murraysmith

CITY OF BEND

Collection System Public Facility Plan

JUNE 2018

COLLECTION SYSTEM
PUBLIC FACILITY PLAN
(June 2018)

CITY OF BEND, OREGON

MURRAYSMITH, INC
888 SW 5th Avenue, Suite 1170
Portland, Oregon 97204

Table of Contents

List of Tables

List of Figures

CITY OF BEND GOAL 11 COLLECTION SYSTEM PUBLIC FACILITY PLAN (Update June 2018)

Introduction and Summary

This 2018 public facility plan (PFP) has been created in compliance with the requirements of Goal 11, Public Facilities Planning, and the implementing rule for the planned land uses under the Bend Comprehensive Plan (2016). The previous PFP was published and adopted in 2014 with the City of Bend's (City) Collection System Master Plan (CSMP, 2014). Subsequently, the City performed an Urban Growth Boundary Expansion Study (UGB Study, 2016) adopting an expanded UGB in 2016. The expanded UGB includes redevelopment areas within the City limits and 2,380 acres of expansion lands. This 2018 PFP replaces the 2014 PFP. This 2018 PFP documents capital improvement projects to support growth in the new UGB including the expansion lands.

The purpose of the plan is to help assure that development within the UGB is guided and supported by the types and levels of urban facilities and services appropriate for the needs and requirements of the areas to be served, and that those facilities and services are provided in a timely, orderly and efficient arrangement, as required by Goal 11 and its implementing administrative rule at Oregon Administrative Rule (OAR) 660-011.

PFP Goal 11 Compliance Components

This PFP includes the following Goal 11 compliance components:

a) An inventory and general assessment of the condition of all the significant public facility systems which support the land uses designated in the Bend Comprehensive Plan (2016);

b) A list of the significant public facility projects which are to support the land uses designated in the acknowledged comprehensive plan;

c) Rough cost estimates of each public facility project;

d) Written description of each public facility projects;

e) Policy statement(s) or urban growth management agreement identifying the provider of each public facility system. If there is more than one provider with the authority to provide the system within the area covered by the public facility plan, then the provider of each project shall be designated;

f) An estimate of when each facility project will be needed; and

g) A discussion of the City's existing funding mechanisms and the ability of these and possible new mechanisms to fund the development of each public facility project or system.

Relationship of the Collection System 2018 PFP with previous Collection System Planning Documents

In 2014, the City Council adopted the CSMP for the Bend UGB (See Ordinance 2231). One of the appendices to this CSMP was a Collection System PFP that was developed to satisfy the goal and administrative rule requirements for Statewide Planning Goal 11, Public Facilities and Services. The 2014 PFP was Appendix C to the CSMP.

This 2018 PFP replaces the 2014 PFP and represents the primary sewer collection planning document upon which the City will rely for capital improvement programming and when working with land use applicants on potential projects that require a sewer collection improvement. This 2018 PFP includes an updated Table 23 that is the Capital Improvement Program (CIP) developed for this PFP. This table includes projects originally identified in the 2014 CSMP and reflected in the 2014 PFP. New projects have been added to Table 23 to reflect new locations and sizes of key interceptors (e.g. North Interceptor Phases 1 through 3), and to provide sewer collection service to areas recently added to the Bend UGB in 2016.

The City will look to the projects in this 2018 PFP, first to inform capital improvement programming, and when working with developers to determine if a project has been identified that can provide sewer service to their proposed development. Where the tables in this 2018 PFP Update do not include data related to a project, the City will then look to the projects identified in the 2014 CSMP for project reference information and specifications, which is incorporated by reference into this PFP for this purpose. It is located at the City website at the following address.
https://www.bendoregon.gov/government/departments/engineering/master-plans-and-analyses/collection-system-master-plan

OAR 660-011-0010(1)(a) – Inventory and General Assessment

The City's primary wastewater collection system is generally comprised of access structures, gravity pipelines, lift stations and force mains that convey sewage to its water reclamation facility (WRF). In general, gravity and pressurized pipelines convey wastewater from the residential and commercial areas to the core of the system, where a large sewer interceptor ultimately transfers the sewage to the WRF. Due to the varied topography and lack of localized and regional gravity pipes in the City, 86 small, regional lift stations have been constructed to convey sewage to the WRF.

Existing System Condition Evaluation

The condition assessment evaluates the current physical state or performance of an asset and compares the current condition to a "like-new" condition. The evaluation is the result of City Operations &Maintenance (O&M) Department sewer access structure inspections, visual pipe inspections, closed-circuit television (CCTV) inspections and O&M personnel input. These condition assessments were developed over the course of several meetings during the development of the 2014 CSMP including workshops and staff interviews.

The components of the collection system subject to condition evaluation include the gravity piping and lift stations. Information related to replacement costs for force mains and pressure systems is included; however, the City has not inspected their condition. Historically, some developments were served by shallow gravity pipes and common pressure mains to expedite sewer service hook-ups. This has led to many small area and residential lift stations, which have increased O&M requirements. These lift stations often feed into a common pressure main with multiple pumping system tie-ins. The City no longer allows this type of sewer system installation and wants to replace the common pressure systems with either gravity systems, or pumping systems with dedicated force mains. The proposed interceptor projects will allow for the decommissioning of many lift stations with gravity service. A local-area improvement fund is also being proposed as part of the capital improvement plan that will, over time, provide sewer service to unsewered areas and improve poorly performing portions of the existing collection system.

Condition Rating of Plant Interceptor

The existing plant interceptor is comprised of a gravity pipeline and a double-barrel siphon near the WRF. The interceptor begins near the North Unit Canal crossing of Purcell Boulevard and discharges to the WRF. The gravity portion is 19,738 feet long and is comprised of 30-, 36-, and 42-inch reinforced concrete pipe. The double-barrel siphons are 21- and 36-inch diameter reinforced concrete pipe each approximately 4,882 feet long.

In 2013, the gravity portion of the plant interceptor and the siphon were inspected by an independent consultant. The gravity portion was evaluated using a combination of digital scanning, laser profiling, and sonar profiling. The siphon was inspected using sonar profiling. The access structures along the plant interceptor were inspected using a combination of digital scanning and man-entry inspection. In summary, approximately 31% of the gravity plant interceptor was rated grade-5, and approximately 37% contained grade-4 defects. The sonar profiling of the siphon did not detect any structural issues in the siphon pipes. However, there was a large accumulation of grease and debris detected in the siphon pipes. The majority of access structures were in good condition, with only ten exhibiting grade-4 or grade-5 defects (requiring near-term improvements).

Condition Rating of Gravity Pipelines

The City's collection system is comprised of gravity pipes between 4 and 48 inches in diameter and totaling approximately 380 miles. Based on information provided by the City's geographical information system (GIS), Tables 1 through 3 present a summary of the physical characteristics of the primary collection system's gravity piping. In order to understand phases and trends in the construction of the system, two attributes have been summarized together: Table 1 presents installation year and diameter, Table 2 installation year and material, and Table 3 material and diameter. Figures 1, 2, and 3 present diameter, installation year, and materials, respectively.

Table 1
Gravity Pipe – Installation Year and Diameter Summary

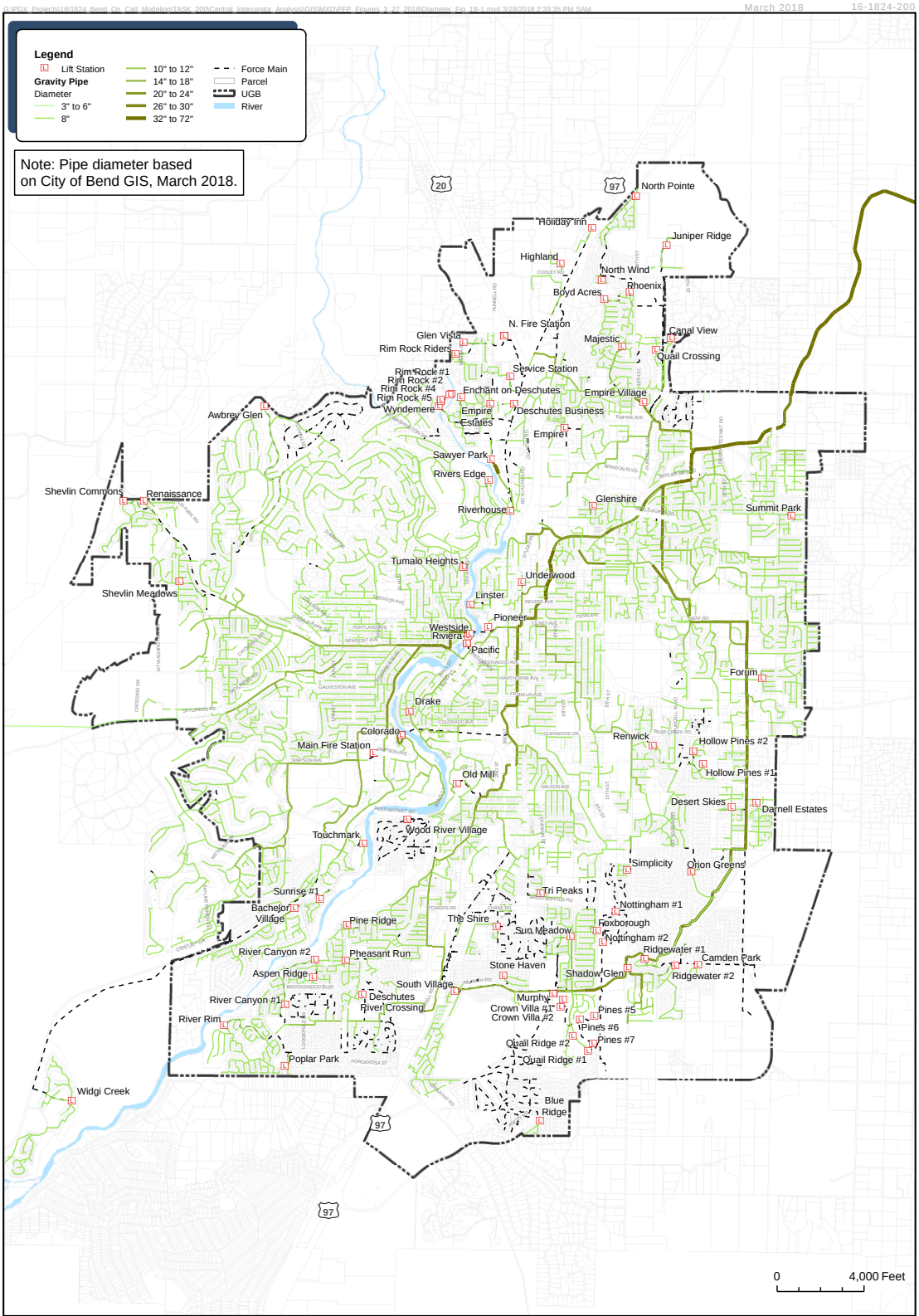
Diameter (inch)	Installation Year - Length (1,000 feet)							Percent
	Unknown	Pre 1970	1970-1979	1980-1989	1990-1999	2000-2009	2010-2017	
4	0	0	0	0	2	0	0	**0%**
6	0	0	46	3	6	6	9	**3%**
8	0.1	9	329	78	447	641	126	**81%**
10	0	2	22	13	21	9	10	**4%**
12	0	2	15	3	21	6	2	**2%**
15	0	0	16	1	9	7	5	**2%**
16	0	2	1	0	0	0	0	**0%**
18	0	0	3	0	16	1	6	**1%**
20	0	2	0	0	0	0	0	**0%**
21	0	0	6	7	5	2	0	**1%**
24	0	0	9	0	3	0	13	**1%**
27	0	1	10	1	0	0	1	**1%**
30	0	0	4	1	0	0	17	**1%**
36	0	0	3	17	0	1	0	**1%**
42	0	0	0	9	0	0	0	**0%**
48	0	0	0	0	0	0	0	**0%**
Percent	**0%**	**1%**	**23%**	**7%**	**26%**	**33%**	**9%**	**100%**

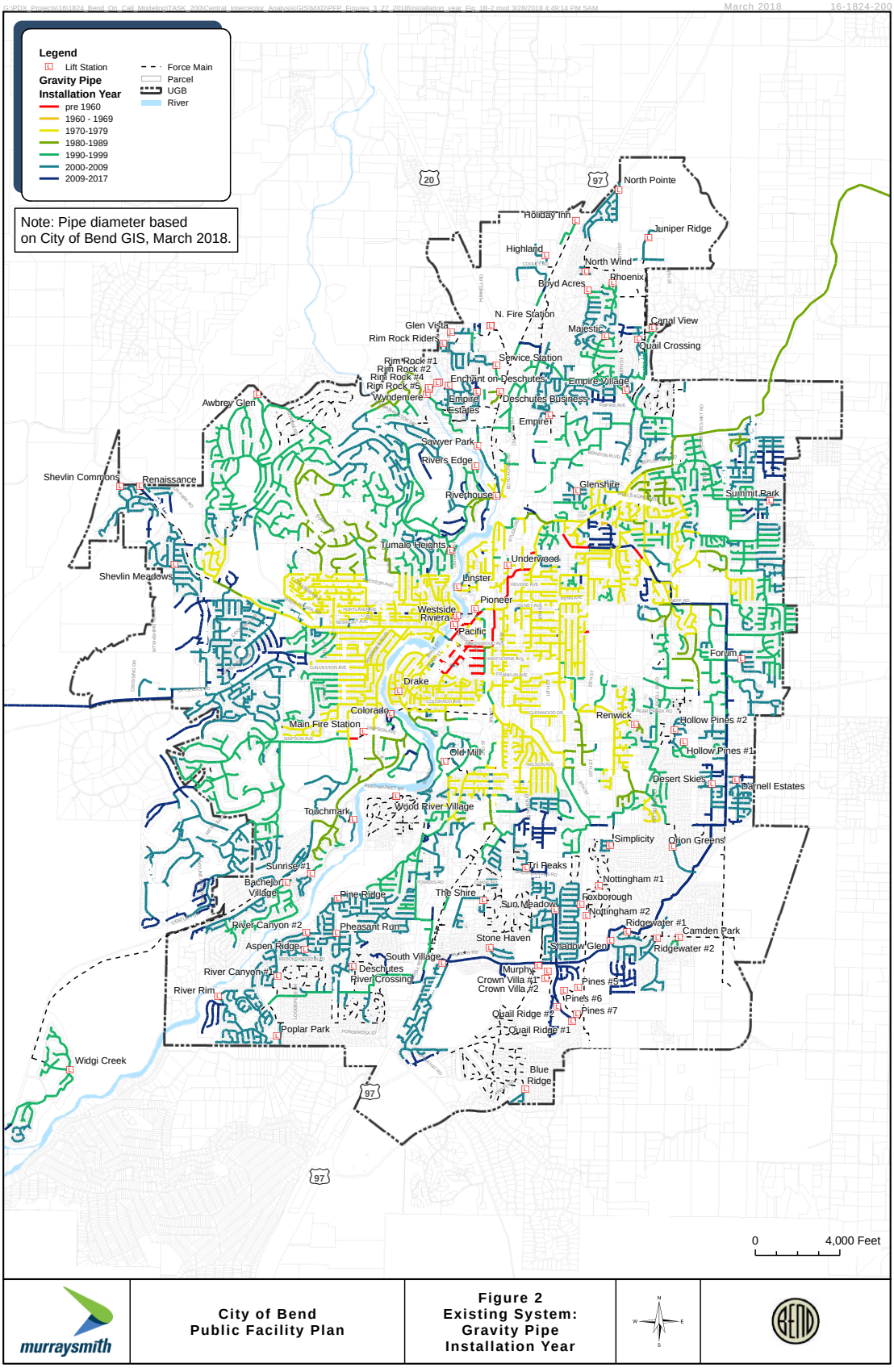
Table 2
Gravity Pipe – Installation Year and Material Summary

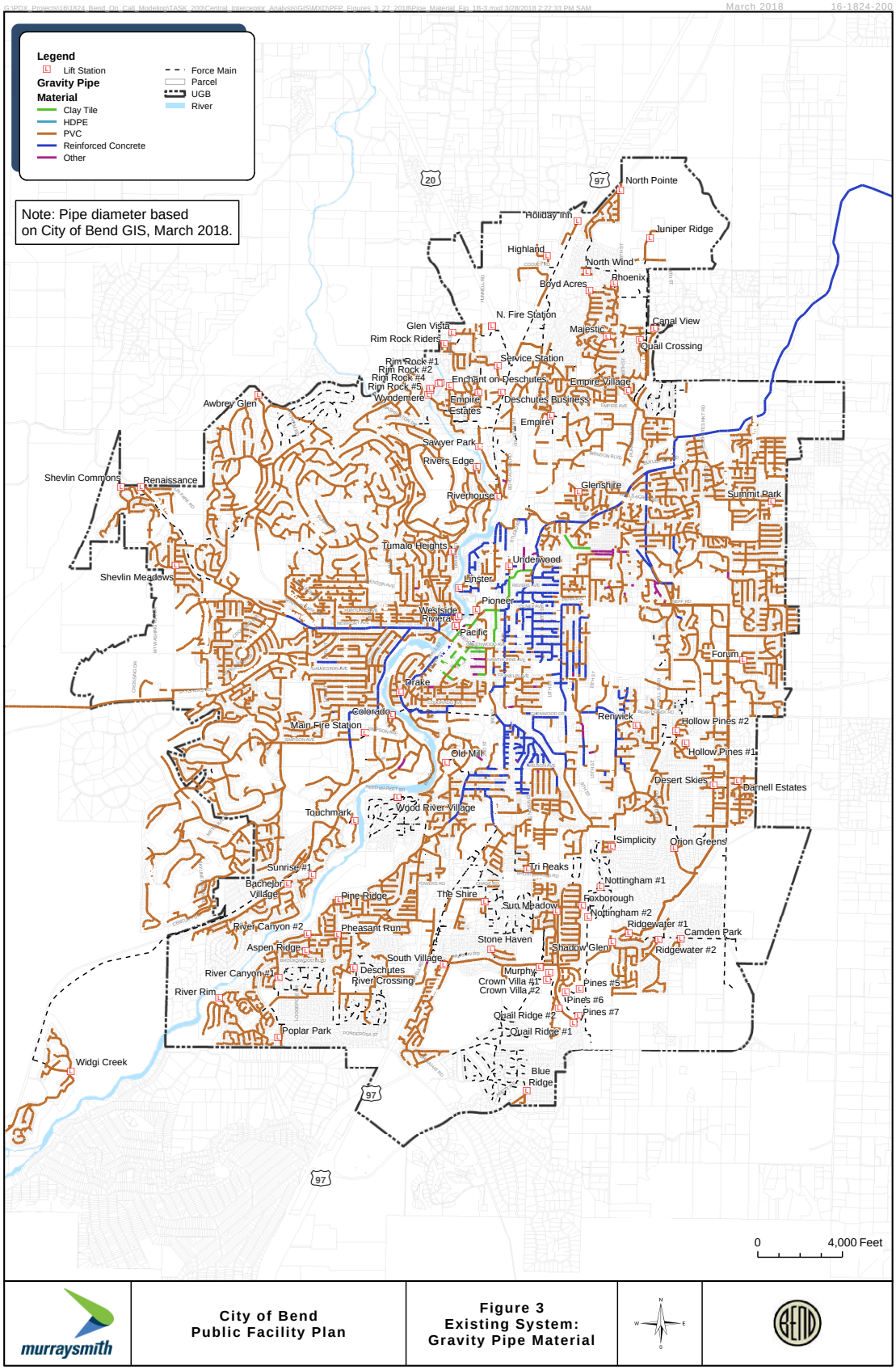
Material	Installation Year - Length (1,000 feet)							Percent
	Unknown	Pre 1970	1970-1979	1980-1989	1990-1999	2000-2009	2010-2017	
Asbestos Cement (AC)	0	0	2	0	0	0	0	**0%**
Cast Iron (CAS)	0	0	0	0	0	0	0	**0%**
Clay Tile (CT)	0	13	1	0	0	0	0	**1%**
Concrete Pipe (non-reinforced) (CP)	0	2	10	1	0	0	0	**1%**
Ductile Iron Pipe (DIP)	0	0	1	0	1	0	0	**0%**
High Density Polyethylene (HDPE)	0	0	0	0	0	0	8	**0%**
Vitrified Clay Pipe (VCD)	0	0	0	0	0	0	0	**0%**
Polyvinyl Chloride (PVC)	0	2	307	97	528	672	182	**89%**
Reinforced Concrete Pipe (RCP)	0	1	142	36	0	1	0	**9%**
Transite Pipe (TP)	0	0	1	0	0	0	0	**0%**
Other	0	0	0	0	0	0	0	**0%**
Percent	**0%**	**1%**	**23%**	**7%**	**26%**	**33%**	**9%**	**100%**

Table 3
Gravity Pipe – Material and Diameter Summary

Diameter (inch)	Material - Length (1,000 feet)											Percent
	Asbestos Cement (AC)	Cast Iron (CAS)	Clay Tile (CT)	Concrete Pipe (non-reinforced) (CP)	Ductile Iron Pipe (DIP)	High Density Polyethylene (HDPE)	Vitrified Clay Pipe (VCD)	Polyvinyl Chloride (PVC)	Reinforced Concrete Pipe (RCP)	Transite Pipe (TP)	Other	
4	0	0	0	0	0	0	0	2	0	0	0	**0%**
6	0	0	0	0	0	0	0	67	2	0	0	**3%**
8	1	0	6	12	1	6	0	1531	73	0	0	**81%**
10	1	0	2	0	1	0	0	64	10	0	0	**4%**
12	0	0	2	0	0	1	0	33	12	0	0	**2%**
15	0	0	0	0	0	0	0	25	14	0	0	**2%**
16	0	0	2	0	0	0	0	0	0	1	0	**0%**
18	0	0	0	0	0	0	0	23	3	0	0	**1%**
20	0	0	2	0	0	0	0	0	0	0	0	**0%**
21	0	0	0	0	0	0	0	9	11	0	0	**1%**
24	0	0	0	0	0	0	0	16	9	0	0	**1%**
27	0	0	0	0	0	1	0	0	12	0	0	**1%**
30	0	0	0	0	0	0	0	17	6	0	0	**1%**
36	0	0	0	0	0	0	0	1	19	0	0	**1%**
42	0	0	0	0	0	0	0	0	9	0	0	**0%**
48	0	0	0	0	0	0	0	0	0	0	0	**0%**
Percent	**0%**	**0%**	**1%**	**1%**	**0%**	**0%**	**0%**	**89%**	**9%**	**0%**	**0%**	**100%**


