase 2	• **Repair/Replacement** • Maintenance	$4,440,000	--			X
WR-5	Charbonneau West Stormwater Improvements	• **Repair/Replacement** • Maintenance	$10,370,000	--			X
City-wide Planning Projects							
City-1	Flow Monitoring and Rain Gauge Installation	• **Capacity**	$100,000	N/A	X		
City-2	Hydromodification Assessment and Stream Survey	• **Erosion/Sediment Control**	$30,000/ event	N/A	X	X	X
City-3	Porous Pavement Pilot Study	• **Water Quality**	$100,000	N/A	X		
City-4	Boeckman Creek Geotechnical Evaluation	• **Erosion/Sediment Control**	$150,000	N/A	X		
				TOTAL:	**$19.14M**	**$20.85M**	**$29.53M**

a. CP numbering reflects the following drainage basins: BC = Boeckman Creek, CLC = Coffee Lake Creek, WR = Willamette River, NC = Newland Creek. City-wide planning projects are designated as "City".

*b. Primary objectives addressed are identified in **BOLD**. Objectives addressed relate to project needs in the contributing watershed to resolve known and predicted system/ facility deficiencies.*

c. % Related to Growth refers to SDC-eligible projects and the proportional cost attributable to growth.

Program Summary

In addition to the identified CPs, the following programs were identified to address regulatory drivers and support proactive stormwater system maintenance. These programs, objectives, and estimated annual cost are listed in Table ES-2 and described below:

- **Local Drainage Improvements Program (P-1).** Allocate funds to install small-scale, localized drainage improvements (i.e., new pipe, catch basins and laterals, grading to support curb-and-gutter flow).
- **Water Quality Retrofit Program (P-2).** Establish an annual funding mechanism to integrate low impact development (LID) and/or green infrastructure (GI) in conjunction with street improvements, public improvements, and other utility projects. This program supports the City's retrofit strategy and regulatory objectives by adding water quality treatment in areas that do not currently have treatment.
- **City-wide Repair/Replacement Program (P-3).** Allocate funds to conduct replacement of public pipe and outfalls (outside of the Charbonneau development area) in conjunction with inspection results and asset management efforts.
- **Charbonneau Repair/Replacement Program (P-4).** Allocate funds to conduct replacement of public pipe and structures within the Charbonneau development area in accordance with the Charbonneau Consolidated Improvement Plan (2014). Excludes portions of the system identified by CPs WR-4 and WR-5.
- **Riparian Vegetation Management Program (P-5).** Allocate funds to conduct riparian and/or in-channel vegetation restoration and maintenance including removal of invasive plant species.
- **Vegetative Facility Maintenance Program (P-6).** Allocate funds to conduct restorative maintenance for select stormwater facilities (public and private) in the City where larger-scale maintenance is needed and/or maintenance agreements are not in place or executed.

Table ES-2. Program Costs

Project Number	Project Name	Objective(s) Addressed	Estimated Annual Cost
City-Wide Programs			
P-1	Local Drainage Improvements Program	• **Infrastructure Need** • Capacity	$100,000/yr
P-2	Water Quality Retrofit Program	• **Water Quality** • Capacity	$200,000/yr
P-3	City-wide Repair/Replacement Program	• **Repair/Replacement** • Maintenance	$275,000/yr
P-4	Charbonneau Repair/Replacement Program	• **Repair/Replacement** • Maintenance	$1,920,000/yr
P-5	Riparian Vegetation Management Program	• **Maintenance** • Water Quality	$25,000/yr
P-6	Vegetative Facility Maintenance Program	• **Water Quality** • Maintenance	$25,000/yr
		Annual Total	$2,545,000/yr

*Note: Primary objectives addressed are identified in **BOLD**. Objectives relate to identified or ongoing city-wide needs to address known system/ facility deficiencies.*

Implementation

CPs, program needs, and policy recommendations collectively inform the City's updated Stormwater Capital Improvement Program (CIP) as described in this SMP.

To ensure effective implementation of the CIP over the 20-year planning period, City staffing levels were analyzed against project and programs developed as part of this SMP. The purpose of this analysis was to inform recommendations as needed for additional Public Works Operations and Community Development engineering staff.

An additional 2.7 FTE in Public Works Operations and 1.4 FTE in Community Development/Engineering are recommended to accommodate new projects and programs defined in this SMP as well as to address deferred maintenance activities and new regulatory requirements.

CPs are prioritized to inform the implementation schedule and respective funding needs of capital investments. The City will need to develop a financial plan to ensure funding of the scheduled capital costs, program costs, and staffing needs. Future financial planning, including level of service goals, a stormwater utility rate evaluation, and a system development charge (SDC) update, should reflect rates necessary to implement the Stormwater CIP while meeting other financial obligations.

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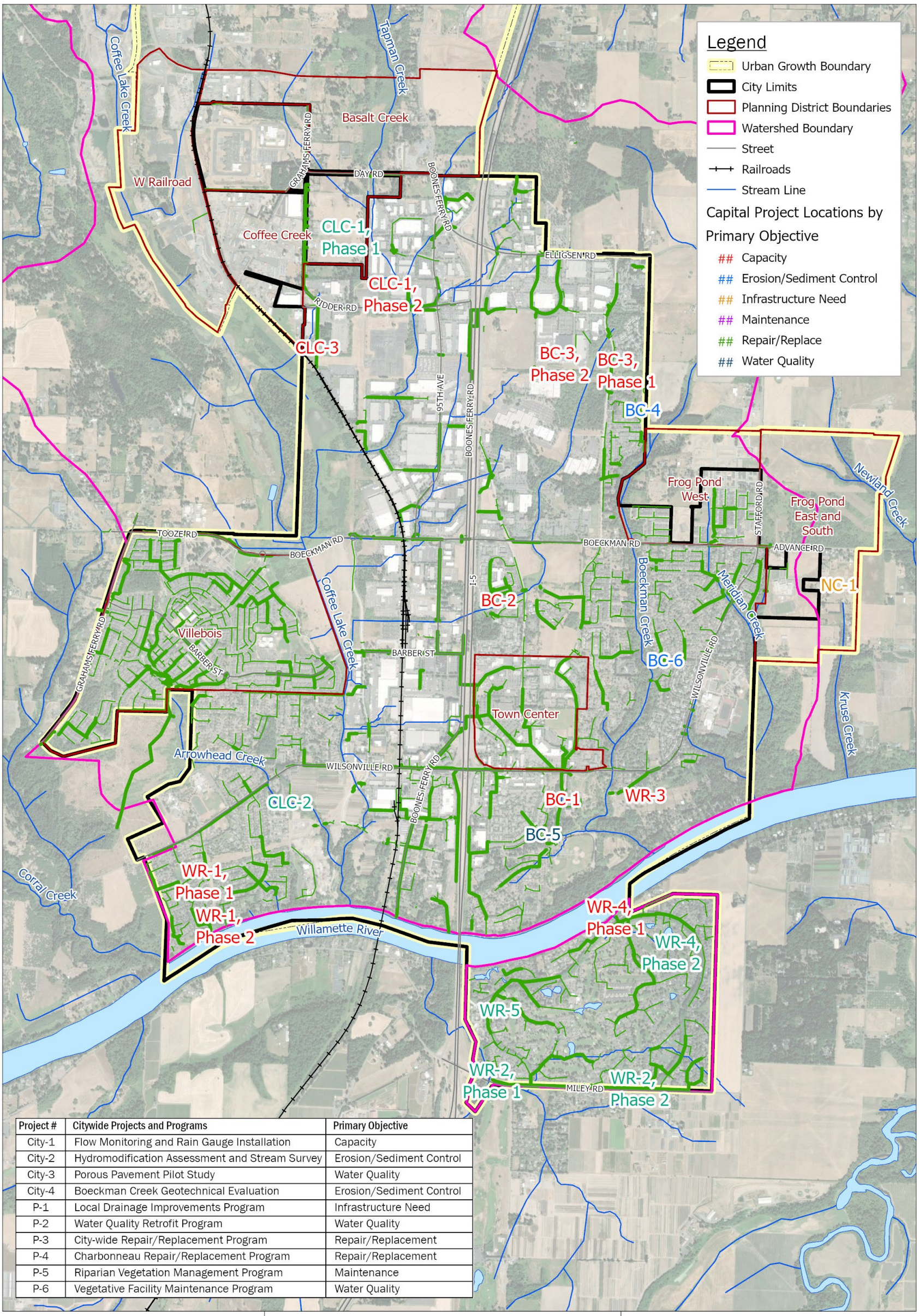

Project #	Citywide Projects and Programs	Primary Objective
City-1	Flow Monitoring and Rain Gauge Installation	Capacity
City-2	Hydromodification Assessment and Stream Survey	Erosion/Sediment Control
City-3	Porous Pavement Pilot Study	Water Quality
City-4	Boeckman Creek Geotechnical Evaluation	Erosion/Sediment Control
P-1	Local Drainage Improvements Program	Infrastructure Need
P-2	Water Quality Retrofit Program	Water Quality
P-3	City-wide Repair/Replacement Program	Repair/Replacement
P-4	Charbonneau Repair/Replacement Program	Repair/Replacement
P-5	Riparian Vegetation Management Program	Maintenance
P-6	Vegetative Facility Maintenance Program	Water Quality

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City of Wilsonville/
Project # 156157

Stormwater Master Plan

Note: Capital Projects City-1 to City-4 and Programs P-1 to P-6 are citywide and not specific to a single location.

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Figure ES-1: City of Wilsonville Capital Improvement Program Overview

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Section 1

Introduction

The City of Wilsonville (City) developed this Stormwater Master Plan (SMP or Plan) to guide stormwater and drainage-related capital project (CP), program, and policy decisions over a 20-year planning period.

The City's overall storm drainage system includes approximately 87 miles of piped and open channel (e.g., ditch, stream) conveyance, in addition to stormwater treatment and detention facilities for stormwater management. Most of the City's stormwater is collected and conveyed from north to south, discharging to the Willamette River via major stream corridors including Boeckman Creek (eastern portion of the City) and Coffee Lake Creek (western portion of the City). This SMP collectively considers both piped and open channel conveyances as part of the overall storm drainage system.

This Plan documents the processes and methods used to evaluate the City's storm drainage infrastructure, City stormwater programs, and maintenance activities. Results of the evaluation provide the City with projects, programs, and policies for implementation over the next 20 years and support future funding evaluations and stormwater utility rate and system development charge (SDC) calculations.

1.1 Need for a Master Plan

The City's previous SMP was completed in 2012, setting the course for stormwater management policies and CPs for the last decade. CPs and programs were proposed, prioritized, and scheduled (short term, midterm, long term, and unfunded) in the 2012 SMP, and some of the higher priority projects have been initiated or constructed. However, for some unconstructed and unfunded projects, the project needs have changed, and warrant reconsideration based on development drivers and regulatory needs.

In 2012, project prioritization focused more on project complexity and cost versus other objectives that are of increased importance (e.g., safety, recurring maintenance, water quality, erosion, and stream protection). New regulatory drivers, including the City's reissued 2021 Phase I National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer (MS4) permit and the Oregon Department of Environmental Quality's (DEQ's) 2021 finalization of the 2019 Revised Willamette Basin total maximum daily load (TMDL) for mercury prompted increased consideration of water quality objectives as part of the capital project and program development effort.

Since 2012, new and re-development activities are rapidly occurring within the City's urban growth boundary (UGB). New infrastructure is continually being added, and ongoing maintenance of new infrastructure can strain City resources. The City also needs a proactive plan to address existing capacity deficiencies and aging and failing infrastructure, while considering resource limitations and development trends.

This SMP addresses water quantity, quality, and natural resource management for constructed drainage systems and stream corridors under the City's management.

1.2 Master Plan Objectives

The City's overarching goal for this SMP is to guide storm drainage infrastructure improvements over a 20-year implementation period. Improvements must address maintenance/system condition issues, capacity issues, and water quality needs into the future. Specific objectives of the City's SMP include the following:

- Establish a process for evaluating and prioritizing stormwater needs in Wilsonville.
- Solicit information from staff to inform the identification of project needs and improvements.
- Identify known areas of flooding and other storm drainage problems, and provide project solutions related to collection, conveyance, treatment, and natural resource protection.
  - Update the City's existing hydrologic and hydraulic (H/H) model to evaluate system capacity based on current system information and updated land use and development conditions as obtained from the City's Planning Division.
  - Integrate findings and project needs stemming from stormwater planning documents completed since 2012 (i.e., 2015 Retrofit Plan, 2015 Hydromodification Assessment, development-specific master plans, etc.).
- Identify programmatic and planning opportunities to address areas of frequent maintenance needs, system condition deficiencies, and water quality concerns on a City-wide scale.
- Support long-term staffing and funding of the City's stormwater utility.
- Support current, pending, and future regulatory requirements and drivers through CPs, programs and policy recommendations.

This Plan is intended to support regulatory directives under the City's NPDES MS4 Permit and total maximum daily load (TMDL) obligations.

1.3 Approach

The City developed this SMP using an initial, collaborative planning approach with Community Development (Engineering and Planning divisions) and Public Works to assess known storm drainage problem areas and identify areas where the addition, replacement, or retrofit of infrastructure is needed to address an issue.

Targeted system evaluations were conducted to investigate water quality or natural resource opportunities and confirm capacity limitations. Following system evaluation efforts, Project Opportunity Areas were defined and vetted with the project team to inform the development of capital project and program concepts and costs.

This overall process allowed the City to develop multi-benefit projects that target areas of the City likely to be prioritized and funded in a capital improvement program.

Figure 1-1 outlines the approach used to develop this Plan. Detail related to specific evaluation efforts can be found in the following technical memorandums:

- Technical Memorandum #1 (TM1)- Stormwater Basis of Planning (February 2022), not included directly in this SMP document, but much of the content and figures have been integrated into this SMP document.
- Technical Memorandum #2 (TM2)-Geomorphic Reconnaissance of Boeckman, Meridian, and Arrowhead Creeks (May 2022), included in this SMP as Appendix C.
- Technical Memorandum #3 (TM3)-Hydrologic and Hydraulic Modeling Methods and Results, included in this SMP as Appendix B.

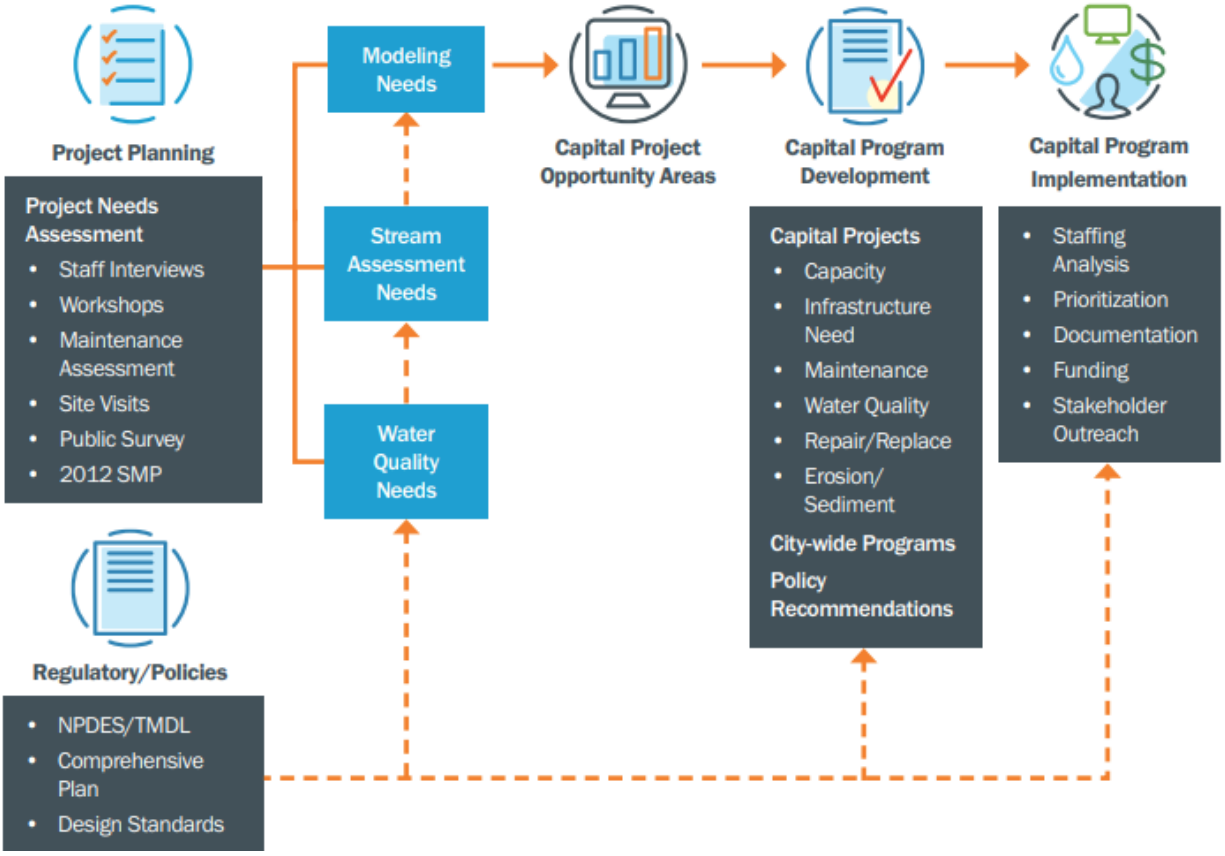


Figure 1-1: Stormwater Master Plan Approach

1.4 Supporting Documents

In addition to the 2012 SMP, several development-specific drainage reports and technical studies prepared since 2012 helped inform project development efforts. Many of these documents contain proposed infrastructure and capital improvements that have been integrated into capital projects proposed in this SMP. However, individual development master plans should still be referenced for detailed design concepts in these development areas. A summary of the reports and studies reviewed and considered for this SMP are listed in Table 1-1.

Additional detail related to regulatory drivers including the 2015 Retrofit Assessment and 2015 Hydromodification Assessment is provided in Section 2.6.

Table 1-1. Existing Stormwater Planning Documentation and Reports		
Report	Date	Summary and application to the SMP
City of Wilsonville Stormwater Master Plan	2012	Recommends capital improvement projects to achieve city wide stormwater goals and objectives. Projects completed or in progress include SD4208 & SD4209, BC-4, BC-7, ST-6, ST-7, SD9030-9037, SD9013-9021, SD9060, ST-5, LID1, SD9022-9029, ST-9, and WD-3.
Villebois Village Master Plan	2013	Establishes projected land use categories/density requirements for the 2,300 residential unit development. Onsite and regional stormwater management concepts for treatment and detention are outlined.
Charbonneau Consolidated Improvement Plan	2014	Documents pipe replacement projects to address capacity deficiencies and poor condition of the existing stormwater collection system. Includes prioritization of stormwater pipe replacement in conjunction with other utilities (sanitary, water, etc.).
Stormwater Retrofit Plan	2015	Provides an updated prioritization of capital project needs stemming from the 2012 SMP, focusing on water quality criteria.
Hydromodification Assessment	2015	Provides an evaluation of hydromodification risk in stream corridors within the City, as well as recommended actions (including projects) for the City to implement.
Frog Pond Area Plan/West Master Plan	2015/2017	Provides the approximate size, location and cost of stormwater infrastructure needed to manage onsite drainage. The Frog Pond West Master Plan does not include information about proposed storm drain infrastructure, as that is detailed in the Area Plan.
Basalt Creek Concept Plan	2018	Provides preferred land use and recommends high-level concepts for transportation and infrastructure planning for the Basalt Creek Planning Area.
Town Center Plan	2019	Documents the proposed reconfiguration of existing stormwater infrastructure in conjunction with redevelopment of the Town Center area. Preliminary concepts send additional flow to the Library Detention Pond and remove an existing high flow bypass structure directing runoff west across I-5.
TMDL Implementation Plan	2019/2022	Outlines programmatic activities and best management practices (BMPs) implemented by the City to address instream temperature.
Frog Pond East/South Master Plan	2022	Provides the approximate size, location and cost of stormwater infrastructure needed to manage onsite drainage.

1.5 Master Plan Organization

Following this introductory Section 1, this SMP is organized as follows:

- Section 2 includes a description of the study area characteristics.
- Section 3 outlines the basis of planning, including the project needs assessment (identification of stormwater problem areas), water quality retrofit evaluation, and additional background to support the project identification and development effort.
- Section 4 summarizes the geomorphic stream assessment.
- Section 5 describes H/H modeling methods and results of the stormwater drainage system capacity evaluation and the identification of capacity-related capital project needs.
- Section 6 summarizes the stormwater capital project development effort, including development of project opportunity areas and determination of final capital project and program needs.
- Section 7 provides an overview of the implementation elements of the capital improvement program, including results of the stormwater staffing analysis specific to Public Works and Community Development, as well as project prioritization and policy recommendations.

Section 2

Study Area Characteristics

This section provides an overview of study area characteristics, including location, topography, soils, land use, climate and rainfall, drainage system configuration, community perspectives, and regulatory objectives.

Referenced figures depicting study area characteristics are located at the end of this section.

2.1 Location and Study Area

The City of Wilsonville (City) is located primarily in Clackamas County with the northern portion of the City located in Washington County. The City is approximately 17 miles south of Portland, Oregon in the Willamette River Valley. The Willamette River runs west-east in the vicinity of the City, generally forming the southern City boundary with the majority of the City situated to the north of the river. The Charbonneau District is located south of the Willamette River (Figure 2-1). Interstate 5 (I-5) runs north to south through the center of the City and influences topography and drainage patterns.

The City covers six major basins within the city limits with topography that causes each basin to ultimately drain to the Willamette River (see Figure 2-2 at the end of this section). The waterways that define the major basins include Mill Creek (including the Corral Creek tributary), Coffee Lake Creek (including the Tapman Creek tributary), Boeckman Creek, and Meridian Creek which all flow from north to south and drain to the Willamette River. Developed areas adjacent to the Willamette River directly discharges to the Willamette River via pipe or open channel, and these areas are indicated on Figure 2-2, at the end of this section, as the Charbonneau basin and Willamette River direct basin. Together, Coffee Lake Creek/Tapman Creek and Boeckman Creek drain about 71 percent of the total city area, and their watershed boundaries extend outside the city limits and the urban growth boundary (UGB). The Coffee Lake Creek watershed is the largest, covering approximately 50 percent of the city area within the UGB.

The future Frog Pond East and South Planning District (within the UGB but partially within and outside of current City limits) will drain to Newland Creek, a tributary to the Willamette River, and the unnamed tributary to the Willamette River at SW Kruse Rd. (thereby known as Kruse Creek in this SMP).

Some drainage systems in the city have also been re-routed to accommodate new development. For example, a historical flow diversion was constructed to re-route flows from Arrowhead Creek (in the Coffee Lake Creek watershed) to Legacy Creek (outside of the city limits), and a current flow diversion is used to re-route flow from the middle tributary of Coffee Lake Creek toward upstream Boeckman Creek. While efforts have been made to redirect flows back to their historical points of discharge, impacts can still be observed.

Table 2-1 summarizes the major basins and contributing drainage areas, both within the city limits/UGB and outside of the UGB. The defined study area for this SMP reflects areas of the City where hydrologic modeling was conducted, and the study area includes all areas within the city limits and UGB, with the exception of the Frog Pond East and South Planning District, located in the Newland and Kruse Creek basins. This area is predominately outside of the current UGB and subject to basin-specific master planning for utility placement (see Section 3.5).

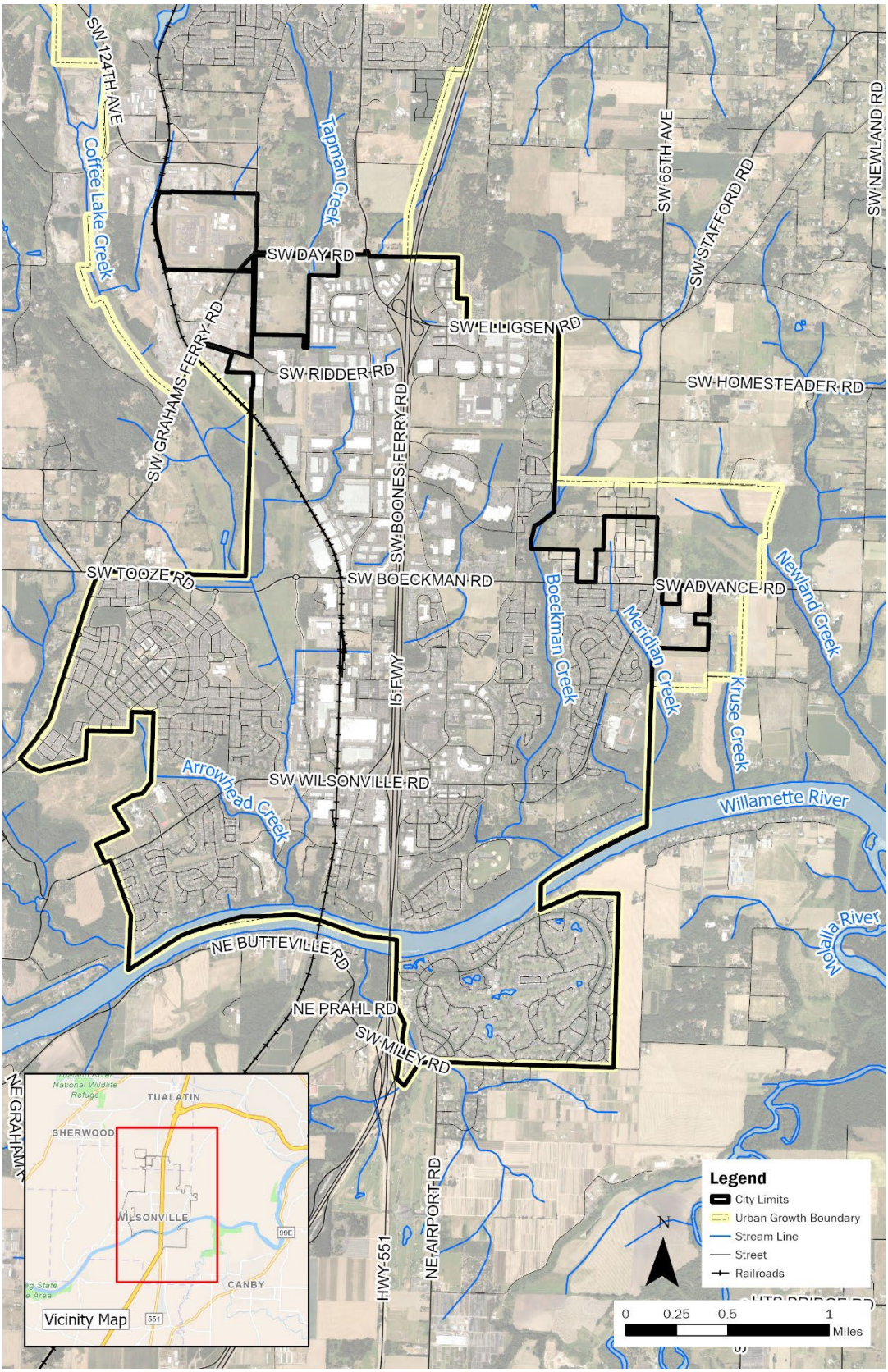


Figure 2-1: Location Overview

Table 2-1. Study Area Overview				
Basin	Study Area (ac)			Total Study Area (ac)
	Within City Limits	Outside of City Limits (within the UGB)	Outside UGB	
Major Basins				
Boeckman Creek	1,096	70	806	1,972
Charbonneau	478	0	4	482
Coffee Lake Creek	2,332	1,418	1,412	5,162
Mill Creek[a]	101	0	10,424	10,525
Meridian Creek	283	100	87	470
Willamette River	505	0	0	505
Total	**4,795**	**1,588**	**12,733**	**19,116**
Related Basins				
Kruse Creek	13	55	231	299
Newland Creek	0	138	3,098	3,236

a. Area outside UGB is provided for informational purposes and does not contribute to City infrastructure.

2.2 Topography/Soils

Wilsonville's natural topography is characterized by steep hillsides on the eastern edge of the city, along the Boeckman Creek corridor, and relatively flat topography and floodplain area around Coffee Lake Creek basin and the associated Coffee Lake wetlands along the western portion of the city. Elevation within the city ranges from approximately 380 feet in the headwaters of Coffee Lake Creek to approximately 60 feet at the Willamette River.

Soil characteristics within the city vary by watershed. Soils within the city are generally limited in infiltration capability (Hydrologic Soil Group (HSG) C/D), although large areas of HSG B soils along the Willamette River and in the headwaters of Tapman Creek have higher infiltration rates. Soils are generally silty or silty loam, except along the canyon portion of Boeckman Creek, which are combination silt and sand. The downstream reach of Coffee Lake Creek also has a higher portion of gravel and cobble substrate materials than other city areas (ODFW, 2006).

Soils are an important watershed characteristic for evaluating potential runoff rates and volumes. Soils information for the study area was sourced from the National Resources Conservation Service (NRCS) Soil Survey online tool. Soil information is based upon data obtained from a 2016 publication from the U.S. Department of Agriculture, NRCS titled "Soil Survey (SSURGO) Database for Columbia County, Oregon."

For this SMP, soil texture classifications were considered for hydrologic modeling purposes. These texture classifications include various parameters that approximate soil runoff and infiltration potential. Generally, soils with sandy or silt textures have higher rates of infiltration and lower runoff potential, whereas soils with clay textures have lower rates of infiltration and high runoff potential.

Table 2-2 lists the NRCS Soil Texture Classes by percent coverage and by basin. Most of the study area (80 percent) is in the Silt Loam soil texture class. This soil class is characterized as, more than 70 percent silt, 50 percent or less sand, and less than 30 percent clay by weight.

Figure 2-3, at the end of this section, shows the soil texture classifications throughout the study area.

Table 2-2. Soil Textures within the Study Area (by % of major basin)						
Basin	Clay	Loam	Sandy Loam	Silt Loam	Silty Clay Loam	Total
Boeckman Creek	0%	1%	0%	95%	4%	100%
Charbonneau	0%	67%	2%	30%	1%	100%
Coffee Lake Creek	7%	12%	0%	76%	5%	100%
Mill Creek	0%	0%	0%	97%	3%	100%
Meridian Creek	0%	0%	0%	100%	0%	100%
Willamette River	0%	16%	6%	74%	4%	100%
Total by Combined Area	**4%**	**11%**	**1%**	**80%**	**4%**	**100%**

2.3 Land Use and Population

The City resides within the Metro UGB, and as such development in and around Wilsonville is coordinated with Metro and the surrounding jurisdictions. The City has grown from a rural farming community to a thriving city encompassing approximately 7.8 square miles (approximately 5,000 acres) and is home to over 26,500 residents. The City's population has increased by approximately 3.6 percent annually over the last decade; increasing from approximately 19,509 in 2010 to 26,597 in 2022.[1]

Land use within the City of Wilsonville includes residential, commercial, and industrial, with most of the commercial and industrial development located along the I-5 corridor. Open space areas are scattered throughout the City and include a number of parks, wetlands, and riparian areas.

2.3.1 Development Conditions

Wilsonville is primarily developed within the current city limits; however, there are areas of undeveloped and underdeveloped land that are anticipated to redevelop and densify over this SMP planning period. These areas include the Town Center Planning District and existing low-density residential in the southern portion of the City.[2]

New development is projected to occur in designated future planning areas within the UGB. These future planning areas include the Coffee Creek Planning Area (industrial development), Basalt Creek Planning Area (industrial development), Frog Pond West Planning Area (residential development), and Frog Pond East and South Planning Area (residential and institutional development). The City uses a similar master planning process for the planning areas to guide infrastructure planning and provide opportunities to mitigate natural resource impacts, including the protection and restoration of adjacent stream channels.

