ADOPTED

**CITY OF PENDLETON**

# Collection System Master Plan


MSA Murray, Smith & Associates, Inc.
Engineers | Planners

MAY 2015

**ORDINANCE NO. 3863**

AN ORDINANCE ADOPTING A COLLECTION SYSTEM MASTER PLAN AS A COMPONENT OF THE COMPREHENSIVE PLAN

**WHEREAS;** the City owns and operates a public sewer collection system; and

**WHEREAS;** pursuant to Oregon Statewide Goal 11 (Public Facilities), the City of Pendleton is required to adopt and/or update public facilities master plans for the 20 year planning horizon; and

**WHEREAS;** in the last 20 years, the City's Urban Growth Boundary (UGB) has been expanded; and

**WHEREAS;** expansion of the UGB necessitates planning for areas not previously planned for; and

**WHEREAS;** the proposed Collection System Master Plan (CSMP) addresses the additional demand of and capacity necessary to serve the entire UGB; and

**WHEREAS;** the CSMP assumes growth according to the projections contained in the Comprehensive Plan both for the 20 year horizon and for full build out of the UGB; and

**WHEREAS;** the CSMP includes the following major components, consistent with Goal 11 requirements and specific needs identified by City staff:

- Description of the City's existing collection system.
- Population and Demand Projections
- System Analysis
- Operations and Maintenance
- Capital Improvement Program
- Financial Plan

**WHEREAS;** the CSMP provides the City with a solid inventory and factual basis upon which to make informed decisions about future rates and expenditures; and

**WHEREAS;** the request is consistent with the City's responsibilities under Goal 11 (Public Facilities and Services); and

**WHEREAS;** the proposal is consistent with the standards and criteria for an amendment to the Comprehensive Plan because it adopts a formal Public Facilities component of the Comprehensive Plan in a manner consistent with Statute and Rule.

**WHEREAS;** notice was provided to the general public as set forth in Oregon Revised Statutes and the City of Pendleton Unified Development Code, and;

**WHEREAS;** the City of Pendleton Planning Commission held a hearing on May 7, 2015, and recommended adoption of the proposed master plan based on the findings and conclusions contained in the staff report; and

**WHEREAS;** a public hearing was held before the City of Pendleton City Council on May 19, 2015, and all written and oral testimony concerning the matter was received and addressed at the hearing;

**NOW, THEREFORE, THE CITY OF PENDLETON ORDAINS AS FOLLOWS:**

The City of Pendleton Comprehensive Plan is amended to include the attached Collection System Master Plan (Exhibit A) as part of a Goal 11 (Public facilities) Element.

**This ordinance is effective 30 days after passage.**

**PASSED** by the City Council and approved by the Mayor June 2, 2015.

Approved as to form

Nancy Kerns, City Attorney

APPROVED

Phillip W. Houk, Mayor

ATTEST

Andrea Denton, City Recorder

# COLLECTION SYSTEM MASTER PLAN

# FOR

# THE CITY OF PENDLETON

# MAY 2015

REGISTERED PROFESSIONAL ENGINEER
81259
OREGON
MAY 13, 2008
DAVID E. STANGEL
RENEWS 6-30-16

REGISTERED PROFESSIONAL ENGINEER
75589
OREGON
MARCH 8, 2005
DENNIS M. J. GALINATO
RENEWS 6-30-15

**MURRAY, SMITH & ASSOCIATES, INC.**
**345 Bobwhite Court, Suite 230**
**Boise, ID 83706**
**208.947.9033**

13-1442 MSA-ID 05/15

**ACKNOWLEDGMENTS**

Appreciation is expressed to all who contributed to the completion of this report.

**The City of Pendleton**
Jeff Brown
Wayne Green
Mark Milne
Bob Patterson, P.E.
Tim Simons, P.E.

**Murray, Smith & Associates, Inc.**
Dené Breakfield
Mark Cummings, P.E.
Joe Foote, P.E.
Dennis Galinato, P.E.
Michelle Hall, P.E.
LaDonne Harris
David Stangel, P.E.

**Galardi Rothstein Group**
Deborah Galardi

**Geo-spatial Solutions**
Alex Friant
Rusty Merritt

## COMMON ENGINEERING ACRONYMS & ABBREVIATIONS

**A**

| | |
|---|---|
| AACE | AACE International |
| ABF | activated biological filter |
| AC | asbestos cement |
| ADA | Americans with Disabilities Act |
| ADD | average daily demand |
| AF | acre-feet |
| AIA | Airport Industrial Area |
| AMCL | alternative maximum concentration level |
| AMI | automated metering infrastructure |
| AMR | automated meter reading |
| AMZ | asset management zone |
| AOR | actual oxygen required |
| APWA | American Public Works Association |
| ASR | aquifer storage and recovery |
| AWWA | American Water Works Association |

**B**

| | |
|---|---|
| BFP | belt filter press |
| BLI | buildable lands inventory |
| BOD | biochemical oxygen demand |
| BWF | base wastewater flow |

**C**

| | |
|---|---|
| C&R | construction and replacement |
| CAA | Clean Air Act |
| CAD | computer aided drafting |
| CAS | cast iron |
| ccf | 100 cubic feet |
| CCI | Construction Cost Index |
| CCR | Consumer Confidence Report |
| CCTV | closed-circuit television |
| cf | cubic feet |
| cfs | cubic feet per second |
| CHL | clarifier hydraulic loading |
| CIA | current impact area |
| CIP | capital improvement program |
| CMOM | capacity, management, operation and maintenance |
| CN | curve number |
| COD | chemical oxygen demand |
| COMPASS | Community Planning Association of Southwest Idaho |
| COSM | Central Oregon Stormwater Manual |
| CP | concrete pipe |

| | |
|---|---|
| CPI-U | Consumer Price Index, Urban Consumers |
| CSL | clarifier solids loading |
| CSMP | Collection System Master Plan |
| CTUIR | Confederated Tribes of the Umatilla Indian Reservation |
| CWA | Clean Water Act |

**D**

| | |
|---|---|
| DBP | disinfection byproducts |
| d/D | depth to diameter ratio |
| D/DBP | disinfectants and disinfection byproducts |
| DEQ | Department of Environmental Quality |
| DIP | ductile iron pipe |
| DOD | depth of flow over diameter of pipe |
| DOE | Department of Ecology |
| DWF | dry weather flow |

**E**

| | |
|---|---|
| ENR | Engineering News Record |
| EOCI | Eastern Oregon Correctional Institution |
| EPA | U.S. Environmental Protection Agency |
| ERP | Emergency Response Plan |
| EUAC | Equivalent Uniform Annual Cost |

**F**

| | |
|---|---|
| FEMA | Federal Emergency Management Agency |
| FM | flow monitors |
| FMB | flow meter basin |
| FOG | fats, oils, grease |
| fps | feet per second |
| ft | foot, feet |
| FTE | full-time equivalent |
| FV | future value |
| FY | fiscal year |

**G**

| | |
|---|---|
| GAC | granular activated carbon |
| GBT | gravity belt thickener |
| GIS | geographical information system |
| gpapd | gallons per acre per day |
| gpcpd | gallons per capita per day |
| gpd | gallons per day |
| gpm | gallons per minute |
| GPS | Global Positioning System |
| gpupd | gallons per unit per day |
| GWI | groundwater infiltration |

**H**

| | |
|---|---|
| HDPE | high-density polyethylene |
| HGL | hydraulic grade line |
| hp | horsepower |
| hr | hour |
| HRT | hydraulic retention time |
| HVAC | heating, ventilating and air conditioning |

**I**

| | |
|---|---|
| ID | inside diameter |
| IEEE | Institute of Electrical and Electronics Engineers |
| I/I | inflow/infiltration |
| in | inch, inches |
| IOC | inorganic compound |

**K**

| | |
|---|---|
| kVA | kilovolt-ampere |
| kW | kilowatt |

**L**

| | |
|---|---|
| L | liter |
| lb | pound |
| LCR | Lead and Copper Rule |
| lf | linear feet |
| LRAA | locational running annual averages |
| LS | lift station |

**M**

| | |
|---|---|
| M | million |
| ma | milliamp |
| MCL | maximum concentration level |
| MCLG | maximum concentration level goal |
| M/DBP | microbial and disinfection byproducts |
| MDD | maximum day demand |
| mg | milligram |
| MG | million gallons |
| mgd | million gallons per day |
| mgh | million gallons per hour |
| mg/L | milligrams per liter |
| MH | manhole |
| mL | milliliter |
| MLSS | mixed liquor suspended solids |
| MLVSS | mixed liquor volatile suspended solids |
| mm | millimeter |
| MRDL | maximum residual disinfectant levels |
| mrem | millirems |

| | |
|---|---|
| MSA | Murray, Smith & Associates, Inc. |
| MSL | mean sea level |

**N**

| | |
|---|---|
| NPDES | National Pollutant Discharge Elimination System |
| NPV | net present value |

**O**

| | |
|---|---|
| O&M | operations and maintenance |
| OAR | Oregon Administrative Rules |
| ODOT | Oregon Department of Transportation |

**P**

| | |
|---|---|
| % | percent (use with numerals – e.g., 13%) |
| PAL | provisionally accredited levee |
| pCi/L | picoCuries per liter |
| PDF | peak design flow |
| PDWF | peak dry weather flow |
| PER | Preliminary Engineering Report |
| PFP | Public Facility Plan |
| pH | measure of acidity of alkalinity |
| PHD | peak hour demand |
| ppb | parts per billion |
| ppm | parts per million |
| PRS | pressure-reducing stations |
| PRV | pressure reducing valve |
| psi | pounds per square inch |
| PSV | pressure-sustaining valve |
| PUD | public utility district |
| PV | present value |
| PVC | polyvinyl chloride |
| PWMP | Public Works Management Practices Manual |
| PWWF | peak wet weather flow |

**Q**

| | |
|---|---|
| QA | quality assurance |
| QC | quality control |

**R**

| | |
|---|---|
| RDII | rainfall dependent infiltration/inflow |
| ROW | right-of-way |
| RRF | resource recovery facility |
| RSSD | Rieth Sanitary Sewer District |

**S**

| | |
|---|---|
| SBOD | soluble biochemical oxygen demand |
| SCADA | supervisory control and data acquisition |
| SDC | system development charge |

| | |
|---|---|
| SDR | standard dimension ratio |
| sec | second (measurement of time) |
| SOC | synthetic organic compound |
| SOW | scope of work |
| SRT | solids retention time |
| SSOAP | Sanitary Sewer Overflow Analysis and Planning |
| SVI | sludge volume index |
| SWMP | Stormwater Master Plan |

**T**

| | |
|---|---|
| TAZ | traffic analysis zones |
| Tc | time of concentration |
| TCR | Total Coliform Rule |
| TDH | total dynamic head |
| TMDL | total maximum daily load |
| TP | transite pipe |
| T/S | transit/storage |
| TSS | total suspended solids |
| Tt | travel time |
| TTHM | total trihalomethanes |

**U**

| | |
|---|---|
| UGA | urban growth area |
| UGB | urban growth boundary |
| UIC | underground injection control |
| USACE | United States Army Corps of Engineers |
| USBR | United States Bureau of Reclamation |
| USDA | United States Department of Agriculture |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |

**V**

| | |
|---|---|
| VFD | variable-frequency drive |
| VCP | vitrified clay pipe |
| VFD | variable frequency drive |
| VOC | volatile organic compound |
| VSS | volatile suspended solids |

**W**

| | |
|---|---|
| WAS | waste-activated sludge |
| WFP | water filtration plant |
| WMCP | Water Management and Conservation Plan |
| WRF | water reclamation facility |
| WSMP | Water System Master Plan |
| WWTP | wastewater treatment plant |

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Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 1
Executive Summary

# SECTION 1
# EXECUTIVE SUMMARY

## Introduction

The City of Pendleton (City) owns and operates a sewer collection system serving the residents and businesses within its service area. This Collection System Master Plan (CSMP) serves as a planning document to help evaluate growth to build-out of the City's urban growth boundary (UGB), which will approximately double the number of current residents and projected sewer loadings. The UGB covers an area of 13.4 square miles and defines the extent to which the City may expand in the future; it was used as the boundary for build-out projections within this CSMP.

This CSMP addresses the City's sewer collection system only, and does not include any evaluation or improvement recommendations for the Resource Recovery Facility (RRF). The Pendleton Wastewater Treatment Facility Plan completed in 2007 provides recommendations for the RRF.

## How This Plan Should Be Used

This CSMP serves as the guiding document for future collection system improvements, and should:

- Be reviewed annually in coordination with other utilities to prioritize and budget needed improvements.
- Have its mapping updated regularly to reflect ongoing development and construction.
- Have its specific system improvement recommendations regarded as conceptual. (The location, size and timing of projects may change as additional site-specific details and potential alternatives are investigated and analyzed in the preliminary engineering phase of project design.)
- Update and refine its cost estimates with preliminary engineering and final project designs.

## Scope of Work

The City selected Murray, Smith & Associates, Inc. (MSA) to create master plans for the potable water, stormwater, and sewer collection systems. The scope of work (SOW) for this CSMP includes the following major tasks and deliverables:

- Describe the City's existing collection system.
- Develop and calibrate a hydraulic model.

- Develop population and dry weather sewer flow projections consistent with the City's 2011 Comprehensive Plan Update.
- Develop infiltration and inflow dependent wet weather flow projections.
- Develop design and planning criteria.
- Evaluate the collection system's hydraulic capacity to identify deficiencies for existing (2013), 5-year, 10-year, 20-year, and build-out planning horizons.
- Conduct and summarize benchmarking data comparing the City's operations and maintenance (O&M) practices to similar municipalities.
- Review the City's current O&M program and present recommendations.
- Develop an ongoing repair and replacement program for lifts stations, system piping and manholes.
- Develop capital improvement program (CIP) recommendations and cost opinions for projects required through build-out.
- Develop a specific future improvement plan for the Airport Industrial Area (AIA) in northwest Pendleton.
- Develop a collection system financial plan that identifies a funding strategy for the CIP, aging infrastructure repair and replacement, and staffing.

## Organization of the CSMP

This CSMP is organized into seven sections, as described in Table 1-1. Detailed technical information and support documents are included in the appendices.

**Table 1-1**
**CSMP Organization**

| Section | Description |
|---|---|
| 1 – Executive Summary | Purpose and scope of the CSMP and summary of key components of each part of the plan. |
| 2 – Existing System Description | Description of the service area and overview of the existing system and facilities. |
| 3 – Population and Wastewater Flow Projections | Population projections, dry weather and wet weather estimates for existing and future sewer flows. |
| 4 – System Analysis | Calibration methodology and results, overview of the evaluation criteria and approach, discussion of hydraulic deficiencies for existing and future planning horizons. |
| 5 – Operations and Maintenance | Describes current operations and maintenance procedures, summary of benchmarking results comparing the City to similar municipalities, summary of recommendations. |
| 6 – Capital Improvement Program | Improvement recommendations including cost opinions and timeframe for implementation. |
| 7 – Financial Evaluation | Strategy for funding collection system improvements. |

## Existing System Description

The Public Works Director manages the City-owned collection system and supervises the Public Works Superintendent, who oversees the system's operation.

Prior to the planning process, MSA and the City undertook an effort to create a Geographic Information System (GIS) of the water, collection and storm systems. Prior to the creation of the GIS, information on the system was generally maintained in CAD, however in some cases hard copy maps provided the most accurate record of the size and location of infrastructure. The new GIS was used as the basis for this planning effort including the development of the hydraulic model. The City recently hired a GIS Coordinator who is working to improve the quality of the information in addition to collecting new data points and attributes.

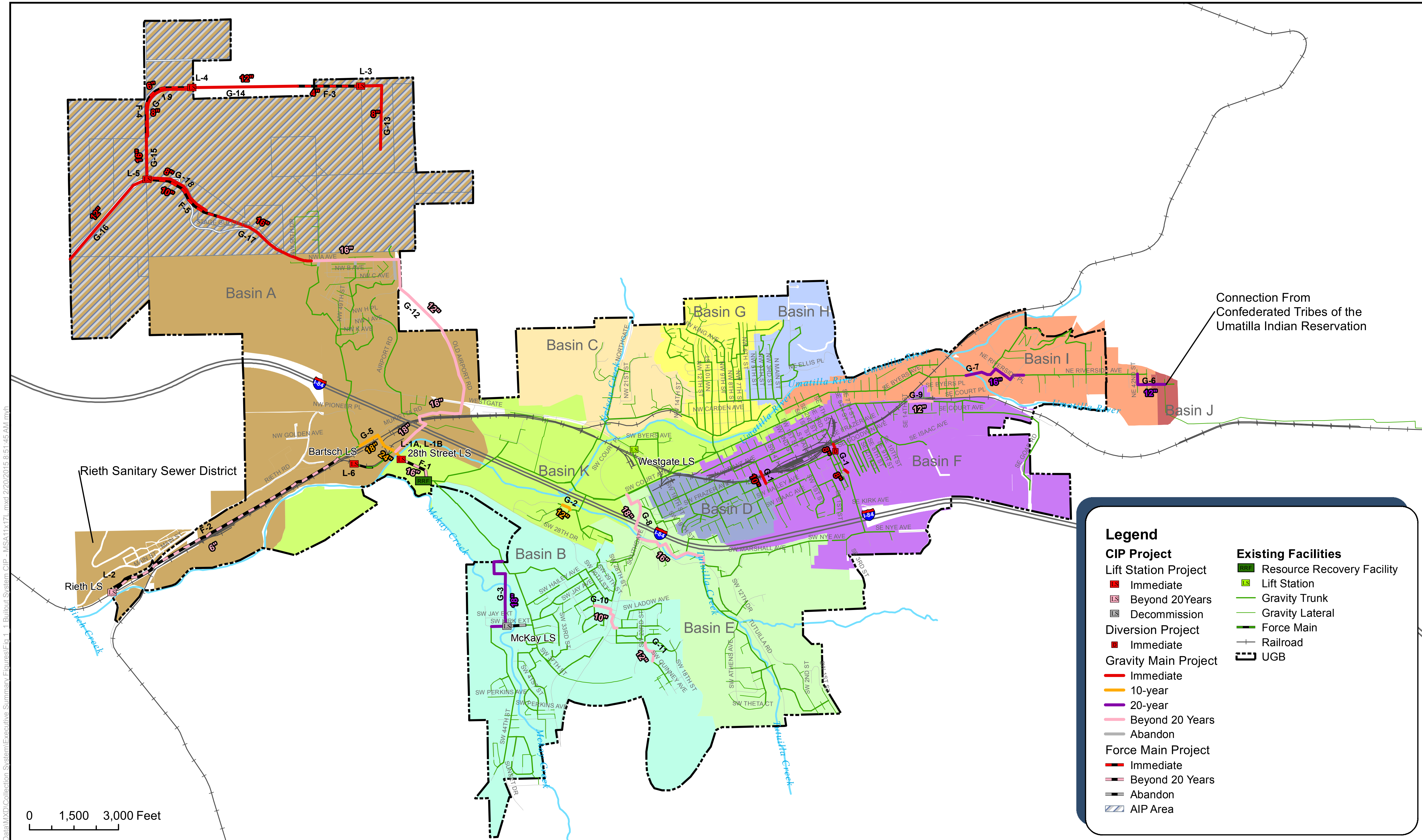
As part of this CSMP, the City's service area was separated into 11 sewer basins shown in Figure 1-1. The collection system consists of approximately 87 miles of gravity pipelines, two miles of force mains, and five lift stations that convey sewage to the RRF.

The City's collection system serves approximately 17,600 people within the City's urbanized area. The Eastern Oregon Correctional Institution is the City's single largest sewer contributor housing approximately 1,600 people and contributing approximately 10% of the City's wastewater flows. In addition, the City receives and conveys flows from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Rieth Sanitary Sewer District (RSSD) for treatment at the City's RRF.

## Population Projections

Population growth and flow projections were developed for; existing, 5-, 10-, 20-year and build-out intervals. Existing flows were estimated based on flow meter data, RRF influent data, existing winter water consumption records and wastewater diurnal patterns. Future flows were based on residential and non-residential flow factors derived from existing wastewater flow characteristics, non-residential area projections, and population projections.

Population projections were based on land use and zoning designations, current and future population, densities, vacancy rates and other assumptions consistent with the City's 2011 Comprehensive Plan Update. The location and rate of anticipated development was based on a review of the developable land and input from City staff. Population projections are presented in Table 1-2.




MSA Murray, Smith & Associates, Inc.

CITY OF PENDLETON INCORPORATED 1880 OREGON

**City of Pendleton**
**Collection System Master Plan**

**Figure 1-1**
**CIP Projects**

May 2015 13-1442

**Table 1-2**
**Population Projections**

| Planning Horizon | Population |
|---|---|
| Existing | 17,611 |
| 5-Year | 19,716 |
| 10-Year | 21,897 |
| 20-Year | 23,970 |
| Build-Out | 31,324 |

## Wastewater Flow Projections

Projected wastewater flows are made up of three components: base wastewater flows (BWF), groundwater infiltration (GWI) and rainfall-dependent infiltration/inflow (RDII). BWF is the average domestic wastewater from residential, commercial, industrial and institutional sources. GWI is groundwater entering the collection system unrelated to a rain event, which in the City's case is from the Umatilla River and its tributary streams for two to three months each spring. RDII is storm water that enters the collection system though infiltration and inflow.

Together, the average BWF and GWI make up average dry weather flow (DWF). Peak DWF is the peak hour of DWF during a typical day with maximum GWI contribution. Peak RDII from the design storm that occurs at the same hour as peak DWF results in the peak design flow (PDF). Peak DWF and PDF were used to analyze the collection system under dry- and wet-weather conditions, respectively. Wastewater flow projections are presented in Table 1-3.

**Table 1-3**
**System-Wide Wastewater Flow Projections**

| Scenario | Wastewater Flow[1] | | | | | |
|---|---|---|---|---|---|---|
| | Unit | Existing (2013) | 5-Year | 10-Year | 20-Year | Build-Out |
| Average Dry Weather Flow | gpm[2] | 1,943 | 2,427 | 2,791 | 3,112 | 4,350 |
| | mgd[3] | 2.8 | 3.5 | 4.0 | 4.5 | 6.3 |
| Peak Dry Weather flow | gpm | 2,612 | 3,170 | 3,619 | 4,005 | 5,854 |
| | mgd | 3.8 | 4.6 | 5.2 | 5.8 | 8.4 |
| Peak Wet Weather Flows | gpm | 3,885 | 4,416 | 4,869 | 5,258 | 8,965 |
| | mgd | 5.6 | 6.4 | 7.0 | 7.6 | 12.9 |
| Peak Design Flow[4] | gpm | 6,497 | 7,585 | 8,488 | 9,265 | 14,819 |
| | mgd | 9.4 | 10.9 | 12.2 | 13.3 | 21.3 |

1 *Per Resolution No. 1065, agreement with the CTUIR, and City input, a permitted flow of 350 gpm, 525 gpm,700 gpm, and 700 gpm was included for 5-year, 10-year, 20-year, and build-out scenarios, respectively.*
2 *gpm = Gallons per minute.*
3 *mgd = Million gallons per day.*
4 *Total flow when the maximum dry weather flow and peak RDII from the design storm occur at the same time, with the peak hour contribution coinciding with the peak storm intensity.*

## System Analysis

The collection system analysis includes a hydraulic model calibration summary followed by evaluations of gravity pipe, pumping, and force main capacity. Sewer basins were developed as part of this CSMP and were used to assist in describing deficiency locations. Basin locations are presented in Figure 1-1. These general conclusions were developed through the system analysis and subsequent validation with City staff:

- The existing piping system has adequate capacity to serve existing peak dry weather and peak design flows, with the exceptions of SE Goodwin Avenue in Basin F, SW Riverview Drive in Basin K, and the McKay Lift Station force main in Basin B.
- Existing lift station facilities have adequate capacity to convey peak design flows through the 20-year planning horizon, with the exception of the 28th Street Lift Station, which is currently deficient.
- The Bartsch Lift Station appears to be oversized through the 20-year planning horizon. Correcting pump sizes and installing a variable-frequency drive (VFD) at this facility should be considered.
- Further investigation at the Rieth Lift Station is recommended to verify actual flows and pump performance.
- In general, the existing piping system is adequately sized to serve projected 20-year flows. Minimal improvements generally south of the railroad are required with a few extensive improvement needed including piping required to decommission McKay Lift Station and improvements to serve future flows from the CTUIR and development in the AIA.
- In general, the existing piping system is adequately sized to serve projected build-out flows beyond 20 years. A few additional minimal improvements located south of the Umatilla River and a few extensive improvements will be required. Extensive improvements are located along Tutuilla Creek (as areas south of Interstate-84 and west of Southgate develop) and generally west of the RRF (as the AIA and RSSD continue to develop).
- Lift stations and force mains at Rieth, 28th Street, and McKay may need to be expanded beyond 20 years to serve projected build-out flows.
- The effectiveness of the City's sliplining program is apparent when historical flow meter data at the RRF is reviewed. Continued sewer flow monitoring is recommended to further understand the distribution and volume of inflow/infiltration (I/I), the impact of spring runoff on the collection system, and the ongoing repair and replacement program.
- The hydraulic deficiency analysis is based on planning-level population growth information provided by City's 2011 Comprehensive Plan Update. Actual development patterns and timing may change the priority of future improvements.

## Operations and Maintenance

Assessment of the City's collection system O&M program included reviewing information from

City staff, comparing the City's O&M practices with those of four similarly sized regional utilities, and consulting regulatory requirements.

The City's Sewer Utility and Streets Division staff are responsible for the O&M of the wastewater treatment and collection system, respectively. The Sewer Utility and Streets Division currently operates with nine full-time equivalent employees (FTEs); two of these FTEs are under the direction of the PW Superintendent and are responsible for the collection system's O&M, storm system O&M, weed spraying, and street maintenance. The City would like to have dedicated O&M staff for each utility with some sharing of resources as needed.

Four other utilities where surveyed to compare their O&M practices to the City's current program including: Walla Walla, Washington; Pullman, Washington; Redmond, Oregon; and Asotin County Public Utility District, Washington. The performance indicators show that each FTE in the City is responsible for more wastewater collected (annual average), total length of gravity system, and total number of lift stations than most of the utilities surveyed. In general, the City operates with fewer staff than the rest of the survey group.

Routine collection system operations include monthly visits to all lift stations, periodic inspection and cleaning of the gravity mains, and responding to customer inquiries and complaints. The City is working to update their program through pursuing Public Works Accreditation, which is implementation of best practices as outlined in the American Public Works Association's *Public Works Management Practices Manual-8th Edition* (PWMP Manual). The following list summarizes key recommendations based on a review of the City's O&M practices, accreditation goals, and benchmarking of other collection systems:

- Update, adopt, and implement the City's 2007 *Wastewater Collection System Maintenance Program* (Appendix B) based on incorporation of the PWMP Manual best management practices to provide consistent long-term O&M.
- Hire 2.5 additional FTEs. Two FTEs are required to implement the Cleaning and Inspection Program, and a partial FTE is required to implement the O&M program and any associated record keeping.
- Hire 1.5 additional FTEs, which will be part of a second crew of four full time staff with dedicated equipment to perform the ongoing pipe replacement program on a 100-year cycle. The other 2.5 FTEs on the crew would be shared and funded with the Water and Storm Utilities.

## Capital Improvement Program

The CIP describes projects identified to address existing and future capacity deficiencies and to plan for ongoing repair and replacement of aging infrastructure. Recommended projects are grouped into three categories: capacity projects needed to convey future flows through the existing system (excluding the airport), projects needed to serve future development in the AIA, and an annual replacement program to address aging infrastructure.

Implementation timeframes for these projects include immediate, 10-year, 20-year and beyond 20 years (build-out). Regular CSMP updates are also recommended and budgeted for approximately every five years. The total expected cost by timeframe, per category and infrastructure type, is shown in Table 1-4. All CIP projects (excluding ongoing repair and replacement) are presented in Figure 1-1.

In general, the existing gravity system is adequately sized to serve flows over the next 20 years. This CIP includes $22,777,000 in improvements over the next 20 years. There are $88,470,000 in improvements to serve build-out flows including; capacity projects, AIA projects, and 100 years of an annual replacement program. Most of the expense within the next 20 years is for development of the AIA and the lifecycle cost of replacing the existing system.

A project summary follows:

- The estimated total cost of an annual program to replace aging infrastructure including gravity main, force main and lift stations over a 100-year cycle is $67,200,000.
- The annual replacement program cost will start at $250,000 per year for first five years and increase incrementally to $672,000 per year after five years and to approximately $699,000 per year beyond 20 years.
- The total estimated cost for all non-airport capacity projects to convey build-out flows is $12,420,000.
- Immediate capacity projects to be constructed within the next five years include constructing approximately 800 feet of gravity main (including one diversion structure), upgrading capacity at one lift station and installing new motors and VFDs at a second lift station. The total estimated cost is $778,000.
- In order to convey 10-year design flows, it is recommended that approximately 300 feet of gravity main be constructed for a total estimated capacity project cost of $104,000.
- In order to convey 20-year design flows, approximately 3,300 feet of gravity main and lift station decommission will be needed in addition to approximately 3,600 feet of gravity main needed if CTUIR flows increase to the contracted amounts, for a total estimated cost of $1,715,000. Wastewater treatment costs associated with additional flow from the CTUIR were not included in this CIP.
- In order to convey build-out flows beyond 20 years, it is recommended that the City construct approximately 19,900 feet of gravity main for a total estimated cost of $5,127,000, and approximately 10,300 feet of force main for a total estimated cost of $785,000.
- Recommended lift station improvements to convey build-out flows beyond 20 years include increasing the firm capacity at two lift stations. The total estimated cost is $3,911,000.
- The CSMP should be updated approximately every five years at a cost of $150,000 per update.
- A budgetary allowance of $370,000 has been provided for the purchase of a combo truck to replace the current combo truck that is being transferred to the Storm Utility in the

immediate timeframe. This cost assumes an estimated $420,000 to purchase a new truck and a $50,000 transfer of funds from the Storm Utility to the Sewer Utility for the current combo truck.

- To convey build-out flows from the AIA, approximately 21,800 feet of gravity main, 6,600 feet of force main, and three lift stations are required. The total estimated cost is $7,880,000.

**Table 1-4**
**CIP Summary**

| Project Category | Project Description | CIP Schedule and Project Cost Summary[1] | | | | |
|---|---|---|---|---|---|---|
| | | **0-5 Years (Immediate)** | **6-10 Years** | **11-20 Years** | **Beyond 20 Years** | **Total** |
| **Gravity Main** | Capacity Projects | $204,000 | $104,000 | $1,715,000 | $5,127,000 | $7,150,000 |
| | AIA[2] Projects | $3,025,000 | $597,000 | | | $3,622,000 |
| | Annual Replacement Program[1] | $1,250,000 | $2,645,000 | $5,290,000 | $43,715,000 | $52,900,000 |
| | **Subtotal** | **$4,479,000** | **$3,346,000** | **$7,005,000** | **$48,842,000** | **$63,672,000** |
| **Lift Station** | Capacity Projects | $574,000 | | | $3,911,000 | $4,485,000 |
| | AIA Projects | $3,791,000 | | | | $3,791,000 |
| | Annual Replacement Program[3] | | $690,000 | $1,380,000 | $11,730,000 | $13,800,000 |
| | **Subtotal** | **$4,365,000** | **$690,000** | **$1,380,000** | **$15,641,000** | **$22,076,000** |
| **Force Main** | Capacity Projects | | | | $785,000 | $785,000 |
| | AIA Projects | $467,000 | | | | $467,000 |
| | Annual Replacement Program[3] | | $25,000 | $50,000 | $425,000 | $500,000 |
| | **Subtotal** | **$467,000** | **$25,000** | **$50,000** | **$1,210,000** | **$1,752,000** |
| **Other** | Collection System Master Plan Updates | $150,000 | $150,000 | $300,000 | TBD | $600,000 |
| | Combo Truck[4] | $370,000 | | | | $370,000 |
| | **Subtotal** | **$520,000** | **$150,000** | **$300,000** | **TBD** | **$970,000** |
| **CIP Total** | | **$9,831,000** | **$4,211,000** | **$8,735,000** | **$65,693,000** | **$88,470,000** |

1 *Costs are based on the* Engineering News Record December 2013 Construction Cost Index.
2 *Airport Industrial Area (AIA).*
3 *Cost based on 100 years of annual replacement programs.*
4 *Cost is based on an estimated $50,000 trade-in value for the current truck that will go toward the estimated $420,000 cost of a new truck.*

## Financial Plan

### *Background*

The sewer system is an enterprise fund of the City, and is supported by sewer system fees and charges, as opposed to general City revenues. The primary funding source is monthly sewer rates charged to customers inside and outside the City. The current monthly sewer rate for a residential dwelling unit is $28.35 inside the City, and $42.50 for a residential retail customer outside the City. The City charges outside-City wholesale customers 110% of the inside-City rates, per prior contract agreements with CTUIR and RSSD. Rates for non-residential customers include both a fixed monthly service charge, and an additional volume charge on water usage over 1,100 cubic feet (cf) for commercial customers.

According to the *2013 Washington/Oregon Water Rate Survey* by Raftelis Financial Consultants, Inc., the City's residential sewer bill is the seventh lowest out of the 41 utilities surveyed. The median bill was $39.73 per month, compared to the City's current bill of $28.35 per month. This represents just the sewer portion of monthly bills and does not include water or other service charges.

The City established an annual inflationary adjustment to its water and sewer rates in 2006. In April of each year, rates are adjusted by an amount equal to the lesser of either 3.5%, or the year-to-year percentage change in the Portland-Salem Consumer Price Index, Urban Consumers (CPI-U). Rate increases beyond inflationary adjustments have been limited to regulatory-driven cost increases.

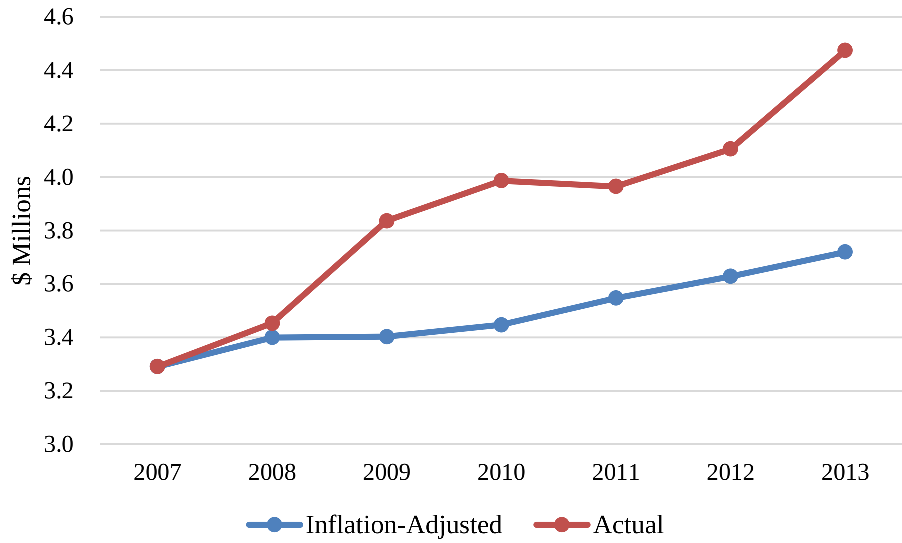
Non-inflationary rate changes over the past ten years are as follows:

- 2005 – 18% increase
- 2006 – 4.6% increase
- 2007 – 98% increase
- 2014 – 7% decrease

### *Financial Capacity*

Since the inflationary adjustment was implemented in 2006, it has not kept pace with rising costs for water and sewer system operations. Figure 1-2 shows a comparison of inflation-adjusted operating expenses for the water and sewer systems combined, compared to actual historical expenses. The CPI-U (used to adjust rates annually) has increased at an average annual rate of 2.3% since 2007, compared to an average increase in operating costs of about 5.3%. This disparity is due to a number of factors, including higher cost escalation for electricity and chemicals (a large part of the sewer system operating costs), franchise fees (related to non-inflationary rate increases), and City-allocated services costs (primarily personnel costs).

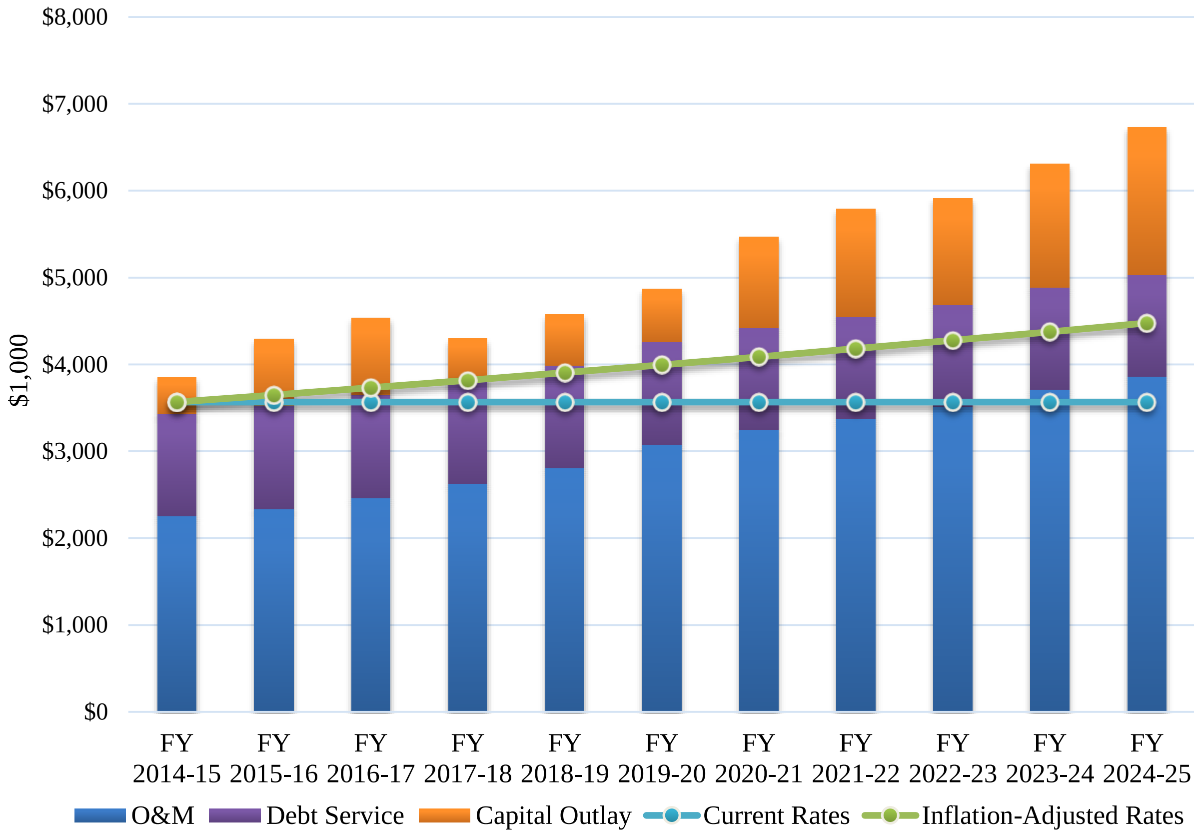
**Figure 1-2**
**Historical Operating Expense Comparison (Combined Water & Sewer)**




Given that the historical rate increases have not kept pace with operating cost inflation, and the City has not increased rates for non-CPI related cost increases (like funding capital improvements related to rehabilitation and repair, and collection system capacity expansion) since 2007, the current rates do not provide sufficient financial capacity to address the future projected system needs (both operating or capital). Figure 1-3 shows the forecasted current and inflation-adjusted rate revenue, compared to projected annual operating, debt service, and capital outlay requirements for the next 10 years (capital requirements shown in this figure do not include improvements associated with Airport Industrial Area projects).

In fiscal year (FY) 2015-16, current rates adjusted for the historical average CPI of 2.3% would just cover current operating costs (about $2.4 million) and debt service ($1.2 million). The City has funded other capital-related expenses in the current budget year (FY2014-15) by drawing down existing operating fund balances. Given the significant capital improvement costs and additional staffing requirements identified in this CSMP, along with other repair and replacement needs for the RRF, additional revenue will be needed beginning in fiscal year 2015-16 to adequately fund the system. Although a transfer from the sewer fund to a fund intended for improvements at the RRF is included in the financial analysis, no evaluation of the improvements needed or adequacy of this funding amount for the RRF are included in this CSMP.

**Figure 1-3**
**Projected Sewer System Revenue Requirements from Rates**




*General note: Debt Service and Capital Outlay do not include AIA projects.*

It is recommended that the additional revenue come from both increases to the City's existing sewer system rates, as well as implementation of new System Development Charges (SDCs). The City currently charges SDCs for the street system, but not for the water, wastewater, and stormwater utilities, and as such is missing an important funding source for capital improvements. Following industry standards for development of SDCs, the recommended CIP would support an SDC of approximately $3,100 per equivalent residential unit. A recent survey by the League of Oregon Cities indicated the range for sewer SDCs is about $500 to $12,000, with the median $3,500 per unit.

While SDCs are generally an important part of a capital funding strategy, they are only a part of the solution, as rate increases will be needed to fund the majority of capital improvements (related to rehabilitation and replacement, and remedying existing deficiencies), and all increases to operating costs (as SDCs may not be used for system operation and maintenance). Table 1-5 shows the total percent increase over current revenue needed for additional revenue requirements within the 10-year planning window. The system has experienced limited customer growth in recent years; if this trend continues, the majority of increased revenue will need to come from sewer rate increases. The required increases shown in Table 1-5 are total for the 10-year planning period. Options for phasing the increases based on the projected timing of capital improvements and staffing modifications will be provided to the City Council.

**Table 1-5**
**Additional Revenue Requirements (10-Year Period)**

| Item | Annual Cost | Required Percentage Increase |
|---|---|---|
| **Current Rate Revenue** | **$3,565,000** | |
| **Additional Requirements[1]** | | |
| New Staff | $386,073 | 11% |
| Franchise Fee on Rate Increase | $235,268 | 7% |
| Other Operating Costs | $936,095 | 26% |
| Rate-supported CIP Costs | $757,277 | 21% |
| RRF Transfer | $600,000 | 17% |
| **Debt Service** | | |
| AIA Projects | $545,043 | 15% |
| Other Projects | $0 | 0% |
| Reserve on New Debt | $196,698 | 6% |
| **Total Additional Requirements** | **$3,656,455** | **103%** |

[1] *Annual amount needed in FY 2024-25 above current (FY 2014-15) requirements including projected inflation.*

### *Recommendations*

The following recommendations related to funding the additional staffing and capital improvements as identified in this CSMP are offered for the City's consideration:

- Adopt a new SDC based on the growth-related portion of this CSMP and completed Phase I RRF improvements. Adjust the SDC annually for inflation based on the Engineering News Record (ENR) Construction Cost index (20-city average). Update SDCs as necessary to incorporate significant changes to the CIP, including Phase II improvements at the RRF.
- Budget an annual operating contingency equal to 30 to 90 days of O&M costs (consistent with industry standards).
- Change the index for annual inflation-adjustments to rates from the CPI to the ENR. The current index has not kept pace with utility cost increases since it was adopted in 2006. The average annual increase in the ENR (20-city average) has been 3.0%, compared to 2.3% for the CPI.
- Maintain existing capital reserves of $3.8 million to fund Phase II of the RRF expansion.

- Set sewer rates sufficient to fund additional cash reserves for ongoing repair and replacement of existing facilities beyond those included in this CSMP (currently estimated at $600,000 per year for the RRF).
- Cash fund annual repair and replacement collection system CIP costs. Limit additional debt funding for major projects, including AIA improvements.
- Review the financial plan annually, and make modifications to planned rate increases and capital phasing as needed to meet system performance targets.

**Summary and Overall CSMP Recommendations**

This CSMP constituted a major investment of time and resources for City staff and the consultant team. The City and, in particular, the Public Works Department should be commended for its foresight in initiating such a comprehensive scope of work in order to successfully operate, maintain, design and improve the City's collection system. This CSMP utilized industry standard approaches by compiling and converting information to a GIS database and utilizing hydraulic modeling software to successful ends.

Prior to this CSMP no single collection system inventory nor hydraulic model existed. Collecting and compiling system data allowed for a more accurate and comprehensive look at the collection system as a whole than what was previously available. The hydraulic modeling allowed for the evaluation of collection system alternatives based on system hydraulics. The capital projects that have been identified, provide the City with a plan, phased over the next 20 years and beyond that is affordable and implementable.

Based on the findings in this CSMP, the following recommendations are made:

- Implement the improvements in the short term (1-10 years) as identified in the CIP to address existing capacity and condition issues as well as provide for planned development in the AIA. In order to maintain infrastructure an annual repair and replacement program should be implemented.
- Operation and maintenance programs should be implemented to increase the lifecycle of infrastructure and to reduce unplanned maintenance.
- Reassess long-term improvements (beyond 10 years) using future CSMP updates: the GIS, hydraulic model and flow monitoring information
- Continue improving the quality of available collection system information, specifically:
    - Continue to collect flow monitoring information to understand the impact of wet weather events and river influence on available capacity and system performance
    - Continue collecting CCTV information related to pipe condition and link to the GIS database
    - Continue utilizing the hydraulic model as a tool for predicting flows in the system

- Hire four additional FTEs to support operation and maintenance programs and the annual replacement program.

## Policy Recommendations

In order to prevent unnecessary large expenditures in the future, it is recommended that the City reconsider its financial and planning review policies, as follows:

### *Planning Review Policies*

Although planning documents have detailed collection system upgrades, there are no policies in place requiring regular updates, public discussion, or review. Consequently, as updated information becomes available and changes in the system occur, planning may be altered and significant investments could be made when an alternative based on new information may be a better option. The following policy recommendations will better define the requirements of future collection system planning and help future City councils and the public plan for future investments long before they are needed:

- Require City staff to provide an annual review to Council on the status of the master plan.
- Provide an updated or new master plan to City Council every five years for adoption.

Once the City revises its policies, it is crucial that future City councils and staff understand the rationale behind these policies. To realize the potential impact of any future policy revisions, the historical context and reasoning behind existing policies must be clearly understood.

Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 2
## Existing System Description

# SECTION 2
# EXISTING SYSTEM DESCRIPTION

## Introduction

This section provides an overview of the City of Pendleton's (City's) existing collection system location, management structure, service area, sewer basins, and existing collection system infrastructure.

## Location, Climate, and Soil Characteristics

The City is located in northeastern Oregon approximately 25 miles south of the Oregon-Washington Border. The City is located in Umatilla County along the Umatilla River, northwest of the Blue Mountains and west of the Umatilla Indian Reservation. It covers an area of approximately 11.3 square miles and has a semi-arid climate with a mean annual precipitation of 12.7 inches and a mean annual air temperature of $52^{o}$ F. Temperatures range from an average high of $87^{o}$ F in the summer, to an average low of $27^{o}$ F in the winter. Figure 2-1 presents a regional map of Oregon showing the City's location within the state.

The City's elevation varies from 950 to 1,570 feet above Mean Sea Level (MSL). Unless noted otherwise, all elevations reported in this Collection System Master Plan (CSMP) are on the 1929 National Geodetic Vertical Datum (NGVD29), the City's officially adopted vertical datum.

According to the National Resources Conservation Service, soils within the City are generally made up of pilot rock silt loam and are well drained, with a restrictive duripan layer at 20 to 40 inches beneath ground level. The parent material in this area is primarily loess over cemented alluvium.

