

OGDEN CITY
SEWER MASTER PLAN
2023

VOLUME 1
EXECUTIVE SUMMARY & MASTER PLAN REPORT



ACRONYMS & NOMENCLATURE

| | |
|-------|--|
| BDO | Business Depot Ogden |
| cfs | cubic feet per second |
| CIP | Capital Improvement Plan |
| CIPP | Cured In-Place Pipe |
| CWSID | Central Weber Sewer Improvement District |
| d/D | depth/Diameter |
| DDR | Defense Depot Reuse |
| fps | feet per second |
| GIS | Geographic Information Systems |
| gpm | gallons per minute |
| gpcd | gallons per capita per day |
| gpd | gallons per day |
| in | inches |
| I&I | Infiltration and Inflow |
| LF | Linear Feet |
| MGD | Million Gallons per Day |
| MRD | Manufacturing, Research and Development |
| PVC | PolyVinyl Chloride |
| UHID | Uintah Highland Improvement District |

INTRODUCTION

This executive summary provides an overview of the Sewer Master Plan Update prepared by Sunrise Engineering (Sunrise) for Ogden City. The objective of the Master Plan Update is to include updated 2023 information for the Sewer Master Plan, make changes accordingly, and to provide recommendations for the sewer system based on new and existing data.

Sunrise created a hydraulic model of the sewer system to help provide an understanding of the collection system and its ability to convey wastewater flows during base flow, state design, infiltration, and inflow scenarios. The Master Plan indicates the areas in need of improvement in the Ogden City Sewer System and defines which areas are currently out of compliance with State Codes.

Through these tools, the Master Plan provides overall recommendations for the sanitary sewer system and a prioritized list of capital improvement projects.

OGDEN SEWER SYSTEM OVERVIEW

Sewer systems are composed of the following facilities and assets:

- Sewer Pipelines and Manholes
- Lift Stations
- Treatment Facilities
- Other Miscellaneous Items

The Ogden City Sewer System consists of seventeen main drainage basins (referred to as Basins A through S) that collect wastewater and outfall it into the Central Weber Sewer Improvement District (CWSID) trunk lines for treatment. The system primarily operates as a gravity-collected system, with wastewater being lifted at two locations. The sewer system facilities and assets include pipelines, manholes, and lift stations.

Neighboring cities, including Roy, South Ogden, Harrisville, and North Ogden, outfall some of their sewer flows into the Ogden City Sewer System through established agreements. These additional flows impact the capacity of trunk lines in the system. Ogden City has a wholesale wastewater treating contract with CWSID for wastewater treatment, and the payment is determined based on population, property valuation, and the district's annual budget. Since CWSID treats the wastewater from Ogden City, the city does not have any treatment facilities within its system.

The sewer pipes in Ogden City's system vary in material, diameter, and age. Most of the pipes are 8-inch in diameter, with various other diameters present. The age distribution also varies from older than 1920 to recent decades. Concrete pipes are the most common material in the system, followed by clay and PVC. There are two lift stations in the system, located at the Northern Utah

Community Correctional Center and the Business Depot Ogden area. Tables 1-3 show elements of the existing sewer system.

Table 1 – Facility/Asset Type of Existing Sewer System

| Lift Stations | Sub Basin Area | Elevation (ft) | Capacity (gpm) |
|--------------------------|----------------|----------------|----------------|
| Water Tower | S | 4,312 | 320 |
| BDO | O | 4,235 | 2,332 |
| Number of Sewer Manholes | | | |
| 5,627 | | | |
| Sewer Mains | | | |
| Diameter | Linear (ft) | Length (miles) | Percentage |
| 6" | 1,595 | 0.3 | 0.1% |
| 8" | 1,149,598 | 217.7 | 77.9% |
| 10" | 128,490 | 24.3 | 8.7% |
| 12" | 84,433 | 16.0 | 5.7% |
| 14" | 787 | 0.1 | 0.1% |
| 15" | 38,728 | 7.3 | 2.6% |
| 18" | 29,459 | 5.6 | 2.0% |
| 20" | 5,597 | 1.1 | 0.4% |
| 21" | 12,151 | 2.3 | 0.8% |
| 22" | 2,732 | 0.5 | 0.2% |
| 24" | 10,870 | 2.1 | 0.7% |
| 30" | 2,260 | 0.4 | 0.2% |
| 33" | 52 | 0.01 | 0.004% |
| 36" | 2,305 | 0.4 | 0.2% |
| 42" | 6,495 | 1.2 | 0.4% |
| Totals | 1,475,552 | 279.5 | 100.0% |

Table 2 – Pipe per Age

| Year | Length (LF) | Length (Miles) | Percentage |
|------------|-------------|----------------|------------|
| Unknown | 204,833 | 38.8 | 13.9% |
| Older 1920 | 131,061 | 24.8 | 8.9% |
| 1920's | 106,838 | 20.2 | 7.2% |
| 1930's | 45,135 | 8.5 | 3.1% |
| 1940's | 146,469 | 27.7 | 9.9% |
| 1950's | 198,561 | 37.6 | 13.5% |
| 1960's | 153,282 | 29.0 | 10.4% |
| 1970's | 120,155 | 22.8 | 8.1% |
| 1980's | 90,548 | 17.1 | 6.1% |
| 1990's | 151,148 | 28.6 | 10.2% |
| 2000's | 81,535 | 15.4 | 5.5% |
| 2010's | 16,349 | 3.1 | 1.1% |
| 2020's | 29,639 | 5.6 | 2.0% |
| Total | 1,475,552 | 279.5 | 100.0% |

Table 3 – Pipe per Material

| Material | Length (LF) | Length (Miles) | Percentage |
|--------------|-------------|----------------|------------|
| Cast Iron | 298 | 0.1 | 0.02% |
| CIPP | 84,956 | 16.1 | 5.8% |
| Clay | 281,668 | 53.3 | 19.1% |
| Concrete | 672,421 | 127.4 | 45.6% |
| Ductile Iron | 253 | 0.05 | 0.02% |
| HDPE | 1,036 | 0.2 | 0.1% |
| PVC | 271,494 | 51.4 | 18.4% |
| RCP | 769 | 0.1 | 0.1% |
| Steel | 335 | 0.1 | 0.02% |
| Transite | 64 | 0.01 | 0.004% |
| Unknown | 162,260 | 30.7 | 11.0% |
| Total | 1,475,552 | 279.5 | 100.0% |

A schematic map of Ogden's sewer system, which summarizes all key elements in the system, is shown below in Figure 1. Each of these key elements will be discussed in detail in the main body of the report.

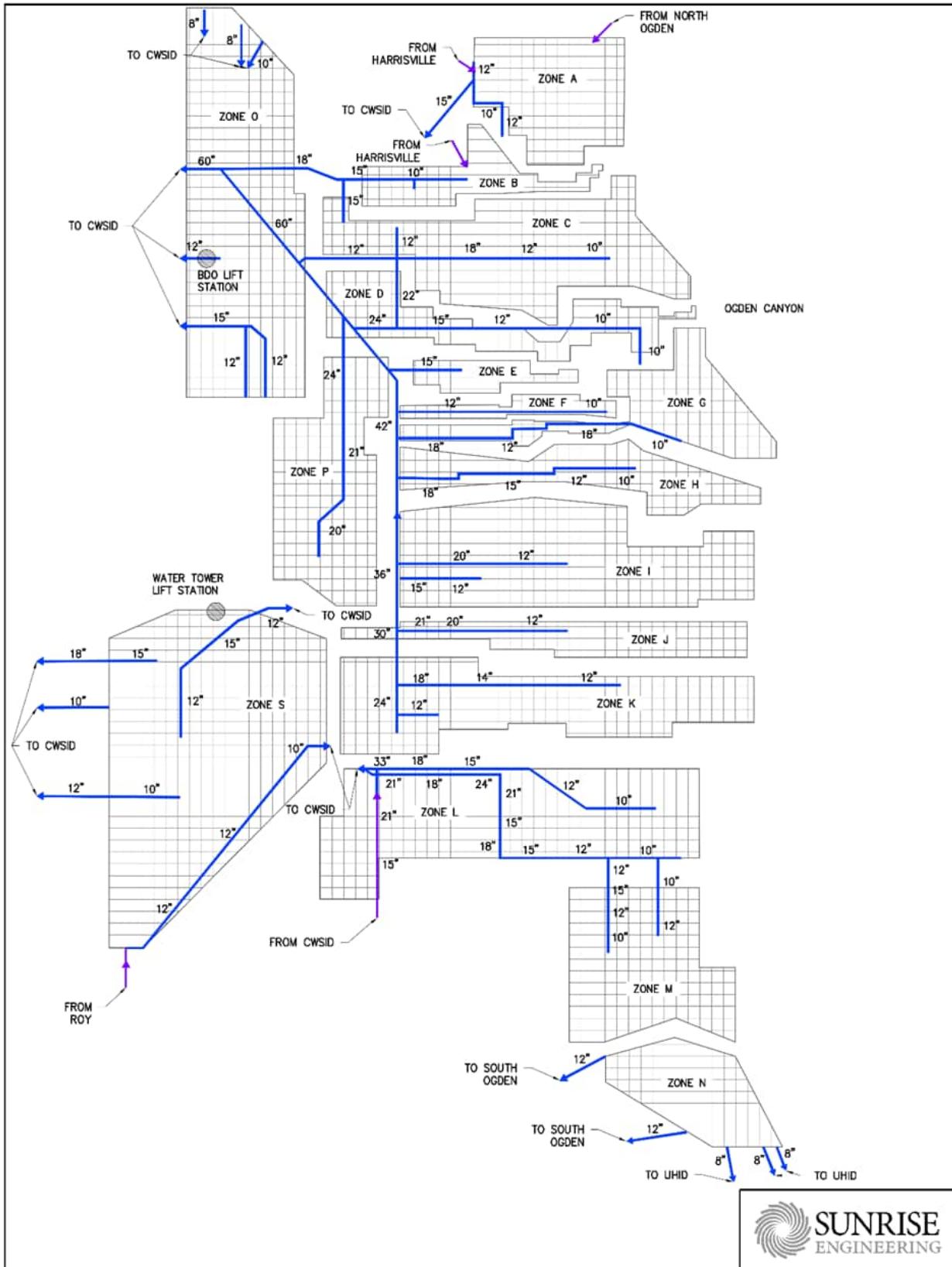


Figure 1 – Existing Sewer System in Ogden

CONNECTIONS AND GROWTH

The current Ogden City population is 87,321 (April 1, 2020, US Census). The projected Ogden City population for 2060 is 106,934 (web.mountainland.org). This is a 22% increase and was applied to the sewer model to simulate flows during buildout condition.

To assess the system's capacity and future needs, existing connections and projected future connections at build-out conditions were analyzed. The existing connections were determined using GIS data and water meter locations, resulting in an estimated total of 28,615 sewer connections. The projected connections for build-out were based on the population projection for the year 2060. The number of build-out connections was projected to be 35,043.

SEWER SYSTEM FLOWS

As part of the Sewer Master Plan, seven locations throughout the City were selected for temporary flow measurement devices. These meters captured approximately 92% of the entire system flow. The seven meters were installed at the following locations shown in Figure 2.

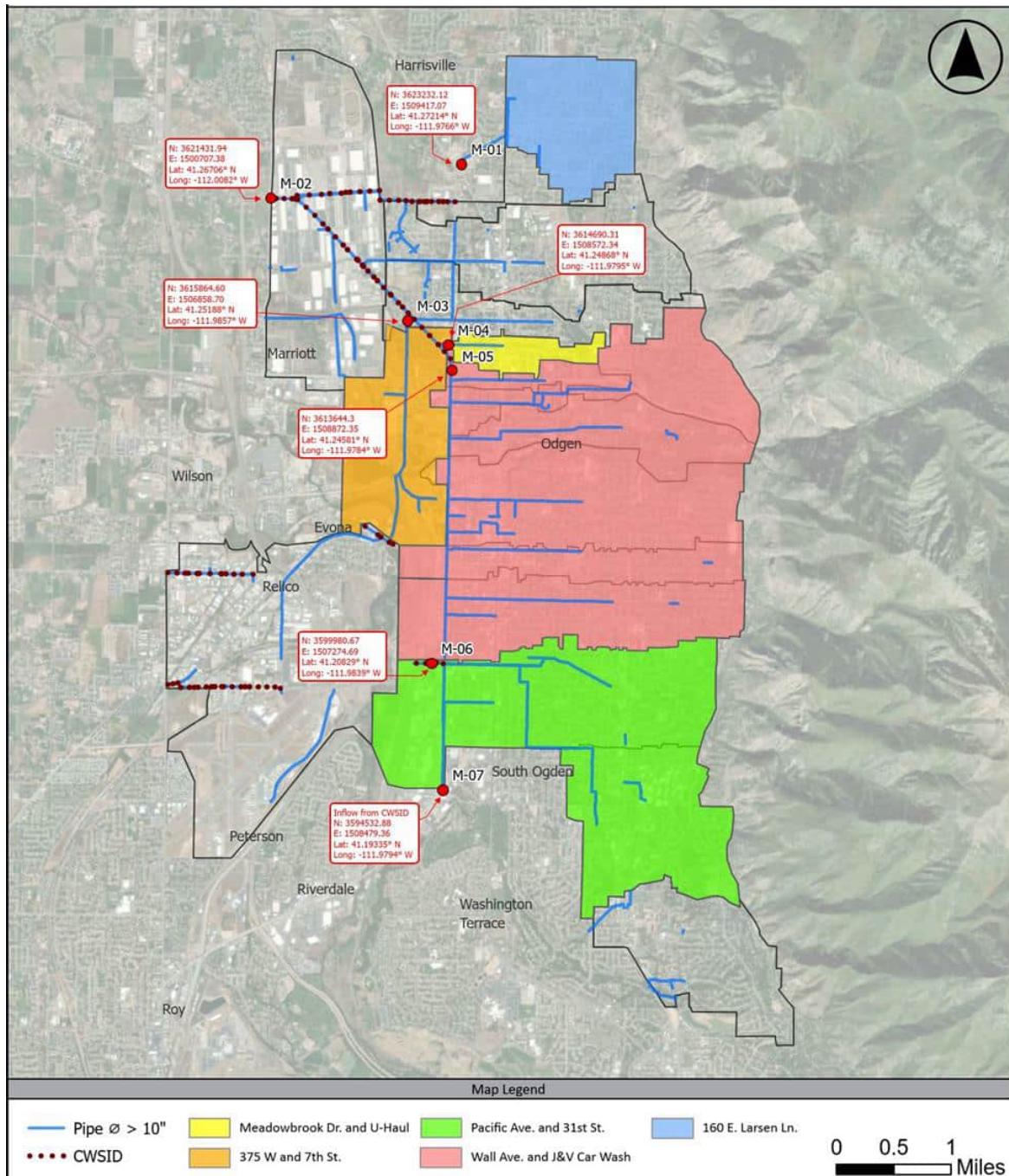


Figure 2 – Meter Installation Locations

The sewer system flows were evaluated, considering base flow, design flows, inflow, and infiltration. Base flow was calculated based on indoor water usage data, resulting in a base flow rate of 8.37 MGD. Design flows suggested by the Utah Division of Water Quality were used to analyze the system's capacity per state requirements. The study also examined inflow and infiltration, which was measured using metered data.

FLOW ANALYSIS

To properly model the capacity of the Ogden City Sewer System, it was necessary to determine the amount of flow collected. There are three types of flow that exist within any sewer system: base flow, infiltration, and inflow.

1. Base flow is the wastewater discharged from residential, commercial, and industrial customers.
2. Infiltration is defined as "groundwater that infiltrates a sewer system through defective pipes, pipe joints, connections, or manholes." [EPA 2014]
3. Inflow is defined as water other than sanitary flow that enters a sewer system from sources which include, but are not limited to; roof leaders, cellar drains, yard drains, area drains, drains from wet areas, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface water, and street wash-water, or drainage [EPA 2014].

The following is a summary of the flow analysis modeled for Ogden's system.

1. Base flow: Base flow was calculated from historical indoor water consumption data and loaded into the model, resulting in an average base flow rate of 5,812 gpm or 8.37 MGD.
2. Design flow: Design flows suggested by the Utah Division of Water Quality were calculated and loaded into the model. As shown in Table 4, Three design flows were modeled: 100 gallons per capita per day for new sewer systems (Design-1), 250 gallons per capita per day for interceptors and outfall sewers (Design-2), and 400 gallons per capita per day for laterals and collector sewers (Design-3). The 250 and 400 gpcd scenarios are conservative to account for peak flows and inflow and infiltration.

Table 4 – Design Flow per Design Scenario

| Design Scenarios | gal/ capita /day | average people/ household | gal/ household /min |
|---------------------------|------------------|---------------------------|---------------------|
| Average Day Demand | Design-1 | 100 | 2.7 |
| Interceptors and Outfalls | Design-2 | 250 | 2.7 |
| Laterals and Collectors | Design-3 | 400 | 2.7 |

3. Build-out flow: Build-out flow is determined by projecting the total number of connections in Ogden City to 2060, which is 35,043 connections. According to the State's requirement

for average daily flow rate, the Ogden City Sewer System has a projected build-out average daily flow of 7,426 gpm, which equates to approximately 11.2 MGD.

On April 11, 2023, the Ogden City Council adopted new zoning standards and a new zoning map for downtown Ogden. The changes implement the Make Ogden downtown plan and seek to increase employment, housing, and walkability in downtown. Due to the higher density housing in future downtown Ogden, a modelling scenario called "Make Ogden Scenario" was created to simulate a built-out downtown Ogden. Several CIPs were identified to address capacity deficiencies resulting from the future developments in downtown Ogden.

4. Infiltration flow: Metered data was used to identify areas that see high infiltration and to calculate the overall infiltration seen in the City system. The area upstream from Meter M-04 was the only location in the city that saw infiltration worse than the state design flows. This area was modeled for capacity problems. The total calculated infiltration for the City system is shown in the table below. The total system average yearly infiltration is 7,832 gpm. The average infiltration during irrigation season is 11,491 gpm, as shown in Table 5. The City has found success in identifying I&I sources from a previous I&I study conducted in 2015; however, it is again recommended (as part of the 5-year CIP) to conduct further I&I investigation in the City.

Table 5 – Infiltration per Season

| | Estimated Total System Flow (gpm) | System Base Flow (gpm) | Total System Infiltration (gpm) | Infiltration % of System Flow |
|--------------|-----------------------------------|------------------------|---------------------------------|-------------------------------|
| Feb-May 2022 | 9,832 | 5,812 | 4,020 | 41% |
| Jun-Oct 2022 | 17,303 | 5,812 | 11,491 | 66% |
| Oct-Dec 2022 | 13,798 | 5,812 | 7,986 | 58% |

5. Inflow: Significant inflow into the City system comes from neighboring city agreements and from extreme weather events (per metered data). The model is loaded with the neighboring inflows across all scenarios.

For the weather data inflow, we identified peak flows that correspond to weather events. Because the flow rates are high, larger amounts of inflow could be an item of concern for the Ogden City Sewer System; however, the peak storm inflow typically has a relatively short duration compared to infiltration or state design flow scenarios.

An extreme weather event was observed in January that had a longer effect on the meter data than is typically seen for regular storm events. However, even under this circumstance the system buffered the larger inflow out quickly because of the large capacity of the full sewer system working together. The total calculated inflow from the weather event peak is around 20,000 gpm.

PROJECTED INFLOW AND INFILTRATION

It has been assumed for this Master Plan that the projected inflow and infiltration will remain constant over time. The assumption was made because any increase of inflow and infiltration will be offset by the efforts of Ogden City to repair leaks and replace or rehabilitate aging pipe.

INFLOW AND INFILTRATION REDUCTION (2014-2022)

In this Sewer Master Plan, the amount of inflow and infiltration in Ogden's sewer system from 2014 to 2022 was compared. Results show that over the 8-year period, the City has achieved an overall estimated 31% reduction in I&I flow. Detailed I&I flow reduction for specific areas/basins within the City can be found in Section 4.6 of this Sewer Master Plan.

The total system flow reduction from 2014 to 2022 is estimated at 24%. Detailed analysis can be found in Section 4.6 of this Sewer Master Plan.

FLOW SUMMARY

The discussion above provides a detailed description of the flows that exist within the Ogden City Sewer System. These flows are summarized in Table 6.

Table 6 – Overall Flows in Ogden City

| Flow Type | Flow (gpm) | Flow (MGD) |
|---|------------|------------|
| <i>Existing Base Flow</i> | 5,812 | 8.37 |
| <i>Build-Out Base Flow</i> | 7,426 | 10.69 |
| <i>Infiltration (Ave. during Irrigation season)</i> | 11,491 | 16.55 |
| <i>Extreme Weather Inflow Peak</i> | 20,000 | 28.80 |

SEWER SYSTEM CAPACITY

Under the above scenarios, capacity was analyzed for the entire system following Division of Water Quality standards for sewer systems. Each scenario that was modeled was analyzed to ensure that the Ogden City Sewer System met the following requirements:

- Minimum Velocity = 2.0 fps for all pipe diameters
- Maximum daily flow depth/pipe diameter ratio (d/D) = 0.75 (all pipe diameters)

Since the state design scenarios are meant to account for normal peak flows and I & I in sewer systems, they were consistently the most conservative flows modeled. Consequently, they also generated the most capacity problems in the modeled system. At 250 gpcd for interceptors [over

10-inch pipe] and 400 gpcd for collectors [10-inch pipe and less], the system had several areas that broke the state dimension ratio requirements for flow. These state scenario flows even exceeded the scenarios based on metered data (such as the infiltration and extreme weather event models).

Based on these results, a list of recommended projects (in alphabetic order) that will fix the capacity-related issues due to the state scenarios was developed and is shown in Table 7.

Table 7 - Capacity Related Projects Due to State Scenario Flow Conditions

| Project | Name | Description | Total Cost |
|---------|-------------------------------|--|-------------|
| A.1 | Washington & Larson Capacity | Adjust slopes for 15" line on Washington Blvd and Larsen Ln. (419 LF) | \$490,633 |
| A.2 | E 1050 North Maintenance | Replace 10" line on 1050 N from Gramercy to Monroe, and portions of Monroe and Gramercy. (3,437 LF) | \$3,720,489 |
| A.3 | Canfield Capacity | Upsize 8" line on Canfield Dr, from 450 E to Eyrie Dr. (1,854 LF) | \$2,031,574 |
| B.1 | Washington & North Capacity | Upsize 8" line on Washington Blvd from North St to 475 North. (392 LF) | \$445,098 |
| B.2 | North St Capacity | Upsize 10" line on North St between Washington Blvd and Wall Ave. (1,995 LF) | \$2,206,567 |
| C.1 | 2nd & Washington Capacity | Sewer line upsizing and replacement, see project write up. (1,197 LF) | \$1,351,374 |
| C.2 | Fowler Capacity | Adjust pipe slopes for 10" lines around Fowler Ave. (1,742 LF) | \$1,911,273 |
| C.3 | 3rd & Jefferson Capacity | Install new 8" sewer line on 3rd Street between Jefferson and Porter. (332 LF) CIPP 8" line on 3rd St from Jefferson to first manhole to the east. (351 LF) | \$431,800 |
| D.1 | 7th St Maintenance/Capacity | CIPP 10" and 12" line on 7th St between Monroe Blvd and Washington Blvd. (4,183 LF) | \$840,643 |
| H.3 | 15th St Capacity/Infiltration | Upsize 8" line on 15th St between Ogden Ave and approximately 826 East. | \$3,090,079 |
| I.1 | 22nd St Capacity | Upsize 8" line on 22nd St between Quincy Ave and Jackson Ave. (759 LF) | \$846,025 |
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$545,837 |
| I.7 | 20th & Childs Capacity | Upsize 8" line on Childs Ave (760 LF), and upsize 10" line on 20th St from Childs to Wall Ave. (1,151 LF) | \$2,144,675 |

| | | | |
|-------|--|---|--------------|
| I.8 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$594,687 |
| J.1 | Quincy & 24th Capacity | Adjust slopes for 10" and 12" line on Quincy Ave and 24th St. (1,042 LF) | \$1,156,993 |
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) | \$755,076 |
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) | \$1,620,089 |
| K.2 | 28th & Wall Capacity | Upsize 8" line on 28th St from Wall Ave to Union Ave. (386 LF) | \$438,551 |
| M.1 | 36th & Quincy Capacity | Upsize 10" line on 36th St from east of Maple St to Quincy. (101 LF) | \$120,966 |
| M.2 | McKay Dee Hospital Capacity | Upsize 8" line by McKay-Dee Hospital. (368 LF) | \$418,860 |
| P.1 | 12th St Trunk Line Capacity | Upsize Fresenius sewer mains, see project write up. (5,180 LF) | \$6,806,685 |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12" & 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,291,784 |
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust slopes of 8" line from MH740 to MH10261 (290 LF). | \$2,162,880 |
| S.1 | Pennsylvania Ave Maintenance | CIPP 15" line from I-15 running Northeast to F Ave. (2,701 LF) | \$632,519 |
| | Capacity Projects | Total | \$37,055,157 |

SEWER SYSTEM MAINTENANCE

The Ogden City Public Works Department was contacted to gather knowledge of the areas in their sewer system that are of concern and are costly to maintain. Ogden City currently has a list of 40 maintenance-related projects within their sewer system. This maintenance list includes the following general categories.

- Capacity related projects as observed by the Public Works team
- Pipe replacement projects due to age and/or deterioration
- Pipe replacement projects due to calcium build-up
- CIPP projects due to infiltration
- Pipe re-route projects to avoid private property
- Combining pipes to reduce maintenance on dual pipes

- Rerouting of sewer laterals to nearby pipe
- Flushing and grease maintenance projects
- Pipe depth concerns

Since the list provided by the Public Works Department was ranked by priority, those rankings were used to place the projects in the appropriate ranked order amongst the Capital Improvement Projects. All of the maintenance projects are described in detail in Appendix A. Which also includes opinions of probable costs for all of these projects. The cost for each project category is shown below in Table 8.

Table 8 - Maintenance Projects

| Project | Name | Description | Total Cost |
|---------|--|---|-------------|
| A.4 | 1050 N Maintenance | Adjust slopes for 8" and 12" line on 1050 N, 750 N and Jefferson Ave. (1,643 LF) | \$1,787,642 |
| A.5 | 1025 East Maintenance | Replace 8" line on 1000 N between 1025 East and Mountain Road. (228 LF) | \$257,660 |
| A.6 | 1225 North Maintenance | Replace 8" line leading west from Quincy on 1225 North. (120 LF) | \$138,362 |
| B.3 | 500 N/North St Maintenance | Replace 8" line extending from North St east of Quincy up to 500 N. (596 LF) | \$652,764 |
| C.4 | 2nd St & Harrison Maintenance | Replace 8" line on Harrison between 2nd and 3rd Street. (535 LF) | \$587,740 |
| C.5 | 4th & Jefferson Manhole | Replace manhole located at 4th Street and Jefferson. | \$18,165 |
| C.6 | North Jackson Ave Maintenance | Replace 8" line on Jackson Ave from Southwell St to 253 North. (367 LF) | \$408,295 |
| C.7 | Orchard Ave Maintenance | Replace 8" line on Orchard Ave from 1st St to Cook St. (281 LF) | \$315,518 |
| D.2 | Monroe Maintenance | Replace 8" and 10" line in Monroe Blvd from Harrop St to 6" St. (1,519 LF) | \$1,635,565 |
| D.3 | Washington 5th to 7th Maintenance | Replace 8" line on west side of Washington between 5th and 7th St and adjust slopes. (1,090 LF) | \$1,176,760 |
| E.1 | 970 Adams Manhole Replacement | Replace manhole at approximately 970 Adams Avenue. | \$18,165 |
| E.2 | 9th St & Grant Maintenance | Replace 8" line on Grant from 9th St to Cross St. (355 LF) | \$395,411 |
| E.3 | 12th Street & Washington Capacity | Upsize 8" on the west side of Washington Blvd between 12th St and 1135 south. (303 LF) | \$347,170 |
| G.1 | 825 Simoron/Taylor Manholes | Replace MH 11185 and MH 11186 at 825 Simoron and 815 Taylor Ave. | \$18,165 |
| H.1 | Washington Blvd 14th to 16th Maintenance | Replace 10" line on the east side of Wahington Blvd from 14th Street to 16th Street. (935 LF) | \$1,037,350 |
| H.2 | El Monte Maintenance | Replace 8" line north of the El Monte golf course; CIPP 8" and 12" lines upstream and downstream of the 8" line. (2,146 LF) | \$467,658 |
| I.2 | 20th St Consolidation | Consolidate the two sewer mains on 20th St between Grant and Washington. (778 LF) | \$866,779 |
| I.3 | 20th & Jackson Manhole | Replace MH 1248 at 20th & Jackson. | \$18,165 |

| | | | |
|-----|---|--|--------------|
| I.4 | 2202 Harrison Manhole | Replace MH 2598 at approximately 2202 Harrison Blvd. | \$18,165 |
| I.5 | Custer Ave Maintenance | Replace 8" line at 2001 Custer Ave. (31 LF) | \$35,852 |
| J.2 | 25th & Adams Maintenance | Replace 8" line on Adams from 25th to 2550. (399 LF) | \$442,498 |
| J.4 | 25th & Washington Manhole | Replace MH 681 on the east side of 25th & Washington. | \$18,165 |
| J.5 | 24th & Van Buren Manhole | Replace MH 11979 at Van Buren & 24th St. | \$18,165 |
| K.3 | 27th & Jefferson Maintenance | Replace 8" line on Jefferson Ave from 27th St to 2750 S. (377 LF) | \$419,007 |
| K.4 | 26th & Ogden Maintenance | Replace MH 12164 and MH 12163; and pipeline spot repair at approximately 2525 Ogden Ave. | \$36,330 |
| L.1 | 29th & Porter Maintenance | Replace 8" line on Porter from 29th to 30th. (759 LF) | \$826,508 |
| L.2 | 32nd & Kiesel Manhole | Replace MH 10119 at 32nd & Kiesel. | \$18,165 |
| L.3 | Stephens Maintenance Phase 2 | Replace 8" line from 32nd St to 31st St. (759 LF) | \$826,508 |
| M.3 | Grandview Acres Phase 2 & 930 E 40th St Maintenance | Replace 8" lines near Grandview Park, see project write up. (2,591 LF) | \$2,755,820 |
| M.4 | Van Buren M Maintenance | Replace 8" line on Brinker, 37th and 1100 East. (1,022 LF) | \$1,104,804 |
| N.1 | 5151 S Harrison Blvd Maintenance | Replace 12" line on Harrison Blvd, south of Shadow Valley Dr. (610 LF) | \$690,688 |
| P.2 | Union Ave Maintenance | Adjust slopes of 8" line on Union Ave from Pacific to 20th St. (559 LF) | \$613,372 |
| S.2 | W 24th St Maintenance | Replace 8" line on 24th St from F to G Ave. (330 LF) | \$368,468 |
| | Maintenance Projects | Total | \$18,839,847 |

SEWER SYSTEM UPDATES DUE TO AGE

Ogden City's Sewer System is an aging infrastructure with over 50% of its sewer lines older than 50 years. Tables 2 and 3 show the pipe ages and materials in the system. A properly installed PVC, vitrified clay, or concrete pipe could have an 80 to 100-year life expectancy.

Using cost estimates (shown in Appendix B) for pipe replacement and slip-lining (CIPP) it becomes clear that the potential costs for replacing all of Ogden's sewer system are huge. If all 1,475,552 feet of sewer pipe in the system were replaced (at \$955/LF) it would cost approximately

\$1.4 billion (not including inflation). Since this amount is impossible to fund, Ogden's preference is to use CIPP (slip-lining) where possible to rehabilitate the system. To slip-line the entire system (at \$155/LF) it would cost approximately \$228 million dollars.

Analyzing the system with pipe survival and pipe age data reveals that the amount of sewer pipe that needs to be replaced during the 40-year funding period is 1,046,255 linear feet. To slip-line this amount of pipe, it would cost \$162 million. For Ogden City this would equate to replacing about 1.77% of its system per year (or \$4,055,000/year). The amount of pipe that will be replaced or slip-lined due to capacity and maintenance projects during the 40-year funding period will be approximately 49,768 linear feet.