1 United States Census Bureau (2022), https://www.census.gov/quickfacts/fact/table/wilsonvillecityoregon#

2 House Bill (HB) 2001 was adopted by the Oregon Legislative Assembly in June 2019, and it promotes middle housing to increase housing options for Oregon citizens. As such, areas zoned as "single family residential" had to be reclassified to allow for duplexes, triplexes, and other middle housing options.

2.3.2 Land Use Coverage and Imperviousness

For this SMP, land use categories, coverages, and impervious percentages by land use category were initially prepared by the City's Planning Division and reviewed by BC to accurately reflect existing conditions and future development/densification anticipated because of House Bill (HB) 2001.[3]

Existing and future land use coverages for the study area are provided in Figure 2-4 and Figure 2-5 at the end of this section. Land use/zoning consolidation and reclassification, as well as associated impervious percentages by land use are reflected in Table 2-3. Additional description of the process for developing updated land use GIS coverages and impervious percentage estimates are reflected in Section 5.4.

Future land use coverage within the city limits or a defined concept planning area assumes that all developable (vacant) lands will develop into their underlining zoning category. In addition, specific residential areas in the City may adjust to a denser land use category (i.e., PDR2 to PDR5) per HB 2001. Aside from these situations, the existing land use coverage is generally assumed to be retained for the future development condition.

Table 2-3. Land Use Categories

Land Use Categories (2012)	Land Use Categories (Updated)	Calculated Impervious Percentage [a] (%)
Agriculture	Rural Agriculture (RA)	15 [b]
Commercial	Commercial/Government (COM/GOV)	82
Commercial-Villebois		
Industrial	Industrial (IND)	71
Residential	Planned Development Residential 1 (PDR1)	17
	Planned Development Residential 2 (PDR2)	33
Multi-Family Residential	Planned Development Residential 3 (PDR3)	43
	Planned Development Residential 4 (PDR4)	51
Residential-Villebois	Planned Development Residential 5 (PDR5)	52
Multi-Family Residential-Villebois	Planned Development Residential 6 (PDR6)	64
Open Space	Open Space (OS)	10
	Park	24
Vacant	Vacant (VAC)	3
NA	Institution (INST)	35
NA	Oregon Department of Transportation (ODOT)	48

NA: Category not used.

a. Based on aerial imagery review and digitization of impervious surfaces conducted by the City (October 2021).

b. Based on the adjusted impervious percentage value per the Boeckman Road Hydraulic Evaluation and model calibration (December 2021).

[3] Key revisions to City zoning coverage made for this SMP include the adoption of the "Planned Development Residential" (PDR) nomenclature to define residential lands, the subsequent removal of the "Villebois" designation for a subset of residential, multi-family residential, and commercial areas, and the addition of several previously uncategorized land use types.

2.4 Climate and Rainfall

Wilsonville's climate is characterized by cool wet winters and warm summers. Most rainfall occurs between October and March. On average, December is the wettest month with an average of 7.1 inches of precipitation. July and August are the warmest and driest months with average high temperatures above 80 degrees Fahrenheit and less than 1 inch of rain per month.

The average annual precipitation for the Portland metropolitan area ranges from 37 to 43 inches, with an average of 1.8 inches of snowfall annually. There is currently no rain gage within the City of Wilsonville's jurisdiction, so the Aurora State Airport (UAO) rain gage (approximately 5 miles to the south) is used as a proxy. Based on the UAO data, Wilsonville averages 43 inches of rainfall a year and 2 inches of snowfall annually. Rainfall data from Clean Water Services (CWS) was also used to supplement H/H modeling and model validation efforts.

The lack of, and need for, local rainfall data has led the City to prioritize the installation of a rain gage and at least three flow meters as funded through the city-wide CP "City-1" (see Section 7 for more information). Acquisition of localized and real-time precipitation data allows the City to prepare for and support mitigation of precipitation-related impacts of climate change including increased rainfall intensities, storm surges and flooding, which are likely to affect many urban systems and services.

Current climate and rainfall projections show wide ranging uncertainty regionally and are not time scales typically used for designing storm systems. Therefore, modifications to the City's Public Works Design Standards (PWDS) and design storm events were not proposed for this SMP and associated CP sizing. However, urban planning is key to developing and implementing responses to changing precipitation patterns in urban systems. Incorporation of tools such as updated design storms reflecting local precipitation patterns are one way to adapt the SMP as necessary to address climate change. As data becomes available, the City will continue to work to identify how climate change is likely to impact the City's ability to operate its facilities and meet policy, program, and project objectives.

2.5 Drainage System

The City maintains an asset inventory of their stormwater collection system in GIS that contains various attribute fields depending on the asset class. This information is continually updated by City staff as new information becomes available, either from field investigations or as-built records.

The City manages approximately 83 miles (approximately 439,100 linear feet [LF]) of stormwater drainage pipe and culverts. Table 2-4 summarizes City-owned pipe and culvert system assets mapped (in GIS) throughout the City, as well as approximately 4 miles of mapped streams.[4]

4 Data for Tables 2-4 through 2-6 was sourced from City-provided GIS databases in 2021.

Table 2-4. System Asset Inventory-Public (City) Pipe/Culvert/Stream (mapped in GIS), City-wide							
Diameter (in)	Length (ft) by basin						Total (ft)
	Boeckman Creek	Charbonneau	Coffee Lake Creek	Mill Creek	Meridian Creek	Willamette River (direct)	
<12	11,941	11,168	21,115	532	1,104	6,514	52,375
12-18	53,046	35,189	126,356	11,591	17,799	29,216	273,196
20-27	9,469	6,104	28,636	1,205	2,772	6,125	54,311
30-36	7,326	8,358	18,855	0	1,045	4,047	39,632
42-48	1,807	823	6,054	0	0	4,381	13,064
54-60	60	0	169	0	0	0	229
72-84	424	0	250	0	0	0	674
Total Pipe [a]	84,072	61,641	201,437	13,328	22,720	50,284	433,481
Total Culvert [b]	1,412	212	3,035	322	331	284	5,596
Total Pipe & Culvert	85,484	61,853	204,472	13,650	23,051	50,568	439,077
Total Mapped Stream [c]	5,791	2,718	11,003	0	2,760	197	22,469

a. Pipe refers to active, public mainlines only, excludes laterals.

b. Ownership, maintenance responsibility, and life cycle status of culverts not identified in GIS data-all available data is included in total length.

c. Mapped stream/creek total length clipped to area within city limits and excludes Willamette River shoreline.

Tables 2-5 and 2-6 summarize major City-owned storm structures, such as clean outs, inlets, manholes, stormwater treatment facilities, and outfalls.

Table 2-5. System Asset Inventory–Storm Structures (City ownership)							
Facility	Number by basin						Total
	Boeckman Creek	Charbonneau	Coffee Lake Creek	Mill Creek	Meridian Creek	Willamette River (direct)	
Clean out	566	95	656	3	104	109	1,533
Inlets [a]	618	423	1,363	101	203	292	3,000
Manholes [b]	619	304	1,574	119	158	307	3,081
Outfalls	77	5	117	18	21	24	262

Note: Excludes identified county, ODOT and private infrastructure.

a. Inlets include all inlet types: area drains, beehive inlets, catch basins, curb inlets, and other.

b. Includes all manhole types. Ownership not identified in GIS attribute data.

Table 2-6. System Asset Inventory-Water Quality Facilities (City ownership/maintenance responsibility)

Facility	Number /Footprint Area (SF) by basin												Total	
	Boeckman Creek		Charbonneau		Coffee Lake Creek		Mill Creek		Meridian Creek		Willamette River (direct)			
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Infiltration Vault [a]	1	N/A	0		2	N/A	0		0		3	N/A	6	N/A
Vegetated Facility [b]	113	37,248	0		44	213,420	2	1,432	50	46,234	3	3,443	212	301,777
Pond	6	35,758	0		4	58,518	0		0		1	992	11	95,268

a. GIS data do not include the configuration of an infiltration vault. Based on communications with City staff, an infiltration vault is likely a proprietary filtration vault (e.g., Contech StormFilter). Infiltration vaults have N/A listed in the area column as these are point locations and not dependent on facility surface size.

b. Includes swales, lined planters, and filtration rain gardens.

Figure 2-6, at the end of this section, provides an overview of the stormwater collection system throughout the City including stormwater mains, manholes, outfalls and public stormwater treatment and detention facilities as of 2021. The City's GIS data reflecting both public and private stormwater treatment and detention/retention facilities is continuously updated by City staff, the most up to date record can be found at https://www.wilsonvillemaps.com/.

2.6 Regulatory Drivers

The Oregon Department of Environmental Quality (DEQ) is responsible for implementing provisions of the federal Clean Water Act pertaining to stormwater discharges and surface water quality. DEQ issues permits related to surface water discharges, establishes water quality criteria for waterbodies based on designated beneficial use, and conducts studies and evaluations to determine whether a waterbody adheres to water quality standards.

Regulatory drivers considered in the context of this SMP include Phase I National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer (MS4) permit requirements and the Total Maximum Daily Load (TMDL) program and associated 303(d) listings for receiving waters.

2.6.1 NPDES Permit Requirements

The City is a co-permittee on the Clackamas County Phase 1 NPDES MS4 permit, along with 13 other jurisdictions in Clackamas County, for management of stormwater runoff. Other neighboring co-permittees include the cities of West Linn, Lake Oswego, and Oregon City.

The NPDES MS4 permit program regulates the discharges of stormwater to receiving waters from urbanized areas and requires permitted municipalities to develop and implement stormwater control measures to address water quality. As a co-permittee, the City is independently responsible for the implementation of their permit, although coordination through intergovernmental agreements (IGAs) with co-permittees is commonplace to help efficiently address programmatic needs such as public education and monitoring. The City's NPDES MS4 permit was reissued in October 2021 after being administratively extended when the previous permit expired in 2017. Most recently, the effective NPDES MS4 permit was modified in May 2023 to address a change in monitoring requirements.

Implementation of the City's NPDES MS4 permit is outlined in their 2022 Stormwater Management Program document (SWMP). Stormwater activities or best management practices (BMPs) are outlined to address the elements of the permit including:

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Stormwater Management for New Development and Redevelopment
- Pollution Prevention and Good Housekeeping for Municipal Operations
- Industrial and Commercial Facilities
- Monitoring and Reporting
- Stormwater Management Facilities Operation and Maintenance Activities

In addition to the elements above, the reissued NPDES permit requires an assessment of outcomes from the 2015 Hydromodification Assessment and 2015 Retrofit strategy, which was due to DEQ by December 1, 2023. This review required an evaluation of progress made under both plans and, as necessary, establishing new goals, priorities, and projects. This SMP incorporates goals and project identification efforts conducted for both documents (see Section 3.2 Water Quality Retrofit Analysis and Section 4 Stream Assessment), as well as identifies new projects and programs to support efforts in the future.

The continued consideration of water quality in conjunction with planning and development efforts is addressed within the City's NPDES MS4 permit, further necessitating the need for this SMP to address stormwater treatment, particularly in locations where treatment is not provided.

2.6.2 TMDL and 303(d) Listings

Wilsonville is in the Middle Willamette River watershed. All areas within the city limits and associated concept planning areas discharge either directly or indirectly to the Willamette River between river mile (RM) 37 and 40.

On September 21, 2006, DEQ finalized a TMDL for the Willamette Basin. The TMDL addressed water quality impairment of the Middle Willamette River and its tributaries and included previously approved TMDLs by reference. The Willamette Basin TMDL addressed bacteria, mercury, and temperature, and included wasteload allocations (WLAs) and load allocations (LAs) specific to Designated Management Agencies (DMAs), except for mercury, as it required additional monitoring and analysis prior to the development of allocations.

On November 22, 2019, DEQ issued the Final Revised Willamette Basin Mercury TMDL, which was in turn submitted and disapproved by the United States Environmental Protection Agency (USEPA) due to questions related to the identification of sources and associated concentrations used to define WLAs and LAs. On February 4, 2021, the Willamette Basin mercury TMDL was reissued by the USEPA, including WLAs specific to the stormwater.

Table 2-7 summarizes the TMDL pollutants and associated LAs and WLAs applicable to Wilsonville. The City's 2022 TMDL Implementation Plan specifies temperature management activities targeting effective shade as well as natural resource and stream channel restoration and riparian cover. Additionally, in conjunction with NPDES MS4 obligations, the City is required to develop pollutant load reduction benchmarks at the end of each permit cycle to quantify TMDL pollutant load reduction estimates due to stormwater management activities and facilities. This requires the continual

installation of water quality treatment facilities to ensure progress is made towards TMDL pollutant load reduction goals.

Additional water quality impairments relevant to the City are reflected in the effective (2018/2020) 303(d) list for receiving waters within the City. Parameters of concern for the Middle Willamette River include aldrin, biological criteria, DDT/DDE, dieldrin, and polychlorinated biphenyls (PCBs). Such parameters represent additional targeted parameters for pollutant reduction with the City's stormwater program, as TMDLs are slated for development for these parameters in the future.

Table 2-7. TMDL Summary for Wilsonville

TMDL	Year	Subbasin(s)	TMDL Parameters	TMDL Surrogate Parameters	WLA	LA
Willamette River	2006	Middle Willamette	• Mercury • Bacteria (*E. coli*) • Temperature	Effective shade (surrogate for temperature)	• Mercury = 97% [a] • Bacteria = 75-88% reduction [b]	Temperature = 85-95% effective shade

a. Air deposition is the primary source of mercury for MS4 permittees. Through the City's reissued (2021) MS4 NPDES permit, the City was required to prepare a mercury minimization assessment and BMP effectiveness analysis to assess pollutant removal potential.

b. The WLA for bacteria varies according to season and discharge location. A 75% reduction in bacteria load is applicable for areas directly discharging to the Willamette River and a 75% reduction is applicable during the fall, winter, and spring seasons for areas discharging to tributaries. An 88% reduction during the summer season is applicable for areas that discharge to tributaries.

2.6.3 Regulatory Program Integration

Development of this SMP provides a unique opportunity to address regulatory requirements in the context of capital improvement program development, as outlined below:

- The City's 2021 NPDES MS4 permit includes expanded stormwater program and maintenance activities that will require additional stormwater resources and staffing, and such needs have been considered when developing capital project and program costs in this SMP (see Section 3.2 and Section 7.3).
- Updates to the 2015 Retrofit Plan and the 2015 Hydromodification Assessment (as required by the 2021 NPDES MS4 permit) are reflected with updated project needs identified and prioritization reflected in this SMP.
- Ongoing preservation and maintenance of stream channel vegetation and planting activities, as reflected in the 2022 TMDL Implementation Plan, are supported by capital project and program efforts (see Section 4).

Regulatory requirements have the potential to influence the City's overall stormwater capital program throughout the 20-year SMP implementation period. Figure 2-7 shows the correlation between the regulatory programs and SMP components. It reflects how requirements and activities conducted independently under individual regulatory programs help inform each other, as well as how the SMP is the primary mechanism to support capital and program funding and staffing resources that collectively benefits all programs.

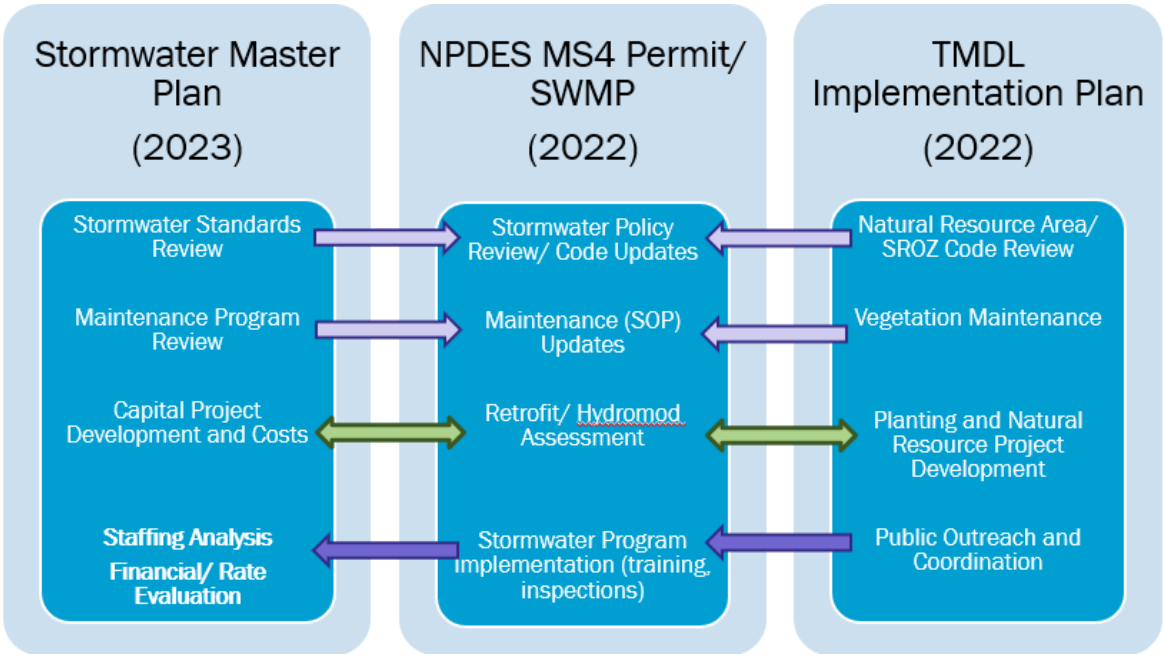


Figure 2-7: SMP and Regulatory Connectivity

2.7 Comprehensive Plan Review

All cities and counties in Oregon are required to adopt Comprehensive Plans and implement ordinances in conformance with the Statewide Planning Goals. Comprehensive Plans direct land use and development within local jurisdictions and must be legislatively adopted by the City and reviewed by the Land Conservation and Development Commission for compliance with Statewide Planning Goals. Local land use decisions must be made in conformance with the provisions and policies of the City's Comprehensive Plan.

The City of Wilsonville Comprehensive Plan (October 2018, updated June 2020) is periodically reviewed to ensure it is current and reflective of continued compliance. BC reviewed the City's Comprehensive Plan with respect to stormwater and consistency with the City's 2021 NPDES MS4 permit. Review comments are associated with the Public Facilities and Services, under the subcategory heading "Storm Drainage Plan". Comments and suggested changes are summarized below:

- Under Policy 3.1.8, page C-8 related to the Storm Drainage Plan, to be more consistent with the MS4 NPDES permit, the reference to pollutants "temperature and turbidity" should be updated to include additional pollutants of concern.
- Under Policy 3.1.8, page C-8 and throughout the plan, there are references to "detention facilities". These references imply that detention is the main or sole type of facility used for stormwater management. Given the focus of the MS4 NPDES permit on green infrastructure, low impact development, and infiltration/retention, the term "detention facilities" should be replaced with a broader term such as "stormwater management facilities" or itemized to include more recently prioritized types of facilities.
- Under Policy 3.1.7 (based on numbering, it should be Policy 3.1.9), there is reference to constructing facilities to improve stormwater quality and control the volume of runoff. To be comprehensive this should be expanded to include reference to controlling peak rates of runoff.

While not related to the MS4 permit, implementation measures related to natural resource areas and overlay zones in the Environmental Resources and Community Design Section (e.g., Implementation Management Measures 4.1.5.e, 4.1.5.m, and 4.1.5.n) were reviewed but no proposed adjustments are recommended in the context of the SMP.

2.8 Stormwater Operations

Stormwater-related maintenance activities are managed by the City of Wilsonville's Public Works Department, Roads and Stormwater Section. Stormwater-related planning, NPDES MS4 and TMDL compliance, and engineering activities are managed under the Community Development Department in the Engineering Division.

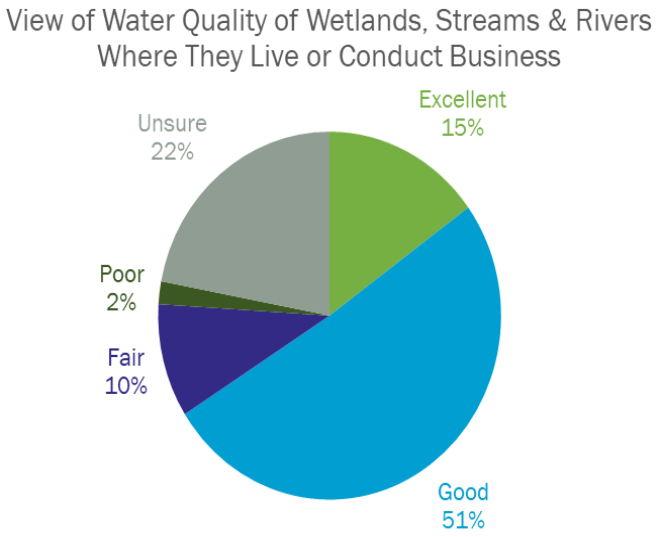
The City of Wilsonville's Public Works Roads and Stormwater Section currently has 2.74 full-time equivalent (FTE) to support ongoing stormwater maintenance efforts (0.4 FTE Stormwater Supervisor and 2.34 FTE Utility Maintenance Specialists). Of the 2.34 FTE Utility Maintenance Specialists, 2.0 FTE are dedicated to stormwater and the other 0.34 FTE reflect staff that assist with underground utility locating, but not dedicated to stormwater. Occasionally, additional coordination with Parks and Recreation is required to supplement staff to conduct routine and response-driven maintenance activities (time not reflected in the FTE summary).

The City of Wilsonville Community Development Department in the Engineering Division includes 1.5 FTE that are responsible for NPDES MS4 and TMDL compliance and directly support the Public Works Roads and Stormwater Section with facility inspections and other activities. Additional Engineering staff oversee and manage capital projects, as well as perform stormwater development review activities.

2.9 Community Perspectives

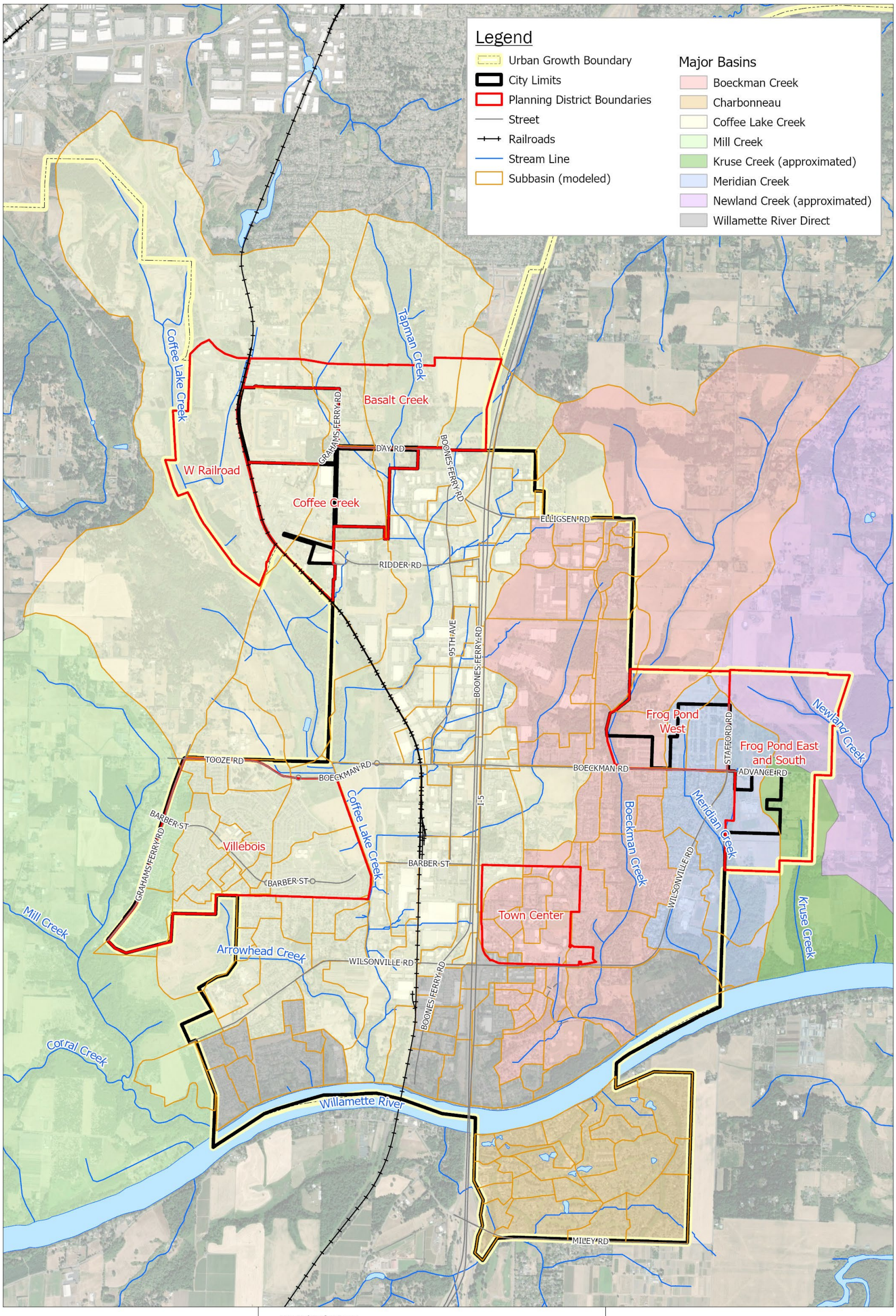
Outreach efforts were conducted at the beginning of the SMP process, in part, to obtain a better understanding of City perceptions of stormwater, as well as the perception of stormwater services provided by the City.

A public survey was advertised from April 1 to May 15, 2021, on the City's *Let's Talk Wilsonville* web platform. Interested citizens and community members were invited to participate. The survey was provided in both English and Spanish, and 90 participants completed the survey, encompassing both residential and business customers. The survey also provided a forum for participants to describe observed issues and concerns with the stormwater system operation and functionality.



Public surveys help confirm the types of capital projects most beneficial to the community

Findings from the survey indicated that more than 65 percent of the participants believe water quality in wetlands, streams, and rivers in Wilsonville are of excellent or good condition and 97 percent of participants the City had a positive impression of Wilsonville's stormwater services. For both residential and business customers, removal of pollutants before runoff enters streams; the improvement of water quality and habitat; and management of flood/flooding problems (in pipes and facilities) were identified as the most important stormwater services.



Brown AND Caldwell

City of Wilsonville/
Project # 156157

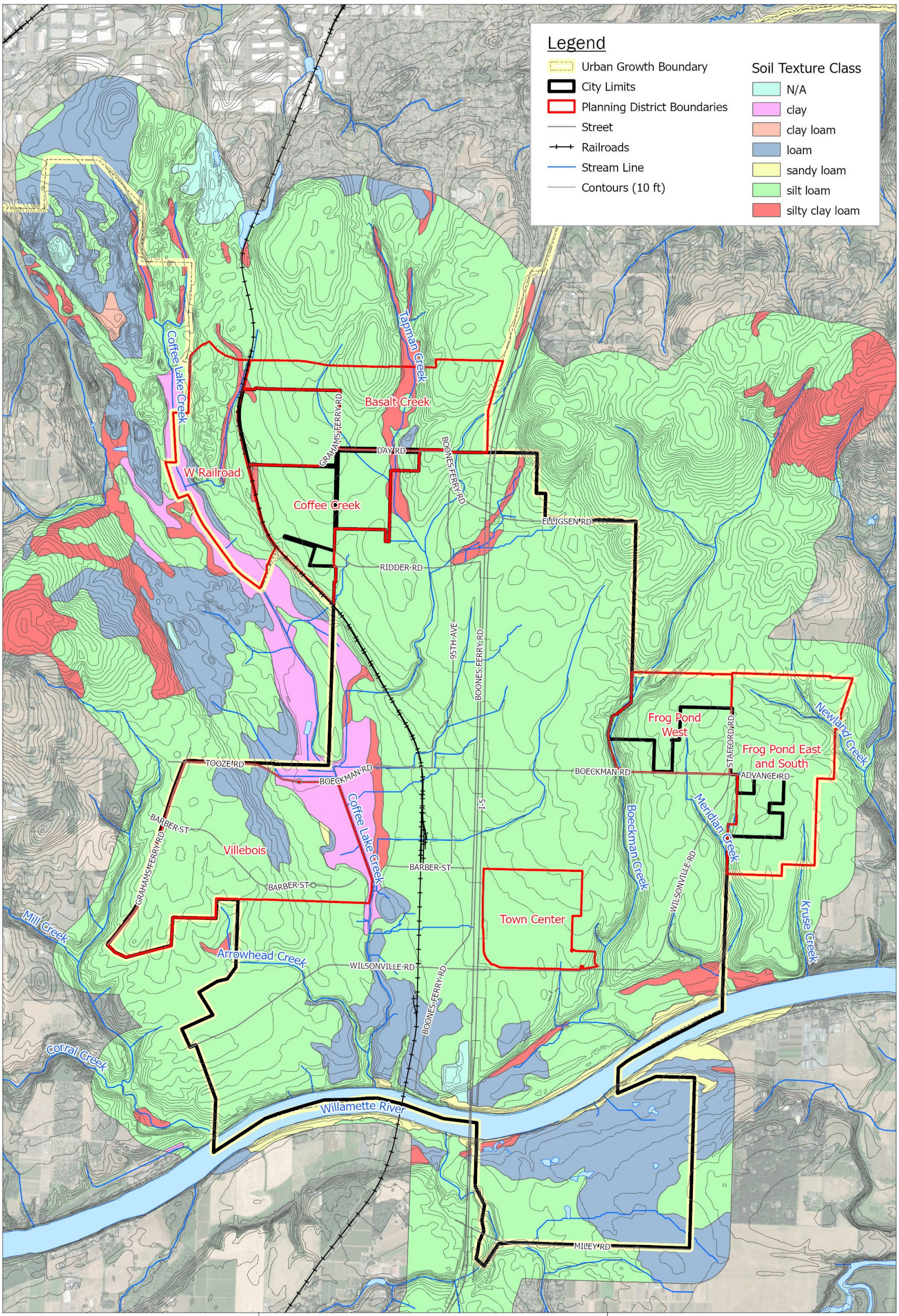
Stormwater Master Plan

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Figure 2-2: Major Basins and Planning Areas



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Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