## System Management and Overview

The City is governed by the Mayor and City Council. City operations are overseen by the City Manager, who directs all City departments including those primarily involved in infrastructure considerations. These departments include Parks and Recreation, Community Development, Public Works, Finance, and Facilities. The Public Works Director manages the sewer, stormwater, water, and street utilities. The City's Public Works Superintendent oversees operation of the collection system excluding the Resource Recovery Facility (RRF), which operates under the direction of the Wastewater Superintendent. Figure 2-2 presents an organizational chart of the City.

With over 89 miles of pressure and gravity sewer pipelines and five lift stations, the City's collection system serves approximately 17,600 people within its urban area, as well as receives discharge from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and Rieth Sanitary Sewer District (RSSD) collection systems. The City's system collects domestic, commercial, and industrial wastewater and conveys it to the RRF, which treats an average flow of 2.2 million gallons per day (mgd) and discharges into McKay Creek, a tributary of the Umatilla River. Figure 2-3 shows the collection system infrastructure and the location of the RRF.

**Collection System Service Area**

The collection system service area shown in Figure 2-3 includes all areas within the City limits and the urban growth boundary (UGB) that are either currently served by the City’s collection system or will be served by the collection system under build-out conditions. The UGB covers approximately 13.4 square miles and defines the current boundary where the City may expand service. The UGB was used as the boundary for all build-out projections within this CSMP. The City also maintains the RSSD collection system northwest of the UGB, and treats the system discharge at the City RRF. Although the City does not maintain the collection system of the CTUIR, it does receive its discharge, which enters the City collection system just east of the UGB.

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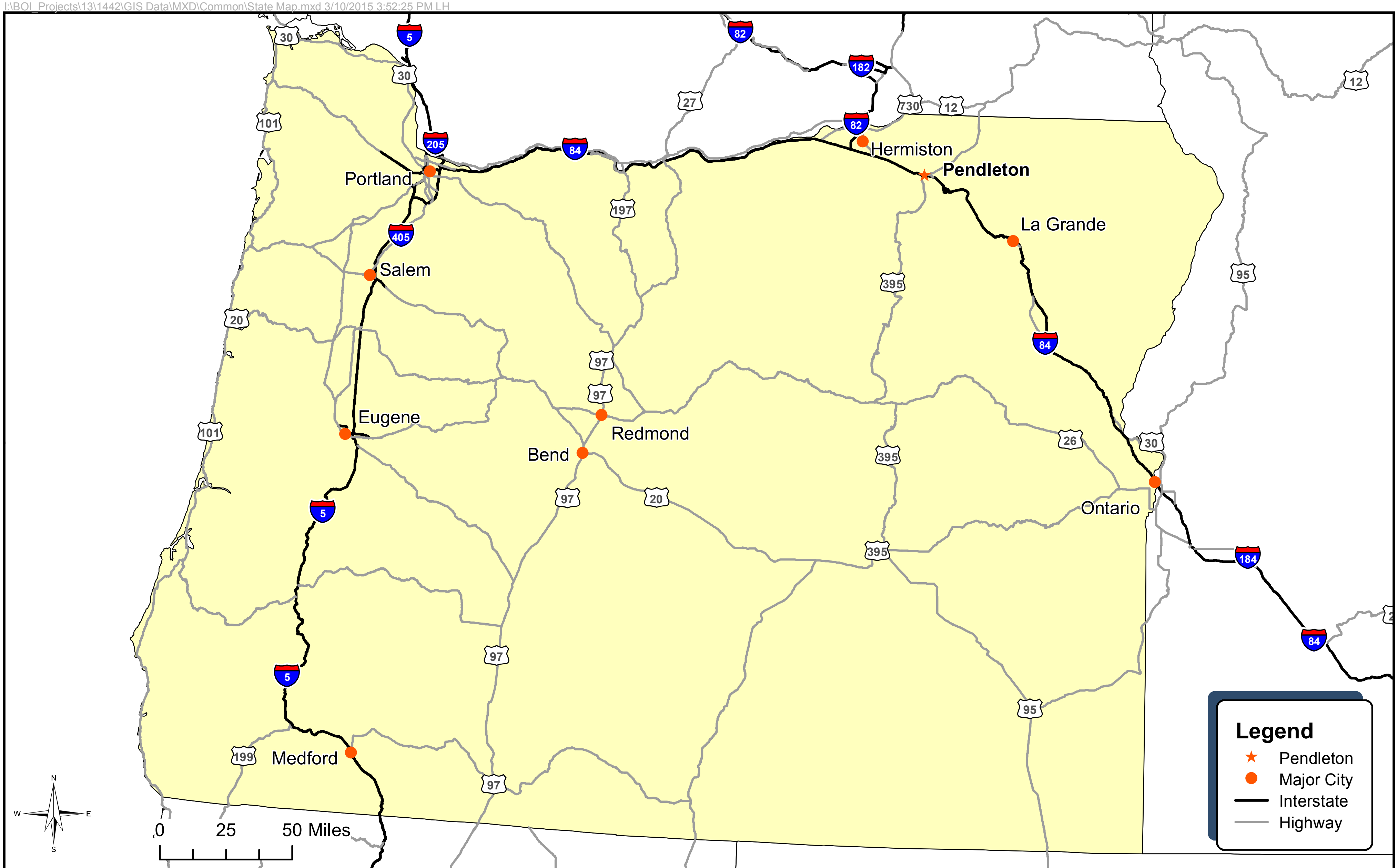


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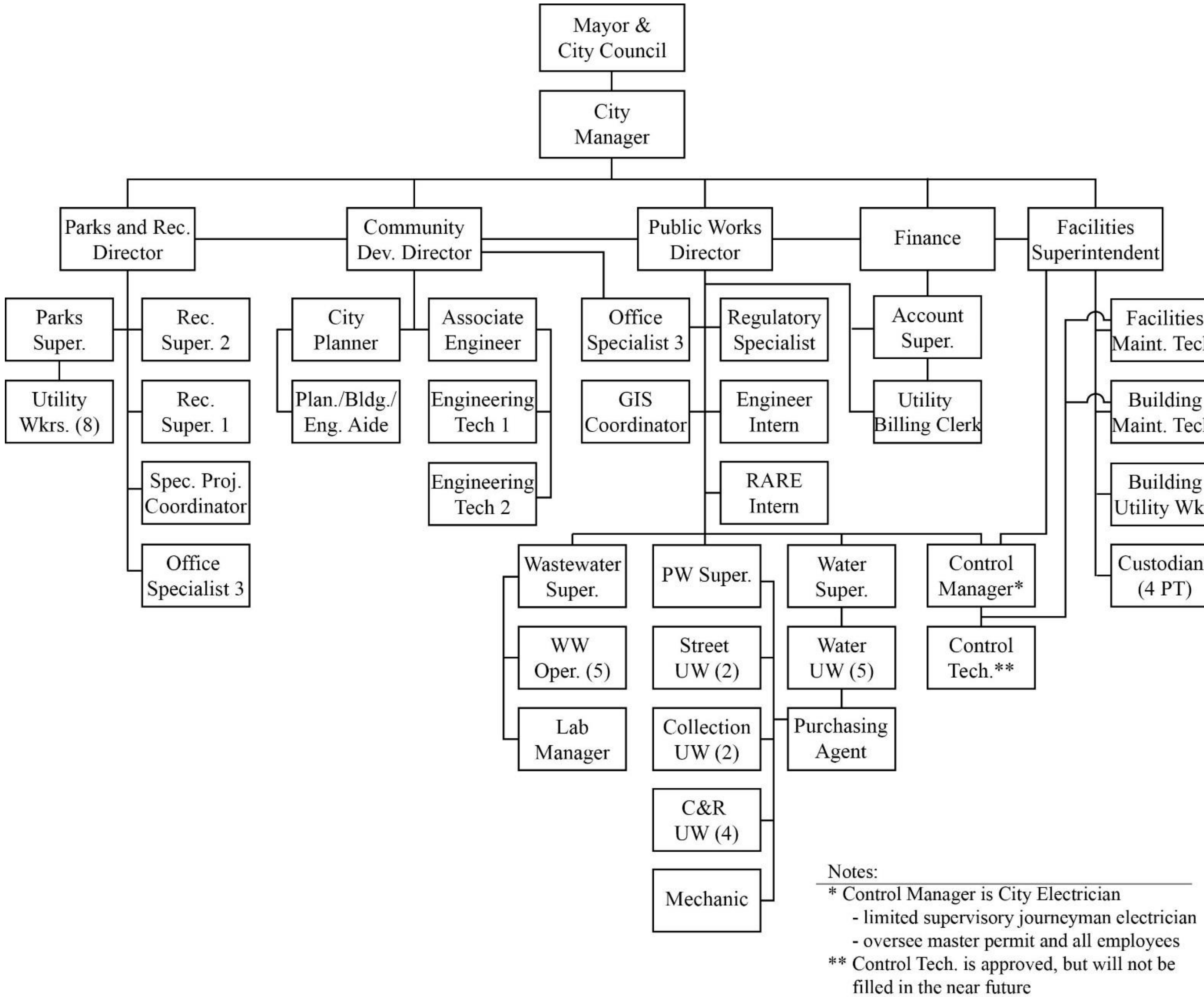
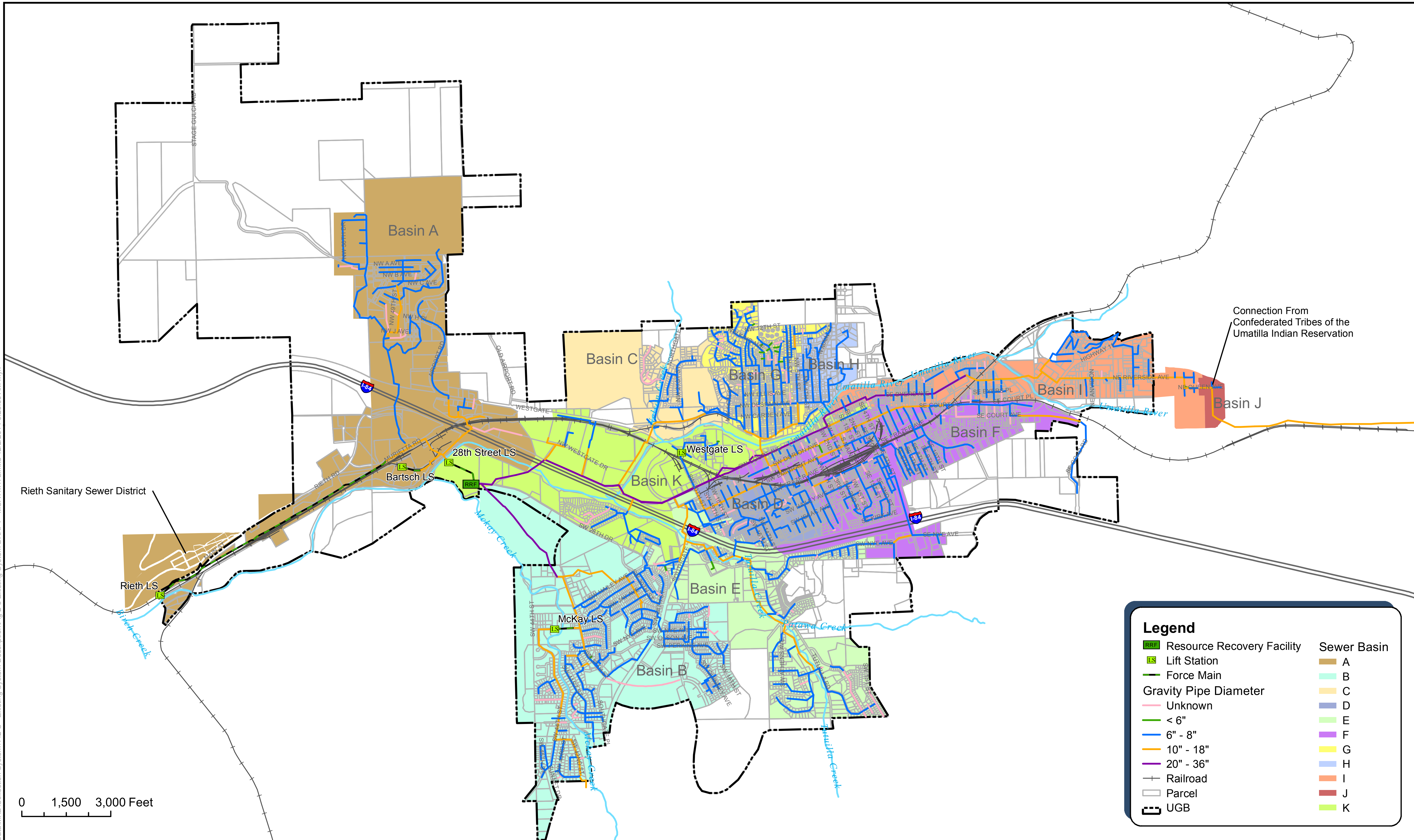
**City of Pendleton**
**Collection System Master Plan**

**Figure 2-1**
**State Map**

City of Pendleton Incorporated 1880 Oregon

**Figure 2-2**
**Organizational Chart**






MSA
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CITY OF PENDLETON OREGON INCORPORATED 1880

**City of Pendleton**
**Collection System Master Plan**

**Figure 2-3**
**Existing Collection System**

## Inventory of Existing System and Facilities

The City's collection system consists primarily of manholes, gravity pipelines, lift stations and force mains. Generally, gravity pipelines convey wastewater from the residential, commercial, and industrial areas and route them to the RRF. Due to the varied topography within the collection system, five lift stations are required to convey sewage to the RRF.

Within the City UGB, flow from the north and the south generally drain to the river valley. Flow is conveyed along the river valley west to the RRF. Flow from the RSSD is collected at the Rieth Lift Station and pumped east in a 4-inch force main over 1.7 miles to the City's collection system. Ten- and twelve-inch gravity trunk lines convey flow to the west from the CTUIR into the east portion of the City's collection system.

Each of the basins and infrastructure components depicted in Figure 2-3 are summarized in the following section:

### *Basins*

The CSMP separates the City's service area into 11 sewer basins covering 8.3 square miles. All basins flow to a common interceptor system that conveys flows to the RRF, with a primary trunk line running the length of the City from east to west along Court Street.

Basin A is located in the northwest portion of the City. It primarily serves an industrial area that includes the Eastern Oregon Regional Airport. Flows from RSSD pumped from the Rieth Lift Station west of the City are conveyed to this basin. Flows from Basin A are gravity-fed south to the $28^{th}$ Street Lift Station that conveys flow to the RRF.

Basin B, located in the southwest portion of the City, consists primarily of low- to medium-density residential zoning with some commercial land use. Flows in the southwest portion of the basin flow into the McKay Lift Station and are subsequently pumped into a trunk line that conveys flow from the entire basin north to the RRF.

Basin C is located north of the Umatilla River and consists of high-, medium-, and low-density residential land use, as well as Pendleton High School and Blue Mountain Community College. Flows from Basin C are gravity-fed southwest to an interceptor where they are conveyed to the RRF.

Basin D contains a commercial area and medium-density residential land use. It is located in the central portion of the City between Interstate 84 and the Union Pacific Railroad. Flows from Basin D are conveyed west by gravity to the RRF.

Basin E is located in the southern portion of the City south of Interstate 84. It primarily consists of low- to medium-density residential land use with a small portion of commercial land use. Flows are conveyed northwest by gravity to interceptors before conveyance to the RRF.

Basin F is located in the eastern center of the City between the Umatilla River and Interstate-84. It contains mixed land uses with medium- and high-density residential, commercial, and industrial zones. Flows are conveyed northwest by gravity to the primary interceptor along Court Street which flows west to the RRF.

Basin G contains exclusively low-, medium-, and high-density residential land uses. It is centrally located north of the Umatilla River. Flows from Basin G are conveyed by gravity south across the river along the 10th Street Bridge to the main interceptor on Court Street and then the RRF.

Basin H, located east of Basin G and north of the Umatilla River, consists of low- and medium-density residential land use. Flows from Basin H are conveyed by gravity south across the Main Street Bridge to the main interceptor on Court Street and then to the RRF.

Basin I is located on the east side of the City along the Umatilla River and west of Basin J. It is made up of a mix of low and medium residential, commercial, and industrial areas. Sewer flows from the CTUIR contribute to Basin J and then are conveyed to Basin I by gravity from the east. In general, flows from Basin I travel west to the RRF.

Basin J is located east of Basin I and north of the Umatilla River. It is made up of residential customers and flows from the CTUIR that connect to Basin J at NE 45th Street and NE Queens Avenue. In general, flows from Basin J travel west to the RRF.

Basin K is located in the central part of the City along interceptors running west. It consists of residential, industrial, and commercial customers, including the Eastern Oregon Correctional Institution that houses up to 1,600 inmates. Flows from Basin K are conveyed west along interceptors to the RRF.

### *Gravity Piping*

The City's collection system currently includes approximately 87 miles of gravity piping ranging from 3 to 36 inches in diameter. The physical characteristics of the collection system are summarized based on information in the City's Geographic Information System (GIS), which has been developed as part of this overall planning effort. The GIS was created based on a conversion of historical CAD layers, hard-copy mapping, and operator input, and was augmented with field data collection. Piping materials in the system include polyvinyl chloride (PVC), concrete, asbestos cement, and clay. The most common reported pipe materials were clay and concrete; comprising 30% and 27% of the system, respectively. Table 2-1 summarizes the collection system's gravity piping by material and diameter.

Pipe installation year is based on input from City staff. The majority of the gravity piping is over 60 years old, with 39% of the piping installed prior to 1950. Pipe installation year and diameter is summarized in Table 2-2

**Table 2-1**
**Gravity Pipe Materials & Diameter**

| Diameter (in) | Length (1,000 ft) | | | | | | Percent |
|---|---|---|---|---|---|---|---|
| | Concrete | Poly Vinyl Chloride (PVC) | Clay | Asbestos Cement | Unknown | Total | |
| Unknown | 9.1 | 13.7 | 11.3 | 4.1 | 0.2 | 38.2 | 8.7% |
| < 6 | 1.5 | 0.4 | 0.1 | 0.4 | 0 | 2.4 | 0.5% |
| 6 - 8 | 81.7 | 57.7 | 85.3 | 70.9 | 1.6 | 295.6 | 67.5% |
| 10 - 18 | 29.5 | 15.5 | 21.3 | 7.3 | 18.5 | 73.6 | 16.8% |
| 21 - 36 | 0.3 | 9.8 | 17.9 | 0.0 | 0 | 27.9 | 6.4% |
| **Total** | **122.0** | **97.1** | **135.8** | **82.8** | **20.3** | **457.9** | |
| Percent | 26.6% | 21.2% | 29.6% | 18.1% | 4.4% | | 100% |

**Table 2-2**
**Gravity Pipe Diameter & Installation Date**

| Diameter (in) | Length (1,000 ft) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Before 1950 | 1950-1959 | 1960-1969 | 1970-1979 | 1980-1989 | 1990-1999 | 2000-2013 | Unknown |
| Unknown | 14.8 | 2.2 | 5.1 | 2.1 | 1.5 | 2.5 | 10.1 | 0.2 |
| < 6 | 0.1 | 1.2 | 0.7 | 0.0 | 0.3 | 0.0 | 0.1 | 0.0 |
| 6-8 | 122.0 | 36.0 | 57.4 | 2.7 | 45.3 | 12.2 | 20.1 | 1.6 |
| 10-18 | 24.3 | 26.9 | 15.2 | 6.8 | 3.3 | 2.5 | 12.1 | 1.0 |
| 21-36 | 18.1 | 0.0 | 0.0 | 0.0 | 0.0 | 5.7 | 4.1 | 0.0 |
| **Total** | **179.3** | **66.3** | **78.4** | **11.6** | **50.3** | **22.8** | **46.4** | **2.8** |
| Percent | 39.2% | 14.5% | 17.1% | 2.5% | 11.0% | 5.0% | 10.1% | 0.6% |

### *Lift Stations and Force Mains*

The City's collection system currently owns and maintains four lift stations. In addition, the City maintains the Rieth Lift Station, which pumps into the City's collection system but is owned by the Rieth Water District. The City has a perpetual agreement with Rieth Water District to operate, maintain, and upgrade this lift station. The five lift station locations are shown in Figure 2-3. Four lift stations have pumps submerged in the wet well where the sewage is stored. The 28$^{th}$ Street Lift Station has a wet well/dry well configuration with pumps housed in the dry well. Four lift stations contain non-clogging pumps that can pass solid objects up to three inches in diameter without clogging. The Rieth Lift Station contains grinder pumps, which grind sewage into slurry so that it can pass through the pump.

Table 2-3 summarizes the lift station characteristics including the number of pumps, total power, total dynamic head (TDH), and total- and firm-design pump capacities. The firm capacity of each lift station assumes the largest pump out of service. Level controls are used to trigger the motors to start and stop, based on water level in the wet well. The City's lift stations utilize either float controls or pressure transducer controls.

Backup power for lift stations is used in the event of a power outage. The 28th Street Lift Station has an onsite generator, and the Rieth Lift Station has the ability to connect to a portable generator during a prolonged power outage; however, the City does not own a portable generator. Other lift stations have no backup power capability.

The City's collection system currently includes two miles of force mains ranging from four to eight inches in diameter. Table 2-4 includes details on the force mains associated with each lift station.

**Table 2-3**
**Lift Station Summary**

| Name | Type | Number of Pumps | Total Design Capacity (gpm) | Firm Design Capacity (gpm) | TDH (ft) | Total Power (hp) | Primary Level Control | Backup Power |
|---|---|---|---|---|---|---|---|---|
| 28th Street | Wet Well / Dry Well | 2 | 1,000 | 500 | 20 | 10 | Float | Yes |
| Bartsch | Submersible | 2 | 520 | 260 | 20 | 6 | Float | No |
| McKay | Submersible | 2 | 510 | 255 | 35 | 10 | Pressure Transducer | No |
| Rieth | Grinder | 2 | 130 | 65 | 84 | 3.74 | Pressure Transducer | No (Plug for Portable) |
| Westgate | Submersible | 2 | 500 | 250 | 20 | 10 | Pressure Transducer | No |

**Table 2-4**
**Force Main Summary**

| Lift Station | Force Main Diameter (in) | Force Main Length (ft) |
|---|---|---|
| 28th Street | 8 | 1,240 |
| Bartsch | 4 | 640 |
| McKay | 4 | 650 |
| Rieth | 4 | 8,950 |
| Westgate | 6 | 30 |

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Engineers/Planners

# SECTION 3
Population and Wastewater Flow Projections

## SECTION 3
## POPULATION AND WASTEWATER FLOW PROJECTIONS

### Introduction

This section summarizes the results of the wastewater characterization and forecasts future planning flow for the City of Pendleton (City). The projected flows were used in Section 4—System Analysis to evaluate the capacity of the existing collection system and identify deficiencies at each of the existing, 5-, 10-, 20-year and build-out planning horizons.

The urban growth boundary (UGB) represents the current limit where the City may expand service and was used as the boundary for all planning horizons in this Collection System Master Plan (CSMP).

### Planning Period

The planning period for this CSMP is 20 years. Growth and population projections were identified for 5-, 10-, and 20-year intervals and build-out. Ultimate build-out occurs when all available land has been developed to its target density. Build-out projections were included to evaluate the City's collection system sizing requirements beyond 20 years. As new system piping is expected to last well beyond 20 years unless otherwise noted, recommended improvements identified in this plan were sized to accommodate build-out flows.

### Wastewater Flow Components

The three main wastewater flow components are described below. Different methodologies were used to estimate and project each component.

1. ***Base Wastewater Flow (BWF)*** is domestic wastewater from residential, commercial, institutional (e.g., schools, churches, hospitals) and industrial sources. The base wastewater flow depends upon the population and land use, and varies through the day in response to residential and non-residential usage trends. Base wastewater is the main component of dry weather flow.
2. ***Groundwater Infiltration (GWI)*** is groundwater entering the collection system that is unrelated to a specific rain event. GWI occurs when groundwater is at or above the sewer pipe invert and infiltrates through defective pipes, pipe joints and manhole walls. This component of the dry weather flow is seasonal and can be influenced by irrigation or river flows. In Pendleton's collection system, this component is the direct result of seasonal variation in the Umatilla River (River).
3. ***Rainfall-Dependent Infiltration/Inflow (RDII)*** is stormwater that enters the sewer system and it is composed of inflow and rainfall-dependent infiltration. Stormwater inflow reaches the collection system by direct connections, such as roof downspouts connected to sanitary sewers, yard and area drains, holes in manhole covers, or cross-connections with storm drains or catch basins. Rainfall-dependent infiltration

includes flow that enters defective pipes, pipe joints and manhole walls after percolating through the soil.

**Base Wastewater Flow Projection**

Base wastewater flow projections were developed using unit flow factors (derived from flow meter data), population projections, land use and zoning designations, and existing winter water consumption and wastewater diurnal patterns. Current zoning within the UGB is shown in Figure 3-1.

Information regarding current and future population, land use, density, vacancy rate, and other assumptions used in this CSMP are consistent with the 2011 Comprehensive Plan amendments produced by Winterbrook Planning. The assumptions used to estimate population growth for existing and future conditions are provided in Table 3-1.

**Table 3-1**
**Comprehensive Plan Population Data**

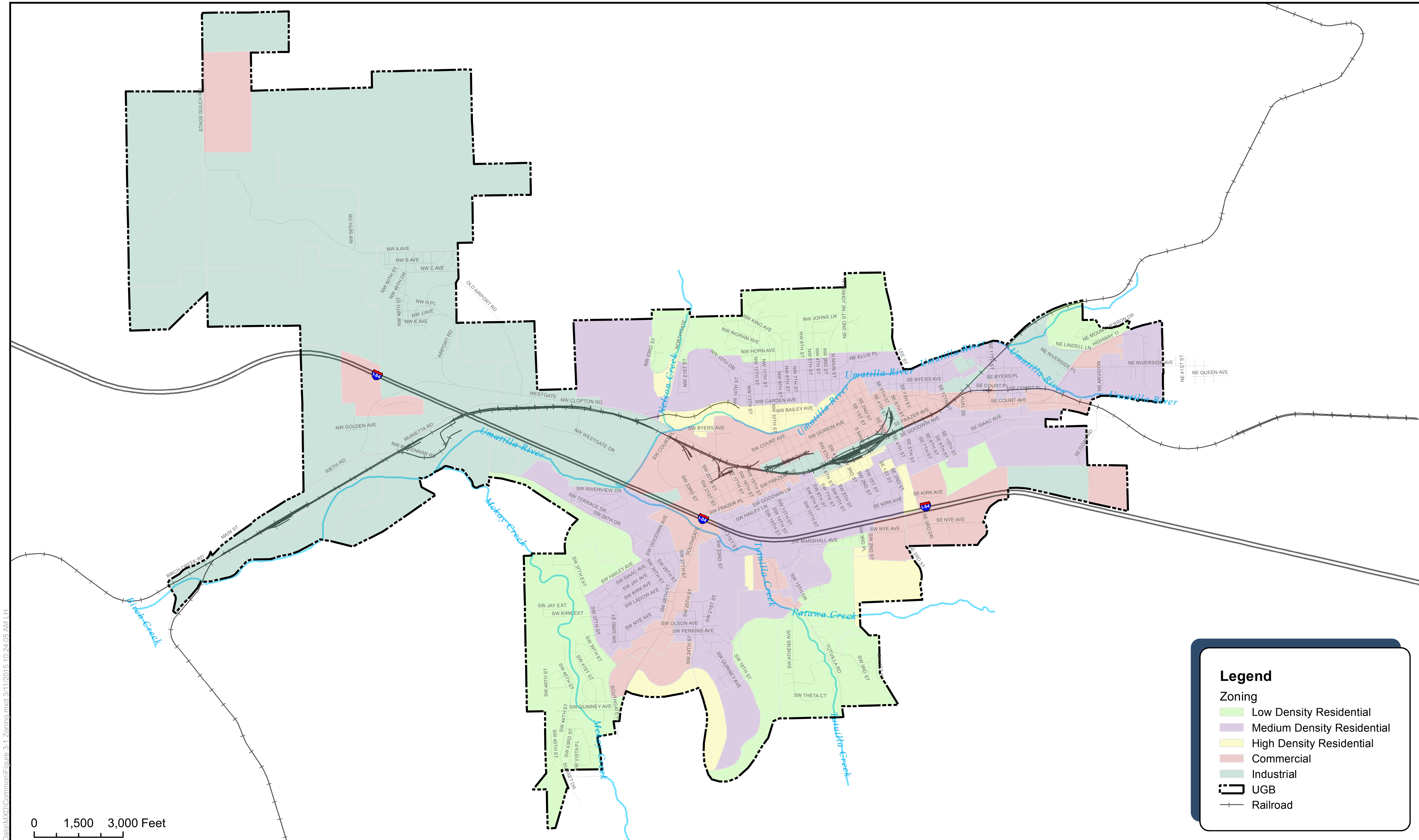
| Attribute | Value |
|---|---|
| 2010 UGB Population[1] | 17,611 people |
| 2033 UGB Population Estimate | 23,970 people |
| Household size | 2.34 people/household |

[1] *Population includes Eastern Oregon Correctional Institution population.*

In addition to forecasting population growth, the 2011 Comprehensive Plan provides parameters for how this growth will occur within the UGB. The land use designations from the 2011 Comprehensive Plan are shown in Figure 3-1. Table 3-2 provides population density by land use type for future residential developments.

**Table 3-2**
**Residential Density Ranges**

| Land Use | Density Range (dwellings/acre) |
|---|---|
| Low-Density Residential | 4-9 |
| Medium-Density Residential | 6-18 |
| High-Density Residential | 12-35 |
| Overall Average Residential | 7 |




Murray, Smith & Associates, Inc.

**City of Pendleton**
**Collection System Master Plan**

**Figure 3-1**
**UGB Land Use**

I:\BOI_Projects\13\1442\GIS Data\MXD\Common\Figure 3-1 Zoning.mxd 3/11/2015 10:24:05 AM LH

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To estimate build-out population, the lowest density range within each land use was applied to undeveloped residential areas within the UGB. For the short- and medium-term planning horizons, the population growth associated with newly developed residential areas was calculated using an average density of seven dwellings per acre. Existing developed parcels are not expected to meet the densities outlined in Table 3-2. Based on that assumption, infill parcels were assumed to develop at the average existing density (3.5 dwellings/acre). The 2011 Comprehensive Plan amendments also assume an 11% vacancy rate for residential development and an average of 20% of the developable land being required for utility easements and road right-of-ways (ROW).

Development assumptions and input from the City's staff predicted which areas are likely to develop first; population in areas within the UGB were expected to increase approximately 6,359 by 2033. The areas illustrated in Figure 3-2 are classified for growth in the 5-, 10-, and 20-year planning horizons and build-out. Infill-related growth areas were distributed relatively evenly through the 20-year horizon.

The forecasted residential development and corresponding population for the short- and medium-term planning horizons are summarized in Table 3-3. The build-out population projections are summarized in Table 3-4.

**Table 3-3**
**20-Year Population Projections**

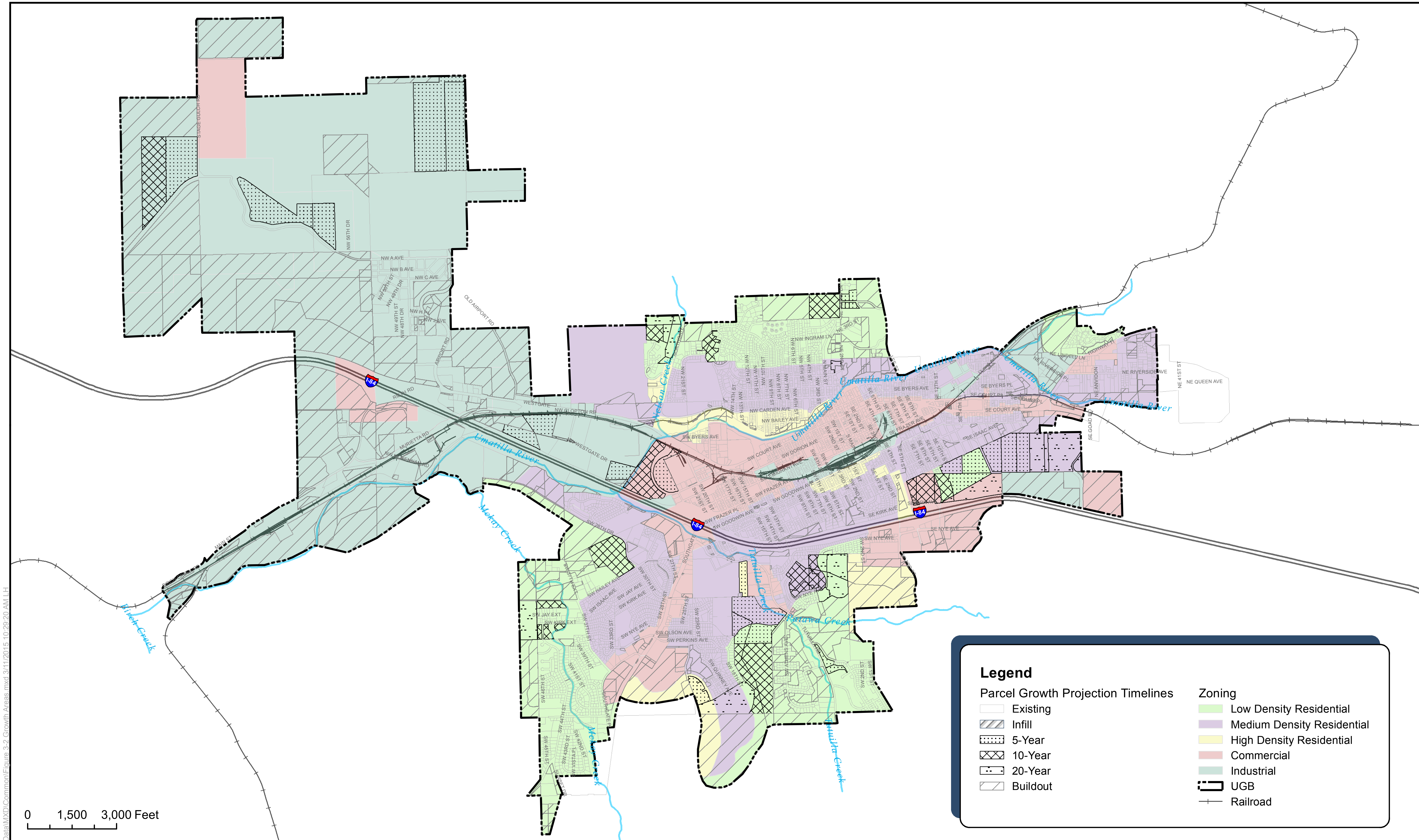
| Planning Horizon | Growth Type | Gross Area[1] (Acres) | Net Area[2] (Acres) | Occupied New Dwellings[3] | Population Increase | Total Population[4] |
|---|---|---|---|---|---|---|
| 0- 5 Year | Infill | 47 | 47 | 146 | 343 | |
| | New Development | 151 | 121 | 753 | 1,762 | |
| | **Total** | **198** | **168** | **899** | **2,105** | **19,716** |
| 6-10 Year | Infill | 42 | 42 | 131 | 306 | |
| | New Development | 161 | 129 | 801 | 1,875 | |
| | **Total** | **203** | **171** | **932** | **2,181** | **21,897** |
| 11-20 Year | Infill | 40 | 40 | 125 | 292 | |
| | New Development | 153 | 122 | 761 | 1,781 | |
| | **Total** | **193** | **162** | **886** | **2,073** | **23,970** |
| **20-Year** | **Overall Total** | **594** | **501** | **2,717** | **6,359** | **23,970** |

1 *Gross Area = total residential area.*
2 *Net Area = total contributing area from residential parcels (does not include utility corridors or ROW).*
3 *Assumes 11% vacancy rate per 2011 Comprehensive Plan.*
4 *Includes existing population of 17,611.*

**Table 3-4**
**Build-Out Population Projections**

| Residential Land Use Type | Gross Area[1] (acres) | Net Area[2] (acres) | Occupied New Dwellings[3] | Population Increase | Total Population[4] |
|---|---|---|---|---|---|
| Low Density | 400 | 320 | 1,139 | 2,665 | |
| Medium Density | 272 | 218 | 1,163 | 2,721 | |
| High Density | 98 | 79 | 841 | 1,968 | |
| **Total** | **770** | **617** | **3,143** | **7,354** | **31,324** |

[1] *Gross Area = total residential area.*
[2] *Net Area = total contributing area from residential parcels (does not include utility corridors or ROW).*
[3] *Assumes 11% vacancy rate per 2011 Comprehensive Plan.*
[4] *Includes existing population of 17,611.*

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**Collection System Master Plan**

**Figure 3-2**
**Projected Growth Areas**

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## Non-Residential Growth

The non-residential growth includes future; commercial, industrial and institutional parcels within the UGB. Table 3-5 summarizes the acreage of non-residential development associated with the areas illustrated in Figure 3-2.

**Table 3-5**
**Non-Residential Growth Projections**

| Planning Horizon | Gross Area[1] (acres) | Net Area[2] (acres) |
|---|---|---|
| 0-5 Year | 279 | 224 |
| 6-10 Year | 103 | 83 |
| 11-20 Year | 21 | 17 |
| Build-Out | 1,902 | 1,522 |
| **Total** | **2,305** | **1,846** |

[1] *Gross Area = total non-residential area.*
[2] *Net Area = total contributing area (does not include utility corridors or ROW).*

## BWF Unit Flow Factors

Sewer flow meter data was compared to current land use and existing population to develop unit flow factors and use patterns. The unit flow factor is the average contribution of wastewater flow per capita, per customer or per acre, calculated based on existing usage and user type. The calculated unit flow factors were then used for forecasting purposes.

The largest water and wastewater customer in the City, the Eastern Oregon Correctional Institution (EOCI) is a hybrid residential/non-residential account. Currently, EOCI accounts for about 10% of the City's wastewater flow during dry conditions. No flow increase is projected at EOCI, and due to its anomalous nature, it was excluded from the unit flow factor analysis.

Other larger contributors to the City system include the Rieth Sanitary Sewer District (RSSD) and the Confederated Tribe of the Umatilla Indian Reservation (CTUIR). RSSD connects to the City system from the Rieth Lift Station and discharges flow into the City through Basin A. Future growth in the RSSD is reflected in the projected flows in Basin A. The City has an agreement with CTUIR to convey wastewater flows from the east of the UGB through Basin J. Future growth in the CTUIR could increase flows (including infiltration) to Basin J, per Resolution No. 1065, up to a total design flow of 1.0 million gallons per day (mgd). These were also excluded from the unit flow factor analysis due to lack information in these areas.

Excluding days with any significant rain events, the average flow measured at the Resource Recovery Facility (RRF) during the flow metering period from August to December 2013 was 1,560 gallons per minute (gpm). There was no significant river influence during this time period. From the water billing records database, the existing Pendleton customer base is approximately 70% residential and 30% non-residential, excluding EOCI, RSSD; CTUIR, and City uses. Table 3-6 shows the assumptions used, and the residential and non-residential unit flow factor calculations.

**Table 3-6**
**BWF Unit Flow Factor Assumptions and Calculations**

| **BWF Unit Flow Factor Assumptions** | |
|---|---|
| Existing Population | 17,611 |
| Existing Population excluding EOCI | 16,011 |
| Existing Non-Residential Area | 930 acres |
| Measured Average RRF Flow | 1,560 gpm |
| Estimated Average RRF Flow, excluding EOCI contribution | 1,390 gpm |
| **Residential Unit Flow Factor** | |
| Estimated Residential Flow | 975 gpm |
| Estimated Residential Flow Factor | 88 gpcd[1] |
| **Non-Residential Unit Flow Factor** | |
| Estimated Non-Residential Flow | 415 gpm |
| Estimated Non-Residential Unit Flow Factor | 640 gpad[2] |

[1] *gpcd=gallons per capita per day.*
[2] *gpad=gallons per acre per day.*

### Future Base Wastewater Flow

Future base wastewater flows for each planning horizon were calculated as follows:

- Residential: population – residential unit flow factor of 88 gallons per capita per day (gpcd).
- Non-residential: area (acres) – non-residential unit flow factor of 640 gallons per acre per day (gpad).

The projected flow increases are summarized in Table 3-7. The areas associated with this growth are illustrated in Figure 3-2.

**Table 3-7**
**Additional BWF Projections[1]**

| Planning Horizon | Residential | | Non-Residential | | Total |
|---|---|---|---|---|---|
| | Population | Additional BWF Flow (gpm) | Net Area (acres) | Additional BWF Flow (gpm) | Additional BWF Flow (gpm) |
| 5-Year | 2,105 | 128 | 224 | 100 | 228 |
| 10-Year | 2,181 | 133 | 83 | 37 | 170 |
| 20-Year | 2,073 | 127 | 17 | 8 | 135 |
| Build-Out | 7,354 | 449 | 1,522 | 676 | 1,125 |
| **Total** | **13,713** | **837** | **1,846** | **821** | **1,658** |
| **Total Additional BWF (mgd)** | | **1.2** | **-** | **1.2** | **2.4** |

[1] *Table does not include existing population, area, or flow.*

### Existing and Future BWF by Flow Meter Basins

Flow meter data measured between August 2013 and December 2013 was used to determine wastewater flow characteristics in the system. Table 3-8 presents existing and future BWF at each meter.

Existing flows for the CTUIR were estimated from data collected at Flow Meter J with the assumption that Flow Meter J was comprised solely of flows from the CTUIR. The contributing BWF from the CTUIR was estimated to be 90 gpm. Future flows from the CTUIR were assumed to increase incrementally to the maximum permitted flow of 1.0 mgd (700 gpm) by the 20-year horizon. Flow from the CTUIR was assumed to enter the collection system at manhole CMH1-97 (Basin J).

The average BWF from the RSSD was determined from data collected at Flow Meter A, which monitored flows from Basin A and the RSSD. The average BWF observed at Flow Meter A (44 gpm) was multiplied by the fraction of the RSSD's contributing area to the total contributing area to determine an average BWF of 22 gpm for the RSSD.

**Table 3-8**
**Base Wastewater Flow Projections by Flow Meter Basin**

| Flow Meter Basin | Meter Location | Existing (2013) Average Base Wastewater Flow (gpm) | Future Base Wastewater Flow (gpm) | | | |
|---|---|---|---|---|---|---|
| | | | 5-Year | 10-Year | 20-Year | Build-Out |
| A | Murietta Rd between I-84 and NW McKenna Rd | 44 | 139 | 167 | 167 | 732 |
| B | SW 28th St Dr near RRF | 200 | 204 | 229 | 259 | 391 |
| C | Between I-84 and Hwy 30 | 80 | 88 | 95 | 107 | 124 |
| D | SW 20th St and SW Dorion Ave | 49 | 49 | 52 | 52 | 53 |
| E | SW 22nd St and SW Dorion Ave | 88 | 116 | 160 | 189 | 310 |
| F | SW 10th and SW Dorion Ave | 212 | 289 | 317 | 367 | 428 |
| G | SW 10th St between SW Court Ave and NE Aura Ave | 107 | 107 | 112 | 112 | 126 |
| H | NW Bailey Ave and S Main St | 48 | 52 | 63 | 65 | 81 |
| I | SE Byers Ave and SE 1st St | 108 | 108 | 108 | 108 | 149 |
| J[1] | NE Queen Ave between NE 43rd St and NE 44th St | 90 | 350 | 525 | 700 | 700 |
| K | RRF | 534 | 545 | 567 | 578 | 735 |
| **Total BWF (gpm)** | | **1,560** | **2,048** | **2,394** | **2,704** | **3,828** |
| **Total BWF (mgd)** | | **2.2** | **3.0** | **3.4** | **3.9** | **5.5** |
| **Total BWF Increase (gpm)** | | - | **488** | **345** | **310** | **1,125** |

[1] *A permitted flow of 350 gpm was used in Basin J in 5-year, 525 gpm in 10-year, and increased to 700 gpm by 20-year horizon per Resolution No. 1065, agreement with the CTUIR, and input from the City.*

### Groundwater Infiltration

Ground water infiltration is defined as groundwater entering the collection system unrelated to a specific rain event, and in the City, is the direct result of the seasonal variation in the Umatilla River level and its tributaries in the area raising the local groundwater table. Some of the groundwater enters the City's collection system and, in combination with BWF, makes up the collection system's dry weather flow (DWF). RRF records and flow metering were used to characterize the influence of the river on the collection system flows. The results of this analysis are summarized below and discussed in detail in Appendix A—Characterization of the Umatilla River Influence in the Pendleton Collection System.

The City began implementing capital improvements to reduce infiltration from the river. The positive effect of these projects can be seen when comparing higher flows observed at the RRF in 2011 to lower flows observed from 2012-2013 at the RRF, after improvements began, in Figure A-1.

To characterize the river's influence in the existing system, a River-Dependent Infiltration Factor (RDIF) was estimated for each flow meter basin based on 2012 flow meter data. Appendix A presents the methodology and assumptions used to determine the RDIF factors for each flow meter basin. These factors were applied to existing base wastewater flows to estimate the existing maximum day dry weather flow conditions. Table 3-9 shows the existing RDIF for each flow meter basin.

Projected dry weather flows were determined by applying an RDIF factor of 1.1 to future BWF. A system-wide low RDIF of 1.1 was chosen for future flows based on the City's ongoing efforts to reduce river-dependent infiltration, future areas being served by newer infrastructure, and because much of the growth occurs in areas assumed to be less influenced by the river due to topography.

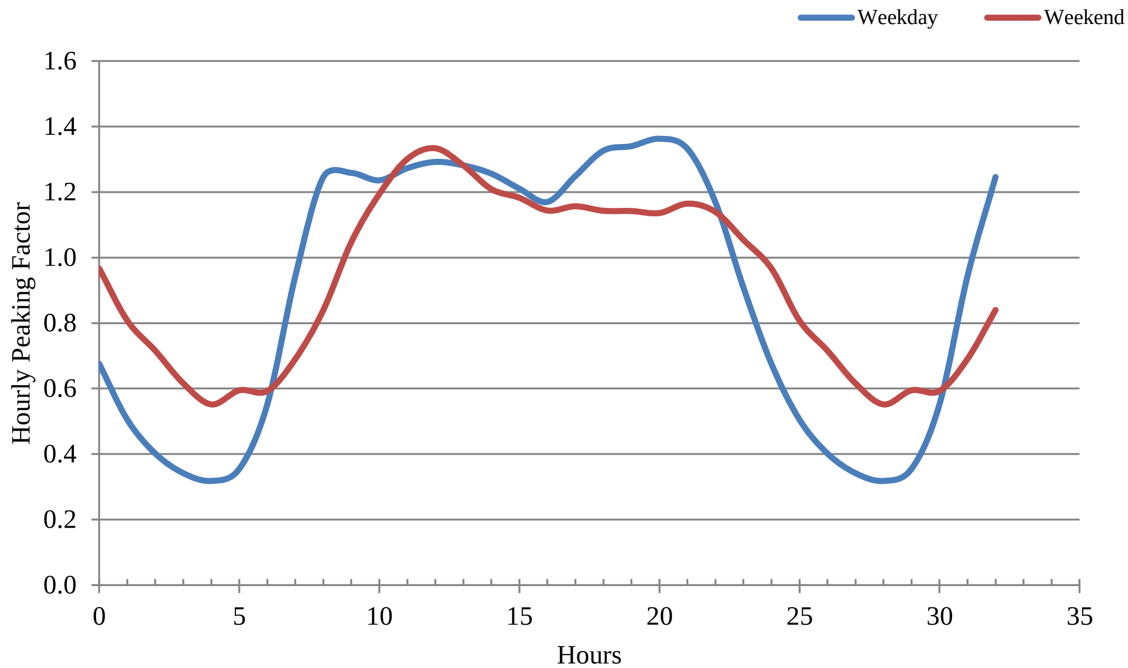
**Table 3-9**
**River-Dependent Infiltration Factors for Existing Flow Meter Basins**

| Flow Meter Basin | 2012 Flow Meter Location or Assumption | River Dependent Infiltration Factor |
|---|---|---|
| A | Assumed RDIF similar to Basin C | 1.10 |
| B | SW 37 Ext | 1.10 |
| C | Oxford Suite and Prison | 1.10 |
| D | Assumed similar to Oxford Suite | 1.20 |
| E | Assumed similar to SW 37 Ext | 1.10 |
| F | Assumed similar to Oxford Suite | 1.20 |
| G | Assumed similar to SW 37 Ext | 1.10 |
| H | Assumed similar to SW 37 Ext | 1.10 |
| I | $20^{th}$ and Byers | 2.30 |
| J | Queens and Riverside | 1.30 |
| K | Estimated | 1.20 |
| RRF | System-Wide | 1.25 |

## Peak Dry Weather Flow

Peak dry weather flow is determined by the total dry weather flow contributed from BWF and GWI and the maximum hour of use described by the diurnal pattern. Flow meter data during days without rain were processed to develop a diurnal curve that represents a typical hourly contribution for each flow meter (for weekday and weekend days). A typical diurnal curve from Basin D is presented in Figure 3-3. Basin D depicts typical weekday and weekend patterns, with weekdays showing an earlier and more distinct morning and evening peak. The diurnal pattern for each flow meter basin was applied to future parcels within its boundaries. The system-wide maximum hour peaking factor is 1.29. Table 3-10 presents the dry weather flow components for the flow meter basins in the system.