G:\PDX_Projects\16\1824_Bend_On_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\PFP_Figures_3_27_2018\Diameter_Fig_1B-1.mxd 3/28/2018 2:33:35 PM SAM
March 2018
16-1824-200
Legend
Lift Station
Gravity Pipe Diameter
3" to 6"
8"
10" to 12"
14" to 18"
20" to 24"
26" to 30"
32" to 72"
Force Main
Parcel
UGB
River
Note: Pipe diameter based on City of Bend GIS, March 2018.
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Rhoenix
Boyd Acres
N. Fire Station
Canal View
Majestic
Glen Vista
Rim Rock Riders
Quail Crossing
Service Station
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Enchant on Deschutes
Empire Village
Empire Estates
Deschutes Business
Empire I
Awbrey Glen
Sawyer Park
Rivers Edge
Shevlin Commons
Renaissance
Riverhouse
Glenshire
Summit Park
Tumalo Heights
Underwood
Shevlin Meadows
Linster
Pioneer
Westside
Riviera
Pacific
Forum
Drake
Colorado
Renwick
Hollow Pines #2
Main Fire Station
Hollow Pines #1
Old Mill
Desert Skies
Darnell Estates
Touchmark
Wood River Village
Simplicity
Orion Greens
Sunrise #1
Tri Peaks
Nottingham #1
Bachelor Village
Foxborough
Pine Ridge
The Shire
Sun Meadow
Nottingham #2
Ridgewater #1
River Canyon #2
Pheasant Run
Camden Park
Stone Haven
Aspen Ridge
Shadow Glen
Ridgewater #2
South Village
Deschutes River Crossing
Murphy
River Canyon #1
Crown Villa #1
Crown Villa #2
Pines #5
River Rim
Pines #6
Pines #7
Quail Ridge #2
Poplar Park
Quail Ridge #1
Widgi Creek
Blue Ridge
20
97
0
4,000 Feet
murraysmith
City of Bend
Public Facility Plan
Figure 1
Existing System:
Gravity Pipe
Diameter


C:\PDX_Projects\16\1824_Bend_Op_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\PFP_Figures_3_27_2018\installation_year_Fig_1B-2.mxd 3/28/2018 4:49:14 PM SAM
March 2018
16-1824-200
Legend
Lift Station
Force Main
Gravity Pipe
Parcel
Installation Year
UGB
River
pre 1960
1960 - 1969
1970-1979
1980-1989
1990-1999
2000-2009
2009-2017
Note: Pipe diameter based on City of Bend GIS, March 2018.
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Rhoenix
Boyd Acres
N. Fire Station
Canal View
Majestic
Glen Vista
Rim Rock Riders
Quail Crossing
Service Station
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Enchant on Deschutes
Empire Village
Empire Estates
Deschutes Business
Awbrey Glen
Empire
Sawyer Park
Rivers Edge
Shevlin Commons
Renaissance
Glenshire
Summit Park
Riverhouse
Tumalo Heights
Underwood
Shevlin Meadows
Bunster
Pioneer
Westside
Riviera
Pacific
Forum
Drake
Colorado
Renwick
Main Fire Station
Hollow Pines #2
Old Mill
Hollow Pines #1
Desert Skies
Barnell Estates
Touchmark
Wood River Village
Simplicity
Onion Greens
Sunrise #1
Tri Peaks
Nottingham #1
Bachelor Village
Pine Ridge
The Shire
Foxborough
Sun Meadow
Nottingham #2
Ridgewater #1
River Canyon #2
Pheasant Run
Camden Park
Stone Haven
Aspen Ridge
Shadow Glen
Ridgewater #2
South Village
Deschutes River Crossing
Murphy
River Canyon #1
Crown Villa #1
Crown Villa #2
Pines #5
River Rim
Pines #6
Pines #7
Quail Ridge #2
Poplar Park
Quail Ridge #1
Widgi Creek
Blue Ridge
20
97
0
4,000 Feet
murraysmith
City of Bend
Public Facility Plan
Figure 2
Existing System:
Gravity Pipe
Installation Year
N
W
E
S


G:\PDX_Projects\16\1824_Bend_On_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\PFP_Figures_3_27_2018\Pipe_Material_Fig_1B-3.mxd 3/28/2018 2:22:33 PM SAM
March 2018
16-1824-200
Legend
Lift Station
Gravity Pipe Material
Clay Tile
HDPE
PVC
Reinforced Concrete
Other
Force Main
Parcel
UGB
River
Note: Pipe diameter based on City of Bend GIS, March 2018.
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Phoenix
Boyd Acres
N. Fire Station
Glen Vista
Rim Rock Riders
Majestic
Canal View
Quail Crossing
Service Station
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Enchant on-Deschutes
Empire Village
Deschutes Business
Empire Estates
Empire
Awbrey Glen
Sawyer Park
Rivers Edge
Shevlin Commons
Renaissance
Riverhouse
Glenshire
Summit Park
Tumalo Heights
Underwood
Shevlin Meadows
Linster
Pioneer
Westside
Riviera
Pacific
Forum
Drake
Colorado
Renwick
Hollow Pines #2
Main Fire Station
Old Mill
Hollow Pines #1
Desert Skies
Darnell Estates
Wood River Village
Touchmark
Simplicity
Orion Greens
Sunrise #1
Tri Peaks
Nottingham #1
Bachelor Village
Pine Ridge
The Shire
Foxborough
Sun Meadow
Nottingham #2
Ridgewater #1
River Canyon #2
Pheasant Run
Camden Park
Stone Haven
Aspen Ridge
Shadow Glen
Ridgewater #2
South Village
River Canyon #1
Deschutes River Crossing
Murphy
Crown Villa #1
Crown Villa #2
Pines #5
Pines #6
Pines #7
River Rim
Quail Ridge #2
Quail Ridge #1
Poplar Park
Widgi Creek
Blue Ridge
20
97
0
4,000 Feet
City of Bend
Public Facility Plan
Figure 3
Existing System:
Gravity Pipe Material
murraysmith

Most of the gravity collection system has been constructed since the late 1970s, when the City received federal funding to construct a centralized wastewater treatment plant. The piping is generally in good condition. The Public Works Department maintains a GIS database of the collection system that summarizes the size, material, and age of the system components.

The O&M Department inspects the gravity collection system through CCTV and, approximately half of the gravity collection system had been inspected and rated. The inspections include a standardized rating index utilizing the National Association of Sewer Service Companies (NAASCO), Pipeline Assessment & Certification Program (PACP) inspection guidelines. Consistency of rating has improved with operator training between 2008 and 2012. The O&M Department has acknowledged a need to re-inspect all piping with a rating of 5 and other known high-risk infrastructure such as the Addison pipeline. The rating index assigns values to defects in pipe segments which are compiled into a composite rating for each pipeline. The O&M Department has used the rating to assign condition according to the categories shown in Table 4. The gravity collection system condition assessment using these condition categories is presented in Figure 4, and is summarized in Table 5 by age, Table 6 by size, and Table 7 by material.

Table 4
Gravity Pipe Condition Assessment by Category

Condition Rating	Condition Assessment	Length (mile)
0 and 1	Failure Unlikely in Foreseeable Future	150
2	Pipe Unlikely to Fail For 20 Years	7
3	Pipe May Fail in 10-20 Years	5
4	Pipe Will Probably Fail in 5-10 Years	2
5	Pipe Has Failed or Will Fail Within 5 Years	1
Not Rated	Not Rated to Date	215

Table 5
Gravity Pipe Condition Assessment by Age

Rating	Installation Year - Percentage							
	Pre 1970	1970 to 1979	1980 to 1989	1990 to 1999	2000 to 2013	Unknown	2014 to 2018[1]	Total
0	0.5%	7.6%	1.7%	11.6%	16.3%	0.6%	0.0%	**38.2%**
1	0.0%	0.6%	0.1%	0.4%	0.2%	0.0%	0.0%	**1.3%**
2	0.0%	0.8%	0.1%	0.4%	0.4%	0.1%	0.0%	**1.8%**
3	0.1%	0.9%	0.0%	0.1%	0.1%	0.0%	0.0%	**1.3%**
4	0.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	**0.6%**
5	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	**0.3%**
Not Rated	0.2%	12.9%	4.6%	13.7%	17.8%	0.0%	7.2%	**56.5%**
Total	**0.9%**	**23.2%**	**6.6%**	**26.5%**	**34.9%**	**0.7%**	**7.2%**	**100.0%**

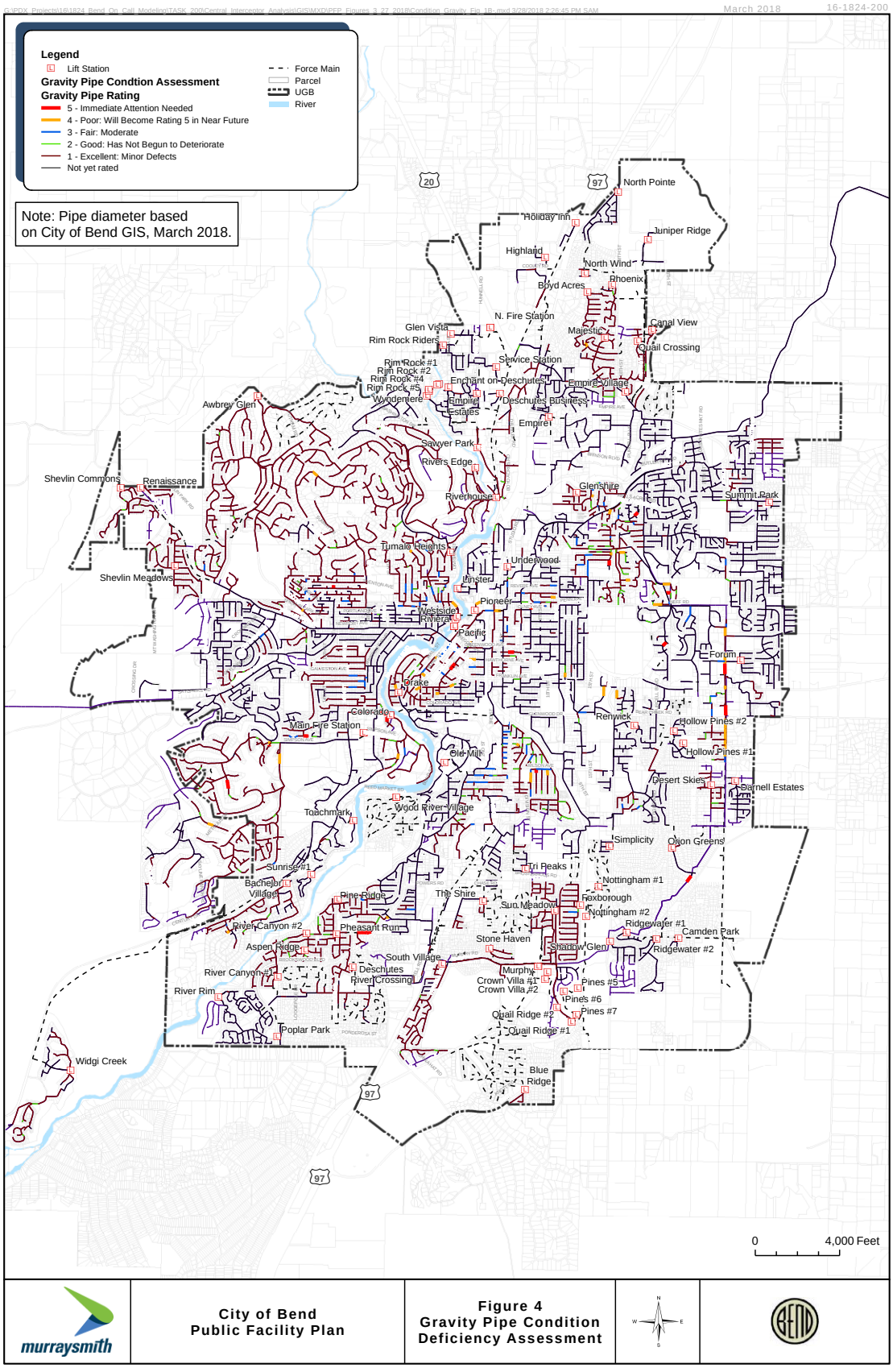
1 Includes projects since CSMP was published in 2014.

Table 6
Gravity Pipe Condition Assessment by Size

Rating	Diameter (inch) - Percentage							
	3 to 6	8	10 to 12	14 to 18	20 to 24	26 to 30	32 to 72	Total
0	0.9%	34.3%	2.0%	0.7%	0.1%	0.0%	0.0%	**38.0%**
1	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	**1.3%**
2	0.1%	1.6%	0.1%	0.0%	0.0%	0.0%	0.0%	**1.8%**
3	0.1%	1.1%	0.1%	0.1%	0.0%	0.0%	0.0%	**1.3%**
4	0.0%	0.4%	0.0%	0.1%	0.0%	0.0%	0.0%	**0.6%**
5	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.3%**
Not Rated	2.3%	42.4%	4.1%	2.7%	2.2%	1.7%	1.4%	**56.8%**
Total	**3.4%**	**81.3%**	**6.3%**	**3.5%**	**2.3%**	**1.8%**	**1.4%**	**100.0%**

Table 7
Gravity Pipe Condition Assessment by Material

Rating	Material - Percentage						
	Polyvinyl Chloride	High Density Polyethylene	Concrete (AC, RCP, Non-Reinforced)	Cast Iron and Ductile Iron Pipe	Clay (CT, VCD, TP)	Unknown	Total
0	36.0%	0.3%	1.3%	0.0%	0.4%	0.0%	**38.0%**
1	1.1%	0.0%	0.2%	0.0%	0.0%	0.0%	**1.3%**
2	1.4%	0.1%	0.3%	0.0%	0.0%	0.0%	**1.8%**
3	0.9%	0.0%	0.3%	0.0%	0.1%	0.0%	**1.3%**
4	0.5%	0.0%	0.1%	0.0%	0.0%	0.0%	**0.6%**
5	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.3%**
Not Rated	49.7%	0.1%	6.8%	0.1%	0.2%	0.0%	**56.8%**
Total	**89.7%**	**0.4%**	**9.0%**	**0.1%**	**0.8%**	**0.0%**	**100.0%**


G:\PDX_Projects\16\1824_Bend_On_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\PFP_Figures_3_27_2018\Condition_Gravity_Fig_1B_mxd 3/28/2018 2:26:45 PM SAM
March 2018
16-1824-200
Legend
Lift Station
Gravity Pipe Condtion Assessment
Gravity Pipe Rating
5 - Immediate Attention Needed
4 - Poor: Will Become Rating 5 in Near Future
3 - Fair: Moderate
2 - Good: Has Not Begun to Deteriorate
1 - Excellent: Minor Defects
Not yet rated
Force Main
Parcel
UGB
River
Note: Pipe diameter based on City of Bend GIS, March 2018.
20
97
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Phoenix
Boyd Acres
N. Fire Station
Glen Vista
Rim Rock Riders
Majestic
Canal View
Quail Crossing
Service Station
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Enchant on Deschutes
Empire Village
Deschutes Business
Empire Estates
Empire
Awbrey Glen
Sawyer Park
Rivers Edge
Shevlin Commons
Renaissance
Riverhouse
Glenshire
Summit Park
Tumalo Heights
Underwood
Shevlin Meadows
Pioneer
Westside
Pacific
Forum
Drake
Colorado
Renwick
Main Fire Station
Hollow Pines #2
Hollow Pines #1
Elk Mill
Desert Skies
Barnell Estates
Wood River Village
Touchmark
Simplicity
Orion Greens
Sunrise #1
Tri Peaks
Bachelor Village
Nottingham #1
Pine Ridge
The Shire
Foxborough
Sun Meadow
Nottingham #2
Ridgewater #1
River Canyon #2
Pheasant Run
Camden Park
Stone Haven
Aspen Ridge
Shadow Glen
Ridgewater #2
South Village
Deschutes River Crossing
River Canyon #1
Murphy
Crown Villa #1
Crown Villa #2
Pines #5
Pines #6
Pines #7
River Rim
Quail Ridge #2
Quail Ridge #1
Poplar Park
Widgi Creek
Blue Ridge
0
4,000 Feet
murraysmith
City of Bend
Public Facility Plan
Figure 4
Gravity Pipe Condition
Deficiency Assessment

Condition Rating of Lift Stations

The City's primary wastewater collection system currently includes 86 regional lift stations. There are many residential lift stations that are not part of the primary collection system. City-owned regional lift stations can be further broken down into two categories, Regional Modeled and Localized Not-Modeled as documented in the 2014 CSMP. Regional Modeled lift stations typically collect sewage from a large region and are included and calibrated in the hydraulic model. Localized Not-Modeled lift stations such as the Pines (5, 6, 7), Quail Ridge (1, 2), Crown Villa (1, 2), and Nottingham (1, 2) are local in nature but are not included in the hydraulic model because they have limited or no gravity piping in their contributory basin. Several lift stations included in the inventory are in the process of being decommissioned including Ridgewater 1, Shadow Glen, Murphy, and Sun Meadow. Table 8 summarizes the lift stations by owner and category. Historically, lift stations have been installed for multiple reasons, including adverse grade, the need to cross a river or other restrictive corridors, or simply as an alternative to more costly gravity piping. Figure 5 shows the lift station locations throughout the system.

Table 8
Lift Stations within the Primary Collection System

Owner	Category	Number
City	Regional - Modeled	68
	Localized – Not-Modeled	18

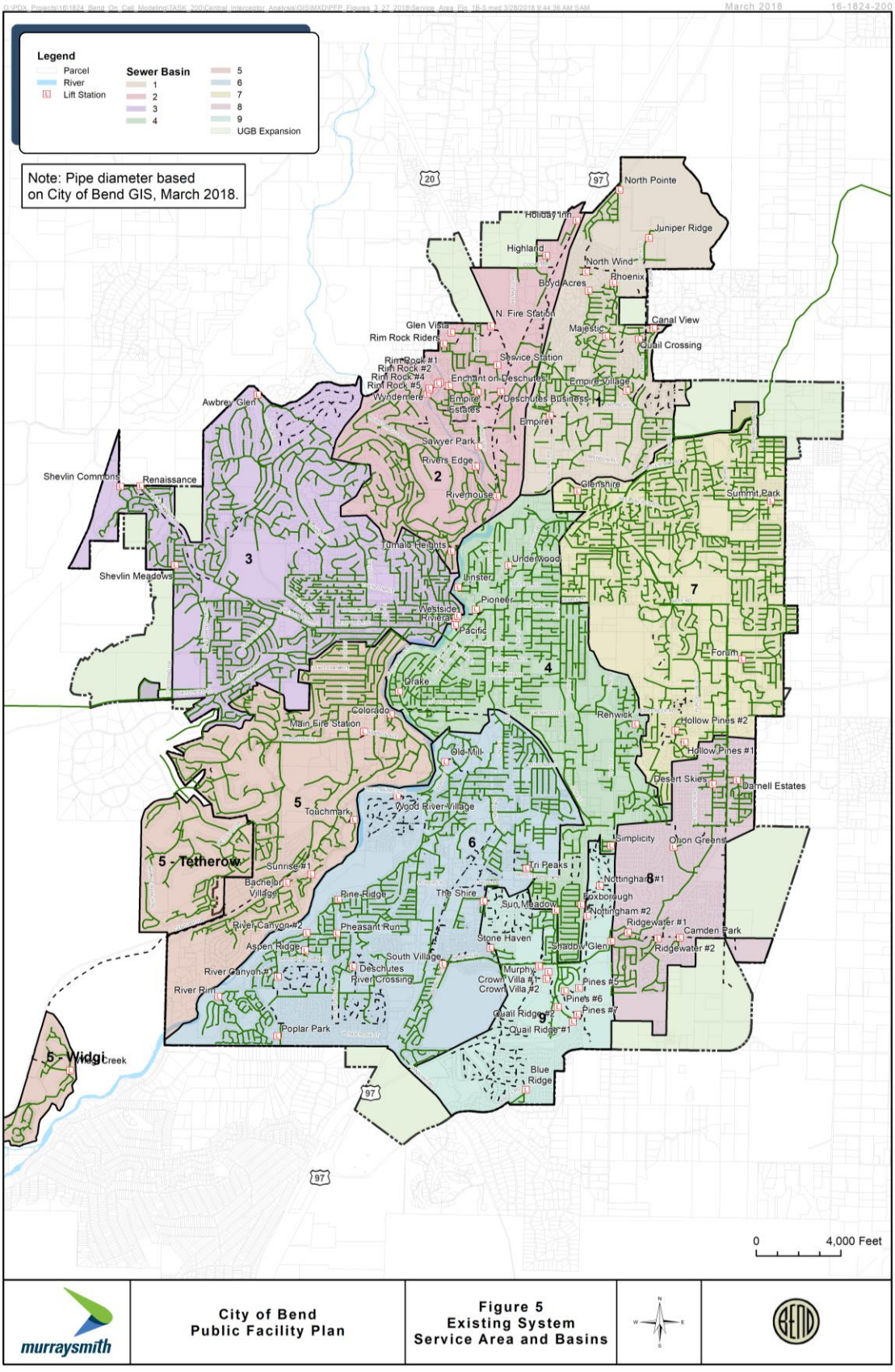
Table 9 includes a summary of the City's existing lift stations. Some lift stations have the pumps submerged in the wet well where the sewage is stored; others isolate the pumps from the wastewater using a dry well configuration connected by piping. The number of pumps in the lift station and total station horsepower are also listed in Table 9. Some of the lift stations have a variable frequency drive (VFD), which controls the frequency of the power to the pumps, allowing the pumps to operate at different speeds while pumping varied amounts of flow. Three benefits of VFD control are energy savings, controlled performance and phase conversion. VFDs are sometimes utilized to maintain a constant wet well level by matching pump output to the flow entering the facility. This mode of operation can have the added benefit of reducing onsite and downstream odors by reducing the time that wastewater is detained at the wet well. Phase conversion is the use of a VFD to create three-phase power from a single-phase power source. Backup power for the lift stations (as shown in Table 9), is used in the event of a power outage. Some of the lift stations have an onsite generator present. Other lift stations have the ability to connect to a portable generator during prolonged power outages.