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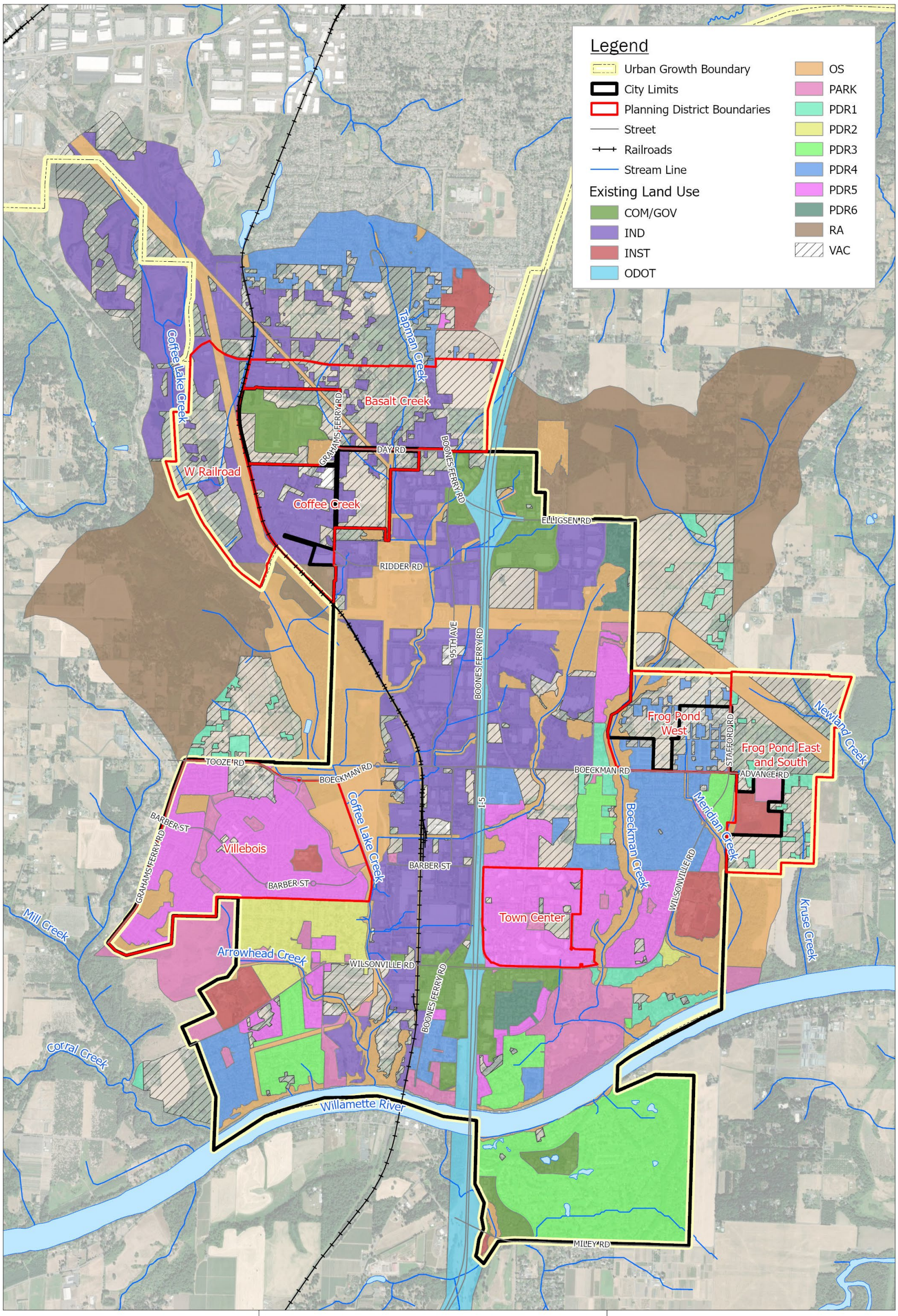
Figure 2-3: Soils and Topography



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City of Wilsonville/
Project # 156157

Stormwater Master Plan

Spatial Reference:
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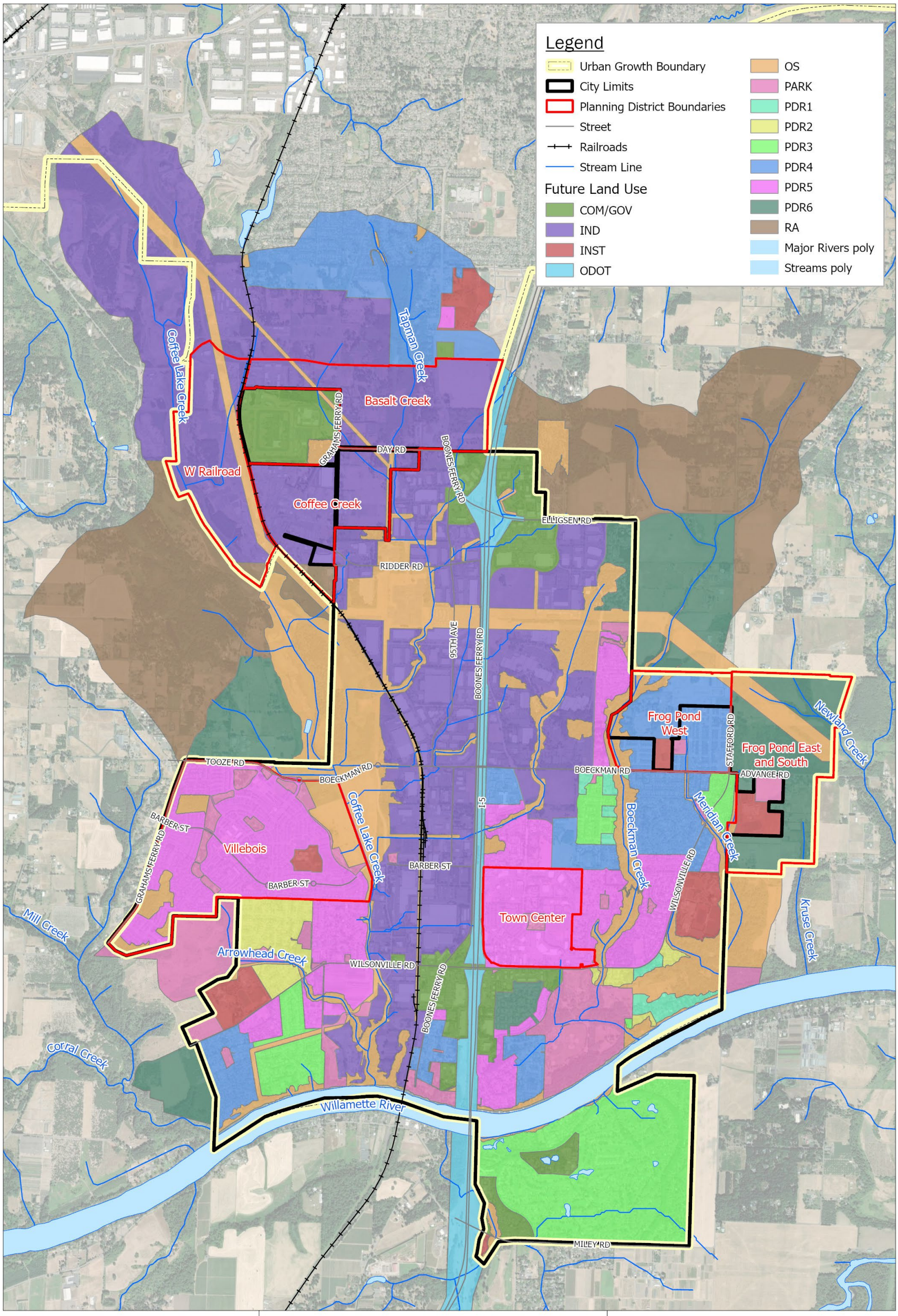
Figure 2-4: Existing Land Use Condition



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City of Wilsonville/
Project # 156157

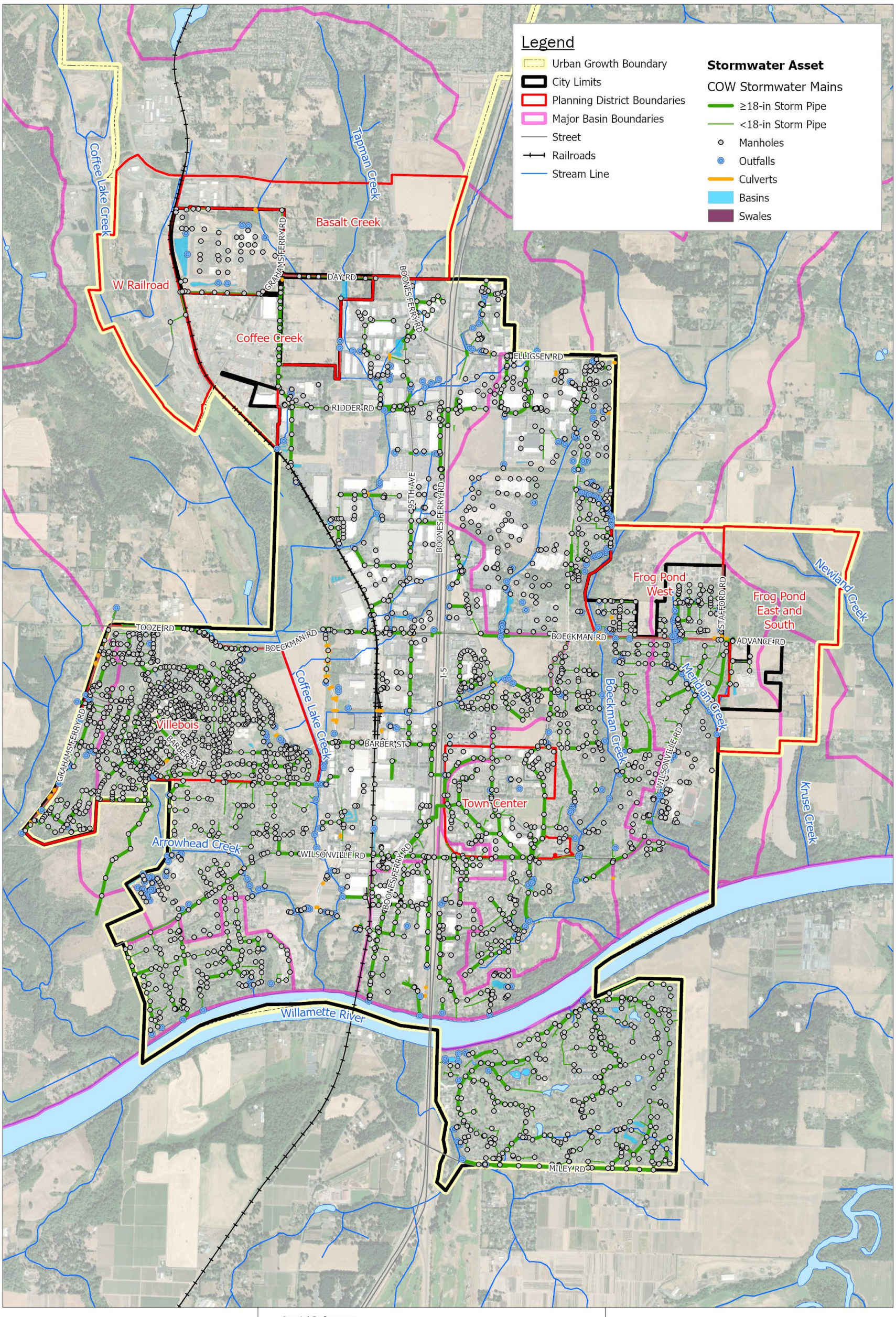
Stormwater Master Plan

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Figure 2-5: Future Land Use Condition



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Project # 156157

Stormwater Master Plan

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Figure 2-6: Stormwater System Overview

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Section 3

Basis of Planning

This section summarizes the overall project planning process and the process to identify stormwater problem areas and water quality retrofit needs, which collectively inform capital project needs identification and development efforts.

This project planning process allowed the City to develop information for areas and activities most likely to be prioritized and funded in a capital improvement program. This process qualified project and program needs in consideration of the SMP objectives, including rectifying known areas of stormwater drainage problems and flooding; enhancing and/or expanding water quality treatment and flow control; and identifying programmatic opportunities to address stormwater needs on a city-wide scale.

Appendix A includes background documentation related to the project planning activities, including a Stormwater Problem Area matrix (Appendix A, Table A-1) and a Project Opportunity Matrix (Appendix A, Table A-2). Identified project opportunities stem from the individual assessment of problem areas (Section 3.1), water quality retrofit opportunities (Section 3.2), stream assessment efforts (Section 4), and H/H modeling results (Section 5).

Referenced figures are included at the end of this section.

3.1 Problem Area Identification

A collaborative approach with Community Development and Public Works staff, as well as the public, was used to identify known stormwater problem areas where infrastructure improvement, replacement, or retrofit may be needed. Problem areas were initially identified through a combination of City staff surveys and follow-up discussions, an external survey (distributed via a virtual open house platform), review of the 2012 SMP, field investigations, and a Project Planning Workshop.

Problem areas were documented in a Stormwater Problem Area Matrix (Appendix A, Table A-1) by primary and secondary deficiency category (i.e., capacity issue, instream erosion/sediment issue, maintenance, and repair and replacement). In addition, portions of the stormwater system requiring refinement/update or expansion of the existing H/H model, as well as locations to be investigated as part of the stream assessment were identified. Problem areas are mapped by primary deficiency (see Figure 3-1 at the end of this section).

3.1.1 City Staff Surveys

In February 2021, surveys were distributed to City staff requesting input on specific locations of reported capacity deficiencies, system condition issues (i.e., pipe and open channel), frequent maintenance needs, and water quality opportunities.

On March 16, 2021, Public Works and Community Development staff collaborated and provided a summary table and accompanying map reflecting 39 problem area locations. Some locations and descriptions provided from Community Development staff overlapped with locations identified by Public Works. Specific issues included culvert misalignments, use of bubblers, standing water in roads and easements due to a lack of system capacity, flooding at open channels, crushed or

improperly abandoned pipe, the buildup of sediment at catch basins, and damaged outfall structures.

3.1.2 External Stakeholder Surveys

To help facilitate external communications to the public (i.e., citizens and business community), a survey was prepared for external stakeholders to solicit information regarding drainage issues and project needs. External stakeholders included community members, businesses and community groups, developers and contractors, and neighboring jurisdictions.

The Let's Talk Wilsonville web platform was used to publish the external survey as well as provide general background information related to stormwater, the City's current stormwater system, and the purpose of the SMP. The external survey was publicized using local publications (i.e., Boones Ferry Messenger) as well as social media.[5] Website content was also translated into Spanish.

The external survey was open from April 1 to May 15, 2021, and included general demographic questions and questions intended to assess the level of understanding of the participant with respect to stormwater utilities. Additional questions related to values and level of service were also included. The survey included an opportunity for the participant to directly identify problem areas/locations and issues of concern.

The external surveys resulted in the identification of four additional problem areas that are documented in the Problem Area Matrix (Appendix A, Table A-1).

3.1.3 2012 Stormwater Master Plan

The City's 2012 SMP identified 50 stormwater CPs. Project categories included pipe replacement, planning/studies, restoration projects, and low impact development (LID) projects. Sixteen of the projects identified in the 2012 SMP were either completed or are in progress. Some of the proposed pipe replacement projects were subsequently reflected in the Charbonneau Infrastructure Plan (2014).

Outstanding (non-constructed) projects from the 2012 SMP were reviewed against identified problem areas and seven locations directly overlapped. The remainder of projects from the 2012 SMP were discussed with the City during a project coordination call to confirm the need to include the associated project area directly in the Problem Area Matrix. Because hydrologic modeling methods for this plan deviate from the 2012 SMP, and additional assessment efforts (water quality retrofit assessment, stream assessment) were conducted for this SMP, the City opted to independently evaluate project needs for this SMP update instead of relying on previous outdated work.

3.1.4 Project Planning Workshop

A Project Planning Workshop was conducted with City staff on August 24, 2021, to review data compilation efforts and the identification of the stormwater problem areas. The objective of the workshop was to solicit additional detail on the nature of each problem area, add any additional problem areas suggested by the City, and to categorize the problem areas by potential solution (whether project-based or programmatic).

A total of 46 problem areas were identified for discussion. Discussion included the size and scale of the anticipated project and whether a capital project solution or programmatic approach may be taken to address the issue. Problem area locations were also reviewed to establish 1) the need to conduct a site visit; 2) a need to expand model extents to evaluate the problem area; and 3) whether

[5] The current website is: Stormwater Master Plan Update | Let's Talk, Wilsonville! (letstalkwilsonville.com).

there is benefit in including the location as part of the stream assessment effort. From the workshop, 22 locations requiring site visits were flagged and scheduled. Seven locations were flagged for consideration as part of the stream assessment effort.

3.1.5 Field Investigation

An initial field investigation was conducted September 27, 2021, to verify stormwater problem areas and assess potential project concepts in conjunction with the Project Planning Workshop. A total of 14 problem areas were visited, clustered into seven discrete site visit locations. The site visits provided BC staff with an opportunity to discuss each of the problem areas and better understand the overall drainage patterns and system to advance discussion of modeling needs and capital project concepts.

Subsequent site visits were conducted to inform H/H model validation, water quality retrofits, and capital project development efforts, and those field investigation efforts are discussed under the respective sections.

3.1.6 Results

The Problem Area Matrix (Appendix A, Table A-1) includes the findings from the Project Planning Workshop and field investigation efforts, and documents whether the problem area and potential project solution required additional evaluation as part of the stream assessment and/or hydraulic modeling (via expansion of the existing modeling extents). Problem area locations, including those where a site visit was conducted are reflected in Figure 3-1 at the end of this section.

Of the comprehensive list of 46 identified problem area locations, 11 locations were not anticipated to warrant a project or program solution but were maintained in Table A-1 for reference. Seven locations were identified for further evaluation as part of the stream assessment effort, and eight locations were identified for evaluation as part of the capacity analysis.

Following field investigations and additional evaluation efforts, vetted problem areas were carried forward as Project Opportunity Areas (see additional discussion in Section 6.1) and CP needs. Project Opportunity Areas are documented in Appendix A, Table A-2.

3.2 Maintenance Evaluation

Per Section 3.1, some problem areas were identified as the result of deferred maintenance or due to a relatively minor drainage issue that may not warrant capital project funding. These issues can be more efficiently addressed by expansion of the City's maintenance program (with increased staffing) and/or by defining a programmatic need that can be annually funded.

Maintenance activities and staffing allocations were discussed during a series of two interviews with Public Works staff in late 2021. Staff labor estimates by department and maintenance activity were compiled for use during interviews. The interviews were used to verify the current (as of 2021) maintenance activities, maintenance frequencies and internal processes to issue work orders. The City's Public Works Department uses Cartegraph for asset management, and Cartegraph refers to features (assets) in the City's GIS system to specify where maintenance is required.

Table 3-1 summarizes the primary stormwater maintenance activities conducted by the City of Wilsonville's Public Works Roads and Stormwater Section, along with a summary of the frequency and ability of the stormwater staff to meet maintenance targets (whether they are NPDES MS4 Permit-related or individual Public Works goals). Table 3-1 does not reflect an extensive list of activities but rather reflects the primary activities with a regulatory driver.

Table 3-1. City Maintenance Activities and Potential Implementation Gaps

Activity	NPDES MS4 SWMP Requirement	Frequency Required [a]	Annual Target [a]	Regularly Meeting Target? (Y/N) [b]	Required Crew Size	Stormwater Staff Time (per person)	Department	Increased Staffing Need (Y/N)
TV inspection	Not explicitly stated	Annual	15% (60,000 LF) of public conveyance system >6"	N	2	200 ft/hr	Public Works (see Cartegraph Work Flow Process 8.0)	Y
Pipeline cleaning	Y	Annual	As required based on inspections	Y	2	250 ft/hr	Public Works	N
Priority CB inspection and cleaning	Y	Annual	All	Y	2	0.5 hr/facility	Public Works	N
Other CB inspection and cleaning (public)	Y	Every 4 years	25% of total	N	2	0.5 hr/facility	Public Works	Y
Culvert inspections and cleaning	Y	Annual	20%	Uncertain	2	2 hr/facility	Public Works	Potential
WQ MH inspection/cleaning	Y	Annual	150	N	2	1 hr/facility	Public Works	Y
Street sweeping [c]	Y	Monthly	All curbed	Y	NA	165 hours total annually	Contractor	N
System repair and maintenance	Y	As needed	–	Y	2	Varies	Public Works	N (Programmatic approach recommended)
Public water quality facility inspections	Y	Annual	All	N	2	1 hr/facility	Community Development/ Public Works	N
Public water quality facility maintenance [c]	Y	Annual	Public works performs maintenance independent of inspection results	Y (magnitude varies)	2	1-16+ hrs/facility	Public Works	Potential
Public water quality facility maintenance (landscaping)	Y	Annual	All	Y (magnitude varies	NA	291 hours	Public Works	Potential
Private WQ facility inspections [d]	Y	Annual	Varies	Y	1	4 hr/facility	Community Development	N

a. Based on the documentation in the 2022 SWMP Document and/or as documented in the City's Stormwater Maintenance Schedule.

b. Based on the available documentation in the NPDES MS4 annual reports or as provided by Public Works. This column reflects the ability of the Roads and Stormwater Section to conduct this work independently (not requiring staff supplementation from other Sections or Divisions).

c. Activity requirements vary based on inspection results.

d. Current GIS data does not differentiate types of facilities in the "basins" GIS layer. Basins includes ponds, swales, planters, and raingardens.

3.2.1 Staffing Estimates to Support Maintenance Activities

In accordance with Table 3-1, additional staffing is required to conduct routine maintenance activities in conjunction with NPDES MS4 permit requirements. Estimated staffing needs were initially calculated based on required staff time and length/number of assets (see Section 2.5) and discussed with the Public Works Operations Manager to better incorporate the following staffing considerations:

- Approximately 35 percent of time reserved for stormwater maintenance ultimately supports other departments and emergency response needs. Because many maintenance activities require a crew of two people, the Public Works Roads and Stormwater Section (with 2.74 FTE) is unable to consistently conduct routine maintenance activities and be available to respond to emergencies.
- Based on detailed staff labor estimates compiled by the City, approximately 15 percent of work orders issued by the Stormwater Division are cancelled, which means staffing limitations are preventing the work orders from being completed.

Additional staffing estimates assume that one FTE equals approximately 1,650 hours of work after deducting estimated annual leaves, training, and other non-task related hours (Personal communication with Martin Montalvo, Public Works Department Operations Manager, November 17, 2021). The following maintenance activities were evaluated and additional staff support needs estimated.

- **CCTV Inspections:** Closed-circuit television (CCTV) inspections for stormwater and sanitary were historically contracted out by the City, but in 2021, the City took over delivery of the work. Stormwater CCTV efforts do not routinely occur. The City maintains a Public Works goal of inspecting 15 percent of their public collection system (>6 inches in diameter) annually, which is approximately 60,000 LF of pipe. Stormwater Division staff are needed to operate the CCTV equipment and review of the CCTV reports.

  Recommendation = 0.5 FTE

- **Non-priority Catch Basin/Pollution Control Manhole Cleaning:** The City regularly maintains identified priority catch basins, but routine cleaning of all catch basins is more challenging with current Roads and Stormwater section staffing levels (i.e., clean all catch basins on a 4-year cycle).

  Recommendation = 0.25 FTE

- **Vegetated System Maintenance:** LID facilities (swales/planters) and stormwater basins (ponds) require more extensive maintenance than traditional gray infrastructure (e.g., filter vaults, underground detention facilities, etc.). Maintenance activities include debris removal, vegetation removal and replacement, regrading, replacement of amended soil media, inlet and outlet cleaning, and repair of structural components. Some activities may occur during each maintenance effort (e.g., annually), whereas some may be conducted once every few years.

  Current staffing levels and maintenance efforts do not account for/include vegetation/soil replacement or the large-scale reconstruction/replanting of facilities that are not operating property. Additional staffing needs will help ensure a more proactive program for inspection and maintenance, as well as development of a standard operating procedure (SOP) to guide vegetated system maintenance (both shorter term and larger scale).

  Recommendation = 1.25 FTE (assuming annual maintenance of 4 hours for vegetated facilities; 16 hours for ponds).

A total of two additional FTE are estimated to address recurring and deferred maintenance activities exclusive to the Public Works Roads and Stormwater Section. Final maintenance-related staffing recommendations in conjunction with the 2022 SWMP Document and identified CPs per this SMP are referenced in Section 7.3.

3.2.2 Programmatic Needs

The Project Planning Workshop and subsequent interviews with Public Works staff also identified the following ongoing programmatic activities that, if routinely conducted, could offset individual CP needs. These programmatic concepts were refined and are detailed in conjunction with CP development activities in Section 6.

- Repair and Replacement (R/R) Program. Dedicated funding is needed to repair/replace all public pipe 12-inches and greater within the City limits over a defined timeframe to address lifecycle costs.
- Localized Drainage Improvements. Dedicated funding is needed to assist with minor system configuration or installation needs or to respond to recurring maintenance needs.
- Inlet Replacement Program. Dedicated funding is needed to relocate and/or install curb inlets instead of catch basins in high traffic roads with significant leaf debris to help address localized drainage issues.
- Green Street Retrofit Program. A dedicated program is needed to retrofit local streets, which may include, depending on the feasibility, porous pavement overlays and/or green street facilities to promote additional infiltration and water quality treatment.

3.3 Water Quality Retrofit Analysis

Opportunities to incorporate water quality treatment are necessitated by the regulatory drivers in place for the City and supported by the community and public goals to protect water quality. These water quality retrofits can be accommodated through the addition of new water quality and/or detention facilities or the reconfiguration of existing facilities.

The problem area identification effort was focused on capacity and maintenance issues (Section 3.1) and did not focus on water quality objectives. Therefore, a separate analysis was conducted to identify locations where water quality could be integrated into the developed landscape or where pending development and future transportation projects could be leveraged to initiate construction of new facilities. To support the analysis, a GIS desktop evaluation was conducted to map public property (classified as vacant, parks, open space, or City-owned), ponds (public and private), water quality projects from the 2012 SMP, existing stormwater facility contributing drainage areas, and future transportation corridors.

Based on a review of the mapping and City staff preferences, the following objectives (strategies) were developed to guide the water quality retrofit analysis for this SMP:

1. Revisit priority (higher scoring) retrofit projects previously identified in the 2015 Retrofit Assessment to confirm continued relevance. These projects reflect water quality-related projects per the 2012 SMP. Review and integration of findings from the 2015 Retrofit Assessment was conducted to support compliance with requirements of the 2021 NPDES MS4 permit.
2. Retrofit underutilized facilities such as ponds or swales to enhance water quality and/or provide downstream flow mitigation to address erosion/hydromodification issues.
3. Integrate water quality and/or flow control into existing project opportunity areas (where possible).

Identification of new facilities to support future development and growth is not a preferred retrofit strategy, given the fact that private development will already be required to adhere to the City's prescriptive stormwater design standards.

Figure 3-2, at the end of this section, reflects source information used for the water quality retrofit analysis, as well as the resulting project needs.

3.3.1 2015 Retrofit Assessment Update

The City's 2015 Stormwater Retrofit Plan documents the City's stormwater policies, projects, and programs intended to improve water quality in areas of the City that are currently underserved or lacking stormwater quality controls. The 2015 Retrofit Plan included a review of twenty, non-constructed capital projects (CPs) per the City's 2012 SMP and 2014 Capital Improvement Program that had a water-quality element. Updated scoring criteria that focused on water quality objectives were applied to each project. Criteria included:

- Progress toward meeting TMDL Wasteload Allocations (i.e., bacteria and mercury)
- Priority areas for treatment (focusing on areas with no structural stormwater treatment facility and high pollutant generating areas [commercial/industrial land uses])
- Temperature control (meet the shade targets identified in the TMDL)
- Erosion prevention and control (i.e., retrofit of outfalls or stream channel restoration where active erosion results in the transport of excess sediment, increased turbidity and reduced instream water quality).
- Additional objectives (including project integration, maintenance, livability/sustainability, safety, and land acquisition).

For this SMP, the prioritized projects per the City's 2015 Retrofit Plan were reviewed to confirm: 1) projects completed and/or where a project need may have changed, and 2) projects that should be carried forward as part of this SMP.

Results of this review are detailed in Table 3-2. Identified project needs are carried forward as a Project Opportunity Area.

Table 3-2. 2015 Retrofit Assessment Review and Project Opportunity Status

2015 Retrofit Assessment Project ID	Project Name	Constructed?	Overlaps with 2023 SMP Problem Area Location ID	Overall Score [a]	Retrofit Assessment Findings			
					Feedback	2024 SMP Result		
						Project Opportunity	Program Opportunity	N/A
LID3	SW Camelot Green Street Mid-block Curb Extension	No	Yes, 46	16	Viable project, but could be reflected in program (Section 6.5)		X	
LID7	SW Wilsonville Road Stormwater Planters	No	No	16	Viable project, but could be reflected in program (Section 6.5)		X	
CLC-10B	Coffee Creek Storm Projects	No	Yes	16	Not Applicable-reflects 2012 SMP CLC-1. Project number is unique to the Retrofit Assessment source document.			X
BC-5	Boeckman Creek Outfall Realignment	No	No	13	• Project involves realignment of an existing outfall into Boeckman Creek (330' N of Wilsonville Rd) that is causing erosion. • Erosion issues not identified/confirmed in 2022 stream assessment effort. • Project location overlaps potential Boeckman Road mitigation site (Creekside Apartments). See Project Opportunity Area #23.	X		
CLC-6	Coffee Lake Creek South Tributary Wetland Enlargement	No	No	13	• Referenced as a long-term project need from source document of retrofit assessment. • Project location overlaps with a portion of the Boeckman Road mitigation area (Siemens/Ash Meadows). Current METRO project may also negate the project need.			X
BC-4	Gesellschaft Water Well Channel Restoration	No	No	13	Project still viable and construction may occur in conjunction with other infrastructure projects (Interceptor Trail).	X		
LID2	SW Hillman Green Street Stormwater Curb Extension	No	No	13	Viable project, but could be reflected in program (Section 6.5)		X	
BC-8	Canyon Creeks Estate Pipe Removal	No	Yes, 37	12	• Short term/High priority CIP need per source document from retrofit assessment. • Project locations may overlap potential Boeckman Road mitigation site (Canyon Creek Park). See Project Opportunity Area #24.	X		
CLC-3	Commerce Circle Channel Restoration	No	Yes, 15/32	12	• Mid-term project need from source document of retrofit assessment. • See Project Opportunity Area #9.	X		
WD-4A	Willamette Way West Outfall Replacement	No	No	11	Project location is being monitored. No immediate project needs.			X
WD-4B	Belknap Ct Outfall Protection	Yes	No	11	Complete. Remove from list.			X

Table 3-2. 2015 Retrofit Assessment Review and Project Opportunity Status

2015 Retrofit Assessment Project ID	Project Name	Constructed?	Overlaps with 2023 SMP Problem Area Location ID	Overall Score [a]	Retrofit Assessment Findings			
					Feedback	2024 SMP Result		
						Project Opportunity	Program Opportunity	N/A
WD-4C	Morey Ct West Outfall Protection	Yes	No	11	Complete. Remove from list.			X
BC-2	Boeckman Creek Outfall Rehabilitation	No	No	9	• Project involves rehab of five existing outfalls between Wilsonville Rd and Boeckman Rd that have erosion issues. • Erosion issues not identified/confirmed in the 2022 stream assessment. • Targeted retrofit of culverts has already occurred.			X
BC-10	Memorial Park Stream and Wetland Enhancement	No	No	9	• Project was intended to enhance the existing stream channel that flows into Boeckman Creek to the N of Memorial Park baseball field (near sanitary lift station). This stream receives flow from the Memorial Drive Swales which are just upstream. Mid-term project need from source document of retrofit assessment. • Project location overlaps with potential Boeckman Road flow mitigation site. See Project Opportunity Area #23.	X		
CLC-1	Detention/Wetland Facility Near Tributary to Basalt Creek	No	Yes, 15/32	8	• Referenced as a long-term project need from source document of retrofit assessment but aligns with problem area. • See Project Opportunity Area #9.	X		
CLC-2	SW Parkway Avenue Stream Restoration	No	No	8	• Project is no longer needed, given onsite improvements for capacity (La Quinta). Remove from retrofit assessment.			X
CLC-7	Coffee Lake Creek South Tributary Stream Restoration	No	No	8	• Project is no longer needed as this location conflicts with proposed new Public Works building. Current METRO project may also negate the project need.			X
CLC-8	Coffee Lake Creek Restoration	No	No	8	• Project is no longer needed. This location is associated with 5th and Kinsman Project-Road isn't going to come out so project no longer applicable. Also at the driveway for Wilsonville Concrete.			X
CLC-5	Coffee Lake Creek Stream and Riparian Enhancement	No	No	7	• Referenced as a long-term project need from source document of retrofit assessment. • Limited access onto private property.			X
CLC-4	Ridder Road Wetland Restoration	No	No	7	• Referenced as a long-term project need from source document of retrofit assessment. • Not a high priority need for future restoration, but maintain as a future Project Opportunity Area.	X		

a. The overall score is per the 2015 Retrofit Assessment and considered for this 2024 SMP as an indication of the preferred water quality projects per the 2012 SMP.

3.3.2 New Retrofit Opportunities

In addition to project needs maintained from the 2015 Retrofit Assessment, several opportunities to integrate water quality and/or flow control into existing, underutilized facilities or another Project Opportunity Area were identified. These opportunities and their preliminary retrofit concepts are summarized in Table 3-3.