**Figure 3-3**
**Basin D Diurnal Curve**



## Table 3-10
## Dry Weather Flow Projection Summary

| Flow Meter Basin | Existing (2013) | | | | | 5-Year | | | | 10-Year | | | 20-Year | | | Build-Out | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BWF (gpm) | Existing RDIF | DWF (gpm) | Peak Hour Factor | Peak DWF (gpm) | BWF (gpm) | Future RDIF | DWF[1] (gpm) | Peak DWF (gpm) | BWF (gpm) | DWF[1] (gpm) | Peak DWF (gpm) | BWF (gpm) | DWF[1] (gpm) | Peak DWF (gpm) | BWF (gpm) | DWF[1] (gpm) | Peak DWF (gpm) |
| A | 44 | 1.10 | 48 | 1.52 | 74 | 139 | 1.1 | 153 | 233 | 167 | 184 | 280 | 167 | 184 | 280 | 732 | 805 | 1,226 |
| B | 200 | 1.10 | 220 | 2.05 | 450 | 204 | 1.1 | 225 | 460 | 229 | 251 | 515 | 259 | 285 | 582 | 391 | 430 | 880 |
| C | 80 | 1.10 | 88 | 1.32 | 116 | 88 | 1.1 | 97 | 127 | 95 | 104 | 137 | 107 | 118 | 155 | 124 | 136 | 179 |
| D | 49 | 1.20 | 59 | 1.36 | 80 | 49 | 1.1 | 59 | 80 | 52 | 62 | 84 | 52 | 62 | 84 | 53 | 64 | 86 |
| E | 88 | 1.10 | 97 | 1.43 | 139 | 116 | 1.1 | 127 | 182 | 160 | 176 | 252 | 189 | 208 | 298 | 310 | 341 | 488 |
| F | 212 | 1.20 | 254 | 1.15 | 293 | 289 | 1.1 | 339 | 391 | 317 | 370 | 427 | 367 | 424 | 489 | 428 | 492 | 568 |
| G | 107 | 1.10 | 118 | 1.55 | 183 | 107 | 1.1 | 118 | 183 | 112 | 124 | 192 | 112 | 124 | 192 | 126 | 138 | 215 |
| H | 48 | 1.10 | 53 | 1.36 | 72 | 52 | 1.1 | 57 | 78 | 63 | 69 | 94 | 65 | 71 | 97 | 81 | 89 | 121 |
| I | 108 | 2.30 | 248 | 1.16 | 287 | 108 | 1.1 | 248.5 | 287 | 108 | 248 | 287 | 108 | 248 | 287 | 149 | 294 | 340 |
| J[2] | 90 | 1.30 | 117 | 1.17 | 136 | 350 | 1.1 | 350 | 350 | 525 | 525 | 525 | 700 | 700 | 700 | 700 | 700 | 700 |
| K | 534 | 1.20 | 641 | 1.17 | 782 | 545 | 1.1 | 653 | 797 | 567 | 677 | 826 | 578 | 689 | 841 | 735 | 861 | 1,051 |
| RRF | 1,560 | 1.25 | 1,943 | 1.34 | 2,612 | 2,048 | 1.1 | 2,427 | 3,170 | 2,394 | 2,791 | 3,619 | 2,704 | 3,112 | 4,005 | 3,828 | 4,350 | 5,854 |

[1] *Future dry weather flow projections were determined by multiplying additional future flow by an RDIF of 1.1.*

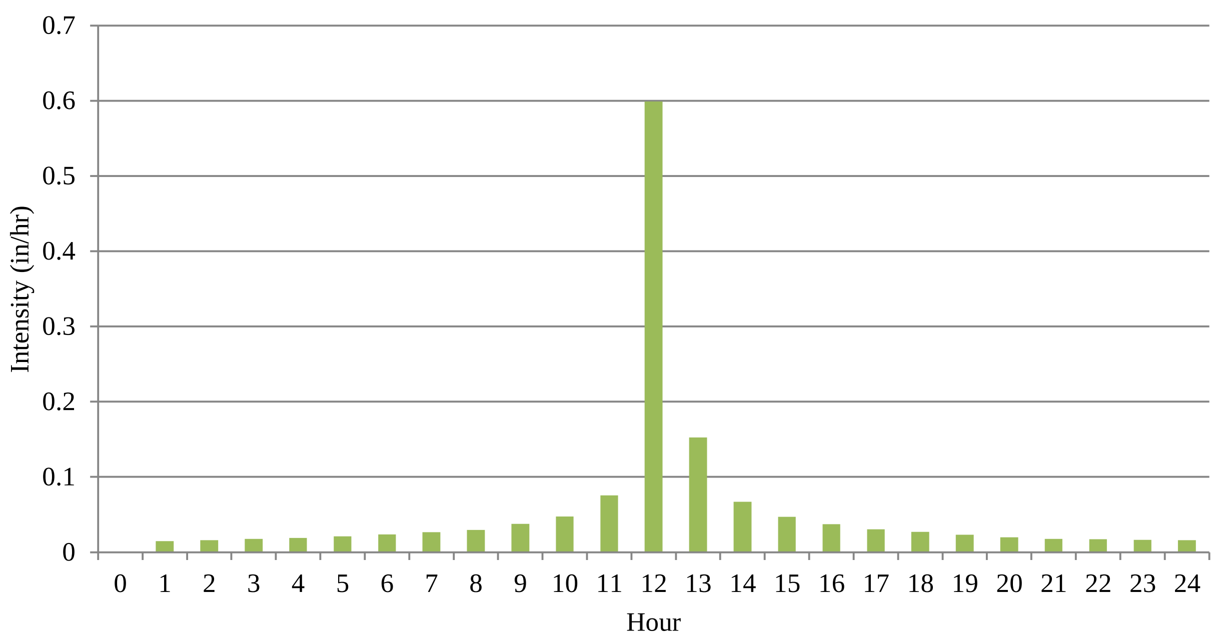
[2] *Per Resolution No. 1065 agreement with the CTUIR, and input from the City, a permitted flow of 350 gpm was used in Basin J in 5-year, 525 gpm in 10-year, and increased to 700 gpm for 20-year horizon and build-out scenarios.*

## Wet Weather Flow Projection

The RDII (wet weather) component of the wastewater flow is generated by storm events. To meet the required hydraulic criteria, the system must be able to collect and convey the peak RDII flow generated by a design storm event, in addition to the peak dry weather flow. Wet weather parameters developed from flow meter data were used to estimate the system response during the design storm.

The storm recommended for evaluating hydraulic capacity of the system was the 10-year frequency, 24-hour duration storm. This storm event is defined by the Natural Resource Conservation Service (NRCS) as a Type II (spring or summer thunderstorm-type event) rainfall distribution. The total rainfall depth for the design storm is 1.5 inches and the peak intensity is 0.6 inches/hour. A 10-year frequency design storm has a 10% chance of occurring in any given year. Figure 3-4 shows the design storm rainfall distribution.

**Figure 3-4**
**City of Pendleton Collection System Design Storm**




The peak wet weather flow represents the existing system's response during the design storm event. The peak wet weather flow was calculated from the difference in the total modeled flow through the system during a design storm simulation (5,685 gpm) with calibration of dry weather flow loading (2,131 gpm), resulting in a peak wet weather flow of 3,554 gpm. The peak wet weather flow was then used to develop the design RDII unit flow factor, presented in Table 3-11.

**Table 3-11**
**Wet Weather Characterization**

| RDII Unit Flow Factor Calculation Assumptions | |
|---|---|
| Calibration Peak BWF + Peak Wet Weather Flow | 5,685 gpm |
| Calibration Peak BWF | 2,131 gpm |
| Peak Wet Weather Flow | 3,554 gpm |
| Existing Contributing Area | 2,590 Acres |
| **RDII Unit Flow Factor** | |
| RDII Area Unit Flow Factor | 1,976 gpad |

### Future Wet Weather Flow

The wet weather RTK parameters developed from the available flow meter data represent the hydraulics of the existing system and reflect the general condition and age of the pipe and manhole infrastructure. For future areas where new infrastructure will be required, these parameters are not applicable; therefore, an average RTK set was used to estimate future RDII. Table 3-12 presents the RTK sets developed from existing flow meter data, and Table 3-13 presents the RTK set used for future development. Table 3-14 summarizes wet weather flow projections based on a system wide unit flow factors. Section 4 details the wet weather parameter development process.

**Table 3-12**
**Existing Wet Weather Parameters**

| Flow Meter Basin ID | Total R (%) | Short-Term Response | | | Medium-Term Response | | | Long-Term Response | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R Ratio | T (hr) | K Ratio | R Ratio | T (hr) | K Ratio | R Ratio | T (hr) | K Ratio |
| Upper A | 0.6% | 0.004 | 1.0 | 1.0 | 0.002 | 3.0 | 2.0 | 0.000 | 7.0 | 3.0 |
| Lower A | 8.5% | 0.040 | 1.0 | 1.0 | 0.030 | 3.0 | 2.0 | 0.015 | 7.0 | 3.0 |
| B | 0.3% | 0.001 | 1.0 | 1.0 | 0.001 | 3.0 | 2.0 | 0.001 | 7.0 | 3.0 |
| C | 2.5% | 0.010 | 1.0 | 1.0 | 0.010 | 3.0 | 2.0 | 0.005 | 7.0 | 3.0 |
| D | 1.8% | 0.008 | 1.0 | 1.0 | 0.005 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| E | 0.2% | 0.001 | 1.0 | 1.5 | 0.000 | 6.0 | 2.0 | 0.001 | 10.0 | 3.0 |
| F | 3.3% | 0.013 | 1.0 | 0.5 | 0.015 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| G | 2.3% | 0.008 | 1.0 | 1.0 | 0.010 | 2.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| H | 0.6% | 0.004 | 1.0 | 3.0 | 0.002 | 5.0 | 3.0 | 0.000 | 0.0 | 0.0 |
| I | 0.3% | 0.002 | 0.5 | 1.0 | 0.000 | 3.0 | 4.0 | 0.001 | 10.0 | 3.0 |
| J | 1.8% | 0.008 | 1.0 | 1.0 | 0.005 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| K | 3.5% | 0.035 | 1.0 | 0.1 | 0.000 | 3.0 | 3.0 | 0.000 | 10.0 | 3.0 |

**Table 3-13**
**Future Wet Weather Parameters**

| System-Wide | R Ratio | T (hr) | K Ratio |
|---|---|---|---|
| Short-Term Response | 0.010 | 1.0 | 1.0 |
| Medium-Term Response | 0.005 | 4.0 | 3.0 |
| Long-Term Response | 0.003 | 7.0 | 3.0 |

**Table 3-14**
**Wet Weather Flow Projections**

| Planning Horizon | Service Area (acres) | Wet Weather Flow[1] | |
|---|---|---|---|
| | | gpm | mgd |
| Existing | 2,590 | 3,554 | 5.1 |
| 5-Year | 3,067 | 4,209 | 6.1 |
| 10-Year | 3,374 | 4,629 | 6.7 |
| 20-Year | 3,587 | 4,923 | 7.1 |
| Build-Out | 6,259 | 8,589 | 12.4 |

[1] *Based on projections using a system-wide UFF and does not take routing into account.*

## Total Wastewater Flow Projections (Wet and Dry)

The total peak wastewater flow was calculated as the superposition of the maximum dry weather contribution (including GWI from the Umatilla River) with the RDII flow from the design storm event, assuming the peak of the storm occurs at the same time as the peak dry weather flow. Tables 3-15 and 3-16 show the flows for existing, 5-, 10-, 20-year, and build-out conditions for each basin and the entire system.

## Summary

Existing flows were estimated based on flow meter data, RRF influent data, existing winter water consumption records and wastewater use patterns. Future flows were based on flow factors derived from existing wastewater flow characteristics, land use and zoning designations, and population projections. Land use and zoning designations, current and future population densities, vacancy rates, and other assumptions were based on the City's 2011 Comprehensive Plan amendments. The location and rate of anticipated development was based on a review of the developable land and input from the City.

The projected flows were used in Section 4 – System Analysis to evaluate the capacity of the existing collection system including piping and lift station facilities and to develop recommended improvements. Approximate timing for growth in the system has been provided for the 5-, 10-, 20-year and build-out planning horizons. The timing of system improvements should be scrutinized based on actual growth at the time the improvement is to be constructed.

## Table 3-15
## Total Wastewater Flow Projections by Basin

| Flow Meter Basin | Existing Peak Dry Weather Flow (gpm) | Existing Peak Design Flow (gpm) | Peak Dry Weather Flow (gpm) | | | | Peak Wet Weather Flow (gpm)[1] | | | | Peak Design Flow (gpm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5-Year | 10-Year | 20-Year | Build-Out | 5-Year | 10-Year | 20-Year | Build-Out | 5-Year | 10-Year | 20-Year | Build-Out |
| A | 74 | 390 | 233 | 280 | 280 | 1,226 | 676 | 761 | 761 | 2,372 | 910 | 1,041 | 1,041 | 3,598 |
| B | 450 | 530 | 460 | 515 | 582 | 880 | 122 | 199 | 291 | 1,094 | 763 | 713 | 874 | 1,974 |
| C | 116 | 432 | 127 | 137 | 155 | 179 | 326 | 341 | 372 | 416 | 453 | 478 | 527 | 595 |
| D | 80 | 212 | 80 | 84 | 84 | 86 | 132 | 155 | 155 | 158 | 213 | 239 | 239 | 245 |
| E | 139 | 203 | 182 | 252 | 298 | 488 | 291 | 499 | 687 | 1,027 | 474 | 751 | 984 | 1,515 |
| F | 293 | 1459 | 391 | 427 | 489 | 568 | 1,241 | 1,244 | 1,320 | 1,430 | 1,631 | 1,670 | 1,809 | 1,997 |
| G | 183 | 499 | 183 | 192 | 192 | 215 | 326 | 333 | 333 | 390 | 509 | 525 | 525 | 605 |
| H | 72 | 132 | 78 | 94 | 97 | 121 | 148 | 177 | 179 | 337 | 226 | 271 | 276 | 458 |
| I | 287 | 397 | 287 | 287 | 287 | 340 | 120 | 122 | 122 | 472 | 407 | 409 | 409 | 812 |
| J[2] | 136 | 137 | 350 | 525 | 700 | 700 | 0 | 0 | 0 | 0 | 350 | 525 | 700 | 700 |
| K | 782 | 2104 | 797 | 826 | 841 | 1,051 | 1,034 | 1,040 | 1,040 | 1,270 | 1,649 | 1,866 | 1,881 | 2,321 |
| **Total Design Flow (gpm)** | **2,612** | **6,497** | **3,170** | **3,619** | **4,005** | **5,854** | **4,416** | **4,869** | **5,258** | **8,965** | **7,585** | **8,488** | **9,265** | **14,819** |
| **Total Design flow (mgd)** | **3.8** | **9.4** | **4.6** | **5.2** | **5.8** | **8.4** | **6.4** | **7.0** | **7.6** | **12.9** | **10.9** | **12.2** | **13.3** | **21.4** |

[1] *Based on model results to take routing into account.*
[2] *Per Resolution No. 1065, agreement with the CTUIR, and City input, a permitted flow of 350gpm, 525gpm, 700gpm, and 700gpm was included in Basin J for 5-,10-, 20-year and build-out scenarios, respectively.*

**Table 3-16**
**Total Wastewater Flow Projections Summary**

| Scenario | Wastewater Flow | | | | | |
|---|---|---|---|---|---|---|
| | Unit | Existing | 5-Year | 10-Year | 20-Year | Build-Out |
| Average Base Wastewater Flow | gpm | 1,560 | 2,048 | 2,394 | 2,704 | 3,828 |
| | mgd | 2.2 | 2.9 | 3.4 | 3.9 | 5.5 |
| Average Dry Weather Flow | gpm | 1,943 | 2,427 | 2,791 | 3,112 | 4,350 |
| | mgd | 2.8 | 3.5 | 4.0 | 4.5 | 6.3 |
| Peak Dry Weather Flow | gpm | 2,612 | 3,170 | 3,619 | 4,005 | 5,854 |
| | mgd | 3.8 | 4.6 | 5.2 | 5.8 | 8.4 |
| Peak Wet Weather Flow | gpm | 3,885 | 4,416 | 4,869 | 5,258 | 8,965 |
| | mgd | 5.6 | 6.4 | 7.0 | 7.6 | 12.9 |
| Peak Design Flow | gpm | 6,497 | 7,585 | 8,488 | 9,265 | 14,819 |
| | mgd | 9.4 | 10.9 | 12.2 | 13.3 | 21.3 |
| Peak Design flow/ Average Base Wastewater Flow | | 4.2 | 3.7 | 3.5 | 3.4 | 3.9 |

Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 4
System Analysis

# SECTION 4
# SYSTEM ANALYSIS

## Introduction

This section summarizes the hydraulic model calibration, criteria, methodology, and results of the collection system analysis conducted for the City of Pendleton (City).

A calibrated hydraulic model predicted the system response under dry and wet weather conditions. The City's collection system was evaluated for existing and future loading conditions, using the data summarized in Section 3—Population and Wastewater Flow Projections. The results of the system analysis were compared with planning and design criteria to determine system deficiencies. The identified deficiencies were then used to develop the recommended system improvements presented in Section 6—Capital Improvement Program.

## Hydraulic Model Development

A skeletonized hydraulic model of the City's collection system trunk lines representing the primary conveyance lines (generally excluding neighborhood piping) was created during this project. This hydraulic model was developed in InfoSWMM, an ArcGIS-integrated, hydrologic and hydraulic simulation software program.

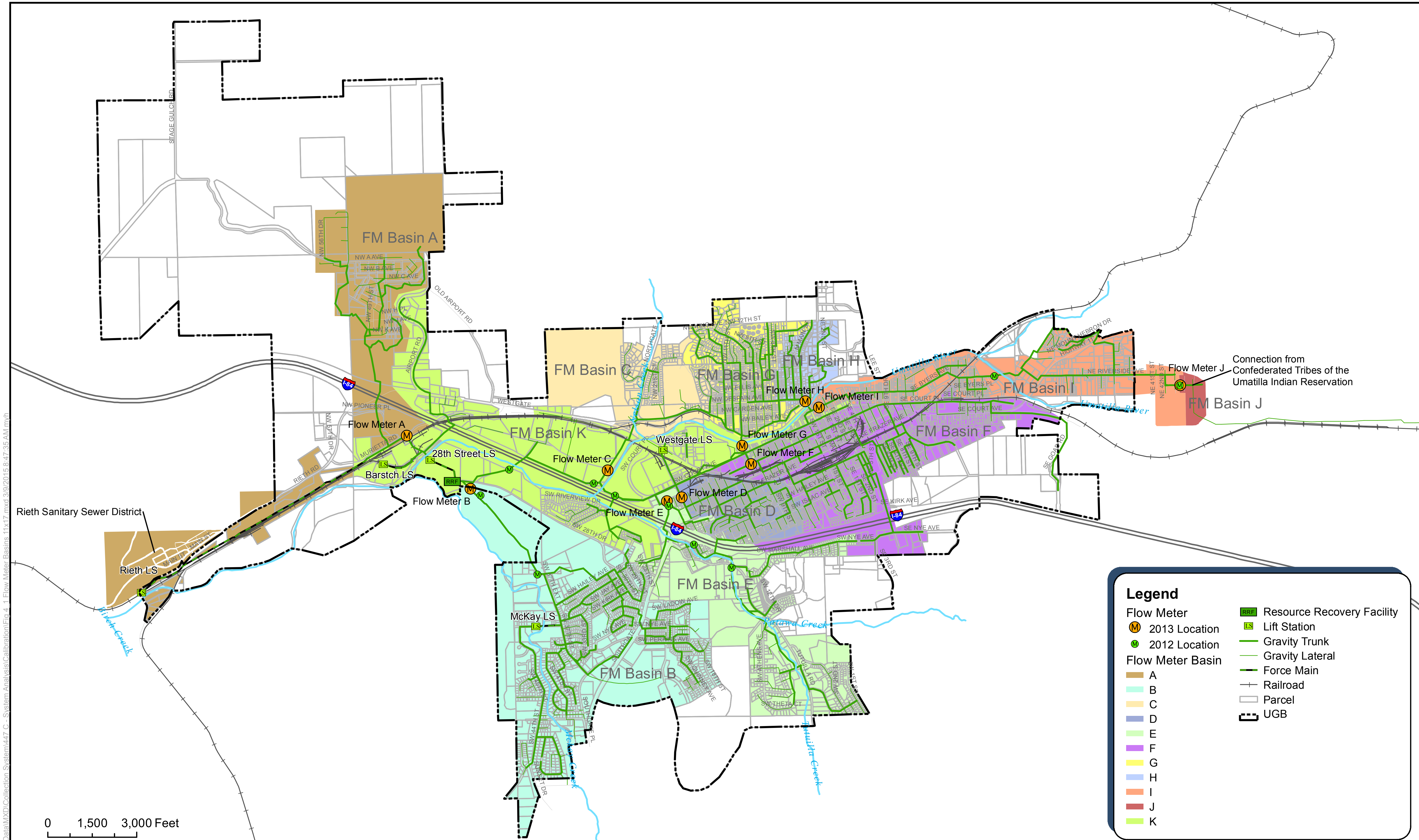
The hydraulic model developed as part of this Collection System Master Plan (CSMP) was based on the recently developed geographic information system (GIS). It was further validated using other electronic and hard-copy data and survey information collected by the City. In general, for locations where invert elevations and rim elevations were not available, every third manhole was surveyed. Where City records were not available and new survey information was not collected, manhole rim elevations were estimated using elevation contours. Manhole and pipe invert elevations for these locations were interpolated, based on upstream and downstream survey information. A manhole drop of 0.1 feet and a constant slope was assumed for all interpolated pipe inverts. Interpolated manhole elevations were noted in the hydraulic model for future data verification.

All five City-maintained lift stations were included in the model, using lift station pump curves, pump controls, and wet well dimensions provided by the City. To complete the hydraulic model development, the dry weather loads, daily patterns, and wet weather parameters described in Section 3 were assigned to corresponding manholes. The final skeletonized hydraulic model includes 55 miles of pipe, representing 63% of the collection system's length.

## Flow Meters

The City has been collecting flow monitoring data since early 2012 to understand the impact of infiltration and inflow (I/I) and better characterize the influence of the Umatilla River flows and its tributary streams on the collection system. The locations of the 10 flow meters installed in 2012 are presented in Figure 4-1.

The flow meters were moved in August 2013 to capture flows from the main sewer basins for hydraulic model calibration based on direction from Murray, Smith & Associates, Inc. (MSA). Flow data was collected in the new locations from August to December 2013. During this timeframe, the impact of seven storms (more than 0.05 inches within 24 hours) was measured. The location of the flow meters installed in 2013 is also shown in Figure 4-1.




Murray, Smith & Associates, Inc.

**City of Pendleton**
**Collection System Master Plan**

**Figure 4-1**
**Flow Meter Basins**

May 2015 13-1442

## Model Calibration

Calibration is the process of adjusting a model's hydraulic and hydrologic parameters until a reasonable representation of the wastewater flows measured throughout the system is obtained. Flows at each metering site are then compared to model flow rates for an extended period of time (usually 24 hours).

The City's collection system model was calibrated under both dry weather and wet weather conditions. The dry weather component was calibrated using the flow metering data recorded during days without precipitation between August and December 2013. Influent flow measured at the Resource Recovery Facility (RRF) was used to supplement the flow meter data. The dry weather flows were calibrated with adjustments to the model loading and diurnal patterns until field and model flows reasonably matched.

The wet weather flows were calibrated using the flow metering data recorded during a storm event on September 5, 2013. The calibration parameters were verified with a second storm event on September 27, 2013. Influent flow measured at the RRF was used to supplement the flow meter data. The methodology, results, and details of the calibration process follow.

### *Dry Weather Calibration Methodology*

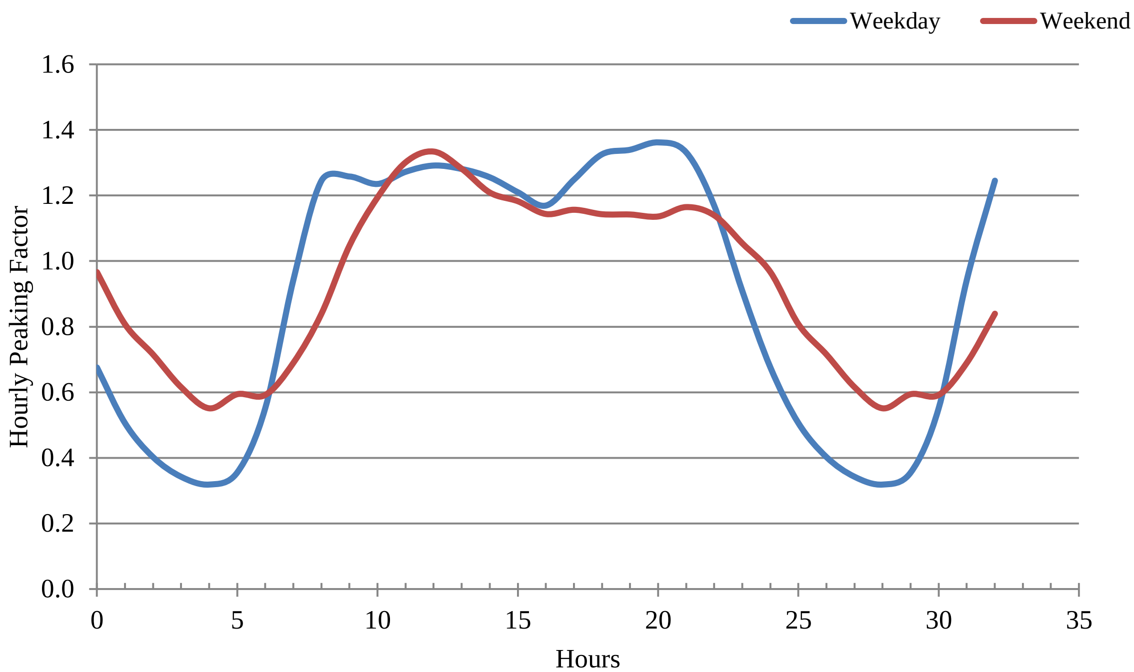
The hydraulic model utilizes two parameters to represent the dry weather wastewater flow at a specific loading point: a daily average dry weather flow and a unit diurnal pattern. The diurnal pattern describes the fluctuation of the loading during a typical 24-hour period. For the City's collection system, these parameters were estimated from flow meter data and then adjusted until an acceptable system response during dry conditions was obtained.

The calibration procedures involved:

- Determining the contributing manholes to each flow metering location – The parameters inferred from flow meter data were assigned to the manholes in the discrete contributing area of each meter location.
- Developing diurnal patterns – Dry weather flow data was processed to develop a curve that represents a typical hourly distribution for each weekday and weekend day. The pattern developed for a flow meter location was assigned to all the manholes in the area conveyed to that specific flow meter. A typical diurnal curve is presented in Figure 4-2.
- Estimating average dry weather contribution in each manhole – The initial existing average contribution was estimated using average winter water demand, obtained from water billing records and meter locations.
- Adjusting average base wastewater flow – The average contribution at each manhole in the contributing flow meter area was adjusted to match the total average measured flow.

Average winter water demand records for the Rieth Sanitary Sewer District (RSSD) were not available, and no flow meter exists where RSSD connects to the City's collection system. RSSD wastewater contributed to flows measured at Flow Meter A. The ratio of this contribution was assumed proportional to the total contributing flows observed at that flow meter. It was assumed the diurnal pattern for RSSD is similar to that measured at the flow meter for Basin A.

**Figure 4-2**
**Typical Collection System Diurnal Curve**




### *Dry Weather Calibration Results*

The results of the dry weather calibration are summarized in Table 4-1. Figure 4-3 shows the model results and flow meter data at the RRF.

The model was calibrated to limit error margins to less than 15% for peak flow and volume at each meter, with many basins having less than 10% difference between modeled and measured flows. The results were also inspected visually to assess the predicted flow pattern during the analysis period. Typical diurnal curve characteristics were observed in all meters. The 10 flow meters covering 80% of the system, paired with the calibration results, indicate a high confidence level for the dry weather model calibration.

Flow meter data collected in 2013 from Basin B was inconsistent with water demand data for this basin and with upstream flow meter data collected in 2012 under dry weather conditions. As a result, Basin B could not be calibrated with the 2013 flow meter data, and was instead calibrated by flow meter data from the 2012 flow meter located along SW 37th Extension, approximately 200 feet west of the intersection of SW 37th Extension and SW 37th Street.

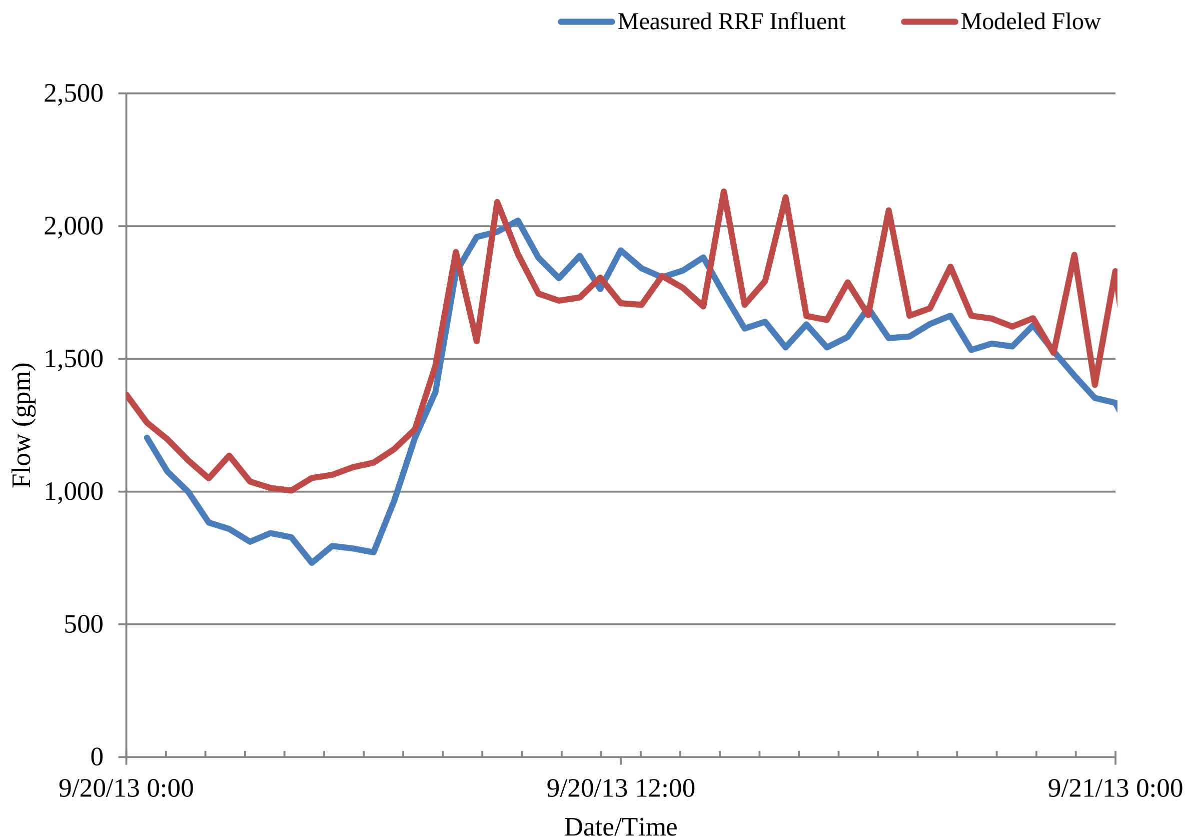
As a final check to the overall system response, the model flows were compared to those observed at the RRF. The average peak flow and volume are predicted at the RRF within 7% error margin of the measured data, which is within the acceptable range.

**Table 4-1**
**Dry Weather Calibration Results**

| Basin | Average Dry Weather Flow | | | | Peak Dry Weather Flow | | | | Dry Weather Volume | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gallons) | Measured (gallons) | Difference (gpm) | Error (%) |
| A | 45 | 39 | 6 | 14% | 67 | 70 | -3 | -5% | 64,596 | 56,636 | 7,960 | 14% |
| B[1] | 198 | 212 | -13 | -6% | 409 | 430 | -21 | -5% | 285,796 | 305,015 | -19,220 | -6% |
| C | 80 | 72 | 8 | 12% | 105 | 109 | -3 | -3% | 115,226 | 103,168 | 12,058 | 12% |
| D | 49 | 48 | 1 | 3% | 67 | 78 | -11 | -14% | 70,610 | 68,463 | 2,147 | 3% |
| E | 91 | 92 | 0 | 0% | 126 | 140 | -14 | -10% | 126,539 | 131,978 | -5,438 | -4% |
| F | 208 | 213 | -5 | -2% | 244 | 259 | -14 | -5% | 300,061 | 306,141 | -6,080 | -2% |
| G | 107 | 101 | 6 | 5% | 166 | 159 | 7 | 4% | 153,935 | 145,911 | 8,024 | 5% |
| H | 48 | 44 | 5 | 10% | 65 | 68 | -3 | -4% | 69,309 | 62,749 | 6,559 | 10% |
| I | 197 | 201 | -4 | -2% | 229 | 259 | -30 | -12% | 283,734 | 289,216 | -5,483 | -2% |
| J | 90 | 86 | 4 | 5% | 105 | 114 | -9 | -8% | 129,586 | 123,698 | 5,887 | 5% |
| RRF | 1,555 | 1,458 | 97 | 7% | 2,131 | 2,020 | 111 | 5% | 2,239,781 | 2,096,033 | 143,748 | 7% |

[1] *Basin B was calibrated using flow meter data from 2012 flow meter located approximately 200 feet west of the intersection of SW 37th Street Extension and SW 37th Street.*

**Figure 4-3**
**Dry Weather Calibration Results at the RRF**




### *Wet Weather Calibration Methodology*

To simulate the wet weather component, the hydraulic model uses a set of hydrologic parameters for each flow meter basin, rainfall information, and the estimated drainage area contributing to each manhole. These parameters were estimated using the parcel and flow meter boundaries, flow meter data, influent data measured at the RRF, and rainfall measurements collected at the Eastern Oregon Regional Airport located in the northeast section of town.

*Rainfall Data and Storm Events*

There were seven storm events measured during the flow meter period of August through December 2013. The characteristics of all measured storms in 2013 are presented in Table 4-2. The storm event measured on September 5, 2013 caused the largest response at the RRF and was selected for calibration. The September 5, 2013 event was a Natural Resources Conservation Service (NRCS) Type 2 Storm with a volume of 0.53 inches and a peak intensity of 0.32 inches per hour. The storm event on September 27, 2013 was also an NRCS Type 2 storm and was used to validate the wet weather parameters determined during calibration. Figure 4-4 shows the rainfall distribution for both the calibration (September 5, 2013) and verification (September 27, 2013) storms. The characteristics of the available measured storms in 2013 are presented in Table 4-2.

**Figure 4-4**
**Calibration and Verification Storms - Rainfall Distribution**

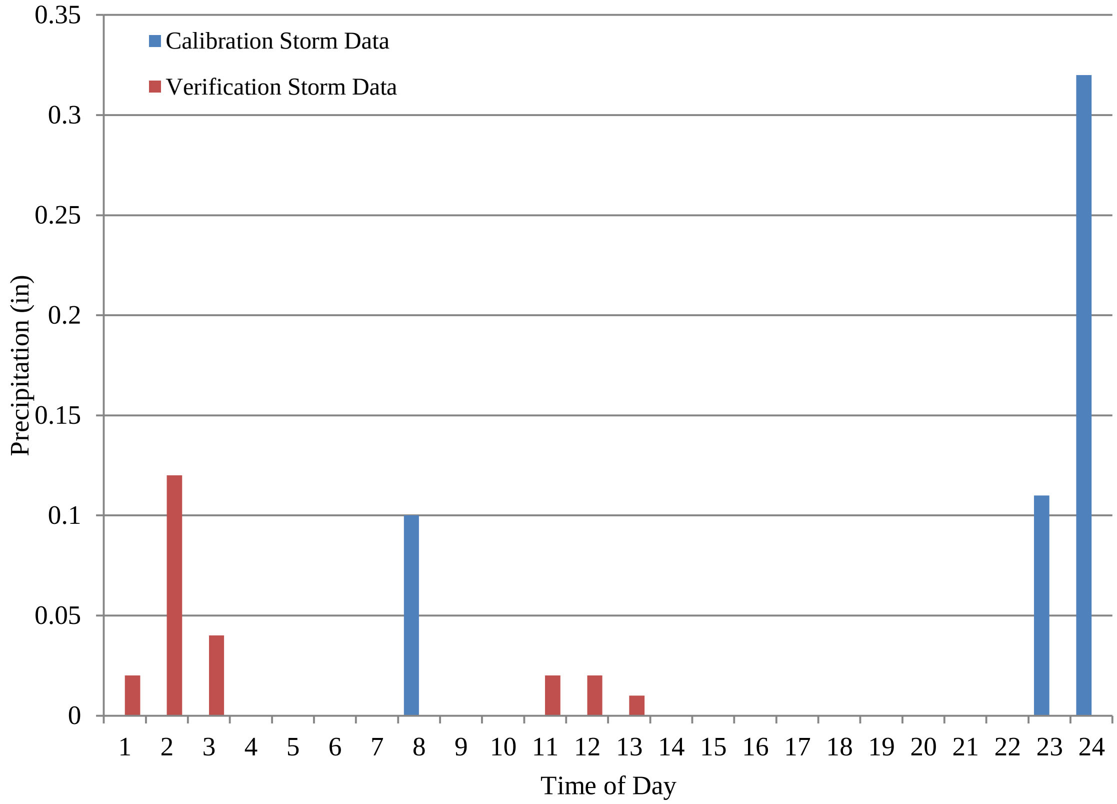



**Table 4-2**
**2013 Storm Events**

| Storm | Date | Peak Intensity (in/hr) | Duration (hr) | Rain Depth (in) | NRCS Storm Type | Return Frequency (year) |
|---|---|---|---|---|---|---|
| Storm 1 | 9/5/2013 | 0.32 | 17 | 0.53 | 2 | 1 |
| Storm 2 | 9/17/2013 | 0.08 | 5 | 0.22 | 1A | <0.5 |
| Storm 3 | 10/9/2013 | 0.08 | 4 | 0.16 | 2 | <0.5 |
| Storm 4 | 9/23/2013 | 0.03 | 16 | 0.12 | 1A | <0.5 |
| Storm 5 | 9/27/2013 | 0.12 | 13 | 0.23 | 2 | <0.5 |
| Storm 6 | 9/29/2013 | 0.11 | 3 | 0.2 | 2 | <0.5 |
| Storm 7 | 10/1/2013 | 0.04 | 4 | 0.07 | 2 | <0.5 |

*Wet Weather Flow Characterization*

The RTK curve-fitting method was used to simulate the Rainfall-Dependent Infiltration and Inflow (RDII) flow. (In the RTK method, R is the fraction of rainfall volume entering the collection system as RDII during and immediately after the rainfall event, T is the time it takes to peak, and K represents the ratio of the time of recession to T.) The RTK method assumes that the portion of the wastewater flow responding to rainfall can be quantified and characterized using three triangular hydrographs that relate RDII to unit precipitation volume, specified time duration, and sewershed characteristics for short-, medium-, and long-term response.

To determine the initial RTK parameters for the City's collection system, an industry-standard Sanitary Sewer Overflow Analysis and Planning (SSOAP) model was developed. Using this tool, superimposed triangular hydrographs were visually compared to the wet portion of the flow at each flow metering location.

SSOAP was used to estimate an RTK hydrograph based on area and pipe length, and its parameters were transferred to InfoSWMM and adjusted until an acceptable wet weather response was obtained. The total R for each basin ranges between 0.2% and 8.5%. The final recommended RTK sets for the system were adjusted in the InfoSWMM model for the September 5, 2013 storm and verified for the September 27, 2013 storm. The final parameters are presented in Table 4-3.

The RTK parameters were applied to the area contributing to each loading manhole in the system. The contributing area was defined by the parcels around the loading manhole.

**Table 4-3**
**RTK Parameters**

| Flow Meter Basin ID | Total R (%) | Short-Term Response | | | Medium-Term Response | | | Long-Term Response | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R Ratio | T (hr) | K Ratio | R Ratio | T (hr) | K Ratio | R Ratio | T (hr) | K Ratio |
| Upper A | 0.6% | 0.004 | 1.0 | 1.0 | 0.002 | 3.0 | 2.0 | 0.000 | 7.0 | 3.0 |
| Lower A | 8.5% | 0.040 | 1.0 | 1.0 | 0.030 | 3.0 | 2.0 | 0.015 | 7.0 | 3.0 |
| B | 0.3% | 0.001 | 1.0 | 1.0 | 0.001 | 3.0 | 2.0 | 0.001 | 7.0 | 3.0 |
| C | 2.5% | 0.010 | 1.0 | 1.0 | 0.010 | 3.0 | 2.0 | 0.005 | 7.0 | 3.0 |
| D | 1.8% | 0.008 | 1.0 | 1.0 | 0.005 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| E | 0.2% | 0.001 | 1.0 | 1.5 | 0.000 | 6.0 | 2.0 | 0.001 | 10.0 | 3.0 |
| F | 3.3% | 0.013 | 1.0 | 0.5 | 0.015 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| G | 2.3% | 0.008 | 1.0 | 1.0 | 0.010 | 2.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| H | 0.6% | 0.004 | 1.0 | 3.0 | 0.002 | 5.0 | 3.0 | 0.000 | 0.0 | 0.0 |
| I | 0.3% | 0.002 | 0.5 | 1.0 | 0.000 | 3.0 | 4.0 | 0.001 | 10.0 | 3.0 |
| J | 1.8% | 0.008 | 1.0 | 1.0 | 0.005 | 3.0 | 3.0 | 0.005 | 10.0 | 3.0 |
| K | 3.5% | 0.035 | 1.0 | 0.1 | 0.000 | 3.0 | 3.0 | 0.000 | 10.0 | 3.0 |

In addition to simulating the RDII flow in the City's collection system, a runoff coefficient analysis was done. This coefficient defines the relationship between the peak RDII flow and the rainfall intensity. Figure 4-5 shows a consistent trend and a runoff coefficient that describes the estimated wet weather hydraulic response. Figure 4-6 shows the RDII volume and rain depth relationship for the calibration, validation, and design storm. These relationships were used to validate the RDII volume generated by the design storm event.

**Figure 4-5**
**RDII Volume and Peak Storm Intensity**

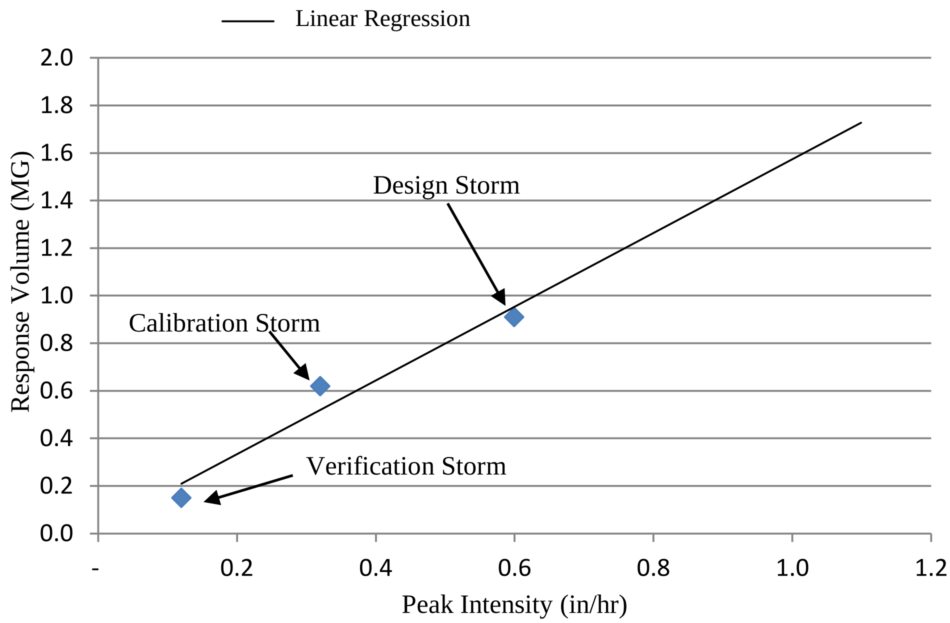
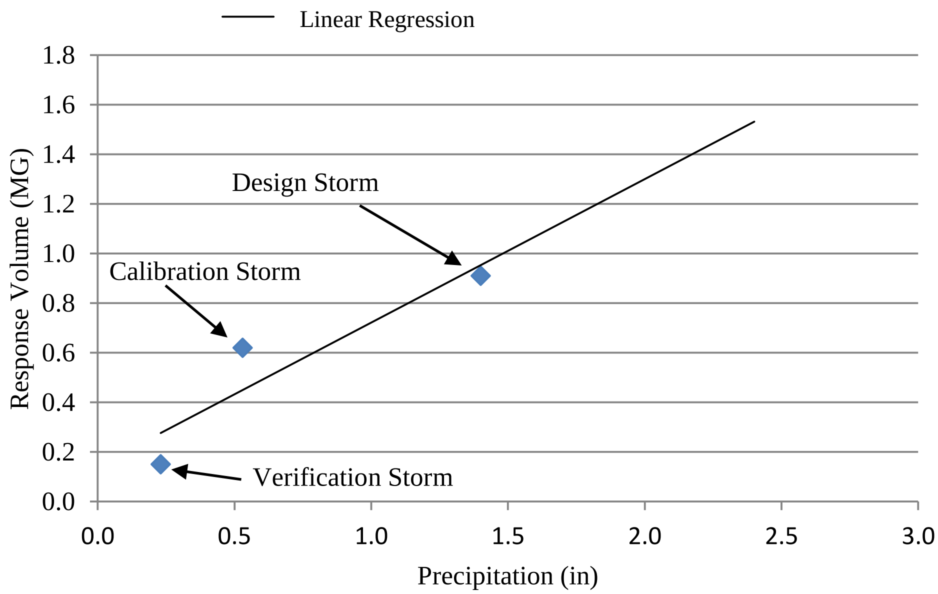



**Figure 4-6**
**RDII Volume and Storm Depth**



The R parameter for the unit hydrograph measures the total volume of inflow and infiltration that enters the sewer system. The total volume of rainfall entering the City's system is 1.5% of the rainfall volume, which is considered low. The short-term R represents the total inflow into the collection system, whereas the medium- and long-term R represent the total infiltration into the collection system. When comparing measured data with model results, the wet weather parameters indicate that the City's collection system is impacted more by inflow in the A (upper portion), H, I, and K basins, and predominantly influenced by infiltration in the A (lower portion) B, C, D, F, G, and J basins. Basin E is equally impacted by inflow and infiltration during a wet weather event.