Ideally, 15 years from now, the current CIP lists should be completed. To replace the remaining 996,487 linear feet in the remaining 25 years, about 39,860 linear feet of pipe would need to be replaced per year. At an estimated replacement cost of \$155 per linear foot (or \$154.5 million total), the cost per year would equate to \$6.18 million per year the last 25 years.

The capital facilities plan identifies \$6.0 million per year to be spent during the 21–40-year planning period. The City should have the budget necessary (within the margin of error for estimation) to execute the spending required for pipe replacement in the 15–40-year planning period.

CAPITAL IMPROVEMENT PLAN

The following table summarizes the recommended capital improvement projects categorized by type of project. This table does not include any cost associated with replacing sewer pipe due to age.

Table 9 - Recommended Capital Improvement Project Cost by Type

| Project Type | Description | Cost |
|-----------------------------|-----------------------------|--------------|
| <i>I&I Study</i> | Inflow & Infiltration Study | \$200,000 |
| <i>Capacity Projects</i> | Multiple Projects | \$37,055,157 |
| <i>Maintenance Projects</i> | Multiple Projects | \$18,839,847 |
| | Total | \$55,895,004 |

This cost represents all the recommended projects in the Master Plan from now until the end of the 40-year planning period.

According to the Ogden Capital Facilities Plan, Ogden City has the ability to spend the amount per year on sewer infrastructure rehabilitation costs listed in Table 10.

Table 10 - Available Funds for Capital Improvement Projects

| Years | \$/Year | Total \$ Available |
|-------|--------------|--------------------|
| 0-5 | \$3,500,000 | \$17,500,000 |
| 6-10 | *\$4,000,000 | \$20,000,000 |
| 11-15 | *\$5,000,000 | \$25,000,000 |
| 16-20 | *\$5,500,000 | \$27,500,000 |
| 21-40 | *\$6,000,000 | \$120,000,000 |

*Future yearly budgets are assumed and shown for information only. A reasonable attempt to account for inflation has been made. These amounts are not presented for City Council approval.

For planning and logistical purposes, it was necessary to analyze all the recommended projects and determine which projects most urgently need to be completed as compared to those that can be completed at a later date.

For this purpose, all the maintenance projects were prioritized by the Public Works team and all other projects were prioritized based on the following criteria:

1. Ogden City provided a list of maintenance projects prioritized based on their maintenance crew observations and feedback. The sewer improvement projects on this list were all ranked. This ranked project list was used as a basis for the overall CIP project ranking.
2. Capacity related projects were identified per modeling results. Some of these capacity projects coincided with maintenance projects. In these cases, the capacity project is combined with the maintenance project and categorized under the same ranking as the maintenance project list.
3. The remaining capacity projects need to be ranked and added to the CIP list. They are ranked based on their proximity to any maintenance project and assigned a similar ranking to the nearby maintenance project.
4. The capacity projects are then compared to the CIP project list from the previous sewer master plan (2012). If the capacity project appeared on the previous CIP list, its old ranking will be taken into consideration. The project will be re-evaluated and either moved up or down based on its old ranking.
5. Finally, the capacity projects are re-evaluated one more time based on the age of the pipes and rankings will be adjusted accordingly.

Pipe lining with CIPP due to age should be prioritized after all maintenance and capacity projects are completed.

5-YEAR CAPITAL IMPROVEMENT PLAN

The 5-year Capital Improvement Plan includes the projects that have been prioritized as the most urgent. These projects should be completed within the next five years. The breakdown of funding for the 5-year CIP is shown in Table 11. The total estimated cost of the projects meets the City's \$17.5 million budget.

Table 11 - 5-year CIP Cost Breakdown

| Project Type | Cost |
|--------------|---------------------|
| I&I Study | \$200,000 |
| Maintenance | \$ 5,203,693 |
| Capacity | \$12,096,307 |
| <i>Total</i> | <i>\$17,500,000</i> |

A list of ranked projects proposed for the 5-year CIP is shown in Table 12 below.

Table 12 – 5-year CIP Projects (Ranked by Priority)

| Project | Project Name | Project Description | Cost | Project Type | Page |
|---------|--|--|-------------|--------------|------|
| | I&I Study | Infiltration & Inflow Study | \$200,000 | | |
| P.1 | 12th St Trunk Line Capacity | Upsize Fresenius sewer mains, see project write up. (5,180 LF) | \$6,806,685 | CAP | A52 |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12" & 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,291,784 | CAP | A52 |
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust slopes of 8" line from MH740 to MH10261 (290 LF). | \$2,162,880 | CAP | A52 |
| H.1 | Washington Blvd 14th to 16th Maintenance | Replace 10" line on the east side of Wahington Blvd from 14th Street to 16th Street. (935 LF) | \$1,037,350 | M | A26 |
| A.4 | 1050 N Maintenance | Adjust slopes for 8" and 12" line on 1050 N, 750 N and Jefferson Ave. (1,643 LF) | \$1,787,642 | M | A4 |
| J.2 | 25th & Adams Maintenance | Replace 8" line on Adams from 25th to 2550. (399 LF) | \$442,498 | M | A34 |
| K.3 | 27th & Jefferson Maintenance | Replace 8" line on Jefferson Ave from 27th St to 2750 S. (377 LF) | \$419,007 | M | A38 |

| | | | | | |
|-------|----------------------------------|---|--------------|-----|-----|
| N.1 | 5151 S Harrison Blvd Maintenance | Replace 12" line on Harrison Blvd, south of Shadow Valley Dr. (610 LF) | \$690,688 | M | A47 |
| L.1 | 29th & Porter Maintenance | Replace 8" line on Porter from 29th to 30th. (759 LF) | \$826,508 | M | A41 |
| C.3 | 3rd & Jefferson Capacity | Install new 8" sewer line on 3rd Street between Jefferson and Porter. (332 LF) CIPP 8" line on 3rd St from Jefferson to first manhole to the east. (351 LF) | \$431,800 | CAP | A12 |
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) (Phase I) | \$403,158 | CAP | A38 |
| Total | | | \$17,500,000 | | |

5 TO 10-YEAR CAPITAL IMPROVEMENT PLAN

The 10-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 5-year CIP but within the next ten years. The breakdown of funding for the 10-year CIP is shown in the following table. The total estimated cost of the projects meets the City's \$20 million budget.

Table 13 - 5 to 10-year CIP Cost Breakdown

| Project Type | Cost |
|--------------|--------------|
| Maintenance | \$1,413,509 |
| Capacity | \$18,586,491 |
| Total | \$20,000,000 |

A list of ranked projects proposed for the 10-year CIP is shown in Table 14 below.

Table 14 - 10-year CIP Projects (Ranked by Priority)

| Project | Project Name | Project Description | Cost | Project Type | Page |
|---------|-----------------------------|---|--------------|--------------|------|
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) (Phase II) | \$ 1,216,931 | CAP | A38 |
| C.2 | Fowler Capacity | Adjust pipe slopes for 10" lines around Fowler Ave. (1,742 LF) | \$ 1,911,273 | CAP | A12 |
| D.1 | 7th St Maintenance/Capacity | CIPP 10" and 12" line on 7th St between Monroe Blvd and Washington Blvd. (4,183 LF) | \$ 840,643 | CAP | A15 |

| | | | | | |
|-----|-----------------------------------|---|--------------|-----|-----|
| S.1 | Pennsylvania Ave Maintenance | CIPP 15" line from I-15 running Northeast to F Ave. (2,701 LF) | \$ 632,519 | CAP | A56 |
| I.1 | 22nd St Capacity | Upsize 8" line on 22nd St between Quincy Ave and Jackson Ave. (759 LF) | \$ 846,025 | CAP | A29 |
| H.3 | 15th St Capacity/Infiltration | Upsize 8" line on 15th St between Ogden Ave and approximately 826 East. | \$ 3,090,079 | CAP | A26 |
| C.1 | 2nd & Washington Capacity | Sewer line upsizing and replacement, see project write up. (1,197 LF) | \$ 1,351,374 | CAP | A12 |
| A.2 | E 1050 North Maintenance | Replace 10" line on 1050 N from Gramercy to Monroe, and portions of Monroe and Gramercy. (3,437 LF) | \$ 3,720,489 | CAP | A4 |
| A.1 | Washington & Larson Capacity | Adjust slopes for 15" line on Washington Blvd and Larsen Ln. (419 LF) | \$ 490,633 | CAP | A4 |
| E.1 | 970 Adams Manhole Replacement | Replace manhole at approximately 970 Adams Avenue. | \$ 18,165 | M | A18 |
| E.2 | 9th St & Grant Maintenance | Replace 8" line on Grant from 9th St to Cross St. (355 LF) | \$ 395,411 | M | A18 |
| E.3 | 12th Street & Washington Capacity | Upsize 8" on the west side of Washington Blvd between 12th St and 1135 south. (303 LF) | \$ 347,170 | M | A18 |
| B.3 | 500 N/North St Maintenance | Replace 8" line extending from North St east of Quincy up to 500 N. (596 LF) | \$ 652,764 | M | A8 |
| B.1 | Washington & North Capacity | Upsize 8" line on Washington Blvd from North St to 475 North. (392 LF) | \$ 445,098 | CAP | A8 |
| B.2 | North St Capacity | Upsize 10" line on North St between Washington Blvd and Wall Ave. (1,995 LF) | \$ 2,206,567 | CAP | A8 |
| J.1 | Quincy & 24th Capacity | Adjust slopes for 10" and 12" line on Quincy Ave and 24th St. (1,042 LF) | \$ 1,156,993 | CAP | A34 |

| | | | | | |
|-----|---------------------|--|---------------|-----|-----|
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) (Phase I) | \$ 677,867 | CAP | A34 |
| | | Total | \$ 20,000,000 | | |

10 TO 15-YEAR CAPITAL IMPROVEMENT PLAN

The 15-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 10-year CIP but within the next fifteen years. The breakdown of funding for the 15-year CIP is shown in the following table. The total estimated cost of the projects meets the City's \$25 million budget.

Table 15 - 10 to 15-year CIP Cost Breakdown

| Project Type | Cost |
|--------------------------|---------------|
| Maintenance | \$12,222,645 |
| Capacity | \$6,372,359 |
| <i>Total</i> | \$18,595,003 |
| Pipe Projects Due to Age | \$6,404,997 |
| <i>Grand Total</i> | \$ 25,000,000 |

The remaining \$14,644,860 budget should be spent on pipe projects due to age.

A list of ranked projects proposed for the 15-year CIP is shown in Table 16 below.

Table 16 - 15-year CIP Projects (Ranked by Priority)

| Project | Project Name | Project Description | Cost | Project Type | Page |
|---------|-------------------------------|---|--------------|--------------|------|
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) (Phase II) | \$ 77,209 | CAP | A34 |
| K.2 | 28th & Wall Capacity | Upsize 8" line on 28th St from Wall Ave to Union Ave. (386 LF) | \$ 438,551 | CAP | A38 |
| M.4 | Van Buren M Maintenance | Replace 8" line on Brinker, 37th and 1100 East. (1,022 LF) | \$ 1,104,804 | M | A44 |
| H.2 | El Monte Maintenance | Replace 8" line north of the El Monte golf course; CIPP 8" and 12" lines upstream and downstream of the 8" line. (2,146 LF) | \$ 467,658 | M | A26 |
| D.2 | Monroe Maintenance | Replace 8" and 10" line in Monroe Blvd from Harrop St to 6" St. (1,519 LF) | \$ 1,635,565 | M | A15 |
| C.4 | 2nd St & Harrison Maintenance | Replace 8" line on Harrison between 2nd and 3rd Street. (535 LF) | \$ 587,740 | M | A12 |

| | | | | | |
|-----|---|--|--------------|-----|-----|
| M.1 | 36th & Quincy Capacity | Upsize 10" line on 36th St from east of Maple St to Quincy. (101 LF) | \$ 120,966 | CAP | A44 |
| M.2 | McKay Dee Hospital Capacity | Upsize 8" line by McKay-Dee Hospital. (368 LF) | \$ 418,860 | CAP | A44 |
| A.3 | Canfield Capacity | Upsize 8" line on Canfield Dr, from 450 E to Eyrie Dr. (1,854 LF) | \$ 2,031,574 | CAP | A4 |
| I.2 | 20th St Consolidation | Consolidate the two sewer mains on 20th St between Grant and Washington. (778 LF) | \$ 1,366,779 | M | A29 |
| A.5 | 1025 East Maintenance | Replace 8" line on 1000 N between 1025 East and Mountain Road. (228 LF) | \$ 257,660 | M | A4 |
| P.2 | Union Ave Maintenance | Adjust slopes of 8" line on Union Ave from Pacific to 20th St. (559 LF) | \$ 613,372 | M | A52 |
| A.6 | 1225 North Maintenance | Replace 8" line leading west from Quincy on 1225 North. (120 LF) | \$ 138,362 | M | A4 |
| K.4 | 26th & Ogden Maintenance | Replace MH 12164 and MH 12163; and pipeline spot repair at approximately 2525 Ogden Ave. | \$ 36,330 | M | A38 |
| I.3 | 20th & Jackson Manhole | Replace MH 1248 at 20th & Jackson. | \$ 18,165 | M | A29 |
| J.4 | 25th & Washington Manhole | Replace MH 681 on the east side of 25th & Washington. | \$ 18,165 | M | A34 |
| I.4 | 2202 Harrison Manhole | Replace MH 2598 at approximately 2202 Harrison Blvd. | \$ 18,165 | M | A29 |
| C.5 | 4th & Jefferson Manhole | Replace manhole located at 4th Street and Jefferson. | \$ 18,165 | M | A12 |
| L.2 | 32nd & Kiesel Manhole | Replace MH 10119 at 32nd & Kiesel. | \$ 18,165 | M | A41 |
| M.3 | Grandview Acres Phase 2 & 930 E 40th St Maintenance | Replace 8" lines near Grandview Park, see project write up. (2,591 LF) | \$ 2,755,820 | M | A44 |
| C.6 | North Jackson Ave Maintenance | Replace 8" line on Jackson Ave from Southwell St to 253 North. (367 LF) | \$ 408,295 | M | A12 |

| | | | | | |
|-----|-----------------------------------|---|---------------|-----|-----|
| C.7 | Orchard Ave Maintenance | Replace 8" line on Orchard Ave from 1st St to Cook St. (281 LF) | \$ 315,518 | M | A12 |
| I.5 | Custer Ave Maintenance | Replace 8" line at 2001 Custer Ave. (31 LF) | \$ 35,852 | M | A29 |
| J.5 | 24th & Van Buren Manhole | Replace MH 11979 at Van Buren & 24th St. | \$ 18,165 | M | A34 |
| D.3 | Washington 5th to 7th Maintenance | Replace 8" line on west side of Washington between 5th and 7th St and adjust slopes. (1,090 LF) | \$ 1,176,760 | M | A15 |
| G.1 | 825 Simoron/Taylor or Manholes | Replace MH 11185 and MH 11186 at 825 Simoron and 815 Taylor Ave. | \$ 18,165 | M | A23 |
| S.2 | W 24th St Maintenance | Replace 8" line on 24th St from F to G Ave. (330 LF) | \$ 368,468 | M | A56 |
| L.3 | Stephens Maintenance Phase 2 | Replace 8" line from 32nd St to 31st St. (759 LF) | \$ 826,508 | M | A41 |
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$ 545,837 | CAP | A29 |
| I.7 | 20th & Childs Capacity | Upsize 8" line on Childs Ave (760 LF), and upsize 10" line on 20th St from Childs to Wall Ave. (1,151 LF) | \$ 2,144,675 | CAP | A29 |
| I.8 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$ 594,687 | CAP | A29 |
| | | Total | \$ 18,595,003 | | |

15 TO 20-YEAR CAPITAL IMPROVEMENT PLAN

The 20-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 15-year CIP but within the next 20 years. All capacity and maintenance related projects will be complete before this time. No specific projects are listed for this funding period; however, pipe replacement due to age should be pursued. Ogden City will have \$5.5 million per year for the 20-year CIP and the cost for remaining pipe projects due to age will be around \$6.0 million per year.

Table 17 - 15 to 20-year CIP Cost Breakdown

| <i>Project Type</i> | <i>Cost</i> |
|---------------------------------|--------------|
| <i>Pipe Projects due to Age</i> | \$27,500,000 |
| <i>Total</i> | \$27,500,000 |

20 TO 40-YEAR CAPITAL IMPROVEMENT PLAN

The 40-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 20-year CIP but within the next 40 years. All capacity and maintenance related projects will be complete before this time. No specific projects are listed for this funding period; however, pipe replacement due to age should be pursued. Ogden City will have \$6.0 million per year for the 40-year CIP and the cost for remaining pipe projects due to age will be around \$6.0 million per year.

Table 18 - 40-year CIP Cost Breakdown

| <i>Project Type</i> | <i>Cost</i> |
|---------------------------------|---------------|
| <i>Pipe Projects due to Age</i> | \$120,000,000 |
| <i>Total</i> | \$120,000,000 |

CAPITAL IMPROVEMENT PLAN SUMMARY

In summary, the following costs by plan year are:

- 5-year Plan – \$17,500,000
- 5 to 10-year Plan – \$20,000,000
- 10 to 15-year Plan – \$18,595,003 (known projects) + \$6,404,997 (pipe age) = \$25,000,000
- 15 to 20-year Plan – \$5,500,000 per year at \$27,500,000 total
- 20 to 40-year Plan – \$6,000,000 per year at \$120,000,000 total

OGDEN CITY SEWER MASTER PLAN

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Appendix A Capital Improvement Project Write-ups and Maps

Appendix B Costs, Public Works List, Pipe Survival, Agreements & State Forms

1 INTRODUCTION

Sunrise Engineering (Sunrise) was hired by Ogden City (City) to prepare a Sewer Master Plan Update (Master Plan or Plan) for the entire Ogden City Sewer System (system). The original sewer master plan was completed in 2013. This sewer master plan update builds upon original information and new data to provide the City with new recommendations for their sewer system. The Master Plan is a valuable tool that can be used to:

1. Provide an understanding of the key elements of the system including existing drainage basins, pipe networks, lift stations, and outfalls.
2. Identify the sewer improvements needed to the system, focusing on specific existing and future capacity and maintenance needs.
3. Provide an understanding of the collection system and its ability to convey wastewater flows during average daily, infiltration, and inflow scenarios.
4. Define current areas within the system that are out of compliance with current State codes including a prioritized list of capital improvement projects.

The items discussed in this Master Plan will focus on the existing system in 2023, followed by an analysis of the sewer system with state design criteria, build-out, and extreme weather conditions. The state design criteria conditions are important to an analysis of the City's sewer system because they represent a highly conservative flow scenario that accounts for peak flows and I & I.

2 OGDEN CITY SEWER SYSTEM OVERVIEW

2.1 SYSTEM DRAINAGE BASINS AND SYSTEM OVERVIEW

The Ogden City Sewer System is in Weber County, primarily within the City of Ogden, Utah, shown in Figure 2.1. Most of the sewer system functions as a gravity-collected system with wastewater being lifted to higher elevations at two locations in the system. The first lift station serves a portion of the Business Depot Ogden (BDO) area, and the second lift station is called the Water Tower lift station and serves a single connection near Water Tower Way.

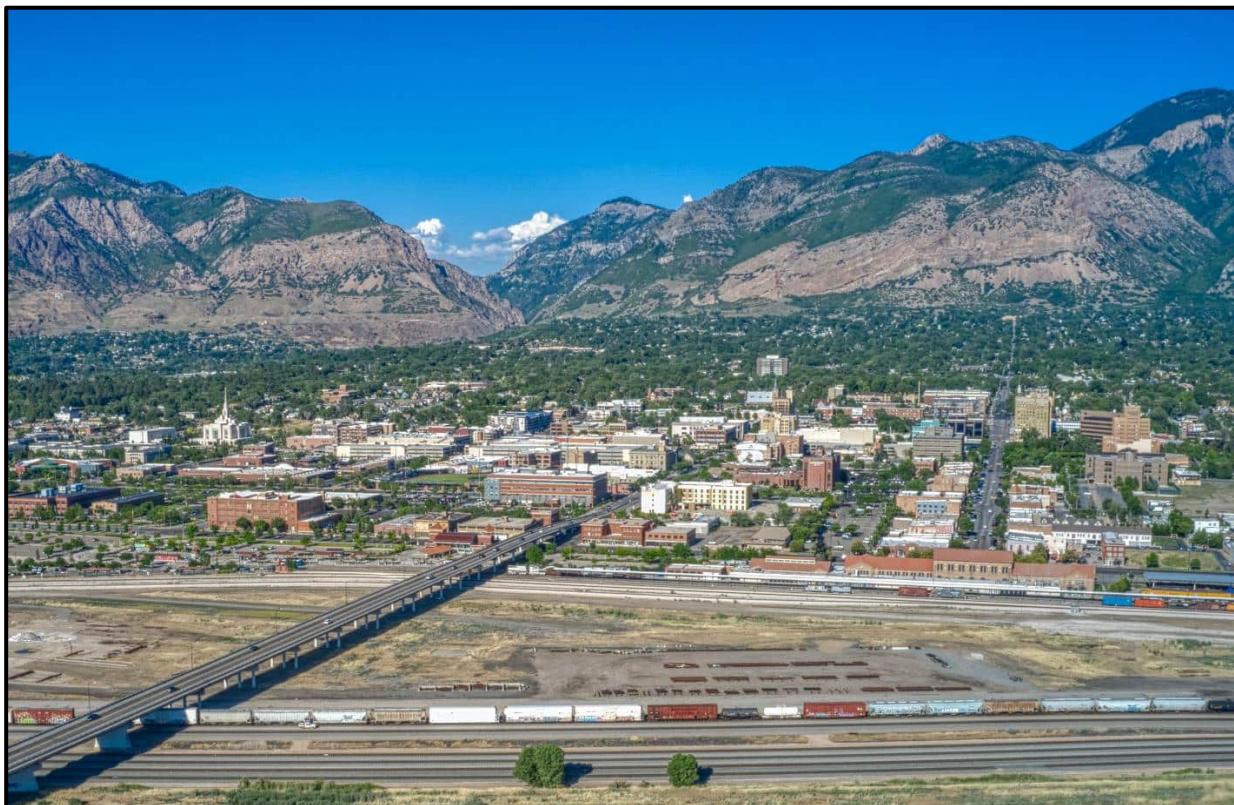


Figure 2.1 – Ogden City, Utah

The system is composed of seventeen main drainage basins that are delineated by larger diameter trunk sewer lines that receive wastewater from smaller collection lines. The drainage basins in the system are referred to as drainage basins A through S. Basins Q and R exist during the original sewer master plan study but are combined with Basins F, G, H, I, J, and K during this update.

The drainage basins collect wastewater and, at specific locations, outfall the collected wastewater into Central Weber Sewer Improvement District (CWSID) trunk lines where the wastewater is treated by CWSID. A general map of the drainage basins in the system is shown in Figure 2.2.

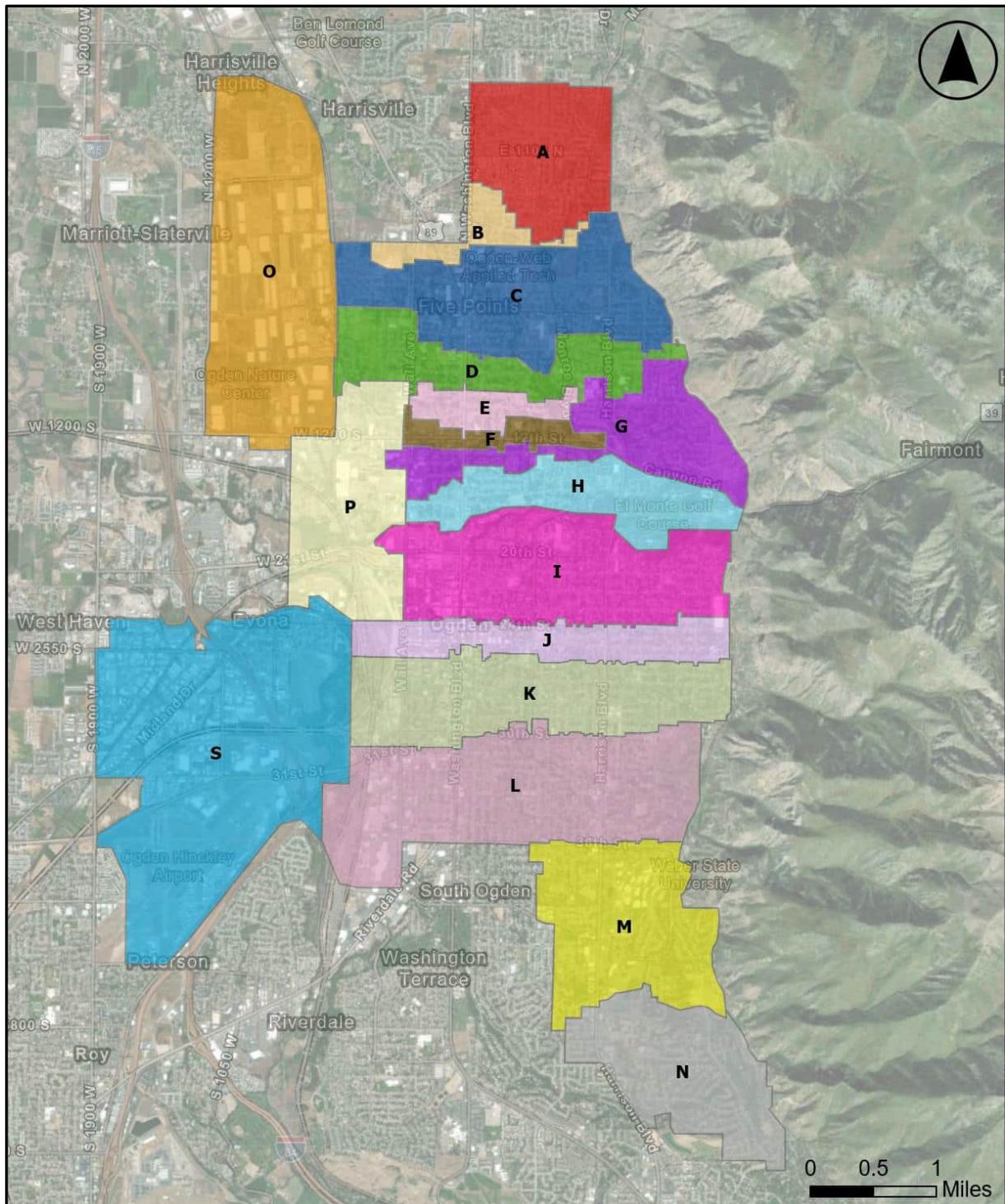


Figure 2.2 - Ogden City Sewer System Drainage Basins

2.2 SEWER SYSTEM FACILITIES AND ASSETS

Every sewer system, including Ogden City, is composed of facilities and assets that include these basic items:

- Sewer Pipelines & Manholes
- Lift Stations
- Treatment Facilities
- Other Miscellaneous Items

Since the Central Weber Sewer Improvement District (CWSID) treats the wastewater from Ogden City, the City does not have any treatment facilities within its system. Table 2.1 shows the specific facilities and assets in the Ogden City Sewer System and what drainage basin each is located within. Figure 2.3 shows the locations of the lift stations in the Ogden City Sewer System.

Table 2.1 – Existing Ogden City Sewer System Facilities

| Lift Stations | Sub Basin Area | Elevation (ft) | Capacity (gpm) |
|--------------------------|----------------|----------------|----------------|
| Water Tower | S | 4,312 | 320 |
| BDO | O | 4,235 | 2,332 |
| Number of Sewer Manholes | | | |
| 5,627 | | | |
| Sewer Mains | | | |
| Diameter | Linear (ft) | Length (miles) | Percentage |
| 6" | 1,595 | 0.3 | 0.1% |
| 8" | 1,149,598 | 217.7 | 77.9% |
| 10" | 128,490 | 24.3 | 8.7% |
| 12" | 84,433 | 16.0 | 5.7% |
| 14" | 787 | 0.1 | 0.1% |
| 15" | 38,728 | 7.3 | 2.6% |
| 18" | 29,459 | 5.6 | 2.0% |
| 20" | 5,597 | 1.1 | 0.4% |
| 21" | 12,151 | 2.3 | 0.8% |
| 22" | 2,732 | 0.5 | 0.2% |
| 24" | 10,870 | 2.1 | 0.7% |
| 30" | 2,260 | 0.4 | 0.2% |
| 33" | 52 | 0.01 | 0.004% |
| 36" | 2,305 | 0.4 | 0.2% |
| 42" | 6,495 | 1.2 | 0.4% |
| Totals | 1,475,552 | 279.5 | 100.0% |

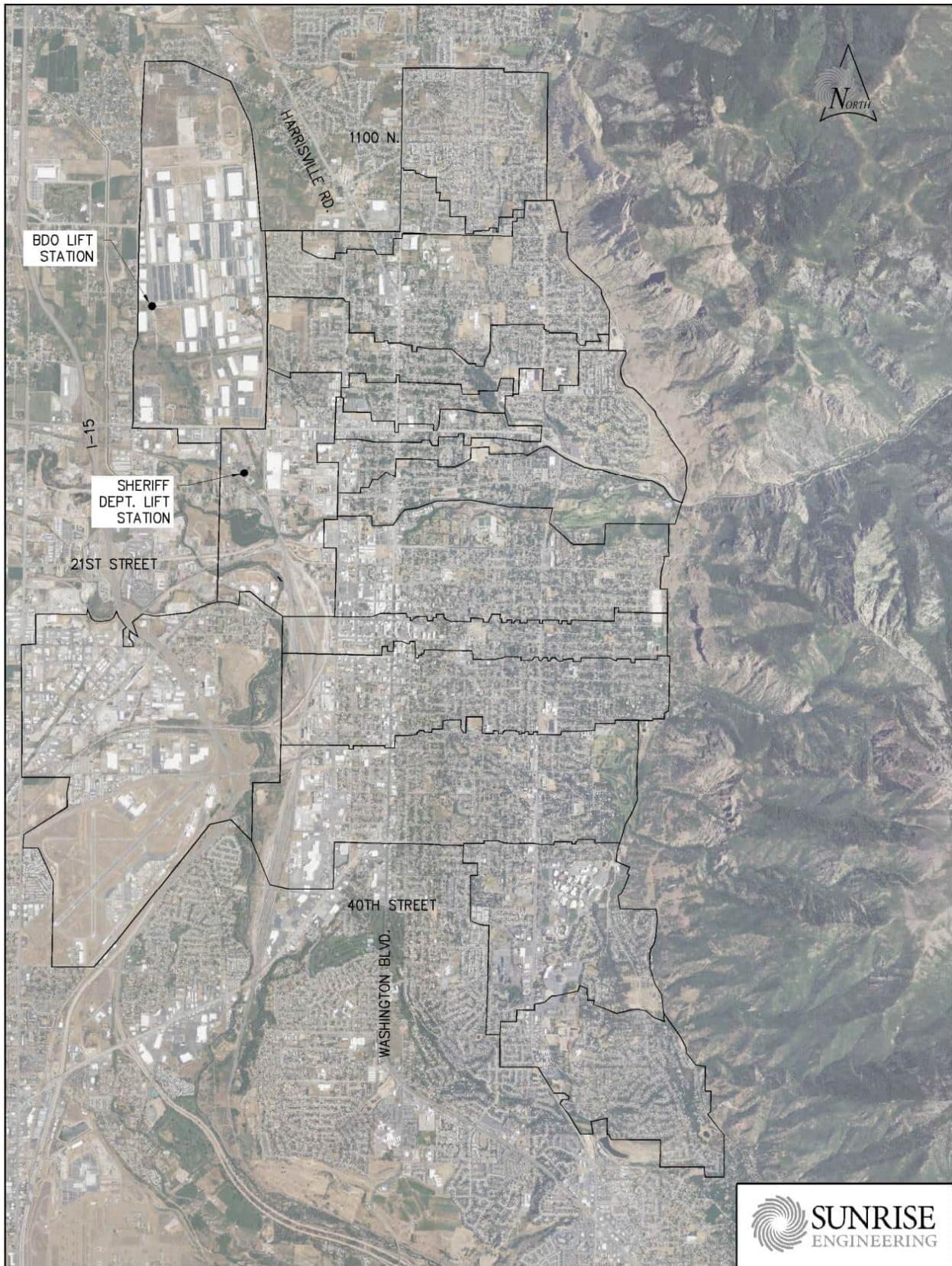


Figure 2.3– Ogden City Lift Stations

2.3 OGDEN CITY SEWER SYSTEM SCHEMATIC

Figure 2-4 is a schematic map of the System that summarizes all the key elements in the System and how they collect the wastewater from each basin and outfall into the CWSID system. The key elements include drainage basins, major interceptor lines, and lift stations. Each of these key elements in the system will be discussed in detail in subsequent sections of this report.

