

City of Bend Utilities Public Advisory Group



CITY OF BEND

Location: Hybrid Meeting

In-person: City of Bend Utilities Department, Deschutes Conference Room,
62975 Boyd Acres Road

Online: [Microsoft Teams Meeting Link](#)

Date: September 4, 2024

Time: 11am-12:30pm

Speakers: Lori Faha, City of Bend Environmental Resources Manager
Elisabeth O'Keefe, City of Bend Stormwater Program Manager
Austin Somhegyi, City of Bend Stormwater Master Plan Project Manager
Trista Kobluskie, Stormwater Master Plan Consultant Team
Aubrie Koenig, Facilitator

Meeting Agenda

Purpose: Gather input on prioritization approach for stormwater capital program and for outfall retrofit program.

1. Introduction

2. Stormwater Master Plan Prioritization Criteria

- a. Review and discuss draft Stormwater Master Plan capital improvement program prioritization criteria (see attached matrix).
- b. Discussion questions:
 - i. Do you support the general approach to scoring? What about the relative total score available in each category? And the relative maximum score of each criterion within a category?

3. Stormwater Outfall Retrofit Program

- a. Share overview of outfall regulatory requirement and review findings (see attached memo).
- b. Discussion questions:
 - i. Does the prioritization approach for outfall retrofits make sense?

4. UPAG Discussion

5. Summary and Closing

UPAG Meeting Roadmap *draft*



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<p>October 2, 2024 11am-12:30pm Hybrid: in-person at City Boyd Acres site or virtual on Teams</p>	<p>OCT 2024 UPAG MEETING: Stormwater Program & Master Plan</p> <ul style="list-style-type: none">• Stormwater program regulatory updates: discuss erosion control requirements for small construction sites and share next steps to update UIC standards for groundwater protectiveness• Stormwater Master Plan policy topics: discuss climate change and drainage and density policies <p><i>Outcome: Feedback on potential policy solutions in master plan.</i></p>
<p>November 6, 2024 11am-12:30pm Hybrid: in-person at City Boyd Acres site or virtual on Teams</p>	<p>NOV 2024 UPAG MEETING: Water Conservation Program</p> <ul style="list-style-type: none">• Discuss turf rebate pilot year results and planning for next year• Discuss scope for program effectiveness review• Get input on communications campaign development <p><i>Outcome: Input on water conservation program planning for 2025.</i></p>
<p>December 4, 2024 11am-12:30pm Hybrid: in-person at City Boyd Acres site or virtual on Teams</p>	<p>DEC 2024 UPAG MEETING: Annual Review</p> <ul style="list-style-type: none">• Introduce new members• Review 2024 highlights and how UPAG advice is being used• Preview 2025 topics and input areas <p><i>Outcome: Welcome new members and refine meeting roadmap for 2025!</i></p>



Accessible Meeting Information

This meeting/event location is accessible. Sign language interpreter service, assistive listening devices, materials in alternate format such as Braille, large print, electronic formats, or any other accommodations are available upon advance request. Please contact Lori Faha at lfaha@bendoregon.gov or (541) 317-3025; Relay Users Dial 7-1-1. Providing, at least, 3 days' notice prior to the event will help ensure availability.

Bend Stormwater Master Plan
CIP Rating Criteria - UPAG Discussion Draft
7/31/24

Weight	High Score	Max Total	Criterion	Description	Scoring Concept
1. Conveyance & Flooding					
1.00	5	5.00	Frequency of Flooding Event	Does the project reduce flooding and if yes, for flooding at what frequency?	Projects that address more frequent floods receive more points.
1.00	5	5.00	Flooding Severity/Risk Avoidance	What types of properties or assets will be protected from flooding under this project? What risks to the traveling public will be avoided under this project?	Projects that address flooding that damages private property or has serious traffic impacts receive more points.
Max points		10.00			
2. Water Quality Improvements					
3.00	5	15.00	Surface Water and Groundwater Protection	Did the drill hole or outfall rate highly in a needs analysis to identify UICs or outfalls that are most in need and best suited to water quality retrofit?	Projects that address already-prioritized drillholes and outfalls receive more points.
1.00	5	5.00	Permit Compliance	Does the project assist in meeting WPCF or MS4 Permit requirements?	Projects that assist in meeting WPCF or MS4 Permit requirements receive more points.
Max points		20.00			
3. Multiple Benefits					
0.75	5	3.75	Increases Equitable Distribution of Public Stormwater Assets	Does the project provide drainage and stormwater management where public storm system is lacking OR does the project serve a location with a traditionally underserved population identified by City of Bend?	Projects that are located where City storm system is not present and that will serve populations living 200% below the federal poverty level (by Census Block Group) or have a relatively high minority populations receive more points. Point values gradually reduce as poverty and minority population percentages reduce.
0.25	5	1.25	System Longevity	Does the project rehabilitate an existing asset or improve the function or longevity of an existing asset?	Projects receive either maximum points or no points.
0.25	5	1.25	Synergy	Is it a "Synergy" project?	Projects receive either maximum points or no points.
0.50	5	2.50	Maintenance Safety/Access	Does the project improve the ease of maintenance and/or safety of staff during maintenance?	Projects receive either maximum points or no points.
0.25	5	1.25	Community Partnerships	Will the project be developed in partnership with an organization such as Bend Park and Recreation District or Upper Deschutes Watershed Council?	Projects receive either maximum points or no points.
1.00	5	5.00	Supports Housing or Economic Development	Does the project support urban renewal or production of middle or affordable housing?	Projects receive maximum points if they are located at the intersection of 3 types of City focus areas listed here; points reduce with fewer types of focus areas: - Urban Renewal District - Economic Improvement District - Enterprise Zone - Opportunity Area
Max points		15.00			
4. Recognized Priority Projects					
2.00	5	10.00	Staff Priority	Is the project an agreed priority for City staff?	Points are awarded based on City Utilities Operations staff priorities (1-3). One point is available for Engineering and Compliance staff priorities.
1.00	5	5.00	UPAG Priority	Did the project received support when presented to the Utilities Public Advisory Group?	Points are graduated based on degree of support from UPAG.
Max points		15.00			
5. Feasibility & Cost					
1.00	5	5.00	Complexity / Site Constraints	Does a physical condition such as proximity to a water well, landslide, or unfractured bedrock or need to acquire significant property mean that a solution is likely higher cost than a similar project in a less complex location?	Projects receive more points when they have less complex site conditions. Site conditions may not be known when scoring. Engineering judgement and information from City staff will be used to score.
1.00	5	5.00	Low Cost	Is the project a low-cost solution?	Projects with low initial capital costs and low ongoing maintenance costs receive maximum points. Points reduce with higher capital cost and higher ongoing maintenance cost.
Max points		10.00			