Table 3-3. New Retrofit Opportunities

Location	Retrofit Strategy	Retrofit Concept
Library Pond	Underutilized Facility	Install outlet structure to existing pond to provide flow control benefits. Drainage from Town Center is conveyed through this facility. Opportunity to implement a fee-in-lieu system for upstream redevelopment.
Tivoli and Oulanka Parks	Underutilized Facility	Combination of public and private swales at these locations. Swales have not been properly maintained and need retrofit.
Oregon Glass Pond	Underutilized Facility	Ponds near the outfall of the Ridder Rd./Peters Rd. Piped stormwater system may be reconfigured to provide a flow control benefit. Opportunity to help mitigate the pipe capacity issues at this location.
Memorial Park Dr. Swales	Underutilized Facility and Existing Project Opportunity	Existing swale is not draining properly. Swale needs retrofit and potential relocation.
Canyon Creek Park	Existing Project Opportunity	Existing Park property has potential for construction of a regional facility. This facility could treat upstream runoff from Argyle Square, Sysco, and other future developments. Due to location within BPA easement, additional coordination would be required.

3.4 Boeckman Road Hydraulic Evaluation and Mitigation Opportunities

Concurrent with development of this SMP, Wilsonville is constructing improvements to Boeckman Road from SW Canyon Creek Road to SW Stafford Road, as part of a Progressive Design-Build project. The Boeckman Road Corridor Project (BRCP), initiated in 2021, involves widening and reconstruction of the road, including removal of an existing culvert and instream flow control structure (FCS) on Boeckman Creek immediately north of Boeckman Road. The removal of the culvert and FCS prompted earlier planning efforts and a technical evaluation of Boeckman Creek. Opportunities for water quality and flow control mitigation within the Boeckman Creek watershed were identified and considered with project planning efforts for this SMP.

In 2021, a hydraulic evaluation of Boeckman Creek was conducted to evaluate potential changes to flows and water surface elevations (WSE) in Boeckman Creek due to removal of the FCS and the existing culvert crossing (Boeckman Road Hydraulic Evaluation, January 2022). The City's existing H/H InfoSWMM model (also used for this SMP) was refined and calibrated to reflect existing hydraulic performance. Efforts to identify potential off-site flow mitigation were initiated in 2022 with significant participation from City staff and the Progressive Design-Build consultant team. Both upland and instream mitigation locations were evaluated based on specific criteria including contributing drainage area and available storage capacity.

Four potential mitigation locations were ultimately identified as preferred locations. Preferred mitigation locations are referenced in the Project Opportunity Matrix for this SMP (see Appendix A, Table A-2).

3.5 Growth-Related Considerations

A particular focus for this SMP is future development/growth areas, as these areas are expected to develop in the near term and require new stormwater infrastructure including pipe and stormwater management facilities. Such future development may result in increased impervious area and additional stormwater runoff.

Specific growth areas of interest for this SMP include those areas documented in the Basalt Creek Concept Plan (2018), the Town Center Plan (2019), and the Frog Pond East/South Concept Plan (2022). These growth areas represent Project Opportunity locations because new public infrastructure is required and may be funded (in part) by the City. Therefore, cost estimates for new infrastructure are required for inclusion in the overall stormwater CIP.

3.5.1 Basalt Creek Concept Planning Area

With the adoption of the Basalt Creek Concept Plan by the cities of Tualatin and Wilsonville in August 2018, efforts are underway to amend the City's Comprehensive Plan and Transportation System Plan to promote industrial development in the area. Downstream capacity deficiencies on Tapman Creek require further study and planning to address increases in impervious surface due to anticipated development. Development in the Tapman Creek basin will be subject to differing onsite stormwater management standards for new and redevelopment activities. The City of Tualatin, in the upstream portion of the basin, implements Clean Water Services (CWS) standards, whereas the City of Wilsonville regulates stormwater locally. Despite differing standards and requirements, all drainage from the Basalt Creek concept planning area will ultimately drain through City infrastructure before entering Coffee Lake Creek.

The Day Road area, including Commerce Circle, is identified as a problem area (Appendix A, Table A-1) and Project Opportunity Area (Appendix A, Table A-2) and receives flow directly from new development in the Basalt Creek Concept Planning area. Policies related to onsite stormwater management in the upstream portions of the basin may be considered to help mitigate existing, downstream capacity constraints.

3.5.2 Town Center Planning Area

The Town Center Plan (2019) addresses a key redevelopment area in the city, located north of Wilsonville Road in the Boeckman Creek basin. Redevelopment of the Town Center area is anticipated to require major reconfiguration of the existing stormwater collection system. The Town Center Plan proposes the demolition of several segments of existing stormwater trunkline and the installation of new piping alignments in conjunction with City ROW. As a result of these improvements, additional flow is anticipated to be conveyed to the downstream Library Detention Pond, south of Wilsonville Road in Memorial Park.

Inclusion of new infrastructure associated with the Town Center redevelopment area is reflected as a Project Opportunity in Appendix A, Table A-2 (Figure 3-3). In addition, the Library Pond is identified as a current problem area, as well as a Project Opportunity. Policies related to the use of the Library Pond as a fee-in-lieu strategy/facility for treatment and/or flow control for upstream redevelopment are described in Section 6.3.4.

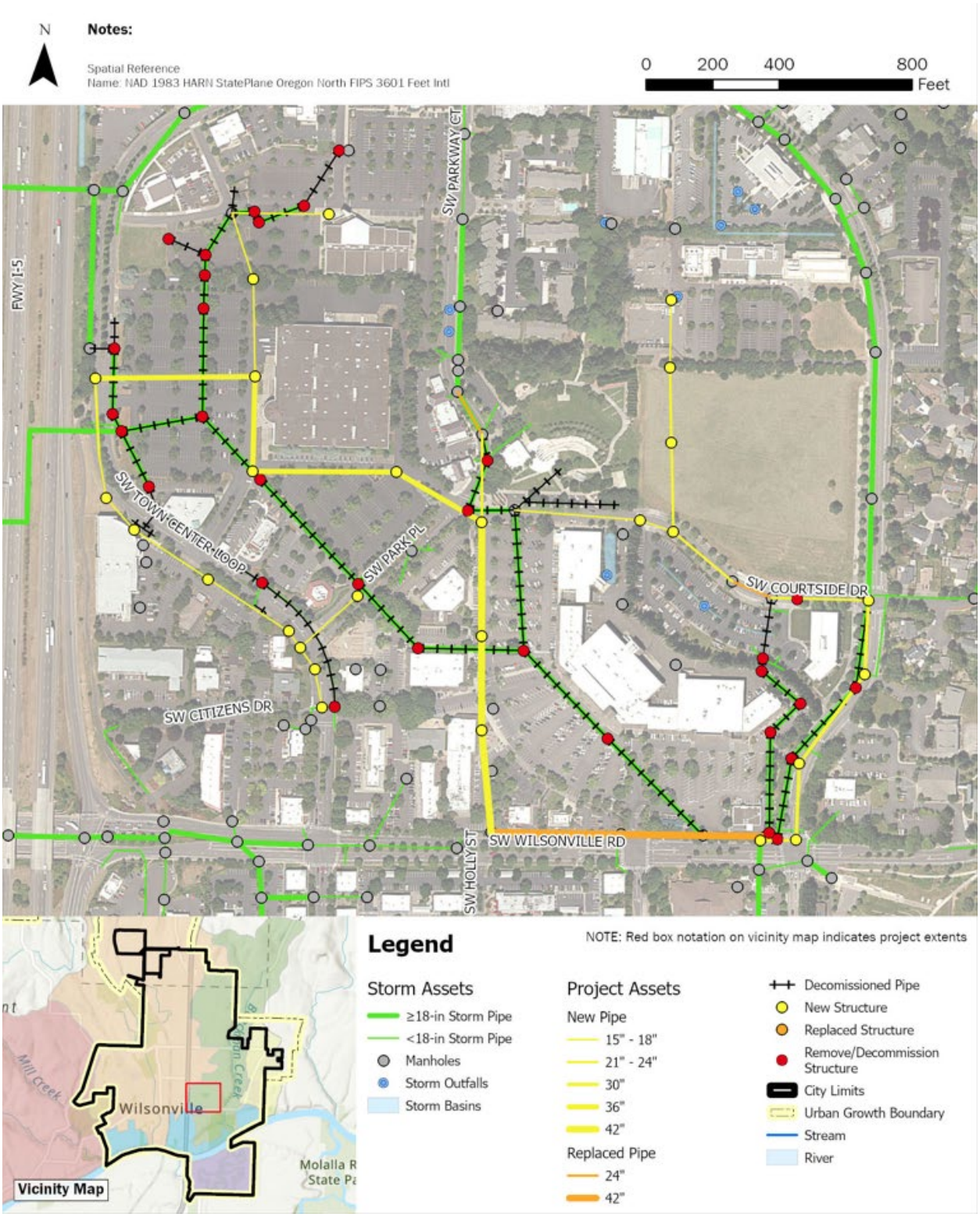

Figure 3-3: Town Center Stormwater Infrastructure Proposal

3.5.3 Frog Pond East and South Planning Area

The Frog Pond East and South Planning Area is located east of the existing Frog Pond development, adjacent to Advance Road in the Newland Creek basin. New development warrants the installation of new stormwater trunklines and outfalls in dedicated City ROW. Inclusion of new infrastructure associated with the Frog Pond East and South Planning Area is reflected as a Project Opportunity Area (Appendix C, Table C-2).

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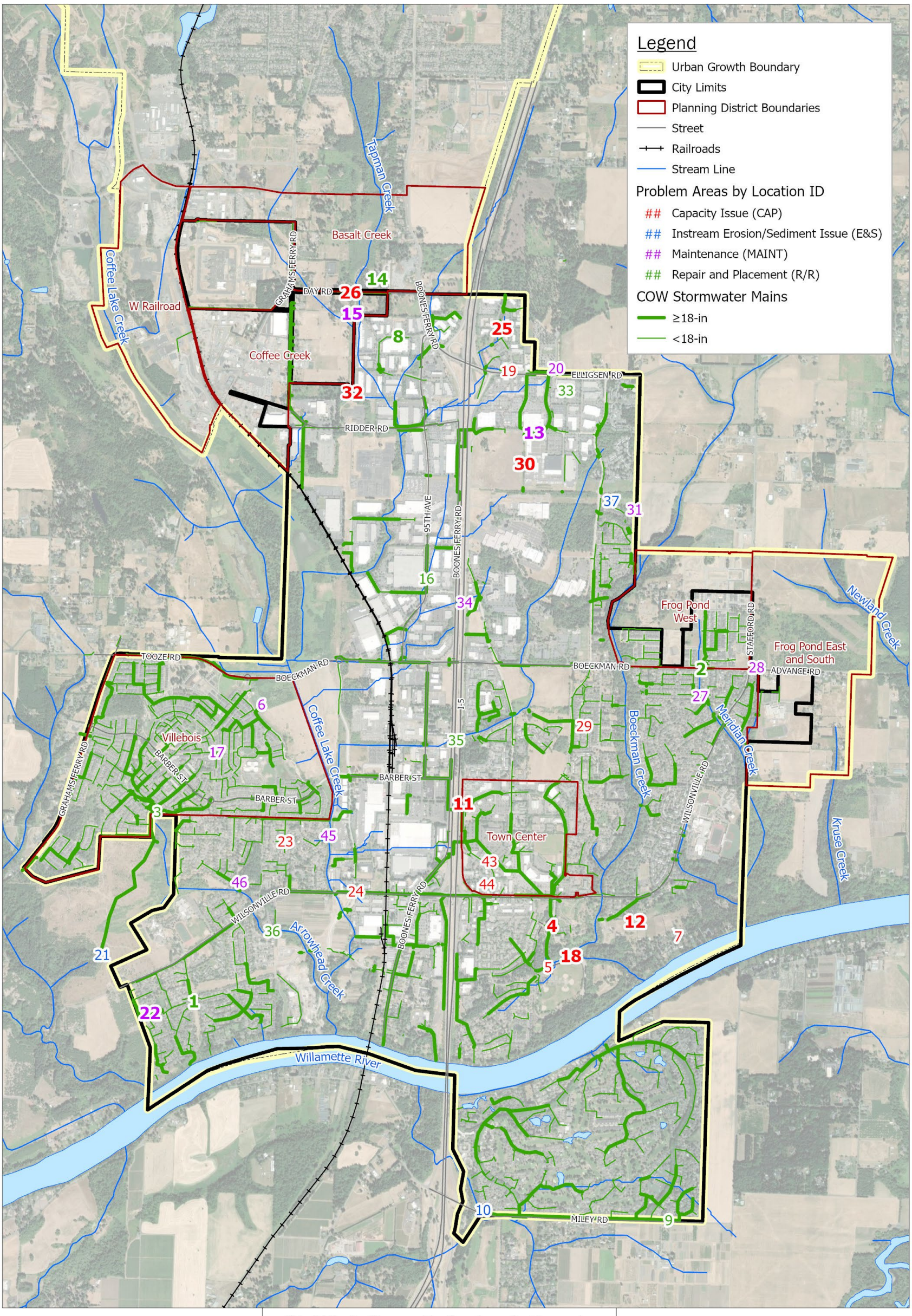

Note: Bold location IDs represent locations where a site visit occurred.

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

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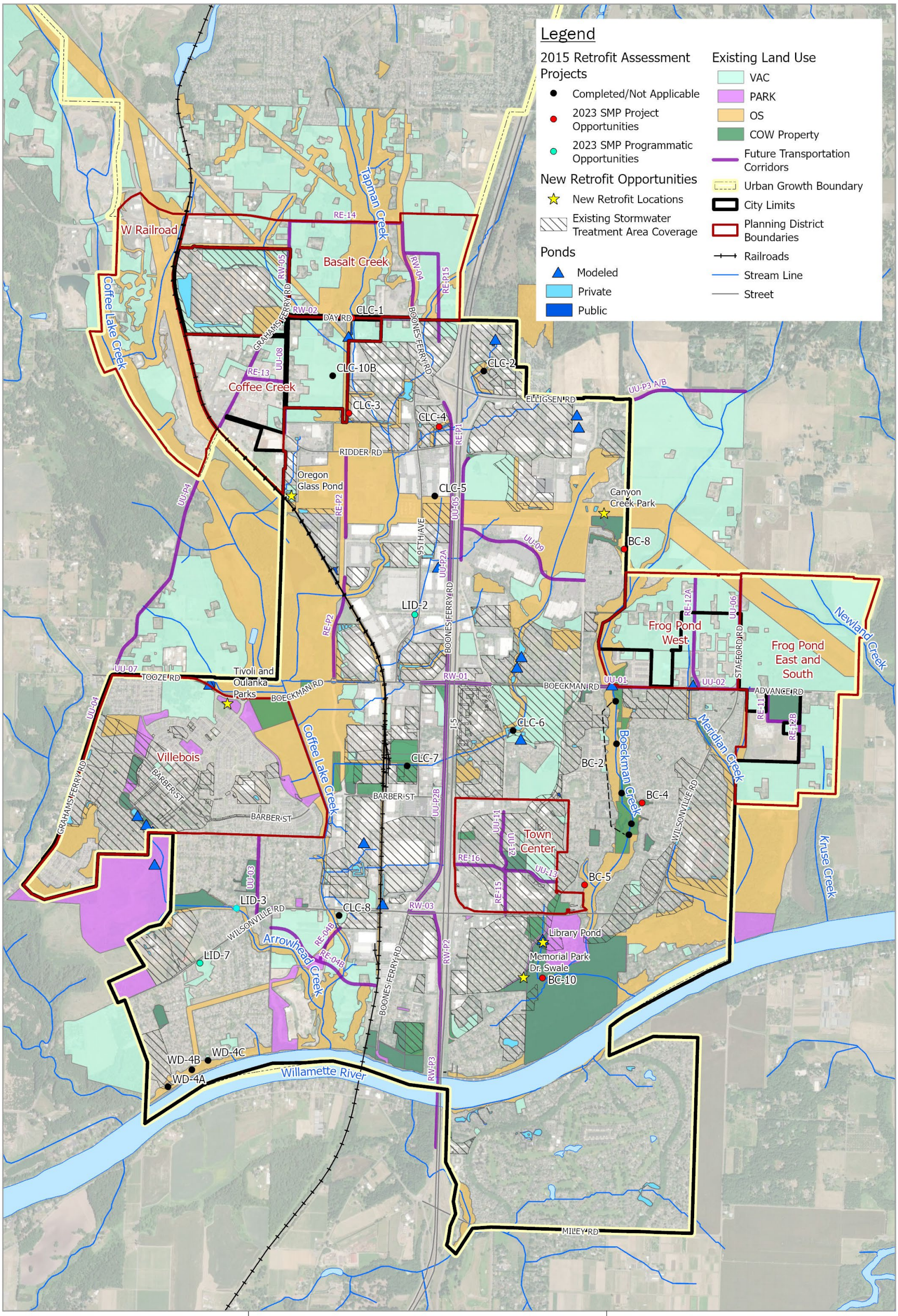
Project # 156157

Stormwater Master Plan

Figure 3-1: Problem Area Location



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Project # 156157

Stormwater Master Plan

Figure 3-2: Water Quality Retrofit Analysis

Section 4

Stream Assessment

Tributary stream channels to the Willamette River are an important element of the overall stormwater collection and conveyance system in the city. Stream channels provide conveyance and storage of water and sediment and provide habitat for aquatic and terrestrial species.

This section outlines results of the stream assessment conducted for this SMP to inform project, program, and policy recommendations. The stream assessment effort helps improve the understanding of hydraulic processes in the selected reaches, as well as identify infrastructure risks associated with changes in stream hydraulics. The stream assessment is described in additional detail in Appendix C. Project Opportunities stemming from the results of the Stream Assessment are detailed below and referenced in the Project Opportunity Matrix (Appendix A, Table A-2).

4.1 Regulatory Background

The City of Wilsonville prepared a 2015 Hydromodification Assessment in accordance with requirements of the City's 2012 NPDES MS4 permit. The 2015 Hydromodification Assessment focused on aspects of hydromodification[6] that are addressed in NPDES MS4 permits, specifically erosion, sedimentation, and alteration of stormwater flow, volume, and duration that may cause or contribute to water quality degradation. Efforts included a GIS desktop assessment, targeted field assessment, and review of existing planning documents and policies to inform the development of strategies and approaches to address hydromodification. Findings from the 2015 Hydromodification Assessment reflect the following:

- Observed stream channels indicate historical hydromodification impacts; minor impacts are observed in locations of concentrated flow or development encroachment.
- Current City programs and policies appear to be effective at addressing hydromodification indicators.
- Current land use and future development patterns show there is a potential for future flow increases; however, the City's current land use policies and updated stormwater design standards are in line with best practices to address hydromodification; and
- The City has identified, and is implementing projects to address hydromodification (per their 2012 SMP).

Recommendations from the 2015 Hydromodification Assessment included the following:

- Implement key capital projects to address instream hydromodification problems including erosion at stormwater outfalls and sites with historic channel modifications.
- Continue to monitor known problem areas.
- Continue to develop and implement master plans for new development areas that address natural resource and channel restoration needs.

[6] The U.S. Environmental Protection Agency (EPA) broadly defines hydromodification as the alternation of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources."

This SMP update includes a focus on instream channel conditions and erosion prevention in conjunction with capital project development. To inform capital project and program needs, as well as directly address the recommendations per the 2015 Hydromodification Assessment, a geomorphic stream assessment was conducted for select reaches of Boeckman, Meridian, Arrowhead, Newland, and Kruse creeks to better understand the stream processes and identify infrastructure at risk due to changes in stream hydraulics.

Channel incision and aggradation can inform locations of active erosion and hydromodification risk

4.2 Objectives and Methods

The stream assessment included stream walks along priority reaches as well as desktop mapping and analysis. The objectives of the stream assessment were to:

- Provide a baseline assessment of existing physical stream conditions.
- Identify existing problem areas, such as locations of channel instability or excessive erosion that may impact private or public infrastructure.
- Assess the potential for changes and impacts to the stream channel.
- Recommend capital, operational, maintenance or other solutions or stream restoration actions that would address the identified risks to infrastructure or improve the resiliency of the stream corridor to impacts associated with hydromodification.

The stream assessment was conducted by Waterways Consulting, Inc. (Waterways) to reflect the continued evaluation of stream channel conditions as recommended by the 2015 Hydromodification Assessment. Information collected as part of this assessment should be referenced and used during future inspection efforts to help assess improvements and degradation.

In accordance with the Problem Area Identification effort (Section 3.1), City staff identified priority and secondary assessment locations in the city based on the observed hydromodification impacts, land accessibility, future development potential (and the ability to establish a baseline condition of the stream), and history of staff or citizen complaints/concerns.

Figure 4-1 identifies specific stream reaches investigated for the Stream Assessment, as well as the secondary assessment locations not investigated as part of this effort that may be considered in the future.

4.2.1 Stream Walks

Stream walks were conducted over four days, in November 2021 and January 2022 in the Meridian, Boeckman, and Arrowhead Creek basins. Additional stream walks were conducted in October 2023 in the Newland Creek and Kruse Creek basins. Stream walk locations are identified generally in Figure 4-1 at the end of this section. Specific reach numbering associated with stream walk locations can be referenced in Appendix C.

Stream walk activities included a review of key geomorphic features, stream and bank conditions, and infrastructure. During the stream walks, photographs were taken to document stream characteristics and conditions. Physical and biological stream conditions were noted and mapped and included:

- General vegetation condition.
- In-stream and hillslope erosion processes (incision, aggradation, and hillslope failures).
- Location of stormwater outfalls, exposed pipes, bridges, culverts, affected roads and trails.
- Wildlife activity (presence of beaver dams).
- Heavily eroded banks, headcuts, and bedrock outcrops.

Photo logs and stream reach summary sheets were developed to identify cross section and physical condition characteristics for each reach at the time of the stream walk (see Appendix A).

4.2.2 Desktop Analysis

The desktop assessment included compilation and analysis of geospatial data, including infrastructure, topographic, and geologic information. Waterways used the 2014 LiDAR data to create "Relative Elevation Models" (REMs) for Boeckman, Meridian, Arrowhead, Newland, Kruse and Tapman[7] creeks. A REM shows the height of the ground surface relative to the adjacent streambed, which is helpful for identifying and interpreting geomorphic surfaces relative to the stream.

Waterways also created and analyzed topographic and geologic cross sections and stream longitudinal profiles to develop a set of field maps identifying streams and stormwater infrastructure identified during the field component.

4.3 Findings and Results

Observations made during the stream walks were used to qualitatively identify current stream channel deficiencies and potential strategies for improvement.

Table 4-1 summarizes the general findings by stream reach. Locations where ongoing vegetation management/invasive removal is needed are identified, as well as locations where future monitoring for impacts is recommended. Locations considered a Project Opportunity (see Appendix A, Table A-2) are also identified, and these locations were discussed with the City for consideration as a capital project (see Section 6). Additional detail on these locations is provided in Appendix C.

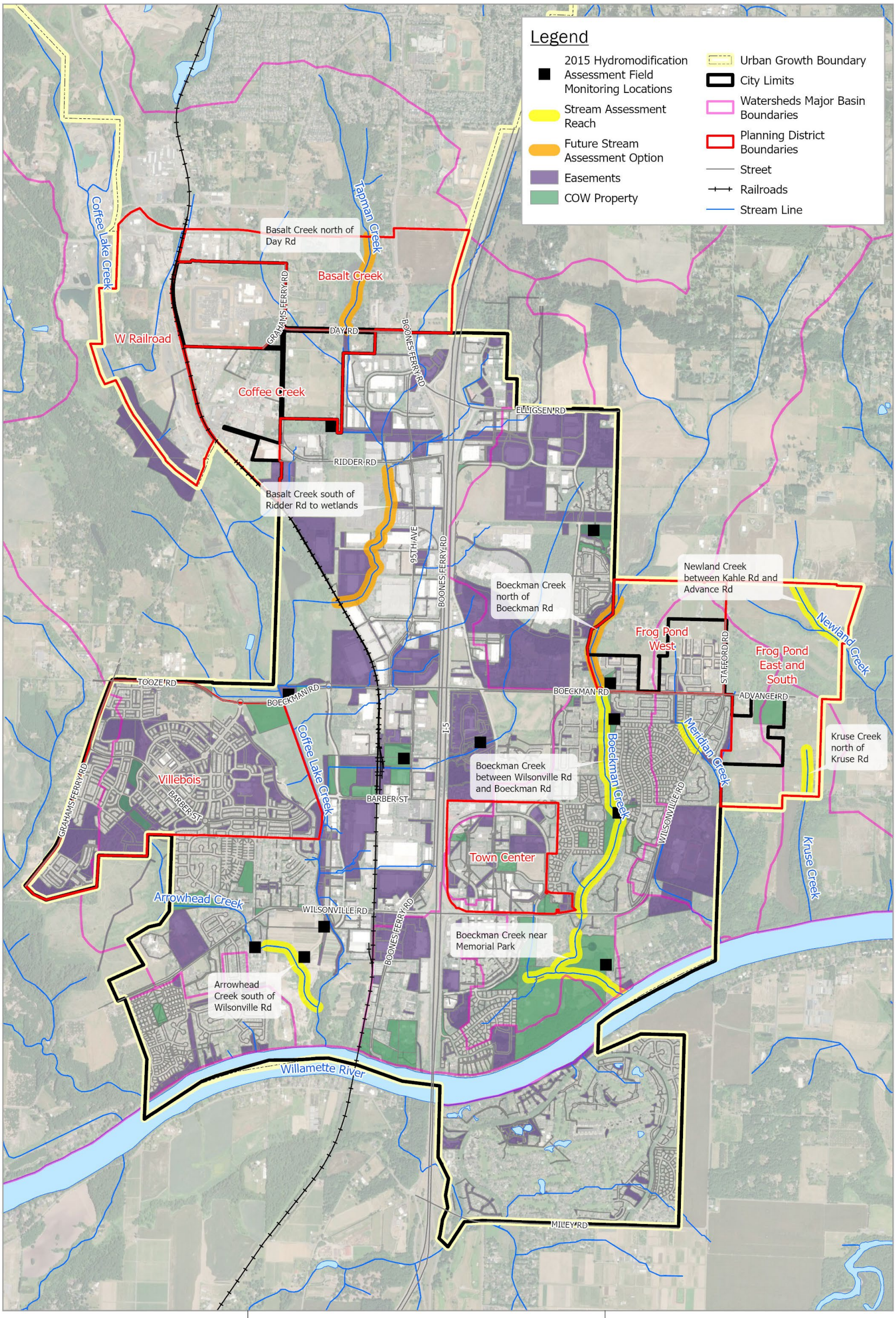
Of note, the downstream portion of Kruse Creek (Reach 4) was unable to be accessed due to bank stability issues. Future annexation and development activity along Kruse Creek should incorporate a geotechnical evaluation and consider setbacks from the top of canyon, given ongoing landslide risk.

[7] Tapman Creek is referred to as Basalt Creek in TM2.

Table 4-1. Summary of Stream Assessment Findings

Stream	Assessment Date(s)	Reach No.[a]	Beaver Dam Presence (Y/N)	Infrastructure at Risk? (Y/N)	Invasive Vegetation Present? (Y/N)	Field Observations	Vegetation Management Need? (Y/N)	Ongoing Monitoring Need? (Y/N)	Project Opportunity? (Y/N)
Boeckman Creek	Nov. 19 and 24, 2021	2-9	Y	N	Y	Stream reaches appear laterally confined and vertically stable.	Y	Y	N
Boeckman Creek	Jan. 25, 2022	1	N	Y	N	Risk of channel incision and lateral erosion due to lack of stable beaver dams and seasonal variability in the backwater conditions on the Willamette River.	N	Y	Y
Meridian Creek	Nov. 26, 2021	1	N	Y	Y	Stable stream reaches due to bedrock base level control and lateral confinement. Obstructed culvert at Wilsonville Road (30") results in backwater conditions.	Y	Y	Y
Meridian Creek	Nov. 26, 2021	2	N	Y	Y	Historic channel incision and head cuts, but active head cuts not readily observed. Obstructed culvert at Willow Creek Drive and downstream stabilization measures in place.	Y	Y	Y
Arrowhead Creek	Jan. 25, 2022	2-3	Y	N	Y	General stream stability due to shallow hardpan and abundant beaver dams. Riparian vegetation management needed to ensure beaver activity.	Y	Y	N
Arrowhead Creek	Jan. 25, 2022	4	Y	Y	Y	Culvert at pedestrian crossing is failing. Upstream portion of culvert not evaluated due to access issues.	Y	Y	Y
Kruse Creek	Oct. 26, 2023	1-2	N	N	Y	Moderately incised channel but appears relatively stable. Riparian corridor in relatively good condition, but non-native (ivy and English holly) was noted in Reach 1.	Y	Y	N
Kruse Creek	Oct. 26, 2023	3-4	Unknown	Unknown	Unknown	Reach 4 was inaccessible due to deep channel incision and unstable banks. High groundwater table and seeps and springs contributing to natural stability issues.	Unknown	Y	N
Newland Creek	Oct. 26, 2023	1-3	N	N	N	Reaches are highly incised and likely to incise further. Culvert at SW Kahle Road is acting as grade control and likely preventing additional headcut. Riparian corridor is in good condition, but narrower in reaches 2 and 3.	N	Y	N
Newland Creek	Oct. 26, 2023	4	Y	N	N	Gradient is flatter with in-channel wood and debris dams. Reach 4 is at risk of bank stability, but only one head cut observed. Riparian corridor is in good condition.	N	Y	N

a. Reach numbering can be referenced in Appendix C.



Brown AND Caldwell

City of Wilsonville
Project # 156157

Stormwater Master Plan

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Figure 4-1: Stream Assessment

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Section 5

Capacity Evaluation

Stormwater conveyance is the primary function of the City's storm drainage infrastructure. This section summarizes the H/H system modeling methods and results to verify and identify conveyance capacity limitations.

H/H modeling conducted for this SMP used the City's existing InfoSWMM model, which was originally developed as part of the 2012 SMP effort. The model includes major hydraulic components of the City's stormwater drainage system including public stormwater pipe (15-inch-diameter and greater) and open channel conveyances defined by a simplified trapezoidal geometry. Capacity deficiencies within the study area were identified and/or problem areas validated using the H/H model.

This section summarizes the updates to the City's 2012 InfoSWMM model for this SMP effort, as well as the H/H modeling approach and results.

H/H modeling assumptions, methods and results are described in additional detail in Technical Memorandum #3 (TM3), included in this SMP as Appendix B. Referenced figures are included at the end of this section.

5.1 Objectives and Approach

The City's existing InfoSWMM model was used to simulate the hydraulic performance of select pipe and open-channel systems and evaluate the capacity limitations of City-owned stormwater infrastructure.

Targeted updates to the City's existing model were conducted where updated development activities, CP installations or identified problem areas were identified and there was a need to quantify system capacity to help develop project solutions.

For this SMP, the following modeling approach was generally used to update the H/H model and evaluate conveyance capacity:

1. Review available data (via GIS, as-builts, etc.) to compare mapped infrastructure (i.e., pipe size, slope, etc.) and existing model profiles. Update the existing hydraulic model accordingly.
2. Compile a list of known and suspected problem areas and identify areas where modeling is needed to inform corrective measures. Expand the hydraulic model extents accordingly.
3. Refine the existing subbasin delineation based on the updated hydraulic model coverage.
4. Develop an updated city-wide hydrologic model to estimate stormwater runoff generated for existing and future development conditions.
5. Validate modeled flooding using historical rainfall records, and anecdotal flooding information (photographs, City records),
6. Verify capacity constraints and identify potential sources or causes of flooding with City staff (preliminary flooding results); and
7. Use the validated hydraulic model to document existing capacity deficiencies for inclusion as Problem Opportunity Areas.
8. Use the validated hydraulic model to develop potential solutions to capacity problems (see Section 6).