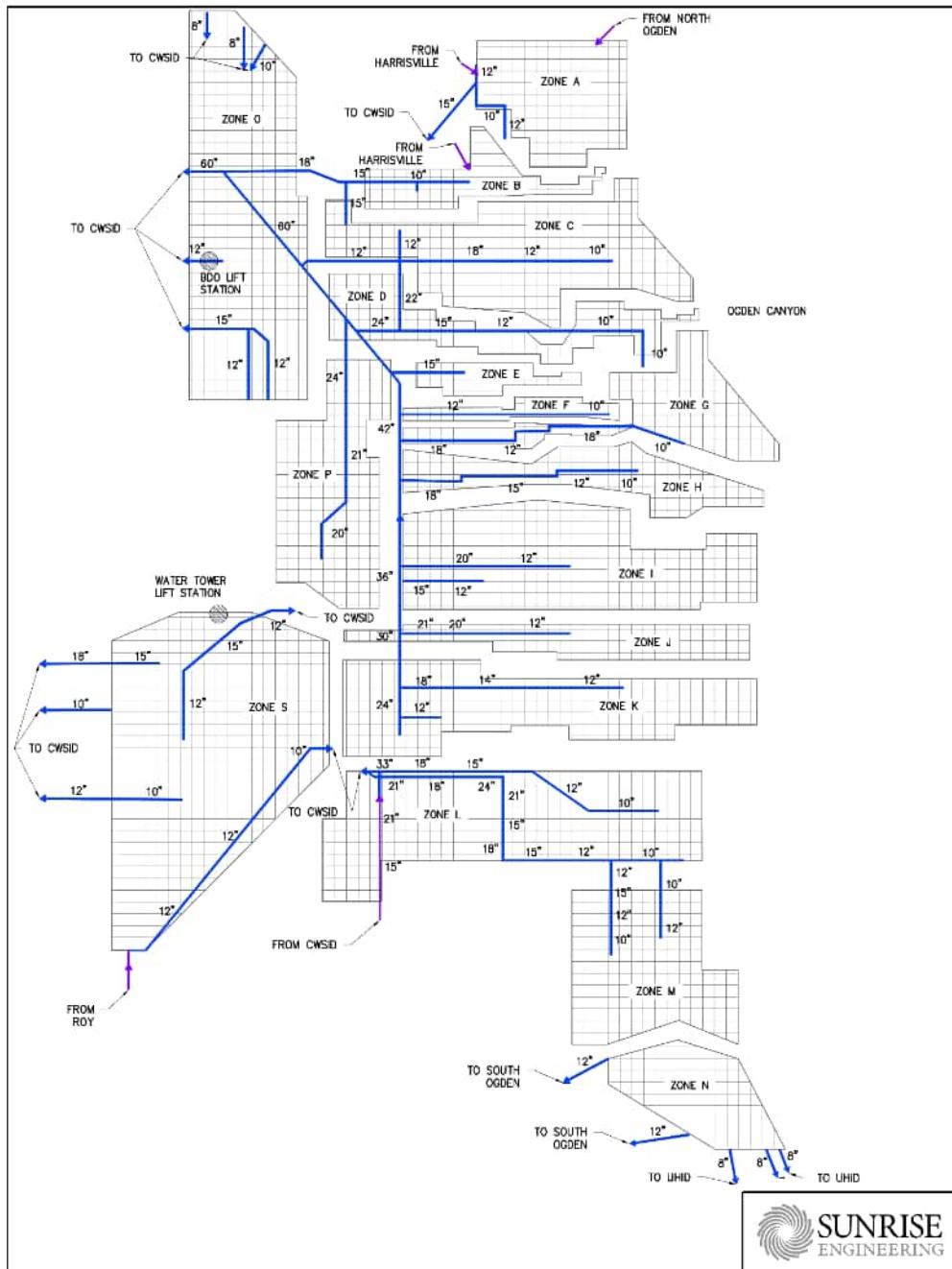


Figure 2.4 – Ogden City Sewer System Schematic Map

3 CONNECTIONS AND GROWTH

For any Master Plan, it is important to determine how many connections exist in the sewer system, where in the system they are located, and how much wastewater each connection typically produces during peak average daily periods. This connection information is essential to analyzing the existing condition of the sewer system and projecting and locating capital improvement projects to keep the system running smoothly and reliably.

This section of the Master Plan provides a detailed discussion of existing connections on the sewer system and how the number of connections was determined for this Plan. This section also shows the number of connections for each drainage basin in the system. The final part of this section is an analysis of population growth and the effect on future sewer connections in the system. The connections shown in this section will be used to determine the sewer system flows in Section 4.

3.1 EXISTING SYSTEM CONNECTIONS

Determining existing sewer flows for each drainage basin in the City is essential to understanding the overall flow. The first step is to verify the number of sewer system connections that exist in each drainage basin. This was accomplished for the Master Plan using the following steps:

- A GIS file was obtained from the City showing the location of each of the known culinary water meter locations.
- This GIS file was input into AutoCAD along with a GIS file of the parcels in Ogden City, drainage basin boundaries, and the latest available aerial photographs.
- The locations of the Ogden City GIS water meters were compared against the existing parcels and aerials to verify any missing water meters or if there was a single meter feeding an entire area. Areas with missing GIS water meters were marked on the map and tabulated. If there was a platted subdivision not constructed, the lots were counted as connections. If there was a single water meter feeding multiple units, the number of units that the meter served were identified and tabulated. This method resulted in an estimate of 28,615 total sewer connections in the Ogden City Sewer System.
- As a check, the sewer connections were compared against the number of culinary water connections that were identified in the 2011 Ogden City Master Plan. This Plan showed a total of 23,598 connections. The Sewer Master Plan identified 28,615 sewer connections. The number of sewer connections is greater than the number of water meters. This was expected since there were areas that were missing meters, platted subdivisions that had not been constructed, and areas in which a single meter feeds multiple units.

The number of existing connections in the Ogden City Sewer System are shown in Table 3.1 and are listed by drainage basin.

Table 3.1 – Existing Connections for Ogden City Sewer System

| Basin | Connections | Percentage |
|-------|-------------|------------|
| A | 3,049 | 11% |
| B | 532 | 2% |
| C | 2,645 | 9% |
| D | 1,655 | 6% |
| E | 469 | 2% |
| F | 374 | 1% |
| G | 1,492 | 5% |
| H | 1,246 | 4% |
| I | 3,344 | 12% |
| J | 1,334 | 5% |
| K | 3,494 | 12% |
| L | 4,118 | 14% |
| M | 1,374 | 5% |
| N | 1,433 | 5% |
| O | 302 | 1% |
| P | 778 | 3% |
| S | 976 | 3% |
| SUM | 28,615 | |

The connections shown in Table 3.1 were used to determine the existing flow on the system in Section 4 of this document.

3.2 PROJECTED FUTURE SYSTEM WITH BUILD-OUT CONNECTIONS

As stated previously, one purpose of this Master Plan is to evaluate the Ogden City Sewer System with the build-out conditions. This requires Sunrise to make projections on future population and future connections to the water system. The projected connections were used to determine the base flow for the Ogden City Sewer System at build-out. This will allow the City to plan for future infrastructure upgrades and capital improvement needs.

The specific year chosen for build-out condition analysis is 2060. There are various methods for projecting population and future growth for cities. For this Master Plan, the projected connections for build-out were determined by applying a multiplier based on the projected Ogden City population in 2060. The number of build-out connections was projected to be 35,043.

The current Ogden City population is 87,321 (April 1, 2020, US Census). The projected Ogden City population for 2060 is 106,934 (web.mountainland.org). This is a 22% increase and was applied to the sewer model to simulate flows during buildout condition.

4 SEWER SYSTEM FLOWS

To properly model the capacity of the Ogden City Sewer System, it was necessary to determine the amount of flow collected. There are three types of flow that exist within any sewer system. They are base flow, infiltration, and inflow.

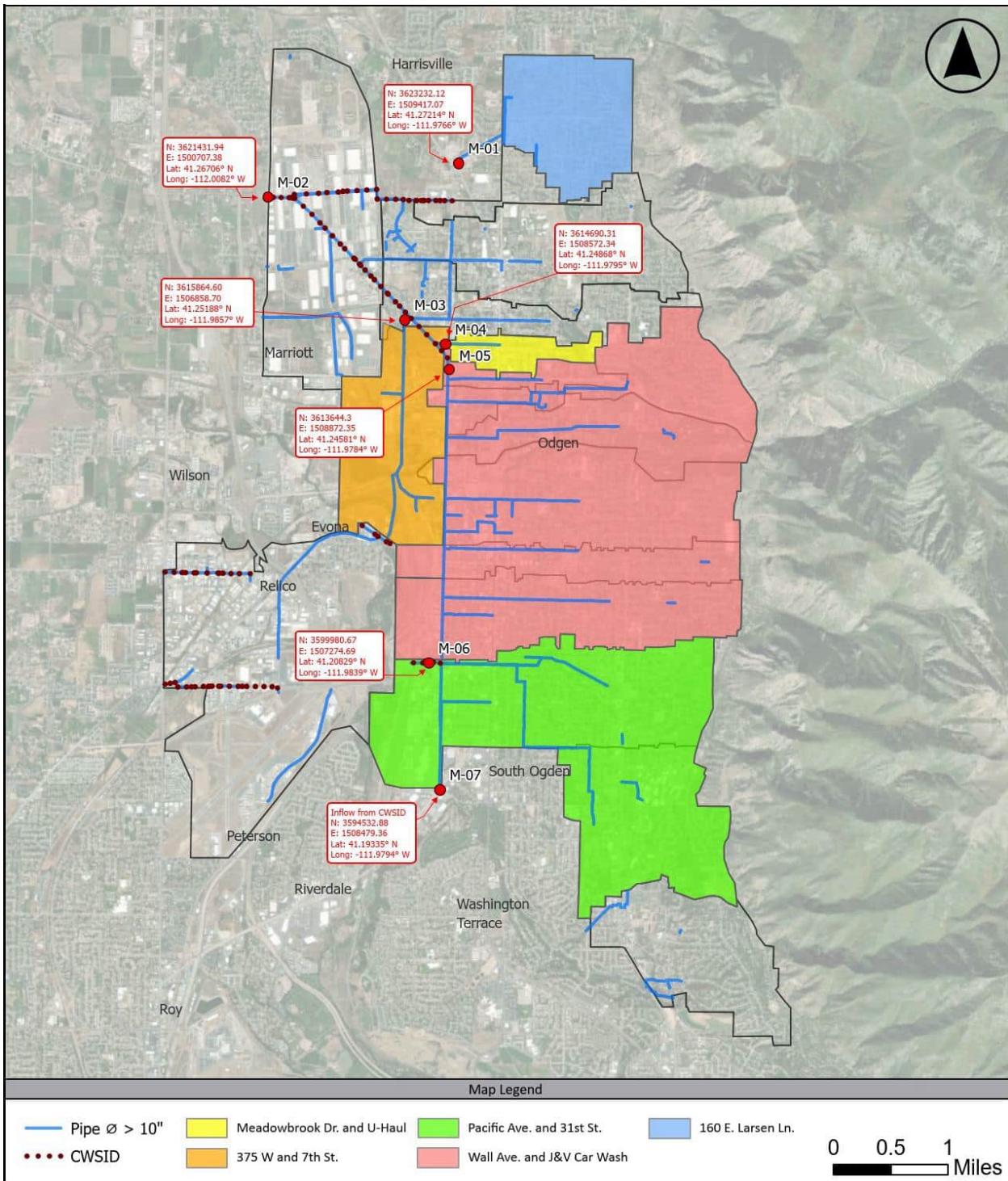
- 1) Base flow is the wastewater discharged from residential, commercial, and industrial customers.
- 2) Infiltration is defined as "groundwater that infiltrates a sewer system through defective pipes, pipe joints, connections, or manholes." [EPA 2014]
- 3) Inflow is defined as water other than sanitary flow that enters a sewer system from sources which include, but are not limited to; roof leaders, cellar drains, yard drains, area drains, drains from wet areas, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface water, and street wash-water, or drainage [EPA 2014].

Infiltration and inflow are commonly known as I & I. Although it is ideal to have no I & I, as a sewer system ages and deteriorates, I & I is unavoidable and becomes part of the total flow of the sewer system.

As part of the Master Plan, seven locations in the City were selected for temporary flow measurement devices. Hach Company was hired as a sub-consultant to install the flow measuring devices and to provide the metering software to track the flow measurements. The meters were installed at concentration points within the drainage basins. Meters were installed at the following locations.

- M-01: Harrisville Rd & Larsen Ln
- M-02: 1200 W & 400 N
- M-03: 7th St & 375 W
- M-04: Meadow Brook Dr (9th St), W of Wall Ave
- M-05: Wall Ave, north of 1200 S
- M-06: 31st St & Pacific Ave
- M-07: Wall Ave, north of Riverdale Rd

These locations were selected based on experience from past metering efforts from the original Master Plan (2013) and the Sewer I & I Study (2015). The locations of these meters and the basins that contribute to the metered flow are shown in Figure 4.1.



1. Base flow: Base flow was calculated from historical indoor water consumption data and loaded into the model.
2. Design flow: Design flows suggested by the Utah Division of Water Quality were loaded into the model. Three different design flows were modeled, and they are 100 gallons per capita per day for new sewer systems (Design-1), 250 gallons per capita per day for interceptors and outfall sewers (Design-2), and 400 gallons per capita per day for laterals and collector sewers (Design-3). The 250 and 400 gpcd scenarios are conservative to account for peak flows and I & I.
3. Build-out flow: Projected base flows at build-out condition (year 2060) were analyzed and simulated.
4. Infiltration: The projected 2060 build-out base flow was increased by a factor to account for system I & I.
5. Extreme weather inflow event: The peak flow observed over the past year at each meter location was entered into the model to simulate an extreme weather peak inflow event.

4.1 BASE FLOW

Ogden City does not meter the amount of water collected in the sewer system or what is sent to CWSID to be treated. In a perfect system, the amount of water that is collected in the sewer system should closely match the indoor culinary water usage.

The indoor water usage records for the months of February 2022 and March 2022 were obtained from Ogden City and used to calculate the amount of wastewater that should be expected to collect in the Ogden City Sewer System, hereby defined as base flow. These months were selected because there should be no outdoor water demand on the water system.

The total amount of water consumed in each drainage basin was divided by the total water meter count in each basin to obtain the average flow rate per household. To minimize the impact of large commercial or industrial water users on the average flow rate per household, the top 17 largest water users in Ogden City were identified and their water usage was subtracted from the total water consumption in each basin. Commercial/industrial water usage of these 17 entities were entered into the sewer model separately. A summary of the top 17 water consumers and their average base flow is shown in Table 4.1.

Table 4.1 – Ogden City Top 17 Water Users Average Base Flow

| Basin | Top Water Users | Feb Water Usage (100 gallons) | Feb Averaged Flow Rate (gpm) | Mar Water Usage (100 gallons) | Mar Averaged Flow Rate (gpm) | Averaged Base Flow Rate (gpm) |
|-------|-----------------------------|-------------------------------|------------------------------|-------------------------------|------------------------------|-------------------------------|
| P | FRESENIUS USA MANUFACTURING | 280,366 | 695 | 186,370 | 417 | 556 |
| P | FRESENIUS USA INC | 169,719 | 421 | 182,661 | 409 | 415 |
| P | FRESENIUS USA INC | 90,127 | 224 | 117,761 | 264 | 244 |
| O | BOYER BDO | 83,005 | 206 | 105,319 | 236 | 221 |
| P | FRESENIUS USA INC | 11,790 | 29 | 100,892 | 226 | 128 |
| K | C J FOODS INC | 23,801 | 59 | 23,101 | 52 | 55 |
| P | ARC III LLC | 12,870 | 32 | 31,888 | 71 | 52 |
| M | IHC HEALTH SERVICES INC | 21,486 | 53 | 18,460 | 41 | 47 |
| S | WILLIAMS INTERNATIONAL | 13,946 | 35 | 24,945 | 56 | 45 |
| P | WEBER COUNTY | 16,803 | 42 | 18,490 | 41 | 42 |
| I | MYLES E TOLIVER | 14,861 | 37 | 18,861 | 42 | 40 |
| O | BARNES AEROSPACE INC | 15,295 | 38 | 17,511 | 39 | 39 |
| S | GREAT SL BRINE SHRIMP COOP | 15,268 | 38 | 17,321 | 39 | 38 |
| L | NEWGATE INDUSTRIAL PARK LLC | 14,542 | 36 | 15,984 | 36 | 36 |
| I | MLS LC | 13,209 | 33 | 15,765 | 35 | 34 |
| M | WEBER STATE UNIVERSITY | 9,601 | 24 | 11,506 | 26 | 25 |
| J | AMERICAN LINEN SUPPLY | 9,800 | 24 | 10,522 | 24 | 24 |
| | SUM | 816,489 | 2,025 | 917,357 | 2,055 | 2,040 |

The sewer system base flow for each basin is summarized in Table 4.2 below:

Table 4.2 – Ogden City Base Flows by Basin

| Basin | Average Base Flow (gpm) | Average Base Flow per Residential Household (gpm) |
|-------|-------------------------|---|
| A | 274 | 0.128 |
| B | 114 | 0.236 |
| C | 372 | 0.148 |
| D | 208 | 0.142 |
| E | 76 | 0.173 |
| F | 107 | 0.453 |
| G | 222 | 0.158 |
| H | 150 | 0.141 |
| I | 492 | 0.157 |
| J | 198 | 0.149 |
| K | 549 | 0.160 |
| L | 465 | 0.138 |
| M | 272 | 0.155 |
| N | 191 | 0.147 |

| | | |
|-----|-------|-------|
| O | 345 | 0.531 |
| P | 1,508 | 0.180 |
| S | 270 | 0.259 |
| SUM | 5,812 | |

Table 4.2 indicates that Ogden's sewer system receives a total base flow of 5,812 gpm, which equates to 8.37 MGD.

According to the Utah Division of Water Quality, new sewer systems shall be designed based on an annual average daily rate of flow of 100 gallons per capita per day. US Census Data (2020) provided that the population of Ogden City is 87,321. This results in a total system design flow rate of 6,064 gpm, which equates to 8.73 MGD. The per capita rate of flow includes an allowance for infiltration/inflow. Therefore, it is normal that the total system existing base flow rate is lower than the total system design flow rate.

4.2 DESIGN FLOWS

The State of Utah Division of Water Quality provides design guidelines for sizing sewers. Rule number R317-3-2(2.2) (B) states the following:

- (1). New sewer systems shall be designed based on an annual average daily flow rate of 100 gallons per capita per day.
- (2). Interceptors and outfall sewers shall be designed for 250 gallons per capita per day.
- (3). Laterals and collector sewers shall be designed for 400 gallons per capita per day.

These demands were input into the Ogden City Sewer Model and used to analyze the capacity of the sewer system.

The sewer model is loaded by entering flow values for manholes. Each manhole receives flow from an upstream manhole plus connections or households that contribute flow directly to the manhole. The number of households contributing flow to each manhole is determined in GIS by identifying the nearest neighbor manhole for each residential water meter address and assigning each manhole a number of contributing households.

The design flow rate per capita is converted into a flow rate per household. This is achieved by multiplying the design flow rate per capita by the average number per household (2.7) in Ogden (US Census 2020). The results are plugged into the model. The model analyzes each design scenario and calculates the flow and maximum depth of flow for each pipe based on loading and pipe properties. Table 4.3 summarizes the loading factor for each design scenario.

Table 4.3 - Design flows and Manhole Loading Factors

| Design Scenarios | gal/ Capita /Day | Average People/ Household | gal/ Household /min |
|---------------------------|------------------|---------------------------|---------------------|
| Average Day Demand | Design-1 | 100 | 2.7 |
| Interceptors and Outfalls | Design-2 | 250 | 2.7 |
| Laterals and Collectors | Design-3 | 400 | 2.7 |

4.3 INFLOW AND INFILTRATION

I & I is excess water (other than sewer water) that flows into sewer pipes from groundwater and other sources. Infiltration is groundwater that finds entrance into the sewer system. Typically, infiltration will occur at pipe joint, broken pipe, cracks or openings in manholes, and defective service laterals. Although it is ideal to have no infiltration, infiltration is unavoidable as a sewer system ages and deteriorates. Therefore, infiltration becomes part of the total flow of the sewer system.

As with infiltration, inflow is unwanted flow that enters a sewer collection system. Inflow comes from rainfall, snowmelt, and other sources. This typically occurs through manhole lids or storm water connections to the sewer system. Due to the variety of potential inflow sources and the difficulty in pinpointing them, the easiest inflow to measure would be from water during storm events. Metered sewer flow spikes after a storm event show that inflow is making its way into the sewer system.

The metered flow data from the Hach meters will be used to help determine the amount of I & I the Ogden City Sewer System is experiencing. The metering period was from February 1st, 2022, to February 16th, 2023. It monitored Ogden City's Sewer System for an entire year and includes dry-weather flow and wet-weather flow. Each meter was analyzed to determine if there was any I & I into the Ogden City Sewer System.

Based on the Ogden City Inflow & Infiltration Study conducted by Sunrise in 2015, it was concluded that inflows from storm events usually have minimal impact on the total metered flow, compared to the infiltration that the system receives. However, several extreme weather events during the metering period created noticeable inflow into the system. Figure 4.2 is an example of the comparison between storm event precipitation data and metered flow. The extreme weather event with the greatest impact was observed in January 2023. It consisted of several back-to-back precipitation events (snowpack) during below freezing temperatures, and then a couple of weeks' warming period to above freezing. Maximum flow scenarios for this extreme weather event were modeled and will be discussed in the following sections.

4.3.0 FLOW ANALYSIS FOR M-01: HARRISVILLE RD & LARSEN LN

The meter located at Harrisville Rd & Larsen Ln captures flow from drainage basin A. This location was selected due to basin A having older pipes and showing I&I in the system from previous

metering. This basin also has its own outlet to CWSID that is separate from the rest of the City. Meter M-01 captures approximately 4% of the total Ogden City system sewer flow.

Table 4.4 shows the number of connections that contributed to the flows recorded and the percentage of the total system connections collected by this meter. Figure 4.2 below shows the metered flow compared to the base flow and design flows.

Table 4.4 – Connections per Meter M-01

| Basin | Connections |
|-------------|-------------|
| A | 3,049 |
| Ogden Total | 28,615 |
| Percentage | 11% |

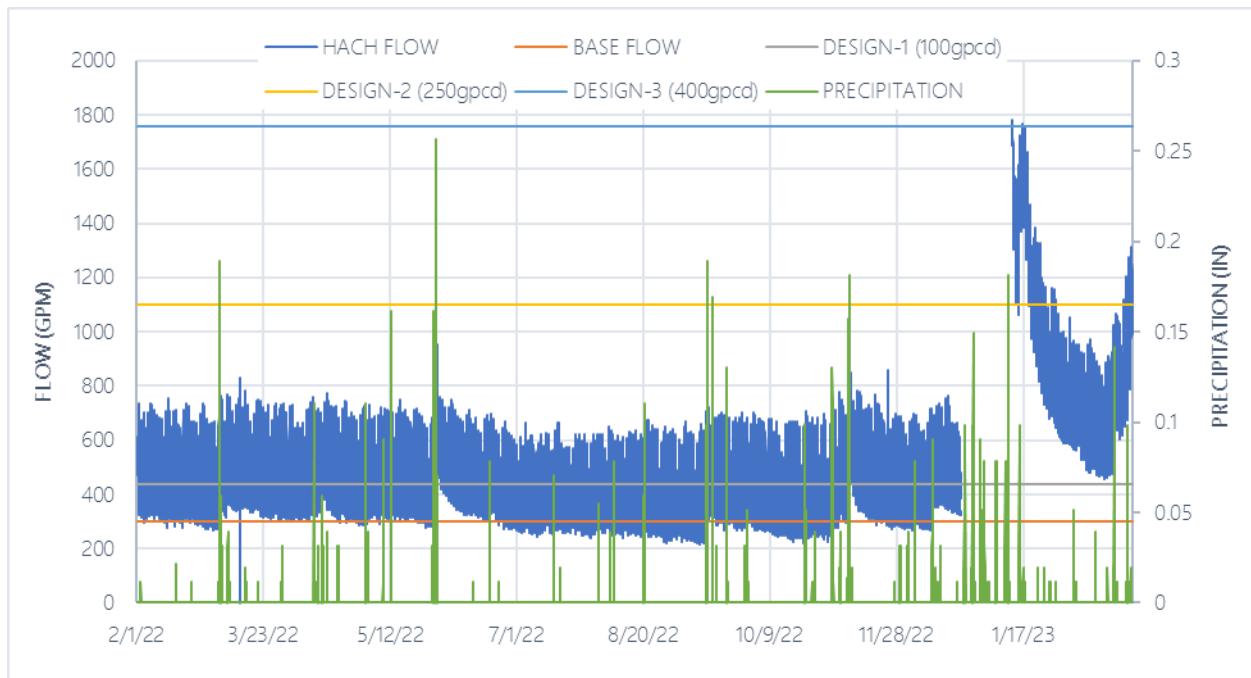


Figure 4.2 – Metered Flow Measurements at M-01: Harrisville Rd & Larsen Ln

Figure 4.2 shows the flow trends at this meter location. Most of the flows at this meter fluctuate between 400-600 gpm depending on the time of day, with a slight trend upward. This is most likely due to the record-breaking winter in 2022-2023. Figure 4.2 also shows a large spike in January. This is likely the result of multiple winter storm events in January, which froze and accumulated, and then warmed up and melted quickly, bringing water into the system. This spike in metered data is a consistent trend across all meter locations. The January spike at Meter M-01 shows a maximum flow equivalent to the design flow for laterals and collectors. There is no significant increase of sewer flow during the irrigation season.

4.3.1 FLOW ANALYSIS FOR M-02: 1200 W & 400 N

The meter located at 1200 W & 400 N captured flows from drainage Basins B, C, D, E, F, G, H, I, J, K, O and P which represents approximately 73% of the Ogden City Sewer System. Table 4.5 shows the number of connections that contributed to the flows recorded by this meter and the percentage of the total system connections collected. The flows are shown in Figure 4.3.

Table 4.5 - Connections Contributing to Meter M-02

| Basin | Connections |
|-------------|-------------|
| B | 532 |
| C | 2645 |
| D | 1655 |
| E | 469 |
| F | 374 |
| G | 1492 |
| H | 1246 |
| I | 3344 |
| J | 1334 |
| K | 3494 |
| O | 302 |
| P | 778 |
| Subtotal | 17665 |
| Ogden Total | 28615 |
| Percentage | 62% |

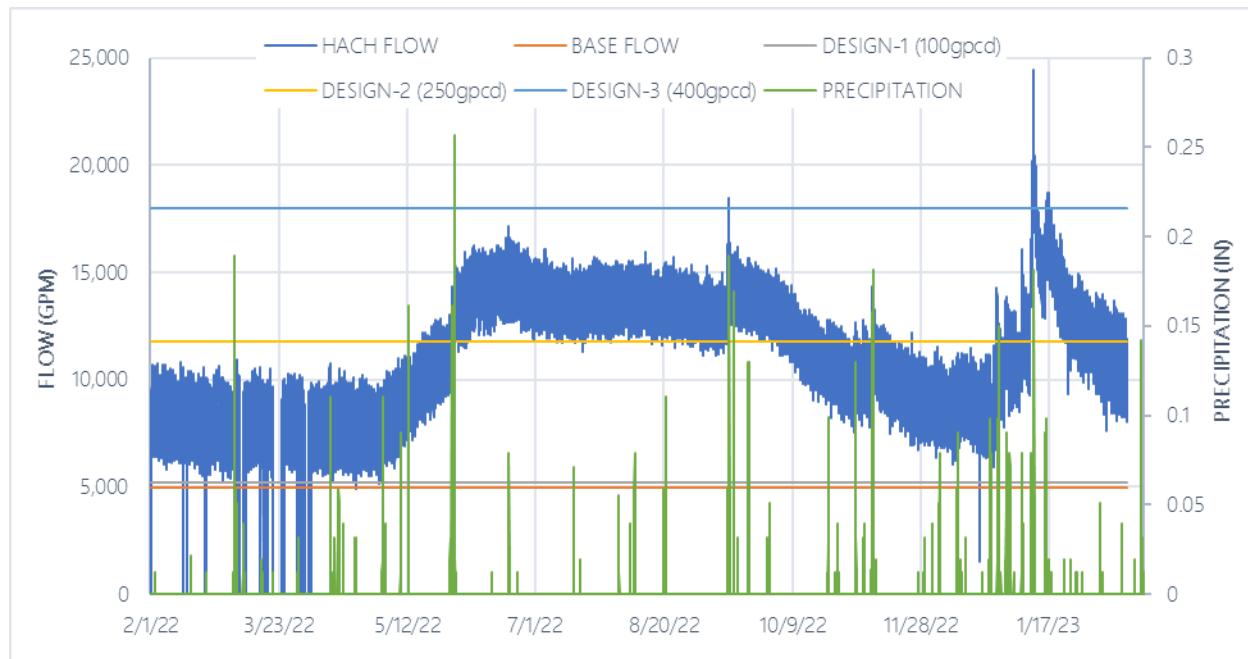


Figure 4.3 – Metered Flow Measurements at M-02: 1200 W & 400 N

Figure 4.3 shows the metered flow trends at M-02: 1200 W & 400 N. Most of the flows at this meter fluctuate between 5,000-10,000 gpm between February and May 2022 depending on the time of day. There is an increase of flow between May and October, which is likely due to irrigation season. This same trend was seen previously in the I & I study (2015) and appears to correspond with the turning on of canals in the area and saturation of the ground water (infiltration) from those canals. Figure 4.3 also shows a large spike in January which resulted from multiple large winter storm events, same as the large spike observed at M-01 in January.

4.3.2 FLOW ANALYSIS FOR M-03: 7TH ST & 375 W

The meter located at 7th St & 375 W captured flows from Drainage Basin P, which represents approximately 23% of the Ogden City Sewer System. Table 4.6 shows the number of connections that contributed to the flows recorded and the percentage of the total system connections collected by this meter. The flows are shown in Figure 4.4.

Table 4.6 – Connections Contributing to Meter M-03

| Basin | Connections |
|-------------|-------------|
| P | 778 |
| Ogden Total | 28615 |
| Percentage | 3% |

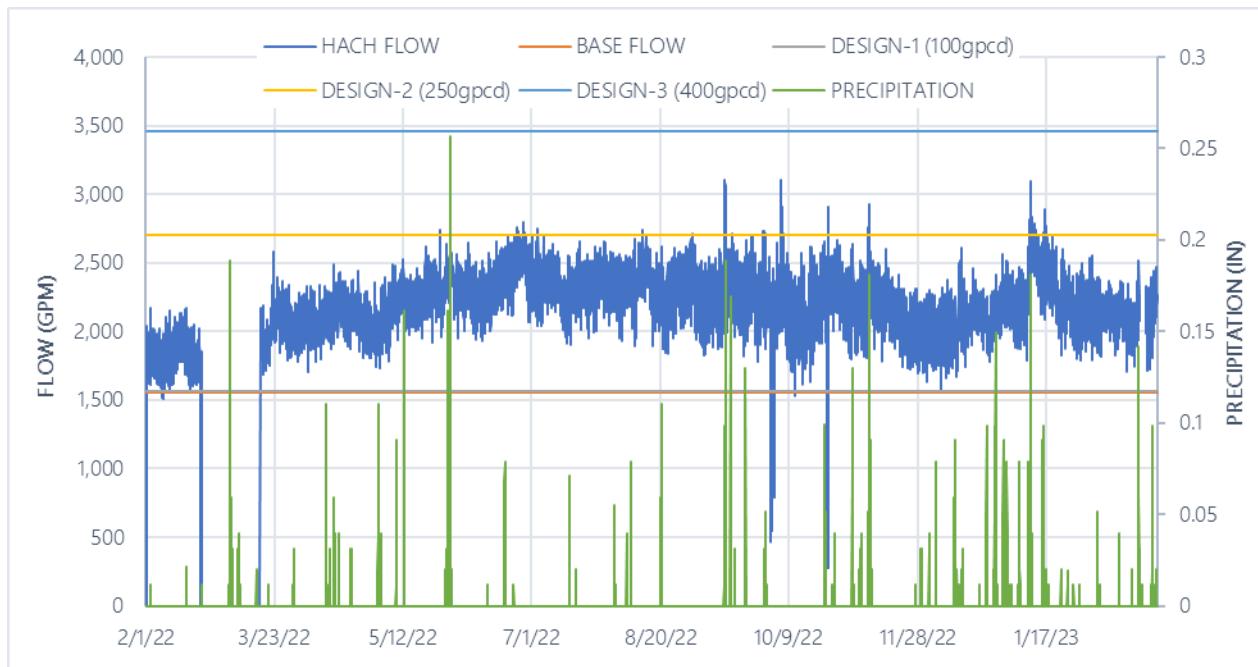


Figure 4.4 – Metered Flow Measurements at M-03: 7th St & 375 W

Figure 4.4 shows the metered flow trends at this location. Most of the flows at this meter fluctuate between 1,600-2,740 gpm depending on the time of day. Figure 4.4 also shows larger

spikes at the same time interval as the previous meters. Again, this is because large storms passed over Ogden City in January. The figure also indicates a slight increase in flow during irrigation season. The trend is not as obvious as shown at M-02.