Max Points 70.00

Bend Stormwater Master Plan
CIP Rating Criteria - UPAG Discussion D
7/31/24

Weight	High Score	Max Total	Criterion	Discussion Notes
1. Conveyance & Flooding				
1.00	5	5.00	Frequency of Flooding Event	
1.00	5	5.00	Flooding Severity/Risk Avoidance	Should we move property damage (exterior) to moderate severity?
Max points		10.00		
2. Water Quality Improvements				
3.00	5	15.00	Surface Water and Groundwater Protection	UPAG indicated that protecting groundwater and protecting the Deschutes are top priorities.
1.00	5	5.00	Permit Compliance	Most projects that receive a 5 score above will also receive this score. Other projects that may receive this score could have education components, illicit discharge elimination components, or source control components.
Max points		20.00		
3. Multiple Benefits				
0.75	5	3.75	Increases Equitable Distribution of Public Stormwater Assets	Exact scoring criteria will be further discussed with Bend Long Range Planning. First, it acknowledge that some areas of the City have little public drainage infrastructure. Second, it gives additional points to any project within an area designated as having a traditionally underserved population. The definitions and extents of these areas are under discussion.
0.25	5	1.25	System Longevity	UPAG indicated equal priority with extending the lives of current facilities and building new facilities. Other programmatic solutions may also address repair/replacement of existing infrastructure.
0.25	5	1.25	Synergy	
0.50	5	2.50	Maintenance Safety/Access	
0.25	5	1.25	Community Partnerships	
1.00	5	5.00	Supports Housing or Economic Development	Exact scoring criteria will be further discussed with Bend Long Range Planning. There is an underserved population map (https://www.bendoregon.gov/government/departments/bend-metro-planning-organization/transportation-data/demographic-and-population-data) that may assist. A lot of grants are heavily weighting project impact to community and disadvantaged communities.
Max points		15.00		
4. Recognized Priority Projects				
2.00	5	10.00	Staff Priority	
1.00	5	5.00	UPAG Priority	We may also ask the general public for input, depending on the roll-out of the public involvement plan. \We would use general public input to finalize the priority order later, when writing the implementation plan.
Max points		15.00		
5. Feasibility & Cost				
1.00	5	5.00	Complexity / Site Constraints	
1.00	5	5.00	Low Cost	We will be asking for City Utilities Operations staff input on ongoing maintenance cost of various facility types.
Max points		10.00		

Max Points 70.00



Memorandum

To: Austin Somhegyi, City of Bend
From: Trista Kobluskie, Philip Kenyon, PE
Copies: Lori Faha, Elisabeth O'Keefe, File
Date: August 27, 2024
Subject: Outfall Retrofit Needs Assessment
Project No.: 20359

Introduction

The City of Bend is updating its Stormwater Master Plan (SMP) and is reviewing its existing stormwater outfalls to identify retrofit needs and opportunities. Stormwater in the City of Bend discharges predominantly into underground injection controls (UICs). However, the area around the Deschutes River north of Farewell Bend Park discharges to the river itself. Geographic Information System (GIS) records indicate that there are 31 outfalls owned by the City of Bend. An outfall is a point discharge from the City's Municipal Separate Storm Sewer System (MS4) into the river. A majority of these outfalls are not located on City-owned property and are located either on Bend Park and Recreation Department (BRPD) properties or located on other private properties. This Outfall Retrofit Needs Assessment studies the characteristics of each outfall's contributing basin with respect to its pollution source potential and incorporates information about the condition and accessibility of the stormwater pipes and outfalls.

Purpose

The purpose of this Outfall Retrofit Needs Assessment is to document the City's stormwater quality retrofit objectives and to identify the outfalls most in need of retrofit when considering the objectives. Subsequent analyses will identify potential projects to retrofit the highest priority outfalls. The City's MS4 permit requires the following: "The permittee must develop a Stormwater Quality Retrofit Strategy that addresses areas identified by the permittee as having an impact on water quality, and that are underserved, difficult to maintain in its current design, or lacking stormwater quality controls.

- A. The stormwater retrofit strategy must be based on a permittee-defined set of stormwater quality retrofit objectives and a comprehensive evaluation of a range of retrofit control measures and its appropriate use. The permittee-defined objectives must prioritize progress toward improving water quality.
- B. The permittee must submit a stormwater retrofit strategy document with permittee-defined objectives with the fourth annual report, due to the Oregon Department of Environmental Quality by November 1, 2025.

Stormwater Quality Retrofit Objectives

The City has identified the protection of the public, natural resources, water quality, and the preservation of existing City infrastructure as primary goals for their Master Plan. The stormwater quality retrofit objectives described below will support these goals.

Urban stormwater runoff is known to carry a variety of pollutants, including metals, oils, chemicals, bacteria, and nutrients. An emerging group of dissolved contaminants of concern are per- and polyfluoroalkyl substances (PFAS). The City of Bend utilizes Magnesium Chloride (MgCl) for deicing operations during the winter months. The Deschutes River from Spring River to North Unit Diversion Dam (AU_ID = OR_SR_1707030104_05_102628) is listed as Category 5 Impaired for sedimentation, temperature (year round), turbidity, and pH, and is listed as Category 4 Impaired for flow modification and habitat modification. Sedimentation, turbidity and pH can all be influenced by urban stormwater.