Table 9
Summary of Bend's Existing Lift Stations

Basin	Lift Station Name	Type	Number of Pumps	Horsepower	VFD	Standby Power
1	Boyd Acres	Submersible	2	12	-	Plug
1	Canal View	Submersible	2	10	VFD	Plug
1	Empire	Submersible	2	10	-	Plug
1	Empire Village	Submersible	2	6	VFD	Plug
1	Juniper Ridge	Submersible	2	46	VFD	Standby
1	Majestic	Submersible	2	10	VFD	Plug
1	North Pointe	Submersible	2	80	-	Standby
1	North Wind	Submersible	2	40	-	Plug
1	Phoenix	Submersible	2	30	VFD	Plug
1	Quail Crossing	Submersible	2	10	VFD	Plug
2	Deschutes Business	Submersible	2	10	-	Plug
2	Empire Estates (Tuscan Pines)	Submersible	2	40	VFD	Plug
2	Enchant on Deschutes	Submersible	2	60	-	Plug
2	Glen Vista	Submersible	2	46	-	Plug
2	Highland	Submersible	2	50	-	Plug
2	Holiday Inn	Submersible	2	46	-	Plug
2	N. Fire Station	Submersible	3	6	-	Standby
2	Rim Rock #1	Submersible	2	2	-	Plug
2	Rim Rock #2	Submersible	2	2	-	Plug
2	Rim Rock #4	Submersible	2	2	-	Plug
2	Rim Rock #5	Submersible	2	2	-	Plug
2	Rim Rock Riders	Submersible	2	40	-	Plug
2	Riverhouse	Wet Well/ Dry Well	2	15	-	Standby
2	Rivers Edge	Submersible	2	15	-	Plug
2	Sawyer Park	Submersible	4	57	VFD	Standby
2	Service Station	Submersible	2	9	-	Plug
2	Wyndemere	Submersible	3	45	VFD	Standby
3	Awbrey Glen	Wet Well/ Dry Well	5	300	-	Plug
3	Renaissance	Submersible	2	62	-	Plug
3	Riviera	Submersible	2	10	-	Standby
3	Shevlin Commons	Submersible	2	40	-	Plug
3	Shevlin Meadows	Submersible	2	20	VFD	Plug
3	Tumalo Heights	Submersible	2	15	VFD	Plug
4	Drake	Wet Well/ Dry Well	1	28	-	Standby
4	Foxborough	Submersible	2	30	-	Plug

Basin	Lift Station Name	Type	Number of Pumps	Horsepower	VFD	Standby Power
4	Linster	Submersible	2	15	-	Plug
4	Pacific	Submersible	2	4	-	Plug
4	Pioneer	Submersible	2	4	-	Plug
4	Renwick	Wet Well/ Dry Well	2	6	-	Plug
4	Simplicity	Submersible	2	15	-	Plug
4	Sun Meadow (decommissioning)	Submersible	2	100	-	Plug
4	Underwood	Wet Well/ Dry Well	2	6	-	Plug
4	West Side	Wet Well/ Dry Well	4	170	VFD	Standby
5	Bachelor Village	Submersible	2	20	-	
5	Main Fire Station	Submersible	2	4	-	Standby
5	Colorado	Wet Well/ Dry Well	3	85	VFD	Standby
5	Sunrise #1	Submersible	2	15	-	Plug
5	Touchmark	Submersible	2	40	-	Standby
5	Widgi Creek	Submersible	2	80	Soft Start	Plug
6	Aspen Ridge	Submersible	2	50	-	Plug
6	Des. River Crossing	Submersible	2	10	-	Plug
6	Old Mill	Submersible	2	30	VFD	Standby
6	Pheasant Run	Submersible	2	10	VFD	Plug
6	Pine Ridge	Submersible	2	10	VFD	Plug
6	Poplar Park	Submersible	2	10	VFD	Plug
6	River Canyon #1	Submersible	2	15	-	Plug
6	River Canyon #2	Submersible	2	20	-	Plug
6	River Rim	Submersible	2	20	-	Plug
6	South Village	Submersible	2	40	-	Plug
6	Stone Haven	Submersible	2	10	-	Plug
6	The Shire	Submersible	2	40	-	Plug
6	Tri Peaks	Submersible	2	10	VFD	Plug
6	Wood River Village	Vacuum Station and Dry Well	2	60	-	Standby
7	Forum	Submersible	2	2	-	Plug
7	Glenshire	Submersible	2	10	VFD	Plug
7	Hollow Pines	Submersible	2	13	VFD	Plug
7	Hollow Pines #2	Submersible	2	10	-	Plug
7	Summit Park	Submersible	2	10	-	Plug
8	Camden	Submersible	2	15	VFD	Plug

Basin	Lift Station Name	Type	Number of Pumps	Horsepower	VFD	Standby Power
8	Darnell Estates	Submersible	2	10	VFD	Plug
8	Desert Skies	Submersible	2	10	VFD	Plug
8	Orion Greens	Submersible	2	20	-	Standby
8	Ridgewater (decommissioning)	Submersible	2	13	-	Plug
8	Ridgewater #2	Submersible	2	20	-	Plug
9	Blue Ridge	Submersible	2	10	-	Plug
9	Crown Villa #1	Submersible	2	2	-	Plug
9	Crown Villa #2	Submersible	2	2	-	Plug
9	Murphy Interim (decommissioning)	Submersible	2	60	-	Standby
9	Nottingham #1	Submersible	2	2	-	Plug
9	Nottingham #2	Submersible	2	20	-	Plug
9	Pines #5	Submersible	2	4	-	Plug
9	Pines #6	Submersible	2	4	-	Plug
9	Pines #7	Submersible	2	34	-	Plug
9	Quail Ridge #1	Submersible	2	2	-	Plug
9	Quail Ridge #2	Submersible	2	2	-	Plug
9	Shadow Glen (decommissioning)	Submersible	2	13	VFD	Standby


Legend
Parcel
River
Lift Station
Sewer Basin
1
2
3
4
5
6
7
8
9
UGB Expansion
Note: Pipe diameter based on City of Bend GIS, March 2018.
March 2018
16-1824-200
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Rhoenix
Boyd Acres
N. Fire Station
Canal View
Majestic
Quail Crossing
Glen Vista
Rim Rock Riders
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Service Station
Enchant on Deschutes
Empire Village
Deschutes Business
Empire Estates
Empire I
Awbrey Glen
Sawyer Park
Rivers Edge
Riverhouse I
Shevlin Commons
Renaissance
Glenshire
Summit Park
Tumalo Heights
Shevlin Meadows
Underwood
Forum
Pioneer
Westside
Riviera
Pacific
Drake
Colorado
Main Fire Station
Renwick
Hollow Pines #2
Hollow Pines #1
Old Mill
Desert Skies
Darnell Estates
Touchmark
Wood River Village
Simplicity
Olson Greens
5 - Tetherow
Sunrise #1
Bachelor Village
Tri Peaks
Nottingham #1
Pine Ridge
The Shire
Sun Meadow
Foxborough
Nottingham #2
Ridgewater #1
Camden Park
Ridgewater #2
River Canyon #2
Pheasant Run
Aspen Ridge
Stone Haven
Shadow Glen
South Village
River Canyon #1
Deschutes River Crossing
Murphy
Crown Villa #1
Crown Villa #2
Pines #5
Pines #6
Pines #7
River Rim
Quail Ridge #2
Quail Ridge #1
Poplar Park
5 - Widgi
Blue Ridge
20
97
0
4,000 Feet
City of Bend
Public Facility Plan
Figure 5
Existing System
Service Area and Basins
murraysmith

Lift station capacity is summarized in Table 10. For lift stations that share common force mains, the capacity may be limited by the number of lift stations operating at any time within the group. The documented total capacity is based on the individual lift station operating with all pumps, but with other lift stations not operating within the group. The firm capacity (the capacity with the largest pump out of service) is also listed with and without other lift stations within the group operating. The capacity of the force main associated with each lift station is also summarized in Table 10. This value is the calculated flow through the force main: Dry weather capacity is calculated at a velocity of 6 ft/sec and wet weather capacity at 10 ft/sec. Force main capacity was included to determine if velocity constraints are the limiting factor in lift station capacity.

Table 10
Lift Station Capacity

Basin	Lift Station Name	Station Pumping Capacity[1] (gpm)	Station Firm Pumping Capacity[2] (gpm)	Station Firm Pumping Capacity Group[3] (gpm	Discharge Diameter[4] (inch)	Dry Weather Discharge Line Capacity at 6 ft/sec[5] (gpm)	Wet Weather Discharge Line Capacity at 10 ft/sec[6] (gpm)
1	Boyd Acres	80	75	n/a	3	132	220
1	Canal View	90	75	55	4	235	392
1	Empire	190	160	n/a	4	235	392
1	Empire Village	350	200	n/a	4	235	392
1	Juniper Ridge	570	440	360	6	529	881
1	Majestic	275	240	n/a	6	529	881
1	North Pointe	320	300	130	6	529	881
1	North Wind	370	350	60	6	529	881
1	Phoenix	500	430	220	6	529	881
1	Quail Crossing	260	180	40	6	529	881
2	Deschutes Business	175	140	4	4	235	392
2	Empire Estates	140	130	28	3	132	220
2	Enchant on Deschutes	155	150	12	4	235	392
2	Glen Vista	260	235	150	6	529	881
2	Highland	170	160	160	4	235	392
2	Holiday Inn	170	160	30	4	235	392
2	N. Fire Station	120	80	n/a	3	132	220
2	Rim Rock #1	80	40	n/a	2	59	98
2	Rim Rock #2	80	40	n/a	2	59	98
2	Rim Rock #4	80	40	n/a	2	59	98
2	Rim Rock #5	80	40	n/a	2	59	98
2	Rim Rock Riders	145	140	30	4	235	392
2	Riverhouse	290	275	2	6	529	881
2	River's Edge	190	160	n/a	3	132	220
2	Sawyer Park	400	380	300	8/10	940	1,567
2	Service Station	110	95	12	4	235	392
2	Wyndemere	280	270	30	6	529	881
3	Awbrey Glen	770	630	n/a	8	940	1,567
3	Renaissance	135	127	40	4	235	392
3	Riviera	284	142	n/a	4	235	392
3	Shevlin Commons	115	110	75	4	235	392
3	Shevlin Meadows	180	170	140	4	235	392

Basin	Lift Station Name	Station Pumping Capacity[1] (gpm)	Station Firm Pumping Capacity[2] (gpm)	Station Firm Pumping Capacity Group[3] (gpm	Discharge Diameter[4] (inch)	Dry Weather Discharge Line Capacity at 6 ft/sec[5] (gpm)	Wet Weather Discharge Line Capacity at 10 ft/sec[6] (gpm)
3	Tumalo Heights	275	225	n/a	4	235	392
4	Drake	875	780	n/a	6	529	881
4	Foxborough	430	420	n/a	6	529	881
4	Linster	165	150	n/a	4	235	392
4	Pacific	60	30	n/a	2	59	98
4	Pioneer	70	35	n/a	6	529	881
4	Renwick	80	40	n/a	4	235	392
4	Simplicity	280	240	n/a	4	235	392
4	Sun Meadow (decommissioning)	410	375	125	6	529	881
4	Underwood	150	135	n/a	4	235	392
4	West Side	4,700	4,200	n/a	16	3,760	6,267
5	Bachelor Village	205	185	n/a	4	235	392
5	Main Fire Station	80	40	n/a	2	59	98
5	Colorado	2,500	2,350	n/a	12 (dual)	2,115	3,525
5	Sunrise #1	275	250	175	4	235	392
5	Touchmark	550	400	n/a	6	529	881
5	Widgi Creek	200	190	185	6	529	881
6	Aspen Ridge	190	180	90	4	235	392
6	Des. River Crossing	150	140	n/a	4	235	392
6	Old Mill	400	290	n/a	6	529	881
6	Pheasant Run	210	180	n/a	4	235	392
6	Pine Ridge	110	90	n/a	4	235	392
6	Poplar Park	135	120	n/a	4	235	392
6	River Canyon #1	330	280	130	4	235	392
6	River Canyon #2	150	140	85	4	235	392
6	River Rim	170	150		4	235	392
6	South Village	590	420	400	6	529	881
6	Stone Haven	340	260	n/a	6	529	881
6	The Shire	180	170	n/a	4	235	392
6	Tri Peaks	100	90	n/a	3	132	220
6	Wood River Village	480	240	n/a	6	529	881
7	Forum	105	90	n/a	3	132	220
7	Glenshire	180	160	n/a	4	235	392
7	Hollow Pines	145	125	120	4	235	392
7	Hollow Pines #2	140	125	125	4	235	392

Basin	Lift Station Name	Station Pumping Capacity[1] (gpm)	Station Firm Pumping Capacity[2] (gpm)	Station Firm Pumping Capacity Group[3] (gpm	Discharge Diameter[4] (inch)	Dry Weather Discharge Line Capacity at 6 ft/sec[5] (gpm)	Wet Weather Discharge Line Capacity at 10 ft/sec[6] (gpm)
7	Summit Park	230	200	n/a	4	235	392
8	Camden	110	105	4	4	235	392
8	Darnell Estates	205	185	110	4	235	392
8	Desert Skies	165	150	110	4	235	392
8	Orion Greens	145	135	n/a	4	235	392
8	Ridgewater (decommissioning)	90	85	12	4	235	392
8	Ridgewater #2	130	120	75	4	235	392
9	Blue Ridge	65	62.5	n/a	3	132	220
9	Crown Villa #1	160	80	n/a	6	529	881
9	Crown Villa #2	160	80	n/a	6	529	881
9	Murphy Interim (decommissioning)	470	420	350	6	529	881
9	Nottingham #1	150	75	n/a	4	235	392
9	Nottingham #2	240	120	n/a	4	235	392
9	Pines #5	20	10	n/a	3	132	220
9	Pines #6	20	10	n/a	3	132	220
9	Pines #7	20	10	n/a	6	529	881
9	Quail Ridge #1	90	10	n/a	4	235	392
9	Quail Ridge #2	90	10	n/a	4	235	392
9	Shadow Glen (decommissioning)	130	120	50	6	529	881

[1] *Station Pumping Capacity - The lift station capacity with all pumps operating. Other lift stations sharing common force mains are not operating. This represents the maximum pumping capacity.*

[2] *Station Firm Pumping Capacity – The lift station capacity with the largest pump out of service. Other lift stations sharing common force mains are not operating.*

[3] *Station Firm Pumping Capacity – The lift station capacity with the largest pump out of service. Other lift stations sharing common force mains are operating. This represents the minimum pumping capacity. Some pump stations with varied size pumps will operate without simultaneous pump operation.*

[4] *Discharge Diameter - The diameter of the lift station force main.*

[5] *Dry Weather Discharge Line Capacity - Flow rate in lift station force main based on 6 ft/sec velocity. Does not indicate true capacity of combined lift station and force main.*

[6] *Wet Weather Discharge Line Capacity - Flow rate in lift station force main based on 10 ft/sec velocity. Does not indicate true capacity of combined lift station and force main.*

The O&M Department rated each of the City-owned lift stations in the collection system. The ratings were based on a review of the components summarized in Table 11.

Table 11
Lift Station Condition Assessment Summary Components

Category	Component	Category	Component
Pump	General Overall Condition	Pump House	General Overall Condition
	Pump ragging problems	Alarms and Sensor	General Overall Condition
	Impeller Damage or Wear		Recurring Alarm Failures
Motor	General Overall Condition		Recurring Sensor Failures
	Motor Connections	Electrical	General Overall Condition
Wet Well	General Overall Condition		Generator or Portable Pigtail
	Hatches/Safety Grate		HVAC
	Corrosion		Lighting
	Fats/Oils/Grease Buildup		Control Panel
	Solids Buildup		SCADA
	Expansion Tank	Site	General Overall Condition
Piping and Valves	General Overall Condition		Access/Security
	Piping		Drainage
	Valves		Overflow Impact

Individual ratings of the components were used to determine the composite rating for each lift station. O&M staff then reviewed and confirmed the final ratings. The general comments are provided below. The final ratings are summarized in Tables 12 through 15 and shown in Figure 6.

The tables are organized in the following categories:

- Table 12: Requires significant improvements immediately (included in the short-term, 1- to-5-year CIP)
- Table 13: Requires significant improvements within 5 years (included in the short-term, 1- to -5-year CIP)
- Table 14: Requires significant improvements within 10 years (included in the long-term, 6- to 10-year CIP).
- Table 15: In good condition requiring no major improvements within 10 years (included in the long-term, 11- to 20-year CIP)

For some lift stations, decommissioning may be accelerated to minimize or eliminate cost of condition repairs. The decommissioning is dependent on timing of key interceptor capital projects. Lift stations are flagged in Tables 12 to 15 to indicate where decommissioning may be an option.

General City of Bend O&M Staff Comments:

- There are numerous basins where pumps overpower other pumps, resulting in long run times, excessive electrical consumption, and risk of sanitary sewer overflow due to constrained lift station pump output.
- The average age of most lift stations is similar (installed during time of rapid growth in the early 2000s). This may result in operational and reliability problems, as these stations all reach the end of useful life at the same time.
- Many lift stations were built with poor quality and unreliable components (pumps and controls).
- Many lift station pumps operate at low efficiency points, consuming excess electricity.
- The large number of lift stations and limited staff restrict the capacity of the operations group to provide proactive maintenance.
- The existing SCADA system is data acquisition only. There is currently no Supervisory Control (remote control/operation).
- The large number of lift stations and limited staff restrict the capacity of the operations group to monitor lift station performance and place significant responsibility on the SCADA system to reliably track lift station function.
- Wood River Village Vacuum System has historically operated with minimal problems, but the pressure system is more difficult to isolate and locate vacuum leaks, which significantly increases the risk of sanitary sewer overflows and backups.
- Romaine Village Common Pressure Area has reasonably reliable systems, but it is overwhelming to check lift stations more than once per year due to number of individual pumping units (248, total). Home sumps create harsh wastewater environments, leading to hydrogen sulfide generation with associated odors and corrosion throughout the system.

Mechanical and electrical systems require improvements approximately every 20 years; therefore, all the City's lift stations include condition-based upgrades within the 20-year CIP timeframe.

Table 12
Lift Station Condition Assessment Summary - Requires Significant Improvements Immediately

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Crown Villa #1	Lift Station Overhaul	Lift station decommission being considered with completion of Southeast Interceptor. New gravity piping improvement required.	Station need to be completely overhauled. New pumps, discharge piping and electrical panel are needed.
Crown Villa #2	Lift Station Overhaul	Lift station decommission being considered with completion of Southeast Interceptor. New gravity piping improvement required.	Station need to be completely overhauled. New pumps, discharge piping and electrical panel are needed. Station also needs a control panel upgrade.
Deschutes Business	Lift Station Replacement		Old station. Original, obsolete pumps and obscurely sized discharge piping make this station extremely difficult to maintain. Wet well, discharge piping and valve pit are deteriorating due to corrosion. Expected to require pump replacement for future development.
Nottingham #1	Lift Station Replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	Aging, poorly designed station. Wet well is deteriorating, and discharge piping is very fragile. Pumps into Nottingham #2.
Nottingham #2	Lift Station Replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	Aging lift station. Corrosion is rapidly deteriorating pumps, piping and rail system. Pumps are obsolete. Entire subdivision pumps to this lift station, failure could be catastrophic. Some recent work to upgrade railing system.
Pacific	Lift Station Replacement		Old and deteriorating station. Extremely unsafe to access pumps and piping. Current pumping components are deficient and outdated. Located within close proximity of the Deschutes River.
Pioneer	Lift Station Replacement		Old and deteriorating station. Extremely unsafe to access pumps and piping. Current pumping components are deficient and outdated.
Quail Ridge #1	Lift Station Overhaul	Lift station decommission being considered with completion of Southeast Interceptor. New gravity piping improvement required.	Station needs to be completely overhauled. New pumps, discharge piping and electrical panel are needed.
Quail Ridge #2	Pump replacement/upgrade	Lift station decommission being considered with completion of Southeast Interceptor. New gravity piping improvement required.	Station needs to be completely overhauled. New pumps, discharge piping and electrical panel are needed.

Table 13
Lift Station Condition Assessment Summary - Requires Significant Improvements within 5 Years

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Awbrey Glen	Lift Station Overhaul		Needs a backup generator dedicated to the station. During storm events, this is often a very difficult station to get to (snow/ice) and we have very little time to get station running before it surcharges and causes an SSO.
Camden Park	Lift Station Overhaul	Lift station decommission possible with completion of Southeast Interceptor but may not occur immediately. New gravity piping improvement required.	Old station. Needs new pumps, rail system and electrical panel
Canal View	Sink Hole Issue (non-urgent)		Needs further assessment. There appears to be a sinkhole adjacent to the wet well, and control panel is sinking into the ground
Drake	Lift Station Replacement, Pump replacement/ upgrade		Older, obsolete design with vacuum priming system and small wet wells make this station hard to maintain.
Empire Village	Pump replacement		Pump replacement and VFDs
Poplar Park	Pump replacement/upgrade		Expected to require pump replacement in near future. Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
Renwick	Lift Station Replacement		Older, obsolete design with vacuum priming system and small wet well makes station hard to maintain.
Rimrock #1	Lift Station Replacement		Very poorly designed. Grossly undersized for current flows. Small wet wells create difficulties in maintaining pumps and control floats. Proximity to river makes these sites a significant liability.
Rimrock #2	Lift Station Replacement		Very poorly designed. Grossly undersized for current flows. Small wet wells create difficulties in maintaining pumps and control floats. Proximity to river makes these sites a significant liability.
Rimrock #4	Lift Station Replacement		Very poorly designed. Grossly undersized for current flows. Small wet wells create difficulties in maintaining pumps and control floats. Proximity to river makes these sites a significant liability.
Rimrock #5	Lift Station Replacement		Very poorly designed. Grossly undersized for current flows. Small wet wells create difficulties in maintaining pumps and control floats. Proximity to river makes these sites a significant liability.