Since M-03 received flow from Ogden City's largest water user (Fresenius), adjustments were made to the Design Flow scenarios at this meter. The sewer flow from Fresenius does not fit within the typical flow patterns seen for interceptors and collectors, since it is constant and non-cyclical. Calculating the correct manhole loading factor for Fresenius needed to be based on actual flow data.

The State interceptor (250 gpcd) and collector (400 gpcd) design scenarios are meant to account for daily peak flows that may occur within those types of pipes. Since Fresenius flow does not peak, the loading factors for manholes receiving flow from Fresenius were adjusted down so that the state design flow in Basin P matches more closely the actual metered flow.

Otherwise, if the Fresenius manhole loading is not adjusted, the modeled flow overwhelms all the interceptor pipes in the Basin because it assumes a peaking factor on top of actual Fresenius flows. This adjustment is also supported by looking at the trends in other basin meter data. The 250 gpcd manhole loading factor for Fresenius was adjusted as shown by the orange line in Figure 4.4. Additionally, the corresponding 400 gpcd factor was scaled similarly (blue line).

4.3.3 FLOW ANALYSIS FOR M-04: MEADOW BROOK DR (9TH ST), WEST OF WALL AVE

The meter located at Meadow Brook Dr (9th St), W of Wall Ave captured flows from Basin E. The flow collected at Meter M-04 represents approximately 1% of the Ogden City total sewer flow. Table 4.7 shows the number of connections that contributed to the flows and the percentage of the total system connections collected by this meter. The metered flows are shown in Figure 4.5.

Table 4.7 – Connections Contributing to Meter M-04

| Basin | Connections |
|-------------|-------------|
| E | 469 |
| Ogden Total | 28615 |
| Percentage | 2% |

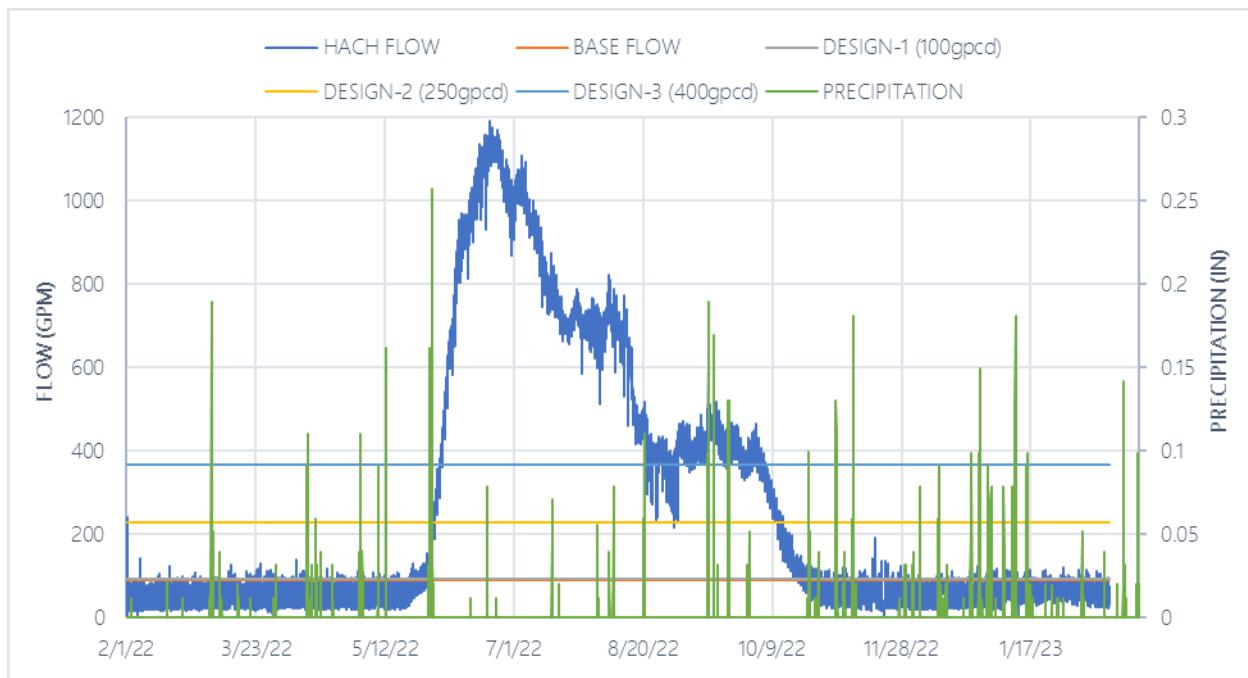


Figure 4.5 – Metered Flow Measurements at M-04: Meadow Brook Dr (9th St), West of Wall Ave

Figure 4.5 shows the metered flow trends at Meter M-04. Most flows at this meter fluctuate between 50-120 gpm in the dry months depending on the time of day. Figure 4.5 also shows a large spike in flow from June to October during irrigation season. This indicates that Basin E experiences significant infiltration issues. The total metered flow during irrigation season even exceeds the 400 gallons per capita day design flow scenario (Design-3 Scenario). The peak flow is 1192 gpm occurring on 6/21/2022. This flow has been modeled through Basin E. Refer to Section 6.3.6 for how this basin has been modeled and what the pipe capacities are.

This infiltration peak was also seen during the I & I Study metering period (2015). It is possible that this peak comes from a single inflow source; however, the pattern is more likely due to canals or irrigation saturating the ground around the pipes. To identify the exact cause of this I&I, it is again recommended (as part of the 5-year CIP) to conduct further I&I investigation, especially since the previous study identified the same problem area.

4.3.4 FLOW ANALYSIS FOR M-05: WALL AVE, NORTH OF 1200 S

The meter located at Wall Ave, North of 1200 S captured flows from Basins F, G, H, I, J and K. The flow captured at Meter M-05 is approximately 31% of Ogden City's total sewer flow. Table 4.8 shows the number of connections that contributed to the flows and the percentage of the total system connections collected by this meter. The metered flows are shown in Figure 4.6.

Table 4.8 – Connections Contributing to Meter M-05

| Basin | Connections |
|-------------|-------------|
| F | 374 |
| G | 1492 |
| H | 1246 |
| I | 3344 |
| J | 1334 |
| K | 3494 |
| Subtotal | 11284 |
| Ogden Total | 28615 |
| Percentage | 39% |

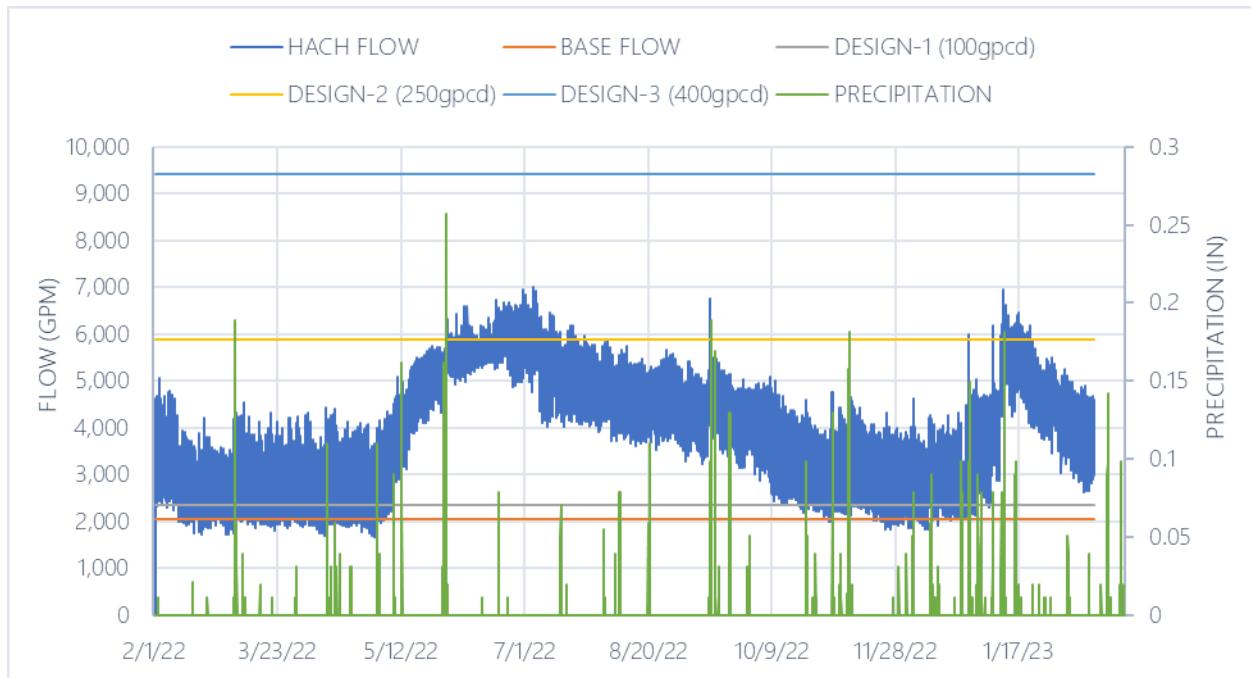


Figure 4.6 – Metered Flow Measurements at M-05: Wall Ave, North of 1200 S

Figure 4.6 shows the metered flow trends at Wall Ave, north of 1200 S. Most of the flows at this meter fluctuate between 2000-4000 gpm during dry months, depending on the time of day. Figure 4.6 also shows an increase in flow during irrigation season (May to October). There is also a large spike in January, which is likely the result of multiple winter storm events around that time. The January spike matches what was discovered at meters M-01, M-02 and M-03.

4.3.5 FLOW ANALYSIS FOR M-06: 31ST ST & PACIFIC AVE

The meter located at 31st St & Pacific Ave captured flows from Basins L and M. This represents approximately 13% of the Ogden City total sewer flow. Table 4.9 shows the number of

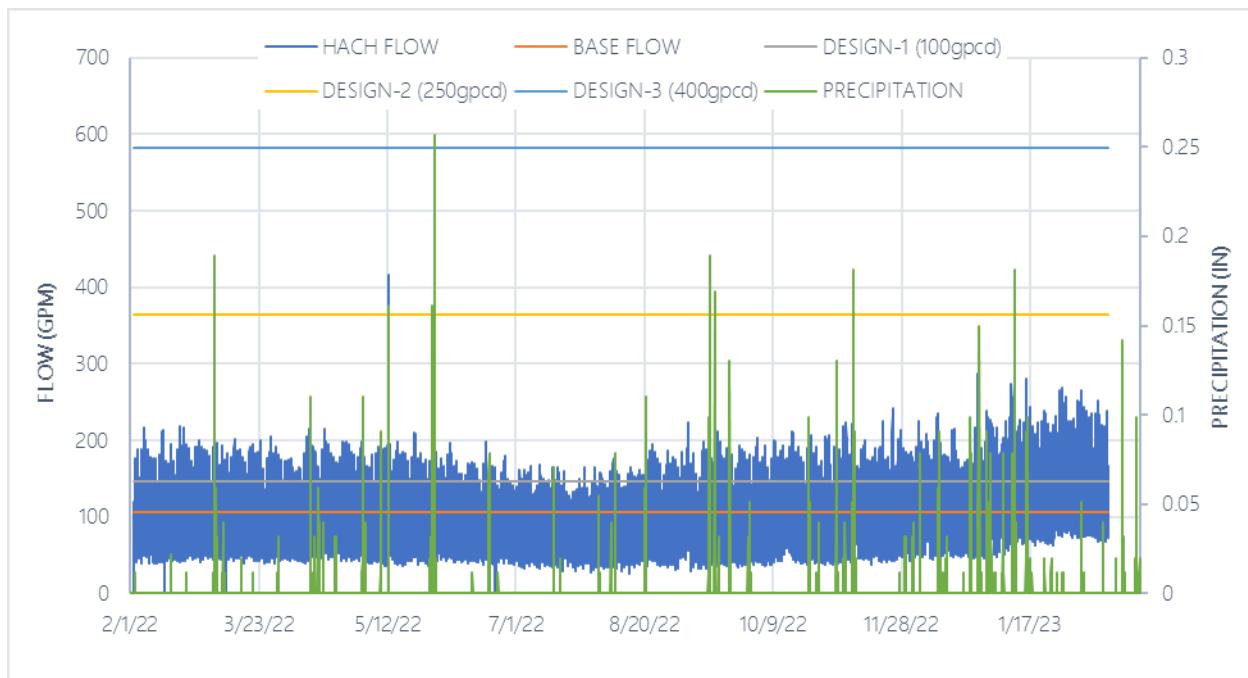


Figure 4.8 – Metered Flow Measurements at M-07: Wall Ave & Riverdale Rd

Figure 4.8 shows the metered flow trends at Meter M-07. Most flows at this meter fluctuate between 45-200 gpm depending on the time of day. There is no apparent increase in flow during the summer months, which indicates minimal infiltration from the area. There are spikes of flows in January which match the trend observed in previous meters.

However, the spike is not as drastic as seen at previous meter locations. This indicates that the pipes and manholes in this area do not experience large amounts of I & I or that the storm event that occurred in January did not have the same level of impact on this area.

4.3.7 ESTIMATED TOTAL SEWER SYSTEM INFILTRATION

To provide an estimate of the total Ogden City Sewer System infiltration, Sunrise considered the entire system flow. The meters were able to capture the flow from approximately 92% of the system connections. To capture flows from 100% of the connections, additional meters would be required. The project had enough funds to provide seven meters. Therefore, it was necessary to estimate the total flow from all connections to the Ogden City Sewer System. This was done using the following steps:

- The flow from each meter was totaled according to the 15-minute sampling period.
- The summed flows per 15-minute sampling period were divided by 92% or the percentage of the system connections that were metered. Dividing the flow by the percentage of connections metered provided a good estimate for what flows will be for the entire system. These flows were input to a graph and are shown in Figure 4.9 as the total system flow.
- An average of the estimated total system flows was calculated and is shown in Figure 4.9 as the total system estimated average flow.

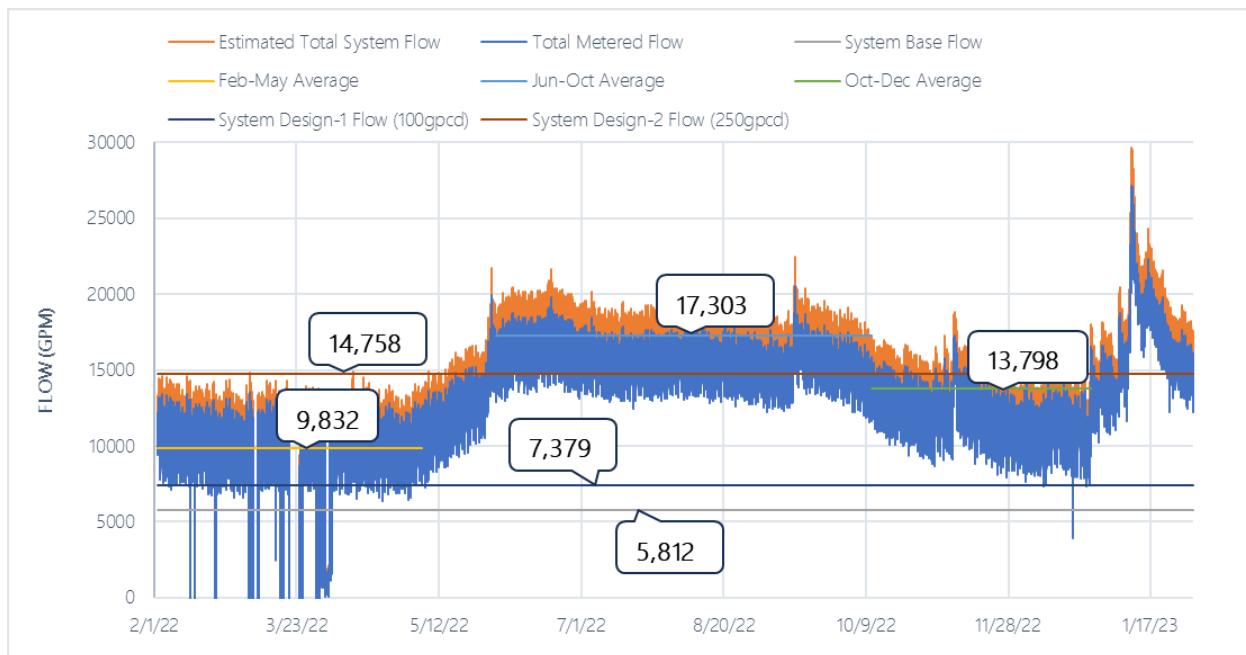


Figure 4.9 – Estimated Total System Infiltration

Figure 4.9 shows the estimated total system flow within the Ogden City Sewer System. Most of the flows fluctuate between 6,950-20,000 gpm depending on the time of day. There is a spike towards the end of the data which is due to extreme weather events in winter 2022. The large spike in flow is generated mostly by inflow, not infiltration. Figure 4.9 also shows multiple smaller peaks throughout the year which represent storm events in the system. These large spikes in flow will be addressed in the inflow portion of this section.

The estimated total system average flows are calculated and shown in Figure 4.9. According to the figure, the estimated total system average flow is 9,832 between February and May 2022. The estimated total system average flow is 17,303 between June and October 2022. The estimated total system average flow is 13,798 between October and December 2022. The system base flow calculated by indoor water usage data is at 5,812 gpm. The system design flow under the 100 gallons per capita per day criteria is at 7,379 gpm. This number includes estimated inflow and infiltration. The system design flow under the 250 gallons per capita per day criteria is at 14,758 gpm. This design flow criterion is used to design interceptors and outfalls and includes estimated inflow and infiltration. It is clear Ogden's sewer system experiences a large amount of infiltration during summer. However, between the months of October to May, Ogden City's total sewer flow generally fall within the limits of the design requirements for large diameter interceptors. Table 4.10 below summarizes the total system infiltration.

Table 4.10 – Total System Infiltration Summary

| Estimated Total System Flow (gpm) | System Base Flow (gpm) | Total System Infiltration (gpm) | Percentage of Infiltration |
|-----------------------------------|------------------------|---------------------------------|----------------------------|
| Feb-May 2022 | 9832 | 5812 | 4020 |

| | | | | |
|--------------|-------|------|-------|-----|
| Jun-Oct 2022 | 17303 | 5812 | 11491 | 66% |
| Oct-Dec 2022 | 13798 | 5812 | 7986 | 58% |

The large infiltration is an item of concern for the Ogden City Sewer System. Excessive infiltration will reduce the capacity in a sewer line for base flow and for inflow due to surface water. To determine the exact areas of infiltration, additional metering will be required to pinpoint the locations. The analysis of the individual meters above will provide a starting point to locate the worst areas of infiltration.

4.3.8 INFILTRATION SUMMARY

The studies performed to this point give an evaluation of the amount of infiltration that existed within the Ogden City Sewer System. These studies identified the approximate amount of infiltration that each flow meter recorded. This was accomplished by averaging the results from each meter. The calculated base flow was subtracted from the average daily metered flow, resulting in the amount of infiltration detected. The flow from each meter is shown in Table 4.11.

Table 4.11 – Infiltration Summary by Meters

| Meter ID | Meter Location | Metered Average Flow (gpm) | Calculated Base Flow (gpm) | Average Infiltration (gpm) | Infiltration % of Metered Flow |
|----------|---|----------------------------|----------------------------|----------------------------|--------------------------------|
| 1 | Harrisville Rd & Larsen Ln | 490 | 274 | 216 | 44% |
| 2 | 1200 W & 400 N | 10,857 | 4,341 | 6,516 | 60% |
| 3 | 7th St & 375 W | 2,028 | 1,508 | 520 | 26% |
| 4 | Meadow Brook Dr (9th St), W of Wall Ave | 297 | 76 | 221 | 74% |
| 5 | Wall Ave, north of 1200 S | 3,996 | 1,718 | 2,278 | 57% |
| 6 | 31st St & Pacific Ave | 1,439 | 737 | 702 | 49% |
| 7 | Wall Ave, north of Riverdale Rd | 112 | N/A | N/A | N/A |

Meter M-07 captures inflow from CWSID. A base flow cannot be calculated for Meter M-07 because the area contributing flows to this meter is outside of Ogden City's boundary.

As shown in Table 4.11, each area of the Ogden City Sewer System has different infiltration flow rates due to variance in the age of the system, groundwater levels, and manhole conditions. The areas with the largest amount of infiltration 10d to be in the older parts or the central portions of Ogden City.

The areas that recorded less infiltration are the new portions or the northern and southern portions of Ogden City. Each area in the model was input with a different infiltration pattern to reflect the various infiltration rates. The total system average infiltration is 7,832 gpm.

4.3.9 ESTIMATED TOTAL SEWER SYSTEM INFLOW

The metered data shows inflow occurs within the Ogden City Sewer System. During the metering period, there were multiple storms that affected Ogden City; however, the one in January was the largest. To determine the amount of precipitation from this storm event, data was received from the <https://www.ncei.noaa.gov/weather-climate-links>. The data compiled from this source is widely regarded as reliable and authoritative and used in our industry.

Sunrise graphed precipitation data and temperature data alongside the meter data in Section 4.3 to determine if the large inflow in January was caused by weather, which it was.

Inflow impacts sewer capacity in the Ogden City Sewer System, so it was necessary to model the system with inflow. The peak inflows caused by the January 2023 extreme weather event, as seen in Meters M-01, M-02, & M-06, represents about 92% of the total potential inflow for the city. In Figure 4.9 the interpolated total system flow, using all connections, shows that for approximately 100% of the city, the total potential peak flow during an extreme weather event is 29,600 gpm. The modeling of these extreme weather events, and how it affects the system is further discussed in Section 6.3.6.

Subtracting the base flow (5,812 gpm) and the average infiltration from Feb-May (4,020 gpm) from the January peak metered inflow (29,600 gpm) results in an inflow of 19,768 gpm which represents approximately 67% of the wastewater flow for Ogden City during an extreme weather event.

Larger amounts of inflow could be an item of concern for the Ogden City Sewer System; however, the peak storm inflow typically has a relatively short duration compared to infiltration or state design flow scenarios. The storm observed in January had a longer effect on the meter data than is typically seen for regular storm events.

However, even under this circumstance, the system buffered the larger inflow out quickly because of the large capacity of the full sewer system. If the inflow continues, it may reduce the sewer system capacity. Locating and terminating the points of inflow into the Ogden City Sewer System will require additional metering. The State 250 and 400 gpcd design scenarios will affect the City system more than the extreme weather event scenario because of duration.

4.3.10 INFLOW SUMMARY

To this point in the study, Sunrise has performed an evaluation of the amount of inflow that exists during extreme weather events within the Ogden City Sewer System. The inflow recorded from each meter and the estimated peak system inflow during the January 2023 storm event is shown in Table 4.12. Total inflow into the system during the January 2023 extreme weather event is around 20,000 gpm.

Table 4.12 – Inflow Summary

| Meter ID | Meter Location | Metered Peak Flow in January 2023 (gpm) | Metered Average Flow (gpm) | Calculated January 2023 Peak Inflow (gpm) | Inflow % of Peak Metered Flow in January 2023 (gpm) |
|----------|---|---|----------------------------|---|---|
| 1 | Harrisville Rd & Larsen Ln | 1,782 | 490 | 1,293 | 73% |
| 2 | 1200 W & 400 N | 24,423 | 10,857 | 13,566 | 56% |
| 3 | 7th St & 375 W | 3,101 | 2,028 | 1,073 | 35% |
| 4 | Meadow Brook Dr (9th St), W of Wall Ave | 168 | 66 | 102 | 61% |
| 5 | Wall Ave, north of 1200 S | 7,014 | 3,996 | 3,018 | 43% |
| 6 | 31st St & Pacific Ave | 4,964 | 1,439 | 3,525 | 71% |
| 7 | Wall Ave, north of Riverdale Rd | 304 | 112 | 192 | 63% |

Like the infiltration, different areas of the Ogden City Sewer System experience varying levels of inflow into the system. It is difficult to determine exactly how the January storm intensity differed from basin to basin in the city; however, each area in the model was input with a different inflow pattern to simulate the January inflow event.

4.4 PROJECTED DESIGN BASE FLOW AT SYSTEM BUILD-OUT

As discussed in Section 4.1, base flow is calculated from indoor water usage. To determine the projected base flow at system build-out (year 2060), the sewer loadings applied to the model at existing base flow condition must be increased by a similar factor as the projected population increase. This factor is discussed in Section 3.2.

Figure 6.6 in Section 6.3.4 shows pipe capacities at system build-out.

The total system flow can be calculated by multiplying the State design flow rate by the projected population at build-out conditions:

$$\begin{aligned}
 106,934 \text{ people} \times 100 \frac{\text{gal}}{\text{day person}} &= 10,693,400 \frac{\text{gal}}{\text{day}} \\
 10,693,400 \frac{\text{gal}}{\text{day}} \times \frac{\text{day}}{24\text{hr}} \times \frac{\text{hr}}{60\text{min}} &= 7,426 \frac{\text{gal}}{\text{min}} \text{ **Build Out Average Daily Flow Rate**}
 \end{aligned}$$

According to the State's requirement for average daily flow rate, the Ogden City Sewer System has a projected build-out average flow rate of 7,426 gpm, which equates to approximately 10.7 MGD.

The average daily flow rate per drainage basin can be calculated using the same method above. Each basin's connections are increased by 22% to obtain the projected future connections at

build-out. Since the projected population is 106,934, the average people per household value is 3.05.

This number is multiplied by the connections from each drainage basin to obtain a population for each basin. Then, the State design flow rate of 100 gal/capita/day is multiplied by the number of connections in each basin to calculate the average daily flow rate. Table 4.13 below summarizes the results of this analysis.

Table 4.13 – Build-Out Average Daily Flow Rate per Drainage Basin

| Basin | Build-out Connections | Average Daily Flow Rate (gal/day) | Average Flow Rate (gpm) |
|-------|-----------------------|-----------------------------------|-------------------------|
| A | 3,734 | 1,138,818 | 791 |
| B | 651 | 198,705 | 138 |
| C | 3,239 | 987,922 | 686 |
| D | 2,027 | 618,152 | 429 |
| E | 574 | 175,174 | 122 |
| F | 458 | 139,691 | 97 |
| G | 1,827 | 557,270 | 387 |
| H | 1,526 | 465,388 | 323 |
| I | 4,095 | 1,249,002 | 867 |
| J | 1,634 | 498,256 | 346 |
| K | 4,279 | 1,305,028 | 906 |
| L | 5,043 | 1,538,095 | 1,068 |
| M | 1,683 | 513,196 | 356 |
| N | 1,755 | 535,233 | 372 |
| O | 370 | 112,799 | 78 |
| P | 953 | 290,587 | 202 |
| S | 1,196 | 364,666 | 253 |
| SUM | 35,043 | | |

4.5 PROJECTED INFLOW & INFILTRATION

For this Master Plan Update, it has been assumed that the projected I & I will remain constant over time. This assumption was made because any increase of I & I will be offset by the efforts of Ogden City to repair leaks and replace aging pipes. The period from June to October 2022 has been selected as the baseline for estimated total projected I & I. The total average I&I flow during this period is 11,491 gpm. Therefore, the projected average total I & I at buildout condition will remain 11,491 gpm or 16.55 MGD.

4.6 OGDEN CITY I&I FLOW REDUCTION ANALYSIS (2014-2022)

Sunrise Engineering conducted an analysis of Ogden City's I&I flow reduction from 2014 to 2022. Meters M-01, M-02, M-03, M-04, M-05 and M-06 from this Sewer Master Plan are used as a base point to compare I&I flows. These meters correspond to meters from the 2015 I&I Study as shown in Table 4.14 below. Meter M-05 does not have a comparison meter installed in 2014, thus the 12th St & Wall Ave Meter from the 2013 Sewer Master Plan was selected for comparison purpose. Figure 4.1 shows the locations of the 6 meters in this analysis and the basins that contribute flow to each meter.

The comparison period is from May to September, where I&I flow is at its peak. Meter M-05's comparison period is from July to September, because flow data is not available between May 2012 to June 2012.

As shown in Table 4.14 below, the average metered flow from May to September was entered for each meter. The average I&I flow for each meter was calculated by subtracting the base flow of each meter from the average metered flow. Five of the six meters show a reduction of I&I flow over the 8-year comparison period (2014-2022). The estimated total I&I flow reduction percentage was calculated by weighing each meter's I&I reduction against each meter's percentage of flow compared to the total system flow. This result shows that Ogden City's total I&I flow reduction from 2014 to 2022 is approximately 31%.

Table 4.14 - Ogden City I&I Flow Comparison (2014-2022)

| Meter ID (2022 Sewer Master Plan) | Meter ID (2014 I&I Study) | Meter Location | Comparison Duration | Average Flow (2014), gpm | Average I&I (2014), gpm | Average Flow (2022), gpm | Average I&I (2022), gpm | Reduction% |
|---|---------------------------------|----------------------------------|------------------------|-----------------------------------|----------------------------------|-----------------------------------|----------------------------------|------------|
| M-01 | FM-01 | Harrisville Rd & Larsen Rd | May- September | 543 | 244 | 474 | 175 | -28% |
| M-02 | FM-02 | 1200 W & 400 N | May- September | 17421 | 12599 | 13331 | 8388 | -33% |
| M-03 | FM-03 | 7th St & 375 W | May- September | 1834 | 712 | 2291 | 741 | 4% |
| M-04 | FM-06 | 9th St, West of Wall Ave | May- September | 782 | 688 | 550 | 462 | -33% |
| M-05 | *12th St & Wall Ave | *Wall Ave, north of 1200 S | *July - September | 5944 | 3514 | 4838 | 2789 | -21% |
| M-06 | FM-11 | 31st St & Pacific Ave | May- September | 2022 | 734 | 1400 | 547 | -25% |
| Estimated Total System I&I Flow Reduction | | | | | | | | -31% |

* Flow data for this meter comes from the 2012 sewer master plan.

As discussed in Section 4.3.7, the meters were able to capture the flow from approximately 92% of the system connections. In order to estimate the total sewer flow reduction for Ogden City, a total system flow needs to be calculated. Results are compared between summer 2014 and summer 2022. Table 4.15 shows that through persistent maintenance and rehabilitation, Ogden City was able to reduce the total system flow by 24% from summer 2014 to summer 2022.

Table 4.15 – Ogden City Total System Flow Comparison (2014-2022)

| Meter ID (2022 Sewer Master Plan) | Meter ID (2014 I&I Study) | Meter Location | Comparison Duration | Average metered Flow (2014), gpm | Average metered Flow (2022), gpm | Reduction% |
|---|---------------------------------|----------------------------|---------------------|--|--|------------|
| M-01 | FM-01 | Harrisville Rd & Larsen Rd | May-September | 543 | 474 | 13% |
| M-02 | FM-02 | 1200 W & 400 N | May-September | 17,421 | 13,331 | 23% |
| M-06 | FM-11 | 31st St & Pacific Ave | May-September | 2,022 | 1,400 | 31% |
| SUM | | | May-September | 19,986 | 15,205 | 24% |
| Estimated Total System Flow | | | May-September | 21,724 | 16,527 | 24% |

5 ADDITIONAL FLOWS/OUTFLOWS AND TREATMENT

5.1 ADDITIONAL FLOWS FROM NEIGHBORING CITIES

Other cities outfall their sewer flows into the Ogden City Sewer System. These flows are transported through Ogden's system until the lines outfall into CWSID trunk lines. These cities include Roy, South Ogden, Harrisville, and North Ogden. Each of these cities has agreements with Ogden City to outfall into its sewer lines. The agreements are in Appendix B.