The City staff has documented numerous instances of inlet clogging and movement of particulate material around and through the stormwater system in undesirable/unintended ways. These challenges can be referred as pretreatment challenges. Lack of pretreatment contributes to stormwater pollution in a couple of ways. First, when inlets are clogged with sediments, inlet capacity is reduced, leading to runoff flowing for longer distances over impervious surfaces and picking up more pollutants. Second, some sediments are conveyed through the piped system and discharged to the river along with pollutants that may adsorb to the particles. Typical pretreatment systems provide capture/removal of particulate matter and floatable materials.

The City staff has also documented both poor condition and maintenance access issues through camera inspection and maintenance records. Where condition or access issues have been documented, the need for retrofit is coupled with a need for repair or redesign of the pipe system.

The stormwater quality retrofit objectives are:

1. Reduce polluted discharges from largest contributing areas that do not already have treatment.
2. Prioritize removal of typical urban stormwater pollutants from higher intensity land uses.
3. Prioritize protecting the capacity and function of existing stormwater conveyance, treatment and infiltration facilities.
4. Prioritize retrofits for outfalls where repairs, rehabilitation, or realignment of pipes and structures is necessary to correct poor condition and/or lack of access to public infrastructure.

Needs Analysis

Otak has developed a framework for prioritizing outfall basins for retrofit in collaboration with the City of Bend by calculating a score identifying need for retrofit for each outfall basin. The score is calculated based on the following criteria: untreated area, pollutant load, sediment load, and maintenance access/pipe condition. Scoring for each criterion is explored below.

Untreated Areas

Reducing polluted discharges from the largest contributing areas that do not already have treatment has been identified as a water quality objective. There are 32 outfall drainage basins as shown in Figure 1. Three basins have multiple outfalls and are identified as such. One basin (labeled "TBD") is delineated in the City's stormwater inventory but has no associated point outfall identified with it in the inventory. The

City identified one very large basin draining to the Newport outfalls. Based on conversations with the City about the recent improvements along Newport Avenue, this large basin has been divided into two smaller basin polygons for the purposes of this assessment. The basins range in size from 0.2 acres to 497.4 acres. For the purposes of this assessment, areas within the MS4 basins draining to runoff treatment facilities or UICs are considered treated areas that are not in need of retrofit. Approximate treated areas are represented visually on Figure 1 and have been tabulated in Table 7.

Treated areas have been estimated at a planning level as follows:

- UICs: approximately 150 UICs have been identified within the boundaries of the outfall drainage basins. Each UIC is assumed to have 12,500 square feet of area draining to it based on a GIS analysis conducted by the City (City of Bend, 2024). Private stormwater swales: private stormwater swales are assumed to provide runoff treatment for the tax lots on which they are located.
- Public stormwater swales: public stormwater swales are assumed to have been sized using a 6% sizing factor, i.e., the swale area is 6% of the area that drains to it. While this rationale is not included in the COSM, it is a simplified approach used in low-infiltration (2 in/hr or less) areas in parts of north-western Oregon. Clean Water Services utilizes a 6% sizing factor (CWS, 2019).
- Contech StormFilter® cartridge vaults and catch basins: we collected drainage basin size for each StormFilter® vault by reviewing the drainage report.

After calculating treated area within a basin, the remaining basin area is considered untreated.

Untreated Area Scores

Outfall basins are scored from 0 to 3 according to the acreage of untreated area as shown in Table 1.

Table 1 Untreated Areas Scoring

Untreated Area (ac)	Score	Basins in this Category (each)
0-10	0	17
10-50	1	8
50-150	2	4
150+	3	2

Pollutant Load

Removal of typical urban stormwater pollutants has been identified as a water quality objective. Pollutant loads can be correlated to land uses and high-traffic roadways. A desktop GIS review of roadway classifications revealed that only moderate variation of roadway types is present within the outfalls study area, with the highest polluting roadways in the City (highways, etc.) being located outside of the area. However, roadways are spatially correlated with land uses such that higher-traffic count roads are adjacent to more intense land uses. Therefore, for this assessment both land use and roadway pollutant intensity are represented by the City’s established zoning. Otak classified zoning into three intensities of pollutant generation, as follows:

- Low pollutant generating land uses include residential, urban reserve, professional offices, and most public facilities such as parks and schools (those with less than 80% impervious area). Zoning codes included in this category are RL, RS, RM, RM-10, RH, UAR, PO, and PF.

- Moderate pollutant generating land uses include mixed uses and commercial uses, as well as public facilities with more than 80% impervious area. A visual inspection of the public facilities within the outfall drainage basins shows two bridge areas as being more than 80% impervious. Zoning codes included in this category are ME, MR, MN, MU, CB, CC, CL, CG, and CN.
- High pollutant generating land uses include industrial and special planned districts. Zoning codes included in this category are IG, IL, and SM.

Pollutant Load Scores

Outfalls are scored from 0 to 3 for pollutant load based on the relative amounts of area in each land use category. Table 2 summarizes the scoring for this factor. The scoring is additive; an outfall basin is awarded a point for each criterion it meets.

Table 2 Pollutant Load Scoring

Description	Add Score	Basins Eligible for this Point (each)
Only "Low" Loading	0	20
Any amount of "High" Loading	Add 1	1
At least 1 acre of "Moderate" Loading	Add 1	10
More than 10 acres of "Moderate" Loading	Add 1	4
Maximum Score is 3		

The counts of basins by total score are listed below:

- Score 0: 20 basins
- Score 1: 7 basins
- Score 2: 4 basins
- Score 3: 0 basins

Sediment Load

Protecting the capacity and function of existing stormwater treatment and infiltration facilities has been identified as a water quality objective. Under existing conditions, the City has collected evidence through tracking drainage complaints and maintenance service calls that sediment in the collection and conveyance system from erosion and winter street maintenance threatens the capacity, function, and longevity of collection, conveyance, and runoff treatment systems within the outfalls basins.

Within the MS4 area, Awbrey Butte has slopes greater than 15%, which then flatten out as it approaches the river (slopes less than 5% slope). Although portions of Awbrey Butte have been developed under more recent and more protective stormwater standards, sediment is still deposited and transported to storm systems on the roads due to runoff flowing over bare or erodible soils and landscaping and sanding for winter traction (HDR, 2017). City staff reported that some of the main roads that lead up or down from Awbrey Butte transport significant sediment.