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Riverhouse	Lift Station Replacement		Older, obsolete design and small wet well make this station hard to maintain.
The Pines #5	Lift Station Upgrade	Lift station decommission may be possible with completion of Southeast Interceptor. New gravity piping improvement required.	Pumps and electrical in good condition. Station plumbing is insufficient.
The Pines #6	Lift Station Upgrade	Lift station decommission may be possible with completion of Southeast Interceptor. New gravity piping improvement required.	Pumps and electrical in good condition. Station plumbing is insufficient.
The Pines #7	Lift Station Upgrade	Lift station decommission may be possible with completion of Southeast Interceptor. New gravity piping improvement required.	Pumps and electrical in good condition. Station plumbing is insufficient.
Underwood	Lift Station Replacement		Replace Cornell older, obsolete design with vacuum priming system and small wet well makes station hard to maintain.

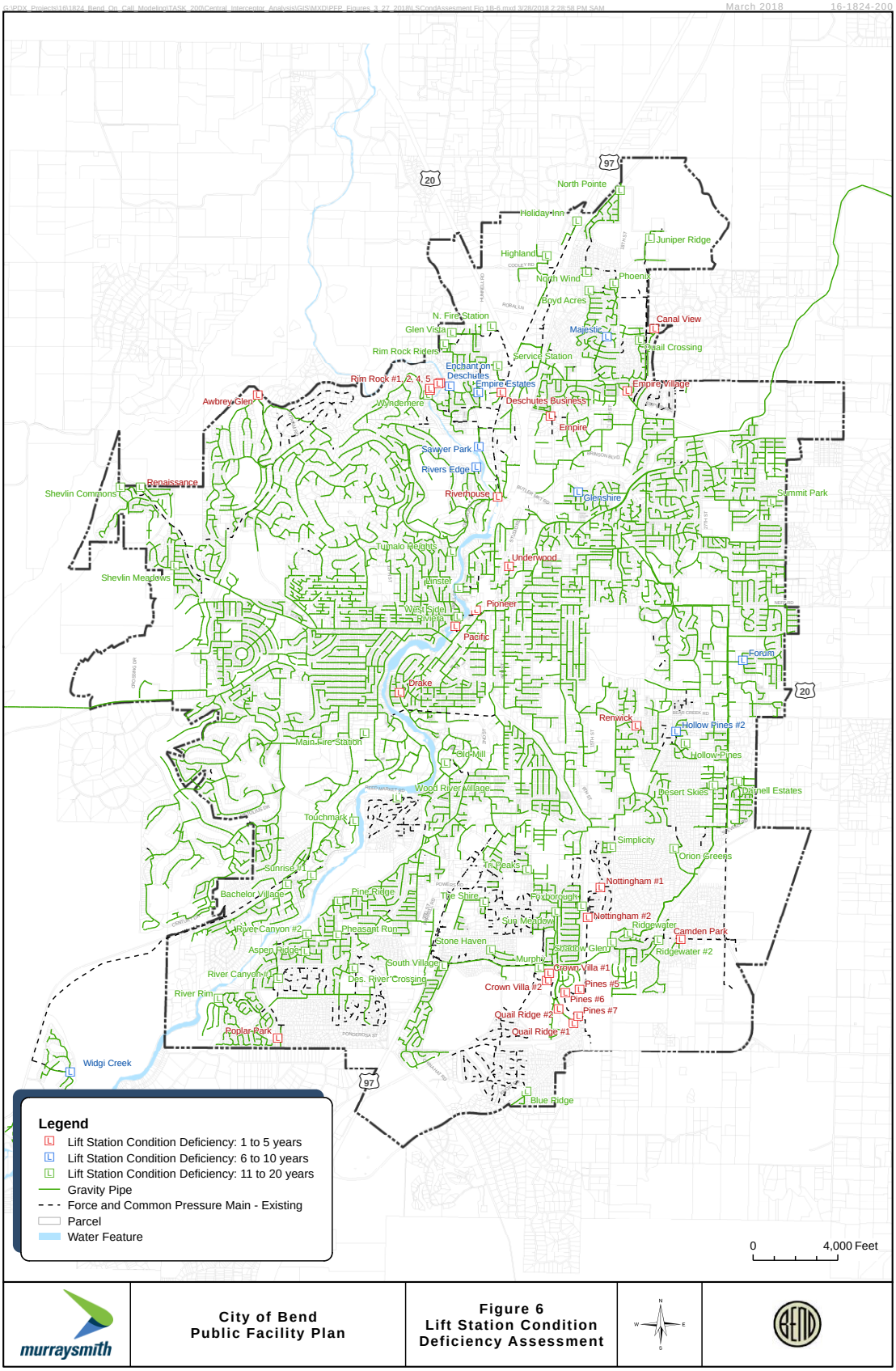
Table 14
Lift Station Condition Assessment Summary - Requires Significant Improvements between 6 and 10 Years

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Empire Estates (Tuscan Pines)	Pump replacement		Expected to require pump replacement in near future. Improved capacity with north area and Riverhouse reconfiguration.
Enchant on Deschutes	Pump replacement		Expected to require pump replacement in near future. Improved capacity with north area and Riverhouse reconfiguration. Improvement work recently performed, and project may be partially or fully completed.
Forum	Pump replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	City to replace pumps in near future
Glenshire	Pump replacement		Could use pump and VFD upgrade
Hollow Pines #2	Pump replacement		City to replace pumps and VFDs in near future
Majestic	-		Rail system is in poor condition/operations
Rivers Edge	-		City to replace pumps in near future. Improvement work recently performed, and project may be partially or fully completed.
Sawyer Park	-		Improved capacity with north area and Riverhouse LS reconfiguration
Widgi Creek	Lift Station Overhaul		Older pumps require upgrading. Rail system and electrical components need to be replaced. (Note: Existing agreement with Widgi Creek obligates them to upgrade if they expand. However, station needs overhaul, regardless.) Improvement work recently performed, and project may be partially or fully completed.

Table 15
Lift Station Condition Assessment Summary - In Good Condition, Requiring No Major Improvements within 10 Years

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Airport	-		-
Aspen Ridge	-		Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
Bachelor Village	-		-
Blue Ridge	-		-
Boyd Acres	-	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	-
Colorado	-		
Darnell Estates	-	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Deschutes River Crossing	-		Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
Desert Skies	-	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Foxborough	-		-
Glen Vista	-	Lift station decommission possible with completion of North Interceptors Phases 1, 2, and 3. New gravity piping improvement required.	-
Highland	Pump replacement	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	-
Holiday Inn	-	Lift station decommission possible with completion of North Interceptors Phases 1 and 2.	-
Hollow Pines #1	-		-
Juniper Ridge	-	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	-
Linster	-		-
Main Fire Station	-		-
Murphy	-	Lift station decommissioned with completion of Southeast Interceptor.	-
North Pointe	Pump replacement	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	Expected to require pump replacement in near future
N. Fire Station			
Northwind	Pump replacement	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	Expected to require pump replacement in near future
Old Mill	Lift Station Overhaul, Pump replacement/ upgrade		Electrical components need upgraded (undersized for existing pumps). Expected to require pump replacement for future development
Orion Greens	-		-
Pheasant Run	-		-
Phoenix	-	Lift station decommission possible with completion of North Interceptors Phases 1 and 2. New gravity piping improvement required.	-
Pine Ridge	Pump replacement		Expected to require pump replacement as budget allows or when existing pumps fail.
Quail Crossing	-		Improved capacity with North Interceptor construction and associated North Area LS decommissioning
Renaissance	Pump replacement/upgrade		Expected to require pump replacement in near future. Coordinate with similar improvements at Shevlin Commons and Shevlin Meadows Lift Stations. Consider VFDs to minimize downstream impacts on Newport Avenue Trunk Sewer.

Lift Station	Replacement Type	Decommissioning Note	O&M Comment
Ridgewater #1	-	Lift station decommissioned with completion of Southeast Interceptor.	-
Ridgewater #2	-	Lift station decommission may be possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Rim Rock Riders	Pump replacement	Lift station decommission possible with completion of North Interceptors Phases 1, 2, and 3. New gravity piping improvement required.	Expected to require pump replacement in near future. Improved capacity with north area and Riverhouse reconfiguration.
River Canyon #1	-		Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
River Canyon #2	-		Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
River Rim	Pump replacement/ upgrade		Expected to require pump replacement for future development. Consider VFDs to minimize downstream impacts on Amethyst/ Mahogany Trunk Sewer.
Riviera	-		-
Service	Pump replacement		Expected to require pump replacement in near future. Improved capacity with north area and Riverhouse reconfiguration.
Shadow Glen	-	Lift station decommissioned with completion of Southeast Interceptor.	-
Shevlin Commons	Pump replacement/ upgrade		Expected to require pump replacement in near future. Coordinate with similar improvements at Renaissance and Shevlin Meadows Lift Stations. Consider VFDs to minimize downstream impacts on Newport Avenue Trunk Sewer.
Shevlin Meadows	Pump replacement/ upgrade		Expected to require pump replacement in near future. Coordinate with similar improvements at Renaissance and Shevlin Commons Lift Stations. Consider VFDs to minimize downstream impacts on Newport Avenue Trunk Sewer.
The Shire	Pump replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Simplicity	Pump replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
South Village	Pump replacement	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Stone Haven	-	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Summit Park	-		-
Sun Meadow		Lift station decommissioned with completion of Southeast Interceptor.	-
Sunrise #1	Lift Station upgrade		New rail system required
Touchmark	Pump replacement		-
Tri Peaks	-	Lift station decommission possible with completion of Southeast Interceptor. New gravity piping improvement required.	-
Tumalo Heights	Pump replacement		-
Westside	-		-
Woodriver Village	-		Good working system, though unique to the rest of collection system
Wyndemere	-		Improved capacity with north area and Riverhouse LS reconfiguration


March 2018
16-1824-200
97
20
North Pointe
Holiday Inn
Juniper Ridge
Highland
Phoenix
Boyd Acres
Canal View
Majestic
Quail Crossing
Service Station
Enchantment
Deschutes
Empire Estates
Empire Village
Deschutes Business
Empire
Sawyer Park
Rivers Edge
Riverhouse
Glenshire
Summit Park
Renaissance
Shevlin Commons
Shevlin Meadows
Tumalo Heights
Underwood
Pioneer
Pacific
Forum
Drake
Renwick
Hollow Pines #2
Hollow Pines
Main Fire Station
Old Mill
Wood River Village
Desert Skies
Caldwell Estates
Touchmark
Simplicity
Orion Greens
Sunrise #1
Bachelor Village
Pine Ridge
The Shire
Foxborough
Nottingham #1
Nottingham #2
Sun Meadow
Ridgewater
Camden Park
Ridgewater #2
Pheasant Run
River Canyon #2
Aspen Ridge #1
Stone Haven
Murphy
Shadow Glen
South Village
Crown Villa #1
Crown Villa #2
Pines #5
Pines #6
Pines #7
Quail Ridge #2
Quail Ridge #1
Deschutes River Crossing
River Canyon #1
River Rim
Poplar Park
Widgi Creek
Blue Ridge
Legend
Lift Station Condition Deficiency: 1 to 5 years
Lift Station Condition Deficiency: 6 to 10 years
Lift Station Condition Deficiency: 11 to 20 years
Gravity Pipe
Force and Common Pressure Main - Existing
Parcel
Water Feature
0
4,000 Feet
City of Bend
Public Facility Plan
Figure 6
Lift Station Condition
Deficiency Assessment
murraysmith

Condition Rating of Vacuum Sewer, Force Mains, and Common Pressure Mains

The City does not have a program to inspect force mains for condition information or routinely flush or clean force main pipe. All force mains in the system are single-pipe except for the Sawyer Park and Colorado lift stations which have dual-pipe systems. Single pipe systems must stay online to convey sewage. For this reason, it is difficult for the City to inspect force mains. However, as noted earlier in this section, the Public Works Department maintains a GIS database of the force main and pressure collection system, which includes size, material and original installation date. Poor pump operational efficiency may be a sign of a downstream force main or pressure main condition issue.

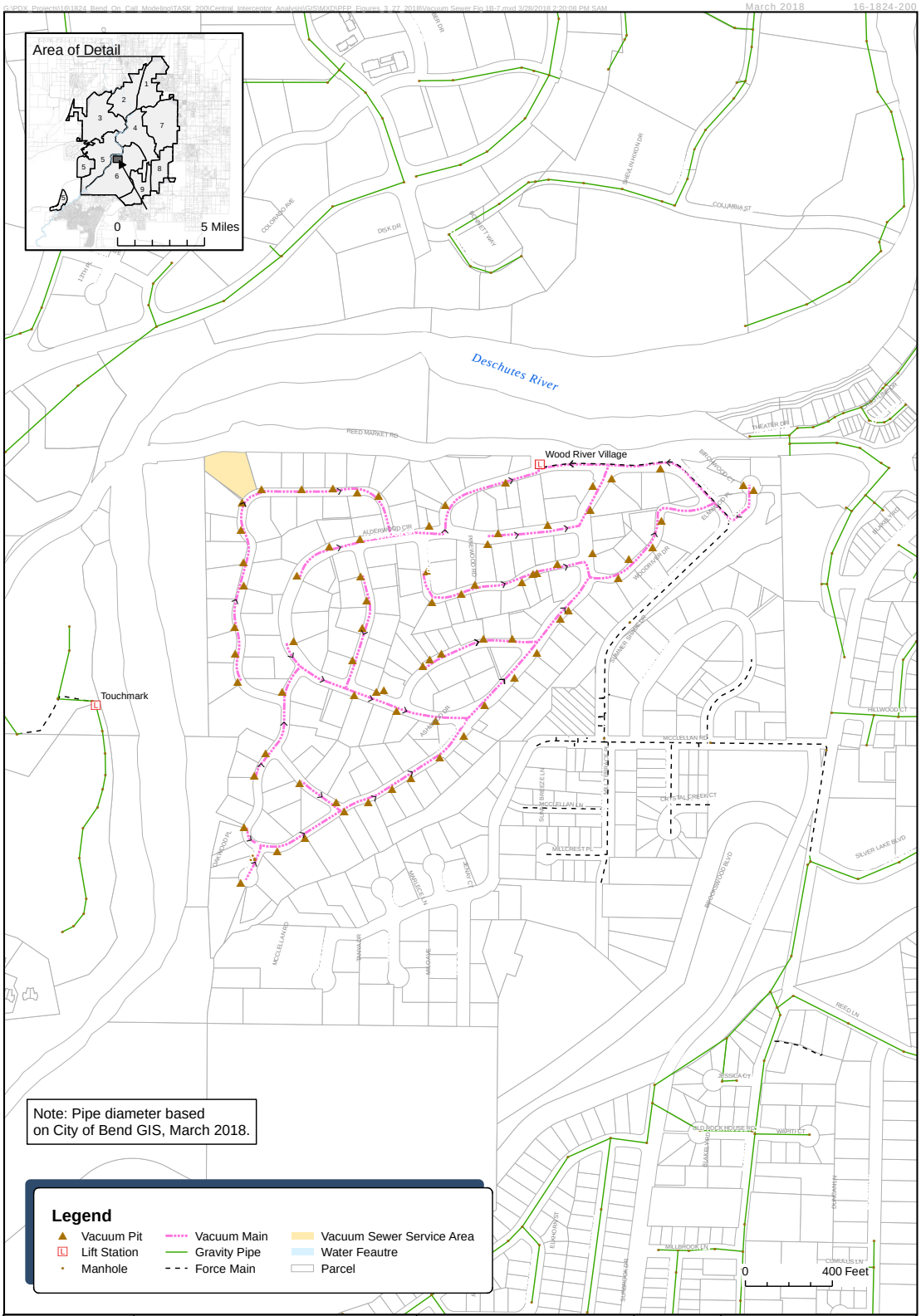
Vacuum Sewers

A vacuum sewer collection system serving 169 residential lots in the Wood River Village subdivision was installed in 2002 in the Wood River Village area, located just south of Reed Market Road along the east bank of the Deschutes River. The vacuum sewer service area is nearly at capacity and may require improvement with additional development.

The vacuum sewer system is comprised of an array of vacuum pits (each pit serving one to three residences), a vacuum sewer and a vacuum station. Traditional gravity pipes carry wastewater from each residence to the vacuum pit. The vacuum pit valve opens after an accumulation of sewage, and the vacuum pulls the sewage into the vacuum main; the vacuum pit valve then closes. The vacuum sewer is slightly sloped toward the vacuum station. At intervals, the vacuum sewer flows uphill by the differential pressure of the vacuum. Inside the vacuum main, wastewater travels between 15 and 18 feet per second (ft/sec). The vacuum main collects and directs sewage toward the vacuum station, which creates the vacuum and pumps the sewage in a traditional force main further downstream into the collection system. Based on information provided by the City, Table 16 summarizes the primary collection system's vacuum mains. Figure 7 presents the area served by the vacuum sewer system.

Table 16
Primary Collection System's Vacuum Sewer Mains

Diameter (inch)	Total Length (feet)	Percentage of Total Length
4	8,967	75.8%
6	2,865	24.2%
Total	**11,832**	**100%**


March 2018
16-1824-200
Area of Detail
0
5 Miles
Deschutes River
Wood River Village
Touchmark
Note: Pipe diameter based on City of Bend GIS, March 2018.
Legend
Vacuum Pit
Lift Station
Manhole
Vacuum Main
Gravity Pipe
Force Main
Vacuum Sewer Service Area
Water Feautre
Parcel
0
400 Feet
City of Bend
Public Facility Plan
Figure 7
Existing System:
Vacuum Sewer
Service Area

Force Mains and Common Pressure Mains

Similar to the method adopted to summarize gravity pipes, force main and common pressure main have been summarized by two attributes: Table 17 presents installation year and diameter, Table 18 installation year and material, and Table 19 material and diameter, and Figure 8 shows existing system force mains by diameter. The force main and common pressure mains total approximately 75 miles. The collection system has many lift stations not served by a dedicated force main. Rather, some force mains are connected to a common pressure main with multiple force mains tied-in to it. This type of connection can cause operational problems at lift stations. For instance, with one lift station pumping, a second lift station cannot effectively pump against the pack pressure created by the first lift station.

Table 17
Force Mains and Common Pressure Mains - Installation Year and Diameter Summary

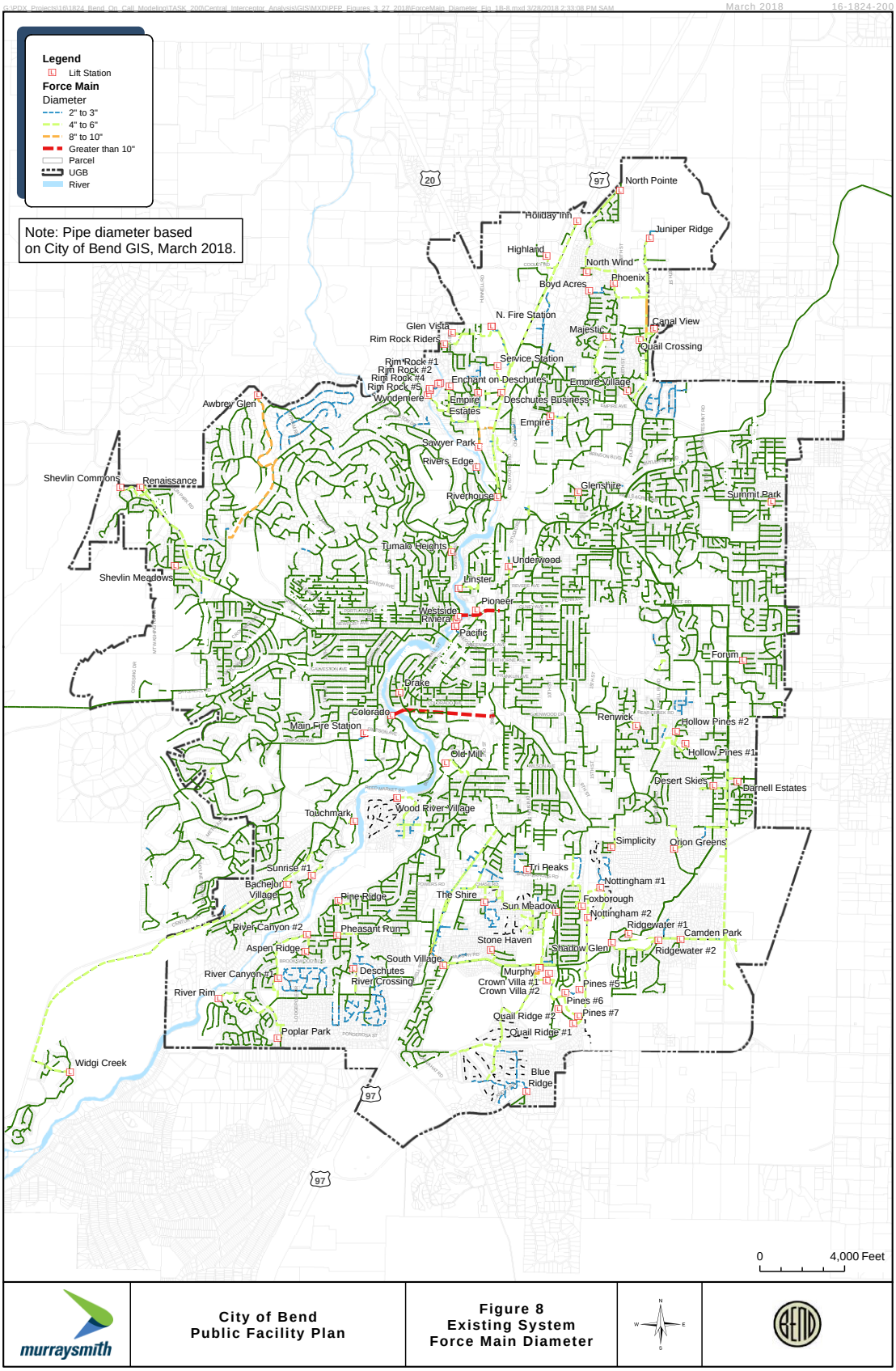
Diameter (inch)	Installation Year - Length (1,000 feet)						Percent
	Pre 1970	1970-1979	1980-1989	1990-1999	2000-2009	2010-2017	
2	0.0	0.9	0.0	1.3	2.6	0.2	**1%**
2.5	0.0	21.7	0.0	10.7	0.0	0.0	**8%**
3	1.3	8.8	0.8	17.6	72.3	4.1	**26%**
4	2.4	16.4	4.8	34.1	45.8	2.9	**27%**
6	0.2	11.2	12.1	45.2	39.3	0.1	**27%**
8	0.0	0.5	0.0	9.3	4.2	0.0	**4%**
10	0.0	0.0	0.0	0.0	3.4	4.2	**2%**
12	0.5	0.0	0.0	0.0	0.0	13.6	**4%**
16	0.6	2.1	0.0	0.0	2.9	0.0	**1%**
Percent	**1%**	**15%**	**4%**	**30%**	**43%**	**6%**	**100%**