All flows from these cities were taken into consideration when modeling the Ogden City Sewer System (except Roy, as explained in Section 5.1.1). These additional flows use capacity in the trunk lines. A description for each of these cities' outfall location and flows is provided below. These flows were input into the model to increase the accuracy of the City sewer model.

5.1.1 ROY

Roy connects to the Ogden City Sewer System at the intersection of 4400 S. and 1610 W. Ogden entered into an agreement with Roy in April 1988 to allow Roy to connect to the Ogden City Sewer System for a period of 20 years. The agreement specifies that the sewer flows from Roy are not to exceed 200 gpm.

At the time of this report, Roy was planning to build a new lift station that would divert the sewer flow to Central Weber Sewer Improvement District instead of Ogden City. It is unknown when the lift station will be completed. Therefore, the Roy connection was removed from the sewer model since it has little impact on the results.

5.1.2 CENTRAL WEBER SEWER IMPROVEMENT DISTRICT

The Central Weber Sewer Improvement District (CWSID) has a sewer line that begins at the intersection of Wall Ave and Riverdale Rd. This line collects wastewater from South Ogden and transports it in this line to the intersection of Wall Ave. and 33rd St.

At this intersection, the CWSID line connects to the Ogden City Sewer System. The Ogden City Sewer System transports the wastewater north from 33rd St to 31st St where the flow turns W and empties into CWSID. At the time of this report, there was no agreement between CWSID and Ogden City for the connection between the two systems at this location.

5.1.3 HARRISVILLE

Ogden entered into an agreement with Harrisville dated May 21st, 1969. This agreement allowed Harrisville to connect and outfall into the Ogden City Sewer System. There are two Harrisville connections. The first is located at the intersection of Washington Blvd. and Larsen Ln. This connects 40 single residence family connections or the equivalent of 1% of the capacity of the Larsen Ln sewer line.

The Larsen Ln sewer line has a minimum capacity of 2,477 gpm. The percentage of flow designated for Harrisville in the Larsen Ln sewer line is 24.7 gpm and was input into the model at the point of connection between the two sewer systems.

A second connection by Harrisville to the Ogden City Sewer System was at the intersection of Washington Blvd. and North St. and was permitted in the same agreement. The agreement allows Harrisville to use 15% of the total capacity of the 10-in. line in North St from Washington Blvd. to Wall Ave. The 10-in. line in North St has a minimum capacity of 600 gpm. The percentage of capacity designated for Harrisville in the North St 10-in. line equals 90 gpm. This flow was input into the model at the point of connection between the two sewer systems.

5.1.4 NORTH OGDEN

North Ogden connects to the Ogden City Sewer System on the W side of the canal at Cold Water Way. Ogden's agreement with North Ogden allows up to 61 residential and single-family lots to have access to the Ogden City Sewer System.

North Ogden pays a fee to Ogden that is 72% of the base monthly charge assessed to Ogden residents for sewer services. Based on the average daily flow from the DWQ of 100 gpd/capita, North Ogden outfalls 12 gpm into the Ogden City Sewer System. This flow has been applied to the Ogden City Sewer Model.

5.2 OUTFLOWS

Ogden does not treat its own wastewater and outfalls into other sewer systems that treat the wastewater. Most outfalls within the Ogden City Sewer System empty into CWSID trunk lines with additional outfalls into the South Ogden, Uintah Highlands, and Marriott-Slaterville sewer systems. Ogden has agreements with each of these cities to do so. The agreements for each of these outfall locations are in [Appendix B](#). A description for each Ogden City outfall location is provided below and has been input into the Ogden City Sewer Model.

5.2.1 CWSID OUTFALLS

Ogden has multiple outfalls into the CWSID sewer lines. There are too many outfalls to discuss each one individually in this report. For this reason, a map has been provided identifying the location of each outfall into the CWSID sewer system is shown in [Figure 5.1](#) at the end of this section.

5.2.2 SOUTH OGDEN OUTFALLS

Ogden entered into an agreement with South Ogden on May 17th, 1965. This agreement allowed Ogden to connect to the South Ogden sewer system at two different locations. The first of these connections is located at the intersection of Edgewood Dr. and Glasmann Way. The second

connection is located at the intersection of approximately 5250 S. and Harrison Blvd. The agreement states that Ogden has the right to use the South Ogden sewer line to transport wastewater to an outfall in the CWSID sewer line located at the intersection of 40th South and Palmer Dr. This agreement states that South Ogden will always reserve 4.5 cfs of capacity for Ogden City.

5.2.3 UNTAH HIGHLANDS IMPROVEMENT DISTRICT (UHID) OUTFALLS

Ogden has two inter-local agreements with the UHID for providing sanitary sewer collection and treatment services for the southernmost portion of the Ogden City Sewer System. The first agreement is dated October 25th, 1999, and allows the area known as The Hamptons located within Ogden City limits to transport their sewage through the UHID sanitary sewer system for treatment.

Ogden City pays \$28.16 per month for each lot within The Hamptons. The UHID will bill Ogden City quarterly for the collection and treatment of the sewer flows. The rate is subject to subsequent reasonable adjustment by the District. This agreement will continue for a period of fifty years.

The second agreement with UHID is dated July 21st, 2005, and states that the UHID will provide sanitary sewer collection service for the area known as Shadow Mountain. The connection point is in Skyline Dr nearest the common boundary line of the District and the City at the south end of Shadow Mountain Subdivision.

The agreement outlines that Ogden will provide all other municipal services to the Shadow Mountain development. Ogden is to pay \$34.19 per month per connection for the Shadow Mountain Subdivision and is subject to reasonable adjustment by the District. This agreement will continue for the maximum period authorized by law for inter-local agreements.

5.2.4 MARIOT-SLATERVILLE

On October 16th, 2008, Ogden entered into a sewer transfer agreement with Marriott-Slaterville. It was presumed that Ogden originally owned and operated a 10" sewer outfall line that begins at approximately 12th St and the Ogden Nature Center and flows W to 1200 West where it empties into the CWSID line. There are approximately four Ogden residential connections to this line.

The agreement transfers the ownership and maintenance responsibility to Marriott-Slaterville. The agreement specifies that Marriott-Slaterville will maintain 15% of the total usable capacity of the sewer line for future users. Although there are Ogden connections to this line, the sewer line was not modeled or shown in any of the maps because it is not owned and maintained by Ogden.

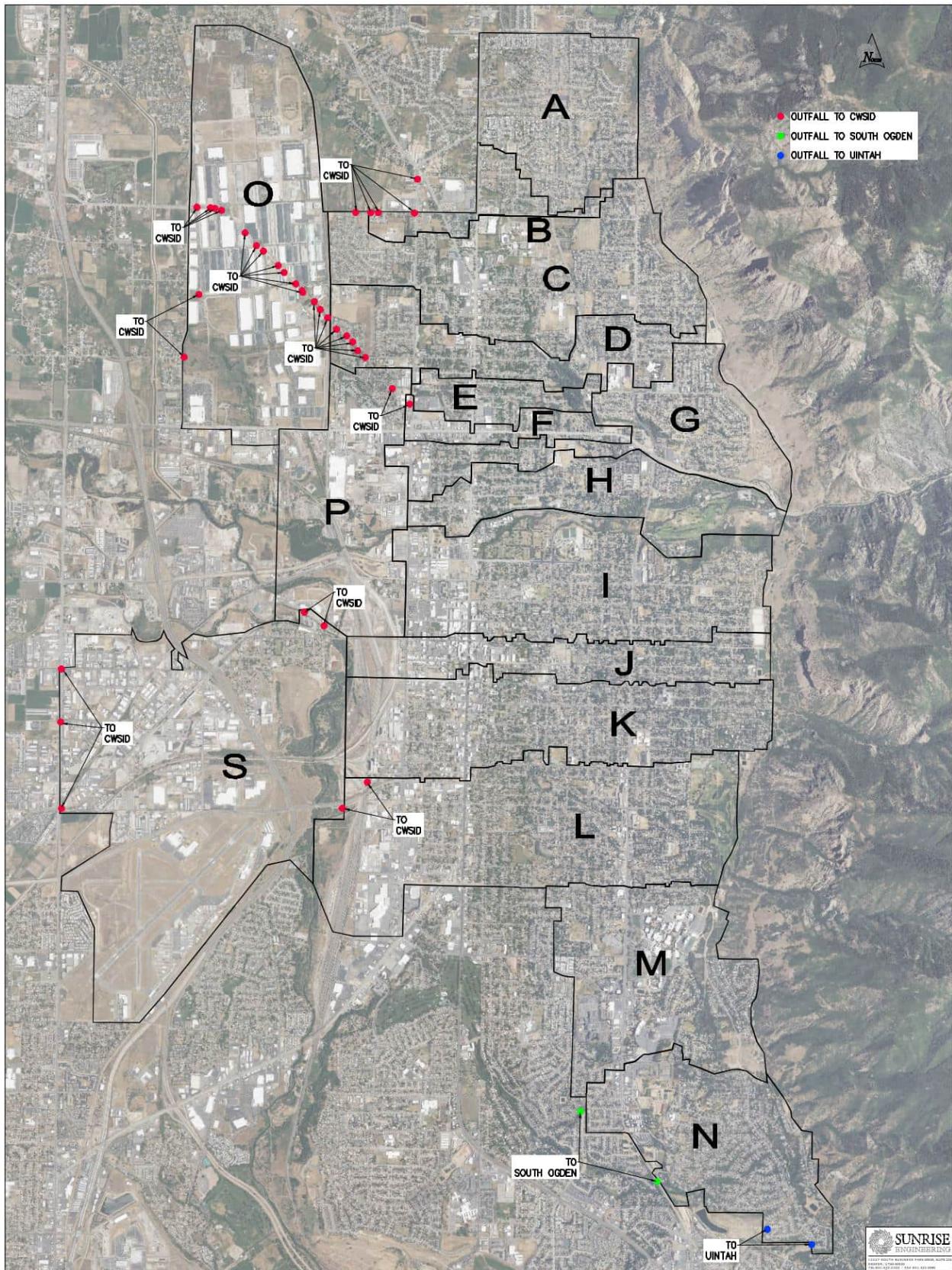


Figure 5.1 – Ogden City Outfall Locations

5.3 TREATMENT

Ogden does not treat its own wastewater. The treatment of the wastewater is completed by CWSID and Ogden City pays for the treatment. Ogden entered a wholesale wastewater treating contract with CWSID on March 19, 2009.

The agreement states that CWSID will provide treatment of the wastewater collected by Ogden and delivered through outfall lines installed, operated, and owned by CWSID. Additionally, it states that CWSID will treat and dispose of all wastewaters delivered into the outfall lines from Ogden City in accordance with their rules, regulations, and other requirements.

CWSID will have the right to adopt and modify wastewater control rules and regulations in accordance with state law. The rules, regulations, requirements, fees, and costs shall apply to Ogden City and all other sanitary sewer customers.

The agreement outlines a payment formula that is used to determine the amount owed to CWSID for wastewater treatment. This payment formula utilizes the property valuation used for Weber County property tax purposes, the population of the area being served, and CWSID annual operation and maintenance budget, which may include capital replacement, debt service, and reserves. Ogden is billed quarterly for the wastewater treatment provided by CWSID. The equation used to figure Ogden's fee is shown below.

$$\text{Ogden City Fee} = \left(\frac{OP}{TP} \right) \left(\frac{1}{2} AB \right) + \left(\frac{OPV}{TPV} \right) \left(\frac{1}{2} AB \right)$$

Where OP = Ogden City Population

TP = Total Population Served

AB = Annual Budget

OPV = Ogden City Property Value

TPV = Total Property Value Served

Should there be a year where excess money is accumulated by CWSID from actual O&M costs versus budgeted O&M costs, the difference will be credited against future payments. Should CWSID revenues not be adequate, Ogden City agrees to pay its proportionate share of supplemental payments to the District.

The agreement between Ogden City and CWSID for treatment and payment is in Appendix B of the Master Plan.

6 OGDEN CITY SEWER SYSTEM

Ogden City's Sewer System is one of the largest in the State of Utah. Section 2 of this Master Plan provided a general overview and description of the system. As detailed in that section, the collection system includes approximately 280 miles of sewer line, 5,627 manholes, and two lift stations. This section of the Master Plan is dedicated solely to the collection elements of the Ogden City Sewer System (i.e., pipelines and lift stations).

This section is a discussion on the Ogden City Sewer Model that was developed and used in this Master Plan. The discussion includes an overview of the assumptions and methods used to develop the Model, followed by a summary analysis of the results and recommended capital improvement projects derived from the sewer model relating to the collection elements of the system.

A detailed discussion of the CIP for the sewer system is provided in Appendix A of this Master Plan. This section concludes with a discussion of the age and condition of the pipes in the system and provides a replacement and maintenance plan that are included as an important element of the capital improvement projects for the system.

6.1 SEWER COLLECTION PIPE AND LIFT STATION OVERVIEW

6.1.1 PIPELINE ATTRIBUTES

The sewer pipes in Ogden City's system are of different material, diameter, and age. Tables 6.1 to 6.3 are pipeline attribute summaries showing the pipe in the system categorized by diameter, age, and material. These tables can be used as a tool to understand the pipe elements of the sewer system.

Understanding the make-up and condition of the pipelines in the system is important in determining and recommending capital improvement projects. Table 6.1 shows the linear footage that exists in the Ogden City Sewer System for each diameter of pipe. The table also includes what percentage of all the pipes are a specific diameter. This is essential information to have when considering pipe replacement, as larger diameters typically require more cost to install and replace.

Table 6.1 – Sewer Pipe Attributes Categorized by Diameter

| Diameter | Length (LF) | Length (Miles) | Percentage |
|----------|-------------|----------------|------------|
| 6" | 1,595 | 0.3 | 0.1% |
| 8" | 1,149,598 | 217.7 | 77.9% |
| 10" | 128,490 | 24.3 | 8.7% |
| 12" | 84,433 | 16.0 | 5.7% |
| 14" | 787 | 0.1 | 0.1% |
| 15" | 38,728 | 7.3 | 2.6% |
| 18" | 29,459 | 5.6 | 2.0% |
| 20" | 5,597 | 1.1 | 0.4% |
| 21" | 12,151 | 2.3 | 0.8% |
| 22" | 2,732 | 0.5 | 0.2% |
| 24" | 10,870 | 2.1 | 0.7% |
| 30" | 2,260 | 0.4 | 0.2% |
| 33" | 52 | 0.01 | 0.004% |
| 36" | 2,305 | 0.4 | 0.2% |
| 42" | 6,495 | 1.2 | 0.4% |
| Totals | 1,475,552 | 279.5 | 100.0% |

As shown in Table 6.1, the 8-in. diameter pipe has the most linear footage, which is about 78% of all the pipes in the system. For this sewer master plan, all pipes 10-in. and below are classified as sewer laterals or collector pipes. All pipes larger than 10-in. are classified as interceptor lines.

It is important to note that there are still significant quantities of remaining pipe diameters in the system. The largest pipes in the system are 42-in. Figure 6.1 shows a map of the system with the pipe elements categorized by diameter.

Table 6.2 shows the linear footage that exists in the Ogden City Sewer System based on pipe age. The table also includes what percentage each age group is of all the pipes in the system. This data is particularly important when developing a maintenance and pipe replacement plan for the pipes in the sewer system. Pipe age, maintenance, and replacement are discussed in detail later in this report.

Table 6.2 – Sewer Pipe Attributes Categorized by Age

| Year | Length (LF) | Length (Miles) | Percentage |
|------------|-------------|----------------|------------|
| Unknown | 204,833 | 38.8 | 13.9% |
| Older 1920 | 131,061 | 24.8 | 8.9% |
| 1920's | 106,838 | 20.2 | 7.2% |
| 1930's | 45,135 | 8.5 | 3.1% |
| 1940's | 146,469 | 27.7 | 9.9% |

| | | | |
|--------|-----------|-------|--------|
| 1950's | 198,561 | 37.6 | 13.5% |
| 1960's | 153,282 | 29.0 | 10.4% |
| 1970's | 120,155 | 22.8 | 8.1% |
| 1980's | 90,548 | 17.1 | 6.1% |
| 1990's | 151,148 | 28.6 | 10.2% |
| 2000's | 81,535 | 15.4 | 5.5% |
| 2010's | 16,349 | 3.1 | 1.1% |
| 2020's | 29,639 | 5.6 | 2.0% |
| Total | 1,475,552 | 279.5 | 100.0% |

The pipelines in the Ogden City Sewer System vary in age. As shown in Table 6.2, it appears that many of the pipes were installed between 1940 and 1970. These three decades combined equal approximately 34% of the system. Approximately 19% of the pipes in the system are older than 1940. Another significant amount of pipe was installed in the 1990's (10% of the system), with about 19% of the system being installed between 1990 and 2020.

It is also important to note that 14% of the sewer system is of unknown age. Figure 6.2 is a map of the Ogden City Sewer System color coded by age. This data will be a valuable tool when determining pipeline replacement due to age.

Table 6.3 shows the linear footage in the Ogden City Sewer System based on pipe material. The table also includes a percentage indicating how much of each material is in the system. This data is important for understanding the pipe elements and is especially useful for the operation and maintenance of the system.

Most of the new pipes in the system are concrete or PVC and older pipes are typically vitrified clay or concrete. There are also several small sections of other pipe material throughout the city. Figure 6.3 is a map of the Ogden City Sewer System color coded by pipe material. This data will be a valuable tool when determining pipeline replacement and disposal based on material.

Table 6.3 – Sewer Pipe Attributes Categorized by Pipe Material

| Material | Length (LF) | Length (Miles) | Percentage |
|--------------|-------------|----------------|------------|
| Cast Iron | 298 | 0.1 | 0.02% |
| CIPP | 84,956 | 16.1 | 5.8% |
| Clay | 281,668 | 53.3 | 19.1% |
| Concrete | 672,421 | 127.4 | 45.6% |
| Ductile Iron | 253 | 0.05 | 0.02% |
| HDPE | 1,036 | 0.2 | 0.1% |
| PVC | 271,494 | 51.4 | 18.4% |
| RCP | 769 | 0.1 | 0.1% |
| Steel | 335 | 0.1 | 0.02% |
| Transite | 64 | 0.01 | 0.004% |
| Unknown | 162,260 | 30.7 | 11.0% |
| Total | 1,475,552 | 279.5 | 100.0% |

Table 6.3 shows most pipes in the system are concrete pipes, followed by Clay and PVC. This is because 34% of the pipes in the system were installed in the 1940's, 1950's, and 1960's. Vitrified clay represents about 19% of the system and is typically an older pipe.

6.1.2 LIFT STATION ATTRIBUTES

Pumping stations in a sewage collection system, also called lift stations, are normally designed to handle raw sewage fed from underground gravity pipelines. Sewage is fed into and stored in an underground pit, commonly known as a wet well. The well is equipped with electrical instrumentation to detect the level of sewage present.

When the sewage level rises to a predetermined point, a pump lifts the sewage upward through a pressurized pipe system called a sewer force main, or rising main, and is discharged into a gravity manhole.

Sewage pumping stations are typically designed so that one pump or one set of pumps will handle normal peak flow conditions. Redundancy is built into the system so that if any one pump is out of service, the remaining pump or pumps will manage the designed flow.

Ogden City has two lift stations in its sewer system. The first lift station is located at the Northern Utah Community Correctional Center in Water Tower Way. This lift station only receives flow from the Correctional Center and pumps it into a gravity manhole.

The second lift station is in the (Business Depot Ogden) BDO area at the intersection of 2nd St and 1140 West. This intersection is a low point in the area and receives flow from the southwestern part of BDO. This lift station pumps the wastewater into a CWSID collection line located on 1200

West. Table 6.4 lists the lift stations in the system with their location, elevation settings, basin area, and pumping capacity.

Table 6.4 – Lift Station Attributes

| Lift Stations | Sub Basin Area | Invert (ft.) | Lead Pump On Elevation (ft.) | Lag Pump On Elevation (ft.) | Capacity (gpm) |
|------------------|----------------|--------------|------------------------------|-----------------------------|----------------|
| Water Tower Way* | S | 4,296 | 4,300 | 4,301 | 320 |
| BDO | O | 4,235 | 4,241 | 4,242 | 2,332 |

*Serves one connection

6.2 OGDEN CITY'S SANITARY SEWER MODEL

6.2.1 DEFINITION OF ATTRIBUTES AND PARAMETERS

The City's Sewer Model was developed using the latest version of the sewer modeling software H2OMAP Sewer, which is developed by Innovyze. In December 2017, Innovyze announced the retirement of the H2OMAP modeling platform and allowed existing customers to upgrade to the more powerful next generation program InfoSewer. The modeling work of this sewer master plan is done in InfoSewer Pro Suite 7.6, SP 1, Update #18.

InfoSewer is a 1D GIS-Centric sewer modeling software used for capacity analysis and planning of gravity sewer systems. It helps you pinpoint the cost-effective ways to reduce overall system flows to restore or increase capacity. Effectively model dry-weather and wet-weather flows for complete capacity analysis to determine cost-effective remediation.

InfoSewer conceptualizes a sewer collection network as a collection of links connected at their endpoints, called nodes. The nodes represent manholes, wet-wells, and outlets while the links represent pipes and pumps. The sewer system can be of any topological configuration and can contain multiple loops and outlets. The following sewer network components are modeled in InfoSewer:

- Manholes represent points in the sanitary sewer system where loads enter the system. Manholes are normally located at places where pipes connect and where pipe characteristics such as diameter and slope change.
- Outlets designate discharge points (e.g., treatment plant, ocean outfall) where flows exit the system and are the most downstream points of the collection system.
- Wet wells are structures in the collection system that collect wastewater flows before they are pumped into force mains for transport to another gravity system.
- Pipes/Channels are circular/non-circular conduits through which flow is transported either by gravity (i.e., gravity mains) or by the energy supplied from pumps (i.e., force mains).
- Pumps are devices that raise the hydraulic head of water through the sanitary sewer system.

InfoSewer contains a flexible set of hydraulic modeling capabilities used to route runoff and external inflows through the drainage system network of pipes, channels, storage/treatment units, and diversion structures. Hydraulic network modeling is performed by the Kinematic Wave or Hydrodynamic (i.e., Saint Venant equations) routing methods.

Kinematic wave routing provides a non-linear reservoir formulation for channels and pipes, including translation and attenuation effects that assume the water surface is parallel to the invert slope. This method cannot simulate backwater or reverse flow. Hydrodynamic routing solves the complete St. Venant equations throughout the drainage network and includes modeling of backwater effects, flow reversal, surcharging, looped connections, pressure flow, tidal outfalls, and interconnected ponds. Flow can also be routed through a variety of different storage elements, such as detention ponds, settling ponds, and lakes.

Three types of hydraulic analyses can be conducted by InfoSewer: Steady State, Design and Extended Period Dynamic Simulation (unsteady).

1. For steady-state analysis, all flows are assumed to accumulate in the system and discharge only at the outlets. This means that even if a pipe has a flow beyond its maximum capacity, the flow is still carried downstream including through pumps and force mains. The transition between gravity flow and pressurized flow is also ensured by assuming that all flows are transported through each force main, subject to the upstream hydraulic control. Peaking factors and the peaking Tab are a key difference between Steady State and EPS simulations. Another key difference is that complicated upstream and downstream Force Mains are not allowed in the Steady States solution.
2. In a Design Simulation, each sewer pipe is designed independently without consideration of the flows in other pipes. This can be done because to design a sewer, only peak discharge is required. The method is attractive because it does not require re-computation of the flow in upstream pipes.
3. In an Extended Period, Simulation, InfoSewer tracks the movement of wastewater flowing through the network over an extended period of time under varying wastewater loading and operating conditions. The extended period simulation (EPS) model implemented in InfoSewer is an unsteady model and is predicated on solving a simplified form of the 1D Saint-Venant equations neglecting local acceleration.

The network flow dynamic equations are formulated by using an explicit finite difference scheme such that the flow depth, discharge, or velocity at a given location and the current time can be solved explicitly from the known information at the previous locations at the same time level, as well as known information at the previous time level.

Thus, the solution is obtained segment by segment, pipe by pipe, over a given time interval for the entire sewer network before progressing to the next interval for another

sweep of individual solutions of the network flow equations for the entire network. A variable time step approach (based on the Courant number $c(\Delta t/\Delta x)$) is used to minimize numerical dispersion and ensure robustness and stability of the numerical scheme. Complex flow attenuation calculations can be explicitly carried out to simulate the movement and transformation of sanitary sewer flows more accurately in the collection system.

Sewer modeling for this sewer master plan update was conducted by the extended period simulation (EPS) method. Ogden City's existing sewer model was built in 2012 during the original Sewer Master Plan. The model network was built to match the actual system layout of Ogden City's Sewer System. The model is in state plane coordinates and matches real-world scale. This enables other AutoCAD drawings to be input into the model and can be used simultaneously with the modeling functions of the software.

As stated previously, the junctions are locations where flows are allocated, and rim and invert elevations are established. In Ogden City's Sewer Model, each household was given dry weather or a sewer flow loading of 1 gpm. Then the model assigns the loadings to the nearest manhole. Each manhole has a loading that varies from 0 up to 3,091. Manhole loadings greater than 40 indicate either a nearby large industrial/commercial water user or inflow from neighboring cities/communities.

The average manhole loading for residential areas is 5.46, which means that on average, there are 5.46 households contributing sewer flow to each manhole. Using the "patterns" function of the modeling software, the sewer loading given to each node was simulated as a base flow, design flow, build-out base flow, and extreme weather event flow. A "pattern" within the modeling software allows the user to input a single demand on a node and multiply that demand by a scale factor.

A pattern can be input for a single time, or if the model is an extended period simulation model, the demand could vary based on the hour by the established scale factor. For this Master Plan Update, the model will be simulated with an extended 24-hour period representing the peak average day for base flow, infiltration, and inflow.

The patterns that will be used were derived from the historical indoor water use data and design flow requirements from the Division of Water Quality. Each manhole was given the pattern from the drainage basin that it contributed flow to.

The junctions in the model required both rim and invert elevation data. The Ogden City Sewer Model has thousands of junctions. The data collection process to obtain these elevations was completed in 2012 during the original sewer master plan study.

Links in the modeling software represent pipes and connect from junction to junction. Links have multiple attributes that needed to be defined for the model to simulate actual system conditions. The three main attributes include diameter, Manning's roughness coefficient, and length.

Other data attributes are not necessary for hydraulic calculations but can be used for mapping and system evaluation. These include material type, installation year, and any other defining pipe information. The software can automatically assign the length and slope of the pipes based on the location and elevation of the junctions that the link is connected to.

The pipes and junctions were input into the model based on aerial photography and parcel maps. An extensive review of the Ogden City Sewer Plat Maps gave the diameter, age, street name, and material of each pipe within the system. Sub-division plans were also obtained for the newer areas of growth that were not included in the original Sewer Master Plan study. Manning's roughness coefficients were assigned to each pipe based on the pipe's age.

The Manning's roughness coefficient is for pipe analysis and helps determine friction losses in a system. This coefficient is important for the hydraulic analysis of the entire system because it helps simulate the loss in flow, velocity, and capacity due to friction and other factors. The Manning's friction loss coefficients used for all the pipes used in the Ogden City Sewer Model is 0.013. This is a conservative number that would produce conservative simulation results.

The hydraulic model also contains the sewer system lift stations. The location of these lift stations was input into the model based on survey data taken at the facilities. The elevations for the lift stations were taken from the plan sets and from Ogden City records. The pumps were modeled using the real-life settings on the pumps and valves. The software allows for a manual input of start and stop settings and other information including "what if" scenarios to match real time settings of the pumps and valves.

6.2.2 MODEL CALIBRATION

With any model, it is necessary to calibrate to adequately represent the actual conditions using field measurements and observations. To calibrate the model effectively, historical indoor water use data was compared against the base flows from the model. The flows at the meter locations were compared to the overall indoor water usage in the drainage basins that contribute flow to each respective meter.

6.3 SEWER SYSTEM CAPACITY

The Ogden City Sewer System was analyzed under several flow scenarios to evaluate system performance and capacity. The system was analyzed following Division of Water Quality standards for sewer systems. The hydraulic analysis included an analysis for base flows, design flows, build-out base flows, and extreme weather flows. The results of the analysis performed are detailed in the following sections. Each scenario that was modeled was analyzed to ensure that the Ogden City Sewer System met the following requirements:

- Minimum Velocity of 2.5 fps when flowing 3/4 full for all pipe diameters if they meet minimum slope requirement in Ogden City standards

- Maximum daily flow depth/pipe diameter ratio (d/D) = 0.75 (all pipe diameters)

6.3.1 BASE FLOW SCENARIO

The base flow scenario was modeled to serve two main purposes:

1. Sewer model calibration: As described in Section 6.2.2, after the sewer model was loaded with values representing the existing base flow, a simulation is run and the modeling results at the meter locations are compared to the metered flow during the dry month. If the modeling results are close to the metered flows, the model is considered calibrated.
2. Calculation of infiltration and inflow: The base flows are used as a baseline for the sewer system. The base flow represents the flows in the sewer system under the ideal condition where there is no inflow or infiltration. Therefore, the metered flows, and all the simulation results that include inflow and infiltration are compared to the base flow. This allows us to calculate an estimated inflow and infiltration for the system.

Pipe capacities under base flow scenario were not a concern; therefore, no figure was generated for this scenario. Ogden's sewer system does not and should not have any deficiencies under base flow condition.

6.3.2 DESIGN-1 (100 GPCD) SCENARIO

For the Design-1 scenario, each sewer connection in the model was loaded with a State design flow of 100 gallons per capita per day. Figure 6.4 shows the result of this simulation.

In the figure, only sewer pipes are shown. Manholes are not shown. Blue indicates that the d/D ratio of the pipe is less than 0.5. Orange indicates that the d/D ratio of the pipe is between 0.5 and 0.75. Red indicates that the d/D ratio of the pipe is between 0.75 and 1. Bright pink indicates that the d/D ratio is 1 and the pipe is running full under current scenario. The color code applies to all pipe capacity maps. For all scenarios, if a pipe is showing as red or bright pink, we automatically assigned a capital improvement project to fix the pipe.

According to the figure, the pipes that experience capacity problems are the sewer mains downstream from Fresenius, the largest water user in Ogden City. Under the Design-1 (100 gpcd) scenario, two gravity mains that receive flows from Fresenius are near capacity.

6.3.3 DESIGN-2 (250 GPCD) AND DESIGN-3 (400 GPCD) SCENARIO

Utah Division of Water Quality recommends a 250 gpcd design flow for interceptors and outfall sewers (assumed to be pipe with diameters $> 10\text{-in.es}$ for this report); and a 400 gpcd design flow for laterals and collectors (dia. $\leq 10\text{-in.es}$). These two design flow rates were loaded into the model and simulated separately. However, a combined pipe capacity map (see Figure 6.5) was

produced to show deficiencies within the system. Figure 6.5 shows the sewer pipes that present capacity problems under the State recommended criteria for their size.

6.3.4 BUILD-OUT SCENARIO

As discussed under Section 4.4, the build-out scenario is the projected flow at year 2060. Under this scenario, the State design flow rate of 250 gpcd has been applied to the projected connections that are associated with population growth. The 250 gpcd criteria was chosen because any future flows from build-out will eventually end up in sewer interceptors. Sewer laterals and collectors are not analyzed under the build-out scenario because it is unknown where future new developments will be located.

If the 400 gpcd design flow rate is applied to the entire system, it will identify many laterals and collectors as having capacity problems, whereas in reality, these laterals or collectors may never receive additional flows from future development. To avoid flagging excessive pipes, only interceptors are being analyzed under the build-out scenario. Figure 6.6 shows interceptors that are likely to experience capacity problems at build-out.