The City of Bend has soils that are predominantly friable and non-cohesive (GSI, 2020). Older parts of the City are lacking curb and gutter infrastructure. In some cases, low exposure curbs approximately three inches tall are present. In these locations, loose sediment readily moves across roadways, alleys,

sidewalks, driveways, paths, etc. during storms. The City applies sand during the winter to provide traction during icy conditions. The steepest roads in the City receive the most sand.

The City’s staff reported that most of their catch basins have sumps, but the depth of these sumps may vary. The City has also identified that some of the filter media cartridge treatment vaults lack pretreatment structures that would extend the service life of the cartridges by capturing trash and larger sediment particles prior to runoff entering the filter vault. Implementation of pretreatment vaults would lessen frequency of clogging of filters and bypassing of flows during storm events.

For the purposes of this assessment, site topography has been identified as an indicator of higher sediment loads.

Slopes have been separated into three categories: “Flat,” “Moderate,” and “Steep.” Flat slopes are defined as less than 5% slopes, Moderate slopes are greater than or equal to 5% and less than or equal to 15% slopes, and Steep slopes are defined as greater than 15% slopes.

Sediment Load Scores

We calculated a “slope factor” in Excel for each outfall basin derived from the inverse of the relative proportions of each slope category normalized against basin size. Then we calculated a score for slope from the slope factor, where higher slope factors are associated with higher scores. Larger slope factors correspond to higher scores (Table 3).

Table 3 Sediment Load Scoring

Slope Factor	Score	Basins in this Category
0.00-0.25	0	7
0.25-0.40	1	15
0.40-0.55	2	4
0.55-1.00	3	5

Related Known Issues

The preliminary planning steps for the Stormwater Master Plan have identified numerous known issues within the outfall basins. Additional emphasis is given in this assessment where there are documented pipes or structures in poor condition based on closed-circuit television (CCTV) investigation, documented maintenance access issues, drainage issues, or documented sedimentation issues. See related known issues descriptions in the notes on Table 7.

Related Known Issues Scoring

The City has provided a list of drainage known issues with priority scores attached to them. A score of 3 (the highest score) is given to outfall identified by the City’s maintenance team as being “Priority 1” or highest priority known issue. Of the remaining known issues within the MS4 permit area, the only “Priority 2” known issue was in the same basin as a “Priority 1” known issue and the only “Priority 3” known issue was listed as being already resolved as of July 2024. After review of each of the specific known issues in each basin, a score of 0, 1, or 2 was applied based on engineering judgement of severity of the known issues. A total of 8 outfall basins have related active known issues.

Scoring Input

The scoring input values were geo-processed and mapped for visualization (Figure 2, Figures attached).

Results

The outfalls are scored from 0 to 9 by adding scores for each of the four factors above. Increasing score corresponds to increasing need for retrofit.

The average score of the outfall basins using the above scoring criteria is a score of 3. The top seven highest scoring basins have scores of 4-9. At the low end of scoring, three basins received scores of 0. Figure 1 below provides a histogram of the outfall scoring.

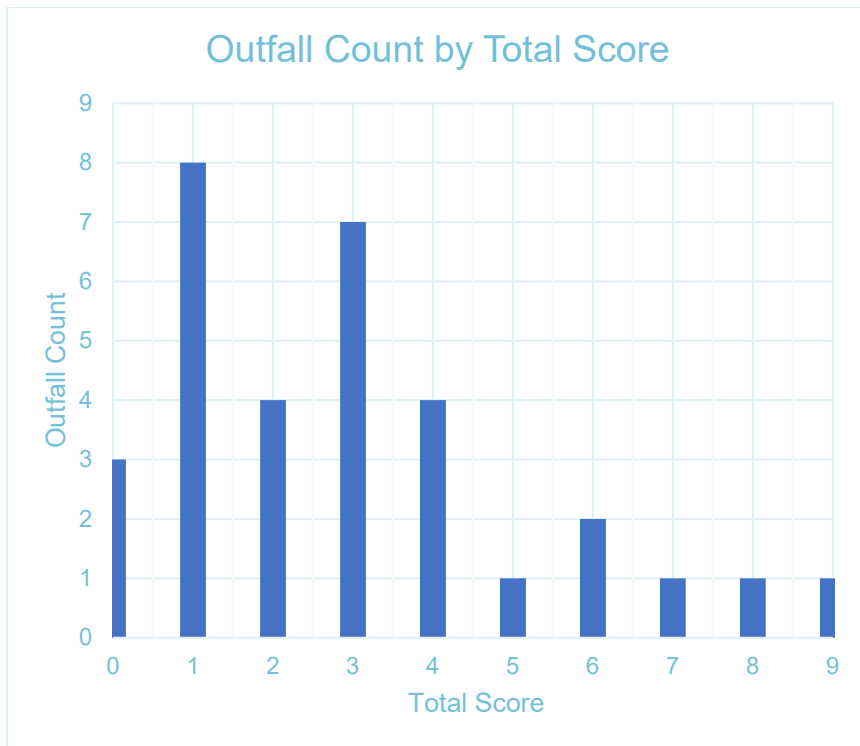


Figure 1 Outfall Retrofit Needs Score Distribution Chart

We ranked basins based on score. See Table 4 below for the outfalls in alphanumeric order, with high score / low rank denoting greatest need. There are many “tie” scores between outfalls. See Conclusions for recommendations to proceed.