Table 18
Force Mains and Common Pressure Mains - Installation Year and Material Summary

Material	Installation Year - Length (1,000 feet)						Percent
	Pre 1970	1970-1979	1980-1989	1990-1999	2000-2009	2010-2017	
Poly Vinyl Chloride	5.0	58.4	17.7	113.1	168.8	25.1	**98%**
Ductile Iron Pipe	0.0	2.1	0.0	4.8	1.6	0.0	**2%**
Cast Iron Pipe	0	1.1	0	0	0	0	**0%**
Percent	**1%**	**15%**	**4%**	**30%**	**43%**	**6%**	**100%**

Table 19
Force Mains and Common Pressure Mains - Material and Diameter Summary

Diameter (inch)	Material - Length (1,000 feet)			Percent
	Poly Vinyl Chloride	Ductile Iron Pipe	Cast Iron Pipe	
2	4.9	0.0	0.0	**1%**
2.5	32.3	0.0	0.0	**8%**
3	104.8	0.0	0.0	**26%**
4	105.3	0.0	1.1	**27%**
6	107.9	0.0	0.0	**27%**
8	7.6	6.4	0.0	**4%**
10	7.6	0.0	0.0	**2%**
12	14.1	0.0	0.0	**4%**
16	3.5	2.1	0.0	**1%**
Percent	**98%**	**2%**	**0%**	**100%**

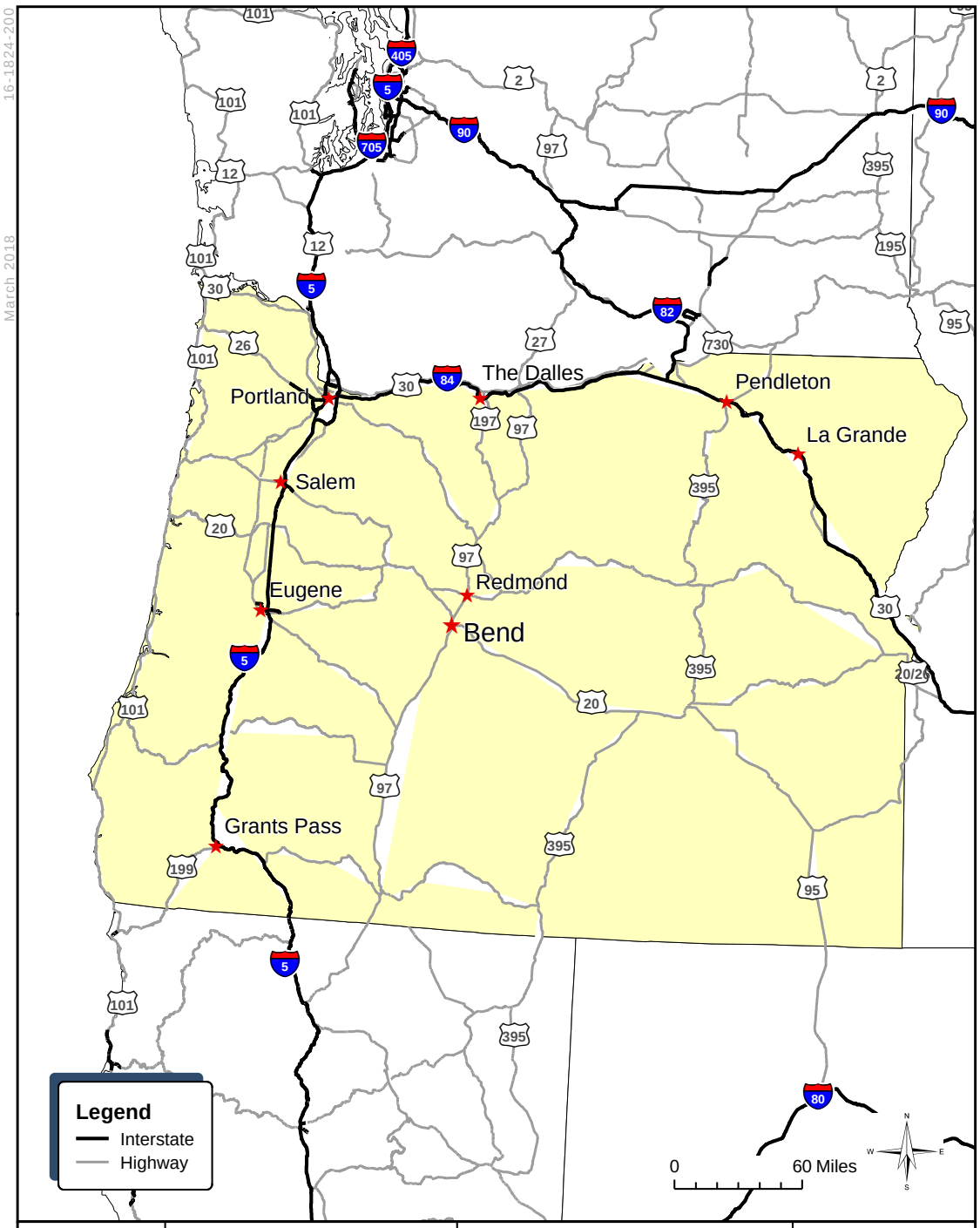

C:\PDX_Projects\16\1824_Bend_On_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\PFP_Figures_3_27_2018\ForceMain_Diameter_Fig_1B-8.mxd 3/28/2018 2:33:08 PM SAM
March 2018
16-1824-200
Legend
Lift Station
Force Main
Diameter
2" to 3"
4" to 6"
8" to 10"
Greater than 10"
Parcel
UGB
River
Note: Pipe diameter based on City of Bend GIS, March 2018.
North Pointe
Holiday Inn
Juniper Ridge
Highland
North Wind
Phoenix
Boyd Acres
N. Fire Station
Canal View
Majestic
Quail Crossing
Glen Vista
Rim Rock Riders
Rim Rock #1
Rim Rock #2
Rim Rock #4
Rim Rock #5
Wyndemere
Service Station
Enchant on Deschutes
Empire Village
Deschutes Business
Empire Estates
Empire
Awbrey Glen
Sawyer Park
Rivers Edge
Shevlin Commons
Renaissance
Riverhouse
Glenshire
Summit Park
Tumalo Heights
Underwood
Shevlin Meadows
Linster
Pioneer
Westside
Riverfront
Pacific
Forum
Drake
Colorado
Renwick
Hollow Pines #2
Main Fire Station
Old Mill
Hollow Pines #1
Desert Skies
Barnell Estates
Touchmark
Wood River Village
Simplicity
Onion Greens
Sunrise #1
Tri Peaks
Nottingham #1
Bachelor Village
Pine Ridge
The Shire
Foxborough
Sun Meadow
Nottingham #2
Ridgewater #1
Camden Park
River Canyon #2
Pheasant Run
Stone Haven
Ridgewater #2
Aspen Ridge
Shadow Glen
South Village
Deschutes River Crossing
Murphy
Crown Villa #1
Crown Villa #2
Pines #5
Pines #6
Pines #7
River Canyon #1
River Rim
Quail Ridge #2
Quail Ridge #1
Poplar Park
Widgi Creek
Blue Ridge
20
97
0
4,000 Feet
City of Bend
Public Facility Plan
Figure 8
Existing System
Force Main Diameter
murraysmith

OAR 660-011-0010(1)(d) General Location of Service Area

The City of Bend (City) is located in central Oregon, on the eastern edge of the Cascade Range. The City is located in Deschutes County, along the Deschutes River and to the east of the Three Sisters Mountains and Mount Bachelor. Elevation within the City varies considerably due to the river channel, Awbrey Butte and Pilot Butte, but the City's general elevation is 3,620 feet above mean sea level. The City covers an area of approximately 33.3 square miles.

The City owns and operates a collection system to manage and collect wastewater in the community. The primary collection system is comprised of City-owned lift stations, gravity pipelines, force main, and common pressure main sewer systems, exclusive of services; it contains approximately 380 miles of gravity pipeline and 75 miles of force main and common pressure sewer pipeline, and includes 86 regional lift stations, many of which convey flow through long force mains.

Figure 9 presents a regional map of Oregon showing the location of the City, and Figure 5 shows the primary collection system.



murraysmith	**City of Bend Public Facility Plan**	**Figure 9 Existing System: Regional Map**	BEND

OAR 660-011-0010(1)(e) Provider(s) Identification

The City provides sewer service to residents and businesses within the UGB. There are no other sewer service providers, special districts or private utilities with which the City coordinates to provide wastewater collection and treatment. The City's sewer system includes a collection system, pump station, and interceptors which convey wastewater to the wastewater reclamation facility (WRF).

OAR 660-011-0010(1)(b) Public Facility Project Descriptions, OAR 660-011-0010(1)(c) Rough Cost Estimates, and OAR 660-011-0010(1)(f) Project Need-Time Estimate

This section includes background and descriptions of proposed projects associated with the City's collection system Capital Improvement Program (CIP).

Capacity Related Capital Project Development

Peak flow rates representing sanitary services and wet weather impacts within the City's UGB were considered to select capital improvements and evaluate improvement phasing. The CIP represents those projects required to serve projected growth within the 20-year planning horizon.

Development tiers or categories in the 1 to 5-year timeframe were identified by City staff to understand impacts to the system from near-term development including impacts of development prior to completion of the large interceptor projects. The tiered analysis was used to prioritize these key interceptor improvements and associated lift station decommissioning.

System loading or average wastewater flows were developed by applying unit wastewater factors to household and employment projections by parcel. Specific flow rates from development permits were used to replace generic assumptions where information was available. The unit wastewater factors were established from existing flow metering records at the WRF and review of wintertime water consumption records. Additional unit factors for schools and breweries were established from water consumption records. Unit flow factors are summarized in Table 20. Equivalent dwelling unit projections and average flow projections are shown in Figures 10 and 11 respectively for the 20-year planning horizon. Peak dry weather flows were established by applying hourly diurnal patterns to the average wastewater flows.

Table 20
Wastewater Average Dry Weather Unit Flow Factors

Unit Flow Factor Category	Unit Flow Factor (gallons-per-day, gpd)
Per Household	130
Per Employee	45
Brewery (per Acre)	6,300
School (per Acre)	350

Figure 10
Equivalent Dwelling Unit Projections by Development Category and Phasing

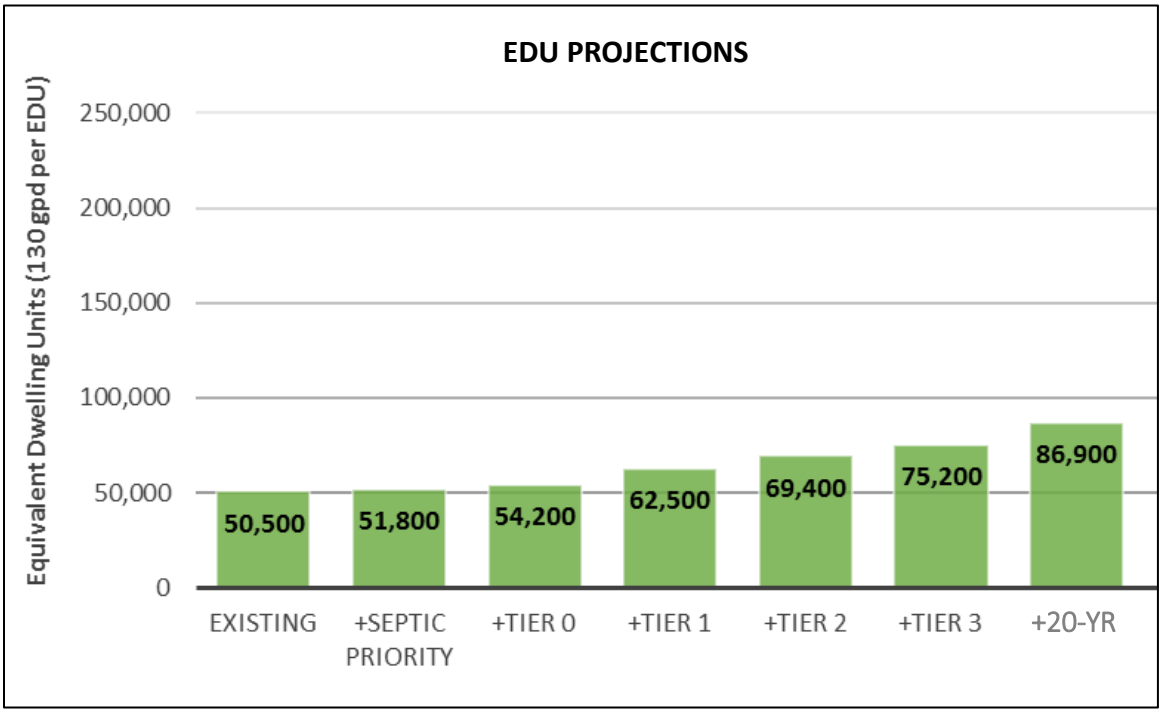
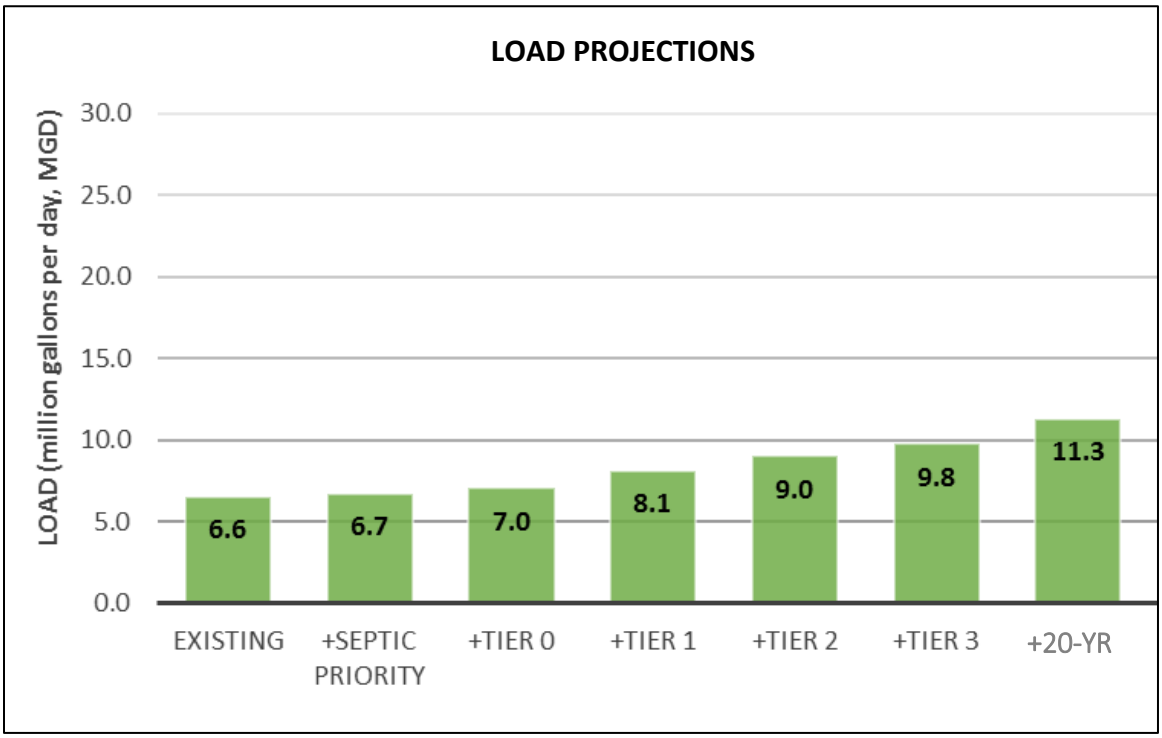


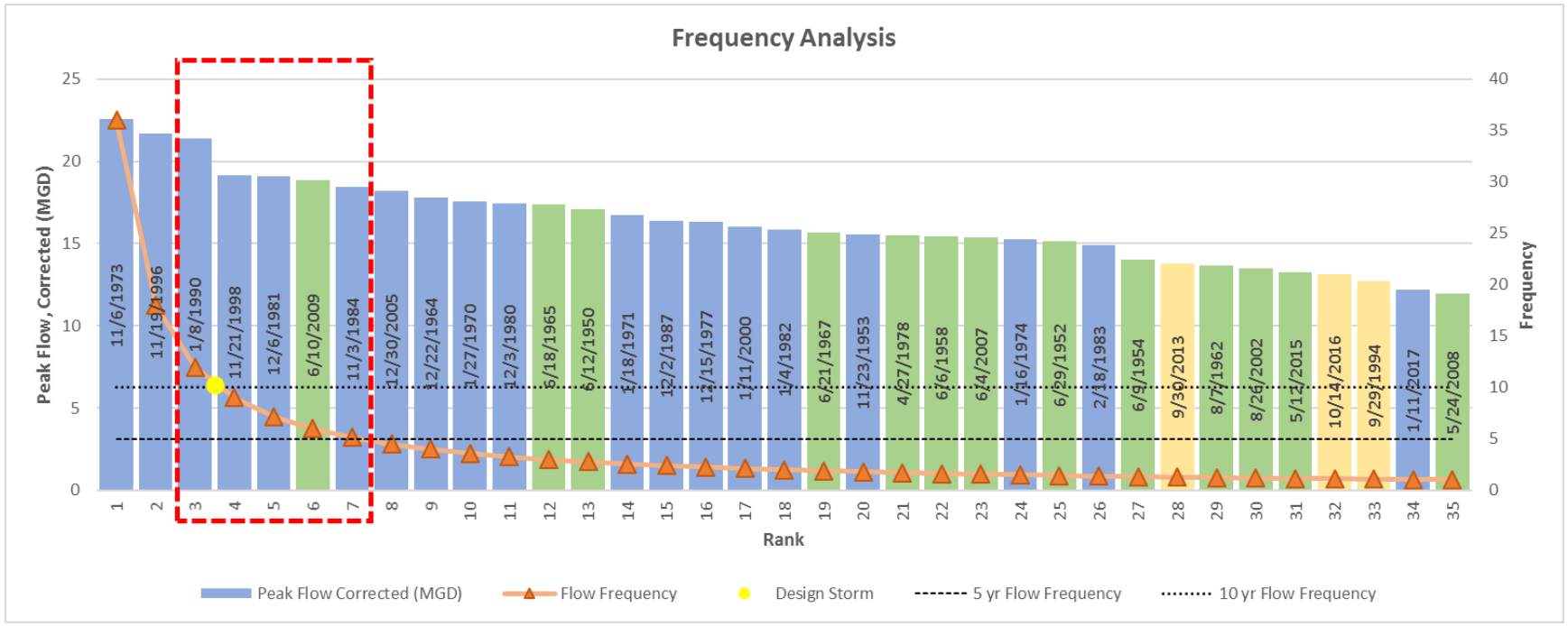
Figure 11
Loading (Average Dry Flow) Projections by Development Category and Phasing



A flow frequency analysis was performed utilizing historic precipitation data. Thirty-five high precipitation and seasonally variable historic rainfall events were simulated in the City's hydraulic model. These events were ranked from highest to lowest by downstream peak flow at the WRF. The recurrence interval (frequency) of each event was estimated to determine the risk of occurrence. Events that bracketed the 5-year (winter) to 10-year (summer) flow frequency were selected to represent a range of acceptable risk based on Oregon Department of Environmental Quality guidelines (Oregon Administrative Rule 340-041-0009). The peak flow rates established by the selected historic events were compared to the City's design storm to confirm a 1 in 10-year recurrence interval as shown in Figure 12. The City's design storm is characterized by a 24-hour rainfall depth of 1.3 inches and the National Resources Conservation Service (NRCS) Type II theoretical storm distribution.

Peak wet weather flows were developed utilizing the City's hydraulic model and applying the design storm event to calibrated wet weather unit hydrographs and associated sewershed areas for existing and future development within the City's UGB.

Figure 12
Flow Frequency Analysis and Design Storm Confirmation, Wet Weather



Design Criteria

The relevant design and performance criteria applied to improvement identification and sizing are consistent with the criteria applied in the CSMP. The criteria include: system surcharge, freeboard and overflow constraints, maximum and minimum velocity constraints, and lift station firm capacity as summarized in Table 21.

Table 21
Capacity Design Criteria

Category	Definition
During peak dry weather flows, depth/Diameter (d/D)	≤ 0.8
During peak wet weather flows, d/D	Existing Pipe: Covered under freeboard requirements New Pipe: < 1.0
During peak wet weather flows, maximum surcharge (freeboard from water surface to manhole rim)	Existing Pipe: Minimum 2.0 feet of freeboard system wide for unsealed gravity pipes. Manholes with < 2.0 feet from crown to rim will be identified and evaluated individually as exceptions or required improvements. New Pipe: No manhole surcharging, piping will be sized to convey peak wet weather flows under full pipe conditions.
Shallow manhole (crown of pipe to rim < 2.5 feet), during peak wet weather flows, maximum surcharge (freeboard from water surface to manhole rim)	Existing Pipe: Covered under peak wet weather requirement. New Pipe: No manhole surcharging, piping will be sized to convey peak wet weather flows under full pipe conditions.
Lift station firm capacity	Lift capacity to discharge the peak flow associated with the design wet weather event with largest unit out of service.
Maximum force main velocity	6 feet per second (fps) max under peak dry weather flows, 10 fps max under peak wet weather conditions with all pumps operating.

Capital Improvement Cost Assumptions

Unit cost rates used for the CIP are planning-level estimates and are consistent with the approach used in the CSMP. All cost estimates are Class 5 budget estimates, as established by the *American Association of Cost Engineers*. This preliminary estimate class is used for conceptual screening and assumes project definition maturity level below two percent. The expected accuracy range is -20 to -50 percent on the low end, and +30 to +100 percent on the high end. The cost estimates are consistent with the definition of OAR 660-011-0005(2) and OAR 660-011-035. Cost estimates are intended to be used as guidance in establishing funding requirements at the project planning level based on information available at the time of the estimate. Estimates exclude land acquisition, financing, and inflation. Cost estimates were performed in 2017 dollars based on *The Engineering News Record Construction Cost*

Index (ENR CCI) basis of 10,870 (December 2017).