Basin A was divided into two sub-basins (upper and lower) to represent the varied topography and infiltration influence from the Umatilla River within the basin. The lower portion of Basin A, located along the Umatilla River, is more influenced by infiltration from the Umatilla River than the upper portion. Basin A's upper portion is located by the airport at a higher elevation where there is less influence from infiltration.

The results of the wet weather calibration are summarized in Table 4-4. The hydraulic model was calibrated to achieve a maximum relative error of less than 20% at each flow meter location. All basins were calibrated within this range except B, C, and J, which are discussed in the following paragraphs. The overall system calibration was verified by comparing modeled data to observed data at the RRF. The modeled peak flow was 8% lower when compared to measured data, and the error in volume was 16%; both percentages fall within the acceptable range. Model results and flow meter data at the RRF are presented in Figure 4-7.

Due to data quality issues, wet weather flow at Basin B could not be directly calibrated using the calibration or verification storms. The flow meter data from this basin was found to be inconsistent with water demand and with upstream flow meter data collected in 2012. Storm response in Basin B was based on 2013 data and applied to the average dry weather flow measured in 2012.

Basin C exhibited a high error during the calibration storm (33%) because the diurnal pattern preceding the storm was not consistent with the typical dry weather pattern for this basin. The storm parameters for this basin were calculated from the validation storm.

Due to inconsistent patterns in flow monitoring data for Basin J, the wet weather response for this basin was estimated using data measured during storms captured from August to September 2013; the response was then verified through calibration of downstream Basin I.

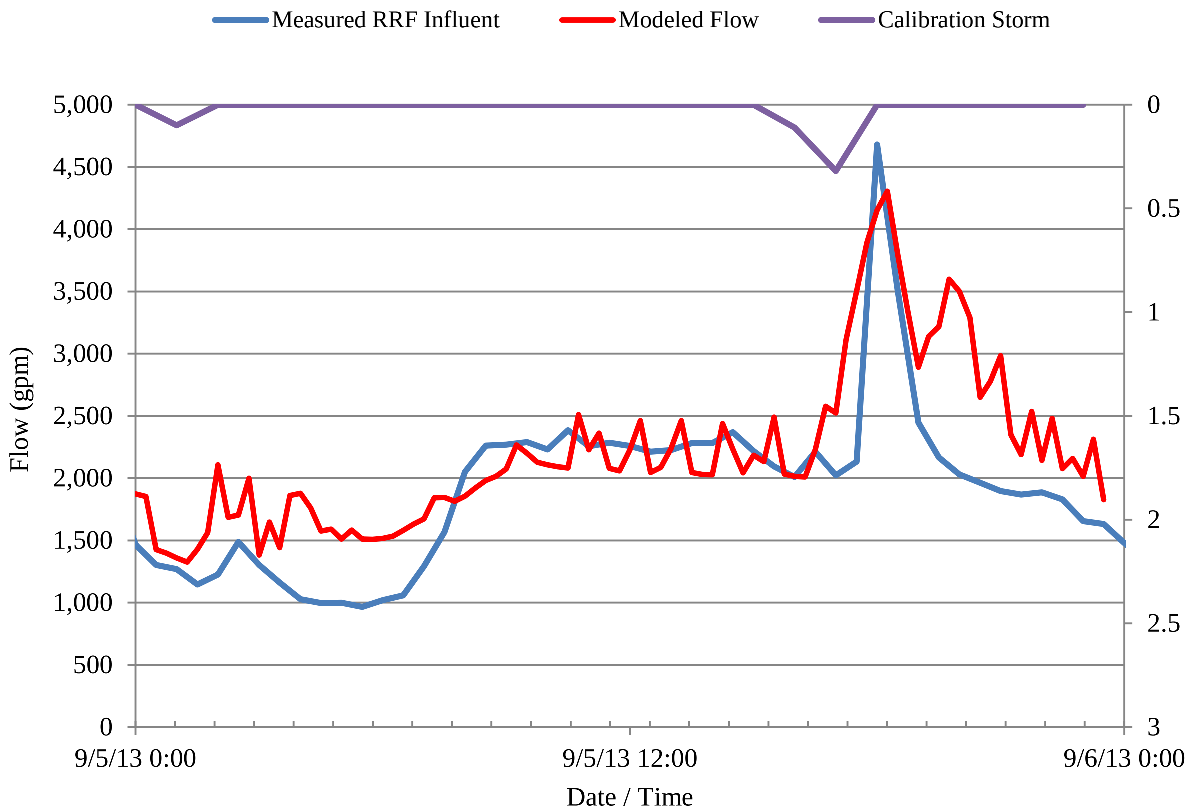
The results of the verification storm are presented in Table 4-5. Measured and modeled flows for the RRF are presented in Figure 4-8. The modeled peak flow was 2% higher compared to measured data, and the error in volume was 11%; which is within the acceptable range.

## Table 4-4
## Wet Weather Calibration Results

| Basin[1] | Average Wet Weather Flow | | | | Peak Wet Weather Flow | | | | Wet Weather Volume | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gallons) | Measured (gallons) | Difference (gpm) | Error (%) |
| A | 67 | 83 | -16 | -19% | 216 | 214 | 2 | 1% | 96,760 | 119,854 | -23,094 | -19% |
| B[2] | 190 | 200 | -10 | -5% | 321 | 264 | 57 | 22% | 299,026 | 287,431 | 11,596 | 4% |
| C[3] | 106 | 158 | -53 | -33% | 257 | 283 | -26 | -9% | 152,518 | 228,147 | -75,630 | -33% |
| D | 58 | 54 | 4 | 7% | 133 | 119 | 14 | 12% | 83,285 | 77,613 | 5,672 | 7% |
| E | 90 | 97 | -7 | -7% | 129 | 143 | -14 | -10% | 129,546 | 139,095 | -9,549 | -7% |
| F | 294 | 270 | 24 | 9% | 828 | 844 | -17 | -2% | 423,651 | 389,261 | 34,390 | 9% |
| G | 134 | 122 | 12 | 10% | 304 | 269 | 35 | 13% | 193,218 | 176,091 | 17,127 | 10% |
| H | 54 | 50 | 3 | 7% | 90 | 93 | -3 | -3% | 77,196 | 72,238 | 4,959 | 7% |
| I | 203 | 193 | 11 | 5% | 285 | 282 | 3 | 1% | 292,939 | 277,739 | 15,200 | 5% |
| RRF | 2,197 | 2,247 | -50 | -2% | 4,306 | 4,681 | -375 | -8% | 3,163,140 | 2,735,601 | 427,539 | 16% |

[1] *Flow monitoring results for Basin J were not included due to inconsistent data and data quality concerns.*
[2] *Due to data quality concerns, Basin B's calibration was based on combination of 2012 and 2013 flow meter data.*
[3] *The diurnal pattern preceding the storm was not consistent with the typical dry weather flow pattern for this basin.*

**Figure 4-7**
**Wet Weather Calibration Results at the RRF**

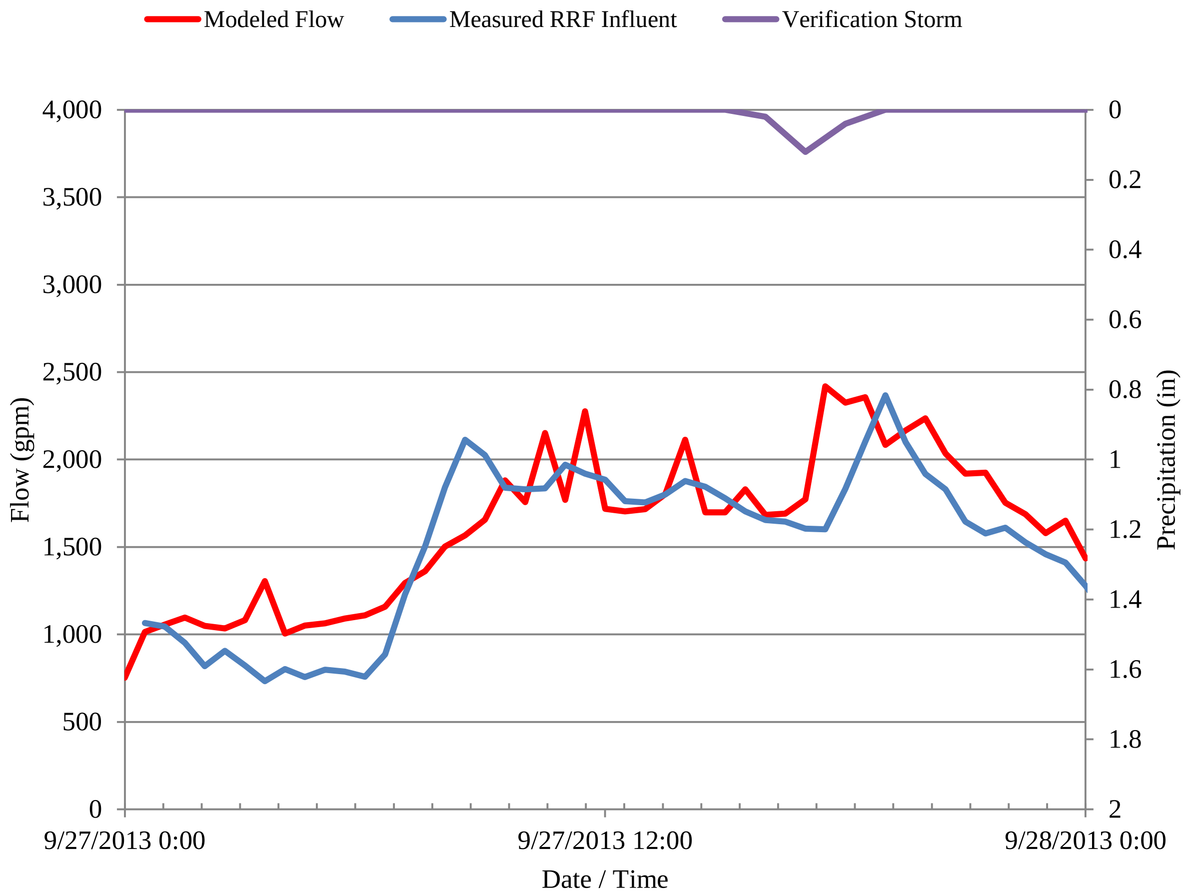


## Table 4-5
## Wet Weather Verification Results

| Basin[1] | Average Wet Weather Flow | | | | Peak Wet Weather Flow | | | | Wet Weather Volume | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gpm) | Measured (gpm) | Difference (gpm) | Error (%) | Modeled (gallons) | Measured (gallons) | Difference (gpm) | Error (%) |
| A | 55 | 47 | 8 | 17% | 114 | 132 | -18 | -14% | 79,812 | 67,976 | 11,836 | 17% |
| B[2] | 201 | 195 | 6 | 3% | 313 | 334 | -21 | -6% | 292,531 | 384,089 | -91,558 | -24% |
| C | 93 | 84 | 9 | 11% | 152 | 142 | 10 | 7% | 133,911 | 120,530 | 13,381 | 11% |
| D | 54 | 46 | 7 | 16% | 90 | 89 | 1 | 1% | 77,055 | 66,693 | 10,362 | 16% |
| E | 89 | 90 | -1 | -1% | 120 | 123 | -3 | -2% | 127,873 | 129,730 | -1,857 | -1% |
| F | 253 | 234 | 19 | 8% | 446 | 367 | 79 | 22% | 364,652 | 337,397 | 27,255 | 8% |
| G | 120 | 110 | 10 | 9% | 191 | 161 | 31 | 19% | 172,166 | 157,694 | 14,472 | 9% |
| H | 51 | 48 | 3 | 5% | 68 | 70 | -2 | -2% | 72,920 | 69,233 | 3,688 | 5% |
| I | 200 | 220 | -20 | -9% | 245 | 263 | -18 | -7% | 287,808 | 316,542 | -28,734 | -9% |
| RRF | 1,614 | 1,522 | 92 | 6% | 2,418 | 2,367 | 51 | 2% | 2,372,550 | 2,145,952 | 226,598 | 11% |

[1] *Flow monitoring results for Basin J were not included due to inconsistent patterns and data quality concerns.*
[2] *Due to data quality concerns, Basin B's calibration was based on a combination of 2012 and 2013 flow meter data.*

**Figure 4-8**
**Wet Weather Verification Results at the RRF**




## Design and Planning Criteria

The design and planning criteria set minimum standards for the existing collection system to determine when improvements are required. Table 4-6 summarizes the recommended hydraulic design and planning criteria, which were developed based on input from the City and review of the following sources:

- Oregon Administrative Rules – Rule 340 Division 52 (OAR 340-52).
- Oregon Standards for Design and Construction of Wastewater Pump Stations.
- Recommended Standards for Wastewater Facilities, 2012 Edition (10 States Standards).

**Table 4-6**
**Hydraulic Design and Planning Criteria**

| Element | Parameter | Flow Conditions | Planning Standard (existing system) | Design Standard (proposed system) |
|---|---|---|---|---|
| Gravity Pipe | Maximum d/D[1] | PDWF[2] | 0.8 | 0.8 |
| | Maximum d/D | PDF[3] | N/A | 1.0 |
| | Maximum Velocity | PDWF | 10 ft/s | 10 ft/s |
| | Maximum Velocity | PDF | 15 ft/s | 15 ft/s |
| | Minimum Velocity | PDWF | 2 ft/s | 2 ft/s |
| Manhole | Maximum Surcharge[4] | PDWF | No Surcharge | No Surcharge |
| | Maximum Surcharge[4] | PDF | 2ft | No Surcharge |
| Shallow Manhole[5] | Maximum Surcharge[4] | PDF | 0.5ft | No Surcharge |
| Lift Station | Firm Capacity[6] | PDF | Firm Capacity ≥ PDF | Firm Capacity ≥ PDF |
| | Emergency Power | N/A | At least two independent sources or provide holding capacity[7] | At least two independent sources or provide holding capacity[7] |
| | Wet Well Detention Time | N/A | N/A | Design should prevent septic action from taking place in wet well and dissolved hydrogen sulfide content shall be below 0.1 mg/l[7] |
| Force Main | Maximum Velocity | PDWF | 6 ft/s | 6 ft/s |
| | Maximum Velocity | PDF | 8 ft/s | 8 ft/s |
| | Minimum Velocity | PDWF | 3.5 ft/s | 3.5 ft/s |
| | Detention Time | N/A | N/A | Detention calculations for the dry weather period, including an evaluation of sulfide control alternatives where average detention will exceed 35 minutes, with design calculations for the selected control system[7] |
| Siphon | Minimum Velocity/ Number of barrels | PDWF | 3 ft/s / 2barrels | 3 ft/s / 2barrels |

1 *Water depth to pipe diameter ratio (d/D).*
2 *Peak dry weather flow (PDWF) is the maximum flow observed on the day of maximum sewer use with no rainfall contribution.*
3 *Peak design flow (PDF) is the maximum flow observed when the peak wet weather flow (PWWF) during the design storm event (PWWF) and the day of maximum sewer use (PDWF) occur simultaneously.*
4 *Maximum surcharge is the freeboard from water surface to manhole rim.*
5 *Shallow manhole is when the difference between pipe crown elevation and rim elevation is less than 2.0 feet*
6 *Firm capacity is the available capacity of a lift station, assuming the largest pump is out-of-service.*
7 *Existing system and proposed projects were not evaluated for this criteria and should be evaluated during the design process.*

### *Minimum Pipe Diameters for Gravity Sewers*

OAR 52 Appendix A and the 10 States Standards indicate that no sewer pipe less than eight inches in diameter shall be installed, with the exception of short, non-extendable sections less than 250 feet long.

### *Pipe Slope for Gravity Sewers*

The minimum slope criteria recommended for new sewers are based on the 10 States Standards and OAR 52 Appendix A. Pipe slopes over 20% require anchoring. Minimum slope criteria are presented in Table 4-7.

**Table 4-7**
**Design Criteria - Minimum Slopes**

| Nominal Sewer Size (inches) | Minimum Slope (feet per 100 feet)[1,2] |
|---|---|
| 8 | 0.4 |
| 10 | 0.28 |
| 12 | 0.22 |
| 15 | 0.15 |
| 18 | 0.12 |
| 21-48 | 0.10 |
| >48 | Designed to give mean velocities, when flowing full, of not less than 3.0 feet per second |

[1] *Minimum slope for pipes less than 48 inches based on a mean velocity of 2 ft/s under full pipe flow conditions.*
[2] *Based on Manning's formula using a Manning's roughness coefficient (n) value of 0.013.*

## System Analysis

Using the calibrated hydraulic model, the system was evaluated by applying the RTK factors, 10-year, 24-hour NRCS Type 2 design storm, and loading as described in Section 3. This evaluation identified system deficiencies by comparing modeled results to the design and planning criteria.

The system analysis included the following evaluations:

- ***Hydraulic Capacity Evaluation:*** The calibrated hydraulic model was used to predict the system response under existing and future peak flows (dry and wet) to identify hydraulic capacity deficiencies in the system.
- ***Lift Station Capacity Evaluation:*** Each lift station's required capacity for existing and future conditions was calculated and compared to the existing firm capacity to determine the need for upgrades.
- ***Force Main Evaluation:*** Each lift station's force main was evaluated to determine the maximum velocity experienced under peak dry and peak wet conditions for each planning horizon to determine required upgrades.

The collection system's infrastructure must have the capacity to convey peak design wastewater flows. These peak flows consist of:

- ***Peak Dry Weather Flow (PDWF):*** largest flow during dry weather conditions, corresponding to the day of maximum sewer use (rainfall does not contribute to the dry weather flow).
- ***Peak Wet Weather Flow (PWWF):*** largest rainfall contribution (RDII) to wastewater flow during the design storm event.
- ***Peak Design Flow (PDF):*** maximum flow observed when the design storm event and the day of maximum sewer use occur simultaneously. It is assumed that the peak dry weather flow and the peak wet weather flow occur at the same time.

### *Capacity Analysis Methodology*

The collection system analysis includes pipeline, pumping, and force main capacity evaluations. The calibrated hydraulic model was used to perform simulations for existing and future conditions, including, 5-, 10-, 20-year and build-out under peak dry weather and peak design flows.

The capacity analysis assumes that all future wastewater flow generated in the areas currently within the City's urban growth boundary, including the RSSD and Confederated tribes of the Umatilla Indian Reservation (CTUIR), will ultimately be conveyed by the existing system to the RRF.

The results for each scenario were compared to the planning and design criteria. Locations not meeting the criteria were analyzed in further detail to determine the need for improvements.

### *Capacity Analysis Results*

The results for each scenario are presented in this section. Table 4-8 provides a general description for each location that did not meet planning criteria for existing or future conditions.

The lift station and force main analyses include all five City lift stations and associated force mains. Tables 4-9 and 4-10 present the results of the lift station and force main analyses, respectively.

#### *Existing Conditions*

In general, the existing system has enough capacity to convey existing peak dry and peak design flows. The four deficiency locations listed below are shown in Figure 4-9.

- The McKay Lift Station force main exceeded the velocity criteria under peak dry weather flow conditions.

- Manholes at two locations (along SE Goodwin Avenue and SW Riverview Drive) exceeded the hydraulic criteria for maximum surcharge depth with overflows observed at manholes along SE Goodwin Avenue under peak design flow conditions.
- The 28th Street Lift Station does not have adequate firm capacity to convey peak design flows.

The force main capacity analysis indicated Bartsch Lift Station's force main is reaching capacity. Field tests to verify the operational point of the pump station and the condition of this force main are recommended for this facility prior to making improvements. No improvements have been identified until further investigation has been performed.

The lift station capacity analysis indicated that the Rieth Lift Station is reaching capacity during peak design flows. Field testing is recommended to verify the operational point of the pump, and flow metering is recommended to better quantify the RDII influence in this sewer shed. No improvements will be identified for this station until further investigation is performed.

*5-Year Conditions*

The increase in average dry weather flow expected in the 5-year horizon is 0.7 million gallons per day (mgd) (27%), assuming 0.5 mgd from CTUIR (50% of the maximum permitted flow). The deficiencies observed in the 5-year scenarios were similar to those observed during the existing scenarios. One additional deficiency location for this planning horizon was identified and is shown in Figure 4-9. This deficiency was observed during peak design flow at the 28th Street Lift Station, where its maximum allowable force main velocity was exceeded. Bartsch Lift Station, located upstream of 28th Street Lift Station, appears to be oversized through the 20-year horizon, which contributes to the 28th Street Lift Station's force main deficiency. In addition to improvements at the 28th Street Lift Station, correct pump sizing and variable speed pump capability at the Bartsch Lift Station should be considered as part of an overall solution to this deficiency.

*10-Year Conditions*

The increase in average dry weather flow expected from the 5-year to 20-year horizon is 0.5 mgd (13%), when assuming 0.75 mgd from CTUIR (75% of the maximum permitted flow). There were no additional deficiencies observed during the 10-year peak dry weather conditions, and one identified during the peak design flow scenario (shown in Figure 4-9). This additional deficiency is located along Murietta Road between NW McKennon Road and Interstate 84, where the manholes exceed the maximum surcharge criteria.

*20-Year Conditions*

Deficiency locations for the 20-year planning horizon are shown in Figure 4-9. The expected increase in average DWF between the 10-year and 20-year horizon is 0.4 mgd (10%), when assuming the maximum permitted flow from the CTUIR (1.0 mgd). The effect of the 1.0 mgd flow from the CTUIR resulted in two new gravity main deficiencies under peak dry weather flow conditions downstream of where the CTUIR pipe connects to the City's collection system. The first is located along NE Queen and NE 42nd Street. The second deficiency is located along NE Riverside Avenue and continues along NE Riverside Place.

*Build-Out Conditions*

The expected increase in average dry weather flows from existing conditions to build-out is 4.11 mgd (126%). This is primarily the result of developments outside the existing City limits and the maximum flow from the CTUIR.

The deficiency locations for this planning horizon are shown in Figure 4-9. Maximum permitted flow (1.0 mgd) from the CTUIR in conjunction with projected growth in Basin I resulted in the expansion of the deficiencies observed in this basin under 20-year conditions. Other build-out deficiencies violate the maximum surcharging criteria under peak design flow conditions and are located in Basin F along SE Court Place and in Basin B along SW 22nd Street between SW Quinney Avenue and SW Quinney Drive. Overflows were observed during peak design flows in manholes along SW Nye Avenue and Southgate (Basin B). The existing trunk system in Basins A and E are also deficient during build-out peak dry weather flow and peak design flow conditions, with overflows observed during peak design flows.

McKay, 28th Street, and Rieth lift stations (pumping capacity) and force mains (velocity) are deficient under build-out conditions.

**Table 4-8**
**Location of Build-Out System Deficiencies**

| Deficiency ID | Diameter (in) | Type | Location | Length (ft) | Scenario | | | | | | | | | | Criteria Violation[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Existing | | 5-Year | | 10-Year | | 20-Year | | Build-Out | | |
| | | | | | PDWF[1] | PDF[2] | PDWF | PDF | PDWF | PDF | PDWF | PDF | PDWF | PDF | |
| Def-1 | 8-10 | Gravity Main | Along SE Goodwin Ave from SE $3^{rd}$ St to SW $6^{th}$ St | 2,660 | | x | | x | | x | | x | | x | PDF Freeboard < 2ft |
| Def-2 | 8 | Gravity Main | Along SW Riverview Dr from approximately 100 ft northwest of the SW Riverview Dr and SW Overlook St intersection to SW Riverview Dr | 380 | | x | | x | | x | | x | | x | PDF Freeboard < 2ft |
| Def-3 | 4 | Force Main | McKay Lift Station force main | 650 | x | | x | | x | | x | | x | x | PDWF Velocity > 6ft/s, PDF Velocity > 8ft/s |
| Def-4 | NA | Lift Station | $28^{th}$ Street Lift Station | NA | | x | | x | | x | | x | x | x | PDWF and PDF Exceed Firm Capacity |
| Def-5 | NA | Lift Station | Rieth Lift Station | NA | | | | | | | | | x | x | PDWF and PDF Exceeds Firm Capacity |
| Def-6[4] | 10 | Gravity Main | Along NE Queen Ave from NE $45^{th}$ St to NE $42^{nd}$ St, then along NE $42^{nd}$ St to NE Riverside Ave | 1,300 | | | | | | | x | | x | | PDWF d/D > 0.8 |
| Def-7[4] | 12 | Gravity Main | Along NE Riverside Ave from approximately 400ft east of NE Anvidon St to HWY 11, then continues along NE Riverside Pl to approximately 300ft southeast of Severe Dr, then cross-country southwest approximately 300ft | 1,550 | | | | | | | x | | x | x | PDWF d/D > 0.8, PDF Freeboard < 2ft |
| Def-8 | 8 | Force Main | $28^{th}$ Street Lift Station Force Main | 1,240 | | | | x | | x | | x | x | x | PDWF Velocity > 6ft/s, PDF Velocity > 8ft/s |
| Def-9[1,5] | 12 | Gravity Main | Cross –country and along Murietta Rd from approximately 750ft northeast of NW McKennon Rd going south then northeast approximately 900ft, then southeast cross-country approximately 850ft towards $28^{th}$ Street Lift Station and backs up tributary pipes approximately 550ft | 2,300 | | | | | | x | | x | x | x | PDWF d/D > 0.8, PDF Freeboard < 2ft |
| Def-10 | 8-12 | Gravity Main | Parallels Tutuilla Creek from approximately 200ft southeast of SW Nye Ave going northwest to Southgate, then parallels Southgate across the Interstate to SW Dorion Ave and backs up tributary pipes up to 1,200 ft | 8,650 | | | | | | | | | | x | PDF Freeboard < 2ft |
| Def-11 | 8 | Gravity Main | Along SE Court Pl from SE $19^{th}$ Dr to SE $17^{th}$ St | 500 | | | | | | | | | | x | PDF Freeboard < 2ft |
| Def-12 | 8 | Gravity Main | From approximately 100ft east of SW Nye Ave and Southgate going northeast approximately 250 ft across Southgate. | 350 | | | | | | | | | | x | PDF Freeboard < 2ft |
| Def-13 | 8 | Gravity Main | Along SW 22nd St between SW Quinney Ave and SW Quinney Dr | 340 | | | | | | | | | | x | PDF Freeboard < 2ft |
| Def-14 | NA | Lift Station | McKay Lift Station | NA | | | | | | | | | | x | PDF Exceeds Firm Capacity |
| Def-15[1] | 8 | Gravity Main | Along Stage Gulch Rd from NW $56^{th}$ Dr west approximately 550ft. | 550 | | | | | | | | | x | x | PDWF d/D > 0.8, PDF Freeboard < 2ft |
| Def-16 | 8-12 | Gravity Main | Basin A upstream of NW McKennon Rd. | 19,800 | | | | | | | | | x | x | PDWF d/D > 0.8, PDF Freeboard < 2ft, PDF GM Velocity >15 ft/s |
| Def-17 | 4 | Force Main | Rieth Lift Station Force Main | 8,950 | | | | | | | | | | x | PDF Velocity > 8 ft/s |

[1] *Peak dry weather flow (PDWF) is the maximum flow observed on the day of maximum sewer use with no rainfall contribution.*
[2] *Peak design flow (PDF) is the maximum flow observed when the design storm event and the day of maximum sewer use occur simultaneously.*
[3] *Water depth to pipe diameter ratio (d/D).*
[4] *Deficiency is the result of 1.0 mgd permitted flow from the CTUIR.*
[5] *Becomes part of Deficiency 16 under build-out peak design flow conditions.*

**Table 4-9**
**Lift Station Analysis**

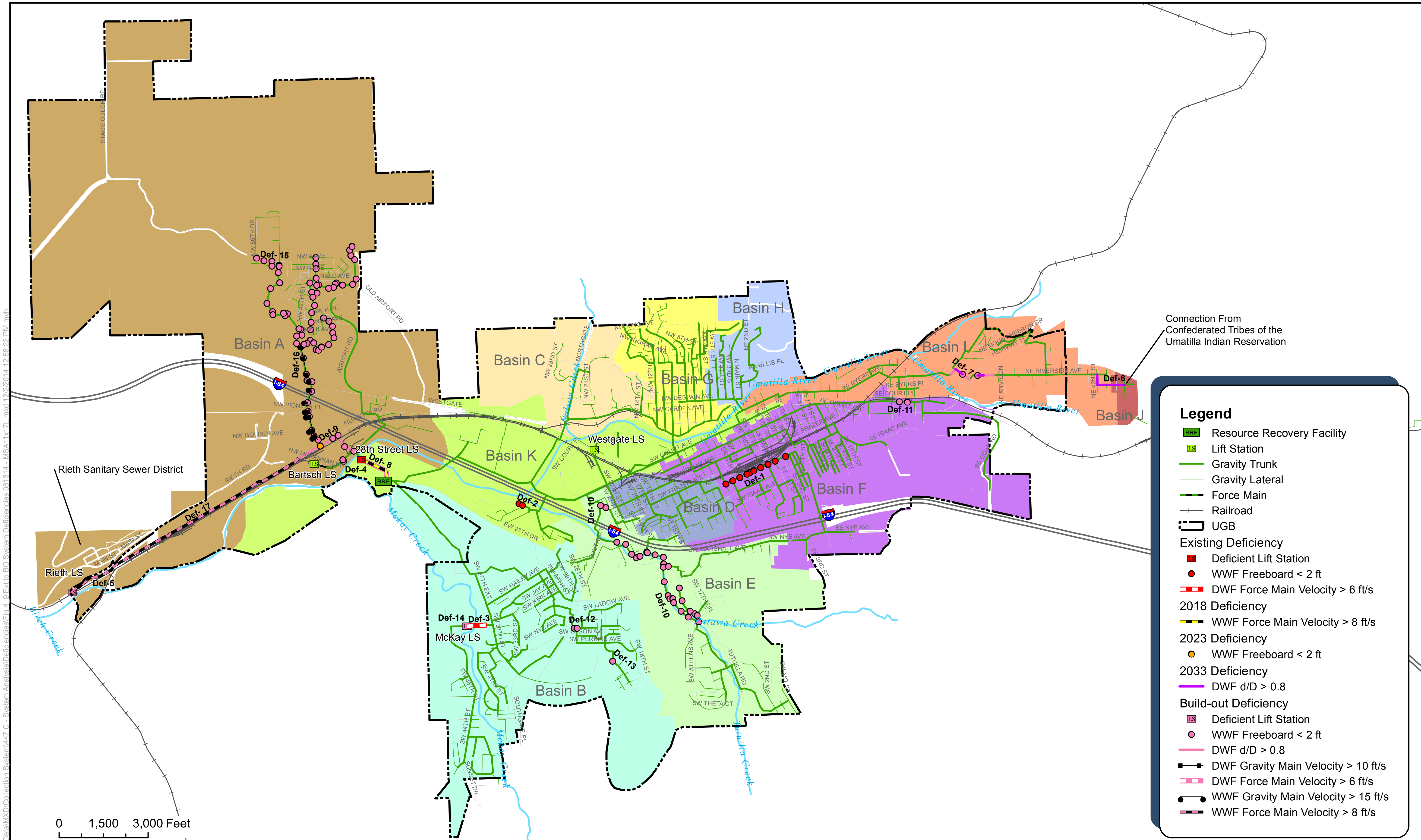
| Lift Station Name | Firm Capacity (gpm)[1] | Existing PDF[2] (gpm) | 5-Year PDF (gpm) | 10-Year PDF (gpm) | 20 -Year PDF (gpm) | Build-Out PDF (gpm) | Deficiency Timeframe |
|---|---|---|---|---|---|---|---|
| 28th Street | 500 | 848 | 1,292 | 1,517 | 1,517 | 4,475 | Existing |
| Bartsch | 260 | 82 | 82 | 82 | 82 | 245 | |
| McKay | 255 | 73 | 73 | 94 | 155 | 366 | Build-Out |
| Rieth | 65 | 79 | 79 | 79 | 79 | 370 | Build-Out |
| Westgate | 250 | 121 | 121 | 121 | 121 | 121 | |

[1] *Firm capacity is the lift station capacity assuming the largest pump out-of-service.*
[2] *Peak design flow (PDF) is the maximum flow observed when the design storm event (PWWF) and the day of maximum sewer use (PDWF) occur simultaneously.*

**Table 4-10**
**Force Main Analysis**

| Lift Station Name | Force Main Diameter (in) | Velocity at Firm Capacity[1] (fps) | Force Main Velocity (ft/s) | | | | | | | | | | Deficiency Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Existing | | 5-Year | | 10-Year | | 20-Year | | Build-Out | | |
| | | | PDWF[2] | PDF[3] | PDWF | PDF | PDWF | PDF | PDWF | PDF | PDWF | PDF | |
| 28th Street | 8 | 3.2 | 2.8 | 5.4 | 2.9 | 8.2 | 2.9 | 9.7 | 3.4 | 9.7 | 9.1 | 29.8 | 5-Year |
| Bartsch | 4 | 6.6 | 4.4 | 7.2 | 4.4 | 7.2 | 4.4 | 7.2 | 4.4 | 7.2 | 4.4 | 7.2 | |
| McKay | 4 | 6.5 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 9.3 | Existing |
| Rieth | 4 | 1.7 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 2.9 | 9.5 | Build-Out |
| Westgate | 6 | 2.8 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | 5.9 | |

[1] *Firm capacity is the lift station capacity assuming the largest pump out-of-service.*
[2] *Peak dry weather flow (PDWF) is the maximum flow observed on the day of maximum sewer use with no rainfall contribution.*
[3] *Peak design flow (PDF) is the maximum flow observed when the design storm (PWWF) and the day of maximum sewer use (PDWF) occur simultaneously.*




MSA Murray, Smith & Associates, Inc.

City of Pendleton Incorporated 1880 Oregon

**City of Pendleton**
**Collection System Master Plan**

**Figure 4-9**
**Existing - Build-out Deficiencies**

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**Summary**

The following general conclusions were drawn from the evaluations performed as part of the system analysis:

- The existing piping system is adequately sized to convey peak dry weather flows through the 20-year planning horizon, with the exception of McKay Lift Station force main in Basin B
- The existing piping system has adequate capacity to convey existing peak design flows, with the exception of the piping along SE Goodwin Avenue in Basin F and SW Riverside Drive in Basin K.
- The 28$^{th}$ Street Lift Station does not have capacity to convey existing peak design flows.
- The Bartsch Lift Station appears to be oversized through the 20-year planning horizon, which exacerbates deficiencies at the 28$^{th}$ Street Lift Station force main. Correct pump sizing and VFD installation at the Bartsch Lift Station should be considered.
- Further investigation at the Rieth Lift Station is recommended to verify actual flows and pump performance.
- In general, the existing piping system is adequately sized to serve projected 20-year flow. Minimal improvements generally south of the railroad are required with a few extensive improvement needed including piping required to decommission McKay Lift Station in Basin B and improvements to serve future flows from the CTUIR in basins I and J; and development in the Airport Industrial Area (AIA) in Basin A.
- In general, the existing piping system is adequately sized to serve projected flows beyond the 20-year horizon. A few additional minimal improvements located south of the Umatilla River and a few extensive improvements will be required. Extensive improvements are located along Tutuilla Creek as areas south of Interstate-84 and west of Southgate develop in Basin E, and generally west of the RRF as the AIA in Basin A and RSSD continue to develop.
- Existing City lift station facilities Rieth, 28$^{th}$ Street, and McKay do not have capacity to convey build-out flows.
- Continued sewer flow monitoring is recommended to gain further understanding of I/I and the impact of spring runoff and river flows on the collection system. This will be particularly valuable to assess the impact of the ongoing repair and replacement program.

Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 5
## Operations and Maintenance

# SECTION 5
# OPERATIONS AND MAINTENANCE

## Introduction

This section assesses the Operations and Maintenance (O&M) program for the City of Pendleton's (City's) collection system. The assessment is based on information from City staff, comparison to the O&M practices of similarly sized utilities, and pertinent regulatory requirements. Improvement recommendations for the City's O&M program are detailed at the end of this section, and are based on the results of this assessment, state and federal requirements, City code, and benchmarking with similar utilities.

## O&M Regulations and Guidelines

Oregon's Department of Environmental Quality (DEQ) does not specifically require O&M manuals for collection systems, but considers them valuable guides for operators to use in the ongoing, effective, efficient and economical operation of the system.

Oregon Administrative Rule (OAR) 340-049, Regulations Pertaining to Certification of Wastewater System Operator Personnel, defines the requirements for operator certification.

OAR Section 340-049-0020, Classification of Wastewater Systems, defines wastewater systems based their complexity and population served. The DEQ's director will advise wastewater utilities as to their classification, which follow:

- **Small Wastewater Systems:** 30 or fewer total points; fewer than 500 design populations, or fewer than 150 connections.
- **Wastewater Treatment Systems** (System classifications are derived from the total points assigned based on criteria shown in OAR 340-049-0025.):
  - Class I — 30 or fewer total points.
  - Class II — 31 to 55 total points.
  - Class III — 56 to 75 total points.
  - Class IV — 76 or more points.
- **Wastewater Collection Systems:**
  - Class I — 1,500 or fewer design populations.
  - Class II — 1,501 to 15,000 design populations.
  - Class III — 15,001 to 50,000 design populations.
  - Class IV — 50,001 or more design populations.

Both collection and treatment operators must receive certification in accordance with the classification of the system they operate. The City's systems are classified Wastewater Treatment System IV and Wastewater Collection System Class III.

In addition, the U.S. Environmental Protection Agency (EPA) provides the following collection system O&M guidance:

- Proposed Rule to Protect Communities from Overflowing Sewers (EPA 833-01-F-001). The EPA drafted proposed revisions in January 2001, per its National Pollutant Discharge elimination System Compliance Monitoring (NPDES) permitting regulations, to reduce the frequency and occurrence of sewer overflows and provide more effective public notification when overflows do occur. The proposed rule has not yet been adopted and is currently undergoing a public comment process. The proposed rule includes the following requirements:
  - Development of Capacity, Management, Operation and Maintenance (CMOM) program.
  - Development of a program to notify public and health authorities of overflows.
  - Development of permits for "satellite" collection systems.
- *Collection System O&M Fact Sheet: Sewer Cleaning and Inspection* pamphlet (EPA 832-F-99-031).

Finally, the collection system O&M program is guided by City Ordinance Nos. 3237 and 3464, which cover public sewer use, connections, protection, inspection, pretreatment, monitoring, permits, and fees. While the O&M procedures used to maintain the system are set within the Sewer Utility and City ordinances, the ordinances do not directly address these procedures.

**System Overview, O&M Staff, and Certification Status**

The following list provides an overview of the City's collection system:

- System serves approximately 17,600 people.
- Service area is 13.4 square miles.
- Average annual flow is 2.2 million gallons per day (mgd).
- Peak daily flow averages 3.08 mgd = max day for 2012 and 2013.
- Gravity line measures 87 miles.
- Force main measures 11,500 feet.
- System has 5 lift stations.
- Resources Recovery Facility (RRF) is a Complete-Mix Secondary Treatment system.

The City's Sewer Utility and Streets Division staff are responsible for the operations and maintenance of the wastewater treatment and collection system, respectively. Based on the system size, the State of Oregon requires a Grade IV Wastewater Treatment System Operator (WWT-4) and a Grade III Wastewater Collection Operator (WWC-3) for the individual in direct charge of the system. The Sewer Utility is headed by the Wastewater Superintendent, who maintains a WWT-4 certification. The Public Works (PW) Superintendent supervises the Streets Division and oversees the collection system and is a WWC-4. Both superintendents report directly to the Public Works Director.

The combined Sewer Utility and Streets Division currently operate with nine full-time equivalent (FTE) employees. Two of these FTEs, under the direction of the PW Superintendent, are responsible for operating and maintaining the collection system, stormwater O&M, weed spraying, and street maintenance. The City would like to have dedicated O&M staff for each utility with some sharing of resources as needed. Table 5-1 lists current City personnel who have State of Oregon wastewater collection certification. The City encourages operations personnel to become certified by sponsoring work-related safety and technical training courses.

**Table 5-1**
**Certification Status of Personnel**

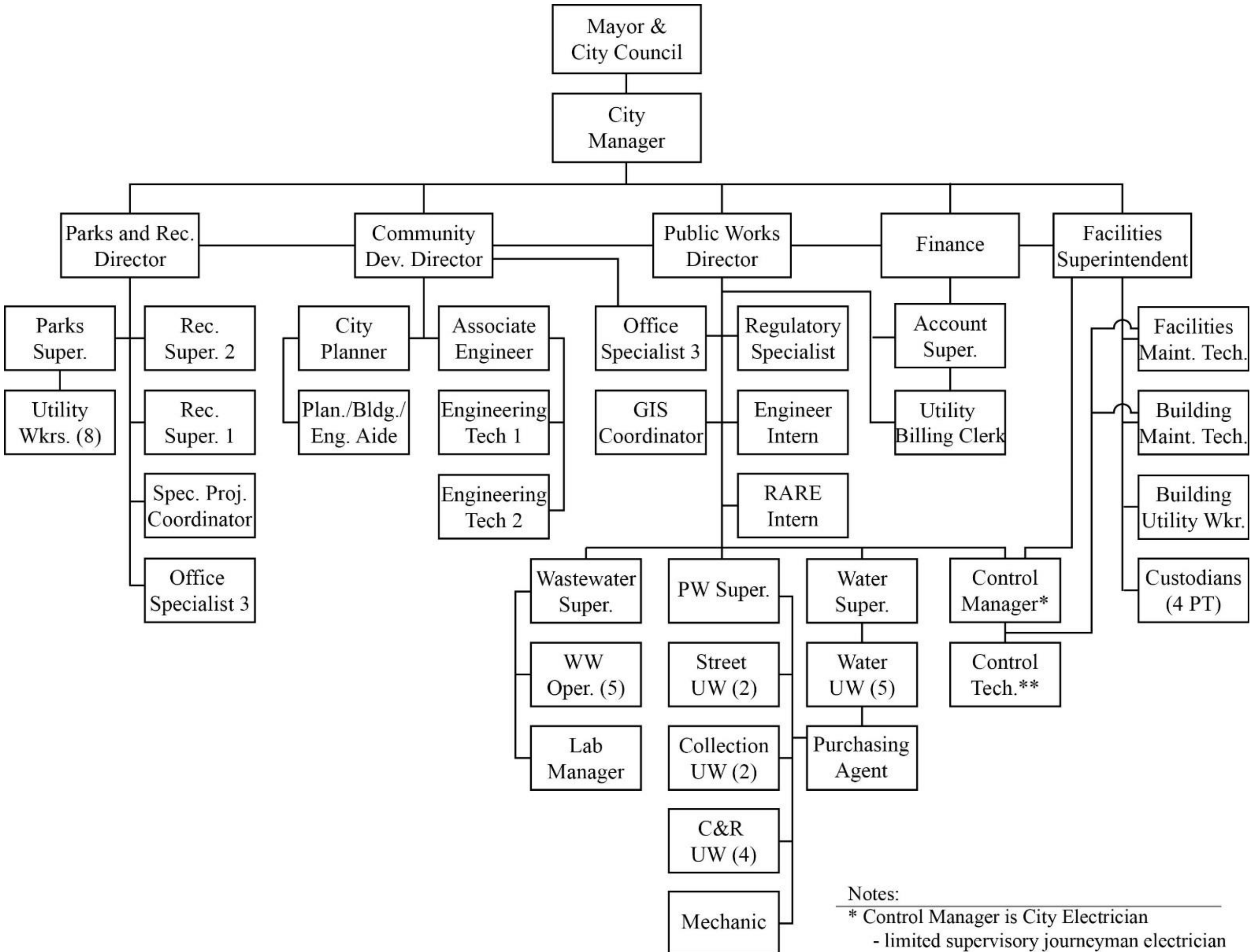
| Certification Number | Name | Job Title | Certification |
|---|---|---|---|
| C-9880, T-9209 | Jeff Brown | PW Superintendent | WWC-4, WWT-1 |
| C-8576 | Gene Baney | Utility Worker 3 | WWC-3 |
| | John Johnson | Utility Worker | In Process |
| C-9063 | Clifford Hyatt[1] | Construction & Repair/Utility Worker | WWC-2 |

*[1] Clifford Hyatt is not part of the City's O&M staff, but provides operations support when required.*

The Sewer Utility maintains the wastewater treatment certification of five staff for the operation of the RRF under the Wastewater Superintendent. The City's collection system organizational structure is shown in Figure 5-1.

The City also maintains a construction and replacement (C&R) crew, consisting of four FTEs under the PW Superintendent. This crew handles C&R for in-house sewer and storm line construction and replacement for pipes shallower than eight feet, as well as for water pipes, but are not dedicated to the Sewer Utility. The City estimates that if this crew were fully dedicated to sewer and water pipe replacement, 2,800 feet of sewer pipe could be replaced each year. Based on estimate, the associated annual in-house labor and equipment costs would total about $222,000 and the sewer pipe material costs would be about $148,000. Currently, however, the C&R crew is assigned to work outside of the Water and Sewer Utility. Additionally, the City follows Oregon Revised Statute 279C.305, which requires that before a utility constructs a public improvement with a value of $125,000 or greater with its own equipment or personnel, it shall prepare adequate plans and specifications and the estimated unit cost of each classification of work.

**Figure 5-1**
**Organizational Chart**




Notes:
* Control Manager is City Electrician
- limited supervisory journeyman electrician
- oversee master permit and all employees
** Control Tech. is approved, but will not be filled in the near future

## Current O&M Practices and Procedures

The City's Sewer Utility and Streets Division are responsible for the ongoing operation, maintenance and repair of the City's wastewater treatment and collection systems, respectively. The City's collection O&M team, as described earlier, consists of a two-person crew that provides sanitary sewer maintenance. The staff rotates to cover street maintenance and stormwater O&M, as needed. The sanitary sewer maintenance activities include monthly visits to all lift stations, periodically inspecting and cleaning the gravity pipes, and responding to customer inquiries and complaints.

Although the City has a draft *Wastewater Collection System Maintenance Program* (Appendix B) created in 2007 that has not been formally adopted. The City is working to update this program through pursuing Public Works Accreditation, which is implementation of best practices in accordance with the American Public Works Association's *Public Works Management Practices Manual – 8th Edition* (PWMP Manual). The following lists the best practices for wastewater collection and conveyance as described in the PWMP Manual:

- **Collection and Conveyance Management Plan:** A plan establishes the method of managing wastewater collection and conveyance.
- **Operations Manual:** An operations manual covers all aspects of lift and pump-station-operating procedures.
- **Records:** A system of recording inspections, operations, and maintenance and repair activities is developed and maintained.
- **Infrastructure Inventory:** A record of wastewater collection and conveyance system infrastructure is maintained and updated.
- **Infrastructure Condition:** A record of wastewater collection and conveyance system infrastructure condition is maintained and updated.
- **Infrastructure Management:** A management system for wastewater infrastructure assets is maintained and guides investment decisions.
- **Facility Maintenance and Inspection:** Inspection, maintenance, repair, and cleaning procedures for all facilities are established and maintained.
- **Inflow and Infiltration:** An infiltration and inflow control plan is established including inspection and repair elements.
- **Illicit Discharges:** A procedure is stablished for locating and determining the source of illicit discharge and for managing abatement of illicit discharges.
- **Industrial Pretreatment:** The agency has established industrial pretreatment requirements for discharge into the collection and conveyance system.
- **Energy Consumption Reports:** Energy consumption reports are conducted at established intervals, and measures are implemented to ensure cost-effective operations of the lift and pump stations.
- **Sanitary Sewer Overflows:** A plan establishes how the agency manages sanitary sewer overflows, including required public notification and cleanup.