Table 4 Outfall Basins' Scores and Ranks

Outfall ID	Untreated Score	Slope Score	Zoning Score	Known Issue Score	Total Score	Rank
DOF000012	0	1	0	0	1	22
DOF000013	3	3	0	0	6	4
DOF000016	0	0	0	0	0	30
DOF000017	1	0	0	0	1	22
DOF000018	1	0	2	3	6	4
DOF000019	1	1	0	2	4	7
DOF000020	2	1	2	2	7	3
DOF000022	1	1	0	1	3	11
DOF000024	2	3	1	2	8	2
DOF000034	0	1	0	0	1	22
DOF000039	2	2	0	0	4	7
DOF000040	0	1	0	0	1	22
DOF000065	0	0	1	0	1	22
DOF000066	0	1	1	0	2	18
DOF000070	0	0	0	0	0	30
DOF000108	0	1	0	0	1	22
DOF000109	0	0	0	0	0	30
DOF000110	0	1	0	0	1	22
DOF000125	0	2	1	0	3	11
DOF000127	1	1	2	0	4	7
DOF000128	1	1	0	3	5	6
DOF000130	1	1	0	0	2	18
DOF000131	2	1	1	0	4	7
DOF000192	0	2	0	0	2	18
DOF000193	0	1	0	2	3	11
DOF000200 & DOF000222 & DOF000223	0	0	1	0	1	22
DOF000207	0	3	0	0	3	11
DOF000220	0	3	0	0	3	11
DOF000221	0	2	1	0	3	11
DOF000266 & DOF000014S	2	1	0	0	3	11
DOF000266 & DOF000014N	3	3	0	3	9	1
TBD	1	1	0	0	2	18

Conclusions

Otak recommends that the highest six ranked basins be considered in the next stage of the master plan. The highest-ranking basin is very large (nearly 500 acres) and has numerous opportunities for potential retrofits. The basins recommended for further consideration are listed as ranked in Table 5.

Table 5 Priority Outfalls for Further Consideration

Outfall ID	Total Score	Rank
DOF000266 & DOF000014N	9	1
DOF000024	8	2
DOF000020	7	3
DOF000013	6	4
DOF000018	6	4
DOF000128	5	6

There is a four-way tie for the seventh-ranked outfalls, which the City could consider in an additional phase of outfall retrofits, as listed in Table 6.

Table 6 Secondary Outfalls for Further Consideration

Outfall ID	Total Score	Rank
DOF000019	4	7
DOF000039	4	7
DOF000127	4	7
DOF000131	4	7

Figure 3 (Figures attached) shows that the outfall basins ranking highest in need are mostly located west of the Deschutes river and tend to be larger basins. Large basins offer opportunities for larger “regional” facilities that simplify maintenance by centralizing captured pollutants. The “DFO000266 & DOF000014” basin has been split into north (N) and south (S) subbasins for this purpose. Even though these two subbasins outfall to the same location, there have been significant improvements to the south subbasin along Newport Avenue. There remain many opportunities in the South Awbrey Butte area to the north. The rating and ranking classified the large north basin as the highest priority basin. A challenge with regional facilities is often the space that they require (whether vegetated or underground), which can be prohibitively expensive where valuable real estate / easements must be purchased. Regional vegetated/above-ground facilities may be difficult to locate due to the land uses in the most highly ranked basins. However, stormwater pretreatment systems such as hydrodynamic separators may centralize pollutants for easier maintenance if they can be located within the existing right-of-way.

Table 7 Outfall Rating and Ranking

Outfall ID	Basin Area	Untreated Area			Slopes								Zoning						Related Known Issues			Total Score and Rank	
		Untreated Area (acres)	Untreated Percentage	Untreated Score	Steep (acres)	Steep (percentage)	Moderate (acres)	Moderate (percentage)	Flat (acres)	Flat (percentage)	Slope Factor	Slope Score	High Load (acres)	High Load (percentage)	Medium Load (acres)	Medium Load (percentage)	Low Load (acres)	Low Load (percentage)	Zoning Score (See Notes Table)	Known Issues (See Notes Table)	Issues Score	Total Score	Rank
DOF000012	3.7	3.7	100%	0	0.1	4%	0.7	18%	2.9	78%	0.36	1	0	0%	0.0	0%	3.7	100%	0	0	1	22	
DOF000013	170.4	160.3	94%	3	16.9	10%	75.4	44%	78.1	46%	0.58	3	0	0%	0.0	0%	170.5	100%	0	0	6	4	
DOF000016	7.9	7.9	100%	0	0.0	0%	0.7	8%	7.2	91%	0.16	0	0	0%	0.0	0%	7.9	100%	0	0	0	30	
DOF000017	11.2	11.0	98%	1	0.0	0%	1.3	11%	9.9	88%	0.20	0	0	0%	0.0	0%	11.2	100%	0	0	1	22	
DOF000018	24.2	20.5	85%	1	0.2	1%	2.4	10%	21.5	89%	0.20	0	0	0%	19.0	79%	5.2	21%	2	Yes	3	6	4
DOF000019	11.3	11.1	98%	1	0.1	1%	1.8	16%	9.3	83%	0.29	1	0	0%	0.0	0%	11.3	100%	0	Yes	2	4	7
DOF000020	56.0	52.7	94%	2	0.6	1%	9.6	17%	45.8	82%	0.30	1	0	0%	11.0	20%	45.0	80%	2	Yes	2	7	3
DOF000022	21.4	21.0	98%	1	0.3	2%	4.2	20%	16.8	79%	0.34	1	0	0%	0.0	0%	21.3	100%	0	Yes	1	3	11
DOF000024	70.4	65.9	94%	2	10.7	15%	21.7	31%	37.9	54%	0.59	3	0	0%	4.6	6%	65.9	94%	1	Yes	2	8	2
DOF000034	0.7	0.6	75%	0	0.0	0%	0.2	22%	0.6	77%	0.36	1	0	0%	0.0	0%	0.7	100%	0	0	1	22	
DOF000039	97.1	91.7	94%	2	10.2	11%	18.0	19%	68.9	71%	0.45	2	0	0%	0.7	1%	96.4	99%	0	0	4	7	
DOF000040	14.4	9.4	65%	0	0.3	2%	2.9	20%	11.2	78%	0.35	1	0	0%	0.0	0%	14.4	100%	0	0	1	22	
DOF000065	9.2	8.9	97%	0	0.2	2%	1.0	11%	8.0	87%	0.24	0	0	0%	1.0	11%	8.2	89%	1	0	1	22	
DOF000066	1.3	1.1	89%	0	0.1	5%	0.2	17%	1.0	77%	0.37	1	0	0%	1.3	100%	0.0	0%	1	0	2	18	
DOF000070	1.4	1.4	100%	0	0.0	0%	0.1	6%	1.3	94%	0.12	0	0	0%	0.0	0%	1.4	100%	0	0	0	30	
DOF000108	0.3	0.3	100%	0	0.0	11%	0.0	4%	0.3	82%	0.31	1	0	0%	0.1	43%	0.2	57%	0	0	1	22	
DOF000109	0.4	0.4	100%	0	0.0	0%	0.0	6%	0.3	93%	0.14	0	0	0%	0.4	100%	0.0	0%	0	0	0	30	
DOF000110	4.2	4.2	100%	0	0.1	2%	0.7	17%	3.4	81%	0.31	1	0	0%	0.0	0%	4.2	100%	0	0	1	22	
DOF000125	0.8	0.6	79%	0	0.1	8%	0.2	27%	0.5	64%	0.51	2	0.3	34%	0.0	6%	0.4	59%	1	0	3	11	
DOF000127	52.7	32.6	62%	1	1.7	3%	6.6	13%	44.5	84%	0.27	1	0	0%	45.5	86%	7.2	14%	2	0	4	7	
DOF000128	12.7	12.7	100%	1	0.1	1%	2.0	16%	10.6	83%	0.28	1	0	0%	0.0	0%	12.7	100%	0	Yes	3	5	6
DOF000130	20.0	19.5	98%	1	0.6	3%	3.8	19%	15.6	78%	0.35	1	0	0%	0.0	0%	20.0	100%	0	0	2	18	
DOF000131	67.4	63.6	94%	2	0.3	0%	10.2	15%	56.9	84%	0.26	1	0	0%	2.6	4%	64.8	96%	1	0	4	7	
DOF000192	7.8	6.8	87%	0	0.9	11%	1.6	21%	5.3	68%	0.48	2	0	0%	0.0	0%	7.8	100%	0	0	2	18	
DOF000193	7.8	7.5	96%	0	0.5	6%	1.3	16%	6.1	77%	0.37	1	0	0%	0.0	0%	7.8	100%	0	Yes	2	3	11
DOF000200 & DOF000222 & DOF000223	1.1	1.0	88%	0	0.0	0%	0.1	8%	1.0	91%	0.17	0	0	0%	1.0	89%	0.1	11%	1	0	1	22	
DOF000207	0.2	0.2	100%	0	0.1	31%	0.0	29%	0.1	39%	0.67	3	0	0%	0.2	100%	0.0	0%	0	0	3	11	
DOF000220	3.7	3.4	92%	0	0.3	7%	1.6	44%	1.8	48%	0.56	3	0	0%	0.0	0%	3.7	100%	0	0	3	11	
DOF000221	1.6	1.3	85%	0	0.1	5%	0.4	24%	1.1	70%	0.45	2	0	0%	1.6	100%	0.0	0%	1	0	3	11	
DOF000266 & DOF000014S	95.3	55.1	58%	2	2.1	2%	17.5	18%	75.8	79%	0.33	1	0	0%	16.1	17%	79.2	83%	0	0	3	11	
DOF000266 & DOF000014N	497.4	486.5	98%	3	73.5	15%	278.6	56%	145.2	29%	0.58	3	0	0%	0.6	0%	496.9	100%	0	Yes	3	9	1
TBD	11.5	10.6	93%	1	0.3	3%	2.3	20%	8.9	77%	0.36	1	0	0%	0.0	0%	11.5	100%	0	0	2	18	