Unit cost rates include materials, installation, and surface restoration in three categories (arterial, local, and dirt). Unit installation and material costs vary by both pipe diameter and depth. Unit cost markups are included for design and administration costs, mobilization, traffic control, erosion control, and contractor's overhead.

Some capital projects include significant unknowns at a planning level assessment. To account for unknowns related to canal crossings, deep rock blasting, utility conflicts and significant downtown disruptions, capital projects were given a contingency markup between 30- and 80-percent. Markups are presented in Table 22.

The actual project costs will likely vary from the estimates presented due to fluctuations in actual labor and material costs, competitive market conditions, site conditions, final project scope, implementation schedule, continuity of personnel, and other unforeseeable factors. Because of these factors, project feasibility, benefit-to-cost ratios, and funding must be carefully reviewed prior to making specific financial decisions or establishing project specific budgets.

Table 22
Unit Cost Markups

Markup Category	Markup
Design and Administration	30%
Construction Mobilization	10%
Traffic Control and Erosion	9%
Contractor Overhead and Profit	15%
Construction Contingency Low End	30%
Construction Contingency High End	80%
Overall Markup	2.1 (low) to 3.1 (high)

Capital Improvement Program

Improvement project descriptions and cost summaries are provided in Tables 23 through 24 and shown in Figure 13. Each project includes a unique identifier and a description of the improvement, including location reference, rough cost estimate (in December 2017 dollars), and timeframe for project implementation. Project implementation is subdivided into short-term (1 to 5-years), mid-term (6 to 10-years), and long-term (11 to 20-years). Where capacity related improvements are required for a lift station or gravity pipeline prior to a condition repair, the project timing is determined by the capacity constraint.

In addition to timeframe, projects are organized by the following categories.

1. Trunk Sewer and Interceptor Improvements – Larger diameter gravity trunk and interceptor projects to provide additional system capacity including the North and East Interceptors.

2. Southeast Lift Station Condition and Decommissioning Improvements– Lift Station decommissioning projects adjacent to the Southeast Interceptor. Several lift stations may require condition improvements prior to decommissioning.

3. South Lift Station Capacity and Condition Improvements impacting the Amethyst/Mahogany/3rd Street Trunk Sewer – Lift Station capacity and condition improvements adjacent to the trunk sewer. Lift station and trunk sewer improvement projects require coordination.

4. Other South and East Area Lift Station Condition Improvements – Condition improvements for lift stations that will not be decommissioned.

5. Central Area Lift Station Capacity and Condition Improvements – Lift Station capacity and condition improvements in the downtown core and directly impacting the Central Interceptor.

6. West Lift Station Capacity and Condition Improvements impacting the Newport Avenue Trunk Sewer – Lift Station capacity and condition improvements upstream of the trunk sewer. Lift stations require improvements to serve UGB expansion growth areas in the west.

7. North Lift Station Condition and Decommissioning Improvements- Lift Station decommissioning projects associated with construction of the North Interceptor. Several lift stations may require condition improvements prior to decommissioning.

8. Other North Area Lift Station Capacity and Condition Improvements – Capacity and condition improvements for lift stations that will not be decommissioned.

9. Programmatic Funding – These projects include annual or periodic funding for pipeline condition assessments, infrastructure repair and replacement program, local area improvements, flow monitoring, on-call hydraulic modeling services, and master planning.

10. Expansion Area Infrastructure – Collection system infrastructure including trunk sewers and one regional lift station to serve recent UGB expansion areas. Cost estimates exclude local sewers and sewer laterals. Projects are anticipated to be funded by developers.

Additional discussion is provided below to describe key projects from the above categories within the recommended implementation timeframes.

Short-Term Projects

In response to existing hydraulic deficiencies, planned near-term development, condition deficiencies and other operational issues identified by City Operations & Maintenance (O&M) staff, there are several major projects identified in the short term (1 to 5 years).

Projects completed or nearing construction between 2014 and 2017 are excluded from the CIP including:

1. Southeast Interceptor Phase 1 and Phase 1 Extension
2. Colorado Lift Station and Force main
3. North Area Improvements
4. Plant Interceptor Rehabilitation (upper segments)
5. Valhalla Sewer Relocation and Flushing

Major projects recommended in the 1 to 5-year timeframe include the following:

1. North Interceptor Phase 1
2. Southeast Interceptor Extension and Diversion
3. Southeast Lift Station Decommissioning
4. Drake Lift Station and Force main

North Interceptor Phase 1 – The project is located one half mile south of the existing Plant Interceptor, connecting to the existing interceptor near Pioneer Loop, and extending east to the WRF. The North Interceptor Phase 1 is required to alleviate capacity and condition related deficiencies in the existing interceptor allowing for continued development within the City's UGB. The project will require coordination with local irrigation districts to develop canal crossings.

Southeast Interceptor Extension and Diversion – The project extends the Southeast Interceptor west from Parrell Road and across Highway 97. The improvement will divert wastewater from the Mahogany/Amethyst trunk sewer and the Central Interceptor system

into the Southeast Interceptor allowing for continued development in the City central core. The diversion structure will allow split flow between the Central Interceptor and the Southeast Interceptor.

Southeast Lift Station Decommissioning – With the completion of the Southeast Interceptor, gravity sewer connections may be implemented to decommission up to 24 lift stations. Accelerated lift station decommissioning in many cases will eliminate potential condition improvements. Where lift station decommissioning is not feasible or cost-effective, condition improvements are recommended.

Drake Lift Station and Force main – Expansion of the Drake Lift Station and force main capacity will accommodate growth in the KorPine service area.

Short to Mid-Term Projects (Development-Driven)

Many projects are driven by development location and timing. The development-driven projects identified in the short- (0 to 5-years) to mid-term (6 to 10-years) are described below. These projects may be accelerated or delayed based on actual development and service trends. These projects include:

1. Amethyst/Mahogany/3rd Street Trunk
2. River Rim Lift Station
3. 8th to 15th Street Trunk
4. Newport Trunk, Shevlin Commons Lift Station, Shevlin Meadows Lift Station and Force main, and Renaissance Lift Station
5. Deschutes Business Lift Station
6. North Interceptor Phase 2
7. North Area Lift Station Decommissioning
8. North Interceptor Phase 3
9. Old Mill Lift Station and Force main
10. East Interceptor Phase 1

Amethyst/Mahogany/3rd Street Trunk and River Rim Lift Station – Expansion of the gravity trunk and the River Rim Lift Station pumping capacity are initially required for development in the River Rim upstream service area. Sizing of the trunk sewer includes planned future service for local septic to sewer conversions. The extent of the Amethyst/Mahogany/3rd Street Trunk sewer improvement is dependent on potential operational changes to implement variable frequency drives at six contributing lift stations.

8th to 15th Street Trunk – Trunk capacity improvements are driven by near-term development adjacent to 10th and 15th Street. Ultimate sizing of the improvement accommodates future infill development.

Newport Trunk, Shevlin Commons Lift Station, Shevlin Meadows Lift Station and Force main, and Renaissance Lift Station – Expansion of the gravity trunk and lift station capacities

are required for development of the West and Shevlin UGB expansion areas. The three lift stations share common force mains. The extent of the Newport Trunk sewer improvement is dependent on operation of the three lift stations and implementation of variable frequency drives.

Deschutes Business Lift Station – Expansion of the Deschutes Business Lift Station pumping capacity are driven by infill development in the service area adjacent to the existing lift station. Coordinate this improvement with service area and available capacity for Tuscany Pines Lift Station

North Interceptor Phase 2 and North Area Lift Station Decommissioning - Phase 2 extends the North Interceptor to Highway 97 and allows for north area development. The project will directly serve future development in Juniper Ridge and north UGB expansion areas (OB Riley and North Triangle). Once the interceptor is in place, gravity sewer connections can be implemented to decommission up to 7 lift stations. These projects will require coordination with local irrigation districts to develop canal crossings and may require conversion of open channel irrigation to piped conveyance prior to constructing the sewer crossing.

North Interceptor Phase 3 – Phase 3 extends the North Interceptor west to OB Riley Road and south to Glen Vista Road. The project is required to serve the OB Riley and North Triangle UGB expansion areas. Once in place, gravity sewer connections can be implemented to decommission an additional two lift stations. This project will require coordination with local irrigation districts to develop canal crossings and may require conversion of open channel irrigation to piped conveyance prior to constructing the sewer crossing.

Old Mill Lift Station and Force main – Expansion of the Old Mill Lift Station pumping, and force main capacity are driven by infill development in the service area adjacent to the existing lift station.

East Interceptor Phase 1 – The East Interceptor Phase 1 extends south from the North Interceptor Phase 1 on Hughes Road and Hamehook Road, to Butler Market Road. The project is driven initially by the Northeast Edge UGB expansion area. Ultimately the pipeline will serve infill, and UGB expansion areas in the southeast and south (Elbow, DSL, Thumb).

Mid to Long-Term Projects (Development-Driven)

The development-driven projects identified in the mid- (6 to 10-years) to long-term (11 to 20-years) are described below. These projects may be accelerated or delayed based on actual development and service trends. These projects include:

1. Drake Downstream Trunk
2. Central Interceptor
3. East Interceptor Phase 2

Drake Downstream Trunk – The gravity sewer between Drake Lift Station and the Central Interceptor requires upsizing to serve buildout densities for the KorPine development site. The project is recommended between the mid- and long-term timeframes (10-years) to accommodate phased development of the site in 5 to 15-years. To minimize traffic disruptions through busy commercial areas, an alternate improvement route from the Drake Lift Station to an improved 2nd Street Trunk may be considered.

Central Interceptor – The Central Interceptor requires upsizing to accommodate buildout densities in a combination of the West UGB expansion area, Shevlin UGB expansion area, Central Business District, KorPine Site, OSU Cascades, and Century Drive area. Similar to the Drake Trunk, the interceptor improvement is recommended between the mid- and long-term timeframes (10-years) to accommodate phased development in 5 to 15-years.

East Interceptor Phase 2 – Phase 2 extends the East Interceptor south on Hamby Road and west near Neff Road to connect with the Southeast Interceptor. A diversion structure is recommended to split flows between the Southeast Interceptor Phase 1 Extension on Neff Road and the East Interceptor. The project is driven by infill, and UGB expansion areas in the southeast and south.

Expansion Area Service

To serve many of the recent UGB expansion areas, projects are required to construct and extend trunk sewers. For the Elbow, a service area lift station and force main are required. These expansion projects exclude local collection piping and laterals. These projects are assumed to occur at the time of expansion area development and may be funded by developers.

1. Elbow Gravity Trunk
2. Elbow Lift Station and Force main
3. DSL Gravity Trunk
4. Thumb Gravity Trunks
5. West Gravity Trunks

The PFP excludes local pipelines and pumping services for expansion areas beyond the trunk sewers and regional lift station in the Elbow. The local sewer infrastructure projects are intended to be provided and funded by the developer of the neighborhood and are not included in the City's Capital Improvement Program.

Other Projects

Other short-, mid-, and long-term projects required to accommodate system growth and maintain system condition are described below:

1. Condition Related Lift Station Improvements
2. Condition Assessment, Sewer Flow Monitoring, Modeling, and Planning Projects

3. Pipeline Repair and Replacement Program
4. Local Area Improvements
5. Plant Interceptor Rehabilitation (lower portion)

Condition-Related Lift Station Improvements – The City's O&M Department rated the condition of City-owned area and regional lift stations determining that 26 lift stations require improvements in the short-term and 33 lift stations require improvements in the mid- to long-term.

Pipeline Repair and Replacement Program – The City plans for long-term stewardship of the collection system by dedicating funds to a systematic long-term collection system replacement program. This program consists of budgeting for the replacement of the collection system based on the useful life of infrastructure with in-kind replacement or rehabilitation methods, where applicable.

Local Area Improvements – City funds allocated for this improvement category provide for planning for sewer service to developed, unsewered areas of the community, with shared funding through local improvement districts, connection fees, or otherwise, and improve poorly performing areas of the existing collection system within the City limits.

Ongoing Condition Assessment, Sewer Flow Monitoring, Modeling and Planning Projects – These projects allow the City to continue improving information and data collection, condition databases, modeling, and planning related to ongoing management of the collection system. Dedicated funding has been identified for condition assessments, flow monitoring, hydraulic modeling and master planning. These projects will support plan updates and prioritization of collection system improvements beyond the 5-year timeframe.

Plant Interceptor Rehabilitation (lower segments) – Once the North Interceptor Phase 1 is constructed, the lower portions of the existing Plant Interceptor may be replaced or rehabilitated to address condition-related deficiencies. The combination of the existing Plant Interceptor and North Interceptor Phase 1 provide system redundancy and operational flexibility.