5.2 Stormwater Design Standards and Performance Criteria

Design standards and criteria related to the sizing and evaluation of stormwater infrastructure are described in the City of Wilsonville's Public Works Standards (PWS), Section 3 Stormwater & Surface Water Design and Construction Standards, as revised in December 2015.

Additional planning guidelines are described in the City of Wilsonville Code (WC), Chapter 4 Wilsonville Development Code (WDC). The WDC defines assumptions related to the concept planning district designations, overlays and open space designations, and general development regulations that inform land use coverage and hydrologic modeling assumptions for this project.

5.2.1 Planning and Sizing Criteria

Stormwater sizing/design criteria will ultimately be used to both assess the existing stormwater system for deficiencies and guide the design of capital projects in the context of the SMP. Planning and sizing design criteria for select infrastructure components are outlined in Table 5-1. Design storms referenced in the design criteria are outlined in Table 5-2.

Table 5-1. Wilsonville Drainage Standards and Design Criteria

Criteria	Source	Value
Water Quality Facility Design	• PWS 301.4.04.c	• Provide water quality treatment for a design storm of 1 inch in 24 hours. • Design water quality facilities to capture and treat 80% of the average annual runoff volume to the MEP with the goal of 70% TSS removal. • See BMP Sizing Tool.
Water Quantity Facility Design	• PWS 301.4.09.d • PWS 301.4.09.e • PWS 301.4.09.f	• Properties or development draining directly to and within 300 ft of the Willamette River or the Coffee Lake wetlands are exempt from the flow control standards. • Maximum water storage depth for the 100-year storm should not exceed 4 ft deep. • Side slopes should not exceed 4H:1V up to the maximum design water surface elevation; maximum exterior side slopes = 2H:1V. • At least 25% of the pond perimeter should be vegetated with maximum slide slopes of 3H:1V. • See BMP Sizing Tool.
Conveyance Piping Design	• PWS 301.1.10.e • PWS 301.1.13 • PWS 301.8.02 • PWS 301.8.02.c • PWS 301.9.03.b	• Mainline pipes shall be 12 inches in diameter. • Design pipes for conveyance of the 25-year undetained storm (emergency overflow structures should be designed for the 100-year storm). • A minimum of 1 ft of freeboard should be provided between the hydraulic grade line and the top of the structure or finished grade. • Mainline pipes should be reinforced concrete pipe (RCP), ductile iron pipe (CIP), polyvinyl chloride pipe (PVC), or corrugated polyethylene pipe (CPP). Pipe and fittings shall consist of one type of material throughout.
Culvert Design	• PWS 301.1.14 • PWS 301.7.02	• Culverts shall be designed for the 100-year storm. • All culverts shall be designed for fish passage in accordance with ODFW's "Fish Passage Criteria," or latest edition, unless exempt by ODFW or the City. • The headwater elevation must be at least 1 foot lower than road or parking lot subgrade. • New culverts ≤18 inches in diameter: the maximum headwater elevation (measured from the inlet invert) should not exceed 2x the pipe diameter. • New culverts >1 8 inches in diameter: the maximum headwater elevation should not exceed 1.5x the pipe diameter.

Table 5-1. Wilsonville Drainage Standards and Design Criteria

Criteria	Source	Value
Open Channel Design	• PWS 301.1.13.f • PWS 301.6.02	• Open channels shall be designed for the 25-year undetained storm with a minimum of 1 ft of freeboard. • Channel lining material is site specific. • The minimum slope for the flow line is 1% where practicable, but flow shall not be less than 2 fps (unless approved by City).
Pipe Cover	• PWS 301.8.02m Table 3.8 Minimum Pipe Cover	• 36" of cover: Nonreinforced, RCP Class III, Other Pipe Materials • 24" of cover: RCP Class IV • 12" of cover: RCP Class V, AWWA C-900, AWWA C-905, DIP
Structure Spacing	• PWS 301.8.06	• The maximum distance between structures (manholes, area drains, and catch basins-excluding clean outs) is 400 ft.
Outfalls to Open Channel Waterways	• PWS 301.6.04	• Design bank stabilization for the 25-year storm. • Flows from outfall structures should be directed downstream, typically no less than 30 degrees from perpendicular to waterway flow. • Outfalls must be located at higher elevations than the downstream mean low water. • Plantings (willows or other approved plantings) every 2 ft.
Manhole Design	• PWS 301.8.01 • PWS 301.9.01 • PWS 301.4.11	• Manholes are required at least every 400 ft (unless approved by the City). Required placement includes at every grade change, change in pipe size, change in alignment, pipe connection greater than 6 inches, and at the end of the main lines. • Manhole sizing: • 48-inch-diameter manhole for pipe ≤24 inches in diameter • 60-inch-diameter manhole for pipe 27 to 36 inches in diameter and pretreatment manholes • 72-inch-diameter manhole for pipe ≥42 inches in diameter • Maximum of four pipes entering/exiting a manhole. • Minimum free drop of 0.20 ft, maximum free drop of 1.5 ft.
Catch Basins/Curb Inlets	• PWS 301.8.04 • PWS 301.8.05 • PWS 301.8.05.b	• Must be designed for the 10-year storm. • All catch basins must have a sump (unless approved by the City). • Maximum of three catch basins may be connected in a series before connecting to the mainline. • Curb inlets should be constructed with an 18"minimum sump and 6 ft deep from the top of grate to the lowest pipe invert. • Between the inlet and the mainline or mainline structure, the maximum length of pipeline shall be 60 ft for 12" pipe, unless additional length is required to cross the street ROW.

Design storms are precipitation patterns typically used to evaluate the capacity of storm drainage systems and to design capital improvements for the desired level of service. Design storms evaluated in this SMP include the 2-, 10-, 25-, and 100-year recurrence interval 24-hour events as well as water quality events. Design storms are listed in the City's PWS and listed in Table 5-2. The rainfall distribution for these design storms is based on a Unified Soil Classification System (USCS) Type IA distribution.

Table 5-2. Design Storm Depths	
Design storm event	Rainfall depth, inches
2-yr, 24-hr	2.50
10-yr, 24-hr	3.45
25-yr, 24-hr	3.90
100-yr, 24-hr	4.50
Water Quality Event , 24-hr	1.00

5.2.2 BMP Sizing Tool

The cities of Wilsonville and Oregon City, together with Clackamas Water Environment Services (WES) developed a custom tool, referred to as the BMP Sizing Tool, to help size stormwater treatment and flow control facilities in consideration of instream hydromodification impacts. The BMP Sizing Tool (updated 2017) is intended to be used in conjunction with the City's PWS to automate some of the required calculations to support sizing and design for a specific set of stormwater management facility types based on long-term rainfall records, soils, and land use cover data. The BMP sizing tool can be used to calculate facility sizes for the following BMP types:

- Rain Garden-Filtration and Infiltration
- Stormwater Planter-Filtration and Infiltration
- Vegetated Swale-Filtration and Infiltration
- Infiltrator
- Detention Pond

The BMP Sizing Tools offers two design options: (1) treatment and flow control, or (2) treatment only. The BMP types that are available for each design option depend on the native soil infiltration rate at the location of the BMP facility. The BMP Sizing Tool was developed and calibrated based on local conditions (rainfall, soil characteristics, etc.) for Clackamas County, Oregon. The distinction between infiltration and filtration-based facilities is based on the facility soil subgroup. Infiltration rates greater than 0.5 in/hr are considered acceptable for use with infiltration facilities and can be used to meet treatment and flow control standards directly. Infiltration rates less than 0.5 in/hr require use of filtration facilities that include piped underdrain systems and orifice controls to meet flow control requirements.

Use of the BMP Sizing Tool represents a shift away from traditional stormwater detention design practices to match pre- and post- development peak flows for standard (i.e., 24-hour) synthetic design storms. Instead, the tool sizes facilities to match the duration of post development peak flows to pre-development levels for the range of flows anticipated to be the most erosive. The BMP Sizing tool was used to size several CPs in this SMP as well as to evaluate policy recommendations associated with use of the Library Pond to support treatment and flow control requirements associated with the Town Center redevelopment. Additional information related to the Library Pond evaluation is discussed in Section 6.3.4 and Appendix F.

5.3 Model Evaluation Criteria

Stormwater infrastructure was evaluated using the H/H model for capacity per the design criteria defined in Table 5-1. Key hydraulic design requirements for modeled elements are listed below:

- **Pipes and Open channels:** Sized to convey and contain the peak runoff from the 25-year design storm while also maintaining a minimum of 1 foot of freeboard between the hydraulic grade line (HGL) and the top of structure or ground surface.
- **Culverts:** Designed to safely pass the 100-year design storm flow and provide a minimum of 1 foot of freeboard between the HGL and the ground surface.

Specific to the identification and evaluation of conveyance capacity issues with existing City infrastructure, the model evaluation identified capacity deficiencies up to the 25-year design storm event. Capacity deficiencies were defined based on predicted flooding where the hydraulic grade line (HGL) exceeds the ground surface elevation. This approach allowed for deficiencies to be quickly identified throughout the system at a city-wide level.

For capacity deficient locations where a CP was recommended and developed (see Section 6), the goal was to adhere to the PWS and accommodate the minimum of 1 foot of freeboard between the HGL and the ground surface.

5.4 Model Refinement

Wilsonville developed a city-wide H/H model using the Innovyze InfoSWMM model platform for the 2012 SMP. Localized model updates were incorporated in 2019.

For this SMP, updates to the model datum, hydrologic input parameters, hydraulic model extents and select hydraulic infrastructure were completed. Additional detail related to datum corrections and hydrologic model refinements are included in TM1, which are independent from this SMP. Specific locations of hydraulic model refinement, as well as more detailed explanation of the model validation effort are outlined in Appendix B.

5.4.1 Datum Conversion

As part of the GIS data review process, initiated in 2021, BC reviewed rim and invert elevation data stored in the City's GIS with LiDAR data to identify consistency regarding the vertical datum. Results of this GIS-based spatial analysis indicated inconsistency between recorded datums within the City's GIS dataset, which prompted a similar comparison effort on the City's 2012 InfoSWMM model.

Based on the model comparison results, the original (2012) hydraulic model appeared to rely on inconsistent vertical datums for select model elements. Through discussions with the City, this inconsistency was due to the City switching standards from the National Geodetic Vertical Datum of 1929 (NGVD29) to the North American Vertical Datum of 1988 (NAVD88) sometime between 2006 and 2008.

To rectify this discrepancy, BC reviewed and adjusted hydraulic model elevations to be consistent with the City's current standard of NAVD88. Successful conversion of the existing model to NAVD88 was completed in June 2021.

5.4.2 Hydrologic Model Refinement

Hydrologic model refinements included updated subbasin delineations, existing and future land use coverage, and land-use based impervious percentages. With the adjusted subbasin delineation, updated area-weighted average values for infiltration parameters and impervious areas were assigned for each subbasin. In addition, updated subbasin areas, slopes and widths were calculated.

The City's 2012 SMP reflected an initial subbasin delineation within each major basin for purposes of characterizing hydrology. BC reviewed this existing watershed and subbasin delineation and made updates based on:

- Topographic Light Detection and Ranging (LiDAR) and contour data (2019)
- Stormwater infrastructure geographic information system (GIS) data (2021)
- Aerial Imagery (2021)

Where necessary, major basin boundaries were adjusted to accurately reflect that the entire drainage area was captured. However, most adjustments occurred on the subbasin level and typically involved the refinement of existing subbasin boundaries to better reflect newly developed areas or the subdivision of subbasins to depict drainage patterns more accurately.

A summary of the updated subbasin delineation by major basin is presented in Table 5-3. Please note Newland Creek (and its associated drainage area) is outside the designated study area for the H/H model and not included in Table 5-3.

Table 5-3. Subbasin Summary

Major Basin	Subbasins			Contributing Drainage Area (acres)
	Number	Average Area (acres)	Median Area (acres)	
Boeckman Creek	46	42.2	14.5	1,941
Charbonneau	20	23.9	16.8	478
Coffee Creek/Tapman Creek	77	67.4	28.5	5,192
Mill Creek	3	47.0	49.0	141
Meridian Creek	7	67.2	40.8	470
Willamette River (direct)	25	20.2	14.6	505
Total	**178**	**49.0**	**23.9**	**8,728**

As introduced in Section 2.3, City staff developed an updated existing and future (full build-out) land use coverage using City zoning and comprehensive plan designations plus specific overlays where development is restricted (e.g., Significant Resource Overlay Zone (SROZ), METRO vacant/developable lands, City maintained vacant lands, Bonneville Power Administration (BPA) easements, significant wetlands, public parks/natural areas etc.). Impervious coverage by land use designation was based on digitization of impervious area (from aerial imagery) for representative tax lots within each existing land use category and calculated by the City as an area-weighted impervious percentage.

Land use categories reflecting reclassification due to HB 2001, as well as calculated impervious percentages are provided in Table 2-3.

5.4.3 Hydraulic Model Refinement and Model Validation

Updates to the City's 2012 InfoSWMM hydraulic model were completed from May 2021 to May 2022. Hydraulic model updates included areas of model expansion, primarily in new growth areas since the 2012 SMP was completed or identified problem areas, and updates to reflect revised pipe sizing/alignment in conjunction with completed capital projects.

The updated H/H model went through a validation process from May to August 2022 with the objective to increase confidence in the updated model's accuracy and results. The model validation effort included the following key components:

- Citywide integration of the model calibration adjustments recommended as part of the Boeckman Road Hydraulic Evaluation (January 2022).
- Simulation of a validation storm event from January 2022 and comparison of model results with photographs and field measurements collected near Ridder Rd.
- Discussion of preliminary model flooding results with City staff to confirm validity of modeled flooding locations and the need for additional refinement of hydraulic model elements using newly provided as-built data.

Discussion of preliminary model flooding results with City staff focused on newly identified 25-year flooding locations where the 2012 SMP did not define a CP to address flooding under existing land use conditions. In general, City staff agreed with the preliminary flooding results presented by the model. However, based on results of the validation exercise, additional hydraulic model updates were warranted in select locations based on updated information provided by the City.

These locations included:

- Charbonneau SW French Prairie Rd. Outfall. Model revised based on as-built information to incorporate the outfall pipe lining completed as part of the emergency repair project in 2019.
- Library Pond. Model revised to more accurately represent the pond's storage capacity based on a review of LiDAR and as-built information. The outlet pipe configuration was also modified to better reflect the ditch inlet and 18-inch outlet pipe per the as-built information.
- Penske Truck Rental Property. Model revised to reflect updated culvert information underneath the parking lot based on as-built drawings.
- Wilsonville Distribution Center Pond. Model revised to reflect the pond outlet structure based on as-built drawings.

Figure 5-1, at the end of this section, summarizes the hydraulic modeling extents as well as locations where the hydraulic model was expanded or updated, including updates based on model validation efforts.

5.5 Model Results and Project Opportunity Area Identification

Upon completion of the model validation effort, detailed H/H model results were simulated for the 2-yr, 10-yr, 25-yr, and 100-yr design storm.

H/H model inputs and results are summarized for the hydrologic and hydraulic models in Appendix B, Attachment B, Tables B-2 and B-3, respectively.

5.5.1 Hydrologic Model Results

The hydrologic model results for all design storms show that future land use conditions (and associated increased imperviousness) result in increased peak flows compared to existing land use conditions. The increase in peak flows is most significant during the 2-year storm and gradually becomes less pronounced with larger storm events.

In general, most locations within the city limits are nearly fully developed; therefore, the increase in peak flow from these areas is expected to be relatively small. This is most evident in urbanized locations such as Charbonneau, Villebois, and along the I-5 corridor. The largest anticipated increases in peak flow are primarily in the subbasins located outside of city limits, specifically within the upper reaches of the Coffee Lake Creek and Boeckman Creek watersheds. These locations are

primarily undeveloped, but new development is pending and will increase the amount of impervious surface (runoff flow).

Although flow attenuation with new development is anticipated through implementation of the City's stormwater design standards, for purposes of this SMP, CP sizing is based on unmitigated flows. In addition, policy recommendations may be considered to ensure that for capacity limited infrastructure, additional efforts are made to retain and mitigate stormwater flows onsite.

5.5.2 Hydraulic Model Results and Project Opportunity Areas

Hydraulic model results identify locations with the potential for flooding and the need to develop CPs to increase conveyance capacity. As described in Section 5.2, flooding within the model is defined as locations where the hydraulic grade line exceeded the structure's rim elevation. Flooding is a direct output from the model that can be used to efficiently identify capacity issues throughout the hydraulic system. Since the City's conveyance standard is the 25-yr design storm, this storm event was used as the benchmark to identify potential issues.

To assist in prioritizing locations by flooding severity, the 2-yr and 10-yr design storms were also simulated to identify the minimum flooding frequency. Table 5-4 and Figure 5-2, at the end of this Section, summarize the 18 locations that are anticipated to experience flooding under the existing conditions. Generally, all modeled flooding locations are designated as Project Opportunity Areas unless indicated otherwise, and the "priority need" column in Table 5-4 indicates whether a flooding location is confirmed by City staff as necessitating a CP or program to address.

Table 5-4. Modeled Capacity Deficiencies

Flooding Location ID (Figure 5-2)	Basin	Location Description	Minimum Flooding Frequency	Flooding Predicted in 2012 SMP? (Y/N)	Project Opportunity Area (Y/N)	Priority Need
1	Charbonneau	Miley Road	10-yr	Y	Y	Y
2	Charbonneau	French Prairie Rd and Old Farm Rd	2-yr	Y	Y	Y
3	Willamette	Parkway Ave/Metolius Ln	10-yr	Y	Y	N
4	Willamette	SW Miami	25-yr	N	Y	N
5	Boeckman	Memorial Dr	2-yr	Y	Y	Y
6	Boeckman	Canyon Creek Rd	10-yr	Y	Y	N
7	Boeckman	Sysco Ditch	10-yr	N	Y	N
8 [a]	Boeckman	Elligsen Rd	10-yr	Y	N	N
9	Coffee	Shrine Center Pond	2-yr	Y	Y	Y
10	Coffee	Commerce Circle Ditch	2-yr	Y	Y	Y
11	Coffee	Garden Acres	2-yr	N (not modeled)	Y	Y
12 [b]	Coffee	Coffee Creek Wetlands	2-yr	Y	N	N
13	Coffee	Boberg Rd and RR crossing	10-yr	N	Y	N
14	Coffee	I-5 Culverts	25-yr	N	Y	N
15	Coffee	Barber Street	25-yr	Y	Y	N
16	Willamette	River Fox Park	2-yr	N	Y	Y
17	Willamette	Lower Boones Ferry	2-yr	Y	Y	N
18 [c]	Coffee Lake	Boeckman Corp. Center Pond	10-yr	Y	N	N

a. *Flooding likely due to modeled routing (large subbasin at the upstream end of model). City indicated no Project Opportunity Area designation needed.*

b. *Generalized modeled cross sections are underrepresenting the actual storage. City indicated no Project Opportunity Area designation needed.*

c. *Model configuration questions exist in regard to an existing flow control structure in this area. City staff report no flooding and so this area was not included as a Project Opportunity at this time.*

Three locations were identified as key flooding locations based on discussions with the City. These locations are considered high priority for purposes of CP development and required alternatives analysis to ensure that City objectives and preferences will be achieved. These locations are discussed further in Section 6.3 and include:

- Flooding Location ID 2: Charbonneau (French Prairie and Old Farm Road)
- Flooding Location ID 10: Commerce Circle Ditch (Day Road)
- Flooding Location ID 11: Garden Acres

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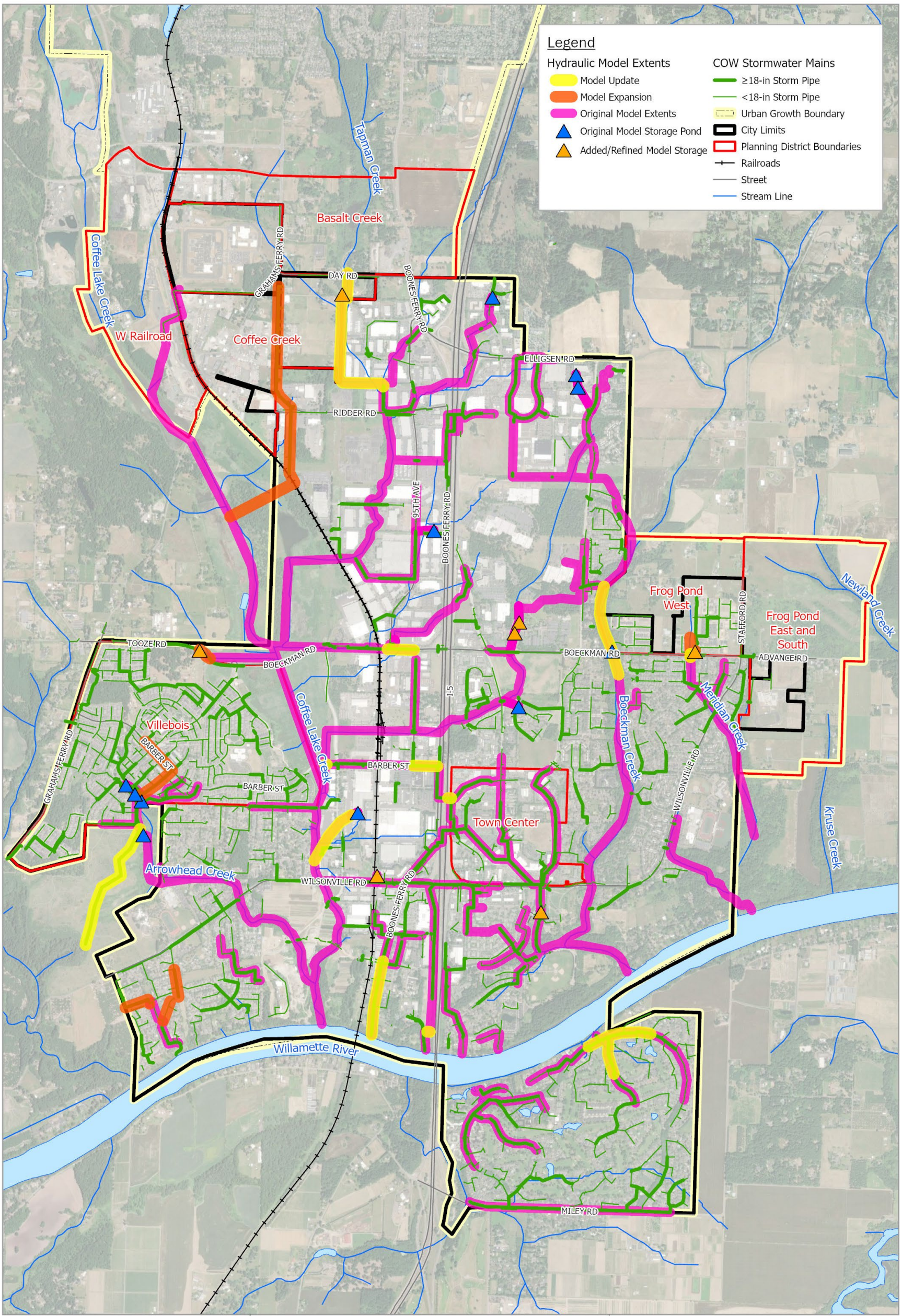

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Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

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Figure 5-1: Hydraulic Model Overview

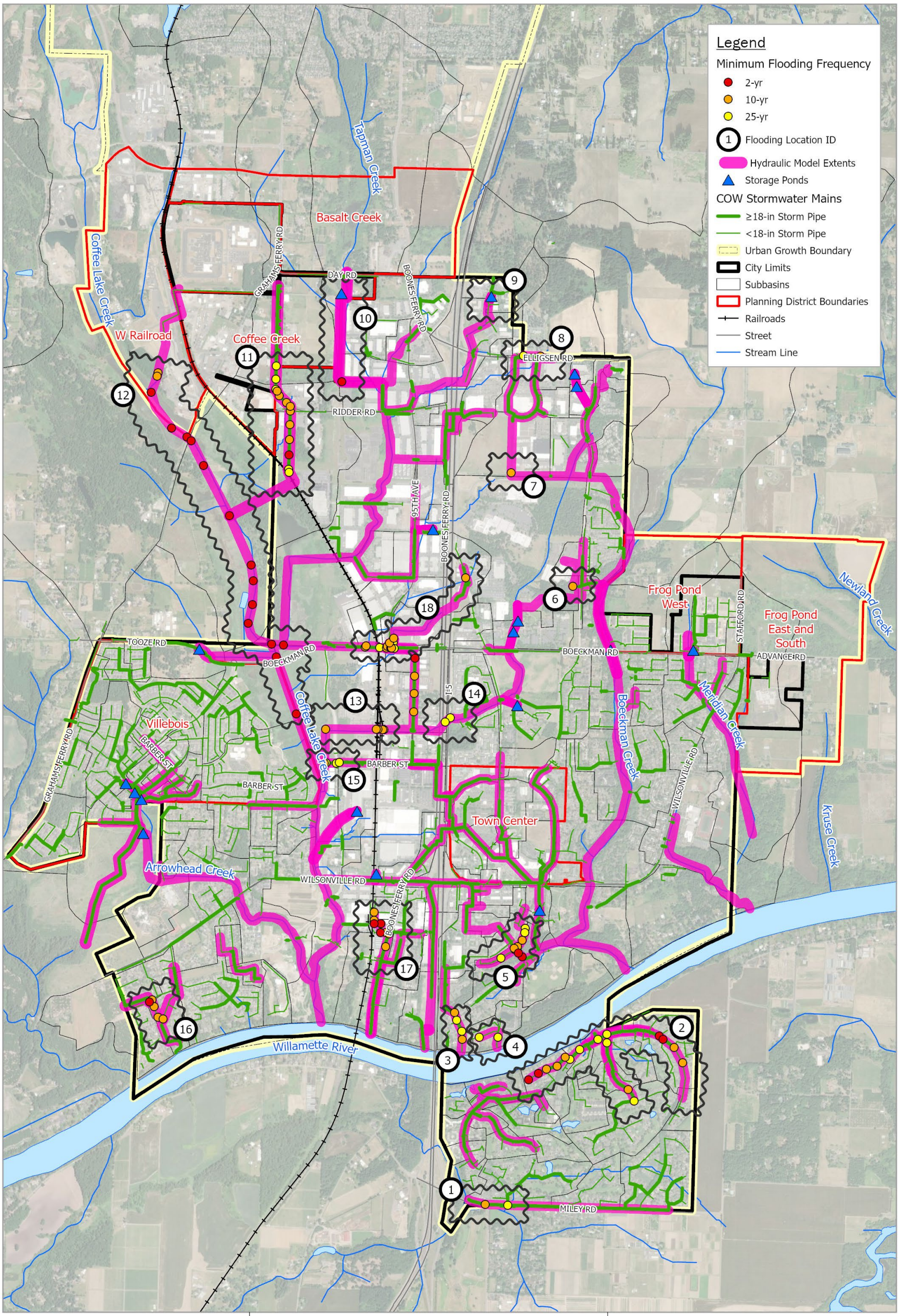

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Figure 5-2: Capacity Deficiencies (Existing Land Use)

Section 6

Capital Program Development

Project planning and technical analyses as outlined in Sections 3, 4, and 5 of this SMP resulted in the identification of 47 Project Opportunities, which represent locations with a potential need for a Capital Project (CP) or program as part of the overall stormwater Capital Improvement Program (CIP).

Input from City staff helped focus the projects and programs selected for inclusion in the CIP on addressing the most immediate needs. Project Opportunities not developed into recommended CPs are documented in this SMP as future project needs, although full project descriptions and costs are not developed as part of this SMP.

This section describes the process to develop CPs from Project Opportunities. A detailed list of Project Opportunities is provided in Appendix A, Table A-2. Resulting fact sheets for identified CPs are provided in Appendix D and detailed cost estimates for identified CPs are provided in Appendix E.

6.1 Capital Project Needs Identification

Project Opportunities stemming from the Problem Area identification effort (Section 3.1); Water Quality Retrofit Assessment (Section 3.3); Stream Assessment (Section 4) and Model Evaluation (Section 5) were compiled into a matrix to facilitate discussion amongst Public Works and Community Development/Engineering staff. Areas with overlapping project needs were consolidated into a single Project Opportunity area to facilitate development of multi-objective project concepts.

6.1.1 Project Opportunity Matrix

The Project Opportunity matrix (Appendix A, Table A-2) details the source of the Project Opportunity; the relative deficiency or objective the project would address; and how the system evaluation activities support the project need. If applicable, the Problem Area Location (Appendix A, Table A-1) is also identified. Figure 6-1, at the end of this section, identifies all Project Opportunity Locations by primary deficiency category.

6.1.2 Capital Project Workshops

Two capital project planning workshops were held in the spring of 2023 with members of Public Works and Community Development/Engineering to discuss which Project Opportunities should be prioritized for project development. Staff considered the feasibility of construction during a 20-year Capital Improvement Plan (CIP) implementation period in the selection of locations warranting a capital project, as well as recurring maintenance activities, known/reported capacity deficiencies, and pending development drivers. These identified priority locations (i.e., Project Opportunities identified as “costed capital project needs” per Table A-2) include a conceptual project design and cost estimate that will ultimately factor into future financial evaluations and rate studies.

In some cases, an immediate project need was not identified, and instead a program to address activities at a city-wide scale was the preferred approach. These programmatic needs are identified with an annual funding mechanism (see Section 6.5). In other cases, the Opportunity Area does not warrant a more immediate project, but a project may become more necessary in the future. Those areas are identified as “unfunded capital project need” per Table A-2. These Project Opportunities

are typically associated with a modeled capacity deficiency that was not confirmed or substantiated by city staff.

Of the Project Opportunity Areas, 22 locations resulted in a capital project conceptually designed and costed in this SMP. Notes from the respective workshops are detailed in Table A-2.

6.2 Capital Project Sizing and Design Assumptions

CP sizing generally follow the City's PWS and design criteria summarized in Table 5-1 as detailed below.

- **Capacity Projects**. Projects to replace stormwater infrastructure, including pipes and culverts, are sized in accordance with the City's PWS unless noted. Pipelines are sized for the 25-year, 24-hour design event under future land use conditions and culverts for the 100-year, 24-hour design event under future land use conditions. Where possible, replaced infrastructure was sized to adhere to the minimum one-foot freeboard between the HGL and top of structure.
- **Water Quality Facility**. For purposes of conceptual sizing and cost estimation, the BMP Sizing Tool was used to size treatment or treatment and flow control facilities in accordance with the specified facility type.
- **New Infrastructure**. Several capital projects require new infrastructure in locations where no storm system currently exists. In the case of the Frog Pond East and South Planning Area, infrastructure sizing per the concept plan was maintained for CP development and costing. For other areas, new infrastructure was sized in accordance with the City's PWS. New infrastructure alignments are in the public right-of-way (ROW). However, it should be noted that final design may require additional structures, alternate alignments, or deeper/shallower infrastructure than assumed for this conceptual project design to address utility conflicts and other constraints not identified as part of this SMP. Survey will be required to verify elevations and locations.

For certain CPs, the project description and costs are developed with a phased approach, splitting the overall project into multiple phases that may be funded and constructed on different timelines. This approach was applied to specific, higher-cost projects for this SMP. These selected projects are generally associated with the same Project Opportunity area but have separate, independent components. In some cases, additional flow monitoring and model calibration may influence the scope or size of the proposed improvements and as such, portions of the project may be delayed, warranting scheduling as a different phase.

For phased projects, Phase 1 project elements should be constructed first, and Phase 2 project elements may be conducted later or following additional evaluation efforts.