Updated 8/27/2024

Related Known Issues Notes

Outfall ID	Description
DOF000018	Rationale: Score this as 3, City identified two "Priority 1" issues in the basin related to long pipe runs with limited access for maintenance.
DOF000019	Rationale: Score this as 2, City reported that this issue occurred at multiple places in the neighborhood, and this was concern for private property.
DOF000020	Rationale: Score this as 2, Tear in the pipe represents potential sinkhole concern.
DOF000022	Rationale: Score this as 1, CCTV shows root intrusion and a void but no outward indicators of an issue.
DOF000024	Rationale: Score this as 2, damage to pipe is a potential safety concern (though it is on private property), there are reported inlet clogging problems, and some flooding.
DOF000128	Rationale: Score as 3, there are multiple "Priority 1" issues identified by the City staff in this basin.
DOF000193	Rationale: Score as 2, gas line through a pipe with a "huge void" is a safety and utility concern.
DOF000266 & DOF000014 N	Rationale: Score as 3, Awbrey Butte is one of the highest priority stormwater issue locations in the City.

Zoning Notes

Outfall ID	Description
DOF000266 & DOF000014 S	Rationale: This basin ranks highly based on land use zone, however Newport Ave has had significant improvements to treat runoff, substantially attenuating the impact of the land use zoning. This basin has been scored "zero" for zoning.

References

GSI, 2020. *Stormwater Infiltration Evaluation Update*. October 2020. GSI Water Solutions, Inc.

HDR, 2017 *South Awbrey Butte Drainage Study Final Improvement Plan*. October 17, 2017.
HDR Engineering, Inc.