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
Trunk Sewers and Interceptors								
99A-r	Year 1 to 5	North Interceptor Phase 1	Pipeline Capacity and Condition	New interceptor located one half mile south of the existing Plant Interceptor, connecting to the existing interceptor near Pioneer Loop, and extending east to the WRF.	The North Interceptor Phase 1 is required to alleviate capacity and condition related deficiencies in the Plant Interceptor in the near-term. This project will require coordination with local irrigation districts to develop canal crossings. Coordinate with ODOT for timing and alignment of the North Corridor Highway project.	up to 60-inch	9,700 LF	$17,900,000
60C-r	Year 1 to 5	Southeast Interceptor Extension	Pipeline Capacity and Development	New piping to extend the Southeast Interceptor west from Parrell Road and across Highway 97. A diversion structure will allow split flow between the Central Interceptor and the Southeast Interceptor.	The improvement will divert wastewater from the Mahogany/Amethyst trunk sewer and the Central Interceptor system into the Southeast Interceptor allowing for continued development in the City central core. Coordinate with improvement 22-r. Routing options may allow for reduced collective improvements between 60C-r and 22-r.	30-inch	3,600 LF	$4,000,000
22-r	Year 1 to 5	Amethyst/Mahogany/ 3rd Street Trunk Sewer	Pipeline Capacity and Development	Upsize existing trunk sewer (or construct parallel sewer) between CMH001647 and CMH001653 on Amethyst and Mahogany Streets; CMH001631 and CMH001636 near Granite Drive, Driftwood Lane, and Crystal Lane; and, CMH009797 and CMH003638 on 3rd Street.	Project required for development in the River Rim service area, infill development, Thumb UGB expansion area, and septic to sewer conversions. Coordinate with improvements 60C-r, 42, 29, 70-r, 28-r, 125, and 114. Routing options may allow for reduced collective improvements between 60C-r and 22-r. VFDs at applicable lift stations reduce potential impact to trunk sewer.	up to 30-inch	6,000 LF	$3,520,000
200-n	Year 1 to 5	Newport Ave Trunk Sewer	Pipeline Capacity and Development	Upsize existing trunk sewer (or construct parallel sewer) between CMH004178 and CMH002539, and CMH008750 and CMH008747 on Shevlin Park Road.	Project required for West and Shevlin UGB expansion development. Coordinate with improvements 111, 123, 112A-r, and 112B-r. VFDs at applicable lift stations reduce potential impact to trunk sewer.	36-inch	1,200 LF	$800,000
202-n	Year 1 to 5	8th to 15th Street Trunk Sewer	Pipeline Capacity and Development	Upsize existing trunk sewer (or construct parallel sewer) between CMH002339 and CMH008036 between 8th and 15th Streets.	Project required for development adjacent to trunk sewer on 10th and 15th Streets.	18-inch	10,000 LF	$6,875,000
99B-r	Year 6 to 10	North Interceptor Phase 2	Pipeline Capacity and Development	Extend the North Interceptor from phase 1 to Highway 97.	Project required for north area development including Juniper Ridge, infill development, North Triangle, and OB Riley. Coordinate with North Area Lift Station decommissioning (100A, 100B, 101A, 101B, 102A, 102B, 103A, 103B, 104A, 104B, 105A, 105B, 106A, 106B). This project will require coordination with local irrigation districts to develop piped canal crossings. Coordinate with ODOT for timing and alignment of the North Corridor Highway project.	up to 60-inch	16,600 LF	$28,900,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
99C-r	Year 6 to 10	North Interceptor Phase 3	Pipeline Capacity and Development	Extend the North Interceptor from phase 2 at Highway 97 west to OB Riley Road and south to Glen Vista Road.	Project required for north area development North Triangle, and OB Riley. Coordinate with North Area Lift Station decommissioning (116A-r, 116B-r, 124A-r, 124B-r). This project will require coordination with local irrigation districts to develop piped canal crossings. Coordinate with ODOT for timing and alignment of the North Corridor Highway project.	24-inch	14,200 LF	$11,300,000
201-n	Year 6 to 10	Drake Trunk Sewer	Pipeline Capacity and Development	Upsize existing trunk sewer (or construct parallel sewer) between CMH0083059 and CMH003482 near Broadway Street, Brooks Street, and Wall Street.	Project required for buildout of KorPine. To minimize traffic disruptions, an alternate route from the Drake Lift Station to an improved 2nd Street Trunk may be considered. Coordinate with improvements 36A-r and 36B-r. The lift station improvements may precede the gravity trunk improvements if VFDs are utilized to minimize gravity trunk impacts.	up to 48-inch	5,000 LF	$3,200,000
107-r	Year 6 to 10	Central Interceptor	Pipeline Capacity and Development	Upsize existing trunk sewer (or construct parallel sewer) between CMH003482 and CMH000319 on or near Olney Street, 4th Street, 5th Street, Studio Road, and Butler Market Road	Project required for buildout of the West, Shevlin, Central Business District, KorPine, OSU Cascades, and Century Drive.	up to 48-inch	10,000 LF	$11,680,000
60A1-r	Year 11 to 20	East Interceptor Phase 1	Pipeline Capacity and Development	New interceptor extending south from the North Interceptor Phase 1 on Hughes Road and Hamehook Road, to Butler Market Road.	Project required for development in the Northeast Edge. Ultimately the interceptor will serve all of Southeast Bend.	36-inch	8,600 LF	$14,300,000
60A2-r	Year 11 to 20	East Interceptor Phase 2	Pipeline Capacity and Development	Extend the East Interceptor from Phase 1, south on Hamby Road and west near Neff Road to connect to the Southeast Interceptor. A diversion structure will split flow between the Southeast Interceptor Phase 1 Extension on Neff Road and the East Interceptor.	Project required for buildout growth in Southeast Bend.	30-inch	14,500 LF	$15,600,000
Southeast Lift Stations Condition and Decommissioning								
15	Year 1 to 5	Murphy Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Project in progress	-	1 EA	$33,000
17A	Year 1 to 5	Ridgewater #1 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Ridgewater #1 Lift Station to the intersection of Ridgewater Loop and Ferguson Road, connecting to the SEI.	Coordinate with 17B, Project in progress	8 to 10-inch	100 LF	$16,000
17B	Year 1 to 5	Ridgewater #1 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 17A, Project in progress	-	1 EA	$33,000
18A	Year 1 to 5	Shadow Glen Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Shadow Glen Lift Station west, cross-country to 15th Street connecting to the SEI northeast of Golden Gate Place and 15th Street intersection.	Coordinate with 18B, Project in progress	8 to 10-inch	100 LF	$37,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
18B	Year 1 to 5	Shadow Glen Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 18A, Project in progress	-	1 EA	$33,000
20	Year 1 to 5	Sun Meadow Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Project in progress	-	1 EA	$33,000
33	Year 1 to 5	Crown Villa #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, discharge piping and electrical panel.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 13A and 13B).	-	1 EA	$116,000
13A	Year 1 to 5	Crown Villa #1 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Crown Villa #1 Lift Station cross-country east to Brosterhous Road, connecting to existing gravity pipe south of Brosterhous Road and Murphy Road intersection.	Coordinate with 13B	8 to 10-inch	500 LF	$119,000
13B	Year 1 to 5	Crown Villa #1 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 13A	-	1 EA	$33,000
34	Year 1 to 5	Crown Villa #2 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, discharge piping and electrical panel and control panel.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 14A and 14B).	-	1 EA	$116,000
14A	Year 1 to 5	Crown Villa #2 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along a private road between Crown Villa #2 Lift Station and 530 feet east to Brosterhous Rd, connecting to existing gravity pipe south of Brosterhous Road and Murphy Road intersection.	Coordinate with 14B	8 to 10-inch	600 LF	$141,000
14B	Year 1 to 5	Crown Villa #2 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 14A	-	1 EA	$33,000
43	Year 1 to 5	Quail Ridge #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, discharge piping and electrical panel.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 90A and 90B).	-	1 EA	$174,000
90A	Year 1 to 5	Quail Ridge #1 Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going northeast approximately 100 feet cross-country from Quail Ridge #1 Lift Station to Brosterhous Road connecting to existing pipe northeast of Brosterhous and Windsor Drive intersection.	Coordinate with 90B	8 to 10-inch	100 LF	$27,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
90B	Year 1 to 5	Quail Ridge #1 Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 90A	-	1 EA	$33,000
44	Year 1 to 5	Quail Ridge #2 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, discharge piping and electrical panel.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 16A and 16B).	-	1 EA	$174,000
16A	Year 1 to 5	Quail Ridge #2 Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New sewer pipe from Quail Ridge #2 Lift Station to Brosterhous Road (cross-country), connecting to existing gravity pipe northwest of Brosterhous Road and Windsor Drive intersection.	Coordinate with 16B	8 to 10-inch	100 LF	$17,000
16B	Year 1 to 5	Quail Ridge #2 Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 16A	-	1 EA	$33,000
50	Year 1 to 5	The Pines #5 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: station piping and plumbing.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 94A and 94B).	-	1 EA	$116,000
94A	Year 1 to 5	The Pines #5 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going southwest cross-country from Pines #5 Lift Station to Brosterhous Road, connecting to existing pipe northwest of Brosterhous Road and Windsor Drive intersection.	Coordinate with 94B	8 to 10-inch	700 LF	$169,000
94B	Year 1 to 5	The Pines #5 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 94A	-	1 EA	$33,000
51	Year 1 to 5	The Pines #6 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: station piping and plumbing.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 95A and 95B).	-	1 EA	$116,000
95A	Year 1 to 5	The Pines #6 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going southwest cross-country from Pines #6 Lift Station to Brosterhous Road, connecting to existing pipe south of Murphy Road and Brosterhous Road intersection.	Coordinate with 95B	8 to 10-inch	1,500 LF	$374,000
95B	Year 1 to 5	The Pines #6 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 95A	-	1 EA	$33,000
52	Year 1 to 5	The Pines #7 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: station piping and plumbing.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 96A and 96B).	-	1 EA	$116,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
96A	Year 1 to 5	The Pines #7 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going southwest, cross-country from Pines #7 Lift Station to Brosterhous Road, connecting to existing pipe northwest of Brosterhous Road and Windsor Drive intersection.	Coordinate with 96B	8 to 10-inch	400 LF	$83,000
96B	Year 1 to 5	The Pines #7 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 96A	-	1 EA	$33,000
6A-r	Year 1 to 5	Tri Peaks Decommission - Southern Gravity Diversion	Gravity Pipe, LS Decommission	New pipeline from Tri Peaks Lift Station to sewer on Brosterhous Rd near Jacklight Ln. Portions of project may be constructed by developers. Coordinate with developer plans for interim Stone Creek/Anderson Ranch lift station.	Coordinate with 6B-r	8 to 10-inch	4,000 LF	$1,848,000
6B-r	Year 1 to 5	Tri Peaks Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 6A-r	-	1 EA	$33,000
32	Year 1 to 5	Camden Park Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, rail system and electrical panel.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 62A and 62B).	-	1 EA	$174,000
62A	Year 1 to 5	Camden Park Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Camden Park Lift Station along Ferguson Road, connecting to New gravity pipe (Project 67A) east of Ferguson Road and Sage Creek Drive intersection.	Coordinate with 62B	8 to 10-inch	1,100 LF	$1,296,000
62B	Year 1 to 5	Camden Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 62A	-	1 EA	$33,000
63A	Year 1 to 5	Desert Skies Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Desert Skies Lift Station along Daily Estates Drive to Clairaway Avenue, then along Clairaway Avenue to 27th Street, connecting to the SEI	Coordinate with 63B	8 to 10-inch	900 LF	$906,000
63B	Year 1 to 5	Desert Skies Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 63A	-	1 EA	$33,000
64A	Year 1 to 5	Forum Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Forum Lift Station along Forum Drive connecting to SEI pipeline at Forum Drive and 27th Street intersection.	Coordinate with 64B	8 to 10-inch	800 LF	$332,000
64B	Year 1 to 5	Forum Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 64A	-	1 EA	$33,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
67A	Year 1 to 5	Ridgewater #2 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Ferguson Road between Ladera Road and King Solomon Lane, connecting to SEI pipeline.	Coordinate with 67B	8 to 10-inch	1,000 LF	$994,000
67B	Year 1 to 5	Ridgewater #2 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 67A	-	1 EA	$33,000
89A	Year 1 to 5	Darnell Estates Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Darla Place between Darby Court and Darnel Avenue, then along Darnel Avenue to 27th Street, connecting to SEI pipeline.	Coordinate with 89B	8 to 10-inch	700 LF	$263,000
89B	Year 1 to 5	Darnell Estates Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 89A	-	1 EA	$33,000
92A	Year 1 to 5	Stone Haven Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Aberdeen Drive between approximately 200 feet south of Silver Sage and Broadmoor Way, then along Broadmoor Way to Murphy Road, connecting to SEI.	Coordinate with 92B	10 to 12-inch	700 LF	$279,000
92B	Year 1 to 5	Stone Haven Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 92A	-	1 EA	$33,000
97A	Year 1 to 5	The Shire Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Benham Road between south of Knightsbridge Place and Silver Sage Street, then along Silver Sage Street to Aberdeen Drive, then along Aberdeen Drive, connecting to new 10-inch pipe south of Silver Sage Street and Aberdeen Drive intersection.	Coordinate with 97B	8 to 10-inch	2,600 LF	$2,034,000
97B	Year 1 to 5	The Shire Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 97A	-	1 EA	$33,000
39	Year 1 to 5	Nottingham #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: corroded pumps, piping and rail system.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 65A and 65B).	-	1 EA	$174,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
65A	Year 1 to 5	Nottingham #1 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from upstream of Nottingham #1 Lift Station south, cross-country for approximately 100 feet, then cross-country east to Robin Hood Lane, then along Robin Hood Lane northeast approximately 150 feet, then cross-country northeast 15th Street, then along 15th Street to Desert Woods Drive, then along Desert Woods Drive to Orion Drive, connecting to SEI pipeline.	Coordinate with 65B	8 to 10-inch	4,800 LF	$1,249,000
65B	Year 1 to 5	Nottingham #1 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 65A	-	1 EA	$33,000
40	Year 1 to 5	Nottingham #2 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: wet well and discharge piping.	Eliminate improvement if lift station is decommissioned in near-term (see improvement 66A and 66B).	-	1 EA	$174,000
66A	Year 1 to 5	Nottingham #2 Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from Nottingham #2 Lift Station east, cross-country to Sherwood Forest Drive, then along Sherwood Forest Drive southeast approximately 400 feet, then cross-country southeast to 15th Street, connecting to SEI pipeline.	Coordinate with 66B	12 to 15-inch	1,600 LF	$478,000
66B	Year 1 to 5	Nottingham #2 Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 66A	-	1 EA	$33,000
19A	Year 6 to 10	South Village Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe from South Village Lift Station to Murphy Road, connecting to SEI northwest of Murphy Road and Parrell Road intersection.	Coordinate with 19B	8 to 10-inch	300 LF	$74,000
19B	Year 6 to 10	South Village Lift Station Decommission	Lift Station Decommission	The decommissioning of South Village Lift Station includes the removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 19A	-	1 EA	$33,000
91A	Year 6 to 10	Simplicity Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Hollis Lane between east of Lincoln Lane and 15th Street, then along 15th Street to Desert Woods Drive.	Coordinate with 91B	8 to 10-inch	1,600 LF	$411,000
91B	Year 6 to 10	Simplicity Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 91A	-	1 EA	$33,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
88A	Year 11 to 20	Blue Ridge Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Knott Road between Blue Ridge Lane and Country Club Drive, then along Country Club Drive to south of Murphy Road, connecting to SEI pipeline south of the intersection.	Coordinate with 88B	8 to 10-inch	6,800 LF	$1,979,000
88B	Year 11 to 20	Blue Ridge Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 88A	-	1 EA	$33,000
South Lift Stations Impacting Amethyst/Mahogany Trunk Sewer								
42	Year 1 to 5	Poplar Park Lift Station Capacity and Condition	Lift Station Capacity and Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors. Implement VFDs to minimize impacts to downstream Amethyst/Mahogany trunk sewer.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r). Improve sink hole issue.	-	1 EA	$231,000
29	Year 1 to 5	River Rim Lift Station Hydraulic Upgrade	Lift Station Capacity	Project includes new pumps, VFDs, piping, electrical and control equipment, standby generator for back-up power, odor control equipment, liquid level monitoring, pressure monitoring, flow monitoring, bypass pumping port and telemetry equipment.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r). Coordinate pump sizing with improvement 68.	-	400 GPM	$1,800,000
68	Year 6 to 10	River Rim Force Main	Force Main Capacity	Upsize force main along Water Front Court from River Rim Lift Station to Charleswood Lane, then along Charleswood Lane to Creek Stone Loop, then along Creek Stone Loop to River Rim Drive, then along River Rim Drive to Brookswood Boulevard, connecting to Amethyst/Mahogany trunk sewer.	Coordinate force main sizing with pump selection for improvement 29.	6-inch	3,400 LF	$1,275,000
70-r	Year 6 to 10	Aspen Ridge Lift Station Capacity and Condition	Lift Station Capacity and Condition	Rehabilitation and, where required, replacement of deteriorating lift station components. Implement VFDs to minimize impacts to downstream Amethyst/Mahogany trunk sewer.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r).	-	1 EA	$399,000
28-r	Year 6 to 10	River Canyon #2 Lift Station Capacity and Condition	Lift Station Capacity and Condition	Rehabilitation and, where required, replacement of deteriorating lift station components. Implement VFDs to minimize impacts to downstream Amethyst/Mahogany trunk sewer.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r).	-	1 EA	$399,000
125	Year 11 to 20	River Canyon #1 Lift Station Capacity and Condition	Lift Station Capacity and Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r).	-	1 EA	$399,000
114	Year 11 to 20	Deschutes River Crossing Lift Station Capacity and Condition	Lift Station Capacity and Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	Consider VFD installation in 1 to 5-year timeframe and coordinate with improvements to Amethyst/Mahogany trunk sewer (improvement 22-r).	-	1 EA	$399,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
Other South and East Lift Station Capacity and Condition Improvements								
45	Year 1 to 5	Renwick Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: vacuum priming system and small wet well.	-	-	1 EA	$399,000
76	Year 6 to 10	Tuscany Pines Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	Portions of this project have been completed.	-	1 EA	$399,000
79	Year 6 to 10	Hollow Pines #2 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and VFDs.	-	-	1 EA	$399,000
82	Year 6 to 10	Widgi Creek Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, rail system and electrical components.	Portions of this project have been completed.	-	1 EA	$399,000
93-r	Year 11 to 20	Summit Park Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components.	-	-	1 EA	$399,000
110-r	Year 11 to 20	Pheasant Run Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components.	-	-	1 EA	$399,000
113	Year 11 to 20	Bachelor Village Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
115	Year 11 to 20	Foxborough Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	Reconfigure connection to expansion tank.	-	1 EA	$399,000
117	Year 11 to 20	Hollow Pines #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
121	Year 11 to 20	Orion Greens Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
122	Year 11 to 20	Pine Ridge Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	-	-	1 EA	$399,000
128	Year 11 to 20	Sunrise #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: rail system.	-	-	1 EA	$399,000
129	Year 11 to 20	Touchmark Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	-	-	1 EA	$399,000
132	Year 11 to 20	Woodriver Village Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
Central Area Lift Station Condition and Capacity Improvements								
21-r	Year 1 to 5	Riverhouse Lift Station Capacity	Lift Station Capacity and Condition	Downsize of mechanical pumping and/or electrical components to decrease hydraulic capacity. Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: wet well, pumps, motors and electrical equipment. Some portion of this project may be privately funded.	-	-	20 GPM	$399,000
36A-r	Year 1 to 5	Drake Lift Station Capacity and Condition	Lift Station Capacity and Condition	Replacement of existing facility with a new lift station to address condition issues, future capacity, and site constraints. Project includes pumps, VFDs, piping, electrical and control equipment, verification of on-site standby generator capacity, odor control equipment, wet or dry well, liquid level monitoring, pressure monitoring, flow monitoring, bypass pumping port and telemetry equipment.	Additional capacity required for KorPine development. Coordinate with 36B-r.	-	1,200 GPM	$2,730,000
36B-r	Year 1 to 5	Drake Lift Station Force main	Force main Capacity	Upsize existing force main near the intersection of Riverside Blvd and Congress Street.	Additional capacity required for KorPine development. Coordinate with 36A-r	8-inch	600 LF	$347,000
71A-r	Year 1 to 5	Old Mill Lift Station Hydraulic Upgrade	Lift Station Capacity	Upgrade of mechanical pumping and/or electrical components to accommodate increased hydraulic capacity requirements. VFS required to minimize downstream impacts in Central Interceptor.	Additional capacity required for infill development. Timing may vary based on development permitting.	-	1,000 GPM	$2,410,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
71B-r	Year 1 to 5	Old Mill Lift Station Force main	Force main Capacity	Upsize existing force main near Bluff Drive and Bond Street.	Additional capacity required for infill development. Timing may vary based on development permitting.	8-inch	1,600 LF	$600,000
27	Year 1 to 5	Pioneer Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps, access to lift station.	-	-	1 EA	$399,000
41	Year 1 to 5	Pacific Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: access to lift station pumps and piping.	Potentially return to private ownership.	-	1 EA	$399,000
53	Year 1 to 5	Underwood Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: vacuum priming system and small wet well.	-	-	1 EA	$399,000
78	Year 6 to 10	Glenshire Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and VFD.	-	-	1 EA	$399,000
81	Year 6 to 10	Rivers Edge Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	-	-	1 EA	$399,000
73-r	Year 11 to 20	Sawyer Park Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components.	-	-	1 EA	$399,000
118	Year 11 to 20	Linster Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
126	Year 11 to 20	Riviera Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
130	Year 11 to 20	Tumalo Heights Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	Portions of this project have been completed.	-	1 EA	$399,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
131	Year 11 to 20	Westside Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition. This lift station is the largest in the system and due to site constraints and size, it will be expensive to upgrade.	-	-	1 EA	$1,155,000
West Area Lift Stations Impacting Newport Ave Trunk Sewer								
31	Year 1 to 5	Awbrey Glen Lift Station Condition	Lift Station Condition	Backup power generator.	-	-	1 EA	$161,000
111	Year 1 to 5	Shevlin Commons Lift Station Hydraulic Upgrade	Lift Station Capacity	Replacement or upgrade of existing facility to accommodate upgrades in capacity. Project includes new pumps, VFDs, piping, electrical and control equipment, standby generator for back-up power, odor control equipment, wet or dry well, liquid level monitoring, pressure monitoring, flow monitoring, bypass pumping port and telemetry equipment.	Coordinate with improvements 123, 112A-r, and 112B-r. Improvement required for West UGB expansion development.	-	120 GPM	$839,000
123	Year 1 to 5	Renaissance Lift Station Lift Station Hydraulic Upgrade	Lift Station Capacity	Upgrade of mechanical pumping and/or electrical components to accommodate increased hydraulic capacity requirements. Implement VFDs to minimize impacts to downstream Newport trunk sewer.	Coordinate with improvements 111, 112A-r, and 112B-r. Improvement required for West UGB expansion development.	-	70 GPM	$399,000
112A-r	Year 1 to 5	Shevlin Meadows Lift Station Hydraulic Upgrade	Lift Station Capacity	Upgrade of mechanical pumping and/or electrical components to accommodate increased hydraulic capacity requirements. Implement VFDs to minimize impacts to downstream Newport trunk sewer.	Coordinate with improvements 111, 123, and 112B-r. Improvement required for West UGB expansion development.	-	190 GPM	$760,000
112B-r	Year 1 to 5	Shevlin Meadows Lift Station Force main	Force main Capacity	Upsize existing force main (Shevlin Park Rd segments)	Coordinate with improvements 111, 123, and 112A-r. Improvement required for West UGB expansion development.	6-inch	600 LF	$300,000
119	Year 11 to 20	Main Fire Station Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$116,000
North Area Lift Stations Condition and Decommissioning								
100A	Year 6 to 10	Boyd Acres Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Stacy Lane, cross-country from Nicolette Drive northwest to Vogt Road and Hunters Circle intersection, then cross-country northeast to Stacy Lane, then along Stacy Lane, connecting to new pipe south of Cooley Road.	Coordinate with 100B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	1,100 LF	$852,000
100B	Year 6 to 10	Boyd Acres Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 100A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
101A	Year 6 to 10	Highland Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going south, cross-country from Highland Lift Station to Cooley Road, then along Cooley Road to Hunters Circle, connecting to North Interceptor.	Coordinate with 101B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	3,600 LF	$1,615,000
101B	Year 6 to 10	Highland Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 101A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
102A	Year 6 to 10	Holiday Inn Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Highway 97 from Holiday Inn Lift Station for approximately 200-feet, then cross-country going east to Hunters Circle, connecting to North Interceptor at Hunters Circle and Joseph Way intersection.	Coordinate with 102B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	800 LF	$605,000
102B	Year 6 to 10	Holiday Inn Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 102A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
103A	Year 6 to 10	Juniper Ridge Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe going east approximately 2,400 feet cross-country from Juniper Ridge Lift Station, connecting to North Interceptor.	Coordinate with 103B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	10 to 12-inch	2,500 LF	$1,656,000
103B	Year 6 to 10	Juniper Ridge Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 103A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
104A	Year 6 to 10	North Pointe Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Hunters Circle from upstream of North Pointe Lift Station to North Interceptor.	Coordinate with 104B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	100 LF	$22,000
104B	Year 6 to 10	North Pointe Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 104A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
105A	Year 6 to 10	North Wind Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Stacy Lane between Overton Place and Cooley Road, then along Cooley Road to Hunters Circle, connecting to North Interceptor.	Coordinate with 105B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	700 LF	$739,000
105B	Year 6 to 10	North Wind Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 105A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
106A	Year 6 to 10	Phoenix Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Ranch Village Drive from Phoenix Lift Station to Cooley Road, then east along Cooley Road, connecting to existing 8-inch pipe west of Cooley Road and 18th Street intersection.	Coordinate with 106B. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	1,800 LF	$692,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
106B	Year 6 to 10	Phoenix Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 106A. North Interceptor Phases 1 and 2 (improvements 99A-r and 99B-r) required.	-	1 EA	$33,000
116	Year 11 to 20	Glen Vista Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	Eliminate improvement if lift station is decommissioned (see improvement 116A-r and 116B-r).	-	1 EA	$399,000
116A-r	Year 11 to 20	Glen Vista Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Glen Vista and OB Riley Rd connecting to North Interceptor.	Coordinate with 116B-r. North Interceptor Phases 1, 2, and 3 (improvements 99A-r, 99B-r, and 99C-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	700 LF	$405,000
116B-r	Year 11 to 20	Glen Vista Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 116A-r. North Interceptor Phases 1, 2, and 3 (improvements 99A-r, 99B-r, and 99C-r) required.	-	1 EA	$33,000
124	Year 11 to 20	Rim Rock Riders Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	Eliminate improvement if lift station is decommissioned (see improvement 124A-r and 124B-r).	-	1 EA	$399,000
124A-r	Year 11 to 20	Rim Rock Riders Lift Station Decommission - Gravity Sewer Diversion	Gravity Pipe, LS Decommission	New gravity pipe along Roper Ln and OB Riley Rd connecting to North Interceptor.	Coordinate with 124B-r. North Interceptor Phases 1, 2, and 3 (improvements 99A-r, 99B-r, and 99C-r) required. This project may require coordination with local irrigation districts to develop piped canal crossings.	8 to 10-inch	1,200 LF	$693,000
124B-r	Year 11 to 20	Rim Rock Riders Lift Station Decommission	Lift Station Decommission	Removal of the existing lift station facility and all associated appurtenances with the exception of the force main, which will be abandoned in place.	Coordinate with 124A-r. North Interceptor Phases 1, 2, and 3 (improvements 99A-r, 99B-r, and 99C-r) required.	-	1 EA	$33,000
Other North Area Lift Station Capacity and Condition Improvements								
35	Year 1 to 5	Deschutes Business Lift Station Capacity and Condition	Lift Station Capacity and Condition	Replacement of lift station and components where O&M Department condition assessment indicated poor condition: pumps, VFDs, discharge piping, corroded wet well, corroded discharge piping and corroded valve pit. Coordinate improvement with other lift stations using common force mains.	Coordinate this improvement with available capacity and recent or planned improvement to Tuscany Pines Lift Station.	-	140 GPM	$610,000
37	Year 1 to 5	Empire Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and variable frequency drives.	- Work performed recently and project may be complete.	-	1 EA	$116,000
38	Year 1 to 5	Empire Village Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and investigation into air locking.	-	-	1 EA	$116,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
46	Year 1 to 5	Rimrock #1 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: small wet well. Proximity to river makes this lift station a significant liability.	-	-	1 EA	$116,000
47	Year 1 to 5	Rimrock #2 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: small wet well. Proximity to river makes this lift station a significant liability.	-	-	1 EA	$116,000
48	Year 1 to 5	Rimrock #4 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: small wet well. Proximity to river makes this lift station a significant liability.	-	-	1 EA	$116,000
49	Year 1 to 5	Rimrock #5 Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: small wet well. Proximity to river makes this lift station a significant liability.	-	-	1 EA	$116,000
26	Year 1 to 5	Canal View Lift Station Condition	Lift Station Condition	Further assessment required to address sink hole and lift station operational risks.	-	-	1 EA	$174,000
77	Year 6 to 10	Enchant on Deschutes Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	-	-	1 EA	$399,000
80	Year 6 to 10	Majestic Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: rail system.	Verify expansion tank, line realignment.	-	1 EA	$399,000
72-r	Year 11 to 20	Quail Crossing Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components.	-	-	1 EA	$399,000
120	Year 11 to 20	N. Fire Station Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$116,000
127	Year 11 to 20	Service Station Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition: pumps and motors.	-	-	1 EA	$399,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
133	Year 11 to 20	Wyndemere Lift Station Condition	Lift Station Condition	Rehabilitation and, where required, replacement of deteriorating lift station components where O&M Department condition assessment indicated poor condition.	-	-	1 EA	$399,000
Programmatic Funding								
8	Year 1 to 5	Large Gravity Pipe Condition Assessment Program - Year 1 to 5	Miscellaneous Project	Continue program to inspect the condition of existing gravity trunk collection system, grade the trunk system components, evaluate rehabilitation options and recommend the most effective solution. This type of inspection requires continued investment in equipment for the O&M Department. Funding includes consultant assistance. This project excludes condition assessment of the Plant Interceptor or Inverted Siphon. City Project ID SW10AA.	-	-	-	$1,155,000
B	Year 1 to 5	Local Area Improvement Plans - Year 1 to 5	Fund Local Area Improvement Plans	Budget to develop a plan for implementing and funding local area sewer improvements in the system within the City limits. These areas include currently unsewered customers (septic) and areas that have poorly performing systems. Specific details such as funding mechanisms and private/public cost sharing, have not yet been determined.	-	-	-	$5,775,000
D	Year 1 to 5	Ongoing Repair and Replacement - Year 1 to 5	Fund Ongoing Repair & Replacement	Fund for implementing long-term ongoing repair and replacement budget to address condition-related projects in the future. Specific details, including alignment, pipe sizes have not yet been determined.	-	-	-	$11,181,000
9	Year 1 to 5	Flow Monitoring Program - Year 1 to 5	Miscellaneous Project	Continue operations and maintenance of permanent and temporary flow monitoring equipment.	Utilize data for model calibration and flow analysis for capital projects.	-	-	$289,000
11	Year 1 to 5	On-Call Hydraulic Modeling Services - Year 1 to 5	Miscellaneous Project	Engineering services contract, tailored to meet the City's future need of updating the sewer model, adjusting calibration, or answering specific system operational questions. City Project ID SW111CA.	-	-	-	$578,000
54	Year 1 to 5	Odor Control Master Plan	Miscellaneous Project	Collection System Odor Master Plan will include study, documentation, and evaluation of the collection system odors issues as well as recommend improvements and prepare a capital improvement plan.	-	-	-	$1,155,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
86	Year 6 to 10	Large Gravity Pipe Condition Assessment Program - Year 6 to 10	Miscellaneous Project	Establish a program to inspect the condition of existing gravity trunk collection system with diameters greater than 15 inches (approximately 4% of the collection system), grade the trunk system components, evaluate rehabilitation options and recommend the most effective solution. This type of inspection requires different equipment than is currently owned by the O&M Department and the budget is for the City to hire a consultant to assist with this project. This project does not include condition assessment of the Plant Interceptor or Inverted Siphon.	-	-	-	$1,155,000
83	Year 6 to 10	Plant Interceptor Condition Assessment Program (lower portion)	Miscellaneous Project	Condition Assessment of the Plant Interceptor and Siphon (lower portion not completed in 2017-2018). This project does not include assessment of any piping other than the Plant Interceptor. The Plant Interceptor will be used as a redundant pipeline with the North Interceptor.	-	-	-	$693,000
G	Year 6 to 10	Local Area Improvement Plans - Year 6 to 10	Fund Local Area Improvement Plans	Budget to develop a plan for implementing and funding local area sewer improvements in the system within the City limits. These areas include currently unsewered customers (septic) and areas that have poorly performing systems. Specific details such as funding mechanisms and public/ private cost sharing have not yet been determined.	-	-	-	$5,775,000
74	Year 6 to 10	Repair/Replace Poor Condition Gravity Pipes - Year 6 to 10	Condition, Trenchless Rehab	Repair or replace gravity collection system that has been identified as condition deficient by the O&M Staff through their CCTV program. City O&M Staff to identify specific schedule for addressing deficient piping. Grade 4 Assessment - 2.3 miles, Grade 4 Assessment - 1.1 miles	-	-	-	$4,492,000
9b-r	Year 6 to 10	Flow Monitoring Program - Year 6 to 10	Miscellaneous Project	Continue operations and maintenance of permanent and temporary flow monitoring equipment.	Utilize data for model calibration and flow analysis for capital projects.	-	-	$289,000
84	Year 6 to 10	On-Call Hydraulic Modeling Services - Year 6 to 10	Miscellaneous Project	Engineering services contract tailored to meet the City's future need of updating the sewer model, adjusting calibration, or answering specific system operational questions. City Project ID SW111CA.	-	-	-	$578,000
85	Year 6 to 10	Collection System Master Plan Update	Miscellaneous Project	Engineering services contract to update the current Master Plan, document changes in the system, update the system analysis and CIP. The update will ensure the City is utilizing up-to-date and accurate information regarding the condition of the collection system, flow projections and applicable regulations.	-	-	-	$1,155,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
136	Year 11 to 20	Large Gravity Pipe Condition Assessment Program - Year 11 to 20	Miscellaneous Project	Establish a program to inspect the condition of existing gravity trunk collection system with diameters greater than 15 inches (approximately 4% of the collection system), grade the trunk system components, evaluate rehabilitation options and recommend the most effective solution. This type of inspection requires different equipment than is currently owned by the O&M Department and the budget is for the City to hire a consultant to assist with this project. This project does not include condition assessment of the Plant Interceptor or Inverted Siphon.	-	-	-	$2,310,000
I	Year 11 to 20	Local Area Improvement Plans - Year 11 to 20	Fund Local Area Improvement Plans	Budget to develop a plan for implementing and funding local area sewer improvements in the system within City limits. These areas include currently unsewered customers (septic) and areas that have poorly performing systems. Specific details such as funding mechanisms and public/private cost sharing have not yet been determined.	-	-	-	$11,550,000
H	Year 11 to 20	Ongoing Repair and Replacement - Year 11 to 20	Fund Ongoing Repair & Replacement	Fund for implementing long term ongoing repair and replacement budget to address condition-related projects in the future. Specific details, including alignment, pipe sizes have not yet been determined.	-	-	-	$31,266,000
9c-r	Year 11 to 20	Flow Monitoring Program - Year 11 to 20	Miscellaneous Project	Continue operations and maintenance of permanent and temporary flow monitoring equipment.	Utilize data for model calibration and flow analysis for capital projects.	-	-	$289,000
134	Year 11 to 20	On-Call Hydraulic Modeling Services - Year 11 to 20	Miscellaneous Project	Engineering services contract, tailored to meet the City's future need of updating the sewer model, adjusting calibration, or answering specific system operational questions. City Project ID SW111CA.	-	-	-	$1,155,000
135	Year 11 to 20	Collection System Master Plan Update	Miscellaneous Project	Engineering services contract to update the current Master Plan, document changes in the system, update the system analysis and CIP. The update will ensure the City is utilizing up-to-date and accurate information regarding the condition of the collection system, flow projections and applicable regulations.	-	-	-	$1,155,000
Expansion Area Infrastructure[3]								
203-n	Year 1 to 5	Development-Based	Elbow Gravity Trunks	New gravity trunk sewers to serve the Elbow	-	Sizing to be determined	3,900 LF	$2,500,000
204A-n	Year 1 to 5	Development-Based	Elbow Lift Station	New Elbow Lift Station	-	Sizing to be determined	To be determined	$600,000