- **Test Alarms:** A schedule is developed to determine the frequency of alarm system testing. A log or records of the test results are maintained.
- **Safety:** A safety plan is established to meet the particular hazards of the collection and conveyance system.
- **Long-Range System Planning:** A long-range plan is developed to meet the future needs of community growth.
- **Capacity:** The capacity of the system needs to be established, monitored, and evaluated as development occurs.

The City will be implementing these best management practices in development of a maintenance program. The following maintenance activities are based on the 2007 draft document.

***Lift Stations***

Lift stations are visited monthly, with a number of system checks being performed, including:

- Visually inspecting all moving equipment within the lift station.
- Washing down the walls of each wet well to ensure no materials are caught on the operating floats.
- Inspecting the lubrication and seals on the pumps.
- Checking the alarm systems to ensure they are functioning properly.

Beyond these scheduled maintenance activities, equipment is rebuilt or replaced, as necessary. The 28th Street Lift Station has backup power. Three lift stations within the City's collection system (Bartsch, Westgate, and McKay) do not have backup power capability, and the City does not currently own a portable generator dedicated to the collection system.

Table 5-2 summarizes the City's lift stations. Note that the City has not experienced an overflow event due to a lift station shutdown, as each lift station has had enough wet well storage to handle incoming flows until the station was able to get back online. Additionally, the City has an inventory of backup pumps for the Westgate and McKay lift stations. No backup pumps are currently maintained for the Bartsch Lift Station.

**Table 5-2**
**Lift Stations**

| Name | Type | Number of Pumps | Total Design Capacity (gpm) | Firm Design Capacity (gpm) | TDH (ft) | Total Power (hp) | Primary Level Control | Backup Power |
|---|---|---|---|---|---|---|---|---|
| 28th Street | Wet Well / Dry Well | 2 | 1,000 | 500 | 20 | 10 | Float | Yes |
| Bartsch | Submersible | 2 | 520 | 260 | 20 | 6 | Float | No |
| McKay | Submersible | 2 | 510 | 255 | 35 | 10 | Pressure Transducer | No |
| Rieth | Grinder | 2 | 130 | 65 | 84 | 3.74 | Pressure Transducer | No (plug for portable) |
| Westgate | Submersible | 2 | 500 | 250 | 20 | 10 | Pressure Transducer | No |

The 28th Street Lift Station, which pumps into the RRF, is maintained by the RRF staff. Its onsite generator undergoes a monthly test where it provides the electrical load to operate the lift station. The Rieth Lift Station is owned by the Rieth Water District, but there is perpetual agreement with the City to operate, maintain, and upgrade this lift station, which pumps into the City's collection system. The agreement between the City and Rieth Water District is found in Appendix C. The City does not maintain a spare pump for the Rieth Lift Station, but can connect to a portable generator during a prolonged power outage.

All lift stations are connected into the City's Supervisory Control and Data Acquisition (SCADA) system for monitoring alarms. The Westgate and McKay lift stations were constructed within the last 10 years, and the City has not identified any upgrades for these stations.

The City would like to upgrade the Bartsch Lift Station with new pumps and variable-frequency drive (VFD) motor controls to match the submersible pump rail system in the Westgate and McKay Lift Stations. Additionally, the City wants to purchase a portable generator and modify Bartsch, Westgate, and McKay to enable connection to a portable generator.

### *Force Mains*

The City currently has no scheduled inspection, cleaning, or maintenance activities for force mains.

### *Gravity Sewers*

Historically, the City has not performed preventative routine inspection and cleaning as part of gravity sewer maintenance, but has addressed problems as they occur. Portions of the City's collection system are 100 years old, and ongoing work is required to maintain the facilities.

Sewer cleaning and inspection are important to maintaining a collection system. To address its aging collection system and to facilitate the inspection and cleaning process, the City upgraded its closed-circuit television (CCTV) equipment in December 2006, allowing City staff to continue providing their own inspection services, but due to competing priorities dedicating staff to this work has been a challenge.

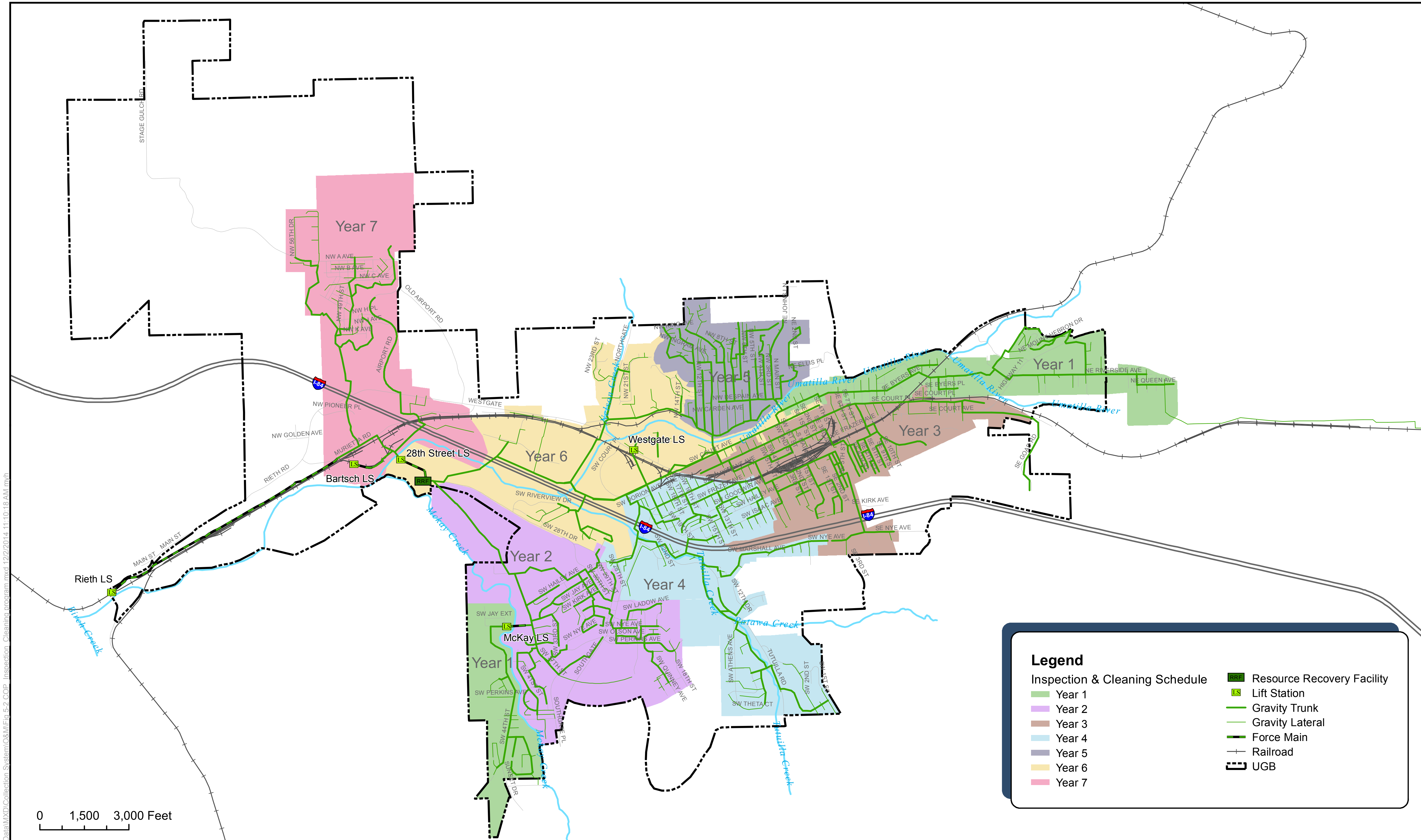
Over time, deterioration, solids buildup, blockages, and collapses can become serious problems. Proactive maintenance through cleaning and inspection keeps the collection system working and many serious problems from occurring by removing the buildup of grease, roots, and debris. Accordingly, the City is planning to implement a pipe cleaning and CCTV inspection program. The program is based on *Collection System O&M Fact Sheet: Sewer Cleaning and Inspection* pamphlet (EPA 832-F-99-031) and research of other sewer utility programs. Typical cleaning programs cover 20% to 30% of the collection system each year, and inspection programs cover 6% to 12%.

The City's Cleaning and Inspection Program will be completed on a 7-year cycle. Based on this cycle, the program would clean and inspect approximately 15% of the collection system each year. Figure 5-2 presents the segments of the collection system that would be inspected and cleaned during each year of the cycle.

In general, the program will start on the upstream end in the east and work towards the RRF on the west side of the City. Areas north and south of the downtown core will be completed in progression, going from higher to lower elevations, east to west. This allows for cleaning to flush debris downstream through the sewer collection system, followed by a CCTV inspection. See Table 5-3 for the yearly summary of pipe lengths that will be inspected and cleaned.

**Table 5-3**
**CCTV Inspection and Cleaning Schedule**

| Year | Length (feet) |
|---|---|
| 1 | 75,000 |
| 2 | 66,000 |
| 3 | 77,000 |
| 4 | 75,000 |
| 5 | 60,000 |
| 6 | 57,000 |
| 7 | 48,000 |




**City of Pendleton**
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**Figure 5-2**
**Inspection & Cleaning Program**

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To implement this program, the City must evaluate staff needs to provide the required resources to achieve the defined level of inspection and cleaning.

An additional recommendation, as part of the cleaning and inspection program, is to monitor areas of low pipe velocity, as identified in Figure 5-3. These areas identified through hydraulic modeling do not see pipe velocities of at least 2 feet per second (ft/s) under daily peak dry weather conditions. Monitoring these areas will determine whether more frequent cleaning is required to prevent buildup of debris.

The City currently maintains a routine cleaning and problem spot list, which defines areas within the collection system that need to be cleaned monthly, every 3 months or every 6 months. Appendix D presents a copy of the City's Routine Sewer Cleaning/Problem Spots list. Additional reasons for inspection include determining pipeline segments that need to be replaced, warranty and new construction inspections, and other special inspection projects.

The City's NPDES Permit #100982 (File #68260), Schedule B(3)(a), requires it to submit an annual Inflow and Infiltration (I/I) Report. The City addresses I/I requirements through cleaning and video inspection of the collection system.

Damaged lines are assessed and prioritized for repair or replacement. Additionally, the City has worked to eliminate direct stormwater connections into the collection system, and in May 2012 purchased 10 flow monitoring units to measure sewer flows and track I/I throughout the system.

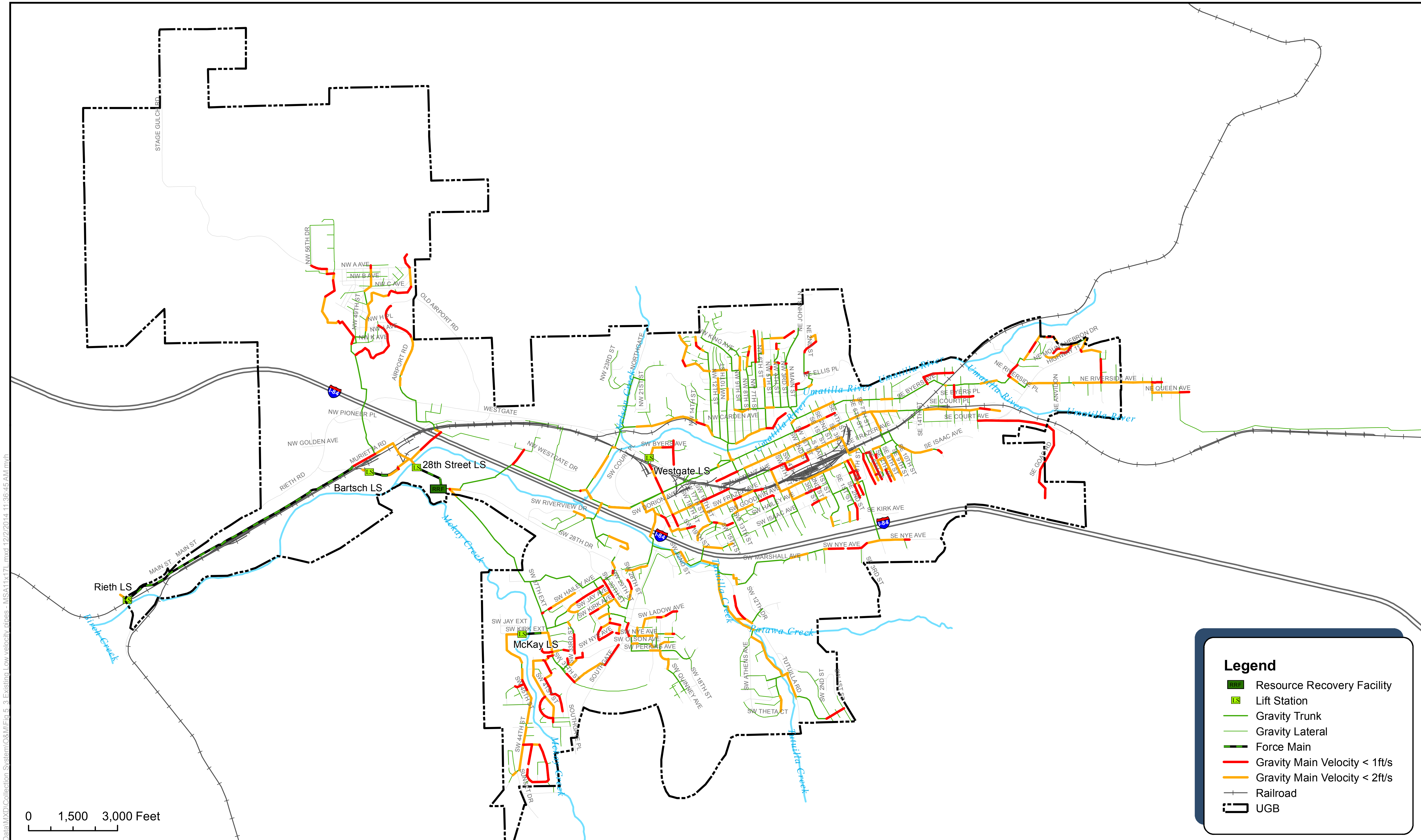
As indicated in the *Characterization of the Umatilla River Influence in the Pendleton Collection System* (Appendix A), sewer flow increases in response to high river levels were lower in 2012-2013 than 2010-2011.

This is the result of the City's capital improvements focused on decreasing and controlling the amount of infiltration from the Umatilla River into the collection system. These improvements included pipe replacement with polyvinyl chloride (PVC) and rehabilitation by sliplining in areas with high I/I levels.

Currently the City does not have maintenance management software to incorporate the video inspection and resulting condition assessment. It is recommended that the City evaluate different data collection and management software to find one that best meets their needs.

The City is currently developing a Geographic Information System (GIS) geodatabase to maintain detailed information about the system, including its facilities, pipelines, and appurtenances.

It spatially locates each part of the system and includes attributes relevant to each feature, such as material, diameter, elevations, and other relevant characteristics. The GIS information can be leveraged in the office and by the O&M staff in the field using a laptop.




City of Pendleton
Collection System Master Plan

# Figure 5-3
# Low Velocity Gravity Mains

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### *Emergency Response*

The City's 2007 draft Wastewater Collection System Maintenance Program covers specific standard operating procedures for responding to sewer overflows associated with lift stations and plugged or broken sewer lines, as well as spill response. Also included in the program are sewer inspection and maintenance guidelines, lift station maintenance procedures, and long-term capital needs.

### *Safety Procedures*

The City's Safety Manual provides the Sewer Utility and Streets Division with a standardized approach for the establishment, implementation, administration, and governance of a comprehensive safety program. The City is accountable for the safety of employees working under its supervision, and is expected to conduct operations safely at all times.

### *Customer Complaints*

The Sewer Utility currently addresses complaints as they arise and coordinates through the PW Department. The City is developing and preparing to implement a Water and Waste Water System Customer Complaints and Inquiries Standard Operating Procedure (SOP).

## Benchmark Comparisons

Four other regional utilities, comparable in size and climate to the City, were surveyed to compare their O&M practices to the City's current program. These other utilities and the population they serve are listed below:

1. Asotin County Public Utility District, Washington (Asotin PUD) = 3,800.
2. City of Pullman, Washington (Pullman) = 27,150.
3. City of Redmond, Oregon (Redmond) = 28,000.
4. City of Walla Walla, Washington (Walla Walla) = 32,000.

Because each utility surveyed has unique attributes, several system performance characteristics were calculated on a unit basis for comparison. The results of these performance indicators are summarized in Table 5-4. Tables 5-5 to 5-12 highlight the responses to specific survey questions.

Compared to the four other utilities surveyed, the City ranked second in the number of lift stations maintained; third in average annual flow serviced by the collection system; and fourth in population served, length of lines maintained, and number of collection system O&M staff and budget.

The City appears to provide similar services with less funding compared with the rest of the survey group, and is in the bottom half of the group when comparing the annual budget to annual average flow collected, total gravity system length, number of lift stations and total number of FTEs on staff.

The performance indicators show that on average, each FTE in the City is responsible for more annual wastewater collection, total gravity system piping length, and total number of lift stations than most of the utilities surveyed. This shows that the City operates with fewer staff when compared to the rest of the survey group. Additionally, based on the *2012 Benchmarking, Performance Indicators for Water and Wastewater Utilities: Survey Data and Analyses Report*, the national median is 230,000 gallons per day per FTE, which, compared to the City's 1,100,000 per FTE, indicates that the City is understaffed.

Similar to other utilities over the past three years, the City received all of its funding from sewer rates. The City's monthly sewer rates are below the average of the utilities surveyed, except Pullman's.

**Table 5-4**
**Benchmarking – Performance Indicators**

| Utility Name | Number of FTE on Staff | Annual Budget/ Annual Average Flow ($/mgd) | Annual Budget/ Gravity System Length ($/feet) | Annual Budget/ No. of Lift Stations ($/ea) | Annual Average Gallons of Wastewater Collected/ FTE | Length of Gravity System/ FTE | Lift Station /FTE | Annual Budget/ FTE |
|---|---|---|---|---|---|---|---|---|
| Asotin PUD | 1 | 910,300 | 3.3 | 86,300 | 379,000 | 104,000 | 4 | 345,000 |
| Pendleton | 2 | 181,800 | 0.9 | 80,000 | 1,100,000[1] | 229,000 | 2.5 | 200,000 |
| Pullman | 4.6 | 370,100 | 2.1 | 252,600 | 590,900 | 103,900 | 1 | 218,700 |
| Redmond | 5 | 848,500 | 2.0 | 100,000 | 330,000 | 143,900 | 3 | 280,000 |
| Walla Walla | 5 | 150,000 | 0.8 | 156,000 | 1,040,000 | 190,100 | 1 | 156,000 |

[1] *Includes wastewater flows from Rieth Sewer District and the Confederated Tribes of the Umatilla Indian Reservation.*

**Table 5-5**
**Benchmarking – Service Areas**

| Rank (population served) | Utility Name | Population Served | Service Area (square miles) |
|---|---|---|---|
| 1 | Walla Walla | 32,000 | 13 |
| 2 | Redmond | 28,000 | 9.1 |
| 3 | Pullman | 27,150 | 10 |
| 4 | Pendleton | 17,611 | 13.4 |
| 5 | Asotin PUD | 3,800 | 19 |

**Table 5-6**
**Benchmarking – Flow Rates**

| Rank (average annual flow) | Utility Name | Flow (mgd) | | Calculated gpcd[1] |
|---|---|---|---|---|
| | | Average Annual | Peak Daily | |
| 1 | Walla Walla | 5.2 | 8.1 | 163 |
| 2 | Pullman | 2.7 | 7.4 | 101 |
| 3 | Pendleton | 2.2 | 3.1 | 125 |
| 4 | Redmond | 1.7 | 2.3 | 59 |
| 5 | Asotin PUD | 0.4 | 0.8 | 100 |

[1] *gpcd=gallons per capita per day.*

**Table 5-7**
**Benchmarking – Gravity Pipe**

| Rank (length of gravity pipe) | Utility Name | Total Length of Gravity Pipe (feet) | Range of Pipe Sizes (inches) | Number of Manholes |
|---|---|---|---|---|
| 1 | Walla Walla | 950,400 | 6-30 | 2,724 |
| 2 | Redmond | 719,600 | 8-30 | 3,199 |
| 3 | Pullman | 480,000 | NA[1] | NA |
| 4 | Pendleton | 458,000 | 4-24 | 1,744 |
| 5 | Asotin PUD | 104,000 | 4-24 | 420 |

[1] *NA = Not answered.*

**Table 5-8**
**Benchmarking – Lift Stations and Force Mains**

| Rank (number of lift stations) | Utility Name | Number of Lift Stations | Total Length of Force Mains (feet) |
|---|---|---|---|
| 1 | Redmond | 14 | 15,400 |
| 2 | Pendleton | 5 | 11,500 |
| 3 | Walla Walla | 5 | 3,600 |
| 4 | Asotin PUD | 4 | 8,000 |
| 5 | Pullman | 4 | 5,000 |

**Table 5-9**
**Benchmarking – Collection System O&M Staff**

| Rank (number of FTEs) | Utility Name | Number of FTEs on Staff | Number of Certified Operators | | | |
|---|---|---|---|---|---|---|
| | | | Class I | Class II | Class III | Class IV |
| 1 | Walla Walla | 5 | 3 | | | |
| 2 | Redmond | 5 | | 5 | 4 | 4 |
| 3 | Pullman | 4.6 | Varies | | | |
| 4 | Pendleton | 2 | 1 | | 1 | 1 |
| 5 | Asotin PUD | 1 | | | | |

**Table 5-10**
**Benchmarking – Budget**

| Rank | Utility Name | Total O&M Budget |
|---|---|---|
| 1 | Redmond | $1,400,000 |
| 2 | Pullman | $1,011,000 |
| 3 | Walla Walla | $780,000 |
| 4 | Pendleton | $400,000 |
| 5 | Asotin PUD | $345,000 |

**Table 5-11**
**Benchmarking – Financing**

| Utility Name | Residential Sewer Fees | | Source of Budget (%) | | | |
|---|---|---|---|---|---|---|
| | Connection Fee | Average Monthly Sewer Rate | Connection Fee | Sewer Rates | General Fund | Loans |
| Asotin PUD | $1,400 | $30.00 | 4 | 96 | 0 | 0 |
| Pendleton | $25.00[1] | $29.70 | 0 | 100 | 0 | 0 |
| Pullman | $1,232 | $23.81 | 8 | 92 | 0 | 0 |
| Redmond | $845 | $29.85 | 1 | 99 | 0 | 0 |
| Walla Walla | $2,500 | $51.00 | 5 | 95 | 0 | 0 |

[1] *Inspection fee.*

**Table 5-12**
**Benchmarking –Budget Allocation**

| Utility Name | Budget Allocation (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Repairs to the Existing System | Misc. Equipment and Material | Wages | Employee Fringe Benefits | Staff Training | Contracted Services | Other |
| Asotin PUD | 5 | 5 | 5 | 2 | 1 | 52 | 30 |
| Pendleton | 6 | 27 | 18 | 9 | 1 | 0 | 39 |
| Pullman | NA[1] | NA | NA | NA | NA | NA | NA |
| Redmond | 10 | 13 | 18 | 9 | 1 | 3 | 46 |
| Walla Walla | 10 | 2 | 29 | 11 | 1 | 0 | 47 |

[1] *NA = Not answered.*

The following summarizes responses to other survey questions. (Not all questions were answered by every utility.)

- ***System Age*: Fifty-four percent (54%) of the City's system is over 50 years old, which is relatively older than the other systems.
- ***Lift Station Capacities***: The City maintains five lift stations that have capacities of under 100 gallons per minute (gpm) to 1,000 gpm. This capacity range is similar to the other utilities surveyed.
- ***Budget Allocation***: The City has the largest percentage of total O&M budget allocated to miscellaneous equipment and material.
- ***Overtime Hours***: The annual number of overtime hours varies between 20 and 120 hours among the utilities. The amount of annual City overtime is about 20 hours, which is tied with Asotin PUD for the utility with the fewest annual overtime hours.
- ***Gravity vs. Pressure System Maintenance***: The City is similar to the majority of other utilities, with greater than 90% of O&M time spent on the gravity system.
- ***Preventative, Planned and Unplanned Maintenance***: The City does less preventative maintenance (40% of total maintenance) than the other utilities that responded. These utilities reported that 80% of their total maintenance time was spent on preventative maintenance. The City also had the highest percentage of unplanned maintenance. There are likely some differences between how each utility defines "preventative," "planned" and "unplanned" maintenance. In addition, the system's age will also impact the amount of time spent on preventative maintenance versus repairs.
- ***Pipe Inspection and Cleaning***: The City and all but one surveyed utility own their own CCTV and high-pressure jet equipment. The City also owns its own root-cutting and root-foaming equipment. The City inspects less than 1% of its system annually. On average, the other utilities performed CCTV inspections on 17% of their systems annually. As mentioned earlier in this section, the City is currently developing a pipe inspection and cleaning program.

- ***Inflow and Infiltration (I/I)*****:** The City and one of the other utilities consider I/I a problem. Based on flow monitoring results, the City attributes 6% of annual average flow to I/I, though during the spring season when the river influence is highest, I/I can be as high as 19%. Three other utilities attributed up to 26% of their average annual flow to I/I.
- ***Flow Monitoring*****:** The City owns 10 area velocity flow monitoring meters and all of the other utilities have at least one flow monitor meter; all were reported to be area velocity meters.
- ***Pipe Repair and Replacement*****:** The City does not have an annual pipe repair and replacement program. Only two utilities surveyed have such a program.
- ***Maintenance Management System*****:** The City does not have a maintenance management system. The majority of other utilities indicated they use a computerized maintenance management system.
- ***In-House Construction***: The City maintains a C&R crew for repair and replacement of collection system infrastructure, however, currently the C&R crew is assigned to work outside of the Water and Sewer Utility. Other utilities surveyed indicated that they do not have a dedicated crew for in-house construction. Only repairs and maintenance projects are performed in-house by operations staff. These utilities use their small works roster or bid out construction of new pipelines and major repair/replacement projects.
- ***Connection Fees*****:** The City does not charge a connection fee, compared to an average connection fee of $1,500 by the other utilities.
- ***GIS*****:** With the exception of the City, all utilities that answered the survey indicated that both office and field staff use GIS software. The City will soon begin having office and field use of its recently developed GIS.

## Conclusions and Recommendations

The following conclusions and recommendations are based on a review of the City's collection system O&M practices and programs, and are intended to increase the reliability of the City's collection system equipment, and improve the City's response to power and equipment failures.

### *General*

An effective O&M program requires timely, relevant information on infrastructure operations and maintenance. This information is used for planning, implementing, reviewing, evaluating, and taking appropriate O&M actions in response to collection system infrastructure needs.

The key to O&M best practices is the ability to get pertinent information from field staff to managers. The following recommendations have been defined for improving record keeping practices for the collection system:

- Update, adopt and implement the 2007 Wastewater Collection System Maintenance Program based on incorporation of the PWMP Manual best management practices to provide consistent long-term operations and maintenance.
- Expand existing record keeping and document every maintenance activity performed. This form should track each piece of equipment, and all maintenance records and man-hours required for each activity.
- Invest in ongoing training for staff related to record keeping and encourage a disciplined documentation program.
- Track and compare annual maintenance costs for each piece of equipment to help determine whether to repair or replace it.
- Continue to maintain a log of sewer backups and customer complaints and issues that includes date, time, location, estimated volume of overflows, cause of the issue, and corrective measures taken. Consider linking the complaints database to GIS.
- To help prevent the introduction and accumulation of fats, oils, and grease (FOG), which cause or contribute to sanitary sewer blockages and obstructions, the City should review and update its FOG program. Regulations typically require the use of grease control devices at food service establishments. This program should also include public information to help in addressing FOG throughout the collection system.
- Ensure that personnel are up-to-date by providing ongoing training and education opportunities (conferences, webinars, etc.).

***Gravity Collection System***

Frequent inspection and cleaning is essential for normal function and problem identification within a collection system. Based on *Optimizing Operation, and Rehabilitation of Sanitary Sewer Collections Systems Manual* (New England Interstate Water Pollution Control Commission, December 2003), CCTV inspections accomplish the following goals:

- Identify defects in the system that can contribute to or cause backups, overflows and bypasses.
- Identify chronic problem areas so maintenance can be scheduled.
- Identify defects that, if not fixed, will result in a future failure.
- Determine system needs for long-term replacement and rehabilitation.
- Develop a baseline for future comparison to determine rates of deterioration.

The City is implementing a maintenance program, defined earlier in this section, which will ensure the collection system is regularly cleaned and inspected.

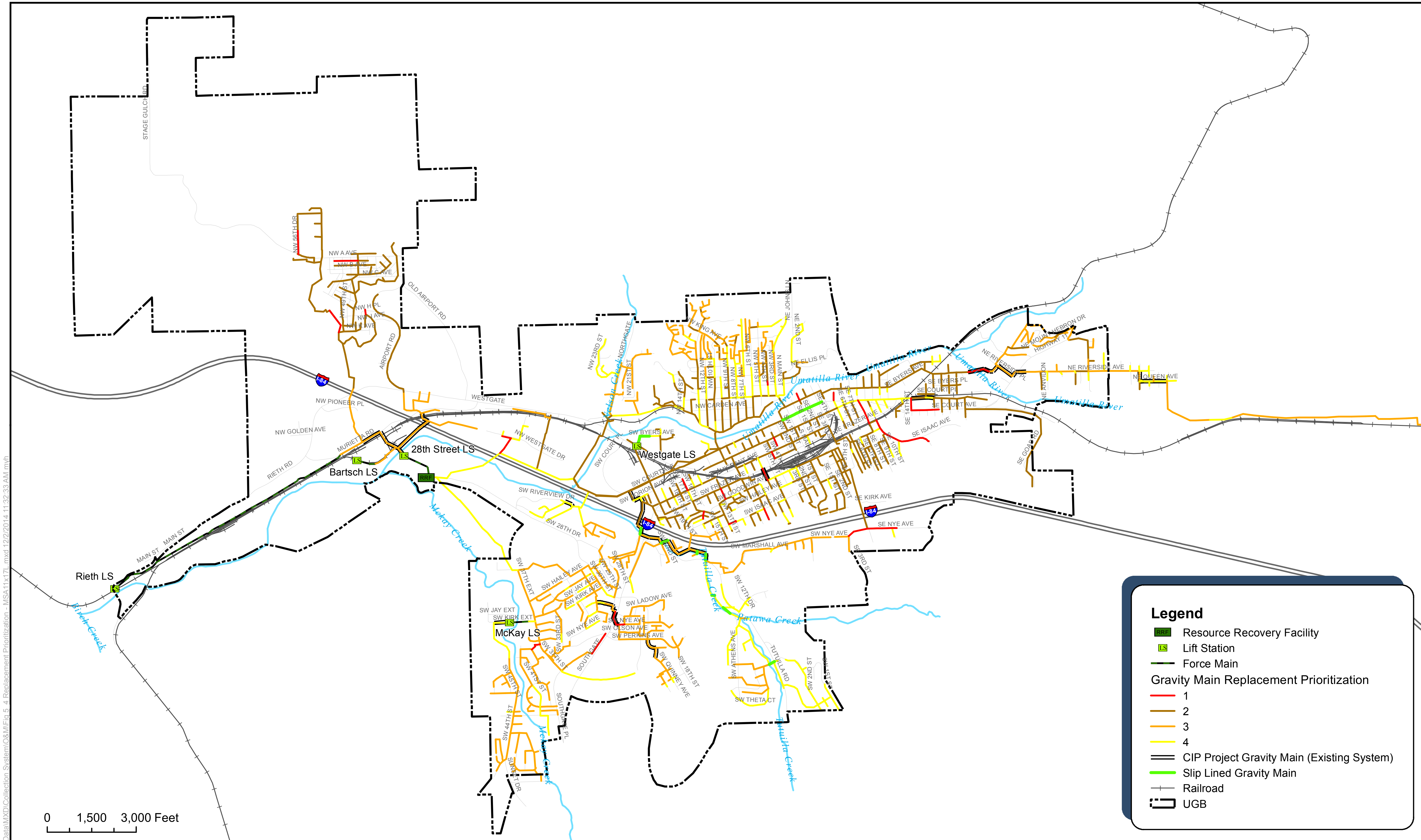
To maintain a high level of service, the City should assess and identify critical components of the sewer collection system. Recommendations for improving sewer collection system O&M follow:

- Leverage the new GIS, incorporating video inspection and resulting condition assessment to develop an initial database of pipe conditions. In the future, the City can evaluate different data collection and management software programs to find one that best meets its needs. (CUES Granite XP is one software option that the City could consider. The approximate cost for the CUES Granite XP is $14,000 for a single license and it is recommended the City consider purchasing the Engineering add-in for $695 as well, to allow for GIS connection.)
- Develop an ongoing monitoring program to utilize the 10 velocity flow monitoring meters owned by the City. This would continue to provide information on potential I/I issues with the City's collection system. Develop a program for pipe replacement based on a 100-year replacement cycle. The replacement prioritization should be:
  1. Known capacity and condition issues – Targeted replacements.
  2. Pipe material – Based on pipe material (clay, asbestos cement, and unknown).
  3. Pipe age – Coordinate replacement of pipes 50 years or older with other City pipe utilities and street (City, County, State) projects.
- Purchase a new combo truck for the Sewer Utility and transfer the existing truck to the Storm Utility. The existing truck is currently used for both utilities. A new truck will provide both utilities with a dedicated truck and expand the service each utility can provide. Costs are included in Section 6—Capital Improvement Program.
- Conduct a physical inspection of newly construction collection system to verify the accuracy and completeness of the record drawings. This inspection will ensure that the new components are clear of construction debris and rocks.

Table 5-13 highlights the priority based on material and age. See Figure 5-4 for the collection system replacement prioritization. Based on 458,000 feet of collection pipe and a 100-year replacement cycle, the City should spend a total of $52,900,000 on gravity pipe replacement over the next 100 years. The new gravity pipe replacement program will be increased incrementally starting at $250,000 per year over the next five years, increasing to $529,000 a year from six to 20 years, and increasing to approximately $547,000 per year after 20 years, which is included in the costs in Section 6.

**Table 5-13**
**Pipe Replacement Prioritization**

| Priority | Description |
|---|---|
| 1 – High | Identified Condition and Capacity Issues |
| 2 – Medium | Clay Pipe All Ages<br>Pre-1950 Asbestos Cement Pipe<br>Pre-1950 Unknown Material Pipe |
| 3– Medium | Concrete Pipe All Ages<br>Cast Iron Pipe All Ages<br>Post-1950 Unknown Material Pipe |
| 4 – Low | PVC Pipe–All Ages |




**City of Pendleton**
**Collection System Master Plan**

**Figure 5-4**
**Gravity Main**
**Replacement Prioritization**

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### *Lift Stations and Force Mains*

Based on the *Optimizing Operation, and Rehabilitation of Sanitary Sewer Collections Systems Manual*, (New England Interstate Water Pollution Control Commission, December 2003), a lift station maintenance program should be based on two factors. The first is the equipment manufacturers' recommendations for such activities as lubricating bearings, oil changes, and parts replacement. The manufacturers' recommendations should be followed especially closely during the warranty period to avoid invalidating the warranty.

The second factor is the specific requirements of the individual lift station should be followed. These requirements are based on operators' observations of the lift stations, and include knowledge gained by experience of local conditions. These can include extremes of heat or cold that may require the use of lubricants different than those in more temperate climates.

The basic inspection should include verification that alarm systems are operating properly, wet well levels are properly set, all indicator lights and voltage readings are within acceptable limits, suction and discharge pressures are within normal ranges, and that the pumps are running without excessive heat or vibration and have the required amount of lubrication.

Properly maintained lift station equipment has a typical of life of 20 years, before it needs to be replaced. These planned replacement costs are included in the City's Capital Improvement Program (CIP).

The following lift station components should be inspected monthly:

- The components comprising the alarm system (e.g., the wet well controller and electrical system); note how the pumps are sequenced.
- The pumps: bearings, packing, seals, suction and discharge gauge pressures.
- The pump motors: temperature, amperage and voltage, coupling and alignment, vibration and noise.
- The valves: check and pressure relief.
- Oil levels and lubrication.
- Belt wear and tightness.
- Emergency generator (exercise under load, if present).

Properly designed force mains are very reliable. In general, force main reliability and useful life are comparable to that of gravity sewer lines; however, pipeline reliability may be compromised by excessive pressure surges, corrosion or build-up of solids. Industry standards regarding force main maintenance are varied, and utilities that have had issues with solids build-up within force mains have typically implemented annual cleaning using cleaning pigs through pigging ports. A key aspect of lift station and force main maintenance is monitoring pump flow rates and discharge pressures to track any changes in the system that may require maintenance.

The following recommendations will allow the City to expand its collection system maintenance program to improve its lift station and force main operations and maintenance program:

- Develop an O&M manual for each lift station to provide consistent maintenance practices over the life of the station. This will also encourage transfer of the City field crew's knowledge and experience to new staff. The O&M manual should include a recommended inventory of critical components, supplier and manufacturer's contact information, and a list of local contractors for emergency repairs, including after-hours contacts.
- Develop an annual maintenance plan that includes benchmarks for the existing equipment. This would include items such as flow capacities, amp draw, and run-temperatures for pumps at each station. This plan might include a "seasonal" routine to inspect each station prior to the occurrence of the heaviest flows. This is a long-range document that may be developed over the course of several years.
- The lift station benchmark can also be used to evaluate the condition of the lift station's force main. Changes in capacity and discharge head in the lift station can indicate that the force main is experiencing solids build-up and should be investigated. The City could consider running lift stations at full capacity (e.g., all pumps on) for extended periods in order to flush the mains if solids build-up is suspected. If solids build-up continues to be a problem, the installation of a pigging port could be evaluated. This would allow for periodic cleaning to remove solid build-ups.
- Develop a lift station equipment replacement program and a force main replacement program, see Section 6 for a defined replacement program.
- Upgrade the Bartsch Lift Station with new pumps and motor controls to match the VFD submersible pump rail system in the Westgate and McKay lift stations.
- Purchase a portable generator and modify Bartsch, Westgate, and McKay lift stations to enable their connection to a portable generator.

### *Emergency Response*

An emergency response plan reduces the likelihood of system overflows and outlines procedures specifically related to manmade or natural disasters. This plan should be designed to maintain reasonable system integrity in the event of natural or other types of disasters, life-threatening situations, or other emergency conditions that affect the collection system.

Recommended updates for the City's current Emergency Management Plan include:

- Purchase a portable generator and provide a portable generator connection at the lift stations.

- Acquire and maintain the necessary equipment and infrastructure for emergency bypass operation of any of the City's lift stations. This emergency response equipment could include any or all of the following:
  - A trailer-mounted, gas- or diesel-driven bypass pump.
  - A portable emergency generator.
  - Bypass piping for the lift stations.

***Staffing***

As noted earlier in this section, the City's collection system has two FTEs, not including the PW Superintendent. Staff are assigned to operate and maintain the collection system and lift stations. The RRF and influent lift station are operated by separate staff supervised by the Wastewater Superintendent. City staffing requirements were included in the benchmarking survey to compare current staffing levels at similar utilities.

The City is operating with fewer staff to maintain wastewater collection than comparable cities and national averages, indicating that current staffing is inadequate to meet the requirements of operating and maintaining the system. And the need for additional staff will grow as the system expands, wastewater flows increase, and regulatory requirements likely become more stringent through the planning horizon.

Based on the staffing review above, the City should have more staff to implement the defined operations and maintenance programs. The following staffing recommendations are for the City to consider. Exact staffing levels need to be determined by the City:

- To implement the Cleaning and Inspection Program, the City would require 2 additional FTEs.
- To implement the O&M program and associated record keeping, the City may need up to 0.5 FTEs in a utility worker role. These FTEs could potentially be shared with other departments.
- To align all lift stations under the Wastewater Superintendent and provide consistent operation, the City should consider revising the PW organizational structure.

Staffing evaluation related to the C&R crew is based on the City's preference for cost effectively implementing the pipe replacement program. A comparison was made between the production cost per foot of the City's C&R crew and the developed capital improvement costs, which include engineering, administration and surface restoration.

The comparison indicates that historically, the City can install pipe at a cost of $134 per linear foot (lf) on average, compared to $172 per lf for outsourced work, which is what the CIP budgets are based on. The City could consider a second C&R crew to increase the length of pipe installed each year; however, approximately 40% of the City's collection system is comprised of pipes less than or equal to six feet deep, so the majority of the pipe replacement would need to be outsourced. City staff typically do not install pipe deeper than eight feet.

Therefore, the recommendation is not to add a second C&R crew specifically to increase capacity for replacing sewer collection system piping, but to rely on shared resources from a second crew that could be added for the water distribution system pipe replacement program, freeing the existing C&R crew to address collection system replacements.

- If the City is going to implement an ongoing pipe replacement program on a 100-year cycle, it would be cost effective to hire 1.5 additional FTEs, which will be part of a second crew of four full time staff with dedicated equipment to perform this work compared to contracting it out. The other 2.5 FTEs on the crew would be shared and funded with the Water and Storm Utilities.

**Summary**

The assessment of the City's collection system O&M program included review of information from City staff, comparison with the O&M practices of similarly sized utilities, and regulatory requirements. Staff from the City's Sewer Utility and Streets Division are responsible for the operations and maintenance of the wastewater treatment and collection system, respectively.

Based on the size of the City's system, the State of Oregon requires a Grade IV Wastewater Treatment System Operator (WWT-4) and a Grade III Wastewater Collection Operator (WWC-3) license for the individual in direct charge of the system. The current combination of the Sewer Utility and Streets Division is structured to operate with nine FTEs.

Routine operations of the City's collection system includes monthly visits to all lift stations, periodically inspecting and cleaning the gravity sewer mains, and responding to customer inquiries and complaints.

A benchmark survey of four other regional utilities was compiled to compare their O&M practices to the City's current program.

The performance indicators show that each FTE in the City is responsible for more wastewater collected (annual average basis), and total length of gravity system and number of lift stations than most of the utilities surveyed. In general, the City operates with fewer staff than the other utilities.

The following conclusions and recommendations are based on a review of the City's O&M practices and benchmarking the other collection systems:

- Update, adopt and implement the 2007 Wastewater Collection System Maintenance Program based on incorporation of the PWMP Manual best management practices to provide consistent long-term operations and maintenance.
- Expand existing record keeping to include documentation of every maintenance activity.

- Train staff in record keeping, and maintain a disciplined documentation program.
- Track and compare annual maintenance costs for each piece of equipment to help determine whether to repair or replace it.
- Continue to maintain a log of sewer backups, and customer complaints and issues.
- Link the complaints database to GIS.
- Develop a collection system condition assessment database.
- Review and update the collection system's FOG program.
- Develop an ongoing monitoring program that uses the 10 City-owned velocity flow monitoring meters.
- Develop a pipe-replacement program based on a 100-year cycle.
- Conduct a physical inspection before accepting newly constructed collection system piping.
- Purchase a new combo truck for the Sewer Utility.
- Develop O&M manuals for each lift station to provide consistent maintenance practices.
- Develop an annual maintenance plan that includes benchmarks for the existing equipment.
- Develop a lift station equipment replacement program.
- Upgrade the Bartsch Lift Station with new pumps and motor controls to match the VFD submersible pump rail system in the Westgate and McKay lift stations (this station also is recommended for VFD implementation to better match existing flows).
- Purchase a portable generator and modify Bartsch, Westgate, and McKay lift stations so they can connect to a portable power source.
- Acquire and maintain the necessary equipment and infrastructure for emergency bypass operation of any City lift station.
- Hire 2 additional FTEs to implement the Cleaning and Inspection Program.
- Hire up to 0.5 FTEs in a utility worker role, who could potentially be shared with other departments, to implement the O&M program and any associated record keeping.
- Place the Wastewater Superintendent in charge of all lift stations to ensure their consistent operation.
- If the City is going to implement an ongoing pipe replacement program on a 100-year cycle, it would be cost effective to hire 1.5 additional FTEs, which will be part of a second crew of four full time staff with dedicated equipment to perform this work compared to contracting it out. The other 2.5 FTEs on the crew would be shared and funded with the Water and Storm Utilities.

Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 6
Capital Improvement Program

# SECTION 6
# CAPITAL IMPROVEMENT PROGRAM

## Introduction

This section presents the Capital Improvement Program (CIP) for the City of Pendleton's (City's) collection system. It summarizes the recommended system improvement projects to correct deficiencies identified in Section 4—System Analysis and improvements for ongoing repair and replacement of aging collection system infrastructure discussed in Section 5—Operations and Maintenance. It also acts as a blueprint for forecasting capital expenditures and preparing the City to meet its collection system infrastructure needs for existing and future customers.

The recommended improvements in this CIP prioritize projects and assign planning-level costs for each project. For the projects identified in this section, the recommended facility sizes and designated locations are schematic. A Preliminary Engineering Report (PER) should be completed for each improvement project to identify its final sizing and location, as a PER provides project-specific details not found within this CSMP.

During the final design of each project, it will be necessary to confirm design flows, pipe and facility sizes, and configurations based upon the current land use plan, proposed development, utility surveys, soil investigations, utility conflicts, physical constraints, and other relevant field conditions.

This section identifies three categories of CIP projects:

1. **Annual replacement program:** This ongoing program ensures repairs or replacement of piping on a 100-year cycle, and lift stations on a 20-year cycle.
2. **Non-airport capacity projects:** These projects provide infrastructure with adequate capacity to convey future flow for the following planning horizons within the City's service area (excluding airport area): immediate (2013), 10-year, 20-year, and build-out as identified in Section 4.
3. **Airport Industrial Area (AIA) projects**: These projects serve future development in the AIA area and address any deficiencies identified in Section 4.

## Project Cost Estimates

All project descriptions and cost estimates in this CIP represent planning-level accuracy and opinions of costs (+50%, -30%). During the design phase of each improvement project, identified lengths should be verified and elevations should be surveyed. Recommended pipeline diameters will vary, based on final design alignment and survey elevations.

In addition, force main diameters may be affected by future lift station improvements or reduction in capacity. The final cost of individual projects will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule and other factors. Because of these factors, project feasibility and risks must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding.

Project cost estimates are intended to help establish funding requirements based on information available at the time of the CIP development. Since construction costs change periodically, an indexing method to adjust present estimates in the future was used. This CIP's project costs were developed in December 2013 dollars based on the Engineering News-Record (ENR) 20-City Average Construction Cost Index (CCI). These cost estimates should be reevaluated periodically to account for inflation and/or regional variation.

Appendix E explains the procedure used in determining project cost estimates, and describes the assumptions made for surface restoration, encountering bedrock, commonly occurring construction activities (such as erosion control), contingency factors, and other elements.

## Capital Improvements

As explained in Section 4, gravity mains, lift stations, and force mains that did not meet the hydraulic capacity criteria were identified for peak dry and peak wet weather conditions for existing, 5-year, 10-year, 20-year and beyond 20-year planning horizons. A subsequent analysis determined the improvements required to address these deficiencies.