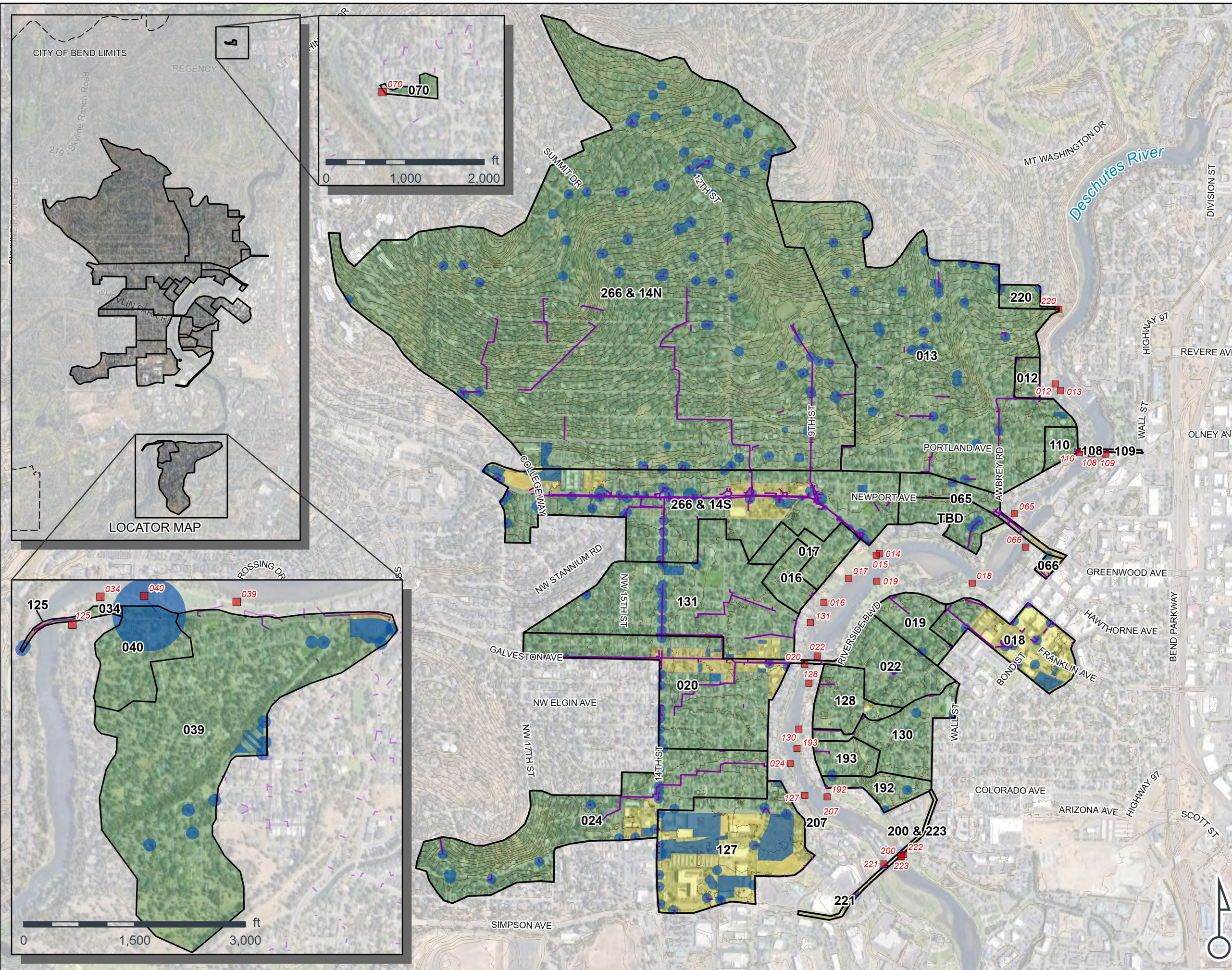
Central Oregon Intergovernmental Council, 2010. *Central Oregon Stormwater Manual*.
Update August 2010.

CWS, 2019. *Design and Construction Standards, Chapter 4*. Clean Water Services. November 12, 2019.

City of Bend, 2024. *Groundwater Protectiveness Demonstration Update for Per- and Polyfluoralkyl Substances (PFAS), City of Bend, Oregon*. April 14, 2024.

Figures

FIGURE 2
STORMWATER OUTFALL
NEEDS ASSESSMENT INPUTS
BEND STORMWATER MASTER PLAN
BEND, OREGON

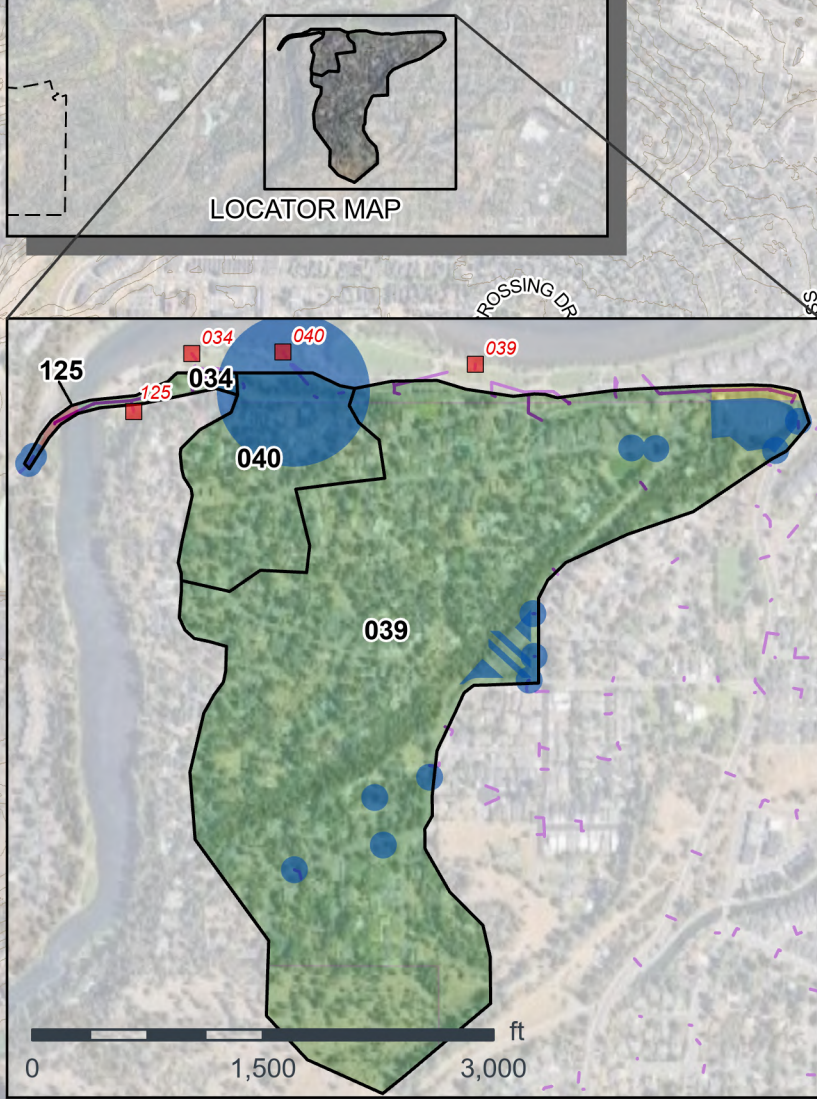
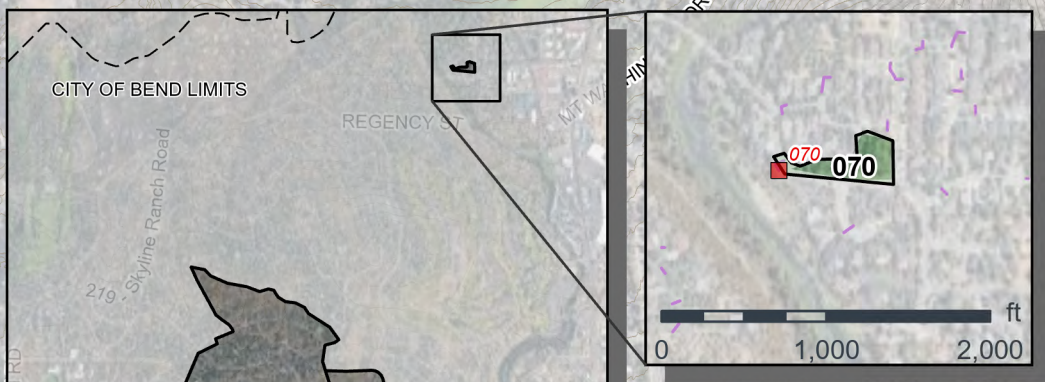