6.3 Project Alternative Analysis

In developing CP concepts, a more in-depth evaluation of alternatives was warranted for select locations. These locations include Day Road, Charbonneau, and Garden Acres Road. These areas have complicated drainage patterns and reflect Project Opportunities where a single project solution may not resolve all deficiencies.

A description of the alternatives analysis and H/H model development is provided below for these locations, identified by their Project Opportunity ID. Additional background and description of the preferred design concept is provided in the respective fact sheets (Appendix D).

6.3.1 Day Road/Commerce Circle (Project Opportunity ID#9)

Tapman Creek, between Day Road and Ridder Road, is conveyed through a series of culverts and open channels before it enters a piped section just north of Ridder Road. The open channels include reaches of negative slope and limited capacity and storage potential. Flooding has been observed at adjacent industrial properties, and the catchment area upstream includes the Basalt Creek Planning Area (see Section 3.5.1). Pending, and future, development from the Coffee Creek Industrial Area and Basalt Creek Planning Area may increase the frequency and severity of flooding.

In 2019, AKS prepared a facility siting alternatives report, which included design concepts expected to alleviate flooding during the existing land use condition. The report did not include analysis of alternatives' performance under future land use conditions.

For this SMP, the preferred AKS concept as well as other system configurations were analyzed for both existing and future development conditions using the updated H/H model. Model results validated the AKS report's conclusion that the preferred concept would alleviate flooding under existing land use conditions, but flooding under future land use conditions is still predicted.

Therefore, to augment the preferred AKS alternative, additional system configuration alternatives were evaluated, including use of a surface detention facility, pipe/culvert upsizing at Day Road, and piped conveyance system upsizing north of Ridder Road. The 25-year storm was used to evaluate flooding, and water surface elevations (WSE) predicted during the 100-year storm were also compared to the elevation of adjacent structures. Results of the additional alternatives evaluation are shown in Table 6-1.

Table 6-1. Day Road Evaluation Summary

Alternative	25-Year Flooding Result		100-Year Flooding Result	
	Existing Land Use	Future Land Use (unmitigated)	Existing Land Use	Future Land Use (unmitigated)
Existing Conveyance	Flooding at multiple points in system	Extensive system flooding	WSE at or above structures at multiple locations	WSE at or above structures at multiple locations
AKS Preferred Concept (AKS)	None	Extensive system flooding	Approx. 2 ft freeboard to structures	WSE at or above structures
AKS + Detention Pond	None	Flooding at multiple points in system	Not analyzed[a]	WSE at or above structures
AKS + Upsizing pipes upstream of Ridder Rd	None	Flooding at multiple points in system	Not analyzed[a]	Approx. 1 ft freeboard to structures
AKS + Detention Pond + Upsizing pipes upstream of Ridder Rd	None	Minimal flooding	Not analyzed[a]	Approx. 1 ft freeboard to structures

a. Alternative not analyzed because it was assumed to have good or better performance than the AKS Preferred Concept.

Evaluation of alternatives considered the relative costs and benefits associated with the alternatives. For example, the addition of a detention pond involves significant costs and logistical challenges, while model results still predict flooding, albeit reduced, for this alternative. Ultimately, the City selected the alternative that included both the preferred AKS concept and upsizing of pipes upstream of Ridder Road. See Appendix F, CP CLC-1, Phases 1 and 2.

In accordance with the City's PWS, the City requires new and redevelopment to implement flow control standards that match pre-development site hydrology. Application of the City's design standards are anticipated to mitigate some of the increased flow associated with future land use.

However, the larger drainage area to this conveyance system includes area outside of city limits, creating further uncertainty about flow mitigation. In conjunction with this CP, a policy defining and directing the implementation of design standards in the Coffee Creek Industrial Area (as well as other new development areas currently outside of the UGB but draining towards capacity-limited infrastructure and stream corridors) is recommended. In addition, a capital planning project is proposed to conduct flow monitoring to inform additional H/H model calibration with hopes of refining/confirming system upsizing needs affiliated with Phase 2.

6.3.2 Charbonneau East (Project Opportunity ID#30)

The Charbonneau East Project Opportunity reflects the continuation of identified pipe replacement and system upsizing along SW French Prairie Rd and SW Old Farm Road. The 2012 SMP identified both capacity and condition limitations throughout the Charbonneau basin. The 2014 Charbonneau Consolidated Improvement Plan categorizes the stormwater infrastructure in this neighborhood as Storm Priority 1 and 2, and efforts to replace deficient infrastructure are ongoing (Figure 6-2). Specific to the SW French Prairie Rd and SW Old Farm Road systems, some pipe upsizing and replacement has already occurred in the downstream portions of the system.

Figure 6-2: Charbonneau Consolidated Improvement Plan (2014), Charbonneau East

In accordance with this SMP, H/H modeling confirmed continued flooding along the extents of SW French Prairie Rd and SW Old Farm Road due, in part, to an undersized outfall pipe discharging to the Willamette River. Reported condition deficiencies also exist.

Various alternatives were evaluated to reduce the extent and coverage of flooding predicted under existing (25-year) and future development scenarios, while considering the portions of the piped collection system that have already been replaced. Due to space limitations, above ground detention was ruled out as a method of flow control to minimize the need for widespread pipe upsizing. Alternatives evaluated included inline detention along SW French Prairie Rd and/or SW Old Farm Rd,

both at the upstream end and downstream end, as well as the upsizing and replacement of the outfall.

Alternatives were presented to the City in a workshop, and ultimately inline detention alternatives were not selected due to existing sanitary utility conflicts, space (limited ROW) constraints, maintenance concerns, as well as cost implications of replacing recently constructed infrastructure. The selected alternative includes a phased approach reflecting upsizing of the outfall to the Willamette River under Phase 1, and selective upsizing/replacing the remaining condition-limited pipes along SW French Prairie Rd and SW Old Farm Rd under Phase 2. See Appendix F, CP WR-4, Phases 1 and 2.

Like with the Day Road CP, a capital planning project is proposed to conduct flow monitoring to inform additional H/H model calibration with hopes of refining/confirming system upsizing needs affiliated with Phase 2.

6.3.3 Garden Acres (Project Opportunity ID#32)

The stormwater collection system along Peters Road is undersized with several pipe constrictions and a downstream pipe constriction at the P&W railroad crossing on the south end of Peters Road. The larger catchment area upstream includes portions of the Coffee Creek Industrial Area and West Railroad Planning Area. Pending development may increase the frequency and severity of flooding.

Options to upsize the collection system at the railroad crossing are limited due to required coordination with the railroad and METRO. Stormwater is currently diverted towards a public stormwater pond on the 10450 SW Riddler Road parcel west of Peters Road to reduce flow through undersized storm piping (Figure 6-3). The existing pond does not have an outlet control structure and based on aerial imagery and site visits, appears to overflow to an existing stormwater ditch west of the pond along the railroad ROW.

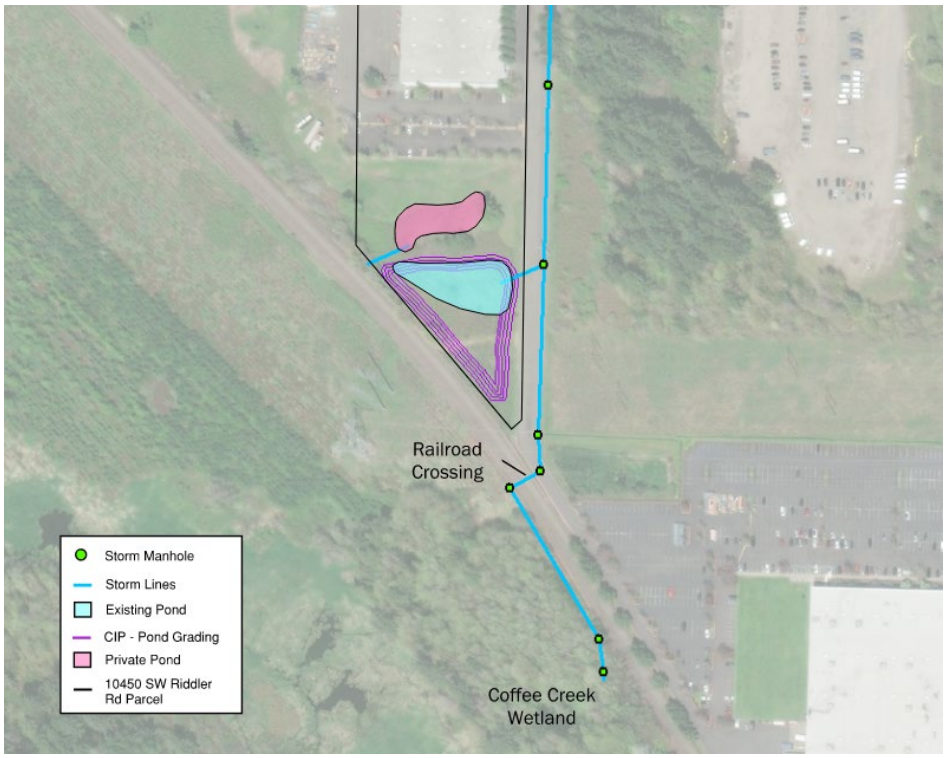

Figure 6-3: Garden Acres Pond (within Coffee Lake Wetlands)

Several alternatives were evaluated to retrofit the existing public pond to provide additional treatment and storage (detention) of stormwater during high flow events. In addition, reconfiguration of the pond to establish a discharge route from the pond to the stormwater collection system in Peters Road would also reduce the amount of overflow to the railroad ROW. Design alternatives include expansion of the public pond footprint and available storage capacity, including one scenario to utilize additional storage capacity in a private detention pond (currently serving private development).

H/H model scenarios to optimize the storage capacity needed and relieve reported flooding in Peters Road during the 25-year storm event were developed and presented to City staff in a workshop setting. The City opted to increase the existing pond storage capacity to 39,000 cubic feet, fully utilizing the existing parcel while maintaining separation from the private pond located to the north. See Appendix F, CP CLC-3.

In accordance with the City's PWS, the City requires new and redevelopment to implement flow control standards that match pre-development site hydrology. As with the Day Road CP, application of the City's design standards is anticipated to mitigate and offset some of the increased flow associated with future land use. The Garden Acres system reflects another area of the City where adherence to current stormwater design standards requiring retention/mitigation of flows to pre-development conditions is needed, as the CP does not completely alleviate all modeled flooding in the system.

6.3.4 Library Pond Analysis (Project Opportunity ID#4)

The Library Detention Pond (Library Pond), located in Memorial Park, was originally constructed in the 1980s and receives drainage from approximately 180 acres of commercial property in the southeastern portion of Wilsonville, predominately associated with the Town Center Planning Area. Although operating as a regional detention facility, the current pond configuration has structural and sizing limitations preventing it from adhering to the City's current PWS as a water quality and flow control facility.

The city anticipates using the Library Pond as a regional stormwater facility to mitigate stormwater treatment and flow control requirements associated with redevelopment of the Town Center Planning Area. Therefore, as part of this SMP, a sizing evaluation was conducted to confirm capital project needs (specific to retrofit of the pond to meet current operations), as well as policy recommendations applicable to the Town Center Planning Area to allow the Library Pond to offset onsite stormwater treatment and flow control needs associated with redevelopment.

The BMP Sizing Tool was used to evaluate sizing of the Library Pond in conjunction with 1) varying pre-development conditions (to facilitate adherence to the City's flow control standard), 2) varying coverage of onsite stormwater management facilities applied to

Dense, overgrown vegetation and accumulated sediment, combined with a lack of an outlet control structure, limits Library Pond's capacity and water quality function.

redevelopment areas, and 3) varying site and depth constraints associated with retrofit of the Library Pond (while maintaining the same pond footprint). Detailed findings and results of the sizing evaluation are contained in Appendix F.

Results of the evaluation conclude that there are limited redevelopment options to retrofit the Library Pond to current design standards under future development conditions. Scenarios are described in Appendix F, Table 5, with Scenario 2B and Scenario 3 being the sole options that meet pond design criteria under future development conditions.

Scenario 2B requires onsite mitigation (treatment and flow control) of approximately 50 percent of all redeveloped impervious surface, which requires redevelopment to adhere to the stormwater standards as outlined in the PWS including definition of pre-developed land cover condition and pond design criteria. Scenario 3 requires the City to approve of a policy change, allowing the definition of pre-development for the Town Center Planning Area to conform with existing development conditions (as opposed to pre-developed land cover).

For purposes of capital project development, Scenario 2B was assumed for costing and reflected in the CP fact sheet. See Appendix F, CP BC-1. In conjunction with this CP, a policy defining and directing redevelopment in the Town Center Planning Area is required. The policy needs to define a fee-in-lieu program and onsite stormwater mitigation tracking system to ensure adequate capacity in Library Pond is available while adhering to the City's current design standards and definition of predevelopment.

6.4 Cost Estimate Assumptions

CP costs are based on the total capital investment necessary to complete a project (i.e., engineering through construction). Unit costs for project (construction) elements are generally based on recent bid tabs and stormwater master planning efforts and (as necessary) adjusted for 2023 based on a historical cost index. City staff validated unit costs used in this SMP. Cost estimates presented in this SMP are Association for the Advancement of Cost Engineering (AACE) Class 5 Conceptual Level or Project Viability Estimates. Actual costs may vary from these estimates between -50 percent to +100 percent, although changes to design may result in cost differences outside of this anticipated range.

Project cost estimates use unit cost information for construction elements and generally apply a 40 percent construction contingency and multipliers to account for traffic control/utility relocation (5-10 percent), erosion control (3 percent), surveying (5 percent) and mobilization (10 percent). The range in traffic control/utility relocation is based on location (arterial vs. local street). Additional multipliers to account for engineering and permitting (20-30 percent) and construction administration (13.5 percent) are applied to the total construction cost with contingencies. The range in engineering and permitting costs is based on the anticipated permitting level of effort, such as whether in-water work is anticipated. Variations from these assumptions are noted on the project fact sheets in Appendix D.

Due to the resulting construction cost of select projects, the cost applicable to engineering and permitting and construction administration was capped in certain cases. For planning purposes, costs were rounded to the nearest $1,000 for engineering and permitting and construction administration; total project cost was rounded to the nearest $10,000 for budgeted purposes.

Appendix E includes unit costs developed for this SMP and presents the planning-level cost estimates for capital projects. Cost assumptions related to program recommendations are described in Section 6.5.

Land acquisition and easements are not included in the cost estimates, as most projects are located on City property or within the City right-of-way (ROW).

6.5 Programmatic Recommendations

During the problem area identification (Section 3.1) and project planning efforts (Section 6.1), select maintenance-related, regulatory-driven, and condition-related project needs were consolidated into program recommendations, to address issues at a city-wide scale instead of as multiple, stand-alone individual projects.

The following programs defined below support the successful management of a municipal stormwater system. Implementation will result in cost savings by providing for proactive maintenance, replacement, and repair, as well as contracting efficiencies for smaller, localized project needs.

Costs proposed for the programs are estimated based on current City spending and vetted with City staff. Funding may accumulate over multiple years to be used on a larger cost effort.

6.5.1 Localized Drainage Improvements (P-1)

This program would dedicate funding to assist with minor system configuration/reconfiguration or installation needs or in response to a recurring maintenance need. Improvements funded under this program are not anticipated to require extensive engineering services and would help address localized issues that do not warrant a standalone capital project. These improvements may include relocation and/or installation of curb inlets instead of catch basins in high traffic roads with significant leaf debris to help address localized drainage issues, as well as the installation of additional inlets and laterals (to address localized flooding or lack of infrastructure) and the minor regrading and replanting of conveyance ditches and swales.

An annual cost of $100,000 is estimated for this program. Project Opportunity Areas potentially benefitting from this program include the following:

- SW Parkway Avenue (south of Costco) (Project Opportunity ID #8),
- Wilsonville Road and Kinsman Road (Project Opportunity ID #10),
- SW Salish Lane and Parkway Ave (Project Opportunity ID #11),
- Commerce Circle (Project Opportunity ID #36),
- Serenity Way (Project Opportunity ID #37),
- SW Camelot Street (Project Opportunity ID #38), and
- SW Del Monte Ct (regular maintenance need reported during staff interviews).

6.5.2 Water Quality Retrofit Program (P-2)

This program stems from the project planning efforts and the stormwater retrofit analysis. This program involves the opportunistic incorporation of LID features (planters, curb bump outs, bioretention basins, porous pavement overlays, etc.) to address water quality in conjunction with other transportation, public improvement, or utility planning projects. These types of retrofit activities promote additional infiltration and water quality treatment, which are core values reflected in results from the public survey and external stakeholder outreach efforts. Efforts will help address NPDES MS4 retrofit requirements and TMDL compliance. Targeted locations may include collector roadways, park properties, and residential neighborhoods with limited or no existing water quality treatment.

An annual cost of $200,000 is estimated for this program. Project Opportunity Areas potentially benefitting from this program include the following:

- SW Parkway Avenue (south of Costco) (Project Opportunity ID #8),
- SW Salish Lane and Parkway Ave (Project Opportunity ID #11),
- Green Streets/LID Facilities (Project Opportunity ID #39),

6.5.3 Repair and Replacement (R/R) Program (P-3)

CCTV is one of the least expensive and most robust methods to document, assess, and identify condition-related issues in the piped stormwater network. The City's Public Works Road and Storm Section is implementing their CCTV program in accordance with staffing recommendations.

An R/R Program is used to budget the design and construction of improvements stemming from a CCTV and Asset Management Program. The gathered information and subsequent ranking of pipe and infrastructure condition will inform the locations where pipes need to be repaired or replaced in accordance with available funding and schedule. An R/R Program is key to the long-term sustainability of the stormwater collection system. An R/R program ensures that replacement is scheduled for older infrastructure nearing the end of its useful life before failure, as well as prioritizing damaged or failing pipes identified through the CCTV Program.

This program includes dedicated funding to repair/replace all public pipe 12-inches to 48-inches in diameter in-kind within the city limits over a 100-year timeframe. This fund would utilize results of the CCTV inspections to proactively schedule necessary replacement projects and exclude Charbonneau infrastructure, as replacement of a significant portion of the system is underway via a separate program effort in accordance with the Charbonneau Consolidated Improvement Plan (2014) (see Section 6.5.4).

Based on the City's asset inventory, this requires the replacement of approximately 3,700 LF of public stormwater pipe and associated manholes annually, reflecting a present-day construction cost (excluding contingencies and multipliers) of approximately $2.66M/year. However, this estimate does not consider ongoing pipe replacement efforts in CIP implementation and other drainage improvements. The estimate also excludes unknowns related to pipe age and associated lifespan of plastic pipe. As such, the City opted to allocate an additional $275,000 per year (approximately 10 percent of the annually calculated amount for this program.

6.5.4 Charbonneau R/R Program (P-4)

Since 2014, the City has implemented stormwater R/R efforts in the Charbonneau basin as part of the Charbonneau Consolidated Improvement Plan. The Charbonneau Consolidated Improvement Plan identified improvements across four utilities and consolidated utility improvements based on priority and location over a 20+ year period. To date, approximately 12,900 linear feet of pipe has been replaced. Project identification and H/H modeling efforts as part of this SMP identified two CP needs (WR-4, Phases 1 and 2 and WR-5) that incorporate pipe upsizing and direct pipe replacement in the Charbonneau basin.

This R/R program reflects direct replacement of remaining public pipe identified in the Charbonneau Consolidated Improvement Plan that has not been replaced or costed as a CP in this SMP (see Figure 6-4). This program includes in-kind replacement of approximately 30,000 linear feet of public pipe and 150 manhole structures. Pipe replacement will use PVC; pipe diameters less than 12 inches are assumed to be replaced with 12-inch pipe in accordance with the PWDS. A program duration of 20 years is maintained in conjunction with the Charbonneau Consolidated Improvement Plan.

Program costs were calculated directly and incorporate contingency, and multipliers as outlined in Section 6.4 (see Appendix E for a detailed cost estimate). The present-day construction cost (including contingencies and multipliers) is approximately $38.36M, resulting in an annualized program cost of approximately $1.92M per year.

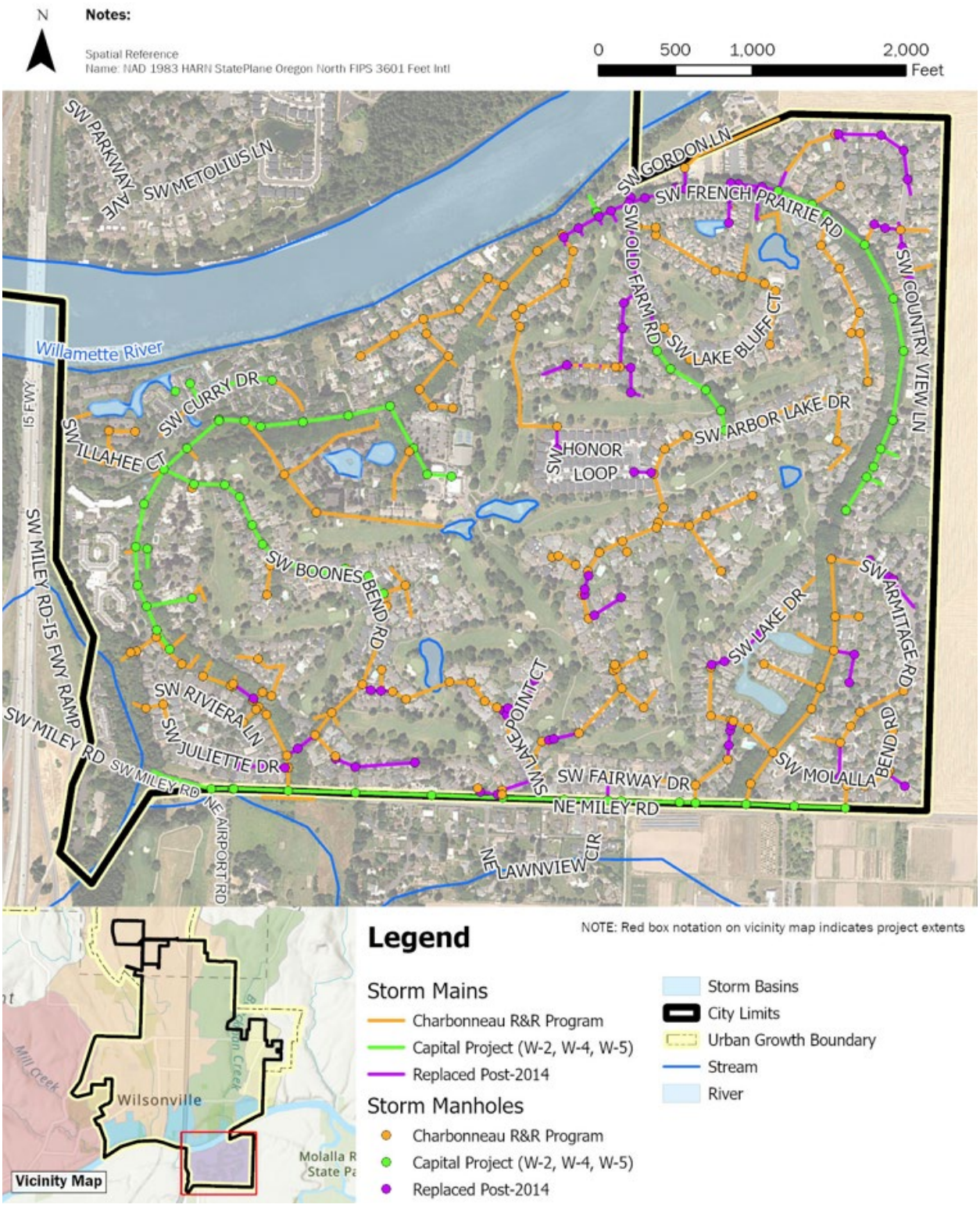

Figure 6-4: Charbonneau R/R Program Coverage

6.5.5 Riparian Vegetation Management Program (P-5)

This program includes dedicated funding to conduct riparian vegetation management and maintenance activities along stream corridors including removal of invasive species. This need was identified in the Stream Assessment (Section 4 and Appendix C), as there was dense coverage of invasive species including Himalayan blackberry, reed canary grass, and English ivy. In some cases, extensive vegetation prevented data collection efforts. These efforts support NPDES MS4 and TMDL (temperature management) initiatives.

An annual cost of $25,000 is allocated for this program. Project Opportunity Areas and specific locations noted in the Stream Assessment (Appendix C) that would potentially benefit from this program include:

- Boeckman Creek Reaches 2-9 (Stream Assessment identified vegetation management need)
- Kruse Creek Reaches 1-2 (Stream Assessment identified vegetation management need)
- Meridian Creek in Landover Park (Reaches 1 and 2) (Project Opportunity ID #18 and #19)
- Arrowhead Creek Reach 4 (Project Opportunity ID #20)
- Boeckman Creek Instream Flow Mitigation and Restoration (Project Opportunity ID #27)

6.5.6 Stormwater Facility Enhanced Maintenance Program (P-6)

This program establishes a dedicated funding mechanism supporting Public Works staff efforts to conduct more reactive and extensive maintenance of public and private vegetated stormwater facilities. Although routine maintenance of public facilities is addressed in conjunction with existing maintenance activities and staffing levels, occasionally additional support is needed to conduct a more robust, restorative maintenance effort on a larger, regional facility or address widespread replacement of amended soils and vegetation on LID/GI facilities.

Private facilities subject to this program would include those where private facility maintenance agreements are not in place and/or not being implemented after enforcement efforts are conducted. Maintenance on private facilities where a maintenance agreement is on file may be subject to reimbursement.

An annual cost of $25,000 is allocated for this program. Project Opportunity Areas potentially benefitting from this program include the following:

- Pond F and other ponds in Villebois (Project Opportunity ID #5),
- SW Daybreak Street and SW Morningside Avenue (Project Opportunity ID #12),
- Oulanka and Tivoli Parks (Project Opportunity ID #22)

6.6 Project and Program Numbering and Naming

CP numbering is applied to all location-specific capital projects, based on major basin. The project numbering convention maintains consistency with the 2012 SMP and includes a major basin abbreviation and number to indicate the individual project location. Phasing is defined within the project numbering. Project naming incorporates the location and primary objective of the project in the title.

Major basin abbreviations used for project numbering are listed below:

- Boeckman Creek (BC)
- Coffee Lake Creek (CC), includes projects associated with Tapman Creek drainage area
- Willamette River (WR), includes projects associated with the Charbonneau planning area
- Newland Creek (NC)

Four planning-related capital projects are identified and numbered with a “City” prefix.

Programmatic activities are numbered P-1 through P-6 and reflect city-wide implementation and an annual funding need.

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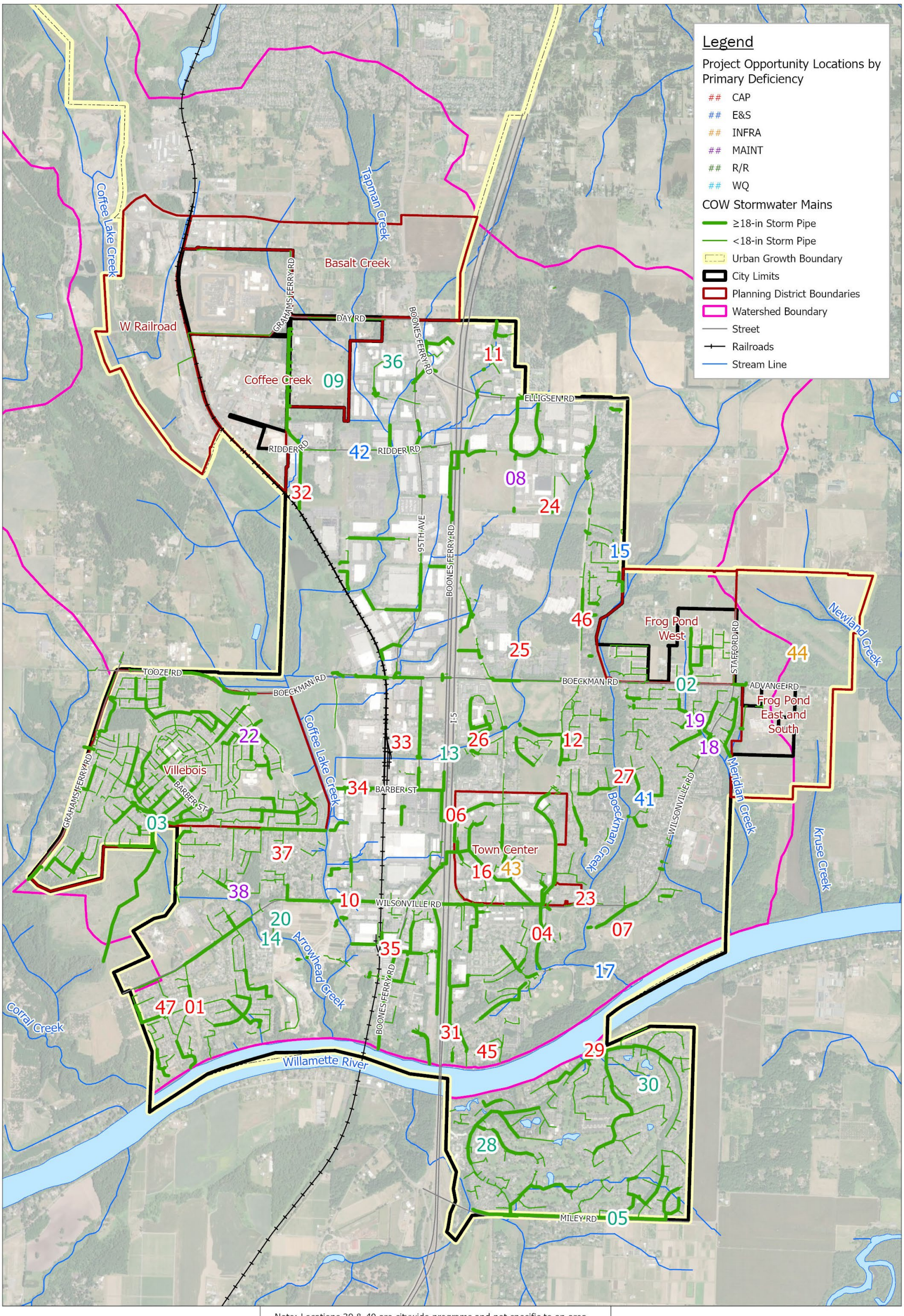

Note: Locations 39 & 40 are citywide programs and not specific to an area.

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

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Project # 156157

Stormwater Master Plan

Figure 6-1: Project Opportunity Locations

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Section 7

Capital Improvement Plan

This section summarizes the capital projects, programs, and policy recommendations identified through the master planning process, collectively comprising the City's Stormwater Capital Improvement Plan (CIP).

A total of 15 capital projects (CPs) are identified to address current and future storm drainage infrastructure needs related to system capacity, repair and replacement (R/R), a lack of infrastructure, recurring maintenance, instream erosion and sediment accumulation, and water quality. Considering multiples phases for some projects, these 15 CPs represent 20 separately costed and phased projects for purposes of project prioritization and scheduling efforts.

CP recommendations are considered a one-time cost and are shown in Figure 7-1, located at the end of this section.

In addition to the 15 CPs, there are four, city-wide planning projects that are also considered a one-time cost. These planning projects are described in Section 7.2.

Six programmatic recommendations are identified, including addressing ongoing support for localized drainage improvements, city-wide system repair and replacement (R/R) needs, water quality retrofits and expanded stormwater facility maintenance needs, and riparian vegetation management. Program recommendations are considered an annual cost, as described in Section 6.5, and intended to support ongoing asset management efforts.

Section 7.1 summarizes the recommended actions costed for this SMP. Section 7.2 summarizes the overall CIP, and Section 7.3 outlines the staffing analysis to assess Public Works and Engineering staffing needs in support of this SMP and regulatory obligations.

7.1 Summary of Recommended Actions

Project, program, and policy recommendations in this SMP are proposed to improve and enhance drainage infrastructure and water resources throughout the City, as summarized by the following recommended actions.