Table 23
Capital Improvement Program

Project ID[1]	Timeframe	Project Name	Type of Improvement	Description	Project Coordination	Recommended Size	Unit, Length, or Capacity	Project Estimate[2]
204B-n	Year 1 to 5	Development-Based	Elbow Force main	New Elbow Force main	-	Sizing to be determined	7,300 LF	$2,900,000
205-n	Year 6 to 10	Development-Based	DSL Gravity Trunks	New gravity trunk sewers to serve the DSL	-	Sizing to be determined	6,600 LF	$4,300,000
206-n	Year 1 to 5	Development-Based	Thumb Gravity Trunks	New and upsized gravity trunk sewers to serve the Thumb	-	Sizing to be determined	8,700 LF	$5,700,000
207-n	Year 1 to 5	Development-Based	West Gravity Trunks	New and upsized gravity trunk sewers to serve the West	-	Sizing to be determined	11,000 LF	$7,000,000

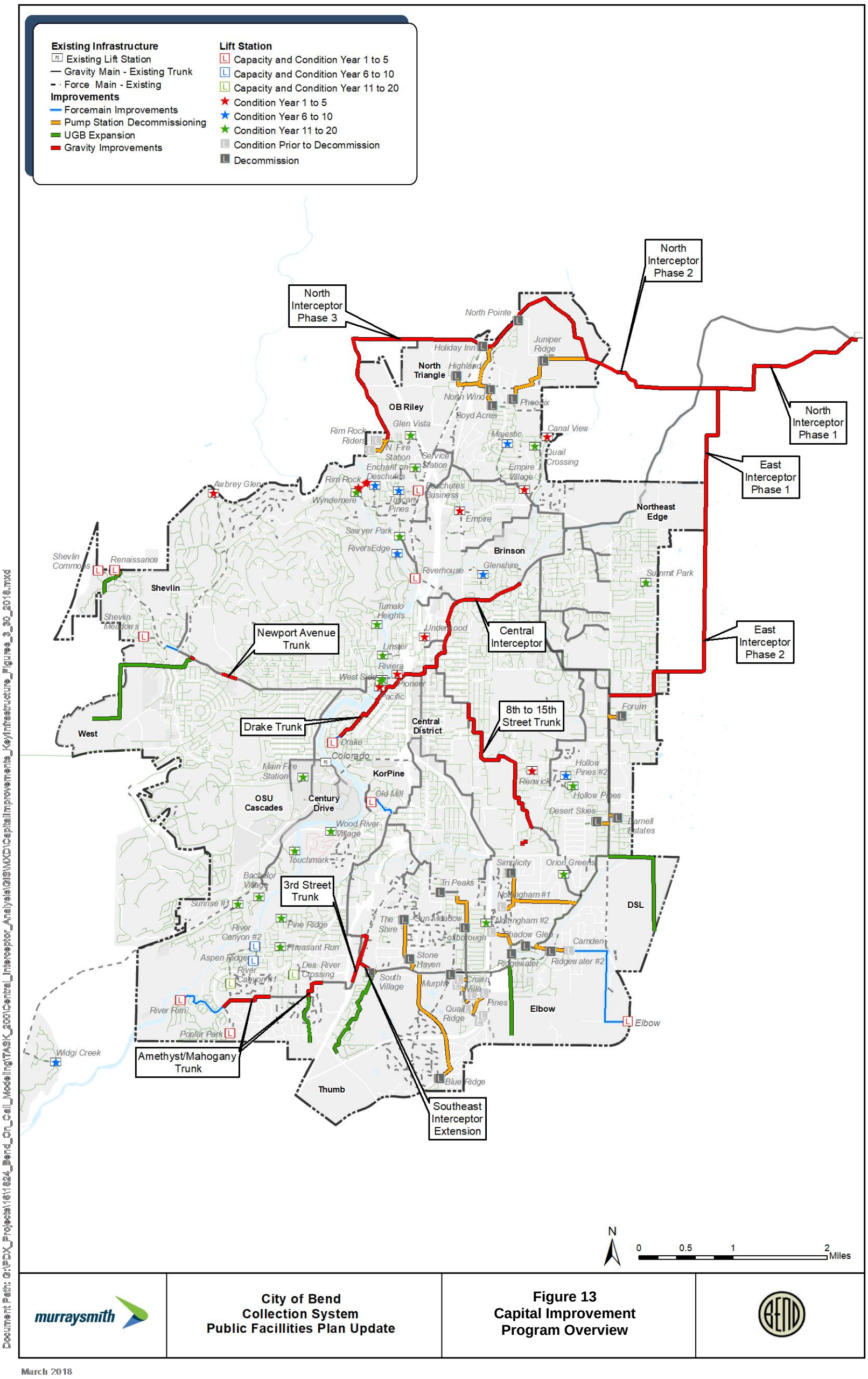
Table 23 Notes:

1 Project IDs from the Collection System Master Plan (CSMP, 2014) were used whenever possible. Where improvements vary in description from the CSMP, a suffix (-r) for "revised" is added to the Project ID. For new improvements, Project IDs are numbered in the 200s with a suffix (-n) for "New" added to the Project ID.

2 All cost estimates are Class 5 budget estimates, as established by the *American Association of Cost Engineers*. This preliminary estimate class is used for conceptual screening and assumes project definition maturity level below two percent. The expected accuracy range is -20 to -50 percent on the low end, and +30 to +100 percent on the high end. The cost estimates are consistent with the definition of OAR 660-011-0005(2) and OAR 660-011-035. Cost estimates are intended to be used as guidance in establishing funding requirements at the project planning level based on information available at the time of the estimate. Estimates exclude land acquisition, financing, and inflation. Cost estimates were performed in 2017 dollars based on *The Engineering News Record Construction Cost Index* (ENR CCI) basis of 10870 (December 2017).

3 Expansion area infrastructure improvement cost estimates included limited trunk sewer extensions to serve recent UGB expansion areas. A single lift station and force main is identified for the Elbow. The estimates exclude local sewers (8 to 10-inch) and sewer laterals. Projects are anticipated to be funded by developers.

General note: The proposed locations of all public sewer facilities in the CIP and this table are based on conceptual data available at the time the 2018 PFP was prepared. The actual location, routing, type or size of any public sewer facility may vary from what is shown, because of actual physical conditions, the timing of development, the availability or cost of rights of way or easements, final engineering design consideration or other similar reasons. To the extent any planned future sewer improvement is shown on private property, the location is only approximate and does not constrain or limit development on that property. If property is developed before the planned sewer improvement is constructed, the design of the sewer improvement shall avoid conflicts with the development where possible. The location of any public sewer facilities outside the UGB is intended only to provide or facilitate service within the UGB. No new connection that allows for service outside the UGB shall be constructed except for new connections to areas that the City already provides service as described in the CSMP.



Document Path: G:\PDX_Projects\16\1624_Bend_On_Call_Modeling\TASK_200\Central_Interceptor_Analysis\GIS\MXD\CapitalImprovements_KeyInfrastructure_Figures_3_30_2018.mxd

murraysmith

City of Bend
Collection System
Public Facillities Plan Update

Figure 13
Capital Improvement Program Overview

March 2018

Table 24
Capital Improvement Program Cost Summary (million $)[1]

Improvement Category	Year 1 to 5	Year 6 to 10	Year 11 to 20	Total
Trunk Sewers and Interceptors	$33.1	$55.1	$29.9	**$118.1**
Southeast Lift Stations Condition and Decommissioning	$12.8	$0.6	$2.0	**$15.4**
South Lift Stations Impacting Amethyst/Mahogany/3rd Street Trunk Sewer	$2.0	$2.1	$0.8	**$4.9**
Other South and East Area Lift Station Condition Improvements	$0.4	$1.2	$4.0	**$5.6**
Central Area Lift Station Capacity and Condition Improvements	$7.7	$0.8	$2.8	**$11.3**
West Area Lift Stations Impacting Newport Ave Trunk Sewer	$2.5	$0.0	$0.1	**$2.6**
North Area Lift Stations Condition and Decommissioning	$0.0	$6.4	$2.0	**$8.4**
Other North Area Lift Station Capacity and Condition Improvements	$1.5	$0.8	$1.3	**$3.6**
Programmatic Funding	$20.1	$14.1	$47.7	**$81.9**
Expansion Area Infrastructure	$18.7	$4.3	$0.0	**$23.0**
Total	**$98.8**	**$85.4**	**$90.6**	**$274.8**

1 All cost estimates are Class 5 budget estimates, as established by the *American Association of Cost Engineers*. This preliminary estimate class is used for conceptual screening and assumes project definition maturity level below two percent. The expected accuracy range is -20 to -50 percent on the low end, and +30 to +100 percent on the high end. The cost estimates are consistent with the definition of OAR 660-011-0005(2) and OAR 660-011-035. Cost estimates are intended to be used as guidance in establishing funding requirements at the project planning level based on information available at the time of the estimate. Estimates exclude land acquisition, financing, and inflation. Cost estimates were performed in 2017 dollars based on *The Engineering News Record Construction Cost Index* (ENR CCI) basis of 10870 (December 2017).

OAR 660-011-0010(1)(g) Provider Funding

The Provider's (City) overall funding strategy includes the wastewater collection system and water reclamation facility (WRF), collectively referred to in this section as the water reclamation utility (Utility).

The City utilizes a Water Reclamation Fund which charges base fees and volume charges by service type (single family, multifamily, commercial) for wastewater services (collection and treatment) and System Development Charges (SDCs) Fund to finance the Utility.

The overall funding strategy is detailed in the following financial plan.

Financial Plan

The overall goal of the financial plan is to have the annual Utility total resources (rates and fees) set at a sufficient level to meet annual uses (O&M, debt service, capital costs and fiscal policy achievement). This helps ensure a self-supported Utility.

The primary source of funding for the Utility is derived from ongoing monthly charges for service, additional revenue from miscellaneous fees and charges, interest income, SDCs, and long-term debt for capital projects. The City Council controls and approves the level of user charges as needed to meet financial objectives.

The financial plan ultimately evaluates the sufficiency of Utility revenues in meeting all obligations, including cash uses such as the following:

- Operations and maintenance
- Debt service
- Capital outlays for vehicles and equipment
- Reserve contributions
- Coverage requirements associated with long-term debt

Fiscal Policies and Other Constraints

Reserves are among the most important constraints for the financial strategy. Whether because of policy or contract, the City's Utility maintains multiple reserves. Reserve requirements reflected in the fiscal policies adopted by the City Council (Resolution No. 2783, June 2017) include the following:

The City will maintain undesignated reserves of at least 25% (or 3 months) of the operating budget for its utility funds. The Water Reclamation Funds will also have rate stabilization reserves no less than $1 million respectively to protect against volatility of revenues. Ending

fund balance and reserves in the Water Reclamation utility funds will be prioritized as follows:

a. Required debt service reserves
b. Operating reserves
c. Rate stabilization reserves
d. Repair & replacement (R&R) reserves which have been identified as a minimum of $5 million. R&R reserves will be used for significant system or facility repairs, replacement or maintenance costs that are unanticipated and exceed ongoing repair and maintenance expenditures in the fund's operating budget.

In addition to required reserves, a minimum debt service coverage ratio is also a constraint in this plan. This ratio is calculated by dividing net revenues (operating revenues less operating expenditures) by annual debt service.

To best position itself to issue needed debt and uphold credit ratings, the City has elected to maintain a minimum debt service coverage ratio of 1.5 or a ratio at a level sufficient to protect the credit rating of the Utility.

Capital Costs Expenditures

The capital expenditures detailed in the CIP, Tables 23 through 24, are financed from the following resources:

- New debt, including both revenue bonds and loans from the Oregon Department of Environmental Quality (DEQ)
- SDCs
- Sewer rates and fund balance
- Public/Private Partnerships

Projected Revenue Requirements

The revenue requirement analysis forecasts the amount of annual revenue that needs to be generated by user rates. The analysis incorporates operating revenues, O&M, debt service payments, rate-funded capital needs, and any other identified revenues or expenses related to operations. The objective of the financial forecast is to evaluate the sufficiency of the current level of rates. The revenue needs also include debt-covenant requirements and specific fiscal policies and financial goals of the City. The analysis determines the amount of revenue needed in a given year to meet that year's expected financial obligations.

Table 25 summarizes the projected the rate revenue requirement for the first five years of this financial plan:

Table 25
Projected Rate Revenues

Revenues	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Rate Revenue under existing rates	$25,938,100	$26,298,639	$26,664,191	$27,034,823	$27,410,607
Non-rate Revenues	$946,400	$843,196	$836,378	$828,767	$820,526
Total Revenues	$26,884,500	$27,141,835	$27,500,569	$27,863,590	$28,231,133
Expenditures	**FY 2018-19**	**FY 2019-20**	**FY 2020-21**	**FY 2021-22**	**FY 2022-23**
Cash Operating Expenses	$14,081,570	$16,027,318	$16,113,478	$16,483,778	$17,397,792
Existing Debt Service	$5,323,117	$5,443,147	$5,415,712	$5,398,209	$4,381,375
New Debt Service	$4,556,377	$5,172,384	$5,545,413	$6,411,634	$7,572,796
Total Expenditures	$23,961,064	$26,642,849	$27,074,603	$28,293,621	$29,351,963
Annual Rate/Revenue Adjustments Projected	6%	6%	6%	3%	3%
Cumulative Rate/Revenue Adjustments Projected	6%	12%	18%	21%	27%
Rate Revenue After Rate Increase	$27,364,695	$29,409,768	$31,607,678	$33,158,166	$34,711,684
Net Cash Flow After Rate Increase	$4,350,031	$3,610,115	$5,369,453	$5,693,312	$6,180,246
Coverage After Rate Increase, Revenue Bonds	24.96	24.43	26.34	16.01	8.82
Coverage After Rate Increase, All Debt	1.84	1.68	1.76	1.71	1.79

General note: FY = fiscal year (July 1 through June 30).

Current and Projected Rates

The rate strategy developed by the City implements a 6% rate increase per year over three years. Annual inflationary rate increases are required thereafter to build the debt capacity to fund the Utility.

Current water reclamation rates for fiscal year 2017-2018 can be found in the City's fee resolution (No. 3108, 2017-2018) and are summarized below.

- Single Family Residential - $34.55 monthly base charge and $3.62 monthly volume charge per 100 cubic feet of winter quarter average water usage
- Multi-Family Residential - $13.65 monthly base charge and $3.62 monthly volume charge per 100 cubic feet of winter quarter average water usage
- Non-Residential Standard - $34.55 monthly base charge and $3.62 monthly volume charge per 100 cubic feet of winter quarter average water usage
- Non-Residential Extra Strength (exceeds 500 parts per billion Biochemical Oxygen Demand or Total Suspended Solids) - $34.55 monthly base charge, $35.00 extra strength program fee, and $6.46 to $9.36 monthly volume charge per 100 cubic feet of winter quarter average water usage scaled by discharge concentration

Affordability Analysis

Affordability measures customers' abilities to pay their monthly utility bills. Often, affordability measures relate more to community-wide affordability. Typically, affordability is based upon the local community's median household income and the percentage of median household income dedicated to utility bills.

The City monitors the affordability of its sewer service by comparing the average residential bill (including franchise fee) with median household income. Table 26 summarizes the affordability of residential sewer service for the first five years of this financial strategy:

Table 26
Residential Rate Affordability

User Fees, Income, & Percentage	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Annual Residential Bill[1]	$666	$706	$748	$771	$794
Median Household Income (Escalated by Expected Inflation)[2]	$64,370	$65,657	$66,970	$68,309	$69,676
Bill as Proportion of Median Household Income	1.03%	1.08%	1.12%	1.13%	1.14%

Note 1. 6-percent increase assumed per year for three years and 3-percent increase assumed thereafter, 492 cubic feet winter quarter average water consumption
Note 2. 2016 median household income of $61,870 escalated by 2-percent annually (United States Census Bureau, American Community Survey, March 2018;/www.census.gov/programs-surveys/acs/)
Note 3. FY = fiscal year (July 1 through June 30)

The affordability analysis indicates the City's rates are below a 1.5% affordability threshold for the five-year period. This does not preclude the possibility that the City's rates may represent more than 1.5% of the household income for some individual households.

System Development Charges

SDCs are one-time fees imposed on new and increased development to recover the cost of system facilities needed to serve that growth. An SDC can include two major components:

- A reimbursement fee that reflects the cost of existing infrastructure with capacity that is available to serve growth
- An improvement fee that reflects the portion of the cost of future projects that is attributable to providing capacity for growth.

The financial strategy above utilizes the City's sewer SDC of $4,655 per equivalent dwelling unit for 2017-2018 as published in the City's fee resolution (No. 3108, 2017-2018). This

plan further assumes that all available SDC revenue will be used to fund projects. SDCs are assumed to increase at an inflationary rate per year. SDC increases may be tied to construction costs utilizing the *Engineering News Record 20 City Construction Cost Index*.

Financial Plan Conclusions

Based on the financial analysis of the Utility and contingent upon the validity of key assumptions described herein, it has been concluded that the City can fund the recommendations of the updated CIP, while meeting existing obligations and policy requirements, by taking the following steps:

- Implement the 6% rate increase for the next three years
- Adopt and implement annual inflationary rate and SDCs increases after the first three years
- Draw down the Utility's fund balance over several years to minimize rate increases
- Expend SDCs for projects whenever possible to mitigate the need to take on additional debt
- Use debt to fund projects as necessary

888 SW 5TH AVENUE, SUITE #1170

PORTLAND, OR 97204

www.murraysmith.us