LEGEND

- Outfalls
- Storm Main
- Outfall Basin Delineation
- Representative Treated Areas
- Contours (10')

Zoning Type Pollutant Load

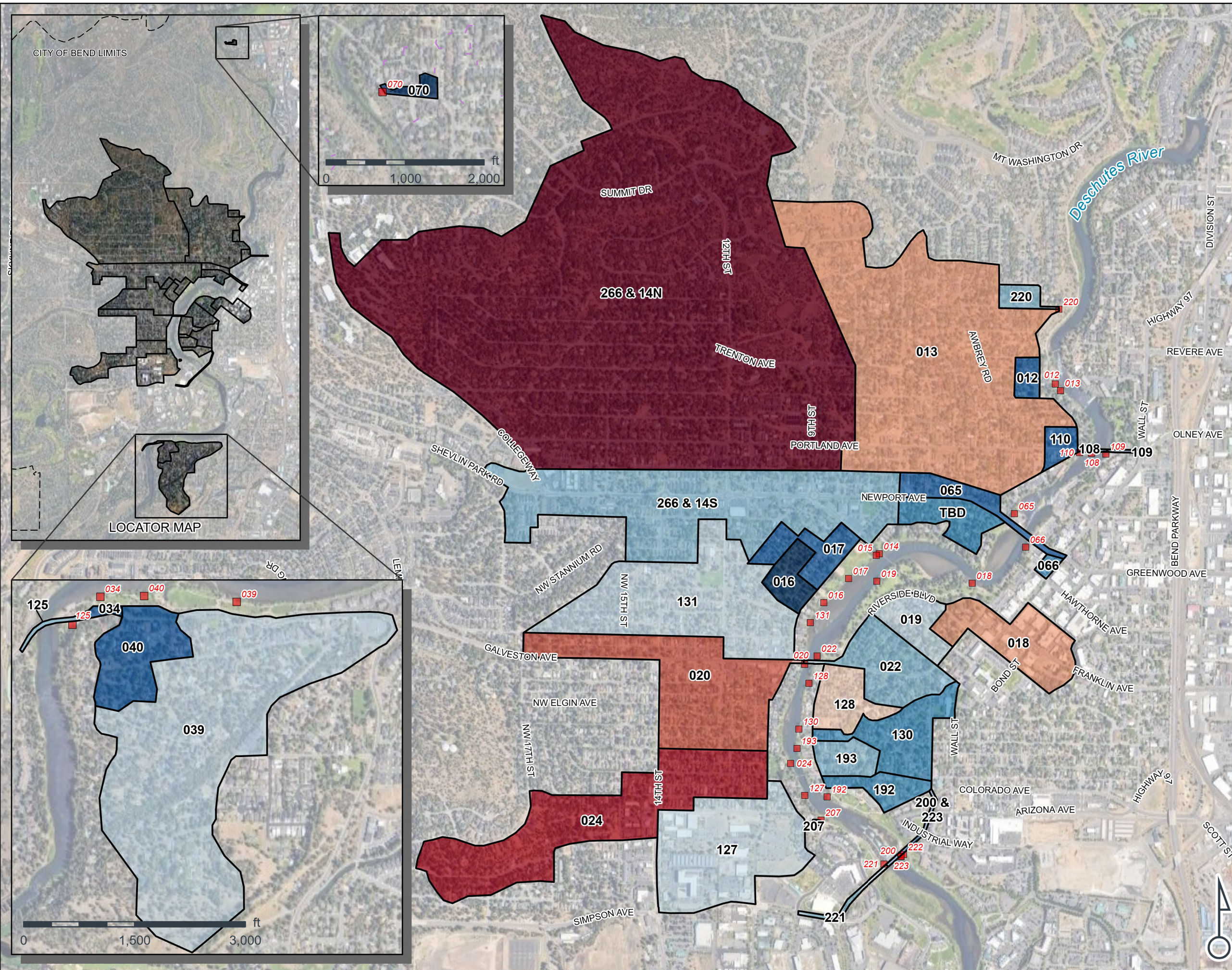
- High
- Moderate
- Low



Data Sources: City of Bend, USGS, Google Maps.
 Date: 8/20/2024
 Disclaimer: This data is not to survey accuracy and is meant for planning purposes only.



FIGURE 3
STORMWATER OUTFALL
Basin Ranking
BEND STORMWATER MASTER PLAN
BEND, OREGON



LEGEND

- Outfall Basin Delineation
- Outfalls

Outfall Basin Ranking

Rank

- 1
- 2
- 3
- 4
- 6
- 7
- 11
- 18
- 22
- 30



Data Sources: City of Bend, USGS, Google Maps.
 Date: 8/27/2024
 Disclaimer: This data is not to survey accuracy and is meant for planning purposes only.