6.3.5 EXTREME WEATHER SCENARIO

At the time of this Sewer Master Plan Update, Utah experienced record-breaking winter storms. As a result, Ogden City's sewer system received large amounts of inflows. The largest spike in inflow happened after a series of winter storm events around the end of December 2022 and the beginning of January 2023. The peak flow collected from each flow meter was entered into the model to simulate an extreme weather scenario.

Under this scenario, it is assumed that all drainage basins in the system reach the maximum peak flow at the same time. For basins S and N, where flows were not metered, the average peaking factor of the metered basins were applied.

Many pipes were identified as having capacity deficiencies, but only sewer collectors 10 in or smaller are highlighted in the capacity map. This is because smaller sewer collectors are at greater risk of creating sewage backups in residential homes. There have not been any reports of sewage overflow during the January storm event.

Therefore, assumptions can be made that although larger interceptors are running full according to the modeling result, the flow from these interceptors can back up into collectors and laterals, without causing any overflow issues. Figure 6.7 shows sewer collectors 10 in and smaller that are likely to experience capacity problems during an extreme weather event like the January 2023 winter storms.

6.3.6 M-04 INFILTRATION SCENARIO

Basin E, where Meter M-04 is located, has been identified as an area that experiences large amounts of infiltration during irrigation season. Refer to Section 4.3.4 for details. Figure 4.5 shows that the amount of infiltration is much larger than the January extreme weather event.

Therefore, it is necessary to model this basin separately just for the peak flow in summer. The model was calibrated to produce the same peak flow recorded at the end of June 2022 for Basin E. Figure 6.8 shows pipe capacities within Basin E during maximum infiltration condition.

6.3.7 MAKE OGDEN SCENARIO

On April 11, 2023, the Ogden City Council adopted new zoning standards and a new zoning map for downtown Ogden. The changes implement the Make Ogden downtown plan and seek to increase employment, housing, and walkability in downtown. Due to the higher density housing in future downtown Ogden, it is necessary to model Ogden's sewer system with proposed future sewer loadings and review if the system has sufficient capacity for new developments.

The new downtown zoning map divides downtown Ogden into six different zones: multiple family horizontal (R-MFH), multiple family vertical (R-MFV), commercial nine rails district (C-9), entertainment commercial (C-ENT), historic 25th Street commercial (H25) and commercial mixed unit (C-MU). In a meeting with Ogden City on November 7, 2023, the City identified 27 undeveloped lots where sewer flow would increase once new buildings are built on these lots. Figure 6.9 shows the various zones under the Make Ogden plan and the proposed lots for development.

The City requested Sunrise to use the same ERCs as the Wonder Block development on 26th Street and Lincoln Ave for all commercial zones. Wonder Block consists of 5 mixed-use buildings with commercial space on lower levels and residential units on higher levels. A Bluebeam number (888-897-171) was provided for the Wonder Block plan set. Sunrise referred to the 10/03/2023 Plan Set by Talisman Civil Consultants and SAR+. The architectural plans A01 through A07 revealed how many apartment units will be built on each floor of each building. For areas where commercial space or offices are proposed, Sunrise assigned smaller ERC values compared to the higher floor levels where the entire floor is occupied by residential apartment units.

A total of 440 ERCs was calculated for the five Wonder Block buildings. The lot size for Wonder Block is 6.25 acres. Therefore, the ERC value for lots similar to Wonder Block is 70.4 ERCs per acre. This number was applied to all undeveloped lots located in the proposed commercial areas of the Make Ogden zoning map.

The City also provided an average ERC of 30 per acre for the multiple family vertical zone (R-MFV). This number was used to adjust sewer loadings for Lot 1 and Lot 13.

Table 6.5 summarizes the calculated ERCs for each undeveloped lot.

Table 6.5 – ERC Values for Each Undeveloped Lot

| Lot ID | Lot Area (AC) | Zone | Basin | Equivalent ERCs |
|----------------|---------------|-------|-------|-----------------|
| Lot 1 | 1.88 | MFV | K | 56 |
| Lot 2 | 1.03 | CMU | K | 73 |
| Lot 3 | 9.45 | CMU | P | 666 |
| Lot 4 | 10.11 | C-ENT | I | 712 |
| Lot 5 | 4.7 | CMU | I | 331 |
| Lot 6 | 5.91 | CMU | I | 416 |
| Lot 7 | 0.93 | CMU | I | 65 |
| Lot 8 | 1.08 | CMU | I | 76 |
| Lot 9 | 0.78 | CMU | J | 55 |
| Lot 10 | 0.41 | CMU | K | 29 |
| Lot 11 | 14.99 | CMU | P | 1056 |
| Lot 12 | 12.08 | CMU | I | 851 |
| Lot 13 | 0.35 | MFV | K | 11 |
| Lot 14 | 1.11 | CMU | K | 78 |
| Lot 15 | 0.56 | CMU | J | 39 |
| Lot 16 | 0.27 | CMU | J | 19 |
| Lot 17 | 0.79 | C-ENT | J | 56 |
| Lot 18 | 1.68 | CMU | I | 118 |
| Lot 19 | 1.55 | CMU | I | 109 |
| Lot 20 | 0.83 | CMU | I | 58 |
| Lot 21 | 8.7 | CMU | P | 613 |
| Lot 22 | 4.11 | CMU | K | 289 |
| Lot 23 | 1.3 | CMU | J | 92 |
| Lot 24 | 1.14 | CMU | J | 80 |
| Lot 25 | 2.28 | CMU | K | 161 |
| Electric Alley | 2.06 | H25 | J | 145 |
| Wonder Block | 6.25 | CMU | J | 440 |

The ERC values from the above table was assigned to the nearest downstream manholes of each lot into the sewer model. However, when there are multiple connection options for a single lot, engineering judgement was used to determine which manhole would receive the additional sewer loadings. Therefore, it is advised that the sewer model is updated according to the final plans of the new development, to ensure that the correct sewer pipes receive the additional flow.

Sunrise ran the model after assigning the new sewer loadings in downtown Ogden under the Design-2 and Design-3 scenario. The following 5 capacity projects were identified:

Table 6.6 – Make Ogden Capacity Related Projects

| Project | Name | Description | Total Cost | Page |
|---------|--|---|-------------|------|
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$545,837 | A29 |
| I.7 | 20th & Childs Capacity | Upsize 8" line on Childs Ave (760 LF), and upsize 10" line on 20th St from Childs to Wall Ave. (1,151 LF) | \$2,144,675 | A29 |
| I.8 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$594,687 | A29 |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12" & 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,291,784 | A52 |
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust slopes of 8" line from MH740 to MH10261 (290 LF). | \$2,162,880 | A52 |
| total | | | \$7,739,864 | |

Figure 6.10 shows pipe capacities in downtown Ogden after the implementation of the Make Ogden Plan.

6.3.8 CAPACITY RELATED PROJECTS SUMMARY

Table 6.7 is a summary table for the recommended projects in this Master Plan that will fix the capacity related issues due to failure of meeting State design criteria.

Table 6.7 – Capacity Project Summary

| Project | Name | Description | Total Cost | Page |
|---------|------------------------------|---|-------------|------|
| A.1 | Washington & Larson Capacity | Adjust slopes for 15" line on Washington Blvd and Larsen Ln. (419 LF) | \$490,633 | A4 |
| A.2 | E 1050 North Maintenance | Replace 10" line on 1050 N from Gramercy to Monroe, and portions of Monroe and Gramercy. (3,437 LF) | \$3,720,489 | A4 |
| A.3 | Canfield Capacity | Upsize 8" line on Canfield Dr, from 450 E to Eyrie Dr. (1,854 LF) | \$2,031,574 | A4 |
| B.1 | Washington & North Capacity | Upsize 8" line on Washington Blvd from North St to 475 North. (392 LF) | \$445,098 | A8 |

| | | | | |
|-------|--|--|-------------|-----|
| B.2 | North St Capacity | Upsize 10" line on North St between Washington Blvd and Wall Ave. (1,995 LF) | \$2,206,567 | A8 |
| C.1 | 2nd & Washington Capacity | Sewer line upsizing and replacement, see project write up. (1,197 LF) | \$1,351,374 | A12 |
| C.2 | Fowler Capacity | Adjust pipe slopes for 10" lines around Fowler Ave. (1,742 LF) | \$1,911,273 | A12 |
| C.3 | 3rd & Jefferson Capacity | Install new 8" sewer line on 3rd Street between Jefferson and Porter. (332 LF) CIPP 8" line on 3rd St from Jefferson to first manhole to the east. (351 LF) | \$431,800 | A12 |
| D.1 | 7th St Maintenance/Capacity | CIPP 10" and 12" line on 7th St between Monroe Blvd and Washington Blvd. (4,183 LF) | \$840,643 | A15 |
| H.3 | 15th St Capacity/Infiltration | Upsize 8" line on 15th St between Ogden Ave and approximately 826 East. | \$3,090,079 | A26 |
| I.1 | 22nd St Capacity | Upsize 8" line on 22nd St between Quincy Ave and Jackson Ave. (759 LF) | \$846,025 | A29 |
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$545,837 | A29 |
| I.7 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$594,687 | A29 |
| I.8 | Quincy & 24th Capacity | Adjust slopes for 10" and 12" line on Quincy Ave and 24th St. (1,042 LF) | \$1,156,993 | A29 |
| J.1 | Quincy & 24th Capacity | Adjust slopes for 10" and 12" line on Quincy Ave and 24th St. (1,042 LF) | \$1,156,993 | A34 |
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) | \$755,076 | A34 |
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) | \$1,620,089 | A38 |
| K.2 | 28th & Wall Capacity | Upsize 8" line on 28th St from Wall Ave to Union Ave. (386 LF) | \$438,551 | A38 |
| M.1 | 36th & Quincy Capacity | Upsize 10" line on 36th St from east of Maple St to Quincy. (101 LF) | \$120,966 | A44 |
| M.2 | McKay Dee Hospital Capacity | Upsize 8" line by McKay-Dee Hospital. (368 LF) | \$418,860 | A44 |
| P.1 | 12th St Trunk Line Capacity | Upsize Fresenius sewer mains, see project write up. (5,180 LF) | \$6,806,685 | A52 |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12" & 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,291,784 | A52 |

| | | | | |
|-------------------|------------------------------|---|--------------|-----|
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust slopes of 8" line from MH740 to MH10261 (290 LF). | \$2,162,880 | A52 |
| S.1 | Pennsylvania Ave Maintenance | CIPP 15" line from I-15 running Northeast to F Ave. (2,701 LF) | \$632,519 | A56 |
| Capacity Projects | | Total | \$37,055,157 | |

6.4 SEWER SYSTEM MAINTENANCE-RELATED ISSUES

The Ogden City Public Works Department was contacted to gather knowledge of the areas in their sewer system that are of concern and are costly to maintain. Ogden City currently has a list of 40 maintenance-related projects within their sewer system. This maintenance list includes the following general categories.

- Capacity related projects as observed by the Public Works team
- Pipe replacement projects due to age and/or deterioration
- Pipe replacement projects due to calcium build-up
- CIPP projects due to infiltration
- Pipe re-route projects to avoid private property
- Combining pipes to reduce maintenance on dual pipes
- Rerouting of sewer laterals to nearby pipe
- Flushing and grease maintenance projects
- Pipe depth concerns

Each of the categories above had multiple address locations that require the maintenance types above. The location at each of the identified maintenance projects was input into the sewer model. Figure 6.11 shows the location of each maintenance-related project. Each of these projects is described in detail in Appendix A, which also includes an opinion of probable cost. The total estimated cost of these projects is shown in Table 6.8.

Since the list provided by the Public Works Department was ranked by priority, those rankings were used to place the projects in the appropriate ranked order amongst the Capital Improvement Projects. This is discussed further in Section 7.0.

Table 6.8 – Maintenance Project Summary

| Project | Name | Description | Total Cost | Page |
|---------|------------------------|--|-------------|------|
| A.4 | 1050 N Maintenance | Adjust slopes for 8" and 12" line on 1050 N, 750 N and Jefferson Ave. (1,643 LF) | \$1,787,642 | A4 |
| A.5 | 1025 East Maintenance | Replace 8" line on 1000 N between 1025 East and Mountain Road. (228 LF) | \$257,660 | A4 |
| A.6 | 1225 North Maintenance | Replace 8" line leading west from Quincy on 1225 North. (120 LF) | \$138,362 | A4 |

| | | | | |
|-----|--|---|-------------|-----|
| B.3 | 500 N/North St Maintenance | Replace 8" line extending from North St east of Quincy up to 500 N. (596 LF) | \$652,764 | A8 |
| C.4 | 2nd St & Harrison Maintenance | Replace 8" line on Harrison between 2nd and 3rd Street. (535 LF) | \$587,740 | A12 |
| C.5 | 4th & Jefferson Manhole | Replace manhole located at at 4th Street and Jefferson. | \$18,165 | A12 |
| C.6 | North Jackson Ave Maintenance | Replace 8" line on Jackson Ave from Southwell St to 253 North. (367 LF) | \$408,295 | A12 |
| C.7 | Orchard Ave Maintenance | Replace 8" line on Orchard Ave from 1st St to Cook St. (281 LF) | \$315,518 | A12 |
| D.2 | Monroe Maintenance | Replace 8" and 10" line in Monroe Blvd from Harrop St to 6" St. (1,519 LF) | \$1,635,565 | A15 |
| D.3 | Washington 5th to 7th Maintenance | Replace 8" line on west side of Washington between 5th and 7th St and adjust slopes. (1,090 LF) | \$1,176,760 | A15 |
| E.1 | 970 Adams Manhole Replacement | Replace manhole at approximately 970 Adams Avenue. | \$18,165 | A18 |
| E.2 | 9th St & Grant Maintenance | Replace 8" line on Grant from 9th St to Cross St. (355 LF) | \$395,411 | A18 |
| E.3 | 12th Street & Washington Capacity | Upsize 8" on the west side of Washington Blvd between 12th St and 1135 south. (303 LF) | \$347,170 | A18 |
| G.1 | 825 Simoron/Taylor Manholes | Replace MH 11185 and MH 11186 at 825 Simoron and 815 Taylor Ave. | \$18,165 | A23 |
| H.1 | Washington Blvd 14th to 16th Maintenance | Replace 10" line on the east side of Wahington Blvd from 14th Street to 16th Street. (935 LF) | \$1,037,350 | A26 |
| H.2 | El Monte Maintenance | Replace 8" line north of the El Monte golf course; CIPP 8" and 12" lines upstream and downstream of the 8" line. (2,146 LF) | \$467,658 | A26 |
| I.2 | 20th St Consolidation | Consolidate the two sewer mains on 20th St between Grant and Washington. (778 LF) | \$866,779 | A29 |
| I.3 | 20th & Jackson Manhole | Replace MH 1248 at 20th & Jackson. | \$18,165 | A29 |
| I.4 | 2202 Harrison Manhole | Replace MH 2598 at approximately 2202 Harrison Blvd. | \$18,165 | A29 |
| I.5 | Custer Ave Maintenance | Replace 8" line at 2001 Custer Ave. (31 LF) | \$35,852 | A29 |
| J.2 | 25th & Adams Maintenance | Replace 8" line on Adams from 25th to 2550. (399 LF) | \$442,498 | A34 |

| | | | | |
|----------------------|---|--|-------------|--------------|
| J.4 | 25th & Washington Manhole | Replace MH 681 on the east side of 25th & Washington. | \$18,165 | A34 |
| J.5 | 24th & Van Buren Manhole | Replace MH 11979 at Van Buren & 24th St. | \$18,165 | A34 |
| K.3 | 27th & Jefferson Maintenance | Replace 8" line on Jefferson Ave from 27th St to 2750 S. (377 LF) | \$419,007 | A38 |
| K.4 | 26th & Ogden Maintenance | Replace MH 12164 and MH 12163; and pipeline spot repair at approximately 2525 Ogden Ave. | \$36,330 | A38 |
| L.1 | 29th & Porter Maintenance | Replace 8" line on Porter from 29th to 30th. (759 LF) | \$826,508 | A41 |
| L.2 | 32nd & Kiesel Manhole | Replace MH 10119 at 32nd & Kiesel. | \$18,165 | A41 |
| L.3 | Stephens Maintenance Phase 2 | Replace 8" line from 32nd St to 31st St. (759 LF) | \$826,508 | A41 |
| M.3 | Grandview Acres Phase 2 & 930 E 40th St Maintenance | Replace 8" lines near Grandview Park, see project write up. (2,591 LF) | \$2,755,820 | A44 |
| M.4 | Van Buren M Maintenance | Replace 8" line on Brinker, 37th and 1100 East. (1,022 LF) | \$1,104,804 | A44 |
| N.1 | 5151 S Harrison Blvd Maintenance | Replace 12" line on Harrison Blvd, south of Shadow Valleye Dr. (610 LF) | \$690,688 | A47 |
| P.2 | Union Ave Maintenance | Adjust slopes of 8" line on Union Ave from Pacific to 20th St. (559 LF) | \$613,372 | A52 |
| S.2 | W 24th St Maintenance | Replace 8" line on 24th St from F to G Ave. (330 LF) | \$368,468 | A56 |
| Maintenance Projects | | | Total | \$18,839,847 |

6.4.1 GREASE MAINTENANCE

Ogden City's Sewer System has problems with fatty oils and greases commonly known as FOGs. Several maintenance projects in this Master Plan will address pipes that have grease issues. However, they seem to be present throughout the city's sewer system with the more serious problems concentrated in commercial areas, and near restaurants.

When FOGs enter the system, they can harden with iron oxide (rust), chemically bond to pipes, harden after reacting with calcium, and become very corrosive. When these take place, the capacity of the system can be significantly reduced, and be compromised by corrosion.

To combat the problems that FOGs create in a sewage system, precautions (usually ordinances or regulations) are adopted to minimize the amount that enters the sewer system. This includes installing grease, oil, and sand interceptors. These interceptors separate grease, oil, and sand from the sewage water, and need to be cleaned out periodically.

Ogden City currently has an ordinance in place that regulates the use and disposal of FOGs. The 1979 code 14.41.010; ordinance 91-45, 12-5-1991; amd. 1999 states that "the Wastewater Control Rules and Regulations for the Central Weber Sewer Improvement District (CWSID) is adopted and enacted as part of the ordinances of the City."

The Wastewater Control Rules and Regulations for the CWSID, section 2.4.6 and 2.4.7 states that "anytime the General Manager determines that a grease, oil and sand interceptor or trap needs to be installed for the proper handling of wastewater, the owner must install one at the owner's expense (dwelling units and living quarters are exempt).

These interceptors or trap types and capacities need to be approved by the General Manager or his designated representatives of the Customer Agency. These also need to be located so that they can be readily cleaned and inspected. Plans for grease interceptors shall be submitted to the District and the Customer Agency having jurisdiction for review and approval prior to installation, and the owner must request and inspection after installation."

Also, in 1979 Code 14.41.030; Ord. 91-45, 12-5-1992, it states that "a violation of the Wastewater Control Rules and Regulations is a Class B misdemeanor, each day is a separate offense, should be declared a public nuisance, and may result in the discontinuance of sewage collection and treatment service by capping the sewer collection or by shutting off the water supply to the premises.

The services will not be reconnected or turned on until the violation has ceased, damages have been paid, all expenses incurred by the City have been paid, and the City has reasonable assurance that the violation will not be repeated."

The above is a summary of the FOG ordinance that Ogden City has in place. As stated, it is an adoption of the Wastewater Control Rules and Regulations for the CWSID. If the City feels that these rules and regulations need to be more stringent, Sunrise advises the City to consider adoption of a stricter ordinance with stricter penalties that will help the City maintain a better sewage system.

6.5 CAPACITY, MANAGEMENT, OPERATIONS, AND MAINTENANCE (CMOM)

The Ogden City Sewer System is a vital element of the City's infrastructure. The sewer system has been built over the last 100+ years and is comprised of a variety of materials, design standards, installation techniques, and maintenance techniques. As the age of the system increases, the importance of preventative maintenance will increase.

The Environmental Protection Agency (EPA) has provided a guide for evaluating CMOM. A CMOM for a municipality includes the following key elements.

- Operation and Maintenance (O&M) considerations during design and construction
- Knowing what comprises the system (inventory and physical attributes)
- Knowing where the system is (maps and locations)
- Knowing the condition of the system (assessment)

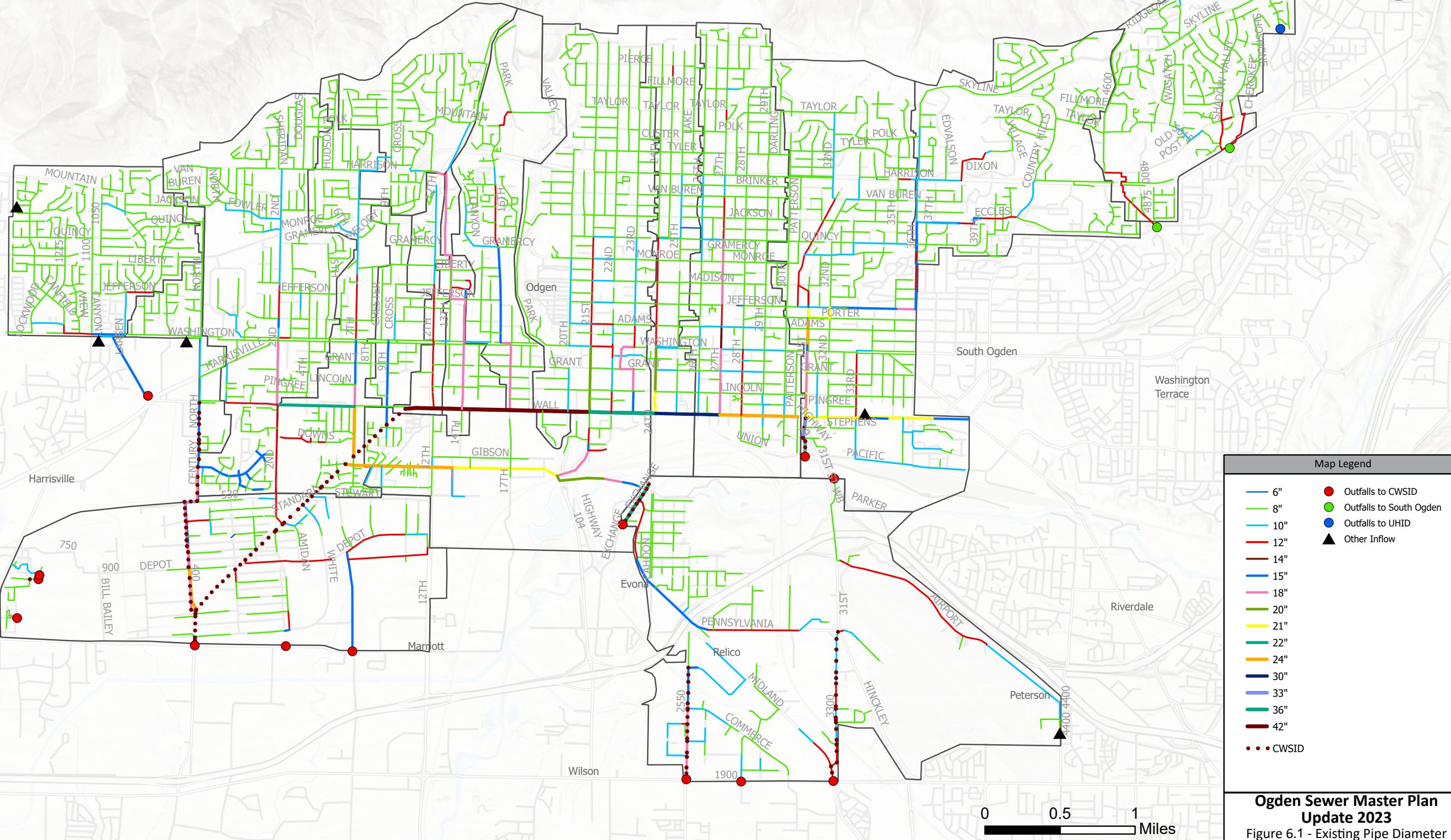
- Planning and scheduling work based on condition and performance.
- Effective maintenance activities
- Repairing, replacing, and rehabilitating system components based on condition and performance.
- Managing timely, relevant information to establish and prioritize appropriate CMOM activities
- Training of personnel

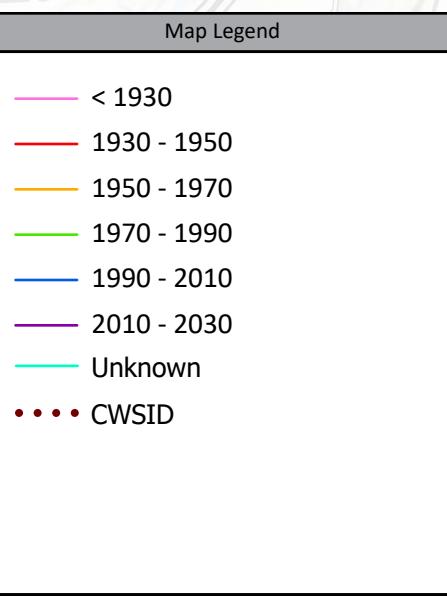
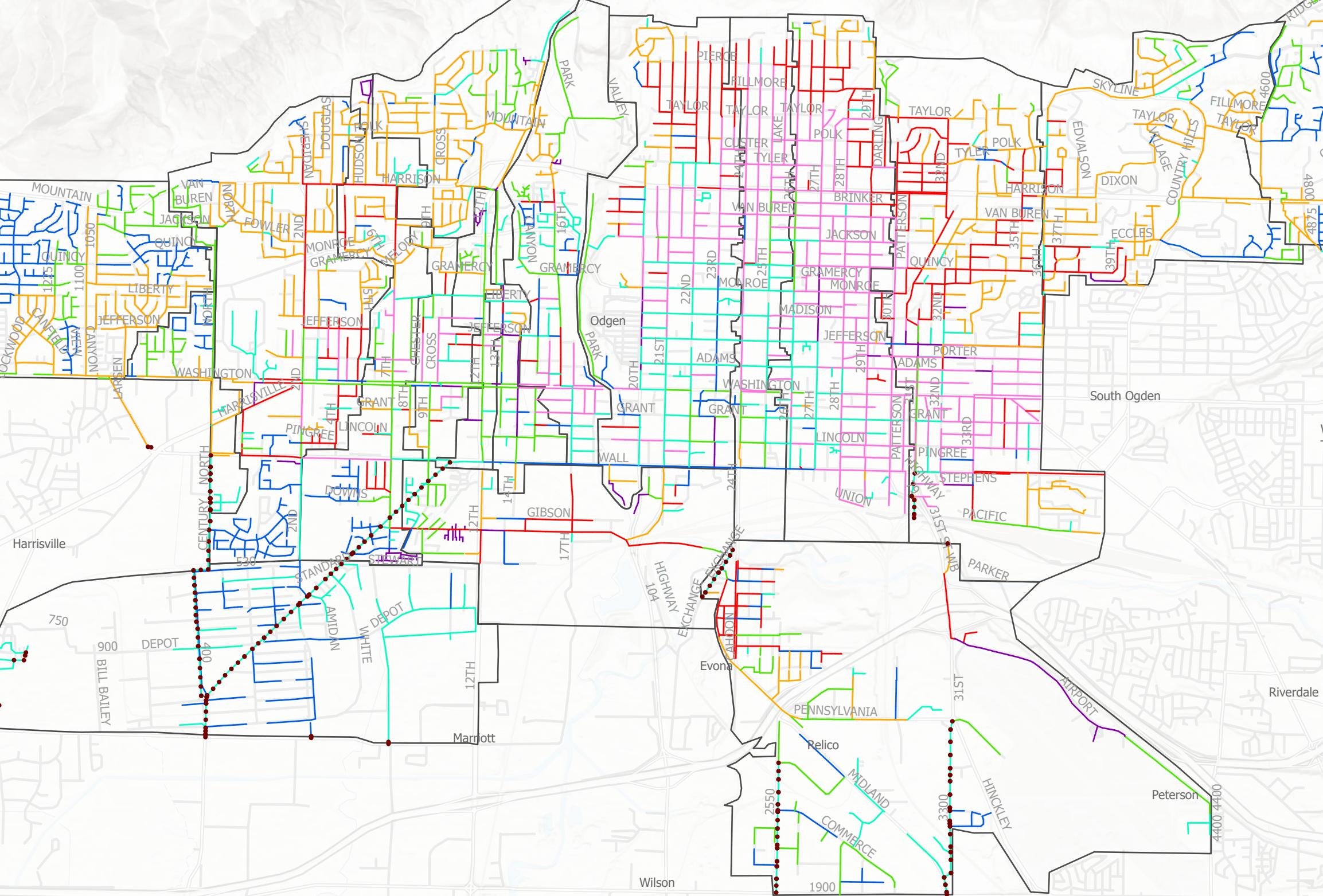
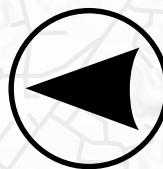
The capacity portion of the CMOM allows for the municipality to plan for and provide adequate capacity in the sewer system to transport the sewer flows safely to treatment. The capacity of a sewer system should include the existing flow, build-out flow, infiltration, and inflow. The use of a hydraulic sewer model is ideal in determining whether the sewer system has capacity for these flows. As part of this Master Plan, a sewer hydraulic model has been created.

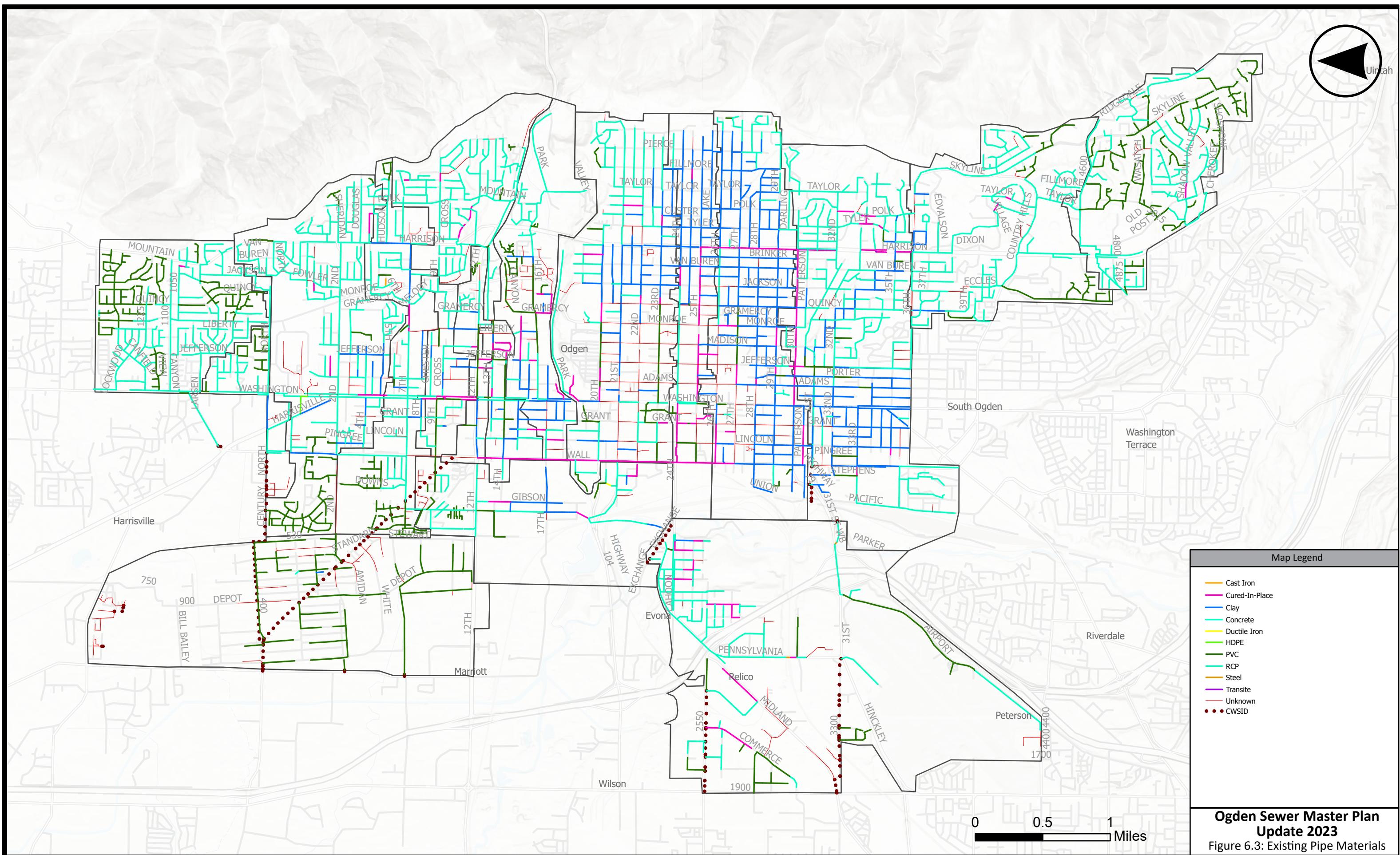
The management portion of the CMOM enables a municipality to put the appropriate programs in place for the operation and maintenance of the system. The management should have a well-organized structure, a good budget, training for staff, internal communication, customer service, management information systems, and an overflow notification program.