The resulting proposed improvements were sized to convey the projected peak dry and wet weather build-out flows, while meeting the required hydraulic criteria and design standards.

## Annual Replacement Program

An annual replacement program includes the replacement of gravity mains, force mains and lift stations as they age and as condition issues arise. Section 5 provides a prioritization of gravity main replacement based on current condition issues identified by the City in addition to age and material information. Piping is assumed to be repaired or replaced every 100 years, and lift stations every 20 years. The annual replacement program cost will be increased incrementally over time to allow for a startup period with the first five years focused on gravity main replacements at a total estimated cost of $250,000 per year. After five years, the cost will increase to $672,000 per year and then to approximately $699,000 per year after 20 years; including budget for gravity mains, force mains, and lift station replacement.

## Non-Airport Capacity Projects

The proposed capacity projects are shown in Figure 6-1 and listed in Table 6-1. These projects address system deficiencies and the additional infrastructure required to convey existing and projected flows within the future service area. Projects required to convey future flows from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) are included in this group.

***Immediate Projects***

Results from capacity analyses and flow projections have determined that the following projects are required to convey existing peak dry and peak design flows and should be constructed within the next five years:

*CIP G-1*

This project addresses wet weather capacity deficiencies, and involves three segments of gravity pipe and a new diversion structure. The first segment is a new 8-inch pipe upstream of the diversion structure starting from approximately 50 feet west of the Highway 11 and Isaac Avenue intersection, going cross-country northwest to SE 4th Street. This segment changes the existing route and includes abandoning the existing 8-inch pipe going west along Isaac Avenue between Highway 11 and SE 3rd Street.

The second segment is a new 8-inch pipe downstream of a proposed diversion structure located at the intersection of SE Goodwin Avenue and SE 4th Street. The new diversion will use existing piping along SW Frazer Avenue and SE 3rd Street, conveying existing and future flows towards the Resource Recovery Facility (RRF).

The third segment upgrades the existing pipe from 8 to 10 inches and is located along SW 6th Street between SW Frazer Avenue and SW Goodwin Avenue. This segment goes beneath the railroad and will add hydraulic capacity to the system. Additional costs were included for the railroad crossing.

*CIP L-1A*

This project upgrades the 28th Street Lift Station's firm capacity from 500 to 1,500 gallons per minute (gpm) to address a wet weather capacity deficiency. This lift station collects flows from the 18-inch trunk that conveys flows from the Rieth Sanitary Sewer District (RSSD) and Basin A, located in northwest Pendleton. Variable frequency drives (VFDs) are also recommended for the lift station upgrade so downstream peaks are minimized to address the wet weather force main velocity deficiency at 28th Street Lift Station. Beyond 20 years, the lift station will need to be upgraded to convey projected build-out flows (See CIP L-1B).

*CIP L-6*

This project replaces existing pump motors and adds VFDs to the Bartsch Lift Station, which is oversized when compared to existing and future inflow. New motors with VFDs will reduce downstream peaks to the 28th Street Lift Station and force main, addressing the wet weather force main velocity deficiency.

A budgetary cost of $370,000 has been provided to replace the Sewer Utility's combo truck that is currently planned to be transferred to the City's Storm Utility. This cost assumes an estimated $420,000 to purchase a new truck and a $50,000 transfer of funds from the Storm

Utility to the Sewer Utility for the current combo truck based on the truck's estimated trade-in value. This cost may be reduced through the procurement of a used vehicle.

One collection system master plan update is budgeted within this timeframe (approximately every five years) at a cost of $150,000.

### *10-Year Projects*

Results from the capacity analyses and associated flow projections have determined that the following projects will be required to convey 10-year peak dry and peak wet weather flows. For 10-year conditions, the CTUIR was assumed to contribute a constant flow of 0.75 million gallons per day (mgd) (525 gpm) to the City's collection system.

*CIP G-2*

This project upgrades the existing pipe from 8 to 12 inches along SW Riverview Drive from SW Overlook Street, going southeast approximately 300 feet. This improvement will address a wet weather capacity deficiency identified in the existing timeframe.

The deficiency is the result of the wet weather design flow assumptions and there is no indication of a problem during dry weather conditions. City staff has not observed any problems at this location. It is recommended that the City monitor this sewer before project implementation.

*CIP G-5*

This project consists of two pipe-segment upgrades and will address wet weather capacity deficiencies. The first upgrade expands the existing pipe from 12 to 18 inches, and the second from 18 to 24 inches. This project will increase the system capacity to convey flows from the RSSD and from development in Basin A, including the AIA area located in northwest Pendleton. Timing of this project will depend on development within the AIA and should be re-evaluated as growth occurs there.

One collection system master plan update is budgeted within this timeframe (approximately every five years) at a cost of $150,000.

### *20-Year Projects*

Results from capacity analyses and flow projections have determined that the following projects will be required in order to convey 20-year peak dry and peak wet weather flows. For 20-year conditions, the CTUIR was assumed to contribute a constant flow of 1.0 mgd

(700gpm) to the City's collection system. Cost for CTUIR projects include cost required for conveyance and do not include any additional cost for wastewater treatment.

*CIP G-3*

This project is a new 18-inch pipe to serve McKay Lift Station's contributing area and allows decommissioning of this station. The project starts at SW $11^{th}$ Street and SW Kirk Extension, along SW Kirk Extension, then along SW $42^{nd}$ Street and cross-country across McKay Creek to SW $37^{th}$ Extension, then along SW $37^{th}$ extension and cross-country to connect with the existing 24-inch pipe approximately 1,700 feet northwest of the SW $37^{th}$ Extension and SW Hailey Avenue intersection. Additional costs were included for the creek crossing. This project will address an existing dry weather force main velocity deficiency. The existing through 20-year dry weather force main velocities are between 6 and 7 feet per second and is a lower priority than other improvements over the next 20 years. Therefore, the recommended timing for this project is 20 years.

This project includes decommissioning the McKay Lift Station and force main. This cost includes demolition of the lift station, salvage of valuable components, haul and disposal of waste, backfilling of lift station area, surface restoration, and abandoning the force main in place.

A $4,000-per-acre property acquisition fee for construction outside of the right-of-way (ROW) is included in this cost, as recommended by the City.

*CIP G-6*

This project upgrades the existing pipe downstream of the connection with the CTUIR line from 10 to 12 inches. The alignment runs along NE Queens Avenue between NE $45^{th}$ Street and NE $42^{nd}$ Street, then along NE $42^{nd}$ Avenue to NE Riverside Avenue. This project addresses dry weather capacity deficiencies by providing capacity to accommodate the maximum permitted flow (1.0 mgd) from the CTUIR. The actual timeframe for this project will depend on when flows increase from the CTUIR. The City should consider installing its own meter on the CTUIR line to determine the timing of this improvement.

*CIP G-7*

This project addresses dry weather and wet weather capacity deficiencies by upgrading existing pipe from 12 to 16 inches along NE Riverside Avenue between NE Anvidon Street and Highway 11, then along Highway 11 to NE Riverside Place, then along Riverside Place approximately 600 feet, then southwest cross-country across the Umatilla River to southeast Byers Avenue. Additional costs were included for the river crossing.

This project is sized to accommodate the maximum permitted flow (1.0 mgd) from the CTUIR and build-out flows within Basin I and J located in northeast Pendleton along the Umatilla River. It is recommended that the City perform additional field investigations at this location to determine the condition of the existing pipe. The timeframe for this project will be dictated by the development within the CTUIR and the condition of the existing piping.

The City should also consider installing its own meter on the CTUIR line to determine the timing of this improvement.

Two collection system master plan updates are budgeted within this timeframe (approximately every five years) at a cost of $150,000 each.

***Beyond 20-Years Projects***

*CIP G-8*

This project will upgrade two pipe segments to address wet weather capacity deficiencies. The first existing pipe segment will be upgraded from 12 to 16 inches, and parallels Tutuilla Creek from the Tutuilla Road crossing with Tutuilla Creek to SW 21st Street, then along SW 21st Street to SW Hailey Avenue, then along Hailey Avenue to SW 22nd Avenue, then parallels Tutuilla Creek to approximately 200 feet west of Southgate. This segment crosses Tutuilla Creek four times.

The second existing pipe segment will be upgraded from 12 to 18 inches, continuing from the first segment and paralleling Southgate (arterial) across Interstate 84 to SW 22nd Street, then along SW 22nd Street to SW Dorian Avenue, then along SW Dorian Avenue to SW 23rd Street, then along SW 23rd Street to SW Court Place, crossing Tutuilla Creek once.

This project will provide capacity to convey build-out flows in Basin E, located in southern Pendleton along Tutuilla Creek. Additional costs were included for interstate and creek crossings. No alternative alignments were found to move the pipe segments currently located adjacent to Tutuilla Creek to a location within the existing ROW.

*CIP G-9*

This project upgrades the existing pipe from 8 to 12 inches along SE Court Place, between SE 17th and SE 14th streets. It will provide capacity to convey build-out flows for upstream development in Basin F located in southeast Pendleton, addressing wet weather capacity deficiencies.

*CIP G-10*

This project addresses wet weather capacity deficiencies by upgrading existing pipe from 8 to 10 inches. It crosses and runs parallel to Southgate (arterial) from SW Nye Avenue to SW 28th Street, then along SW 28th Street to SW Ladow Avenue, then east along SW Ladow Avenue to approximately 400 feet northeast of SW 31st Street. Additional costs were included for the arterial crossing. The completed project will convey build-out flows in the southeast portion of Basin B located in southwest Pendleton along McKay Creek.

A portion of the existing gravity main has been identified by the City as a condition and grade problem, which could accelerate the project.

*CIP G-11*

This project upgrades the existing pipe from 8 to 12 inches along SW 22nd Street between SW Quinney Avenue and SW Quinney Drive, then along SW Quinney Drive to SW Perkins

Avenue. It will convey build-out flows for upstream development in Basin B located in southwest Pendleton, and address wet weather capacity deficiencies.

*CIP G-12*

This project will serve as the new trunk to convey build-out flows from the AIA to 28th Street Lift Station and consists of five segments:

- The first segment is a new 16-inch pipe connecting to the existing system at approximately 500 feet southeast of NW 56th Drive and NW A Avenue intersection abandoning the existing pipe to the south and conveying flows along NW A Avenue to Airport Road. This segment will connect to the existing system at three additional locations, diverting flows down the new trunk and abandoning existing 8-inch pipe connections. The first new connection is located approximately 300 feet west of NW A Avenue and NW 52nd Street, the second is located at NW A Avenue and NW48th Street, and the third is located at NW A Avenue and NW C Avenue.
- The second segment is a new 12-inch pipe continuing from the second segment along Airport Road to Old Airport Road, then along Old Airport Road to approximately 200 feet north of Westgate (arterial). This segment along Airport Road assumes an unpaved surface restoration.
- The third segment is a new 16-inch pipe that continues south from the second segment along Old Airport Road crossing Westgate (arterial) and continuing cross-country to Murietta Road, then along Murietta Road and cross-country to connect to the existing system.
- The fourth existing pipe segment will be upgraded from 10 and 12 inches to 16 inches continuing from the fourth segment running parallel to Murietta Road and then south, cross-country, across the railroad.
- The fifth existing segment will be upgraded from 12 and 14 inches to 18 inches, continuing from the forth segment, cross-country southeast and then southwest across Interstate 84 to connect to CIP G-5, approximately 300 feet northwest of 28th Street Lift Station.

This improvement will address dry weather and wet weather capacity deficiencies. New pipes in this project were assumed to, where possible, generally follow the slope of the terrain. Additional costs were included for arterial, interstate, and railroad crossings.

*CIP L-1B*

This project upgrades the 28th Street Lift Station to a firm capacity of 4,900 gpm, to collect projected build-out flows from RSSD and Basin A. This project should be built in conjunction with CIP F-1, and is a subsequent expansion to CIP L-1A. This improvement will address wet weather and dry weather firm capacity deficiencies.

*CIP L-2*

This project upgrades Rieth Lift Station to a firm capacity of 400 gpm to convey projected build-out flows from the RSSD and should be built in conjunction with CIP F-2. This improvement will address wet weather and dry weather firm capacity deficiencies.

*CIP F-1*

This project upgrades the existing 28$^{th}$ Street Lift Station force main from 8 to 16 inches. CIP L1-B must be implemented in conjunction with this improvement, which will address wet weather and dry weather velocity deficiencies.

*CIP F-2*

This project upgrades the existing Rieth Lift Station force main from 4 to 6 inches to convey projected build-out flows from the RSSD. This improvement will address a wet weather velocity deficiency, and should be built in conjunction with CIP L-2.

**Table 6-1**
**CIP Capacity Projects**

| Gravity Main Projects | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CIP ID** | **Description** | **Recommended Diameter (in)** | **Total Project Length (ft)** | **Surface Restoration Type** | **Rock Excavation** | **Dewatering** | **Crossings** | **Total Cost** | **Timeframe** |
| G-1 | New 8-in pipe going northwest cross-country from 50 ft west of Highway 11 and Isaac Ave intersection to SE 4th St. (Addresses Def-1) | 8 | 800 | Local Road | Y | Y | | $204,000 | Immediate |
| | New 8-in pipe along SE 4th St between SE Goodwin Ave and the railroad, including a new diversion structure at the intersection of SE Goodwin Ave and SE 4th St. (Addresses Def-1) | 8 | | Local Road | N | Y | | | |
| | Upgrade existing 8-in pipe to 10-in pipe along SW 6th St between SW Goodwin Ave and SW Frazer Ave. (Addresses Def-1) | 10 | | Local Road | N | Y | Railroad | | |
| G-2 | Upgrade existing 8-in pipe to a 12-in pipe along SW Riverview Dr between Overlook St and SW Riverview Dr. (Addresses Def-2) | 12 | 300 | Local Road | N | N | | $104,000 | 10-Year |
| G-5[1] | Upgrade existing 12-in pipe to 18-in pipe along Murietta Rd between McKennon Rd and I-84, then cross-country southeast approximately 800 ft. (Addresses Def-9) | 18 | 1,900 | Local Road | N | Y | 3 x Railroad | See Table 6-2 | 10-Year |
| | Upgrade existing 12- and 18-in pipe to 24-in pipe southeast cross-country between the railroad and 28th Street Lift Station. (Addresses Def-9) | 24 | | Local Road | N | Y | River | | |
| G-3[2] | New 18-in pipe along SW Kirk Ext between SW 44th St and SW 42nd St, then along SW 42nd St, then north cross-country across McKay Creek to SW 37th Ext, then along SW 37th Ext, then cross-country going north and then east to connect to existing 24-in line. Project includes decommission of McKay Lift Station. (Addressed Def-3 and Def-14) | 18 | 3,300 | Local Road and Unpaved | N | Y | Stream | $743,000 | 20-Year |
| G-6 | Upgrade existing 10-in pipe to 12-in pipe along NE Queens Ave from NE 45th St to NE 42nd St, then along NE 42nd St to NE Riverside Ave. (Addresses Def-6) | 12 | 1,300 | Local Road | N | Y | | $356,000 | 20-Year |
| G-7 | Upgrade existing 12-in pipe to 16-in pipe along NE Riverside Ave between NE Anvidon and Highway 11, then along Highway 11 to NE Riverside Pl, then along Riverside Pl approximately 600 ft, then southwest cross-country to SE Byers Ave. (Addresses Def-7) | 16 | 2,300 | Local Road and Unpaved | N | Y | River | $616,000 | 20-Year |
| G-8 | Upgrade existing 12-in pipe to 16-in pipe paralleling Tutuilla Creek from the Tutuilla Rd crossing to SW 21st St, then along SW 21st St to SW Hailey Ave, then along Hailey Ave to SW 22nd Ave, then parallels Tutuilla Creek to approximately 200ft west of Southgate (arterial). (Addresses Def-10) | 16 | 4,900 | Local Road and Unpaved | N | Y | Interstate, 5 x Stream | $1,592,000 | Beyond 20 Years |
| | Upgrade existing 12-in pipe to 18-in pipe paralleling Southgate (arterial) from I-84 on/off ramp going across I-84 to SW 22nd St, then along SW 22nd St to SW Dorian Ave, then along SW Dorian Ave to SW Court Pl. (Addresses Def-10) | 18 | | Local Road and Unpaved | N | Y | | | |
| G-9 | Upgrade existing 8-in pipe to 12-in pipe along SE Court Pl from SE 17th St to SE 14th St. (Addresses Def-11) | 12 | 800 | Local Road | N | Y | None, Parallels Railroad | $169,000 | Beyond 20 Years |
| G-10 | Upgrade existing 8-in pipe to 10-in pipe along and paralleling Southgate (arterial) from SW Nye Ave to SW Ladow Ave, then east along SW Ladow Ave approximately 560 ft (Addresses Def-12) | 10 | 1,400 | Local Road | Y | N | Arterial Road | $402,000 | Beyond 20 Years |

| Gravity Main Projects | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CIP ID** | **Description** | **Recommended Diameter (in)** | **Total Project Length (ft)** | **Surface Restoration Type** | **Rock Excavation** | **Dewatering** | **Crossings** | **Total Cost** | **Timeframe** |
| G-11 | Upgrade existing 8-in pipe to 12-in pipe along SW 22nd St between SW Quinney Ave and SW Quinney Dr, then along SW Quinney Ave to SW Perkins Ave. (Addresses Def-13) | 12 | 800 | Local Road | Y | N | | $323,000 | Beyond 20 Years |
| G-12 | New 12-in pipe along NW A Ave between NW C Ave and Airport Rd, then along Airport Rd to Old Airport Rd, then along Old Airport Rd to approximately 300 ft north of Westgate (arterial). (Addresses Def-16) | 12 | 12,000 | Local Road and Unpaved | Y | N | | $2,641,000 | Beyond 20 Years |
| | New 16-in pipe connecting to the existing system at NW A Ave and NW 52 St, then along NW A Ave between NW 52 St and NW C Ave. | 16 | | Local Road | N | N | | | |
| | New 16-in pipe along Old Airport Rd from approximately 300 ft north of Westgate to Westgate (arterial), then cross-country to Murietta Rd, then along west along Murietta Rd approximately 800 ft to connect to existing 10-in pipe. (Addresses Def-16) | 16 | | Local Road | N | N | Arterial Road | | |
| | Upgrade existing 10- and 12-in pipe to 16-in running parallel to Murietta Rd approximately 600 ft from approximately 1,000 ft southwest of Westgate and Old Airport Rd, then south approximately 200 ft, cross-country, across the railroad. (Addresses Def-16) | 16 | | Unpaved | N | N | Railroad | | |
| | Upgrade existing 12 and 14-in pipes to 18-in pipe running parallel to I-84 for approximately 400ft from approximately 200 ft northeast of I-84 and the railroad intersection, then going southwest cross-country across I-84 to approximately1,100 ft southwest of I-84. (Addresses Def-16) | 18 | | Unpaved | N | N | Interstate | | |
| | | | | | | | **Subtotal Cost (Gravity Main):** | **$7,150,000** | |

| Force Main Projects | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **CIP ID** | **Description** | **Diameter (in)** | **Total Project Length (ft)** | **Surface Restoration Type** | **Rock Excavation** | **Dewatering** | **Total Cost** | **Timeframe** |
| F-1 | Upgrade 28th Street Lift Station Force Main (existing 8-in)[3] (Addresses Def-8) | 16 | 1,300 | Unpaved | N | Y | $185,000 | Beyond 20 Years |
| F-2 | Upgrade Rieth Lift Station Force Main (existing 4-in)[3] (Addresses Def-17) | 6 | 9,000 | Unpaved | N | Y | $600,000 | Beyond 20 Years |
| | | | | | | **Subtotal Cost (Force Main):** | **$785,000** | |

| Lift Station Projects | | | | | |
|---|---|---|---|---|---|
| **CIP ID** | **Description** | **Firm Capacity (gpm)** | **Firm Horsepower (HP)** | **Total Cost** | **Timeframe** |
| L-6 | Bartsch Lift Station VFD and motor replacement (existing 2 pumps) (Addresses Def-8) | 120 | 3 | $128,000 | Immediate |
| L-1A[4] | Increase capacity of 28th Street Lift Station (Addresses Def-4 and Def-8) | 1,500 | 15 | $446,000 | Immediate |
| L-1B[5] | Increase capacity of 28th Street Lift Station (Addresses Def-4) | 4,900 | 85 | $3,328,000 | Beyond 20 Years |
| L-2[4] | Increase capacity of Rieth Lift Station (Addresses Def-5) | 400 | 25 | $583,000 | Beyond 20 Years |
| | | | **Subtotal Cost (VFD):** | **$4,485,000** | |
| | **Total Cost** | | | **$12,420,000** | |

[1] *Timing for this project is dependent on development planned in the AIA, RSSD and the rest of Basin A. It should be re-evaluated if planned development in the AIA does not occur within 10 years. This project is referenced in this subsection, but project cost is not included. Refer to AIA Projects Cost Table 6-3 for project cost.*
[2] *The associated cost includes property acquisition.*
[3] *Force main projects can be constructed as an upgrade to the existing force main or as a new parallel pipe.*
[4] *Cost is based on the cost curve for submersible lift stations.*
[5] *Cost is based on the cost curve for wet well\dry well lift stations.*

## Airport Industrial Area Projects

AIA projects are sized to accommodate future industrial development. Significant development is assumed to occur within the next 10 years. To accommodate this expected growth as it develops immediate projects to provide collection system infrastructure are required.

Proposed alignments and locations for future services were based on current and future road alignments, parcel boundaries, topography, and input from the City. Gravity pipe diameters for new pipes were calculated assuming minimum slope, unless otherwise indicated.

These projects will be constructed as development in the AIA warrants. This CSMP provides guidance on the sizing and network configuration to be confirmed and verified through detailed preliminary and final designs.

The proposed AIA alignment is based on an assumed future connection to the existing system. If the connection points change, the proposed projects may also require modification.

A summary of the recommended AIA projects are presented in Table 6-2, which also provides information related to what projects need to be constructed prior to or concurrently with a given improvement in order for it to operate correctly. Figure 6-2 shows the locations of these projects. The following projects appear in the order in which it is recommended they be constructed.

### *Immediate Projects*

*CIP G-17*

The first segment of this project is a new 16-inch gravity pipe to convey projected build-out flows for development along Airport Road, as well as flows collected from the rest of the AIA from Airport Road Lift Station force main (CIP F-5); it will be constructed alongside Airport Road, connecting to the existing system at Airport Road and NW 56$^{th}$ Drive intersection. The second segment will upgrade the existing pipe from 8 to 16 inches along NW A Avenue from NW 56th Drive east for approximately 600 feet. Beyond 20 years a new trunk (capacity project G-12) will be constructed to convey build-out flows in Basin A including flows from G-17.

The new gravity pipe diameter for project was sized assuming minimum pipe grade following existing topography. Required concurrent or preceding project includes L-1A.

*CIP F-5*

This project is a new 10-inch force main to convey new Airport Road Lift Station (CIP L-5) flows to CIP G-17. It will be constructed alongside Airport Road. Required concurrent or preceding projects include L-1A, G-17 and L-5.

*CIP L-5*

This project is a new lift station with a firm capacity of 1,700 gpm, located at the intersection of Stage Gulch Road and Airport Road. It will serve projected build-out flows collected throughout the AIA. Required concurrent or preceding projects include L-1A, G-17 and F-5.

*CIP G-15*

This project is a new 16-inch gravity pipe to convey projected build-out flows for development in the AIA and will connect Stage Gulch Rd Lift Station force main (CIP F-4) to Airport Road Lift Station (CIP L-5). This project is to be constructed alongside Stage Gulch Road. Required concurrent or preceding projects include L-1A, G-17, F-5 and L-5.

*CIP G-16*

This project is a new 12-inch gravity pipe to convey projected build-out flows for development in the southwestern portion of the AIA to Airport Road Lift Station (CIP L-5). It will be constructed alongside Airport Road. Required concurrent or preceding projects include L-1A, G-17, F-5 and L-5.

*CIP G-18*

This project is a new 8-inch gravity pipe to convey projected build-out flows from development along Airport Road to the Airport Road Lift Station (CIP L-5). It will be constructed alongside Airport Road. Required concurrent or preceding projects include L-1A, G-17, F-5 and L-5

*CIP F-4*

This project is a new 6-inch force main to convey new lift station Stage Gulch Road (CIP L-4) flows to CIP G-15. It will be constructed alongside the future road and Stage Gulch Road. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, and L-4.

*CIP L-4*

This project is a new lift station with a firm capacity of 600 gpm, located approximately 3,800 feet north of Airport Road and approximately 1,500 feet east of Stage Gulch Road. This lift station will serve projected build-out flows for development in the eastern and central AIA. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, and F-4.

*CIP G-14*

This project is a new 12-inch gravity pipe to convey projected build-out flows for development in the central portion of AIA, and will convey flows from East Airport Lift Station force main (CIP F-3) to Stage Gulch Road Lift Station (CIP L-4). It will be constructed alongside a new road to be built in conjunction with the planned development. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, F-4 and L-4.

*CIP G-19*

This project is a new 8-inch gravity pipe to convey projected build-out flows from development in the northwest AIA to Stage Gulch Road Lift Station (CIP L-4). It will be constructed alongside Stage Gulch Road and a planned road to serve future development. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, F-4 and L-4.

*CIP F-3*

This project is a new 4-inch force main to convey new East Airport Lift Station (CIP L-3) flows to CIP G-14. The new force main will be constructed alongside the future road. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, F-4, L-4, G-14, and L-3.

*CIP L-3*

This project is a new lift station with a firm capacity of 300 gpm, located approximately 5,900 feet north of NW A Avenue and approximately 7,200 feet east of Stage Gulch Road. The lift station will serve projected build-out flows for development in the northeast portion of the AIA. Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, F-4, L-4, G-14 and F-3.

*CIP G-13*

This project is a new 8-inch gravity pipe to convey projected build-out flows for development planned in the eastern portion of the AIA, and will be constructed alongside a new road that will be built in conjunction with the planned development. It will connect new development to the East Airport Lift Station (CIP L-3). Required concurrent or preceding projects include L-1A, G-17, F-5, L-5, G-15, F-4, L-4 and G-14, F-3 and L-3.

### ***10-Year Project***

*CIP G-5*

This project described earlier in this section consists of two segments and will address wet weather capacity deficiencies. The first segment upgrades the existing pipe from 12 to 18 inches along Murietta Road between McKennon Road and Interstate-84, then cross-country across three railroad tracks, to the southeast, approximately 400 feet. The second segment upgrades the existing pipe from 18 to 24 inches, continuing from the first segment going southeast cross-country, across the Umatilla River, to connect to the 28$^{th}$ Street Lift Station. Additional costs were included for river and railroad crossings.

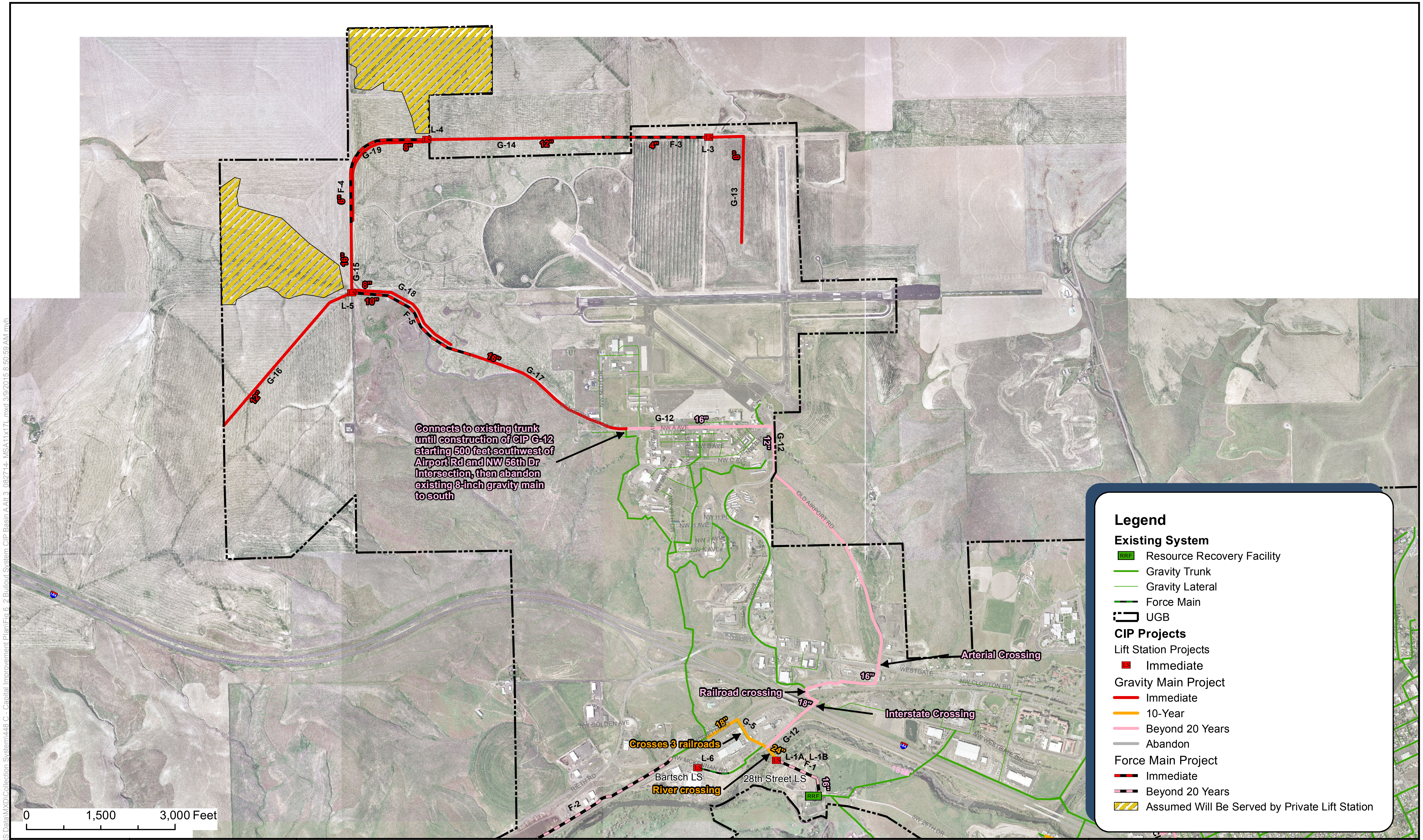
This project is required to convey flows projected through the 20-year planning horizon from the AIA, RSSD, and other development planned in Basin A, located in northwest Pendleton. CIP G-5 was also mentioned in the proposed capacity projects sub-section, with costs included in the AIA project summary only. This project requires CIP project L-1A to be constructed.

**Table 6-2**
**Airport Industrial Area CIP**

| CIP ID | Description | Required Concurrent or Preceding Projects | Recommended Diameter (in) | Total Project Length (ft) | Surface Restoration Type | Rock Excavation | Dewatering | Crossings | Total Cost | Timeframe |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gravity Main Projects** | | | | | | | | | | |
| G-13 | New 8-in pipe going north approximately 2,200ft cross-country from approximately 3,700ft northeast of NW A Ave, then going cross-country east 700ft. | L-1A, G-17, F-5, L-5, G-15,F-4, L-4, G-14, F-3, L-3 | 8 | 2,900 | Unpaved | N | N | | $378,000 | Immediate |
| G-14 | New 12-in pipe going west cross-country paralleling Daniel Rd to the south approximately 1,000 ft between Hagen Rd and Stage Gulch Rd. | L-1A, G-17, F-5, L-5, G-15,F-4, L-4 | 12 | 2,500 | Unpaved | N | N | | $395,000 | Immediate |
| G-15 | New 16-in pipe along Stage Gulch Rd between Airport Rd and approximately 2,600 ft south of Daniel Rd. | L-1A, G-17, F-5, L-5 | 16 | 1,400 | Unpaved | N | N | | $254,000 | Immediate |
| G-16 | New 12-in pipe along Airport Rd between the west border of UGB and Stage Gulch Rd. | L-1A, G-17, F-5, L-5 | 12 | 3,800 | Unpaved | N | N | | $576,000 | Immediate |
| G-17 | New 16-in line along Airport Rd between NW 56th Dr and approximately 2,800ft east of Stage Gulch Rd. | L-1A | 16 | 3,600 | Unpaved | N | N | | $682,000 | Immediate |
| | Upgrade existing 8-in pipe to 16-in along NW A Ave between NW 56th Dr and NW 52nd St. (Addresses Def-15 and Def-16) | | 16 | | Local Road | N | N | | | |
| G-18 | New 8-in pipe along Airport Rd from approximately 2,900 ft southeast of Stage Gulch Rd to Stage Gulch Rd. | L-1A, G-17, F-5, L-5 | 8 | 2,900 | Unpaved | N | N | | $382,000 | Immediate |
| G-19 | New 8-in pipe along Stage Gulch Rd from approximately 2,500 ft south of Daniel Rd to approximately 1,800 ft southeast of Daniel Rd and Stage Gulch Rd intersection. | L-1A, G-17, F-5, L-5, G-15,F-4, L-4 | 8 | 2,800 | Unpaved | N | N | | $358,000 | Immediate |
| G-5[1] | Upgrade to 18-in pipe from existing 12-in pipe along Murietta Rd between McKennon Rd and I-84, then across-country to the southeast approximately 800 ft. (Addresses Def-9) | L-1A | 18 | 1,900 | Local Road | N | Y | 3 x Railroad | $597,000 | 10-Year |
| | Upgrade to 24-in pipe from existing 12- and 18-in pipe southeast cross-country between railroad and 28th Street Lift Station. (Addresses Def-9) | | 24 | | Local Road | N | Y | River | | |
| | | | | | | | | **Subtotal Cost:** | **$3,622,000** | |
| **Force Main Projects** | | | | | | | | | | |
| **CIP ID** | **Description** | **Required Concurrent or Preceding Projects** | **Recommended Diameter (in)** | **Total Project Length (ft)** | **Surface Restoration Type** | **Rock Excavation** | **Dewatering** | **Crossings** | **Total Cost** | **Timeframe** |
| F-3 | New East Airport Force Main | L-1A, G-17, F-5, L-5, G-15,F-4, L-4, G-14, L-3 | 4 | 2,200 | Unpaved | N | N | | $115,000 | Immediate |
| F-4 | New Stage Gulch Rd Force Main | L-1A, G-17, F-5, L-5, G-15, L-4 | 6 | 1,800 | Unpaved | N | N | | $113,000 | Immediate |
| F-5 | New Airport Rd Force Main | L-1A, G-17, L-5 | 10 | 2,600 | Unpaved | N | N | | $239,000 | Immediate |
| | | | | | | | | **Subtotal Cost:** | **$467,000** | |

| Lift Station Projects | | | | | | |
|---|---|---|---|---|---|---|
| CIP ID | Name | Required Concurrent or Preceding Projects | Capacity (gpm) | Firm Horse Power (HP) | Total Cost | Timeframe |
| L-3[2] | New East Airport Lift Station | L-1A, G-17, F-5, L-5, G-15,F-4, L-4, G-14, F-3 | 300 | 20 | $523,000 | Immediate |
| L-4[2] | New Stage Gulch Rd Lift Station | L-1A, G-17, F-5, L-5, G-15, F-4 | 600 | 20 | $523,000 | Immediate |
| L-5[3] | New Airport Rd Lift Station | L-1A, G-17, F-5 | 1,700 | 70 | $2,745,000 | Immediate |
| | | | | **Subtotal Cost:** | **$3,791,000** | |
| **Total Cost** | | | | | **$7,880,000** | |

*[1] Project is also referred to in proposed capacity project; however, cost is only included in this table.*
*[2] Cost is based on the cost curve for submersible lift stations.*
*[3] Cost is based on the cost curve for wet well/dry well lift stations.*




MSA Murray, Smith & Associates, Inc.

City of Pendleton Oregon Incorporated 1880

**City of Pendleton**
**Collection System Master Plan**

N W E S

**Figure 6-2**
**Airport CIP**

I:\BOI_Projects\13\1442\GIS Data\MXD\Collection System\448 C - Capital Improvement Plan\Fig 6_2 Buildout System CIP Basin A Alt 3_082714 - MSA11x17L.mxd 3/9/2015 8:50:59 AM mvh

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### Summary

This section summarizes CIP projects identified to address capacity deficiencies identified in Section 4 and a plan for addressing ongoing repair and replacement due to aging infrastructure discussed in Section 5. Recommended projects were grouped into three categories: non-airport capacity projects needed to convey future flows through the existing system, projects needed to serve future development in the Airport Industrial Area (AIA), and an annual replacement program to address aging infrastructure. Implementation timeframes for these projects include immediate, 10-year, 20-year and beyond 20 years. The total expected cost by timeframe per infrastructure type is shown in Table 6-3.

**Table 6-3**
**CIP Summary**

| Project Category | Project Description | CIP Schedule and Project Cost Summary[1] | | | | |
|---|---|---|---|---|---|---|
| | | 0-5 Years (Immediate) | 6-10 Years | 11-20 Years | Beyond 20 Years | Total |
| Gravity Main | Capacity Projects | $204,000 | $104,000 | $1,715,000 | $5,127,000 | $7,150,000 |
| | AIA[2] Projects | $3,025,000 | $597,000 | | | $3,622,000 |
| | Annual Replacement Program[1] | $1,250,000 | $2,645,000 | $5,290,000 | $43,715,000 | $52,900,000 |
| | **Subtotal** | **$4,479,000** | **$3,346,000** | **$7,005,000** | **$48,842,000** | **$63,672,000** |
| Lift Station | Capacity Projects | $574,000 | | | $3,911,000 | $4,485,000 |
| | AIA Projects | $3,791,000 | | | | $3,791,000 |
| | Annual Replacement Program[3] | | $690,000 | $1,380,000 | $11,730,000 | $13,800,000 |
| | **Subtotal** | **$4,365,000** | **$690,000** | **$1,380,000** | **$15,641,000** | **$22,076,000** |
| Force Main | Capacity Projects | | | | $785,000 | $785,000 |
| | AIA Projects | $467,000 | | | | $467,000 |
| | Annual Replacement Program[3] | | $25,000 | $50,000 | $425,000 | $500,000 |
| | **Subtotal** | **$467,000** | **$25,000** | **$50,000** | **$1,210,000** | **$1,752,000** |
| Other | Collection System Master Plan Updates | $150,000 | $150,000 | $300,000 | TBD | $600,000 |
| | Combo Truck[4] | $370,000 | | | | $370,000 |
| | **Subtotal** | **$520,000** | **$150,000** | **$300,000** | **TBD** | **$970,000** |
| **CIP Total** | | **$9,831,000** | **$4,211,000** | **$8,735,000** | **$65,693,000** | **$88,470,000** |

[1] *Cost are based on the* Engineering News Record December 2013 Construction Cost Index.
[2] *Airport Industrial Area (AIA).*
[3] *Cost based on 100 years of annual replacement programs.*
[4] *Cost is based on an estimated $50,000 trade-in value for the current truck that will go toward the estimated $420,000 cost of a new truck.*

The CIP includes $14,042,000 in projects over the next 10 years and $22,777,000 over the next 20 years. The total estimated cost for all CIP projects required to serve build-out flows is $88,470,000 including capacity projects, AIA projects, and 100 years of annual replacement programs.

***Annual Replacement Program***

An annual replacement program will be required to replace aging infrastructure including gravity mains, force mains, and lift stations. The estimated total cost for the program over a 100-year cycle is $67,200,000.

***Non-Airport Capacity Projects***

In general, the existing gravity system is adequately sized to serve long-term flows. The total estimated cost for capacity projects required to convey build-out flows is $12,420,000.

*Immediate Projects*

- In order to convey existing peak dry and peak design flows and address existing deficiencies it is recommended that the City construct approximately 800 feet of gravity main including one diversion. The total estimated cost is $204,000.
- Recommended lift station improvements to address existing peak dry and peak wet weather deficiencies include upgrading the firm capacity at 28th Street Lift Station to 1,500 gpm, and upgrading Bartsch Lift Station with new motors and VFDs. The total estimated cost is $574,000.

*10-Year Projects*

- In order to convey peak dry and peak design flows it is recommended that the City install approximately 2,200 feet of gravity main. The total estimated cost for 300 feet of the gravity main is $104,000. The cost for the remaining 1,900 feet of gravity main is included in the AIA projects CIP.

*20-Year Projects*

- The CTUIR was assumed to contribute an average flow of 1.0 mgd (700 gpm) to the City's collection system by the 20-Year planning horizon, resulting in two downstream peak dry and peak wet weather capacity deficiencies. It is recommended that the City construct approximately 3,600 feet of gravity main for a total estimated cost of $972,000 to address these deficiencies
- In order to address a force main velocity deficiency it is recommended that the City construct approximately 3,300 feet of gravity main for a total estimated cost of $743,000.

*Beyond 20 Years Projects*

- In order to convey peak dry and peak wet weather build-out flows beyond 20 years it is recommended that the City construct approximately 19,900 feet of gravity main for a total estimated cost of $5,127,000
- Force main improvements recommended to address peak dry and peak wet weather deficiencies include construction of approximately 10,300 feet of force main for a total estimated cost of $785,000.
- Recommended lift station improvements to address peak dry and peak wet weather deficiencies include increasing the firm capacity at 28th Street Lift Station to 4,900 gpm and Rieth Lift Stations firm capacity to 400 gpm. The total estimated cost is $3,911,000.

***Airport Industrial Area Projects***

- AIA projects were sized to convey build-out flows and assumed to be constructed to serve development as it occurs.
- Approximately 21,800 total feet of gravity mains, 6,600 feet of force mains and three lift stations are required to convey ultimate flows from the AIA area for a total estimated cost of $7,880,000.

***General Projects***

- Updates to the collection system master plan are recommended approximately every five years at a cost of $150,000 each.
- A budgetary allowance of $370,000 is provided to purchase a combo truck to replace the current combo truck that is being transferred to the Storm Utility in the immediate timeframe.


FIGURE 6-1
City of Pendleton
Collection System Master Plan
CIP Projects
MSA
Basin A
Basin B
Basin C
Basin D
Basin E
Basin F
Basin G
Basin H
Basin I
Basin J
Basin K
Rieth Sanitary Sewer District
Rieth LS
Bartsch LS
28th Street LS
Westgate LS
McKay LS
Connection From Confederated Tribes of the Umatilla Indian Reservation
L-1A, L-1B
L-2
L-3
L-4
L-5
L-6
F-1
F-2
F-3
F-4
F-5
G-1
G-2
G-3
G-4
G-5
G-6
G-7
G-8
G-9
G-10
G-11
G-12
G-13
G-14
G-15
G-16
G-17
G-18
G-19
Legend
CIP Projects
Lift Station Project
Immediate
Beyond 20 Years
Decommission
Diversion Project
Immediate
Gravity Main Project
Immediate
10-Year
20-Year
Beyond 20 Years
Abandon
Force Main Project
Immediate
Beyond 20 Years
Abandon
AIA Area
Existing Facilities
Resource Recovery Facility
Lift Station
Gravity Trunk
Gravity Lateral
Force Main
Railroad
Parcel
UGB
N
S
E
W
0 450 900 Feet

Murray, Smith & Associates, Inc.
Engineers/Planners

# SECTION 7
Financial Plan

## SECTION 7
## FINANCIAL PLAN

### Introduction

This section analyzes the overall impact that the 5- and 10-year capital improvements and staffing additions recommended in this Collection System Master Plan (CSMP) will have on sewer rates. Although a transfer from the sewer fund to a fund intended for improvements at the Resource Recovery Facility (RRF) is included in the financial analysis, no evaluation of the improvements needed or adequacy of this funding amount for the RRF are included in this CSMP.

For the purposes of this financial plan, annual projections of costs and revenues are provided for the current year and 5-year forecast periods, fiscal year (FY) 2014-15 through FY 2019-20, so that the City may develop a 5-year implementation plan, including annual revenue adjustments. In addition, summary information associated with the 10-year financial forecast is also presented, in order to give the City some indication of potential additional rate adjustments beyond the 5-year window. Finally, a sewer system financial forecast model allows the City to monitor and update financial projections over a 20-year period.

### Background

The sewer system is an enterprise fund of the City, and is supported by sewer system fees and charges, as opposed to general City revenues. The system's primary funding source is monthly sewer rates charged to customers inside and outside the City.

#### *Existing Sewer Rates*

The current monthly sewer rate (excluding water charges) for a typical residential customer is $28.35 inside the City, and $42.50 for a customer outside the City. The City charges outside-City wholesale customers 110% of the inside City rates, per prior contract agreements with the Confederated Tribe of the Umatilla Indian Reservation and the Rieth Sanitary Sewer District. Rates for non-residential customers include both a fixed monthly service charge and an additional volume charge on water usage over 1,100 cubic feet (cf) for commercial customers.

According to the *2013 Washington/Oregon Water Rate Survey* by Raftelis Financial Consultants, Inc., the City's residential sewer bill is the seventh lowest out of 41 utilities surveyed. The median bill for surveyed utilities was $39.73 per month, compared to the City's existing sewer bill of $28.35 per month (not including the water portion of the utility bill).

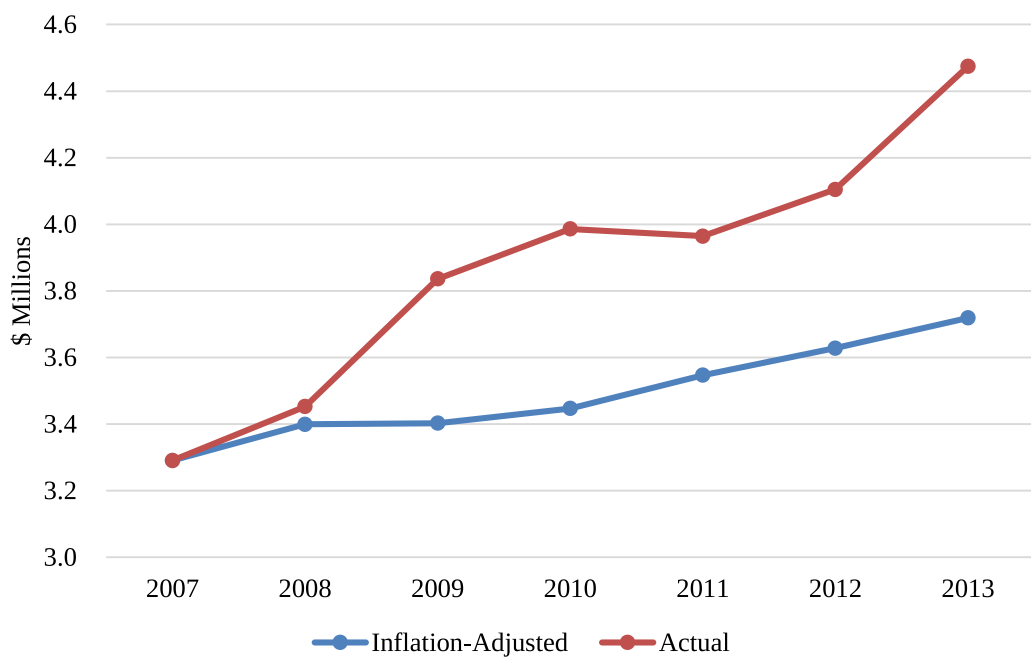
### *Rate Increase History*

The City established an annual inflationary adjustment to its water and sewer rates in 2006. In April of each year, rates are adjusted by an amount equal to the lesser of 3.5% or the year-to-year percentage change in the Portland-Salem Consumer Price Index, Urban Consumers (CPI-U). Rate increases beyond inflationary adjustments have been limited to regulatory-driven cost increases. Non-inflationary rate changes over the last 10 years include the following:

- 2005 – 18% increase
- 2006 – 4.6% increase
- 2007 – 98% increase
- 2014 – 7% decrease

Since its implementation in 2006, the inflationary adjustment has not kept pace with rising costs for water and sewer system operations. Figure 7-1 shows a comparison of inflation-adjusted operating expenses for the water and sewer systems combined, compared to actual historical expenses. The CPI-U (used to adjust rates annually) has increased at an average annual rate of 2.3% since 2007, compared to an average increase in operating costs of about 5.3%. This disparity is due to a number of factors, including higher cost escalation for electricity and chemicals (a large part of the system operating costs), franchise fees (related to non-inflationary rate increases), and City-allocated services costs (primarily personnel costs).