- Implement CPs required to address system capacity, system maintenance, repair and replacement, water quality, instream erosion/sediment control, and new infrastructure needed to accommodate pending development. These CPs are intended to manage areas of reported deficiencies and accommodate development and growth.
- Implement stormwater-related improvement programs to address recurring, maintenance-related system needs in an expedited manner, as well as address system condition issues in accordance with ongoing inspections and the City's asset management goals.
- Implement stormwater retrofits both proactively and opportunistically to enhance water quality and improve natural system aesthetics and function.
- Update policies and procedures to support public and private partnerships for new and redevelopment activities, specifically related to stormwater infrastructure replacement and stormwater fee-in-lieu payments in conjunction with the Town Center redevelopment.
- Continue implementation of the City's Public Works Design Standards (PWDS) to address regulatory drivers, support private development activities, and protect stream health.

- Add staff necessary to maintain compliance with the City's National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer (MS4) permit, as well as to implement recommendations outlined in this SMP.
- Clearly document capital project and program costs and schedule to inform future funding and rate analyses.

7.2 Capital Improvement Program Recommendations

CP locations are mapped in Figure 7-1, at the end of this section, based on the following objectives (identified in **BOLD**):

- Increase **system capacity** to address existing and potential future deficiencies (i.e., flood control).
- Install **water quality** treatment and address instream **erosion and sediment control (E&S)** to meet regulatory drivers including the City's NPDES MS4 permit and total maximum daily load (TMDL) obligations.
- Address recurring **maintenance** and **infrastructure needs** (i.e., lack of maintenance access, add infrastructure to address localized drainage issues).
- Address system condition through **repair & replacement (R&R) needs**.

Table 7-1 lists all CP and program recommendations and references the associated Project Opportunity Area as defined in Section 6. A brief description of the project and summary of project objectives are also included. Most projects address multiple objectives. Table 7-1 also reflects the anticipated implementation schedule for the CP, based on prioritization efforts. Corresponding CP fact sheets with more detailed project information are provided in Appendix D.

The portion of total project cost considered eligible for funding via system development charges (SDCs) is also provided in Table 7-1. Projects solely related to planning, repair & replacement, and maintenance were determined not eligible for SDCs, as they do not address required improvements associated with new or redevelopment. The portion of the total project cost considered SDC eligible is calculated based on the increase in flow associated with anticipated development, using percent increase in impervious coverage as a surrogate.

Description of the four planning-related projects (City-1, City-2, City-3, and City-4) are provided below. Planning projects require specific, scheduled budget allocations and so were added to the overall stormwater CIP.

7.2.1 Flow Monitoring and Rain Gauge Installation (City-1)

This planning project includes the installation of three flow monitors, installed in the piped stormwater collection system, as well as the installation of one rain gauge to assess stormwater flow and aid in the more refined calibration of the City's InfoSWMM model. Additional flow monitoring and model calibration will help confirm the need for and sizing of select CPs, particularly where City staff have not yet observed flooding issues, but the model is predicting flooding.

Recommended locations for installation of flow monitoring include locations with a phased, capacity-related CP and pending new development. They include locations in each of the three major basins: Coffee Lake Creek, Boeckman Creek, and the Willamette basin (e.g., Charbonneau). CPs potentially informed by this effort include Day Road Stormwater Improvements (Project ID CLC-1), Garden Acres Pond Retrofit (Project ID CLC-3), Morey's Landing (Project ID WR-1), Charbonneau East (WR-4), and Charbonneau West (WR-5).

The project duration (for costing purposes) is estimated at 12 months, and the cost estimate of $100,000 for this effort is based on recent bids for similar levels of service. This estimate has not been validated or based on a detailed scope.

7.2.2 Hydromodification Assessment and Stream Survey (City-2)

This planning project includes follow up monitoring efforts related to the 2022 geomorphic assessment of select high priority reaches as conducted for this SMP (see Appendix C). Although the focus of the assessment was to identify existing and potential future risks associated with hydromodification, the assessment also provided a baseline within the study areas to assess changes in channel, floodplain, and riparian condition over time. This was done by documenting locations of noticeable bank erosion, headcuts, neglected or compromised riparian corridor, grade control locations, and other points of interest.

Data collection efforts will use similar protocols and data sheets developed during the 2022 assessment along these high priority reaches to provide continuous monitoring of stream impacts associated with upstream development activities or hydromodification mitigation strategies. The assessment will be both field-based, consisting of stream walks along the select reaches, and qualitative, including descriptions of geomorphic setting, geomorphic trends (i.e., aggrading, incising or stable), presence of base level controls, and the primary risk to infrastructure. Reaches recommended for ongoing evaluation per the 2022 assessment include Boeckman Creek (reaches 2, and 9), Meridian Creek (reaches 1 and 2), Arrowhead Creek (reaches 2 and 3), Newland Creek (reaches 1-4), and Kruse Creek (reaches 1-3).

Additionally, the City may want to establish baseline conditions associated with identified "secondary" locations that were not included in the 2022 geomorphic assessment effort. This new evaluation may be conducted in addition to or in lieu of ongoing monitoring at select reaches.

The complete assessment will be documented in a technical memorandum summarizing the results for inclusion in TMDL and/or NPDES MS4 reporting.

This project is estimated to be completed every three years and/or following a high flow event that exceeds the 10-yr discharge. A project cost of $30,000 per monitoring event is reflected in Table 7-1 and is assumed to occur once during initial 5-year CIP implementation period; once during the second 5-year CIP implementation period; and twice during the third, 10-year CIP implementation period.

7.2.3 Porous Pavement Pilot Study (City-3)

This planning project stems from the City's NPDES MS4 Retrofit Strategy, water quality project objectives, TMDL drivers, and the need to expand water quality treatment to areas lacking in treatment. To date, use of pervious pavement, porous asphalt or other permeable road and drive surfaces has not been used in the public right-of-way (ROW). This pilot study would include the installation of a porous pavement overlay in conjunction with pavement resurfacing efforts in the City. Water quality monitoring may be conducted to confirm/inform stormwater pollutant reduction, as local research efforts have indicated water quality benefits (i.e., reduction of sediment, bacteria, heavy metals, and organic compounds) can be observed, even with an overlay versus full pavement replacement with pervious pavement.

Recommended locations for implementation of the pilot project have not yet been identified but are anticipated to coordinate with scheduled pavement maintenance. A project duration (for costing purposes) is estimated at 24 months and scheduled during the first 5-year CIP implementation period, and the cost estimate of $100,000 for this effort is based on recent efforts in the City of Milwaukie. This estimate has not been validated or based on a detailed scope.

7.2.4 Boeckman Creek Geomorphic and Geotechnical Evaluation (City-4)

This planning project is to conduct a geomorphic and geotechnical evaluation on Reach 1 of Boeckman Creek, where continued risk of channel incision and bank erosion exists. This project stems from a recommendation in the 2022 geomorphic assessment, which was unable to confirm source, rate, or extent of bank failure in the reach (see Appendix C). A holistic evaluation of backwater conditions, geomorphic conditions and a geotechnical assessment of slope stability and potential bank stabilization techniques is recommended.

The project duration (for costing purposes) is estimated at 12 months, and a cost estimate of $150,000 for this effort is based on recent bids for similar levels of service. This estimate has not been validated or based on a detailed scope.

Table 7-1. City of Wilsonville Stormwater Capital Project and Program Summary

Project No.[a]	Project Opportunity Area Location ID[b]	Basin/ Waterbody	Project/Program Name	Objectives[b]	Location	Contributing Drainage Area, acres	Project/Program Summary	Estimated Cost[c]	SDC Eligible Cost[c]	Recommended Project/Program Timing			
										Annual	High Priority (2024-28)	Medium Priority (2029-33)	Low Priority (2034-43)
BC-1	4	Boeckman Creek	Library Pond Retrofit	• **Capacity** • Water Quality • Infrastructure Need	Existing Library Pond facility, east of SW Memorial Drive in Memorial Park	132.0	• Clear, regrade, and replant 0.7 acre detention pond, including adding 3 ft required rocks and media to pond bottom, to support additional treatment and flow control function for redevelopment of Town Center. • Install a new outlet structure. • Replace 70 LF of 18-inch CSP pipe. • Install 70 LF of 6-inch perforated HDPE underdrain. • Install 15-foot-wide, 25-foot-long road for maintenance access.	$1,880,000	$213,000		X		
BC-2	25, 26	Boeckman Creek	Ash Meadows Flow Mitigation	• **Capacity** • Water Quality	East of SW Ash Meadows Rd, West of SW Parkway Ave, and north of SW Greenway Dr	295.0	• Plug the flow diversion structure at Siemens Pond B. • Upsize 95 LF of 30-inch culvert at Boeckman Road to 48-inch diameter PVC. • Update 80 LF of 36-inch culvert at SW Parkway Ave to 48-inch diameter PVC. • Install a 3-foot x 3-foot grated inlet to serve as a flow control structure at Ash Meadows Cir. • Clear, regrade, and replant 1.3 acres of drainage way and embankment to ensure a low-flow drainage path and healthy vegetation.	$2,940,000	$798,000		X		
BC-3-Phase 1	24	Boeckman Creek	Wiedemann Ditch and Canyon Creek Park Retrofit, Phase 1	• **Capacity** • Water Quality	Canyon Creek Park, north of SW Carriage Oaks Ln	295.0	• Clear, regrade, and replant approximately the 1.6-acre proposed vegetated storage facility. • Install a flow control/outlet structure with emergency overflow at the storage facility. • Install 350 LF of 36-inch diameter PVC to discharge from the southeast corner of the site towards Boeckman Creek. • Install one new manhole at bend in new 36-inch pipe.	$4,860,000	$920,000				X
BC-3-Phase 2	24	Boeckman Creek	Wiedemann Ditch and Canyon Creek Park Retrofit, Phase 2	• **Capacity** • Water Quality	Existing Wiedemann Ditch alignment, south of Sysco property	295.0	• Clear, regrade, and replant approximately 2.1 acres along the existing ditch alignment to install five, tiered wetland complexes. • Install a 12-foot-wide, 1,500-foot-long access road west of Canyon Creek Road.	$7,210,000	$1,365,000				X
BC-4	15	Boeckman Creek	Boeckman Creek Stabilization at Colvin Lane	• **Erosion/Sediment Control** • Repair/Replacement • Maintenance	Boeckman Creek corridor adjacent to Canyon Creek Estates and bounded on the west by SW Roanoke Dr	358.0	• Removal of approx. 30 LF of existing outfall pipe. • Installation of approx.70 LF of 12-inch-diameter PVC to serve as a new outfall. • Install planting and bioengineered restoration/stabilization measures along approx. 600 LF of stream corridor. • Reconstruction of 150 LF of vegetated swale in accordance with the City's PWS.	$410,000	$78,000		X		
BC-5	21	Boeckman Creek	Memorial Park Swale Retrofit	• **Water Quality** • Erosion/Sediment Control • Maintenance	Within Memorial Park, north of the parking lot by the baseball fields and south of SW Memorial Dr	33.0	• Remove 90 LF of 10-inch CSP (SD5041 and SD5042). • Remove 120 LF of 12-inch CSP (SD5044). • Remove: manhole (ST5098), swale inlet structure (CARTE ID 568), and outlet structure (CARTE ID 19). • Fill existing 1,500 SF swale and revegetate area. • Replace two 48-inch manholes (ST5200 and ST5208). • Replace 60 LF of 12-inch CSP with 18-inch PVC pipe (SD5046). • Replace 50 LF of 18-inch CSP with 18-inch PVC pipe (SD5206). • Replace manhole ST5208 with a 72-inch flow splitting/WQ manhole. • Install 2,400 SF vegetated water quality swale with 1 foot of drain rock and 1.5 feet of amended soil. • Install 140 LF of 6-inch perforated HDPE underdrain pipe. • Install 50 LF of 12-inch PVC pipe. • Install structures for the new swale: swale inflow spreader with rip-rad pad, beehive overflow structure, and outfall to the creek.	$910,000	$22,000				X

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Project No.[a]	Project Opportunity Area Location ID[b]	Basin/ Waterbody	Project/Program Name	Objectives[b]	Location	Contributing Drainage Area, acres	Project/Program Summary	Estimated Cost[c]	SDC Eligible Cost[c]	Recommended Project/Program Timing			
										Annual	High Priority (2024-28)	Medium Priority (2029-33)	Low Priority (2034-43)
BC-6	41	Boeckman Creek	Gesellschaft Water Well Channel Restoration	• **Erosion/Sediment Control** • Maintenance	Boeckman Creek riparian area near Wilsonville High School, at the Gesellschaft well site (29001 SW Meadows Pkwy)	25.0	• Install approx. 480 LF of 12" PVC pipe to convey discharge flows from the well maintenance. • Install two new 48-inch manholes. • Install outfall with 8 CY of Class 200 rip-rap to the creek. • Restore approx. 310 LF of the existing channel with coir log check dams and matting, and re-vegetating with native trees and shrubs.	$400,000	$2,000		X		
CLC-1 - Phase 1	9	Coffee Lake Creek	Day Road Stormwater Improvements, Phase 1	• **Repair/Replacement** • Capacity	Open channel alignment south of Day Rd	944.0	• Regrade and reconstruct approx. 4,500 feet of open channel to eliminate negative slope. The resulting channel shall be approximately 5-foot wide (bottom width) ranging from 1-foot to 6-feet deep. The channel widens at elevation 223.0 to create a floodplain. Side slopes are designed at 2H:1V. • Construct a structural earth wall at bends in the channel and along the east-west portion of the alignment, as specified in the AKS report. • Install 200 LF of open-bottom or box culverts (4 culverts total) to provide access to the existing BPA utility poles while also maximizing conveyance. • Remove the unmapped, 50-foot existing culvert at the northwest corner of the northernmost industrial property south of Day Road. • Install approx. 180 LF of two barrel, 36-inch diameter PVC culverts at Day Road.	$8,020,000	$3,054,000		X		
CLC-1 - Phase 2	9	Coffee Lake Creek	Day Road Stormwater Improvements, Phase 2	• **Capacity**	North of Ridder Rd through Tax Lot 500	944.0	• Remove 1.200 LF of existing pipe. • Upsize 1,800 LF of existing 36-inch parallel storm pipes to 48-inch. • Replace seven 72-inch manholes. • Install 3 trash racks.	$3,930,000	$1,497,000			X	
CLC-2	20	Coffee Lake Creek	Arrowhead Creek Culvert Replacement at Arrowhead Creek Trail	• **Repair/Replacement** • Maintenance	Arrowhead Creek culvert crossings under pedestrian path at the south end of SW Morey Ln	421.0	• Remove and replace approx. 70 LF existing double 5 ft x 5 ft concrete box culverts with a 10 ft x 3 ft concrete box culvert. • Install planting and bioengineered restoration/stabilization measures after replacement of the culvert to stabilize an area approximately 20 feet along the pedestrian path length and approximately 50 feet upstream and downstream of the crossing. • Repave approx. 30 LF of the approx. 20-foot-wide pedestrian path after culvert replacement.	$290,000	$16,000			X	
CLC-3	32	Coffee Lake Creek	Garden Acres Pond Retrofit	• **Capacity** • Water Quality	Existing public pond in an industrial area along Peters Rd between SW Graham's Ferry Rd to the west, SW Day Rd to the north, SW 95th Ave to the east, and the Coffee Lake Wetlands to the south.	231.0	• Install a flow diversion structure at Peters Road (ST2101A). • Install 95 LF of 24-inch PVC pipe from Peters Road to the inlet of the detention pond. • Increase existing detention pond capacity by 25,600 cubic feet and lower pond bottom invert to 196-ft. • Clear, regrade, and replant 0.9-acres of pond footprint area. • Install an outlet control structure within the detention pond. • Install 155 LF of 24-inch diameter PVC pipe from the detention pond to the stormwater conveyance system on Peters Road (ST2431). • Install pond underdrain in accordance with the 2015 PSW Section 3, Appendix A landscape and soil media requirements. Including 15" of drain rock, a 3" separation layer, and 18" of growing media.	$3,780,000	$1,339,000			X	
NC-1	44	Newland Creek	Frog Pond East and South Conveyance Pipe Installation	• **Infrastructure Need**	East of SW Stafford Road and the Frog Pond West development area in Wilsonville, outside of the current city limits and UGB. Only K1 Basin of Frog Pond East and South.	61.0	• Install 2,050 LF of 24-inch PVC pipe. • Install 310 LF of 30-inch PVC pipe. • Install seven 60-inch manholes. • Install 1 outfall.	$4,090,000	$3,222,000		X		

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Project No.[a]	Project Opportunity Area Location ID[b]	Basin/ Waterbody	Project/Program Name	Objectives[b]	Location	Contributing Drainage Area, acres	Project/Program Summary	Estimated Cost[c]	SDC Eligible Cost[c]	Recommended Project/Program Timing			
										Annual	High Priority (2024-28)	Medium Priority (2029-33)	Low Priority (2034-43)
WR-1 - Phase 1	1	Willamette River	SW Willamette Way/Morey's Landing Stormwater Improvements, Phase 1	• **System Capacity** • Water Quality	Along Willamette Wy East from SW Pkwy Dr to the Belknap Ct Outfall, including greenfield along BPA easement	46.0	• Remove existing Morey's Landing Bubbler (STD6604). • Clear, grade, and replant 0.12-acres to create two infiltration raingardens within the BPA easement. • Install a flow control diversion structure and 25 LF of 8-inch PVC to route water quality events (low flow) to new raingardens and high flow events to the Belknap Court outfall. • Install 120 LF of 12-inch PVC for flow exceeding the water quality event. • Upsize 575 LF of 10-inch CPS to 12-inch PVC (SD6629, SD6630, SD6632). • Upsize 145 LF of 10-inch CSP to 18-inch PVC (SD6638). • Install one 48-inch manhole and replace four 48-inch manholes (ST6618, ST6619, ST6606, and ST6605).	$2,310,000	$45,000			X	
WR-1 - Phase 2	1	Willamette River	SW Willamette Way/Morey's Landing Stormwater Improvements, Phase 2	• **System Capacity**	SW Champoeg Dr	46.0	• Upsize 610 LF of 12-inch CSP to 18-inch PVC on SW Champoeg Dr E (SD6634 - SD6637). • Replace three 48-inch manholes (ST6607, ST6608, and ST6609) and field inlet (6647).	$1,080,000	$21,000				X
WR-2 - Phase 1	5	Willamette River	Miley Road Stormwater Improvements, Phase 1	• **Repair/Replacement** • Erosion/Sediment Control • Maintenance	Miley Rd outfall	138.0	• Replace and upsize 80 LF outfall pipe (from area drain with ENG ID 9341 to outfall) from 36-inch CMP to 42-inch PVC. • Replace area drain (ENG ID 9341). • Replace 320 LF of existing storm pipe between area drain (9341) and MH (ST9002) with same diameter 42-inch PVC. • Replace and lower invert of MH (ST9002) to ensure 3 ft cover requirement is met for incoming pipe. Maintain 0.2 ft drop within MH. • Install planting and bioengineered restoration/stabilization measures after replacement of the culvert to stabilize an area approximately 25 feet along the channel upstream and downstream of the outfall.	$820,000	$0		X		
WR-2 - Phase 2	5	Willamette River	Miley Road Stormwater Improvements, Phase 2	• **Repair/Replacement** • Maintenance	Miley Rd from NE Airport Rd to eastern intersection with SW French Prairie Rd	138.0	• Install approx. 530 LF of new 42-inch pipe from replaced MH ST9002 to new manhole at the near intersection with SW French Prairie Road. • Install three 72-inch diameter manholes for the above 42-inch line, the most upstream of which is at the SW French Prairie Road. • Install 10 new 60-inch diameter manholes and approx. 3015 LF of new 36-inch storm pipe along NE Miley Road from SW French Prairie Road to new manhole adjacent to MH ST9011. • Install 2 new 48-inch diameter manholes and approx. 650 LF of new 24-inch storm pipe from the new manhole adjacent to MH ST9011 to new manhole at upstream most lateral. • Extend six total existing main connections to the new pipe alignment (approx. 40 LF each, varying diameters). Note that these points of connection run under the existing brick wall. • Reconnect all existing curb inlets along new NE Miley Road alignment - approximately 13.	$10,510,000	$0			X	
WR-3	7	Willamette River	Rose Lane Culvert Replacement	• **Capacity** • Maintenance	SW Rose Ln between SW Wilsonville Rd and SW Montgomery Wy	14.0	• Remove the existing 25 LF of 12-inch culvert (CARTE ID: 24370). • Install approx. 40 LF of parallel 12-inch RCP culverts. Realign the culverts at a diagonal across the road with the same outlet location. • Reinforce stormwater conveyance around property near culvert to move water into ditch.	$200,000	$19,000		X		
WR-4 - Phase 1	30	Willamette River	Charbonneau East Stormwater Improvements, Phase 1	• **Capacity** • Repair/Replacement	SW French Prairie outfall	159.0	• Remove and replace existing Charbonneau East Outfall (ENG ID: STD9005). • Upsize 115 LF of 30-inch pipe to 36-inch PVC discharging to Willamette River (ENG ID: STD9005 to ST9014). • Replace one 72-inch manhole (ST9014).	$600,000	$0				X

Table 7-1. City of Wilsonville Stormwater Capital Project and Program Summary

Project No.[a]	Project Opportunity Area Location ID[b]	Basin/ Waterbody	Project/Program Name	Objectives[b]	Location	Contributing Drainage Area, acres	Project/Program Summary	Estimated Cost[c]	SDC Eligible Cost[c]	Recommended Project/Program Timing			
										Annual	High Priority (2024-28)	Medium Priority (2029-33)	Low Priority (2034-43)
WR-4 - Phase 2	30	Willamette River	Charbonneau East Stormwater Improvements, Phase 2	• **Repair/Replacement** • Maintenance	SW French Prairie Rd and SW Old Farm Rd	159.0	• Replace 230 LF of 10-inch pipe with 12-inch PVC on SW French Prairie Rd (ST9087 to end, and ST9088 to end). • Replace 680 LF of 12-inch pipe with 12-inch PVC on SW French Prairie Rd (ST9023 to ST9242). • Replace 1,200 LF of 15-inch pipe with 15-inch PVC on SW French Prairie Rd (ST9023 to ST9020). • Replace 310 LF of 18-inch pipe with 18-inch PVC on SW French Prairie Rd (ST9020 to ST9019). • Upsize 360 LF of 21-inch pipe to 30-inch PVC on SW French Prairie Rd (ST9019 to ST9017). • Replace 570 LF of 24-inch pipe with 24-inch PVC on Old Farm Rd (ST9030 to ST9027). • Replace 300 LF of 30-inch pipe with 30-inch PVC on Old Farm Rd (ST9031 to ST9030). • Replace eight 48-inch manholes. • Replace nine 60-inch manholes.	$4,440,000	$0				X
WR-5	28	Willamette River	Charbonneau West Stormwater Improvements	• **Repair/Replacement** • Maintenance	SW Curry Dr, SW French Prairie Rd, and SW Boones Bend Rd	54.0	• Pipe replacement along SW Curry Drive: • Replace 110 LF of 15-in pipe with PVC (PST9012 to new manhole). • Replace 520 LF of 18-in pipe with PVC (new manhole to PRIVATE manhole CARTE ID: 1892). • Replace 140 LF of 18-in private pipe with PVC (private manhole CARTE ID: 1892 to private outfall CARTE ID: 15). • Replace private outfall (CARTE ID: 15). • Replace two private 48-in manholes (CARTE ID 1892 and 1383). • Install three 48-in manholes. • Pipe replacement along SW French Prairie Road: • Replace 200 LF of 12-in pipe with PVC (ST9331 to ST9044) • Replace 1,280 LF of 15-in pipe with PVC (ST9048 to ST9046; ST9269 to ST9046; and ST9281 to ST9043). • Replace 1,370 LF of 18-in pipe with PVC (ST9046 to ST9044 and ST9043 to CARTE ID: 1859 - ENG ID unknown) • Replace 550 LF of 24-in pipe with PVC (ST9044 to ST9040). • Replace 640 LF of 30-in pipe with PVC (ST9040 to ST9067, ST9041 to ST9067, and unknown to ST9041). • Replace 20 LF of 36-in pipe with PVC (unknown to ST9067). • Replace 150 LF of private 36-in PVC pipe (ST9041 to private outfall - ID unknown). • Replace private outfall; install one 48-in manholes and replace 14 48-in manholes; replace four 60-in manholes; and replace two 72-in manholes. • Pipe replacement along SW Boones Bend Road: • Replace 150 LF of 15-in pipe with PVC (ST9059 to ST9058). • Replace 420 LF of 18-in pipe with PVC (ST9058 to ST9055). • Replace 680 LF of 21-in pipe with PVC (ST9055 to ST9051). • Replace 120 LF of 24-in pipe with PVC (ST9051 to ST9050). • Replace 420 LF of 27-in pipe with PVC (ST9050 to ST9040). • Replace eight 48-in manholes; and replace three 60-in manholes.	$10,370,000	$0				X
City-1	N/A	City-wide	Flow Monitoring and Rain Gauge Installation	• **Capacity**	City-wide	N/A	• Location of one rain gauge and installation of a minimum of three flow meters over a 12-month duration to aid in Info-SWMM model calibration and validation of project needs/phasing.	$100,000	N/A		X		

Table 7-1. City of Wilsonville Stormwater Capital Project and Program Summary

Project No.[a]	Project Opportunity Area Location ID[b]	Basin/ Waterbody	Project/Program Name	Objectives[b]	Location	Contributing Drainage Area, acres	Project/Program Summary	Estimated Cost[c]	SDC Eligible Cost[c]	Recommended Project/Program Timing			
										Annual	High Priority (2024-28)	Medium Priority (2029-33)	Low Priority (2034-43)
City-2	18, 19, 27	Boeckman, Meridian, and Newland	Hydromodification Assessment and Stream Survey	• **Erosion/Sediment Control**	Stream corridors associated with developing portions of the Boeckman Creek, Meridian Creek and Newland Creek basins	N/A	• Follow-up monitoring related to the 2022 geomorphic assessment, targeting select stream reaches where ongoing monitoring was recommended to ensure no exacerbation of existing conditions/ potential issues.	$30,000/event	N/A		X	X	X
City-3	40	City-wide	Porous Pavement Pilot Study	• **Water Quality**	City-wide	N/A	• Implementation of a porous pavement overlay and associated water quality monitoring to inform more widespread applications for improved water quality.	$100,000	N/A		X		
City-4	17	Boeckman Creek	Boeckman Creek Geotechnical Evaluation	• **Erosion/Sediment Control**	Downstream 750' of the Boeckman Creek stream corridor	N/A	• Geomorphic and geotechnical evaluation of the downstream 750' of Boeckman Creek at the confluence with the Willamette River based on findings from the 2022 geomorphic assessment.	$150,000	N/A		X		
P-1	5, 7, 10, 17	City-wide	Local Drainage Improvements Program	• **Infrastructure Need** • Capacity	City-wide	N/A	• Installation of small-scale, localized drainage improvements (i.e., new pipe, catch basins and laterals, grading to support curb-and-gutter flow) to be managed/ contracted in house to address more immediate system deficiencies. • Relocate/install curb inlets instead of catch basins in high traffic roads to address local drainage issues	$100,000/yr	N/A	X			
P-2	8, 11, 39, 40	City-wide	Water Quality Retrofit Program	• **Water Quality** • Capacity	City-wide	N/A	• Design and install opportunistic LID or green infrastructure (porous pavement overlays, regional facilities, stormwater planters/curb bump outs) along streets, within public property, and/or within available ROW to provide water quality treatment.	$200,000/yr	N/A	X			
P-3	N/A	City-wide	City-wide Repair/Replacement Program	• **Repair/Replacement** • Maintenance	City-wide	N/A	• Conduct proactive replacement of public pipe and structures over a 100-year period (assumed end of useful like). Use results of CCTV analysis to inform locations.	$275,000/yr	N/A	X			
P-4	29	Willamette River	Charbonneau Repair/Replacement Program	• **Repair/Replacement** • Maintenance	Charbonneau Basin	478.0	• In-kind repair and replacement of public pipe and manholes within the Charbonneau basin, in accordance with the Charbonneau Consolidated Improvement Plan. Excludes pipes replaced within the last 10-years (since 2014) and CP WR-4, Phases 1 and 2 and WR-5.	$1,920,000/yr	N/A	X			
P-5	18, 19, 20, 27	City-wide	Riparian Vegetation Management Program	• **Maintenance** • Water Quality	City-wide	N/A	• Conduct riparian and/or in-channel vegetation maintenance including removal of invasives in accordance with recommendations from the 2022 geomorphic assessment.	$25,000/yr	N/A	X			
P-6	5, 12, 22	City-wide	Stormwater Facility Enhanced Maintenance Program	• **Water Quality** • Maintenance	City-wide	N/A	• Conduct restorative maintenance on select public and private stormwater facilities with reported deficiencies.	$25,000/yr	N/A	X			
									TOTAL	$2.545M	$19,140,000	$20,850,000	$29,530,000

N/A: Not Applicable

a. CP numbering reflects the following drainage basins: BC = Boeckman Creek, CLC = Coffee Lake Creek, WR = Willamette River, NC = Newland Creek. Citywide planning projects are designated as "City". Programs (to be funded annually) are prefaced with a P designation.

*b. Primary objective (for mapping purposes) is identified in **BOLD**. Objectives addressed relate to project needs in the contributing watershed to resolve known and predicted system/ facility deficiencies. Refer to the Project Opportunity matrix (Appendix A, Table A-2) for background on deficiencies addressed with the project.*

c. Estimated costs and SDC eligible costs are described in Section 7 of the SMP and detailed cost summaries provided in Appendix E. City-wide planning projects and solely related to Repair/Replacement or Maintenance are not eligible for SDCs and the SDC eligible cost is indicated as N/A. For projects with no developable lands in the upstream contributing drainage area, the portion of project cost associated with SDCs is $0.

7.3 Future/Unfunded Capital Project Opportunities

Table 7-2 summarizes potential, additional CP needs as identified during project planning efforts and documented in the Project Opportunity Matrix (Appendix A, Table A-2). However, these are considered unfunded capital projects for purposes of this SMP, as needs are more undefined and/or staff have not observed specific deficiencies in these areas. In some cases, a standalone CP may not be necessary if the project opportunity can be addressed as part of a program activity (i.e., Localized Drainage Improvement [P-1]).

Specific cost estimates have not been developed and schedule for implementation not established for these projects.

Table 7-2. Unfunded/Future Capital Project Concepts

Project Opportunity Location ID	Location/ Asset Description	Basin	Source	Problem Description	Deficiency Category [a]		Project Background			
					Primary	Secondary	Modeled Capacity Deficiency (Y/N)	Stream Assessment ID Need (Y/N)	Water Quality Retrofit Opportunity (Y/N)	Project Concept
8	SW Parkway Ave south of Costco	Boeckman Creek	Staff Surveys H&H Model	Modeled results indicate flooding at US node of 30" culvert at N-S end of ditch. Downstream N-S drainage swale has flat grades and is routinely filled with sediment, surcharging the roadway drainage system, and resulting in an ongoing maintenance concern.	MAINT	CAP	Y	N	Y	• Install WQ manhole(s) or other facilities to remove sediments from public runoff.
11	SW Salish Ln at intersection with Parkway Ave	Coffee Lake Creek	Staff Surveys H&H Model	A city-owned pond receives a small amount of drainage and requires frequent maintenance (due to undersized catch basins). Model predicts flooding within the pond and outlet.	CAP		Y	N	N	• Improve maintenance access from the Shrine Center parking lot. • Expand/retrofit pond to improve water quality function and outlet configuration.
17	Boeckman Creek - Reach 1 (US of Willamette R.)	Boeckman Creek	Stream Assessment	Continued channel incision and lateral erosion along the lowest reach of Boeckman Creek prior to confluence of the Willamette River.	E&S		N	Y	N	• Planning project (City-4) proposed to evaluate source and potential, structural repairs first. • Channel stabilization and grade control (retaining/crib wall or soldier pile) pending planning study feedback.
22	Oulanka and Tivoli Parks	Coffee Lake Creek	Retrofit Analysis	Four private swales—have not been maintained consistently	MAINT	WQ	N/A	N	Y	• Acquire private swales and conduct restorative maintenance.
23	Creekside Apartments (Boeckman Creek at Wilsonville Rd.)	Boeckman Creek	Boeckman Road Mitigation Study Retrofit Analysis	Underutilized irrigation pond adjacent to Boeckman Creek. Upstream of this location there is an existing outfall to Boeckman Creek that has known erosion issues per the 2012 SMP (BC-5).	CAP	WQ	N/A	N	Y	• Expand water quality treatment through retrofit of existing facility. • Will require private property partnership.