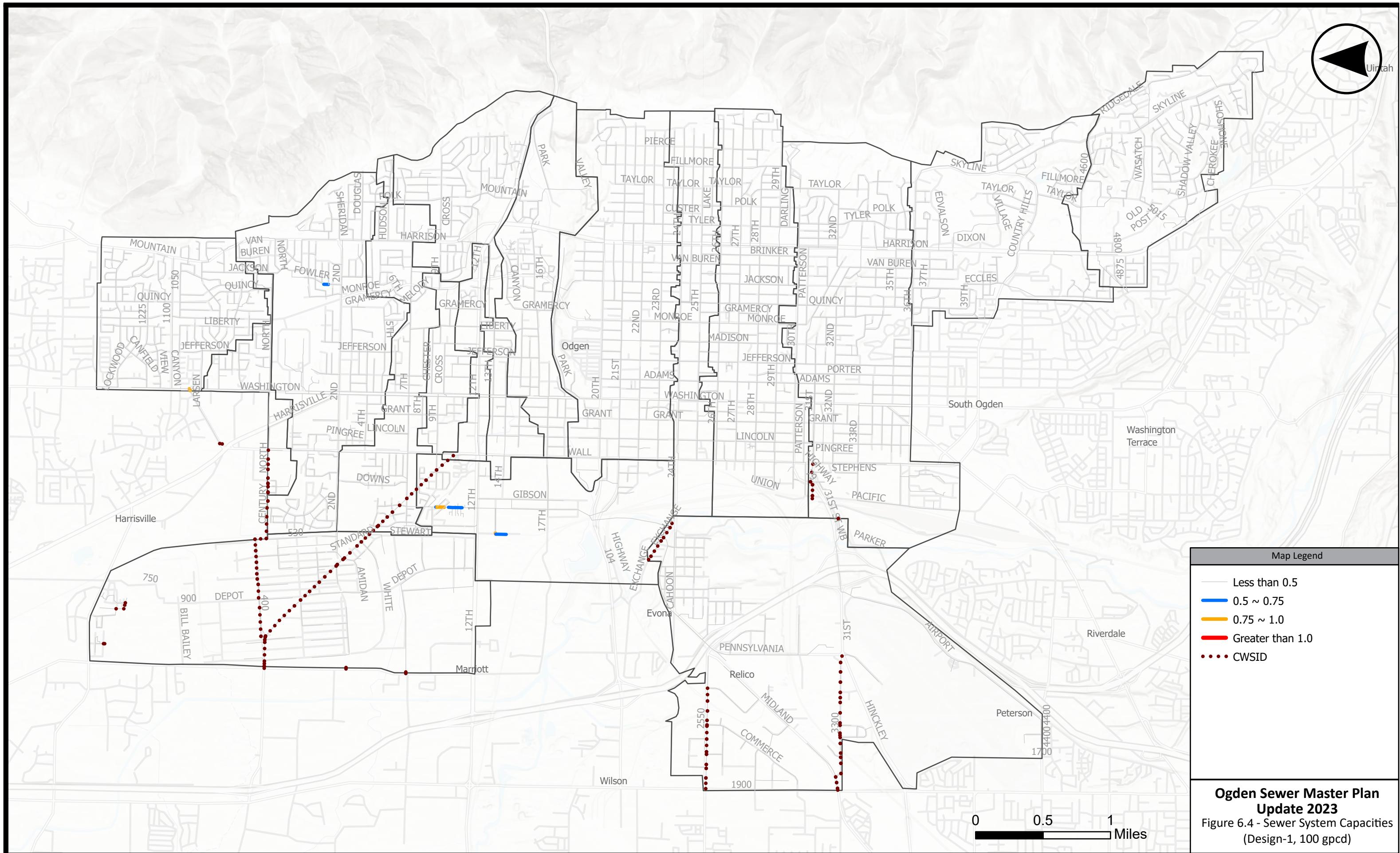
The Operation and Maintenance portion of CMOM allows the municipality to identify the areas of the system that need repairs or replacement. The O&M should include the following: flow monitoring (permanent and temporary meters), sewer system inspection and testing (Smoke, dye manhole, visual pipe, CCTV, building), sewer system rehabilitation, sampling and monitoring, hydrogen sulfide(H2S) control, safety programs, emergency preparedness and response procedures, mapping, maintenance budgeting, sewer cleaning, and parts and equipment inventory.

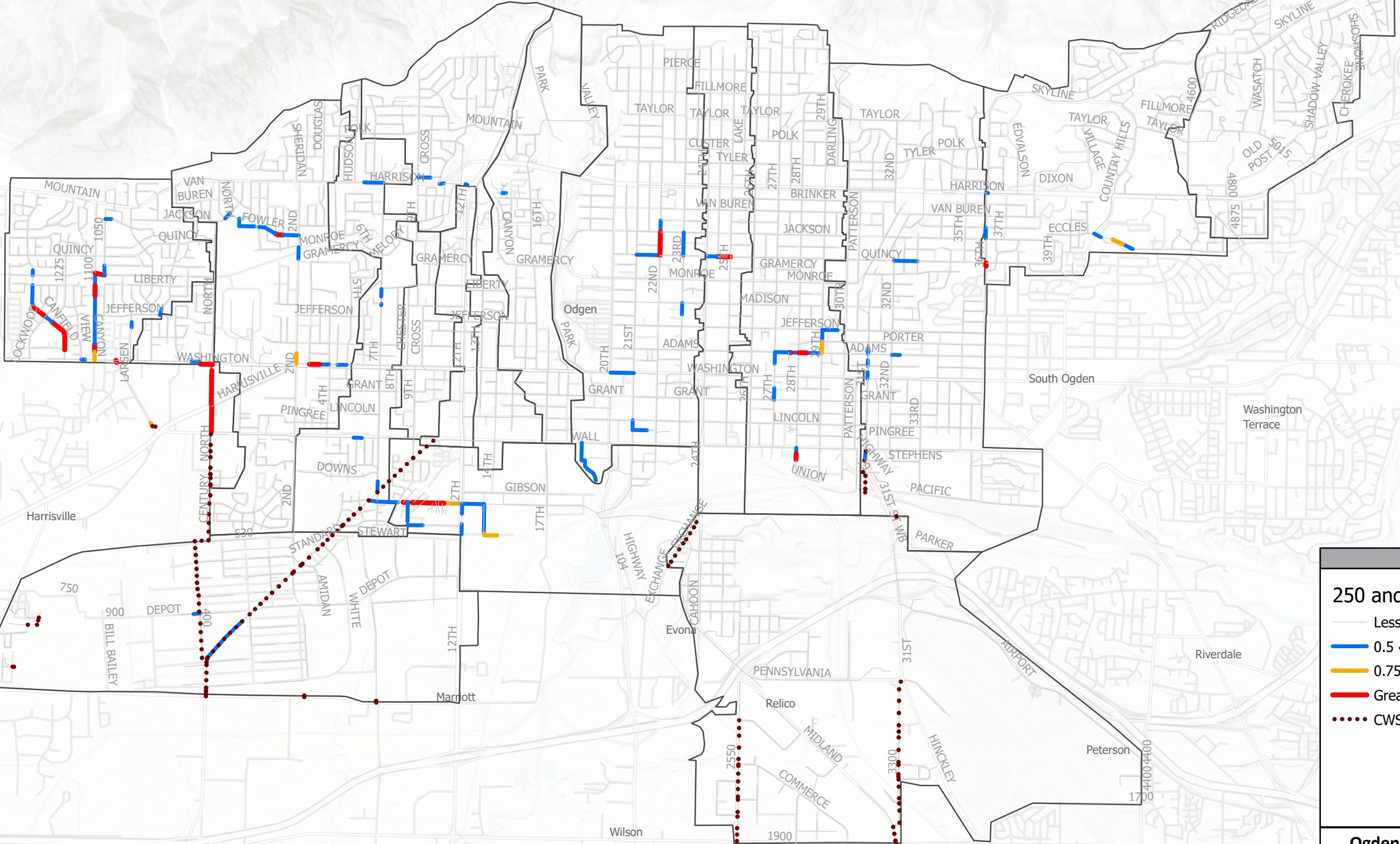
It is recommended that Ogden City perform a CMOM self-evaluation audit on its system to identify any gaps and areas for improvement in system operations. The audit is a screening tool and identifies areas of strengths and weaknesses and addresses practices that the EPA believes should be considered by most utilities.

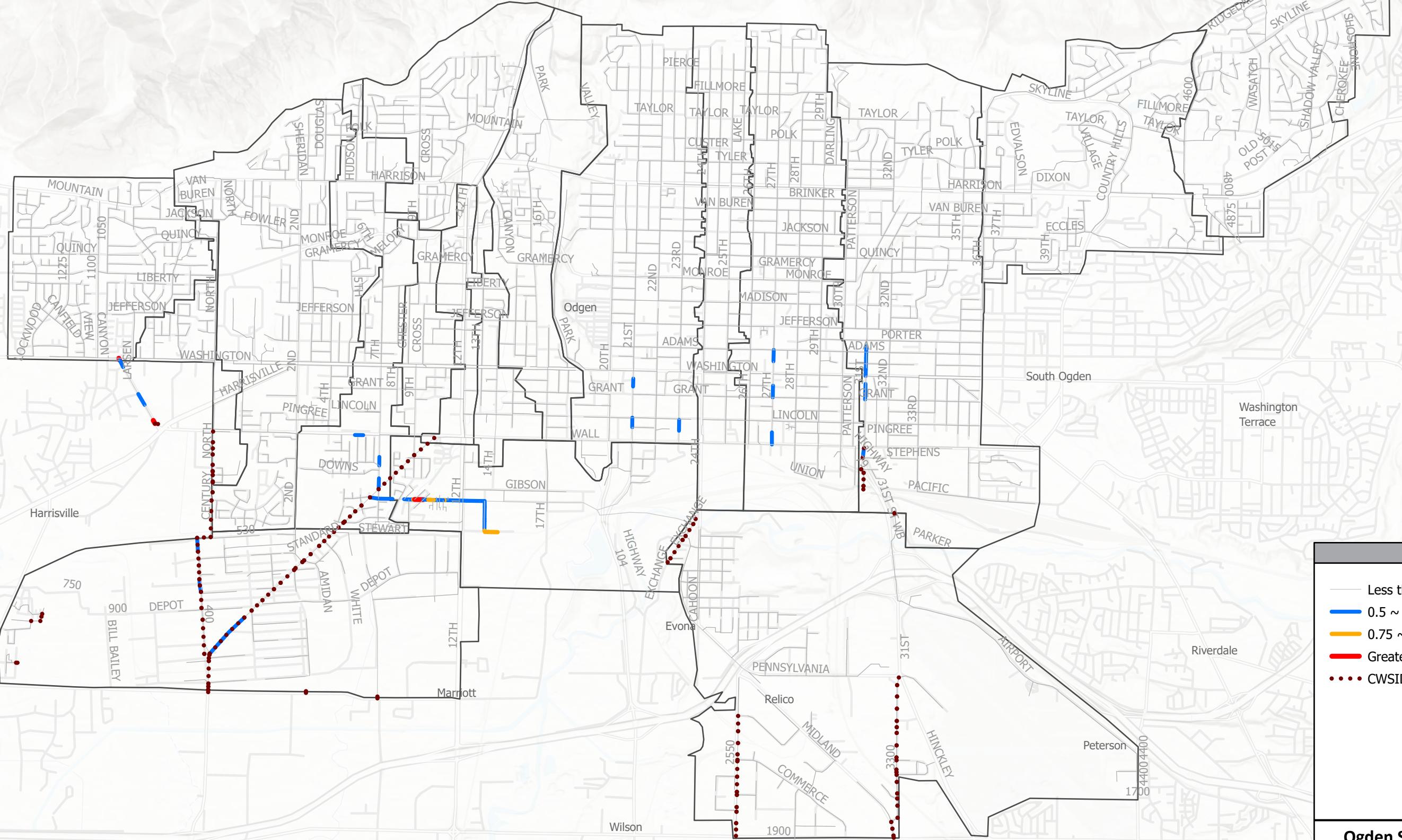


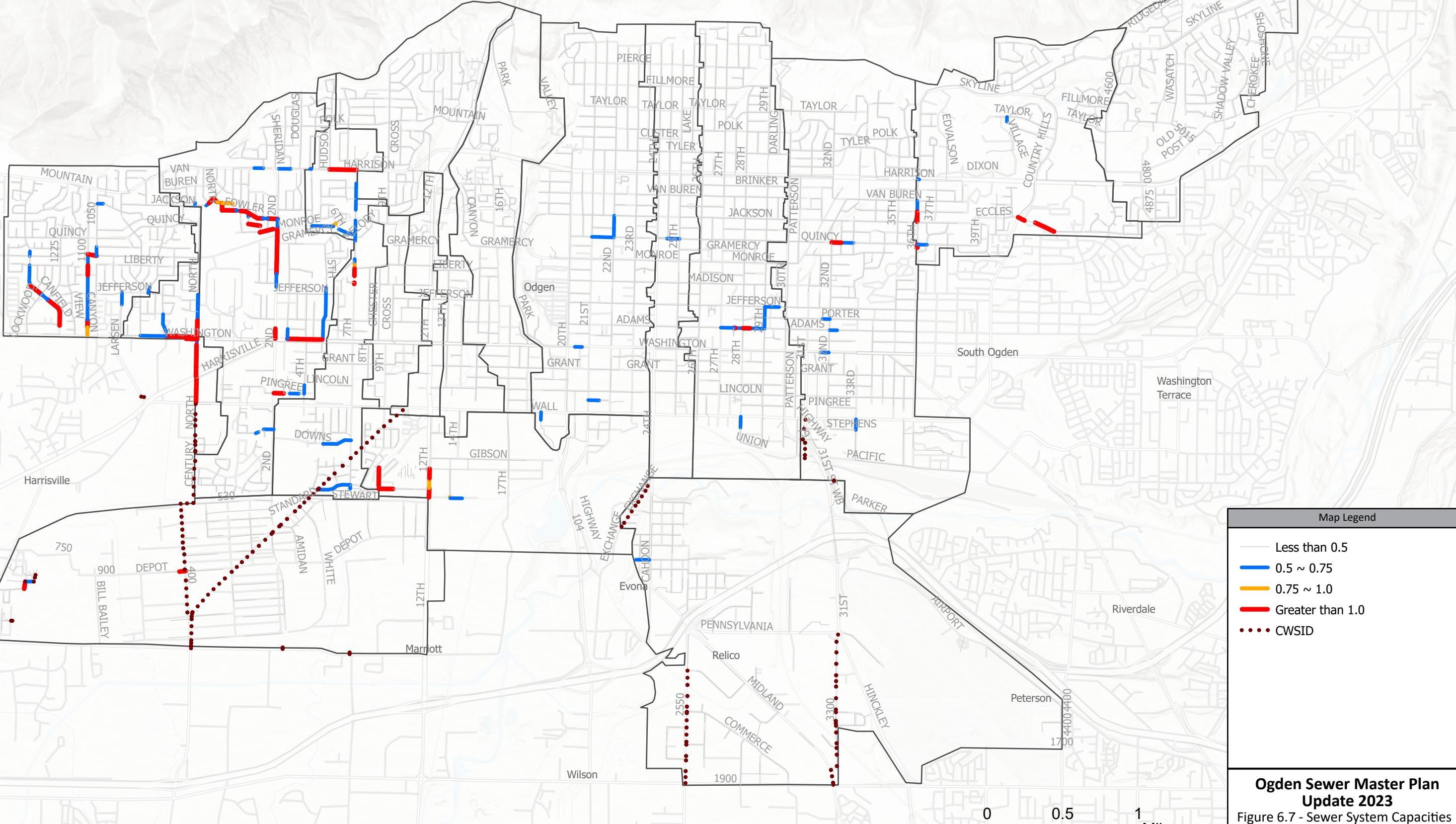






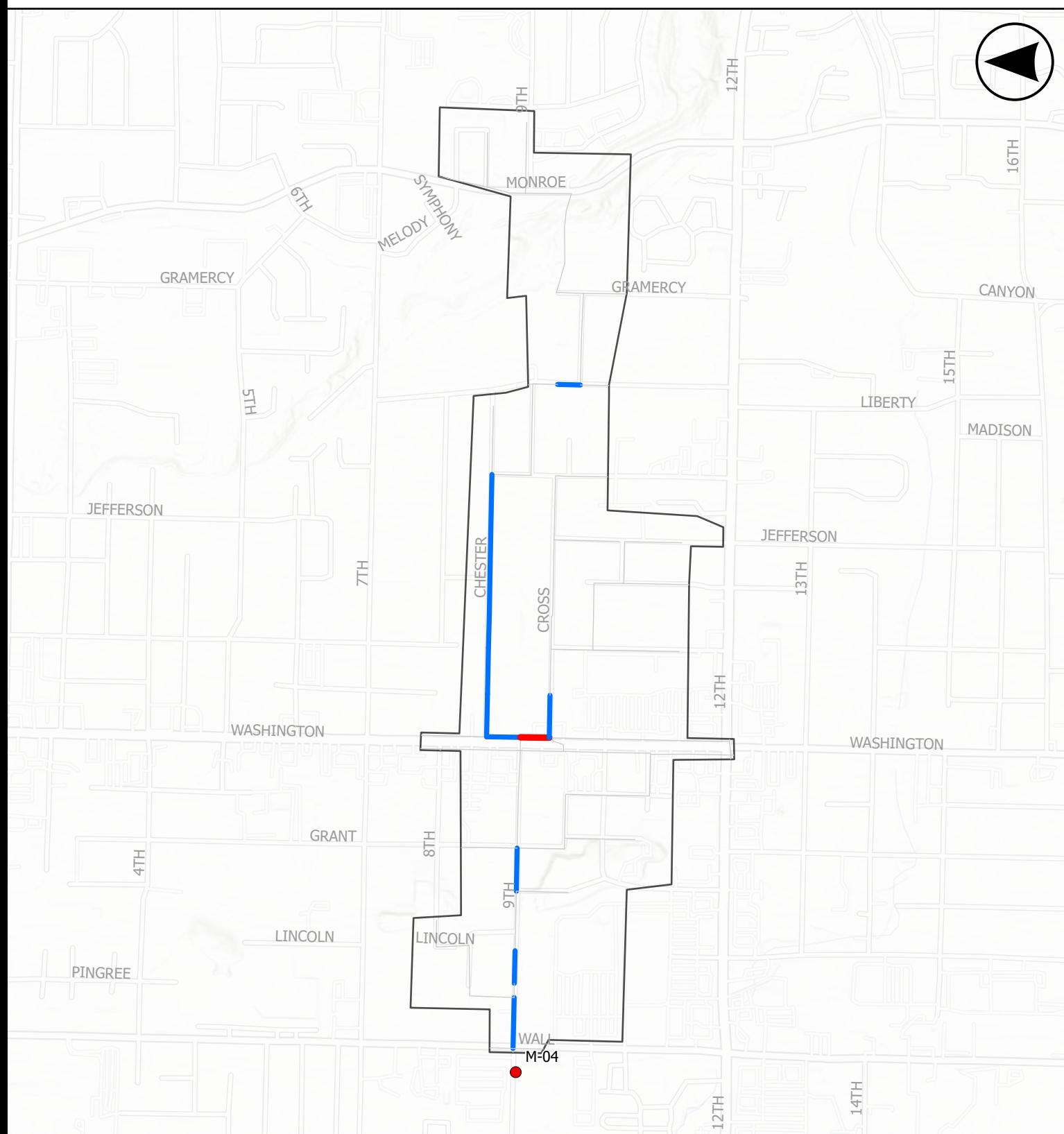






Ogden Sewer Master Plan Update 2023

Figure 6.8 - M-04 Capacities (Max Infiltration)

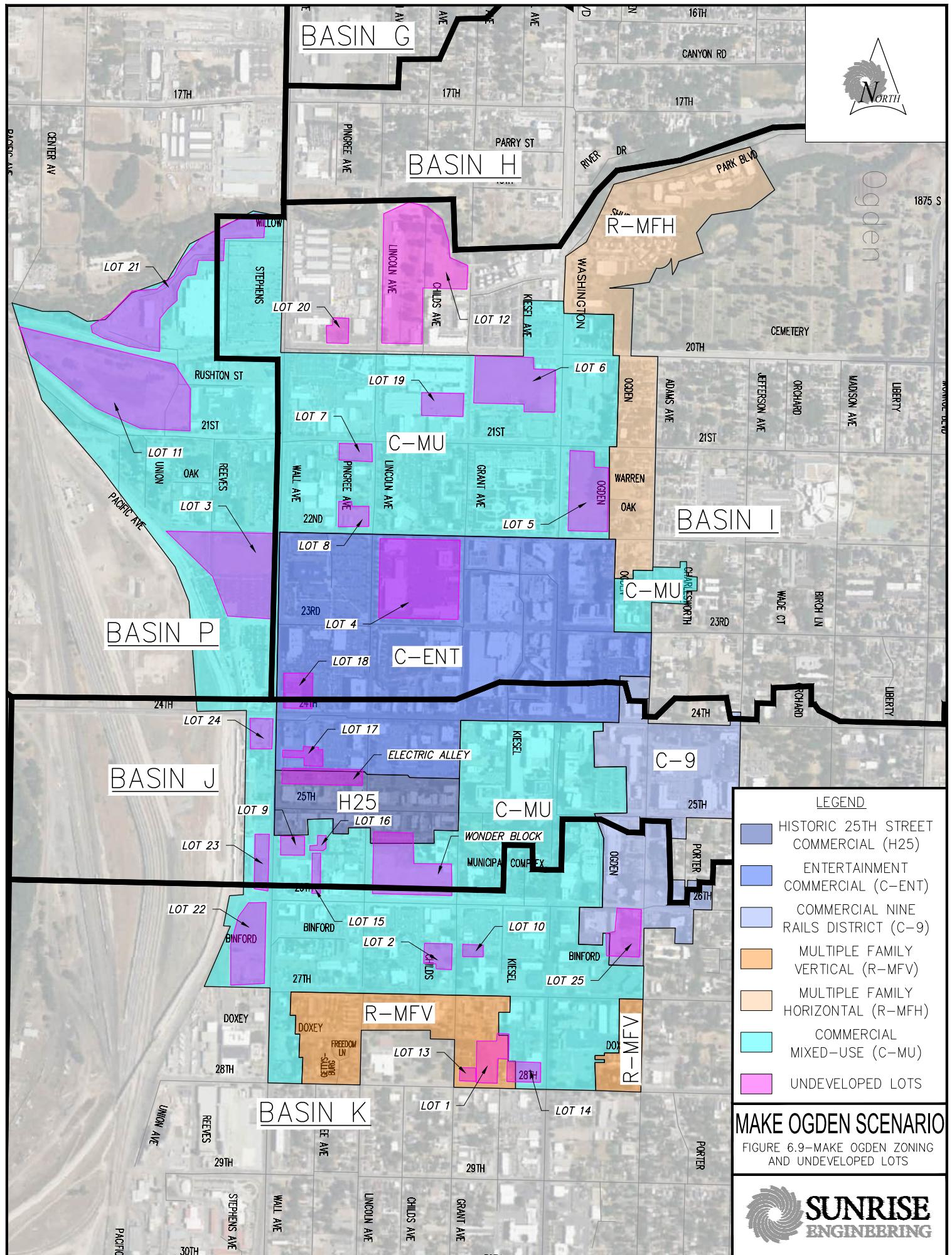


Map Legend

- Less than 0.5
- 0.5 ~ 0.75
- 0.75 ~ 1.0
- Greater than 1.0



0 0.1 0.2 Miles



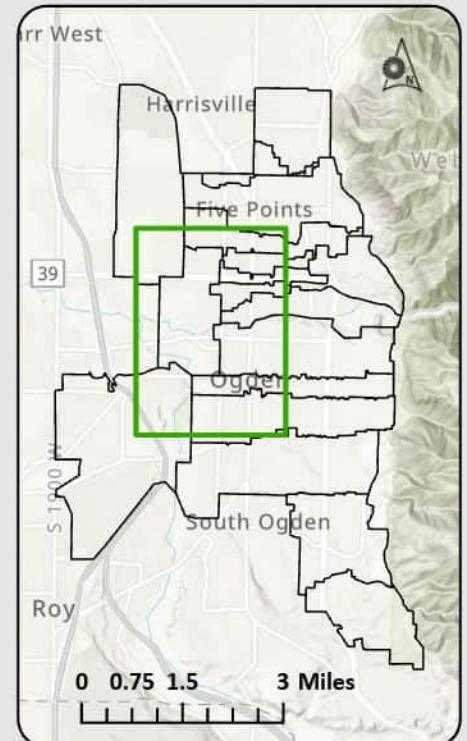
Ogden Sewer Master Plan Update 2023



Legend

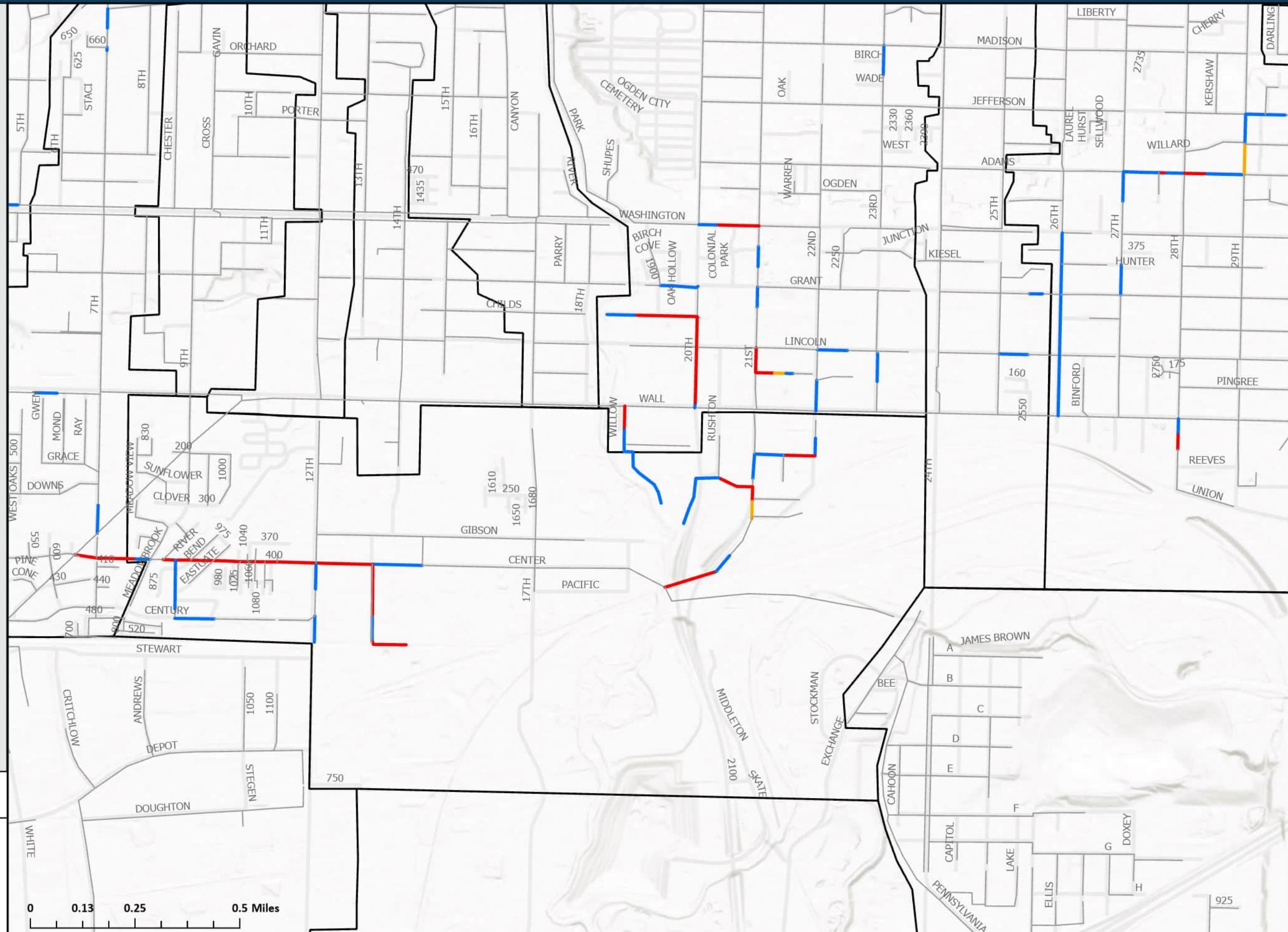
d/D

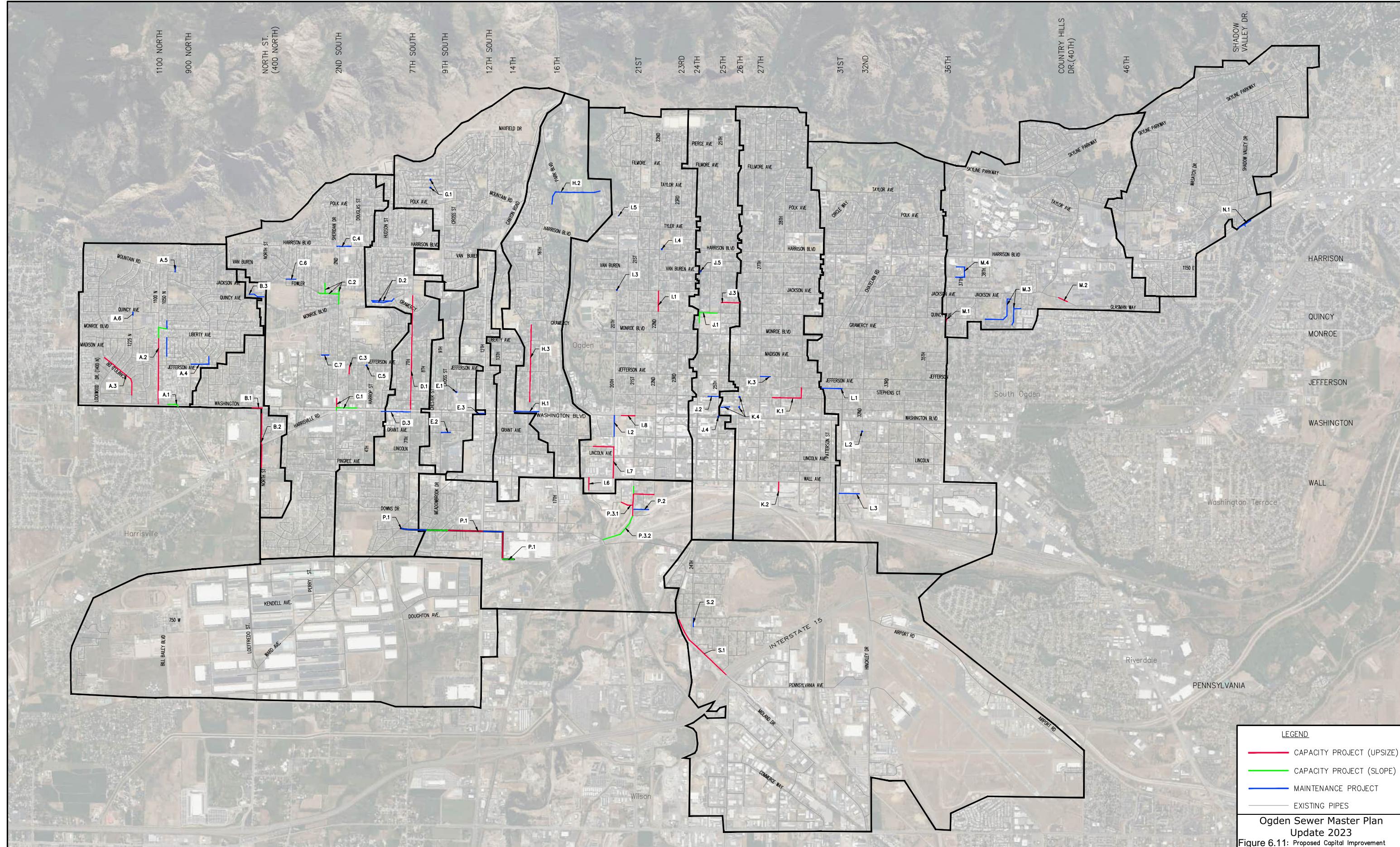
- Less Than 0.5
- 0.5 ~ 0.75
- 0.75 ~ 1.0
- Greater than 1.0



Updated 11/29/23

Figure 6.10- Sewer System Capacities
(Make Ogden Scenario)





6.6 SURVIVAL CURVES AND PIPE REPLACEMENT

Using cost estimates (shown in Appendix B) for pipe replacement and slip-lining (CIPP) it becomes clear that the potential costs for replacing all of Ogden's sewer system are huge. If all 1,475,552 feet of sewer pipe in the system were replaced (at \$955/LF) it would cost approximately \$1.4 billion (not including inflation). Since this amount is impossible to fund, Ogden's preference is to use CIPP (slip-lining) where possible to rehabilitate the system. To slip-line the entire system (at \$155/LF) it would cost approximately \$228 million dollars.