**Figure 7-1**
**Historical Operating Expense Comparison (Combined Water & Sewer)**



Historical rate increases have not kept pace with operating cost inflation, and the City has not increased rates for non-CPI cost increases (such as funding capital improvements related to rehabilitation and repair, and collection system capacity expansion) since 2007. The 2007 rate increase was specifically targeted for debt service associated with improvements at the RRF. Consequently, the current rates do not provide sufficient financial capacity to address the projected system needs.

## Financial Plan

### *Overview*

This financial plan projects the City's costs or revenue requirements during the planning period, and the revenues, under existing rates, that it expects to generate during the same period.

To develop adequate revenues from sewer rates, the system's annual revenue requirements must be determined. Basic revenue requirements include the following:

- Operation and maintenance (O&M) costs.
- Annual capital improvement projects funded by rates and reserves (cash outlays or pay-as-you-go capital).
- Debt service expenditures (principal and interest on loans and bonds).
- Transfers to the City's other funds for indirect and direct services provided to the utility.

### *Key Forecast Assumptions*

This financial plan is based on a set of overall assumptions related to customer growth, inflation, and other factors, as well as the phasing of the Capital Improvement Program (CIP). The following is a list of key assumptions used in the forecast:

- The average annual customer growth rate is estimated to be 0.5% per year throughout the 5-year period, reflecting recent trends. (This financial plan uses a more conservative customer growth estimate than Section 3—Population and Wastewater Flow Projections, which is based on the City's 2011 Comprehensive Plan. It is appropriate for this plan to base customer growth assumptions on more recent growth trends in order to more accurately project revenue in the short term).
- An elasticity of demand factor equal to -1.00 is assumed for all rate increases and applied to the volume (usage) portion of the sewer rate revenue (i.e., for every 10% increase in usage rates, consumption will decrease 1.0%).
- Billed rate revenues are reduced by 0.8% annually to account for bad debts.
- Non-rate revenues are escalated at 3.2% annually (reflecting inflation and customer growth).

- Interest earnings on fund balances and reserves are estimated to accrue at a rate of 0.75% annually.
- O&M costs are based on the current (FY 2014-15) budget, adjusted for one-time expenses, changes in operation and staffing levels, and cost escalation. Specific escalation factors used are:

    - Personnel costs – Salaries, 3.0%; Benefits, 5.0%.
    - Material and service costs – 3.0%.
    - Energy costs – 4%.
    - General cost escalation rate (for non-specified categories) – 2.7% (reflecting historical trend in cost inflation as measured by the Engineering News-Record 20-city average *Construction Cost Index*).
    - Franchise fees – 7% of annual sewer sales revenues.

  In addition, labor costs are adjusted for additional personnel as recommended in Section 5—Operations and Maintenance. Specifically, additional full time equivalent (FTE) positions are assumed to be phased as follows:

    - Clerical (0.15 FTE) – FY 2015-16.
    - Shared Utility Worker (0.5 FTE) – FY 2016-17.
    - Dedicated Utility Worker (1 FTE) – FY 2017-18.
    - Dedicated Utility Worker (1 FTE) – FY 2018-19.
    - Pipe Replacement Crew (1.5 FTE) – FY 2019-20.

  Annual labor costs for utility workers are assumed to average $65,000 per year in current dollars.
- Future capital costs are increased at an annual rate of 2.7%.
- The FY2014-15 budget includes $400,000 transfer to the Sewer Capital Reserve Fund, bringing the total balance in that fund to $3.7 million for future improvements at the RRF. Due to the acute collection system improvement needs during the first 5 years of the CIP, the financial analysis assumes no additional transfers to the RRF reserve until year 6 (FY 2020-21), at which time, the annual transfer is assumed to be $600,000, and continue annually thereafter. Transfers out of the Sewer Capital Reserve are limited to a $550,000 expense in FY 2015-16 associated with levee certification.
- The City will target to maintain a minimum operating fund balance of at least 30 days of operating expense (the minimum industry standard) by the end of the planning period.

This financial analysis includes development of a new sewer System Development Charge (SDC). The SDC methodology is documented in a separate report, but following industry standards and Oregon statutory requirements, the CIP supports an SDC of approximately $3,100 per equivalent residential unit. Revenues from new system development are projected to average, based on the projected number of new customers and the updated SDC, almost $100,000 per year during the 5-year period.

Each component of the baseline financial projection is discussed in more detail below.

### *Operations and Maintenance Costs*

Table 7-1 summarizes projected collection system O&M costs for FY 2014-15 through FY 2019-20. Total sewer O&M costs are currently about $2.5 million, excluding a budgeted contingency; future O&M costs are projected to increase to almost $3.4 million in FY2019-20. As shown in Table 7-1, almost one-third of the projected increase in O&M costs is related to new staffing expenses (estimated to be $0.3 million in FY 2019-20.)

**Table 7-1**
**Summary of Forecast O&M Costs**

| O&M Item | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2019-20 |
|---|---|---|---|---|---|---|
| Personnel Services | $590,290 | $611,823 | $634,192 | $657,434 | $681,583 | $706,679 |
| Materials & Services | $1,878,585 | $1,952,714 | $2,040,859 | $2,134,351 | $2,233,625 | $2,339,160 |
| Capital Outlay | $0 | $0 | $0 | $0 | $0 | $0 |
| Transfers | $15,610 | $16,234 | $16,884 | $17,559 | $18,261 | $18,992 |
| Additional Staffing | $0 | $11,250 | $45,500 | $117,624 | $195,445 | $317,324 |
| **Total O&M Costs** | **$2,484,485** | **$2,592,021** | **$2,737,435** | **$2,926,967** | **$3,128,915** | **$3,382,154** |
| Percent Change | | 4.3% | 5.6% | 6.9% | 6.9% | 8.1% |

### *Capital Improvements*

Future capital expenditures for the sewer collection system are based on the CIP, which identifies $10.8 million (inflation adjusted) in system improvements for the period FY 2014-15 to FY 2019-20, as shown in Table 7-2. The CIP projects are necessary to repair and maintain existing system facilities, and to meet the needs of projected growth, particularly in the Airport Industrial Area (AIA). Capital expenditure estimates are allocated to 5-year time increments. As shown in Table 7-2, in the next 5-year increment (FY 2020-21 to FY 2024-25) CIP costs are about half ($5 million) of the costs in the first 5 years. A detailed list of the projects is provided in Section 6—Capital Improvement Program. The average annual CIP cost is estimated to be almost $1.8 million in the first period, and about $1.0 million in the second period.

**Table 7-2**
**Summary of Forecast CIP Costs**

| CIP Item | FY 2014-2015 to FY 2019-20 | FY 2020-21 to FY 2024-25 |
|---|---|---|
| Airport Improvements | $7,550,845 | $719,906 |
| Pipe Replacement | $1,319,347 | $4,051,731 |
| Other Facilities | $1,912,909 | $306,292 |
| **Total** | **$10,783,101** | **$5,077,928** |
| **Average Annual Cost** | | |
| Airport Improvements | $1,258,474 | $143,981 |
| Pipe Replacement | $219,891 | $810,346 |
| Other Facilities | $318,818 | $61,258 |
| **Total** | **$1,797,184** | **$1,015,586** |

*General note: Costs have been adjusted for inflation.*

As shown in Table 7-3, a combination of projected annual revenue from rates and SDCs, and debt proceeds from state loans are assumed to fund the 5-year CIP. In order to mitigate the short-term impact on rates, debt financing is assumed for about 70% of the 5-year CIP. Debt financing is assumed specifically for the AIA project costs. Cash funding from rates and SDCs is assumed to fund pipe replacement and non-AIA capacity costs.

**Table 7-3**
**Summary of CIP Funding Sources**

| Funding Source | Amount Generated |
|---|---|
| Rates | $2,283,101 |
| SDCs | $450,000 |
| Debt Proceeds | $7,500,000 |
| Existing Reserve | $550,000 |
| **Total** | **$10,783,101** |

### *Revenues*

As mentioned previously, rate revenues are the main source of funding for sewer system revenue requirements. Under state law, SDCs may not be used to fund O&M costs, and the portion of capital costs eligible for SDC funding is also limited to growth-related capital expenditures. Other revenue sources available to fund a portion of the annual revenue requirements for the sewer system include other fees (septage hauling, tipping, and lab), land rental, interest income, and reimbursements. Estimated total revenues from these sources average about $250,000 per year during the 5-year period. Revenue from user charges (rates) is estimated to total $3.5 million in FY 2014-15.

### *Revenue Requirements from Rates*

Table 7-4 shows how the current revenue from rates is distributed across major expense categories. Current O&M costs, net of non-rate revenues, represent 63% of existing requirements. Of the remaining $2.2 million for capital expenses, almost $0.9 million is funded from existing reserves. Rate-supported capital totals $1.3 million, but is primarily for existing debt service ($1.2 million). The remaining $0.1 million of rate revenue is available for CIP costs in FY 2014-15.

Table 7-4 shows annually projected rate requirements through the 5-year planning period, and for the last year of the 10-year period. Significant additional capital funding (both debt and cash, or pay-as-you-go funding) is needed in both the 5- and 10-year period to fund the CIP costs shown in Table 7-2. Debt is assumed in the near-term to fund improvements in the AIA ($7.5 million). At the end of the 5-year forecast period, total debt service may exceed $1.7 million per year. No additional debt is assumed in the 10-year planning period, reflective of the lower CIP costs in years 6-10, as shown in Table 7-2.

As shown in Table 7-4, the annual increase in revenue requirements (inclusive of inflation) is about 11% through FY 2019-20, with a cumulative increase of 68%. The City may choose to implement smooth annual rate increases over the planning period to meet the annual requirements, or have fewer but larger increases at the beginning of the period.

The cumulative 10-year increase is also shown in Table 7-4. Inclusive of inflation, requirements from rates are projected to grow 103%, based on the CIP and the current projections of debt versus cash funding. The City will revisit the capital priorities and staging at the end of the 5-year period, in order to refine this estimate. Furthermore, the City will need to evaluate available financing options as it implements specific CIP projects, and update the rate revenue requirements accordingly, as financing commitments are secured.

**Table 7-4**
**Current and Projected Revenue Requirements from Rates**

| | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2019-20 | FY 2024-25 |
|---|---|---|---|---|---|---|---|
| **Operations and Maintenance Expenses** | $2,484,485 | $2,592,021 | $2,737,435 | $2,926,967 | $3,128,915 | $3,382,154 | $4,041,921 |
| **Capital Expenses** | | | | | | | |
| Transfer to RRF Fund | $400,000 | $0 | $0 | $0 | $0 | $0 | $600,000 |
| Debt Service | $1,170,609 | $1,294,097 | $1,564,377 | $1,724,148 | $1,723,629 | $1,722,281 | $1,715,151 |
| Pay as You Go | $600,000 | $194,500 | $420,006 | $1,388,023 | $1,425,500 | $1,463,988 | $1,070,408 |
| **Subtotal Capital Expenses** | $1,570,609 | $1,488,597 | $1,984,383 | $3,112,172 | $3,149,129 | $3,186,270 | $3,385,559 |
| **Total Expense Requirements** | **$4,655,094** | **$4,080,618** | **$2,562,902** | **$6,039,139** | **$6,278,044** | **$6,568,424** | **$7,427,480** |
| **Non-rate Revenue** | | | | | | | |
| Operating | $228,225 | $237,312 | $246,277 | $271,564 | $269,587 | $269,984 | $199,631 |
| SDC-supported Capital | $0 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $175,000 |
| **Total Non-rate Revenue** | **$228,225** | **$327,312** | **$336,277** | **$361,564** | **$359,587** | **$359,984** | **$374,631** |
| Addition to Operating Fund Balance | $0 | $200,701 | $0 | $0 | $0 | $0 | $196,459 |
| Use of Operating Fund Balance | $861,869 | $0 | $0 | $813,318 | $523,133 | $223,965 | $0 |
| **Requirements from Rates** | **$3,565,000** | **$3,954,007** | **$4,385,541** | **$4,864,257** | **$5,395,324** | **$5,984,475** | **$7,249,308** |
| Annual % Revenue Increase[1] | - | 11% | 11% | 11% | 11% | 11% | |
| Cumulative % Increase | | | | | | 68% | 103% |

[1] *A 10.5% rate increase and 0.5% increase in customers.*

### ***Financial Performance Targets***

Table 7-5 presents the expected revenues, expense, debt service coverage, and changes in fund balance for the City’s operating fund for the 5-year period ending June 30, 2020.

*Fund Balances*

As shown in Table 7-5, the City’s beginning operating fund balance in FY 2014-15 was $1.1 million, but because most of that is budgeted for expenses in the current year, the ending fund balance is estimated at $0.2 million, about 10% of operating expenses. The industry standard minimum contingency for small systems is 30-90 days (or 8% to 25%) of O&M expenses. The forecasted revenue requirements include a minimum contingency of 30 days, which is projected to be met in every year of the forecast. Some fluctuations in fund balance are needed to smooth rate increases over the forecast period.

*Debt Service Coverage*

Lending agencies such as Business Oregon and conventional revenue bond issues, generally require a minimum debt service coverage ratio of 1.2 times annual average debt. Net revenues available to pay debt service are calculated as operating revenues minus operating expenses. As shown in Table 7-5, the City’s senior lien debt service coverage is expected to exceed the minimum requirements during the study period; however, subordinate debt service coverage may fall short in FY 2014-15.

## Table 7-5
## Projected Operating Results

| | FY 2014-15 | FY 2015-16 | FY 2016-17 | FY 2017-18 | FY 2018-19 | FY 2019-20 |
|---|---|---|---|---|---|---|
| **Beginning Balance of Operating Fund** | **$1,119,815** | **$257,946** | **$471,960** | **$2,647,850** | **$1,834,760** | **$1,311,857** |
| Projected Sewer Rate Increases | 0.00% | 10.50% | 10.50% | 10.50% | 10.50% | 10.50% |
| **Revenue** | | | | | | |
| Sewer Service Revenue | $3,565,000 | $3,954,007 | $4,385,541 | $4,864,257 | $5,395,324 | $5,984,475 |
| Non-rate Revenue | $129,500 | $134,033 | $138,724 | $143,579 | $148,604 | $153,805 |
| SDC Revenue | $0 | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 |
| Operating Fund Interest | $30,000 | $6,362 | $16,274 | $21,934 | $16,910 | $14,083 |
| Interest (Other Funds)[1] | $15,000 | $25,924 | $24,067 | $24,282 | $24,524 | $24,793 |
| **Total Operating Revenue** | **$3,739,500** | **$4,210,326** | **$4,654,605** | **$5,144,052** | **$5,675,363** | **$6,267,157** |
| **Operating Expenses** | | | | | | |
| Operations & Maintenance | $2,468,875 | $2,575,787 | $2,720,551 | $2,909,408 | $3,110,653 | $3,363,162 |
| Transfers | $15,610 | $16,234 | $16,884 | $17,559 | $18,261 | $18,992 |
| **Total Operating Expenses** | **$2,484,485** | **$2,592,021** | **$2,737,435** | **$2,926,967** | **$3,128,915** | **$3,382,154** |
| Net Revenue Available for Debt Service | $1,255,015 | $1,618,305 | $1,917,170 | $2,217,085 | $2,546,448 | $2,885,003 |
| **Debt** | | | | | | |
| Senior Lien Debt Service | $744,573 | $744,698 | $743,923 | $741,673 | $742,673 | $742,873 |
| Existing Subordinate Debt | $426,036 | $440,390 | $438,924 | $437,432 | $435,913 | $434,365 |
| New Subordinate Debt | $0 | $109,009 | $381,530 | $545,043 | $545,043 | $545,043 |
| **Total Debt Service** | **$1,170,609** | **$1,294,097** | **$1,564,377** | **$1,724,148** | **$1,723,629** | **$1,722,281** |
| Sr. Lien Debt Service Coverage | 1.69 | 2.17 | 2.58 | 2.99 | 3.43 | 3.88 |
| Subordinate Debt Service Coverage | 1.19 | 1.59 | 1.42 | 1.50 | 1.83 | 2.18 |
| All Debt Service Coverage | 1.07 | 1.25 | 1.23 | 1.29 | 1.48 | 1.68 |
| **Other Financial Sources/Uses** | | | | | | |
| Debt Proceeds | $0 | $3,000,000 | $4,500,000 | $0 | $0 | $0 |
| Transfer from Sewer Capital Reserve Fund | $0 | $550,000 | $0 | $0 | $0 | $0 |
| Loan Repayments from Water Fund | $68,725 | $110,230 | $108,254 | $106,278 | $104,302 | $102,326 |
| Transfer to RRF Fund | $400,000 | $0 | $0 | $0 | $0 | $0 |
| Transfer to Capital Improvement Fund | $600,000 | $3,744,500 | $2,761,090 | $1,388,023 | $1,425,500 | $1,463,988 |
| **Net Other Sources/Uses** | **$931,275** | **$84,270** | **$1,847,164** | **$1,281,745** | **$1,321,198** | **$1,361,662** |
| **Ending Balance of Operating Fund[3]** | **$257,946** | **$471,960** | **$2,647,850** | **$1,834,760** | **$1,311,857** | **$1,088,124** |
| Portion of Balance for Debt Service Reserve | $0 | $109,009 | $381,530 | $545,043 | $545,043 | $545,043 |
| Available Balance for Operating Expenses | $257,946 | $362,951 | $2,266,320 | $1,289,717 | $766,814 | $543,081 |
| Minimum Operating Balance Requirement[2] | $204,204 | $213,043 | $224,995 | $240,573 | $257,171 | $277,985 |

[1] *Interest from other funds counts towards revenue, but is not actually in the Operating Fund balance.*

[2] *Based on 30 days of operating expenses.*

[3] *Does not include interest from other funds.*

## Recommendations

As indicated in Table 7-2, the average annual CIP cost for the 5-year planning period is almost $1.8 million, compared to current CIP funding capacity of less than $0.1 million. Significant rate increases will be necessary to generate the revenues required to support the recommended CIP and to fund O&M costs, including additional staffing.

The following recommendations are offered for the City's consideration related to funding the additional staffing and CIP:

### *Rate and Revenue Increases*

In FY 2014-15, revenue from existing (July 2014) rates is estimated to be $3.5 million; rate revenue requirements are projected to increase by about 68% by FY 2019-20 to almost $6.0 million. The growth in revenue requirements is attributed to ongoing increases in O&M expenses, as well as increases in cash outlays and debt service to fund the CIP.

To meet the needed revenue increases, the City should continue adjusting rates annually for inflation; however, the index should be changed from the CPI to the Engineering News Record (ENR) 20-city average *Construction Cost Index*. The current CPI index has not kept pace with utility cost increases since it was adopted in 2006. The average annual increase in the ENR has been about 2.7%, compared to 2.3% for the CPI.

In addition to the inflationary increases, the City will need to implement other rate increases to fund the projected revenue requirements, and to maintain cash reserves consistent with industry standards. Based on current projections of customer growth and water use, additional annual rate increases of 7.8% are needed through FY 2019-20.

Assuming a combined annual increase of 10.5% (2.7% inflation, plus 7.8% additional), applied uniformly to the City's existing rate structure, monthly bills for typical residential customers would increase approximately $3.00 to 4.00 each year, as shown in Table 7-6.

**Table 7-6**
**Projected Residential Bills**

| Year | Monthly Bill | Annual Increase ($) |
|---|---|---|
| FY 2014-15 | $28.35 | - |
| FY 2015-16 | $31.33 | $2.98 |
| FY 2016-17 | $34.62 | $3.29 |
| FY 2017-18 | $38.26 | $3.64 |
| FY 2018-19 | $42.28 | $4.02 |
| FY 2019-20 | $46.72 | $4.44 |

Even with the initial rate increases, a typical customer's bill would be below the $39.73 median bill for Oregon communities indicated in the 2013 rate survey. The rates in other communities will also continue to increase, most in excess of inflation; so it is likely that the City's sewer rates will continue to compare favorably with those of other communities.

### *Financial Plan Updating*

This financial plan is based on available information on revenue and expenditures as of March 2015. There will usually be differences between assumed and actual conditions, because events and circumstances frequently do not occur as expected; differences may be significant. Therefore, it is important that the City continue to monitor its financial plan annually and make adjustments as needed.

Among the variables that could impact future rate increases are changes in customer growth, and water consumption patterns. Over the past several years, the City has observed fluctuating water use per account. This financial plan assumes new customer growth averaging 0.5% per year over the forecast period, and reductions in water use per account as a result of water conservation and price elasticity (i.e., reductions in use in response to increasing prices).

Other key assumptions related to capital financing that could impact future rate increases are:

1. The City will secure favorable borrowing terms for the State's Infrastructure Finance Authority for approximately $7.5 million to fund improvements in the AIA.
2. The City will implement a new SDC to fund growth-related costs of the CIP.

### *System Development Charges*

The SDCs calculated as part of this study result in an equitable distribution of capital costs to future development. The revised SDC per EDU is about $3,100, which is within the range of SDCs charged in Oregon. Based on 2014 data, sewer SDCs generally range from $500 to $12,000 for an EDU. Furthermore, the City should adjust the SDCs annually for inflation based on the ENR *Construction Cost Index*, and complete comprehensive updates as necessary to incorporate significant changes to the CIP, including additional RRF improvements.

Murray, Smith & Associates, Inc.
Engineers/Planners

# Appendix A

River Influence

## APPENDIX A
## Characterization of the Umatilla River Influence in the Pendleton Collection System

### Introduction

The City of Pendleton's (City) collection system experiences seasonal influence from the Umatilla River (River) and its tributary streams. Resource Recovery Facility (RRF) records and flow metering data from April 2012 through December 2013 were used to characterize the influence of the River on the collection system flows.

### Dry Weather Flow

Dry weather flows are the combination of Base Wastewater Flow (contributions from users) and Groundwater Infiltration (GWI). GWI occurs when groundwater is at or above the sewer pipe invert and infiltrates through defective pipes, pipe joints and manhole walls. This component of the dry weather flow is seasonal. In the City's collection system, this component is typically in direct response to the River's seasonal variation and predominately occurs for two to three months in the spring.

### RRF Historical Flow and Umatilla River Influence

The seasonal variation of the flows measured at the RRF can be observed in Figure A-1; this figure also shows the River flow measured at station PDTO3, on the north side of the River near the intersection of NW Fifth Street and NW Bailey Avenue. Table A-1 presents the corresponding stage level for a range of River flows.

The City has implemented capital improvements to decrease and control the amount of infiltration from the River into the collection system. These measures include pipe replacement (with polyvinyl chloride) and rehabilitation by sliplining in areas with high infiltration/inflow levels. The positive effect of these projects can be observed in Figure A-1; the increase in sewer flows in response to high river levels is lower in 2012-2013 than 2011, before the projects were implemented.

**Figure A-1**
**Sewer Flow Measured at the RRF and Umatilla River Discharge**

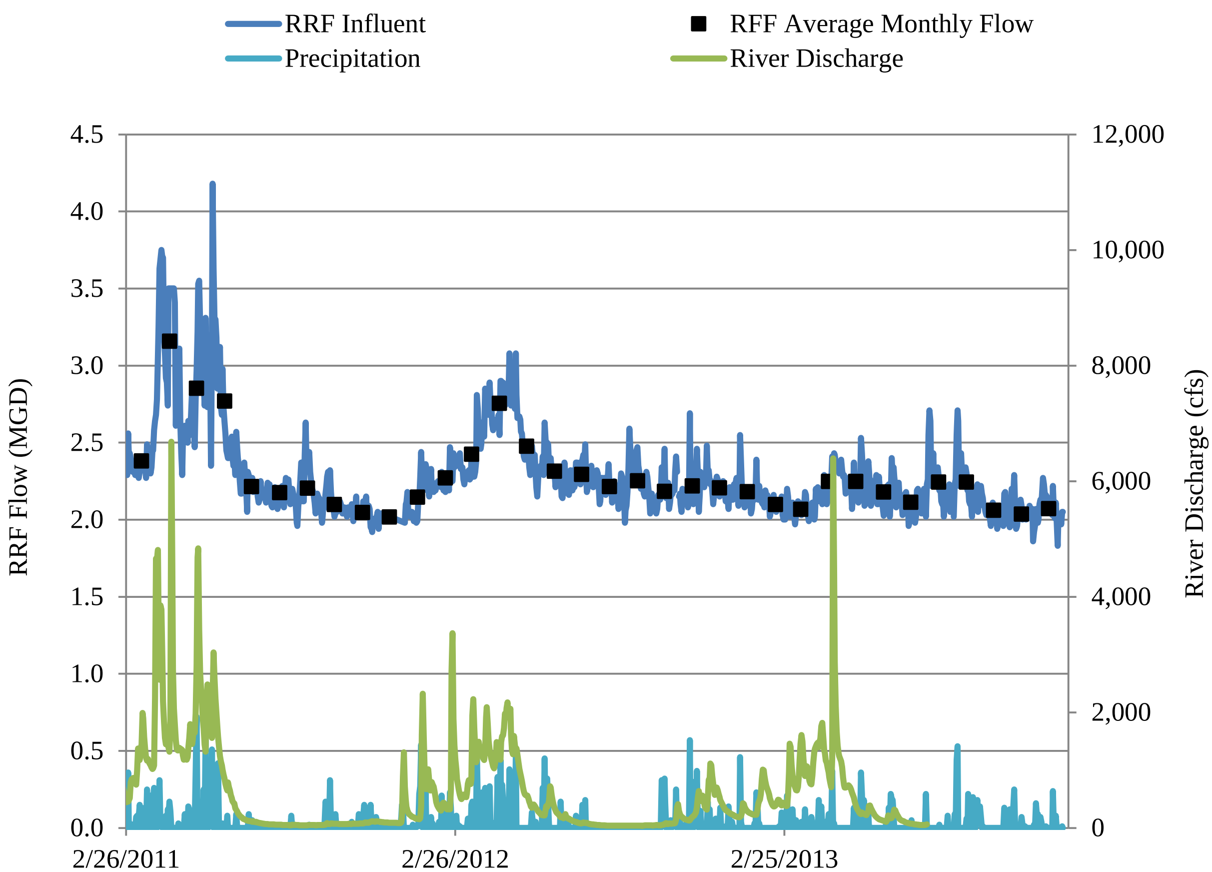



**Table A-1**
**Umatilla River Discharge and Approximate Stage Height**

| River Discharge (cfs) | Approximate Stage Height (ft) |
|---|---|
| 2,000 | 5.6 |
| 4,000 | 6.0 |
| 6,000 | 7.0 |
| 8,000 | 8.4 |

## Methodology

A River Dependent Influence Factor (RDIF) was estimated using the flow metering data captured from April 2012-March 2013. The calculated factors were then assigned to the August-September 2013 flow meter basins. The 2013 calibration basins and the flow meter locations (2012) are shown in Figure A-2. For basins with no corresponding flow meter in the 2012 locations (basins A, D, F, G, H, and K), the RDIF was assumed based on data from basins with similar proximity to the River and topography.

The process to estimate the RDIF was as follows:

1. **Calculated the BWF:** average dry weather flow for a representative week with minimal influence from the River (August 1-7, 2013).
2. **Calculated the average dry weather flow for a week with high influence from the River:** as it can be observed in Figure A-1, the largest River flow during the flow metering period occurred on April 20th, 2013; the week after this event was selected.
3. **Calculated the RDIF:** ratio between the high-influence week average dry weather flow and the base wastewater flow**.**

Table A-2 shows a summary of the results. Table A-3 presents the recommended factors for each calibration basin and the dry weather average flow calculated as base wastewater flow affected by the RDIF. The total dry weather flow, including the River influence component were used for system analysis.

The factors were adjusted to match the observed system-wide RDIF. This factor was calculated using two years (2012-2013) of RRF daily flows. The observed factor at the plant was 1.25.

**Table A-2**
**Estimation of RDIF**

| Flow Meter (2012 Location)[1] | Base Average Flow (gpm) | High River Influence Average Flow (gpm) | River-Dependent Infiltration Factor |
|---|---|---|---|
| **Oxford Suite** | 835 | 988 | 1.2 |
| **Prison[2]** | 893 | 1,083 | 1.2 |
| **Queens and Riverside** | 88 | 113 | 1.3 |
| **20th and Byers** | 115 | 258 | 2.3 |
| **SW 37 Ext** | 197 | 212 | 1.1 |
| **Tutuilla** | 21 | 21 | 1.0 |
| **Nordon NE** | 814 | 1,044 | 1.3 |

[1] *Data from flow meters at 703 SW 21, Safeway and Nordon E were not included due to quality issues.*
[2] *Eastern Oregon Correctional Institution.*

**Table A-3**
**River Dependent Infiltration Factors for Each Flow Meter Basin**

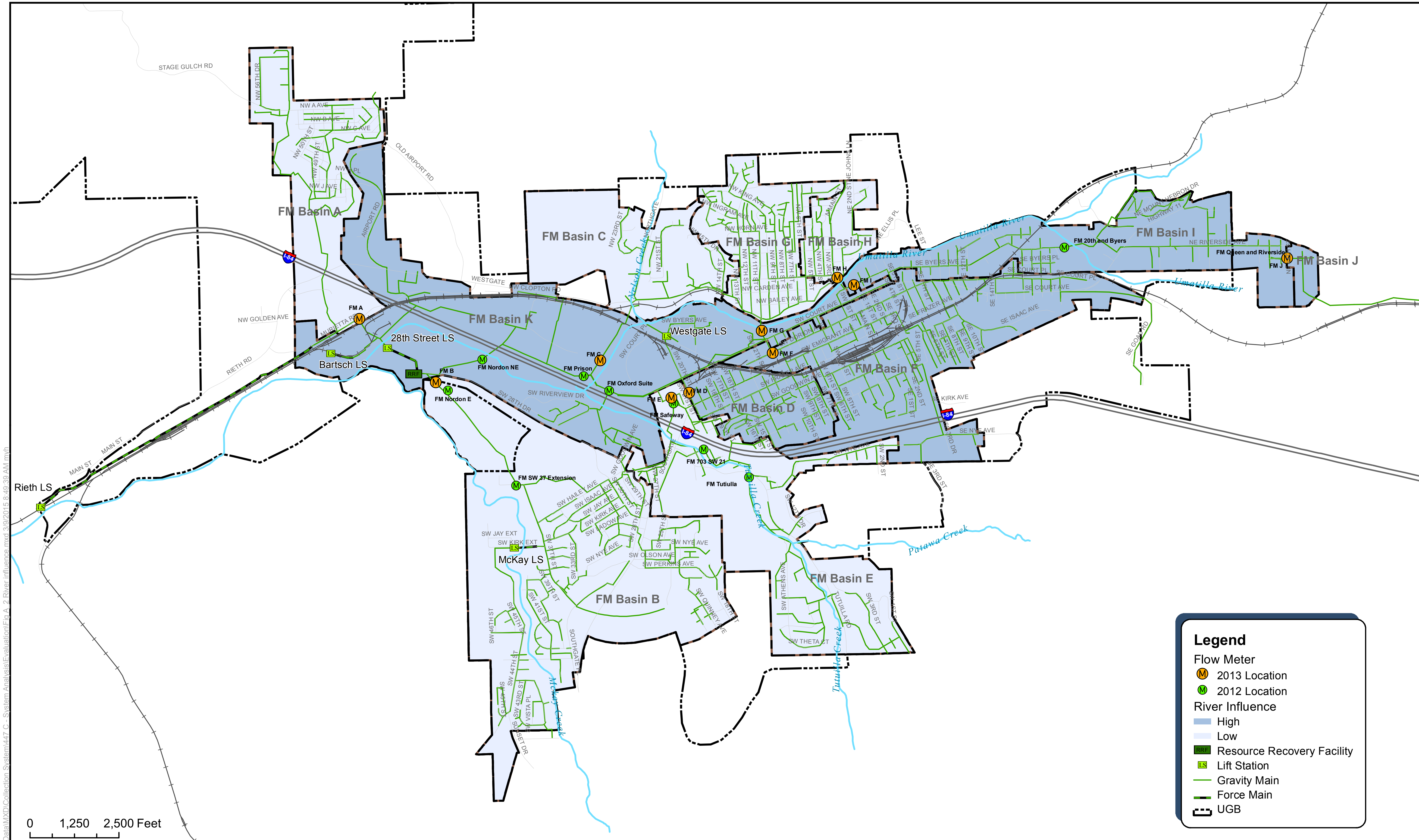
| Flow Meter Basin | 2012 Flow Meter Location or Assumption | Average Baseflow (gpm) | River-Dependent Infiltration Factor | Average Dry Weather Flow (gpm) |
|---|---|---|---|---|
| A | Assumed RDIF similar to Basin C | 44 | 1.1 | 48 |
| B | SW 37 Ext | 200 | 1.1 | 220 |
| C | Oxford Suite and Prison meters and City input | 80 | 1.1 | 88 |
| D | Assumed similar to Oxford Suite | 49 | 1.2 | 59 |
| E | Assumed similar to SW 37 Ext | 88 | 1.1 | 97 |
| F | Assumed similar to Oxford Suite | 212 | 1.2 | 254 |
| G | Assumed similar to SW 37 Ext | 107 | 1.1 | 118 |
| H | Assumed similar to SW 37 Ext | 48 | 1.1 | 53 |
| I | 20th and Byers | 108 | 2.3 | 248 |
| J | Queens and Riverside | 90 | 1.3 | 117 |
| K[1] | Estimated | 534 | 1.2 | 641 |
| RRF | Calculated | 1,560 | 1.25 | 1,943 |

[1] *RDIF estimated to match flows at the RFF.*

## Conclusions

Based on location and topography, the calibration flow meter basins where a larger influence from the River was expected were D, F, I, J, and K (see Figure A-2). The flow meter data was consistent with this assumption.

The basin with the largest influence from the River was Basin I, located on the east side of the City along the River to the Confederated Tribes of the Umatilla Indian Reservation border.




City of Pendleton
Collection System Master Plan

Figure A-2
Umatilla River Influence

May 2015 13-1442

Murray, Smith & Associates, Inc.
Engineers/Planners

# APPENDIX B

Wastewater Collection System Maintenance Program

# CITY OF PENDLETON

# WASTEWATER COLLECTION SYSTEM

# MAINTENANCE PROGRAM

**March 26, 2007**

**Prepared by**

**Jeff Brown**
**Public Works Superintendent, City of Pendleton**

**City of Pendleton**
**Wastewater Collection System Maintenance Program**

**Table of Contents**

## INTRODUCTION

The City of Pendleton City Council has recently adopted Goals for 2007-2009, one of which is "Develop Long-Term Financial Plan to Fund City Operations (i.e., streets, sewer, and water infrastructure, airport, cemetery…)". This report was written to help the reader understand the importance of developing and implementing a wastewater collection system maintenance program.

The City of Pendleton will someday be faced with meeting the CMOM (Capacity, Management, Operations, and Maintenance) regulations. These regulations were created by the EPA in order to reduce the occurrence of Sanitary Sewer Overflows (SSO's) nationwide. It was created as a framework for municipalities to identify and incorporate widely accepted wastewater industry practices in order to

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas
- Respond to SSO events

According to the latest number found (1980) the City of Pendleton operates approx 76 miles of sanitary sewer lines. The majority of the collection system consists of 8" diameter main lines with some 6" diameter main lines and some as large as 36" diameter.

The system utilizes gravity flow as much as possible, with a majority of the lines sloping toward the treatment plant located near the confluence of McKay Cr. and the Umatilla River. The City also operates 4 lift stations, 3 of which are maintained by the collection crew, and 1 maintained as part of the Wastewater Treatment Plant (WWTP).

The City of Pendleton collection system is made up of mostly old clay lines from the early 1930's to the 1950's and concrete lines from the 1940's to the 1970's. A small portion of the system was built with PVC mostly in new subdivisions and a few mainlines that have been replaced. The older lines are deteriorating and have cracks, holes, root intrusion, and offset joints. The maintenance program will be implemented to identify problem lines that are in need of replacement and to prolong the useful life of other mainlines in the system.

Another problem in the system is inflow and infiltration (I & I) is a term for the ways that clear water, such as rainwater, groundwater, makes its way into sanitary sewer pipes and eventually gets treated unnecessarily at wastewater treatment plants. I & I is a problem because it takes up limited capacity in sewer lines that will be needed to convey wastewater from future households in the city and can require upgrades at the treatment plant. Infiltration occurs when groundwater seeps into sewer pipes through cracks, leaky joints or deteriorated manholes. Inflow is the far larger problem. It occurs in direct proportion to rainfall. The typical source is water from roof drains, basement sump pumps (designed to capture water that enters basements) or foundation drains illegally connected directly to a sanitary sewer pipe. Inflow also occurs through leaking manhole lids.

# OVERVIEW OF SYSTEM CONDITION

## Collection System Maintenance

To maintain proper function, a wastewater collection system needs a cleaning schedule. There are several traditional cleaning techniques used to clear blockages and act as preventative maintenance tools.

The most common method of cleaning for pipes between 4" and 24" is jetting. Jetting directs high velocities of water against pipe walls to remove debris and grease build-up, clears blockages, and cuts roots within small diameter pipes. Jetting is an efficient method of clearing blockages as well as preventative maintenance.

Another important part of a preventative maintenance program is inspections. Inspection programs are required to determine current sewer conditions and aid in planning a maintenance strategy as well as a replacement schedule.

Closed-circuit television (CCTV) inspections are the most frequently used, most cost effective in the long term, and most effective method to inspect the internal condition of the collection system. CCTV inspections are recommended for sewer lines with diameters of 4" to 48". The CCTV camera must be assembled to keep the lens as close as possible to the center of the pipe. To see details of the sewer walls, joints, and service connection the camera and lights should swivel both vertically and horizontally. Documentation of inspections is very critical to a successful operation and maintenance (O&M) program. CCTV inspections produce a video record of the inspection that can be used for future reference.

Visual inspections are vital in fully understanding the condition of a sewer system. Visual inspections of manholes and pipelines are comprised of surface and internal inspections. Operators should pay specific attention to sunken areas and ponding water in the area above a sewer line. In addition inspectors should thoroughly check the physical condition of stream crossings, the condition of manhole frames and covers, and visibility of manholes and other structures.

A study performed by the American Society of Civil Engineers reports that the most important maintenance activities are cleaning and CCTV inspections. The table below shows the average frequency of maintenance activities and recommendations.

| Activity | Average (% of system/year) Source: ASCE, 1998. | Recommended (% of system/year) |
|---|---|---|
| Cleaning | 29.9 | 33 |
| Root removal | 2.9 | As Needed |
| Manhole inspection | 19.8 | 33 |
| CCTV inspection | 6.8 | 10 |
| Smoke testing | 7.8 | As Needed |

## Condition Assessment

A maintenance plan attempts to develop a strategy and priority for maintaining pipes based on several of the following factors:

- Problems- frequency and location; 80 percent of problems occur in 25 percent of the system (Hardin and Messer, 1997).

- Age- older systems have a greater risk of deterioration than newly constructed sewers.

- Construction material- pipes constructed of materials that are susceptible to corrosion have a greater potential of deterioration and potential collapse. Non-reinforced concrete pipes, brick pipes, and asbestos cement pipes are examples of pipes susceptible to corrosion.

- Pipe diameter/volume conveyed- pipes that carry larger volumes take precedence over pipes that carry a smaller volume.

- Location- pipes located on shallow slopes or in flood prone areas have a higher priority.

- Force main vs. gravity-force mains have a higher priority than gravity, size for size, due to the complexity of the cleaning and repairs.

- Subsurface conditions- depth to groundwater, depth to bedrock, soil properties (classification, strength, porosity, compressibility, frost susceptibility, erodibility, and pH).

- Corrosion potential- Hydrogen Sulfide (H2S) is responsible for corroding sewers, structures, and equipment used in wastewater collection systems. The interior conditions of the pipes need to be monitored and treatment needs to be implemented to prevent the growth of slime bacteria and the production of H2S gases.

# Identification of Priority Areas

## Line Cleaning

Due to age, construction materials, location, and subsurface conditions the low lying/downtown area should be a priority for cleaning.

The main trunk line from Mission should also be cleaned due to its inaccessible location and potential for serious overflow.

## Collection System Inspections

CCTV inspect all low lying areas to look for I&I

Visually inspect manholes while performing routine cleaning and CCTV inspections.

### Flow Monitoring

Monitor the flow from a section/neighborhood at the point where it joins the larger trunk line for both a baseline and during a few high flow events. Determine the areas of highest I&I based on flow and precipitation. Continue to monitor smaller areas until the source of the problem can be determined. Utilize this information to determine area to concentrate on for CCTV and manhole inspections.

## Smoke Testing

Utilizing the information gathered from CCTV and flow monitoring, confirm the sources of I & I by smoke testing. This should help to determine if there are illegal connections to the sanitary sewer from roof drains, foundations and basement sump pumps. Leaks in the mainline and side sewers may also be identified for repair.

## Record Keeping

Record keeping is vital to the success of such a maintenance program. The city needs to track the number of times their sewer lines were inspected and cleaned and the number of overflows and backups a sewer line experienced. This information can help to re-prioritize sewer line maintenance and adapt a more appropriate time schedule for cleaning and inspecting the sewer lines. The cost per foot for maintaining the sewer collection system may decrease over the years due to streamlining and increasing efficiency and productivity of field staff.

## Training

Training is also an important component of a well managed O & M program. Yearly review of procedures listed in this report should be performed by staff to insure proper response to maintenance and emergency problems. Documentation of the training should be kept on file.

**Sewer Inspection and Maintenance Report**

Date of Inspection:____________________________Time of Inspection:____________________AM/PM

Name of Employee completing report:_______________________________________________________

Location (be specific by line, manhole #'s, etc):___________________________________________
__________________________________________________________________________________________
________________________________________________________________________

Reason for Inspection or Maintenance (routine/scheduled, preventative, overflow, problem history, etc.):__________
__________________________________________________________________________________________
________________________________________________________________________

Conditions Found (both usual and unusual):________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
_________________________________________________________________

Unusual conditions were reported immediately to the following supervisor(s):_______________________
_______________________________________________________________________________

List inspection or maintenance work performed:_____________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________

List equipment used:______________________________________________________________________
_______________________________________________________________________________

List personnel who performed inspection or maintenance:______________________________________
_______________________________________________________________________________

Other information:________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
_________________________________________________________________

Follow up actions needed at this location:__________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________

Based on conditions found during this visit, it is recommended that this location be inspected/maintained again within:

1 month ________
3 months ________
6 months ________
9 months ________
12 months ________
18 months ________
24 months ________
36 months ________

# LIFT STATION EVALUATION

## Condition Assessment

| | |
|---|---|
| Lift station#1 (WWTP) | Located within the perimeter of the Wastewater Treatment Plant (WWTP) and is maintained as a component of the WWTP. |
| Lift station #2 (Bartsch) | The oldest lift station maintained by the collections crew. The wet well shows no signs of deterioration and should be useable for many years. The pumps and motor controls should be replaced within the next 2 years with newer style components. This lift station should also be fitted with an emergency bypass coupling. |
| Lift station #3 (Westgate) | Installed in 2004, downstream manhole within 20 feet, therefore a bypass coupling is not needed. |
| Lift station #4 (McKay) | Installed in 2006, no downstream manhole nearby, therefore a bypass coupling is needed. |
| Lift station #5 (Rieth) | Scheduled to be added to the system in 2007 |
| All lift stations | Staff needs to determine the total dynamic head (TDH) for each lift station and size emergency bypass pump accordingly.<br>Review and test emergency bypass procedures annually and document the training. |

## Lift Station Maintenance Procedures

Lift station operation is usually automated and does not require continuous on-site operator supervision. The most labor-intensive task for lift stations is routine preventive maintenance. A well-planned maintenance program prevents unnecessary equipment wear and break downs. Lift station inspections typically include observation of the pumps and motors for unusual noises, vibration, and leakage, check of pump suction and discharge lines for valve arrangements, and check control panel switches for proper position. Inspections should be conducted monthly at a minimum.

## Monthly

Equipment required:

- High pressure washer
- Lift station degreaser
- Confined space entry equipment (if necessary)
- Proper PPE (rubber gloves, safety glasses)

1. Pump wet well down enough to visually inspect pumps.

2. Hose accumulated grease and debris from walls and pumps.

3. Pull floats to remove debris if necessary.

4. After cleaning, pump down wet well again to remove remaining debris

5. Add lift station degreaser as per manufacturers directions,

6. Return pumps to automatic setting and confirm proper function

7. Clean and disinfect area if needed.

## Annual

1. Follow procedures for pulling pumps in the following section

2. Inspect lifting chains/cables for signs of corrosion and replace as needed.

3. Inspect impeller and volute for wear by separating motor from the volute.

4. Perform any maintenance prescribed in manufacturers operating manual and return to service.

## Removing pumps from wet well

Equipment required:

- Service truck with cable hoist
- 5/16 grab hook adaptor
- Basic hand tools
- Electrical tester
- Bucket w/ lid for debris
- Confined space entry equipment (if necessary)
- Proper PPE (rubber gloves, hard hat, coveralls, safety glasses)

1. Pump the level of the lift station down as far as possible

2. Position cable hoist over the lifting eye on the pump to ensure the pump can be lifted straight up

3. Hook the lift cable as low as possible on the lift chain or cable

4. Turn off the pump to be pulled, lock out, tag-out the power and confirm the pump is isolated by testing the power or trying to turn the pump on

5. Pull the pump up with the cable hoist. Care should be taken to ensure the pump clears all wires and cables and does not hang up on the guide rails as it is raised. If water is available, the pumps can be hosed off as they are being removed.

6. Check to make sure remaining pump is keeping up with incoming flow. If not check to see if flow is returning to wet well through the check valve. If it is, close the gate valve.

7. Set pump on flat surface and perform the required maintenance (see maintenance schedule).

8. Lower pump back into wet well making sure it is secure on the guide-rails, clears all wires and is securely seated in place. Open any valves you have closed.

9. Turn power back on and start pump. If water sprays around flange, jiggle the chain until the pump is seated.

Repeat with second pump.

After both pumps have been serviced, turn both pumps to automatic and confirm they are functioning properly. Clean up the site removing all debris. If necessary disinfect the area.

## Emergency Bypass Procedures

Tools required

- Bypass pump and hoses
- Electrical tester
- Basic hand tools
- Confined space entry equipment (if necessary)
- Proper PPE (rubber gloves, earplugs, coveralls, safety glasses)

1. Turn pumps to the off position.

2. Connect hoses to bypass pump and place suction hose into wet well and connect the discharge hose to the bypass cam-lock fitting in the vault.

3. Open a check-valve by lifting the swing arm to relieve pressure in the force main by draining the line back into the wet well

4. Open bypass valve slowly

5. Prime bypass pump and start pumping

6. Maintain the level in the wet well to prevent an overflow and keep from pumping wet well dry

After the emergency is over confirm the lift station is operational and then disconnect the bypass pump.