Table 7-2. Unfunded/Future Capital Project Concepts

Project Opportunity Location ID	Location/ Asset Description	Basin	Source	Problem Description	Deficiency Category [a]		Project Background			
					Primary	Secondary	Modeled Capacity Deficiency (Y/N)	Stream Assessment ID Need (Y/N)	Water Quality Retrofit Opportunity (Y/N)	Project Concept
31	Parkway Ave./Metolius Ln.	Willamette River	H/H Model 2012 SMP	Model predicts flooding along N-S run of pipe starting at the 10-yr design storm. Capacity is limited by the small diameter (21") pipes near the outfall which is causing a constriction. Flooding at this location could threaten the adjacent properties along SW Parkway Ave.	CAP		Y	N	N	• Invert elevation in MH prior to outfall are misaligned, causing constriction. • Pipe upsizing and realignment as necessary.
34	Barber St.	Coffee Lake Creek	H/H Model 2012 SMP	Model predicts flooding at several DS nodes prior to Coffee Creek outfall and at node near RR tracks starting at the 25-yr design storm. Backwater conditions from Coffee Creek may be contributing to downstream flooding.	CAP		Y	N	N	• Pipe upsizing and realignment as necessary. No immediate need.
35	Lower Boones Ferry Rd.	Willamette River	H/H Model	Model predicts flooding along private drainage (former Albertsons property) to Boones Ferry Rd starting at the 2-yr design storm. Flooding at this location could impact the commercial properties along SW Boones Ferry Rd.	CAP		Y	N	Y	• Pipe upsizing and realignment as necessary. No immediate need.
42	Ridder Road Wetland Restoration	Coffee Lake Creek	2012 SMP Retrofit Analysis	Current drainage channel is underutilized with invasive vegetation. Referenced as CLC-4 per 2012 SMP.	E&S	MAINT	--	N	Y	• Future restoration/retrofit opportunity.
43	Town Center Conveyance Piping	Boeckman Creek	Community Development Town Center Concept Plan	Public stormwater collection pipe (>15" diameter) per Town Center Concept Plan.	INFRA		--	N	Y	• Additional assets/re-piping is development driven. • New/decommissioned infrastructure pending development activities.

Table 7-2. Unfunded/Future Capital Project Concepts

Project Opportunity Location ID	Location/ Asset Description	Basin	Source	Problem Description	Deficiency Category [a]		Project Background			
					Primary	Secondary	Modeled Capacity Deficiency (Y/N)	Stream Assessment ID Need (Y/N)	Water Quality Retrofit Opportunity (Y/N)	Project Concept
45	SW Miami	Willamette River	H/H Model	Model predicts flooding along 15" piping starting at the 25-yr design storm.	CAP		Y	--	N	• Pipe upsizing and realignment as necessary. No immediate need.
46	Canyon Creek Rd (near Xerox)	Boeckman Creek	H/H Model	Model predicts flooding at node that conveys private stormwater from Xerox to the E across Canyon Creek Rd. starting at the 10-yr design storm.	CAP		Y	--	N	• Pipe upsizing and realignment as necessary. No immediate need.
47	River Fox Park	Willamette River	H/H Model	Model predicted flooding in 12" pipe	CAP		Y	--	N	• Pipe upsizing and realignment as necessary. No immediate need.

N/A = not applicable.

a. Categories include: MAINT=Maintenance; R/R=Repair and Replacement; CAP=Capacity Issue; E&S=Instream Erosion/Sediment Issue; INFRA=New infrastructure need per growth and development; WQ= Water Quality.

7.4 Staffing Evaluation

A supplemental staffing analysis was conducted to support the earlier, maintenance-related staffing evaluation described in Section 3.2. This analysis included both Public Works and Engineering staffing needs in conjunction with 1) new regulatory obligations associated with the City's 2021 NPDES MS4 permit and 2022 Stormwater Management Program (SWMP) Document, and 2) implementation of this SMP.

Specific to implementation of this SMP, additional Engineering staff are required to execute and manage the CPs over the 20-year CIP (see the construction administration cost by CP included in Appendix E). Additional Public Works staff support will be needed to maintain additional assets resulting from CP implementation. Figure 7-2 summarizes the departments and associated activities resulting in the need for additional staff. Summary tables and documentation related to this evaluation are included in Appendix G.

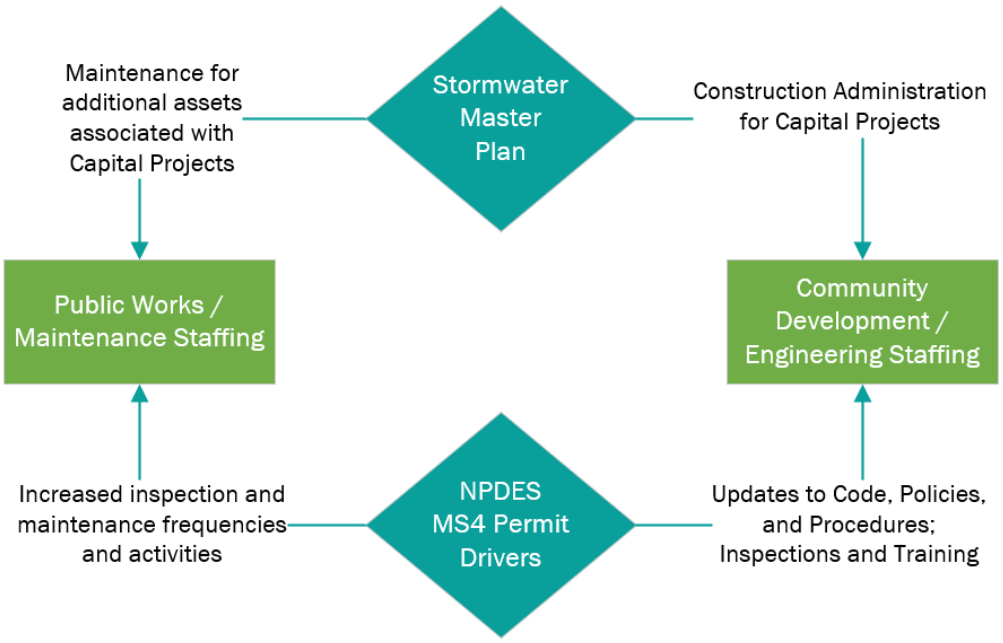


Figure 7-2: Staffing Evaluation Considerations

7.4.1 Assumptions

The following general assumptions were used to develop the staffing evaluation for both Public Works Stormwater staff and Engineering staff. Detailed assumptions specific to staffing estimates by activity are outlined in Appendix G.

- Except for the additional Public Works staffing needs identified in Section 3.2 for deferred maintenance, it is assumed that existing Public Works and Engineering staffing levels were adequate to implement the City's stormwater program and CP implementation prior to reissuance of the City's NPDES MS4 permit or implementation of this SMP. Thus, only additional activities are used to inform additional staff resource needs.
- One FTE represents 1,650 hrs (after deducting estimated annual leaves, training, and other non-task replaced hours); 0.02 FTE represents 40 hrs. For purposes of calculating an equivalent FTE cost estimate, an annual FTE labor cost was assumed at $200,000/year (as confirmed by City staff).

- The NPDES program costs are based on an implementation schedule covering a 5-year permit term (Oct. 1, 2021-Sept. 30, 2026) - reported in tables as Fiscal Years (FY) 2023-2027, with an anticipated administrative extension after FY 2027.
- CPs are assumed implemented on an annual basis, and the CIP is assumed to be implemented over a 20-year implementation schedule, ranging from 2024-2043. Given uncertainty with schedule, CP costs are averaged across the 20-year implementation schedule equally. In practice there will be cycles of more and less staff time demands based on which projects are in construction/constructed.
- For the CPs listed in this SMP, 100 percent of engineering and permitting costs will be used for consultant support, and 100 percent of design/construction administration costs will be required for City Engineering staff.

7.4.2 Results

Table 7-3 provides a summary of the combined Public Works/Stormwater and Community Development/Engineering staffing needs for both the NPDES MS4 Permit driven activities and CP implementation activities. Detailed staffing projections, as reported in Appendix G, reflect FY 2023-2027 in alignment with the NPDES MS4 Permit timeline. However, staffing projections are relatively consistent when annualized and reflect the ongoing implementation of regulatory requirements over the 5-year permit period, as well as an annual average over a 20-year CIP implementation period. Thus, the annual average staffing is reflected below, and rounded to the nearest 0.1 FTE.

Table 7-3. Combined Staffing Assessment Summary

		Increased Staffing (FTE)
		Annual Average
Public Works/Stormwater Staff Cost Schedule	NPDES MS4 Permit Driven Activities	2.1
	Staffing contingency for NPDES MS4 Driven Activities [a]	0.4
	CP Implementation	0.2
	Public Works Staffing Total	2.7
Community Development/Engineering Staff Cost Schedule	NPDES MS4 Permit Driven Activities	0.2
	CP Implementation	1.2
	Community Development Staffing Total	1.4

a. Staffing contingency estimated at 20% to account unscheduled maintenance and response.

For Public Works (Roads and Stormwater Section), an increase of approximately 2.5 FTE is recommended to address both deferred and additional maintenance activities as defined with the reissued NPDES MS4 permit. This increase reflects a 20 percent contingency to account for additional, unscheduled activities as well as prescriptive maintenance efforts. An additional 0.2 FTE increase is anticipated for maintenance of new infrastructure (assets) associated with CIP implementation. However, timing of this 0.2 FTE may vary in accordance with construction of CPs and could be delayed over the 20-year implementation period.

For Community Development (Engineering Division), an increase of approximately 0.2 FTE is recommended to address additional tracking and inspection needs as defined with the reissued NPDES MS4 permit. This may be accommodated through reallocation of existing staffing or contracted support. An additional 1.2 FTE is anticipated to manage and execute contracts for CP

design and construction services. This increase accounts for the 1.0 FTE of engineering staff currently dedicated to overseeing stormwater CP implementation, and reflects the additional staffing need. As with Public Works staffing, timing of this 1.2 FTE may vary in accordance with design and construction schedules and could be delayed over the 20-year implementation period. It should be noted that cost estimates for programmatic activities (i.e., Projects P-1 through P-5) have not been included in the staffing projections.

7.5 Project Prioritization

Project prioritization is an important component of the stormwater master planning process and can provide direction in sequencing projects in accordance with City objectives. This section summarizes the prioritization of CPs for implementation.

For this SMP, a CP prioritization tool was developed to assist with project prioritization. This Multi-Criteria Decision Analysis (MCDA) tool was developed using Microsoft Excel and includes prioritization criteria, scoring mechanism, and weighting factor schemes to present graphical and numeric rankings of CPs. The MCDA tool normalizes City-assigned scores for each criterion and project, which allows better differentiation of relative project performance (difference between best and worst options) and balances variability in scoring. Normalized scores were multiplied by their associated weights and summed to represent the overall project priority. The MCDA tool is intended to be updated on a continual basis; as projects are constructed, they can be removed from the ranking tool and new projects can be included as master plans are updated.

It should be noted that the overall stormwater CIP includes several new programs established to facilitate improvements without dedicated, individual CP consideration. Programs are not prioritized as part of this effort.

7.5.1 Prioritization Criteria

Proposed CPs are developed to address a variety of objectives including increased capacity, new infrastructure needs, maintenance, repair & replacement, water quality, and instream erosion/sediment control.

In consideration of the varied scope of proposed CPs and overlapping project objectives, the following scoring categories were used as the basis for developing project prioritization criteria.

- System Operations: System operations is a collective category representing capacity deficiencies, regular or recurring maintenance needs, and safety and accessibility as related to the location of a proposed issue or deficiency.
- System Condition: System condition reflects known problem areas where repair or replacement of an asset addresses a known or immediate issue.
- Compliance: Compliance reflects a CPs ability to address regulatory drivers including NPDES MS4 permit needs (water quality retrofits needs), TMDL and shade management drivers, and hydromodification risk.
- Other: Other criteria including contributing drainage area, project sequencing and phasing, construction constraints and funding source.

Table 7-4 summarizes the evaluation criteria and scoring guide. The scoring guide helps score projects consistently and advises others that may need to apply the tool in the future. A range of scores, from 0 to 3, is applied to each criterion for every project to yield an unweighted total score. As the City implements projects over time, and as priorities change and evolve, these criteria and the scoring guide can be revised in the CP prioritization tool.

Table 7-4. Project Prioritization Criteria

Criteria	Scoring Definition (3 = High; 2 = Medium; 1 = Lower; 0=Does not address)			
	High (H)	Medium (M)	Lower (L)	Does not address
System Operation-Capacity	• Addresses a reported capacity deficiency (problem area) per Wilsonville Public Works or Engineering, and • Addresses an existing capacity deficiency per hydraulic modeling efforts.	• Addresses a reported capacity deficiency (problem area) per Wilsonville Public Works or Engineering, and • Addresses a lack of infrastructure (infrastructure need)	• Addresses a future capacity/infrastructure need.	• May provide some capacity benefit, but the location has not been identified as an existing or future capacity deficiency.
System Operation-Maintenance	• Addresses a location that has frequent citizen complaints and onsite response requirements.	• Addresses a location that has frequent citizen complaints and will reduce existing maintenance needs.	• Addresses a location that has less frequent citizen complaints and will reduce existing maintenance needs.	• Project does not address existing maintenance deficiency or lack of infrastructure
System Operation-Safety and Accessibility	• Reduces risk near a transit line, school, or backbone utility	• Mitigates risk, including system relocation into the public ROW to avoid collateral damage, safety concerns on private property.	• Reduces risk to non-essential property/minor roadways/structures.	• The identified problem is not anticipated to address safety concerns.
System Condition	• Addresses an immediate system condition need (problem area) where delay may result in immediate property damage or safety concerns.	• Addresses a system condition need (problem area) where delay may result in additional infrastructure deterioration or property damage.	• Replaces an existing City asset.	• The project does not include replacement of an existing asset.
Compliance-Water Quality	• Provides new or enhanced water quality treatment to address pollutants of concern, qualifying as a retrofit project with potential for fee-in-lieu	• Restores or enhances water quality function or coverage, qualifying as a retrofit project only.	• Provides some water quality benefit through sedimentation.	• The project does not include water quality treatment.
Compliance-Vegetation Management	• Restores shade protection (within 100' of stream bank) to address temperature TMDL	• Enhances riparian corridor vegetation coverage; removes invasive species	• Enhances upland vegetation conditions/characteristics.	• No plantings or vegetation enhancement associated with project construction
Compliance-Hydromodification	• Addresses area of known or observed instream erosion that could result in property damage or infrastructure failure.	• Addresses area of known or observed instream erosion that could result in bank stability issues.	N/A	• Project does not address area of known hydromodification impacts
Other-Contributing Area	• Project has regional impacts (drainage area is > 100 acres)	• Project has subbasin impacts (drainage area is > 10 acres)	• Project has local impacts (drainage area is < 10 acres)	
Other-Sequencing	• Project is required as a pre-requisite or preliminary project before another prioritized project need.	N/A	N/A	• Project construction scheduling would not be impacted by other project scheduling needs.
Other-Traffic and Accessibility	• Project construction is not expected to impact traffic or private property	• Construction may impact residential streets.	• Construction may impact collector streets.	• Construction will impact arterial streets or structures on private property are expected
Other-Development Drivers	• Project is a prerequisite to a current construction project.	• Project is required to support future growth and development or a planning area.	N/A	N/A
Other-Funding Source	• Project is eligible for funding via SDCs (50% or greater)	• Project is eligible for funding via SDCs (25%-50%)	• Project is eligible for funding via SDCs (up to 25%)	• Project is not eligible for SDC funding.

7.5.2 Scoring and Weighting Factors

Every CP was reviewed by the City Engineer, Natural Resource Manager, and Public Works Operations Supervisor and scored by assigning a "0" through "3" score to each criterion in accordance with the scoring definitions (Table 7-4).

The MCDA tool includes the ability to incorporate weighting factors schemes that vary based on the importance of various scoring categories and individual criteria. Weighting factor schemes were established in collaboration with City staff including 1) an initial weighting with emphasis on system condition and balanced weights within the system operation and compliance categories, 2) adjusted weighting to emphasize on project sequencing (part of the other category), and 3) emphasis on criteria prioritized by Public Works.

Results of the various weighting schemes were compared, and outcomes discussed internally by the City. These schemes resulted in relatively consistent prioritization of projects, with some projects moving slightly up or down in ranking depending on the scheme. Ultimately, the city selected the initial weighting scheme and opted to make some related project scheduling adjustments in accordance with Public Works feedback. Resulting weighting factors are provided in Table 7-5.

The final, average score for each criterion were multiplied by the weighting factors associated with the select weighting factor scheme and summed for a final project score creating a project ranking.

Table 7-5. Selected Weighting Schema

Scoring Category	Category Weight (%)	Criteria	Criteria Weight (%)
System Operation	30	System Operation - Capacity	10
		System Operation - Maintenance	10
		System Operation - Safety and Accessibility	10
System Condition	25	System Condition	25
Compliance	25	Compliance - Water Quality	8.33
		Compliance - Vegetation Management	8.33
		Compliance - Hydromodification	8.33
Other	20	Other - Contributing Area	5
		Other - Sequencing	5
		Other - Traffic and Accessibility	5
		Other - Development Drivers	2.5
		Other - Funding Source	2.5

7.5.3 Prioritization Results

The CP prioritization tool provides a bar graph that illustrates scoring results (see Figure 7-3). Each bar represents the total score, and each colored segment of the bar represents a specific evaluation criterion so the user can see which criterion played the most prominent role in the scoring results for each project.

The prioritization and ranking of the CPs were reviewed and used to inform the ultimate project scheduling (see Figure 7-1). In general, the highest scoring priority projects are scheduled in the next 5 years (2024-2028); the next level of priority projects are scheduled in the following 5 years (2029-2033); and the remaining priority projects are scheduled 10 years from now (2034-2043). Based on the total number and cost of projects within any one timeframe, some project schedules were adjusted per City feedback (see Table 7-1).

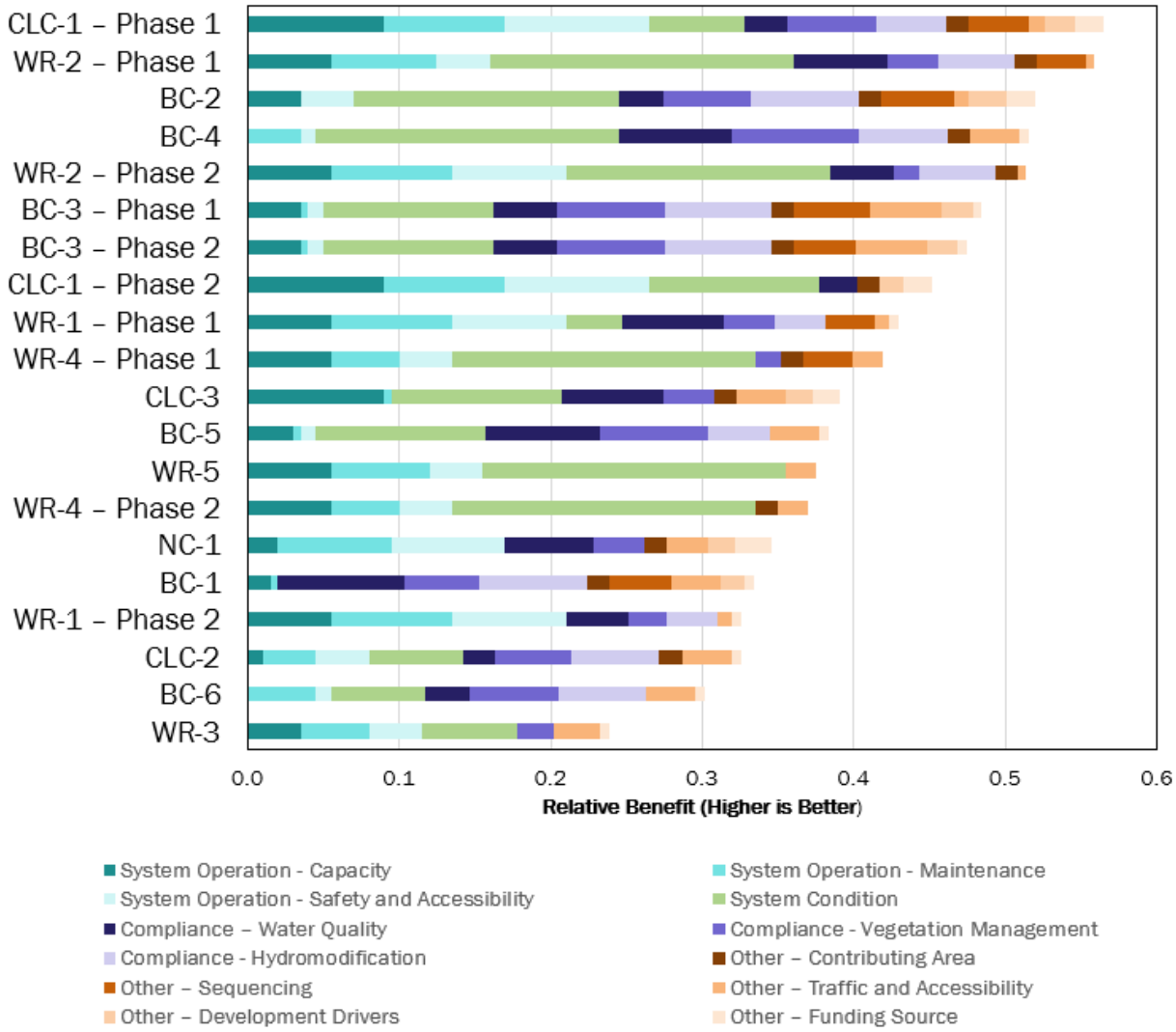


Figure 7-3: Prioritization Results

7.6 Policy Recommendations

The following policy recommendations pertaining to the implementation of this SMP and associated CIP have been referenced in this SMP and are summarized for City consideration:

7.6.1 Stormwater Design Standards Applicable to Town Center

As described in Section 6.3.4, utilization of the Library Pond to mitigate stormwater treatment and flow control for Town Center redevelopment requires a site-specific stormwater design standard applicable to the Town Center property.

The City will need to define a fee-in-lieu program and onsite stormwater mitigation tracking system to ensure adequate capacity in Library Pond is available while adhering to the City's current design standards and definition of predevelopment. Onsite treatment and flow control will need to be provided for 50% of the redeveloped property (both private and public ROW).

7.6.2 Comprehensive Plan Updates

As summarized in Section 2.7, the City of Wilsonville Comprehensive Plan was reviewed with respect to stormwater and consistency with the City's 2021 NPDES MS4 permit to ensure it is current and reflective of continued compliance.

A detailed summary of proposed modifications to the Comprehensive Plan are provided in Appendix H.

7.6.3 Design Standards for New Development and Growth Areas

Capacity-related CPs are sized in accordance with future growth and development, both within the city limits and outside city limits to the extent future zoning is established. Most area subject to new development will be within the City's jurisdiction and subject to the city's stormwater design standards that mimic pre-development flow conditions and require the use of infiltration-based facilities to the maximum extent feasible.

Site constraints occasionally prevented CP design to adhere to the City's design criteria, and in a few cases, flooding or system surcharge is still anticipated with implementation of CPs. Implementation of the City's stormwater design standards help ensure maximum capacity in the downstream stormwater collection system.

There are a few key locations in the City where future development outside of the city limits will be subject to another jurisdictions stormwater design standards (i.e., CP CLC-1: Day Road Stormwater Improvements). Establishing consistent stormwater design standards and design metrics for key Planning Areas (Coffee Creek Industrial Planning Area, Basalt Creek Planning Area) that encompass neighboring jurisdictions including Clean Water Services and the City of Tualatin is recommended to ensure that onsite retention and flow mitigation are applied to these new development areas. This mitigation should mimic pre-development site conditions to reduce the risk of downstream capacity and hydromodification impacts, as well as preserve water quality.

7.6.4 Stormwater Facility Tracking and Maintenance for Private Facilities

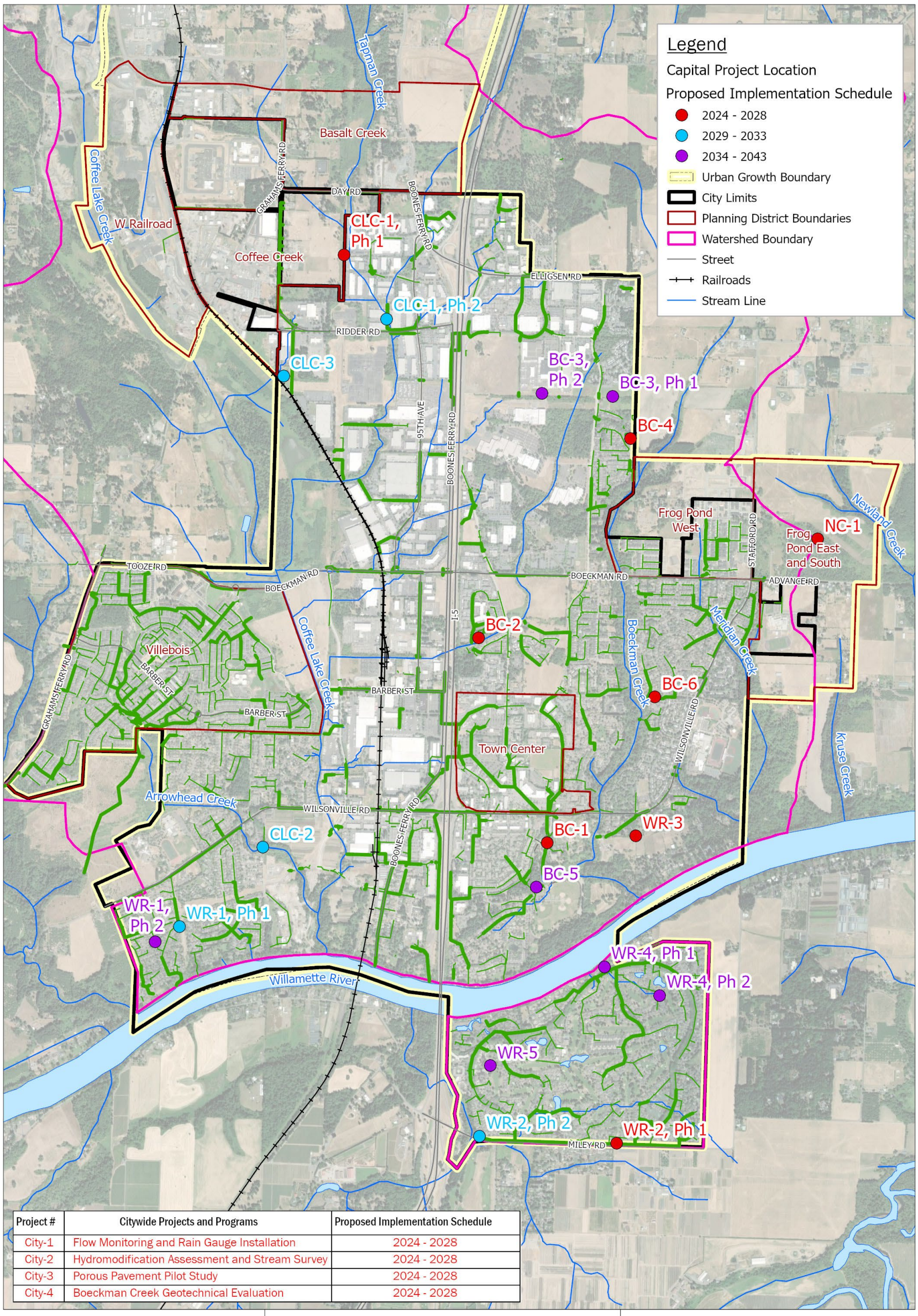
The City's GIS inventory of stormwater treatment and detention facilities is currently being updated to include consistent facility naming conventions (i.e., swales, raingardens, detention ponds) and inclusion of ownership information (specific to private facilities). Such updates will allow better integration between mapping and asset management, as well as allow geographic tracking of maintenance activities and responsibilities.

The City's Stormwater Operations and Maintenance Plan is required for newly installed private facilities to ensure that the owners recognize responsibility for inspections and maintenance of their private stormwater facilities. The Stormwater Operations and Maintenance Plan requirements went into effect in 2012 and require submittal of an Annual Inspection and Maintenance Report by May 1 each year. The City conducts private facility inspections annually, targeting facilities that did not return an Annual Inspection and Maintenance Report.

In conjunction with the identification of problem areas and Project Opportunity Areas, private facilities are routinely observed to have deficient system maintenance, due to inconsistent and infrequent maintenance. In cases where the private facility is not being maintained and functionality is compromised, the City may consider a policy to reassign maintenance responsibility for existing private stormwater facilities and conduct maintenance in accordance with public facility maintenance protocols and schedules, subject to reimbursement by the private facility owner. Implementation of this proposed policy is supported through P-5: Stormwater Facility Enhanced Maintenance Program.

7.7 Next Steps

Following adoption of this Plan, a financial analysis will be required to evaluate the City's current stormwater utility rate and SDCs to ensure adequate funding is available for implementation of CPs and programs outlined in this SMP. The resulting financial plan will provide a funding structure in accordance with the defined LOS that allows the City to implement the CPs and programs as costed and scheduled in this SMP while meeting other financial obligations and policy objectives.



Project #	Citywide Projects and Programs	Proposed Implementation Schedule
City-1	Flow Monitoring and Rain Gauge Installation	2024 - 2028
City-2	Hydromodification Assessment and Stream Survey	2024 - 2028
City-3	Porous Pavement Pilot Study	2024 - 2028
City-4	Boeckman Creek Geotechnical Evaluation	2024 - 2028

Note: Planning Projects City-1 to City-4 and Programs P-1 to P-6 are all city-wide and not specific to a location. Programs P-1 to P-6 assume annualized funding.

Spatial Reference:
Name: NAD 1983 HARN StatePlane Oregon North FIPS 3601 Feet Intl

N

0 0.25 0.5 1 Miles

Brown AND Caldwell

City of Wilsonville/
Project # 156157

Stormwater Master Plan

Figure 7-1: Capital Improvement Projects Prioritization

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Section 8

Limitations

This document was prepared solely for City of Wilsonville in accordance with professional standards at the time the services were performed and in accordance with the contract between City of Wilsonville and Brown and Caldwell dated January 11, 2021. This document is governed by the specific scope of work authorized by City of Wilsonville; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by City of Wilsonville and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

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Section 9

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Appendices

Appendix A: Project Planning Matrices

Appendix B: TM #3: Stormwater Modeling Methods, Assumptions, and Results

Appendix C: TM #2: Stream Assessment

Appendix D: Capital Project Fact Sheets

Appendix E: Capital Project Cost Estimates

Appendix F: Library Pond Analysis

Appendix G: Staffing Evaluation

Appendix H: Comprehensive Plan Review

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