7. To disconnect, shut off the bypass pump, turn lift station pumps to off position.

8. Open the swing check valves to relieve pressure in force main and drain discharge hose.

9. Close bypass valve and disconnect hoses.

10. Turn lift station pumps to automatic

11. Disinfect suction and discharge hoses as needed.

After the emergency situation is resolved turn both pumps to automatic and confirm they are functioning properly. Clean up the site removing all debris. If necessary disinfect the area.

# LONG TERM CAPITAL

A critical component to any plan is to provide the resources for implementation. The following proposal is to provide the resources for the city as it grows and expands to also maintain the current infrastructure to provide service into the future. Wastewater creates a harsh environment for equipment and it is important to replace or rebuild before imminent failure occurs.

## Lift Station

Pumps and valves should be replaced or rebuilt on a 10 to 15 year cycle - $500/year/station

Wet well level controls replaced every 10 to 15 years - $200/year/station

Motor Control Center replacement every 20 to 25 years - $500/year/station

Wet well replaced or lined every 50 years - $100/year/station

## Collection System

The average sewer line life is 50 yrs. To set a schedule to reflect replacement to keep up with deteriorating system we would have to know the dates that each line was installed. Unfortunately this information is not available. The City will need to use the information gathered from the inspections to determine the lines to be replaced. Lines that have been replaced may then be put on a replacement schedule. With current construction costs at approx $60 per ft, the City should budget a minimum of $120,000 per year for sewer line replacement.

## Equipment and Personnel Needs

The sewer cleaning truck was purchased for $216,000 dollars with an average life of 10 years and an annual replacement charge of $32,000

The CCTV inspection equipment was purchased for approx $40,000 with an average life of 10 years. The dept. should put away at least $5,000 per/yr toward replacement.

2 FTE are needed with 100% of their time devoted to maintaining the collection system. Based on the latest calculation (1980) the collection system consists of approx 76mi of sewer lines, and the crews can clean an average of 1000’-1200’ per day and CCTV inspect 600’-1000’ per day.

## CAPACITY, MANAGEMENT, OPERATIONS, AND MAINTENANCE (CMOM) REGULATIONS

CMOM stands for "Capacity, Management, Operations, and Maintenance". These regulations were created by the EPA in order to reduce the occurrence of Sanitary Sewer Overflows (SSOs) nationwide. It was created as a framework for municipalities to identify and incorporate widely accepted wastewater industry practices in order to:

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas of the collection system
- Respond to sanitary sewer overflow (SSO) events

In CMOM planning, the utility selects performance goal targets, and designs CMOM activities to meet the goals. Information collection and management practices are used to track how well each CMOM activity is meeting the performance goals, and whether overall system efficiency is improving.

### Status of CMOM Regulations

The CMOM regulations are currently waiting for finalization and publication, which was initially expected in mid-2004. The EPA continues to develop guidance and information to encourage the implementation of the Combined Sewer Overflow (CSO) policy. State and federal NPDES permitting authorities are working with permittees to incorporate CSO conditions into NPDES permits and other enforceable mechanisms, such as administrative and judicial orders.

### CMOM Requirements and Program Elements

There are four major documentation requirements of the CMOM permit. These requirements vary based on the size and complexity of the municipal wastewater collection system and include a written summary of the CMOM Program; an Overflow Emergency Response Plan; a Program Audit Report; and a System Evaluation and Capacity Assurance Plan. For municipalities to meet CMOM requirements, the following legal, administrative, and management elements will be required:

### Planning Criteria and Sewerage System Regulations

Legal Authority. Adopt a sewer use ordinance that requires proper design installation, testing and inspection (including service lines) and includes pretreatment standards for fats, oils, and greases.

Information Management. Maintain up-to-date mapping of the collection system and establish a process to update maps with new development; maintain a database on pipes including size, material and date constructed; maintain overflow data, three years of work order history, complaint records, performance and implementation measures, and a list of system components with inadequate capacity.

Overflow Response Plan. Develop and implement an SSO response plan to stop and mitigate impacts as soon as possible. The plan must outline staff training in SSO response procedures, a process for plan review and updating, a public notification program, and steps for immediate notification of health officials and the National Pollutant Discharge Elimination System (NPDES) authority.

Condition Assessments. Conduct periodic video pipe inspections and smoke testing to identify structural deficiencies and illicit connections. Update information management systems as needed based on the condition assessment.

Capacity Assurance. Identify deficient components of the system for both existing and future conditions through system modeling. Develop a master plan that includes a capital improvement plan to address deficiencies. Budget for capital improvements.

Construction Standards. Adopt and enforce defined design criteria that include evaluation of downstream impacts for new development, capital improvements, and rehabilitation. Require proper review of construction drawings as well as acceptance tests and inspection, including laterals.

Staff Training. Provide a training program for operation and administrative personnel that includes all elements of the CMOM program. Develop a mandatory certification program.

Compliance Audits. Assign responsible staff to conduct an audit of the CMOM program audit report based on interviews with staff, observations of crews, SSO data records, and work order records. The audit review report is to identify apparent deficiencies, steps taken to address problems, and additional measures needed.

## Implications for the City of Pendleton

The City of Pendleton already has many elements of the CMOM program currently in place or in the process of being developed. It is recommended that the City assign staff to monitor the EPA's final adoption of CMOM regulations, and eventually oversee the City's compliance.  The collection system maintenance plan is a vital component in meeting the CMOM Regulations.

The primary benefit of implementing a sewer maintenance program is the reduction of sanitary sewer overflows (SSO's) , basement backups, and other releases of wastewater from the collection system due to substandard sewer conditions. The City of Pendleton has already made progress in reducing the frequency of SSO's, in 2004 the City reported 5 SSO's, since then we have only had 5 to date

## PROCEDURES FOR SANITARY SEWER OVERFLOWS

revised 03/03/06

The following procedures should serve as a guide to employees in their response to sewer lift station alarms, plugged or broken sewage lines, and sewage spills.

### SEWAGE LIFT STATIONS

1. When a high limit alarm from a sewage lift station is sounded, immediately proceed to the lift station in question and **assess the problem**.

2. **Power Outage**: If the cause of the problem is a power outage, contact the power company as follows:
   Mon.-Fri., 8:00 AM-5:00 PM-----541-278-2955
   After hours and weekends---------888-221-7070

3. **Contact** the individual/department responsible for lift station maintenance. Primary responsibility for the sewage lift stations is given in the table below.

| | |
|---|---|
| **Jeff Brown** (Public Works)<br>276-3078▪work<br>276-0404▪home<br>310-9210▪cell | **Mark Milne** (WWTP)<br>276-3372▪work<br>276-2831▪home<br>240-1304▪cell |
| McKay Creek<br>(Meter No. 28381315) | 28th Street @ WWTP<br>(Meter No. 50827154) |
| Bartsch Road<br>(Meter No. 76372588) | |
| Westgate<br>(Meter No. 23762401) | |

4. If it appears that there is a possibility of sewage overflow, set up to pump the sewage from the lift station. If unable to handle the volume of waste with existing equipment, contact one of the following septic services for pumping assistance:
   Doug♣s Septic Service 541-276-9202
   Humbert Septic Service 541-938-3689
   Redi-Rooter 541-276-1754

5. After the sewage has been pumped, dispose of it by one of the following methods:
   a. Discharge the sewage into a nearby **downstream sewer manhole**. (Contact WWTP if the waste is septic, contains any chemicals, or contains rocks or other debris that might be harmful to the WWTP process.)
   b. Discharge the sewage at the WWTP. (Coordinate this with WWTP before discharge.)

6. If any sewage is spilled onto public streets and/or into a water body, follow the **SPILL RESPONSE** guidelines that follow.

**PLUGGED OR BROKEN SEWAGE LINES**

1. Visit the site and **assess the problem**. Contact others on the ■Public Works Call-Out Schedule• for assistance as needed.

2. If the line is plugged, utilize the Jet Machine and attempt to break up the plug. If successful, monitor the plug downstream to make sure it does not cause additional problems. Contact WWTP if the material is septic, contains any chemicals, or contains rocks or other debris that might be harmful to the WWTP process.

3. If the line is broken or cannot be unplugged, **bypass the problem section**. This can be done by using a portable pump to pump the flow to a downstream sewer manhole. (There are 3-inch and 4-inch pumps available at the Public Works Shops.) Alternately, the sewer line can be plugged temporarily above the problem section to facilitate repairs.

4. Complete repairs and return the sewage line to normal operation as soon as possible.

5. If any sewage is spilled onto public streets or into a water body, follow the **SPILL RESPONSE** guidelines that follow.

## SPILL RESPONSE

1. **Containment:** Contain or reroute the spill to minimize damage and exposure. **Primary concern is to prevent any sewage from entering a stream, river, lake, or storm drain.**

2. Contact one or more of the following individuals for assistance:

| NAME | WORK PHONE | HOME PHONE | CELL PHONE |
|---|---|---|---|
| Jeff Brown | 541-276-3078 | 541-276-0404 | 541-310-9210 |
| George Hall | 541-276-3078 | 541-276-3420 | 541-969-8384 |
| Karen King | 541-966-0249 | 541-278-2151 | |
| Mark Milne | 541-276-3372 | 541-276-2831 | 541-240-1304 |

**If none of these individuals is available, the lead person responding is responsible for making the following contacts and completing the Sanitary Sewer Overflow Onsite Assessment form.**

3. **Power Outage**: If the cause of the problem is a power outage, contact the power company as follows:
   Mon.-Fri., 8:00 AM-5:00 PM-----541-278-2955
   After hours and weekends---------888-221-7070

   **METER NUMBERS:** If the problem is related to a lift station, please provide the Power Company with this information when you call for assistance.

| Location: | Main Meter Number |
|---|---|
| WWTP | 68691367 |
| 28th St | 50827154 |
| McKay Cr. | 28381315 |
| Bartsch Road | 76372588 |
| Westgate | 23762401 |

4. **Contact** the following emergency numbers:
   **For minor spills** that do not enter a water body or pose a threat to the public, contact local ODEQ **within 24 hours**. (Elizabeth Hutchison is our local ODEQ contact person.) If local contact cannot be made within 24 hours, (i.e. Fri. 5:00 PM-Sun. 8:00 AM), contact Oregon Emergency Response Service (OERS) at the number below.

   **For major spills** that enter a water body or pose a threat to public health, **contact** local ODEQ **as soon as possible** within 24 hours. If you do not reach Elizabeth Hutchison at her office OR the local ODEQ office during business hours, be sure to contact OERS and follow instructions from them.

   **Mon.-Fri., 8:00 AM-5:00 PM-----Elizabeth Hutchison, ODEQ--------278-8681**
   **or ODEQ office -----------------------276-4063**
   **After hours and weekends----**
   **Oregon Emergency Response Service (OERS)------ 1-800-452-0311**

5. **Additional contacts**:

   **For minor spills** that do not enter a water body or pose a threat to the public, contact Bob Patterson, Public Works Director, at his office the next working day.

   **For major spills** that enter a water body or pose a threat to public health, contact Bob Patterson, either at his office or at his home.

   Mon.-Fri., 8:00 AM-5:00 PM-----Bob Patterson----966-0241
   After hours and weekends---------Bob Patterson----276-6483

   **Contact WWTP** if the waste is septic, contains any chemicals, or contains rocks or other debris that might be harmful to the WWTP process.

6. **Proceed with repairs** as necessary.

7. For any sewage that is on the ground or pavement, **clean up the spill** as much as possible. Return as much material as reasonable (without rocks & debris) to the manhole. Scoop up and remove any additional waste and dispose of properly. Finally, apply lime or bleach solution to the affected area.

8. **<u>Document everything</u>** carefully (Sanitary Sewer Onsite Assessment form), including the time you first learned about the spill, the location of the spill, the steps you followed to contain the spill, who and when you contacted others for assistance, and the date and time you contacted the emergency numbers. Estimate the approximate volume of spilled sewage.

9. ODEQ (Elizabeth Hutchison) will provide instructions if a **written report** is required as a result of the spill. If a written report is required, it must be submitted to ODEQ within 5 days of the spill. If the spill enters a stream, river, lake or storm drain, ODEQ will provide instructions on **public notice** if it is required, such as announcements in the newspaper and/or posting of the affected area.

10. **Information to Relay to Property Owner/Resident**

    A) Instruct the property owner/resident to take proper precautions to minimize loss and potential health effects, including:
    - Keep children, pets, and others out of the overflow;
    - Move any uncontaminated property away from the overflow area; and
    - Arrange for initial clean-up through a cleaning contractor. Provide a prepared list of cleaning contractors or refer the caller to the Yellow Pages.

    B) Use general terms that the owner/resident can understand, and give your name and phone number for future reference.

    C) Clearly communicate that a blockage in the sewer main line will be promptly cleared, but that **the City is NOT allowed to work on a blockage in the property owner♣s/resident♣s service lateral line.**

    D) Show concern and empathy for the property owner/resident, but **do not admit or deny liability.** Remain calm and professional, even if the property owner/resident is distraught and emotional. If property owner/resident is violent, leave the site and call for assistance.

# SANITARY SEWER OVERFLOW INCIDENT REPORT

*If you receive a call about a sanitary sewer overflow, collect the following information. Remember to remain calm and objective, even if the caller is emotional and distraught. Show concern and empathy for the property owner/resident, but do not admit or deny liability.*

Name of caller: ______________________________________________________________

Phone or Contact Information of Caller: ______________________________________________

Date of Call: ________________________ Time of Call: ________________________ AM/PM

Approximate date and time of overflow, if different than date and time of call: ________________

Address where overflow occurred or nearest cross street: __________________________________

Location of Overflow (basement, restroom, laundry room, etc.): ___________________________

Approximate size of overflow (in gallons): _____________________________________________

Property that has been affected by the overflow: ________________________________________

Immediate health or safety issues: ____________________________________________________

Is overflow expanding, stationary, or receding: __________________________________________

Name of person receiving the call**:** ______________________________________________________

Initial Actions Taken (Who was the call turned over to for response?): _______________________

******************************************************************************************

**Information to Give Caller Before Hanging Up**

1) Instruct the caller to take proper precautions to minimize loss and potential health effects, including:
   - Keep children, pets, and others out of the overflow;
   - Move any uncontaminated property away from the overflow area; and
   - Arrange for initial clean-up through a cleaning contractor. Provide a prepared list of cleaning contractors or refer the caller to the Yellow Pages.

2) Clearly communicate who will respond and when and what area(s) they will need access to.

3) Use general terms that the caller can understand, and give the caller your name for future reference.

4) Clearly communicate that a blockage in the sewer main line will be promptly cleared, but that **the City is NOT allowed to work on a blockage in the property owner's/resident's service lateral line.**

5) Show concern and empathy for the property owner/resident, but **do not admit or deny liability.**

## SANITARY SEWER OVERFLOW ONSITE ASSESSMENT

Complete as soon as possible after problem is corrected; one form for each property involved in overflow. For liability reasons, use the buddy system if entering a private residence or business. **DO NOT track sewage to uncontaminated areas of the property.**

Your Name: ______________________________________________________________________

Date and Time you learned of the overflow: ______________________________ AM/PM

Date and Time you arrived onsite: _____________________________________ AM/PM

Other Personnel responding to the overflow: ___________________________________________

Property Owner♣s/Resident♣s Name: __________________________________________________

Address of overflow or nearest cross street: ____________________________________________

Approximate date and time of overflow: _______________________________________________

Location of overflow (basement, restroom, laundry room, etc.):______________________________

Immediate health or safety issues: ____________________________________________________

Initial actions taken: ______________________________________________________________

Did you contain the spill and how?___________________________________________________

Estimate the amount that spilled (gallons):_________ Did any of the overflow enter a stream, river, lake or storm drain?______ If yes, estimate how much (in gallons): _________________________

Was lime or anything else applied to the area? __________________________________________

Did you observe conditions that may have led to the overflow? Yes ______ No ______ If Yes, describe the conditions.__________________________________________________________________

Time area was cleaned up: __________________________________________________________

What actions were taken to prevent future overflows at this location? ___________________________
________________________________________________________________________________

Other information specific to this incident (objective comments only): _________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

**Use the form on the back to record who you notified and if you received any instructions from them.**

**Complete the notification information below.**

| CONTACT | | TIME NOTIFIED | INSTRUCTIONS RECEIVED |
|---|---|---|---|
| | Jeff Brown 276-3078 (W)<br>**CITY** 276-0404 (H)<br>310-9210 (Cell) | | |
| OR | George Hall 276-3078 (W)<br>**CITY** 276-3420 (H)<br>969-8384 (Cell) | | |
| OR | Karen King 276-3078 (W)<br>**CITY** 278-2151 (H) | | |
| OR | Mark Milne 276-3372 (W)<br>**CITY** 276-2831 (H)<br>240-1304 (Cell) | | |
| | Bob Patterson 966-0241 (W)<br>**CITY** 276-6483 (H) | | |
| | **ODEQ** (Elizabeth Hutchison )<br>278-8681 (W)<br>276-4063 (Off) | | |
| OR | Oregon Emergency Response<br>**OERS** **1-800-452-0311** | | |

*****************************************************************************************************

## <u>Information to Relay to Property Owner/Resident</u>

1) Instruct the property owner/resident to take proper precautions to minimize loss and potential health effects, including:
   - Keep children, pets, and others out of the overflow;
   - Move any uncontaminated property away from the overflow area; and
   - Arrange for initial clean-up through a cleaning contractor. Provide a prepared list of cleaning contractors or refer the caller to the Yellow Pages.

2) Use general terms that the owner/resident can understand, and give your name and phone number for future reference.

4) Clearly communicate that a blockage in the sewer main line will be promptly cleared, but that **the City is NOT allowed to work on a blockage in the property owner’s/resident’s service lateral line.**

5) Show concern and empathy for the property owner/resident, but **do not admit or deny liability.** Remain calm and professional, even if the property owner/resident is distraught and emotional. If property owner/resident is violent, leave the site and call for assistance.

Murray, Smith & Associates, Inc.
Engineers/Planners

## Appendix C

2004 Rieth Wastewater System Agreement

MEMORANDUM OF AGREEMENT BETWEEN UMATILLA
COUNTY AND CITY OF PENDLETON
REITH WASTEWATER SYSTEM

WHEREAS, Umatilla County, Oregon (the "County") and the City of Pendleton, Oregon (the "City"), desire to enter into an agreement for the use and the disposition of the Reith Sanitary District wastewater system;

WHEREAS the community of Reith, through the Reith Sanitary District, is in the process of creating a wastewater system, and financing of the project is proposed to be from a Community Development Block Grant ("CDBG") and loans from the Oregon Department of Environmental Quality state fund; and

WHEREAS after the system is completed, the system will be operated by the City and be connected to the City wastewater system; and

WHEREAS due to the grant and loan restrictions, it has been requested, and the County has agreed, for the County to be the sponsor of an application for the CDBG and DEQ loan for the Reith wasterwater system improvements; and

WHEREAS the grant and loan terms restrict the ownership of the improvements to the Reith Sanitary District; and

WHEREAS the County and the City desire to set out an agreement for the continued use and disposition of the wastewater system in the event of a default in the terms of the grant or loan, and/or the operation the wastewater system is assumed by or becomes the responsibility of the County.

NOW, THEREFORE, the parties do agree that in the event the operation of the Reith wastewater system becomes the responsibility of the County, the City agrees to allow the system to be connected to the City wastewater system, and to continue to operate and to maintain the system to the same extent and on the same terms as existed prior to a loan default or the involvement of the County.

AUTHORITY

The parties agree that each has the authority to execute this Agreement and that the Agreement is executed pursuant to each party's lawful authority.

EFFECTIVE DATE

This Agreement shall become effective on the signing of both parties.

UMATILLA COUNTY

By: Dennis D. Doherty	2-12-04
Dennis D. Doherty, Chair	Date
Board of Commissioners

CITY OF PENDLETON

By: Robert E. Ramig	Feb. 6 2004
Mayor	Date

Judi A. Fosler
City Recorder

Approved as to form:

Douglas R. Olsen, County Counsel

Peter H. Wells, City Attorney

ATTEST:
Office of County Records

By: Jean Humphries
Records Officer

ATTEST:
City of Pendleton

# AGREEMENT FOR THE PROVISION OF WASTEWATER SERVICES NECESSARY FOR THE OPERATION AND MAINTENANCE OF THE RIETH SANITARY SEWER DISTRICT WASTEWATER SYSTEM

Dated: November 14, 2003

Between: The City of Pendleton, an Oregon municipal corporation, hereinafter referred to as "City".

And: The Rieth Sanitary Sewer District, a Umatilla County Special Service District, hereinafter referred to as "District".

**Recitals:**

A. The District intends to construct a wastewater collection system with pump station and forcemain to provide wastewater service to residents in the District.

B. The City will provide wastewater treatment, and operation and maintenance services for the District wastewater system, when completed.

C. The District will own the system and provide for replacement costs.

**Article 1 – Definitions**

"City" shall mean the City of Pendleton, Umatilla County, Oregon.

"District" shall mean the Rieth Sanitary Sewer District.

"District's Wastewater System" shall mean the entire wastewater system from the point where individual services lines leave private property to where the system connects to the City wastewater collection system at the closest location to the District where it crosses the railroad tracks. This includes all piping, manholes, pumps, valves, electrical, and controls necessary for providing wastewater services for residents in the District.

"Wastewater Service" shall mean the provision of wastewater transport through the City's existing collection system; wastewater treatment as required by law; and operations, maintenance and equipment replacement services by the City for the District's Wastewater System pursuant to this Agreement. This service shall include the costs of parts, equipment, electricity, liability insurance and other costs incidental to the proper operation and maintenance of the District's Wastewater System. Equipment replacement from normal wear and tear will be at the cost of the District.

**Article 2 – Project Construction**

2.1 The District will be responsible for construction of the District's Wastewater System. This shall include all administration, legal, engineering and construction including coordination with applicable agencies.

City Did not do 1 yr. follow up "walk through"

2.2 The City will be responsible for providing review comments on the design plans and specifications and participating in the final acceptance inspection with the District, County, Engineer, Contractor and funding agency.

**Article 3 – Terms and Conditions for Wastewater Service**

3.1 Upon completion of the District Wastewater System, the City hereby agrees to provide Wastewater Service to the District for the users connected to the District Wastewater System.

3.2 It is agreed that connection fees will not be charged for the users that connect to the District Wastewater System within one calendar year after the Project construction is completed. Connections made after this time will be assessed an amount equal to 110 percent of the City's in-city rate per user, as defined by City ordinances.

3.3 The District agrees to pay the City monthly for Wastewater Service based on the number of users connected to the system and using water.

3.4 The District agrees to pay the City an amount equal to 110 percent of the City's in-city rate per user, as defined by City ordinances.

Raised from 11.50 to 15.00 TO 29.00 no written notification?

3.5 The City shall give the District 60 days notice that the City intends to change any ordinances or resolutions regarding wastewater rate changes or hookup fees. If the City fails to give the District 60 days notice prior to changing rates or hookup fees, the rate and fee changes shall not be effective as to the District until 60 days after actual notice is given.

3.6 The District agrees to allow access for the City to the District Wastewater System.

3.7 The District shall notify the City of any proposed changes to the District Wastewater System or required Wastewater Service, prior to the District approving the changes. This includes the connection of new users or changes in wastewater characteristics.

3.8 The District agrees to comply with commercial and industrial wastewater requirements (i.e., pretreatment and/or inspection programs) outlined in City ordinances for other users of the City system. This is intended to prevent the dumping of substances the City's treatment facility cannot adequately process.

3.9 The District shall pay the City, without being invoiced, for Wastewater Service on a monthly basis within 60 days after the date of mailing bills to the users. This will provide the District with the time required to collect applicable fees from the users.

3.10 An interest charge of 2/3 of 1 percent per month may be assessed on all sums payable under this Agreement that are not paid within the time lines outlined above.

3.11 After the date of this agreement, if the United States Environmental Protection Agency or the Oregon Department of Environmental Quality rules and regulations are changed requiring an upgrading of the wastewater system, or replacement of capital assets to comply with EPA and DEQ rules and regulations, this agreement shall be amended to provide that the parties will permit paying a pro rata share for the constant upgrading or replacement of capital assets of the City's wastewater treatment facility.

3.12 Notwithstanding the terms of this agreement, the District and the City agree to fully cooperate to comply with all state and federal rules and regulations affecting sewage treatment and disposal.

3.13 If the City for any reason fails to provide the services required by this agreement, the City agrees to indemnify and hold harmless the District for any resulting liability.

3.14 If due to a power outage or other emergency situation the availability of wastewater services is limited, the City shall give equal priority in restoring and/or maintaining the wastewater system for the District.

3.15 The District retains the right to employ an agent or representative to inspect the City's wastewater system in order to ascertain its ability to meet the terms of this agreement.

3.16 The City agrees to provide access to the District, its agents or representatives to all facilities and easements in order to facilitate inspection of the City's wastewater system.

**Article 4 – Term**

The term of this Agreement shall be 21 years after startup of the new facilities and shall be renewable, unless otherwise agreed to in writing by both the City and the District.

**Article 5 – Miscellaneous**

5.1 If any term of this agreement is held to be invalid in any judicial action, the remaining terms of this agreement shall remain effective.

5.2 If any dispute arises between the City and the District affecting the terms, conditions and covenants of this agreement, the same shall be submitted to an arbitrator. The arbitrator shall be selected pursuant to the terms of ORS 36.300, et. seq. The matter shall proceed in conformity with ORS 36.300, et. seq.

Change contact for district TO office

5.3 Any notice to which the District shall be entitled to under this agreement shall be delivered or sent to Tim Cain, Rieth Sanitary Sewer District, 42449 George Street, Pendleton OR 97801. Any notice to which the City shall be entitled to under this agreement shall be delivered or sent to City Manager, 500 SW Dorion Avenue, Pendleton OR 97801

5.4 To the extent permitted by law, the prevailing party in any dispute arising from this contract shall be entitled to recover from the other its reasonable attorney fees at arbitration, at trial and on appeal.

5.5 The terms of this contract will not be waived, altered, modified, supplemented, or amended in any manner, except by written instrument signed by the parties.

5.6 This contract constitutes the entire agreement between the parties on the subject matter hereof. There are no understandings, agreements or representations, oral or written, not specified herein regarding this contract.

**Signatures**

| City of Pendleton | Rieth Sanitary District |
|---|---|
| Robert E. Ramig 02/06/04 | Tim Cain Commissioner |
| Mayor | Name Title |
| Judi A. Zoske | Bill [illegible] Commissioner |
| City Recorder | |

# CITY OF PENDLETON

***Public Works Department***
500 S.W. Dorion Avenue
Pendleton, Oregon 97801-2090
Telephone (541) 966-0202
FAX (541) 966-0251
TDD Phone (541) 966-0230

March 28, 2011

Freda Wyss
Rieth Sanitary Sewer District
73292 Wyss Lane
Pendleton, OR 97801

RE: Annualized Sewer Rate Increases

Dear Freda (and Board Members):

It has been brought to my attention that there is a concern that the City is not providing 60-days notice of a rate increase in accordance with our mutual agreement. City initiated an annualized rate increase under Resolution 2246 effective July 1, 2005. I met with the then current Board (and other customers) and informed them of this increase and provided a copy of Resolution 2246 and discussed how this helps the City to pace inflation without enacting "step" increases every 2 to 5 years. This policy adopted by our Council has worked extremely well in allowing us to maintain our infrastructure with rising costs from year to year. The intent was to also allow our wholesale and larger use customers to look up the information and budget accordingly on their own.

To date, we have not changed or modified any resolutions or ordinances in regards to our sewer system. If we do, we will provide the 60-day notice as required in our agreement. I appreciate the reminder that with Board member turnover, issues like this get lost in the exchange of Board members.

The language in Resolution 2246 pertinent to the annualized rate increase follows:

*Each April 1 the Residential, Transient, Commercial (Light), Commercial (Heavy), RV Spaces, Septic Waste, and Wastewater Treatment Plant Lab charges shall be adjusted by an amount equal to the lesser of 3.5% or the year to year percentage change in the Portland-Salem Consumer Price Index, Urban Consumer (CPI-U) as of December of the preceding calendar year. The billing rate will be the adjusted rate rounded to the nearest $0.05.*

The annualized rate increase information can be found via the internet at:
http://www.qualityinfo.org/pubs/cpi/cpi.pdf.

I have attached a copy of the information and our upcoming rate adjustments to be applied to the April 2011 billing cycle. Our rate increase cannot be greater than 3.5% in any given year. This allows for our customers to plan their budgets and when they contact us, we are happy to share our information. We did not have a rate increase last year due to the 2009 CPI-U set at 0.1%. If you would like to verify the annualized rate increase, please contact our Utility Billing staff at 541.966.0334 every March; otherwise, if you use the internet link provided above, you will have the same information as our staff.

If you would like to have me address the Board on this issue, please contact me at 541.966.0241.

Sincerely,

Bob Patterson
Public Works Director

BP/bp/jh

Enclosures
c: Andrea Denton, City Recorder
Kendra Alvarado, Utility Billing
File: Rieth Sanitary Sewer District

Murray, Smith & Associates, Inc.
Engineers/Planners

# APPENDIX D
Routine Sewer Cleaning/Problem Spots

| Routine Sewer Cleaning / Problem Spots | | | |
|---|---|---|---|
| **LIFT STATION** | **LOCATION** | **DATE CLEANED** | **OBSERVATIONS** |
| | | | |
| MCKAY CREEK | SW Kirk Ave 600' west of SW 37th St | | |
| | | | |
| WESTGATE | On Westgate Pl neaqr Sears | | |
| | | | |
| BARTSCH | On Bartch Rd in Keystone RV lot | | |
| | | | |
| REITH | On Birch Cr Rd in Reith | | |
| | | | |
| **MONTHLY** | | | |
| | | | |
| Hill Meat | MH 250' south of corner 49th & H ave. | | |
| S.W. 12th & Frazer | In intersection run south to bottom of hill | | |
| S.W. 28th & Goodwin pl. | On dirt road behind Hailey Pl. Apt. | | |
| N.W. 6th at top | MH at 827 N.W. 6th run north | | |
| City Hall | In front parking lot run both ways | | |
| N.W. Westgate dr & Keystone | West of intersection | | |
| S.W. 16th & Emigrant | Run North | | |
| S.E. 9th Emigrant to Court | Run South | | |
| S.E. 20th & Court to S.E. 14th & Court | | | |
| R.V. Dump to 4th st. | MH at east end of Village Apt. run east | | |
| S.E. 3rd dr. & Nye | Run east, west & south | | |
| SW Niye Ave at Southgate | Run east | | |
| | | | |
| **CLEANED 3 MONTH** | **Mar, June, Sept, Dec** | | |
| | | | |
| N.W. 51st & A st. | in alley SW corner of trailer G | | |
| N.W. 56th & A st. | Westside of intersection | | |
| Old sanitary service shop line | Below SE corner of lot | | |
| S.W. 3rd & Emigrant | To MH at SW 3rd and Dorion | | |
| S.W. 4th & Frazer | To MH at SW 4th & Emigrant | | |
| S.E. 6th Court to Byers | Run North | | |
| S.W. 8th at top | Above Isaac flush w/ rootx | | |
| Roosters | SE corner of lot run north | | |
| S.E. 6th & Goodwin | Run east, west and south | | |
| SE 10th st. | Below Boy's home | | |
| SW Hailey Ave | Blue Mtn. Apts. | | |
| SW 15th & Goodwin | south toward Hailey under deck | | |
| | | | |
| **CLEANED 6 MONTH** | **April, Oct** | | |
| | | | |
| NW 57th Dr | Greaybeal Dist. | | |
| SE 2nd & Byers | Run North | | |
| NW 3rd & Ellis | North | | |
| SW 37th to SW 39th | Mid Block | | |
| SW Byers Ave | MH 30' off the end of the road (Sears) | | |
| SE 21st & Byers | east across river | | |
| SE 14th | Court to Court PL | | |
| SW 13th & Isaac | Run east to 12th behind curb | | |

Murray, Smith & Associates, Inc.
Engineers/Planners

# APPENDIX E
Cost Estimating Methodology and Assumptions

## APPENDIX E
## COST ESTIMATING METHODOLOGY AND ASSUMPTIONS

### Introduction

This appendix summarizes the approach used in development of unit costs and project costs used in the Capital Improvement Program (CIP) for the City of Pendleton's (City) Collection System Master Plan (CSMP).

### Cost Estimating

The probable costs estimated for each improvement are based on average costs from the 2013 RS Means Heavy Construction Cost Data (RSMeans), City input, construction costs for similar projects across the Northwest, and information provided by local suppliers. All costs identified in this section reference U.S. dollars. The *Engineering News Record* Construction Cost Index (ENR CCI) basis is 9668 (20-City Average, December 2013).

Project cost estimates were prepared in accordance with the guidelines of AACE International. (*AACE International Recommended Practice No. 56R-08 Cost Estimate Classification System - As Applied For The Building and General Construction Industries - TCM Framework: 7.3 - Cost Estimating and Budgeting Rev. December 31, 2011*). The project cost estimates in this CSMP are categorized Class 5, as defined by AACE International:

> *Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. As such, some companies and organizations have elected to determine that due to the inherent inaccuracies, such estimates cannot be classified in a conventional and systemic manner.*
>
> *Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc.*
>
> *Typical accuracy ranges for Class 5 estimates are -20% to -30% on the low side, and +30% to +50% on the high side, depending on the construction complexity of the project, appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks.*

All project descriptions and cost estimates in this CSMP represent planning-level accuracy and opinions of costs (+50%, -30%). During the design phase of each improvement project, project definition, scope and specific information (e.g., pipe diameter and length) should be verified. The final cost of individual projects will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule and other factors. Because of these factors, project feasibility and risks must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding.

The project costs presented in this CSMP include estimated construction costs, and allowances for permitting, legal, administrative and engineering fees. A contingency factor is also added to each cost to help account for any unanticipated components of the project costs. Construction costs are based on the preliminary concepts and layouts of the system components developed during the system analysis.

Total estimated project costs were developed through a progression of steps and multiple methodologies. The steps included development of component unit costs, construction costs and, finally, project costs. The component unit cost includes the sum of materials, labor and equipment of a project's basic features. The construction cost is the sum of component costs and mark-ups to determine the probable cost of construction (i.e., the contractor bid price). The project cost is the sum of construction costs with additional cost allowances for engineering, legal and administrative fees as well as a contingency factor to estimate the total project cost to the City.

The following costs are not included:

- Land or right-of-way acquisition, unless directed by the City.
- Required improvements or upgrades to the Resource Recovery Facility to accommodate system expansion.
- Collection System planning or modeling.
- Borrowing or finance charges during the planning, design, or construction of assets.
- Improvements to conveyance, pumping, storage, or treatment facilities in response to changes in regulatory standards or rules.
- Remediation or fines associated with system violations.

## Component Unit Costs

### *Pipelines*

Gravity pipe material was assumed to be PVC D3034 SDR 35 for 15-inch diameter pipe and smaller and PVC F-679 for pipe with a diameter greater than 15 inches**.** The pipe material assumed for new force mains was PVC SDR 21 for 4- to 12-inch diameter pipe and SDR 32.5 for 14- to 18-inch diameters. The pipe material costs were obtained from a local distributor and were similar to RSMeans.

A specific cost has been identified for each pipe diameter and pipe depth for gravity pipe. For all pipe installations including new and replacement projects, the cost is assumed to include:

- Excavation.
- Waste of the material associated with trenching (which includes haul, load and dump fees).
- Imported bedding and zone material.
- Native backfill (including minimal haul and compaction of material).
- Trench box use (for trenches deeper than 4 feet).
- Testing of fittings by closed-circuit television (CCTV) inspection.

For replacement of existing sewer lines, additional costs include bypass of sewer flow during construction (2% of pipe costs applied to cost per foot). Other construction methods may be utilized, especially for deep pipelines; prior to budgeting or construction, additional cost analyses should be completed. See Table E-1 for linear feet costs for gravity pipes.

**Table E-1**
**Gravity Pipe Costs per Linear Foot**

| Pipe Invert Depth (feet) | Diameter (inches) | | | | | | |
|---|---|---|---|---|---|---|---|
| | **8** | **10** | **12** | **14** | **15** | **16** | **18** |
| 4 | $24 | $29 | $34 | $40 | $43 | $47 | $56 |
| 5 | $25 | $31 | $35 | $42 | $45 | $49 | $58 |
| 6 | $31 | $37 | $42 | $49 | $52 | $56 | $65 |
| 7 | $33 | $39 | $44 | $50 | $53 | $58 | $67 |
| 8 | $34 | $40 | $45 | $52 | $55 | $60 | $69 |
| 9 | $36 | $42 | $47 | $54 | $57 | $61 | $70 |
| 10 | $37 | $43 | $49 | $56 | $59 | $63 | $72 |
| 11 | $39 | $45 | $50 | $57 | $60 | $65 | $74 |
| 12 | $40 | $46 | $52 | $59 | $62 | $67 | $76 |
| 13 | $41 | $48 | $53 | $60 | $64 | $69 | $78 |
| 14 | $43 | $49 | $55 | $62 | $65 | $70 | $80 |
| 15 | $44 | $51 | $57 | $64 | $67 | $72 | $82 |
| 16 | $46 | $52 | $58 | $65 | $69 | $74 | $84 |
| 17 | $48 | $55 | $61 | $68 | $72 | $77 | $87 |
| 18 | $52 | $59 | $65 | $72 | $76 | $81 | $91 |

| Pipe Invert Depth (feet) | Diameter (inches) | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | $57 | $63 | $70 | $77 | $81 | $86 | $96 |
| 20 | $62 | $69 | $75 | $83 | $87 | $92 | $102 |

Force mains were assumed to be at a cover depth of four feet, and a specific cost has been identified by diameter. See Table E-2 for force main costs.

**Table E-2**
**Force Main Costs**

| Diameter (inches) | Cost per Linear Foot |
|---|---|
| 4 | $20 |
| 6 | $25 |
| 8 | $30 |
| 10 | $38 |
| 12 | $46 |
| 14 | $53 |
| 16 | $60 |
| 18 | $63 |

*Bedrock*

There is typically ripable rock in the Pendleton area. For planning purposes, a cost factor was applied to projects identified by the City where rock excavation may be necessary. Based on rock at or very near the surface, rock excavation will increase pipeline unit costs by approximately 100%.

*Special Pipe Crossings*

Special pipe crossings are required for crossing rivers, canals, railroads and highways, or areas where traditional open cut construction is not possible. An additional 100% is applied to pipeline unit costs for any projects with these conditions.

### *Manholes*

New gravity pipelines and gravity pipeline upgrades include costs for new manholes. Project costs for gravity pipelines include manholes along the length of the asset spaced 400 feet for diameters less than or equal to 15 inches, and 500 feet for larger pipe diameters. New manhole costs include the cost for the base, frame, standard cover, installation, and testing. No manhole-related surface restoration costs were included, since they will be addressed separately under surface restoration costs. The cost for manholes varies, depending on the depth. See Table E-3 for manhole construction costs. The costs for manholes were developed from RSMeans.

**Table E-3**
**Manhole Construction Costs**

| Diameter (inches) | Invert Depth (feet) | | | | |
|---|---|---|---|---|---|
| | **<5** | **5-10** | **10-15** | **15-20** | **20-25** |
| 48 | $3,344 | $6,239 | $10,484 | $16,080 | $23,026 |
| 60 | $4,543 | $8,662 | $14,599 | $22,356 | $31,932 |
| 72 | $5,927 | $11,139 | $18,383 | $27,657 | $38,963 |

### *Diversion Manholes*

Manholes that include a diversion structure were assumed to be twice the RSMeans manhole cost for a particular depth. This cost is assumed to include the purchase and installation of a 72-inch manhole and the construction of a flow diversion structure inside the manhole.

### *Surface Restoration*

Surface restoration of construction sites is required based on the existing surface condition of the project area. As with the pipe installation costs, the surface restoration costs will increase with the size of pipe and depth of construction, due to the larger trench and greater surface area impacted. Therefore, a unit surface restoration cost has been used for each pipe diameter at pipe invert depths of 5-foot increments. See Table E-4 for surface restoration costs. The surface restoration is developed from local supplier and costs and RSMeans.

**Table E-4**
**Surface Restoration Unit Costs**

| Cost per Unit Length ($/LF) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario** | **Pipe Invert Depth (feet)** | | | | | | | | | | | | | | |
| | **Local[1]** | | | | | **Arterial[2]** | | | | | **Unpaved[3]** | | | | |
| **Diameter (inches)** | **<5** | **5-10** | **10-15** | **15-20** | **20-25** | **<5** | **5-10** | **10-15** | **15-20** | **20-25** | **<5** | **5-10** | **10-15** | **15-20** | **20-25** |
| 4 | $18 | $18 | $18 | $30 | $30 | $19 | $19 | $19 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 6 | $18 | $18 | $18 | $30 | $30 | $19 | $19 | $19 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 8 | $19 | $19 | $19 | $30 | $30 | $20 | $20 | $20 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 10 | $20 | $20 | $20 | $30 | $30 | $20 | $20 | $20 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 12 | $20 | $20 | $20 | $30 | $30 | $21 | $21 | $21 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 14 | $20 | $20 | $20 | $30 | $30 | $21 | $21 | $21 | $31 | $31 | $5 | $5 | $5 | $9 | $9 |
| 15 | $21 | $21 | $21 | $30 | $30 | $22 | $22 | $22 | $31 | $31 | $6 | $6 | $6 | $9 | $9 |
| 16 | $21 | $21 | $21 | $30 | $30 | $22 | $22 | $22 | $31 | $31 | $6 | $6 | $6 | $9 | $9 |
| 18 | $22 | $22 | $22 | $30 | $30 | $23 | $23 | $23 | $31 | $31 | $6 | $6 | $6 | $9 | $9 |

[1] *Local: Road repair and replacement along trench: 3.5-inch asphalt and 4 inches of ¾-inch minus and 8 inches of 2-inch minus.*
[2] *Arterial: Road repair and replacement along trench: 4.5-inch asphalt and 4 inches of ¾-inch minus and 8 inches of 2-inch minus.*
[3] *Unpaved: repair and replacement along trench cross-country or in gravel road.*

### *Lift Stations*

*New Lift Station*

Unit construction costs for new lift stations are developed based on comparisons to other similar pump station projects completed in the Northwest. Specific components will vary somewhat across projects based on site conditions and hydraulic requirements. The costs include basic site, civil, mechanical, electrical, and instrumentation and control conditions. They also include mobilization, contractor overhead and profit, contingency and engineering, legal and administrative fees.

For conservative planning cost estimates, two general lift station categories were developed: Submersible and Wet Well/Dry Well. The submersible lift stations were generally assumed to utilize concrete wet well construction, submersible pumping equipment, standby power provided by a standby generator, a bypass pumping port and liquid level, pressure and flow monitoring. The Wet Well/Dry Well lift stations were generally assumed to utilize concrete wet well, concrete dry well, control building, pumping equipment in the dry pit, standby power provided by a standby generator, a bypass pumping port and liquid level, pressure and flow monitoring. Cost curves for both lift station types were developed based on lift station firm horsepower. Horsepower was calculated for each lift station assuming a 60% efficiency. Generally, Wet Well/Dry Well type lift stations have higher a cost per horsepower because of the higher cost items included in that type of project. See Table E-5 for lift station cost curves.

**Table E-5**
**Lift Station Construction Costs**

| Lift Station Type | Cost per Horsepower |
|---|---|
| Submersible | $= 267{,}383 \cdot \ln(HP_{firm}) - 277{,}989$ |
| Wet Well/Dry Well | $= 3{,}000{,}000 \cdot \ln(HP_{firm}) - 10{,}000{,}000$ |

*Variable Frequency Drive Retrofit*

A cost estimate was also developed for upgrading the existing Bartsch Lift Station with variable frequency drives (VFDs). Cost was based on comparisons to other pump facility improvement projects completed in the Northwest that included the addition of VFDs and was scaled to estimate the Bartsch Lift Station improvement by comparing horsepower of the pumps in each facility. This lump-sum cost includes the purchase and installation of two VFDs with housing, two new invert duty motors, existing pump rehabilitation, and miscellaneous piping and electrical upgrades.

*Lift Station Decommission*

For lift station decommissioning projects, a lump-sum cost of $20,000 was assumed. This cost includes the demolition of the lift station, salvage of valuable components, haul and disposal of waste, backfilling of lift station area, surface restoration and abandoning the force main in place.

### *Land Acquisition*

For most CIP projects, acquisition of land is not required, therefore no cost is applied. However, for CIP G-3, the addition of a land easement cost was required for a cross-country portion of the project. City staff provided a typical land easement acquisition cost of $4,000 per acre. This cost was applied to a typical easement width of 10 feet by the length of required pipe corridor outside the City's right-of-way.

## Construction Cost Allowances

The construction cost is the sum of materials, labor, equipment, mobilization, contractor's overhead and profit, and contingency for each project. Tables E-6 and E-7 present the additional allowances associated with the construction costs and project costs, respectively.

### *Traffic Control*

Traffic control will be required for all projects that occur in roadways. The cost and level of traffic control should be evaluated based on the scope and size of each project and local conditions at the time of construction. For planning purposes, the cost of traffic control is estimated at 0.5% for low-traffic control areas or 2% for high-traffic control areas, depending on project location. Traffic control mark-up accounts for the cost of signage, flagging and temporary barriers, street widening, pavement markings, lane delineators and lighting at flagging locations.

### *Erosion Control*

Erosion control will be required for all projects. For planning purposes, erosion control is estimated at 1% of the construction costs. Erosion control mark-up accounts for materials and practices to protect adjacent property, stormwater systems, and surface water in accordance with regulatory requirements. The level of effort and cost for erosion control depends on the size and scope of a project, and the local conditions at the time of construction.

### *Dewatering*

Dewatering groundwater is expected to be necessary when construction is near the Umatilla River and other smaller water drainages as identified by the City. For planning purposes, dewatering is estimated at 1% of the construction costs for projects located in these areas.

### *Construction Contractor Overhead and Profit*

This 10% mark-up accounts for the contractor's indirect project costs and anticipated profit.

### *Construction Mobilization*

A 10% mobilization mark-up accounts for the cost of the contractor's administrative and direct expenses to mobilize equipment, materials and labor to the work site.

### *Construction Contingency*

A 30% increase was added in each project's construction cost to account for a contingency factor to cover the uncertainties inherent to planning-level development. The contingency is provided to account for factors such as:

- Unanticipated utilities.
- Relocation and connection to existing infrastructure.
- Minor elements of work not addressed in component unit cost development.
- Details of construction.
- Changes in site conditions.

- Variability in construction bid climate.

The contingency excludes:

- Major scope changes such as end product specification, capacities and location of project.
- Extraordinary events such as strikes or natural disasters.
- Management reserves.
- Escalation and currency effects.

A summary of construction mark-ups is provided in Table E-6.

**Table E-6**
**Additional Construction Costs**

| Additional Cost Factor | Percent |
|---|---|
| Low Traffic Control | 0.5% |
| High Traffic Control | 2% |
| Erosion Control | 1% |
| Dewatering | 1% |
| Contractor Overhead and Profit | 10% |
| Mobilization | 10% |
| Contingency | 30% |

### Total Project Cost

The total project cost is the sum of construction cost with additional cost allowances for engineering, legal, and administrative fees. Table E-7, shown below, presents the cost allowances for each additional project cost. The engineering costs include design and surveying. Construction administration is the cost associated with managing the construction of the project. The administrative and legal costs are those associated with the City providing financial and legal oversight of the contract.

**Table E-7**
**Summary of Additional Costs**

| Additional Cost Factor | Percent |
|---|---|
| Construction Administration | 5% |
| Engineering | 15% |
| Legal and Administrative | 10% |

CITY OF PENDLETON
INCORPORATED
1880
OREGON

MSA

MURRAY, SMITH & ASSOCIATES, INC.
ENGINEERS | PLANNERS