The purpose of procuring and using a pipe survival curve is to have a rational method for determining how many linear feet of pipe need to be replaced each year in a sanitary sewer system.

A properly installed PVC, vitrified clay, or concrete pipe could have an 80 to 100-year life expectancy. A principal factor that may shorten the life of concrete pipe specifically is corrosion. Depending on the corrosiveness of the soil and/or transport material the longevity of the concrete pipe may vary. Principal factors shortening the life of PVC and vitrified clay pipe are poor installation, improper loading, and irregular bending conditions.

Ogden City's sanitary sewer system is an aging infrastructure with over 50% of its sewer lines older than 50 years. At the end of the City build-out period those sewer lines would be older than 120 years. As part of this study, it is recommended that a portion of CIP expenditure be made towards replacing old and aging sewer pipes.

This section discusses the method used in this study for determining how many linear ft of pipe need to be replaced in each of the build-out planning periods. Once the linear footage of replacement per year is determined, a budget can be developed. Deciding which pipes need to be replaced should be determined by Ogden City staff based on age, leaks, infiltration, flow requirements, and GIS sewer system mapping.

6.6.1 PIPE SURVIVAL CURVE

A pipe survival curve shows the probable survival of a properly installed pipe compared to how long it has been in service based on historical data of specific pipe types in specific cities. The importance of sewer pipe survival curves is that they can be applied to sewer utilities for prediction of annual replacement rates necessary to maintain or improve the level of service in the utility.

The Japanese National Institute for Land and Infrastructure Management performed a life expectancy data survey for sewer utilities throughout cities in Japan. Pipe age data was collected and averaged to generate a Weibull Distribution survival curve. Pipe data was collected and averaged for concrete, vitrified clay, and PVC sewer pipe (Matsumiya, Y., Miyauchi, C., and Fujiu, K. 2007). The average life cycle curve of the three materials is shown in Figure 6.12.

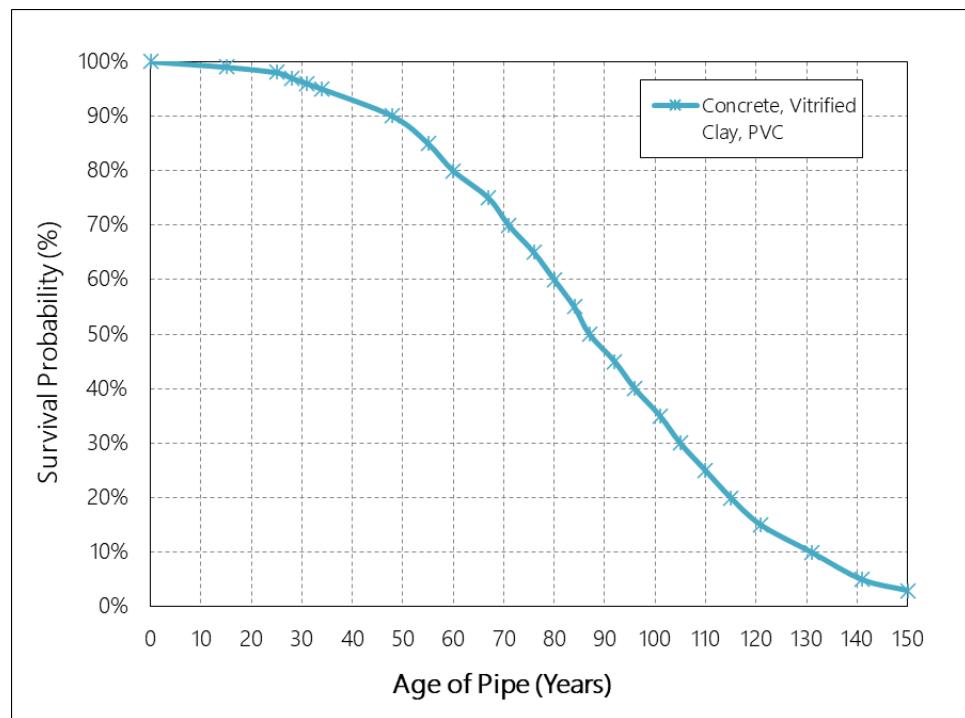


Figure 6.12 – Survival curves of concrete, vitrified clay, and PVC sewer pipe

As shown in the curve of Figure 6.12, all three pipe material types hold similar survival probabilities. For concrete, vitrified clay, and PVC pipe that is 50 years old, there is an 87% survival rate. For 100-year-old pipe the survival rate is near 38%. This historical data works well for sewer pipe life cycle prediction as it can accurately predict the percentage of pipe that needs to be replaced for each age group of pipes in a system.

To accurately match Ogden City's survival rate to the curve above, an extensive soil investigation would have to be performed comparing soil types from Ogden to those of the utilities in Figure 6.12. This is impractical and expensive, and the results would still be inaccurate at best. For this report, the survival rate curve shown will be used to estimate the Ogden City Sewer System pipe survival rate. This rate will be used to determine a linear footage of pipe to be replaced in the build-out period of this study.

Table 6.9 shows the data for the average survival curve shown in Figure 6.12. The data in Table 6.9 shows the statistical probability of sewer pipe that has survived depending on the age of the material. This data will be used to determine how much of the Ogden City Sewer System needs to be replaced.

Table 6.9 – Average Survival Rate of Concrete, Vitrified Clay, and PVC Pipes from
MLIT (Japan) Publication

| Years | Survival % |
|-------|------------|
| 0 | 100 |
| 10 | 100 |
| 20 | 100 |
| 30 | 97 |
| 40 | 92 |
| 50 | 88 |
| 60 | 80 |
| 70 | 72 |
| 80 | 60 |
| 90 | 48 |
| 100 | 36 |

Table 6.10 is a summary of the linear footage of pipe that should be replaced within the Ogden City's Sewer System based on the statistical analysis of the survival curve and data shown in Table 6.9. It should be noted that the linear footage and costs shown for each period assume that the linear footage from the previous period was replaced.

Table 6.10 – Length and Cost of Pipe Replacement (Survival Curve)

| Year | LF | LF/Year | \$/Cycle | \$/Per Year |
|--------|---------|---------|---------------|--------------|
| 2028 | 507,352 | 101,470 | \$78,640,000 | \$15,728,000 |
| 2033 | 130,010 | 26,002 | \$20,152,000 | \$4,031,000 |
| 2063 | 265,741 | 8,858 | \$41,192,000 | \$1,373,067 |
| Totals | 903,103 | - | \$139,984,000 | - |

Table 6.10 should be used for budgeting purposes for pipe replacement of old and aging pipes. The costs shown in Table 6.10 for the planning periods are included in the CIP lists in the next section. The initial annual cost during the 2028-year planning period is higher because the City would be catching up during the next 5 years. The unit price per linear ft for each project was estimated to be \$155. This number was taken from the cost of using cured-in-place pipe (CIPP) for an 8-in. pipe.

The majority of the Ogden City Sewer System is 8-in. pipe, and the preferred method for Ogden City to replace its sewer infrastructure is to use cured-in-place pipe. The linear-foot cost for this method was obtained from contractors and includes engineering, mobilization, pre-con video, traffic control, service connections, main line pipe, sewer by-pass, pipe cleaning, manhole lining, and construction management costs. Each individual project may vary depending on the size and length replaced. However, for budgeting purposes the dollar amount is a good average.

Table 6.10 also provides a very high estimated linear footage of pipe that the Ogden City should replace annually in the next 5 years. There are three critical factors in determining which lines should be replaced. These factors are age, how critical the pipe is to the network (especially during major flow events), how many leaks and problems the pipe has (including infiltration), and build-out demands on the system.

Each year, City officials must identify which pipes are in the worst condition, which are the oldest, and which are critical to the system to prioritize which pipes to replace. The maps shown in this section are available to determine the age of existing pipes.

Realizing that \$15,728,000 per year is not economically feasible for Ogden City, another option would be to replace individual pipe as it reaches 100 years old. For Ogden City, this would significantly reduce the replacement costs during the initial 5-year planning period but would still produce inflated costs (approx. \$8,075,000 per year). Keeping track of pipe age would be essential to this method. Table 6.11 shows the dollar per year amounts associated with this option.

Table 6.11 – Length and Cost of Pipe Replacement (100 Yr. Replacements)

| Year | LF | LF/Year | \$/Cycle | \$/Per Year |
|--------|-----------|---------|---------------|-------------|
| 2028 | 260,466 | 52,093 | \$40,373,000 | \$8,075,000 |
| 2033 | 164,079 | 32,816 | \$25,433,000 | \$5,087,000 |
| 2063 | 621,710 | 20,724 | \$96,366,000 | \$3,212,200 |
| Totals | 1,046,255 | - | \$162,172,000 | - |

Both methods would require an unsustainable amount of money for pipe replacement within the first 5 years and would reduce the amount spent per year for the remaining years. This is because over 50% of the Ogden City sewer lines are older than 50 years.

Since costs are still high for both previous methods, another solution would be to replace the same amount of total linear footage each year. For Ogden City this would equate to replacing about 1.77% of its system per year. This would allow Ogden City to replace the same amount of linear ft of pipe required in the forty-year span shown above.

Table 6.12 – Length and Cost of Pipe Replacement (1.77% of system/year)

| Year | LF | LF/Year | \$/Cycle | \$/Per Year |
|--------|-----------|---------|---------------|-------------|
| 2028 | 130,782 | 26,156 | \$20,272,000 | \$4,055,000 |
| 2033 | 130,782 | 26,156 | \$20,272,000 | \$4,055,000 |
| 2043 | 261,564 | 26,156 | \$40,543,000 | \$4,055,000 |
| 2053 | 261,564 | 26,156 | \$40,543,000 | \$4,055,000 |
| 2063 | 261,564 | 26,156 | \$40,543,000 | \$4,055,000 |
| Totals | 1,046,255 | - | \$162,173,000 | - |

As shown in Table 6.12, replacing 1.77% of the pipes in the sewer system annually results in an annual replacement cost of approximately \$4,055,000. As discussed later in this Master Plan, the Capital Facilities Plan lists the amount of funds available to be spent per year on sewer system infrastructure repairs.

There are not enough funds in the Capital Facilities Plan to complete the capacity and maintenance projects and replace the amount of pipe per year outlined above. The CIP list will first focus on the projects needed to complete the capacity and maintenance projects. It will take approximately 15 years to complete these projects. The pipe replacement plan will be postponed until all capacity and maintenance projects are completed.

The amount of sewer pipe that needs to be replaced during the forty-year span is 1,046,255 linear feet, as shown above. The amount of pipe that will be replaced or slip-lined due to capacity and maintenance projects will be approximately 56,488 linear ft.

Ideally, 15 years from now, the current CIP lists should be completed. To replace the remaining 989,767 linear ft in the remaining 25 years, about 39,591 linear ft of pipe would need to be replaced per year. At the same price per linear ft as identified above, the cost per year would equate to \$6.18 million per year.

The capital facilities plan identifies \$6.0 million per year to be spent during the 21-40-year planning period (see Table 7.2). This budgeted amount for the 21-40-year funding period and the potential required yearly cost for pipe replacement for the remaining 25 years are close and well within the margin of error for this Master Plan.

The City should have the budget necessary to execute the spending required for pipe replacement in the 21-40-year planning period. If some additional pipe replacement projects can also be done at the same time as the 5-to-15-year CIP lists, the \$6.0 million per year from years 21-40 is very achievable.

6.6.2 PIPE AGE REPLACEMENT SUMMARY

The pipe survival and replacement discussion provided above demonstrates that the aging Ogden City Sewer System needs replacement. It would be too costly in the first 5 years to replace pipe based on the pipe survival curve shown above or based on the age of the pipe (when the pipe is 100 years old).

As discussed in Section 7.0, the Capital Facilities Plan lists the amount of funds available to be spent per year on sewer system infrastructure repairs. The CIP list will first focus on the projects needed to complete the capacity and maintenance projects, which will take approximately 15 years to complete.

The amount of pipe left to replace during the last 25 years is 989,767 linear ft. Replacing this amount during the last 25 years of planning periods will require \$6.18 million to be spent each year. Since the city budget for the 21-40-year funding period is \$6,000,000 per year, the City should have the budget necessary (within the margin of error for estimation) to execute the spending required for pipe replacement within this period.

7 CAPITAL IMPROVEMENT PLAN

The previous sections in this Master Plan have provided descriptions, analysis, and evaluations of all the working components of the Ogden City Sewer System. Each evaluation performed included a discussion and recommendation of potential sewer improvement projects that need to be performed because of existing conditions or to meet State design criteria.

In each section, the total opinion of probable cost was provided for each project and calculated to determine a comprehensive estimated cost for each type of project. Table 7.1 is a summary of the recommended capital improvement projects categorized by type of project.

Table 7.1 – Recommended Capital Improvement Project Cost by Type

| Project Type | Description | Cost |
|----------------------|-------------------|--------------|
| I&I Study | | \$200,000 |
| Capacity Projects | Multiple Projects | \$37,055,157 |
| Maintenance Projects | Multiple Projects | \$18,839,847 |
| Total | | \$55,895,004 |

As shown in the table above, the estimated cost for all the recommended improvement projects for this Master Plan is \$55,895,004. This number does not include the \$4,055,000/year proposed for pipe replacement due to age. This cost represents all the recommended projects in the Master Plan from now until the end of the 15-year planning period. After the 15-year planning period, pipe replacement due to age should be pursued until the end of the forty-year planning period.

Now that the cost for all the recommended projects has been determined, it is necessary to determine the amount that Ogden City is able to spend each year on these projects. According to the Ogden Capital Facilities Plan, Ogden City can spend the amount per year on sewer infrastructure replacement costs listed in Table 7.2. If needed, Ogden City does have a large sewer reserve fund of approximately \$8-9 million that can be used. This fund will need to be replaced by Ogden City to maintain better bond rates. For this CIP list, it is assumed that there are no funds used from the reserve.

Table 7.2 – Available Funds for Capital Improvement Projects

| Years | \$/Year | Total \$ Available |
|-------|--------------|--------------------|
| 0-5 | \$3,500,000 | \$17,500,000 |
| 6-10 | *\$4,000,000 | \$20,000,000 |
| 11-15 | *\$5,000,000 | \$25,000,000 |
| 16-20 | *\$5,500,000 | \$27,500,000 |
| 21-40 | *\$6,000,000 | \$120,000,000 |

*Future yearly budgets are assumed and shown for information only. A reasonable attempt to account for inflation has been made. These amounts are not presented for City Council approval.

The list of recommended projects should be completed between now and the end of the forty-year planning period. For planning and logistical purposes, it is necessary to analyze all the recommended projects and determine which projects are most urgent and need to be completed first as compared to projects that can be completed later.

For this purpose, all the projects have been prioritized into a 5-yr, 10-yr, 15-yr, 20-yr and 40-yr Capital Improvement Plan (CIP). The criteria for determining priority for the improvement projects are as follows:

1. An additional I&I Study (based on learnings from all previous metering campaigns) is recommended to further investigate areas that have I&I problems and pinpoint potential sources (such as the M-04 metering area).
2. Ogden City provided a list of maintenance projects that are needed based on their maintenance crew observations and feedback. The sewer improvement projects on this list were all ranked. This ranked project list was used as a basis for the overall CIP project ranking.
3. Capacity related projects were identified per modeling results. Some of these capacity projects coincided with maintenance projects. In these cases, the capacity project is combined with the maintenance project and categorized under the same ranking as the maintenance project list.
4. The remaining capacity projects need to be ranked and added to the CIP list. They are ranked based on their proximity to any maintenance project and assigned a similar ranking to the nearby maintenance project.
5. The capacity projects are compared to the CIP project list from the previous sewer master plan (2012). If the capacity project appeared on the previous CIP list, its old ranking will be taken into consideration. The project will be re-evaluated and either moved up or down based on its old ranking.
6. Finally, the capacity projects are re-evaluated one more time based on the age of the pipes and rankings will be adjusted accordingly.

7.1 PIPE REPLACEMENT COSTS

When determining the cost estimates, there are several levels of accuracy depending upon the percentage of detailed design that has been completed. For a Master Plan estimates, the accuracy of the cost estimates is $\pm 30\%$. While this may not seem fully accurate, the purpose of Master Planning is to develop general sizing, location, cost & scheduling information on several individual projects that may be designed over a period of many years.

There are two different methods of pipe replacement that have been used in the cost estimating for the CIP lists. These methods are open trench, and cure in place pipe (CIPP). Most maintenance and capacity projects identified have been estimated using the open trench method. There are maintenance projects that use the cure-in-place pipe method. The cost for the Ogden City pipe replacement based on age was estimated using CIPP method.

Appendix B has a schedule of values and unit prices for each construction method discussed above. The unit prices were taken from previous projects, and from estimates obtained from contractors. The linear ft prices were figured from a 500 linear ft section with manholes at each end, 10 ft deep, and 10 residential service laterals.

The open trench method assumes 60-in. manholes. This method does not include drop manholes, trench dewatering, rock excavation, flowable backfill, clay cutoff wall, and geotextile fabric. If any of these items are needed during design, the price per linear ft cost will increase.

Cost estimates for the pipe bursting method were calculated. However, there were not any proposed projects to be constructed with this method. This is mainly because pipe bursting cannot be done when laterals are present. For this report, the open trench method was selected, although pipe bursting may be possible. The open trench method is the more costly and conservative method. When design of a project takes place and there are not any laterals present, pipe bursting may be a viable and more cost-effective option.

Engineering and construction management costs were taken from the USDA Fees for Professional Engineering Services as a Percentage of Net Construction Costs. This form has also been included in Appendix B.

7.2 5-Year Capital Improvement Plan

The 5-year Capital Improvement Plan includes the projects that have been prioritized as the most urgent. These projects should be completed within the next 5 years. The types of projects included in the plan are those from the maintenance project list.

As discussed previously, Ogden City will have \$3,500,000 per year for the first 5 years. This equals a total of \$17.5 million for the 5-year CIP Plan. The top project recommended for the 5-year CIP is the 12th St Trunk Line Capacity Project. This project was identified as the number one priority by the City's maintenance crew. Simulation results also indicate capacity deficiency not only on the 12th St trunk line, but also the upstream sewer lines on 13th St and A Ave. The breakdown of funding for the 5-year CIP is shown in Table 7.3.

Table 7.3 – 5-year CIP Cost Breakdown

| Project Type | Cost |
|--------------|--------------|
| I&I Study | \$200,000 |
| Maintenance | \$ 5,203,693 |
| Capacity | \$12,096,308 |
| Total | \$17,500,000 |

The total estimated cost of the projects for the 5-year CIP is \$17,500,000. This meets the City's \$17.5 million budget. A summary priority list of the projects included in the 5-year CIP is shown in Table 7.4.

Table 7.4 – 5-year CIP Project List

| Project # | Project Name | Project Description | Cost | Project Type |
|-----------|--|--|-------------|--------------|
| | I&I Study | Infiltration & Inflow Study | \$200,000 | |
| P.1 | 12th St Trunk Line Capacity | Upsize Fresenius sewer mains, see project write up. (5,180 LF) | \$6,806,685 | CAP |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12" & 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,291,784 | CAP |
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust slopes of 8" line from MH740 to MH10261 (290 LF). | \$2,162,880 | CAP |
| H.1 | Washington Blvd 14th to 16th Maintenance | Replace 10" line on the east side of Wahington Blvd from 14th Street to 16th Street. (935 LF) | \$1,037,350 | M |
| A.4 | 1050 N Maintenance | Adjust slopes for 8" and 12" line on 1050 N, 750 N and Jefferson Ave. (1,643 LF) | \$1,787,642 | M |
| J.2 | 25th & Adams Maintenance | Replace 8" line on Adams from 25th to 2550. (399 LF) | \$442,498 | M |
| K.3 | 27th & Jefferson Maintenance | Replace 8" line on Jefferson Ave from 27th St to 2750 S. (377 LF) | \$419,007 | M |

| | | | | |
|-------|----------------------------------|---|--------------|-----|
| N.1 | 5151 S Harrison Blvd Maintenance | Replace 12" line on Harrison Blvd, south of Shadow Valley Dr. (610 LF) | \$690,688 | M |
| L.1 | 29th & Porter Maintenance | Replace 8" line on Porter from 29th to 30th. (759 LF) | \$826,508 | M |
| C.3 | 3rd & Jefferson Capacity | Install new 8" sewer line on 3rd Street between Jefferson and Porter. (332 LF) CIPP 8" line on 3rd St from Jefferson to first manhole to the east. (351 LF) | \$431,800 | CAP |
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) (Phase I) | \$403,158 | CAP |
| Total | | | \$17,500,000 | |

7.3 5 to 10-year Capital Improvement Plan

The 10-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 5-year CIP but within the next 10 years. The 10-year CIP includes both capacity and maintenance projects.

Ogden City will have \$4,000,000 per year for the years six to 10. The breakdown of funding for the 10-year CIP is shown in Table 7.5.

Table 7.5 – 10-year CIP Cost Breakdown

| Project Type | Cost |
|--------------|--------------|
| Maintenance | \$1,413,509 |
| Capacity | \$18,586,491 |
| Total | \$20,000,000 |

The total estimated cost of the projects for the 10-year CIP is \$20,000,000. A summary priority list of the projects included in the 10-year CIP is shown in Table 7.6.

Table 7.6 – 10-year CIP Project List

| Project # | Project Name | Project Description | Cost | Project Type |
|-----------|-----------------------|---|-------------|--------------|
| K.1 | 29th & Adams Capacity | Upsize 8" and 10" line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) (Phase II) | \$1,216,931 | CAP |
| C.2 | Fowler Capacity | Adjust pipe slopes for 10" lines around Fowler Ave. (1,742 LF) | \$1,911,273 | CAP |

| | | | | |
|-----|-----------------------------------|---|-------------|-----|
| D.1 | 7th St Maintenance/Capacity | CIPP 10" and 12" line on 7th St between Monroe Blvd and Washington Blvd. (4,183 LF) | \$840,643 | CAP |
| S.1 | Pennsylvania Ave Maintenance | CIPP 15" line from I-15 running Northeast to F Ave. (2,701 LF) | \$632,519 | CAP |
| I.1 | 22nd St Capacity | Upsize 8" line on 22nd St between Quincy Ave and Jackson Ave. (759 LF) | \$846,025 | CAP |
| H.3 | 15th St Capacity/Infiltration | Upsize 8" line on 15th St between Ogden Ave and approximately 826 East. | \$3,090,079 | CAP |
| C.1 | 2nd & Washington Capacity | Sewer line upsizing and replacement, see project write up. (1,197 LF) | \$1,351,374 | CAP |
| A.2 | E 1050 North Maintenance | Replace 10" line on 1050 N from Gramercy to Monroe, and portions of Monroe and Gramercy. (3,437 LF) | \$3,720,489 | CAP |
| A.1 | Washington & Larson Capacity | Adjust slopes for 15" line on Washington Blvd and Larsen Ln. (419 LF) | \$490,633 | CAP |
| E.1 | 970 Adams Manhole Replacement | Replace manhole at approximately 970 Adams Avenue. | \$18,165 | M |
| E.2 | 9th St & Grant Maintenance | Replace 8" line on Grant from 9th St to Cross St. (355 LF) | \$395,411 | M |
| E.3 | 12th Street & Washington Capacity | Upsize 8" on the west side of Washington Blvd between 12th St and 1135 south. (303 LF) | \$347,170 | M |
| B.3 | 500 N/North St Maintenance | Replace 8" line extending from North St east of Quincy up to 500 N. (596 LF) | \$652,764 | M |
| B.1 | Washington & North Capacity | Upsize 8" line on Washington Blvd from North St to 475 North. (392 LF) | \$445,098 | CAP |
| B.2 | North St Capacity | Upsize 10" line on North St between Washington Blvd and Wall Ave. (1,995 LF) | \$2,206,567 | CAP |
| J.1 | Quincy & 24th Capacity | Adjust slopes for 10" and 12" line on Quincy Ave and 24th St. (1,042 LF) | \$1,156,993 | CAP |

| | | | | |
|-----|---------------------|--|--------------|-----|
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) (Phase I) | \$677,867 | CAP |
| | | Total | \$20,000,000 | |

7.4 10 to 15-year Capital Improvement Plan

The 15-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 10-year CIP but within the next 15 years. The main types of projects included in this plan are both maintenance and capacity projects.

As discussed previously, Ogden City will have \$5,000,000 per year for the years 11-15. The breakdown of funding for the 15-year CIP is shown in Table 7.7.

Table 7.7 – 15-year CIP Cost Breakdown

| Project Type | Cost |
|--------------------------|--------------|
| Maintenance | \$12,222,645 |
| Capacity | \$6,372,359 |
| Total | \$18,595,003 |
| Pipe Projects Due to Age | \$6,404,997 |
| Grand Total | \$25,000,000 |

The total estimated cost of the projects for the 15-year CIP is \$18,595,003. The remaining \$6,404,997 budget should be spent on pipe projects due to age. A summary priority list of the projects included in the 15-year CIP is shown in Table 7.8.

Table 7.8 – 15-year CIP Project List

| Project # | Project Name | Project Description | Cost | Project Type |
|-----------|-------------------------------|---|-------------|--------------|
| J.3 | Fowler Ave Capacity | Upsize 6" line on Fowler between 25th and 26th. (692 LF) (Phase II) | \$77,209 | CAP |
| K.2 | 28th & Wall Capacity | Upsize 8" line on 28th St from Wall Ave to Union Ave. (386 LF) | \$438,551 | CAP |
| M.4 | Van Buren M Maintenance | Replace 8" line on Brinker, 37th and 1100 East. (1,022 LF) | \$1,104,804 | M |
| H.2 | El Monte Maintenance | Replace 8" line north of the El Monte golf course; CIPP 8" and 12" lines upstream and downstream of the 8" line. (2,146 LF) | \$467,658 | M |
| D.2 | Monroe Maintenance | Replace 8" and 10" line in Monroe Blvd from Harrop St to 6" St. (1,519 LF) | \$1,635,565 | M |
| C.4 | 2nd St & Harrison Maintenance | Replace 8" line on Harrison between 2nd and 3rd Street. (535 LF) | \$587,740 | M |
| M.1 | 36th & Quincy Capacity | Upsize 10" line on 36th St from east of Maple St to Quincy. (101 LF) | \$120,966 | CAP |
| M.2 | McKay Dee Hospital Capacity | Upsize 8" line by McKay-Dee Hospital. (368 LF) | \$418,860 | CAP |
| A.3 | Canfield Capacity | Upsize 8" line on Canfield Dr, from 450 E to Eyrie Dr. (1,854 LF) | \$2,031,574 | CAP |
| I.2 | 20th St Consolidation | Consolidate the two sewer mains on 20th St between Grant and Washington. (778 LF) | \$1,366,779 | M |
| A.5 | 1025 East Maintenance | Replace 8" line on 1000 N between 1025 East and Mountain Road. (228 LF) | \$257,660 | M |
| P.2 | Union Ave Maintenance | Adjust slopes of 8" line on Union Ave from Pacific to 20th St. (559 LF) | \$613,372 | M |

| | | | | |
|-----|---|---|-------------|---|
| A.6 | 1225 North Maintenance | Replace 8" line leading west from Quincy on 1225 North. (120 LF) | \$138,362 | M |
| K.4 | 26th & Ogden Maintenance | Replace MH 12164 and MH 12163; and pipeline spot repair at approximately 2525 Ogden Ave. | \$36,330 | M |
| I.3 | 20th & Jackson Manhole | Replace MH 1248 at 20th & Jackson. | \$18,165 | M |
| J.4 | 25th & Washington Manhole | Replace MH 681 on the east side of 25th & Washington. | \$18,165 | M |
| I.4 | 2202 Harrison Manhole | Replace MH 2598 at approximately 2202 Harrison Blvd. | \$18,165 | M |
| C.5 | 4th & Jefferson Manhole | Replace manhole located at 4th Street and Jefferson. | \$18,165 | M |
| L.2 | 32nd & Kiesel Manhole | Replace MH 10119 at 32nd & Kiesel. | \$18,165 | M |
| M.3 | Grandview Acres Phase 2 & 930 E 40th St Maintenance | Replace 8" lines near Grandview Park, see project write up. (2,591 LF) | \$2,755,820 | M |
| C.6 | North Jackson Ave Maintenance | Replace 8" line on Jackson Ave from Southwell St to 253 North. (367 LF) | \$408,295 | M |
| C.7 | Orchard Ave Maintenance | Replace 8" line on Orchard Ave from 1st St to Cook St. (281 LF) | \$315,518 | M |
| I.5 | Custer Ave Maintenance | Replace 8" line at 2001 Custer Ave. (31 LF) | \$35,852 | M |
| J.5 | 24th & Van Buren Manhole | Replace MH 11979 at Van Buren & 24th St. | \$18,165 | M |
| D.3 | Washington 5th to 7th Maintenance | Replace 8" line on west side of Washington between 5th and 7th St and adjust slopes. (1,090 LF) | \$1,176,760 | M |
| G.1 | 825 Simoron/Taylor Manholes | Replace MH 11185 and MH 11186 at 825 Simoron and 815 Taylor Ave. | \$18,165 | M |

| | | | | |
|-------|------------------------------|---|--------------|-----|
| S.2 | W 24th St Maintenance | Replace 8" line on 24th St from F to G Ave. (330 LF) | \$368,468 | M |
| L.3 | Stephens Maintenance Phase 2 | Repalce 8" line from 32nd St to 31st St. (759 LF) | \$826,508 | M |
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$545,837 | CAP |
| I.7 | 20th & Childs Capacity | Upsize 8" line on Childs Ave (760 LF), and upsize 10" line on 20th St from Childs to Wall Ave. (1,151 LF) | \$2,144,675 | CAP |
| I.8 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$594,687 | CAP |
| Total | | | \$18,595,003 | |

7.5 15 TO TWENTY-YEAR CAPITAL IMPROVEMENT PLAN

The twenty-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the 15-year CIP but within the next 20 years. The main types of projects included in this plan are projects related to the pipe age. All capacity and maintenance related projects will be complete before this time.

As discussed previously, Ogden City will have \$5,500,000 per year for the years 16-20. No specific projects are listed for this funding period; however, as discussed in Section 6.6, pipe replacement due to age, which should be planned to cost about \$6,000,000 per year, should be executed. The breakdown of funding for the twenty-year CIP is shown in Table 7.9.

Table 7.9 – Twenty-year CIP Cost Breakdown

| Project Type | Cost |
|--------------------------|--------------|
| Pipe Projects due to Age | \$27,500,000 |
| Total | \$27,500,000 |

7.6 TWENTY TO FORTY-YEAR CAPITAL IMPROVEMENT PLAN

The forty-year Capital Improvement Plan includes the projects that should be completed after the projects listed on the twenty-year CIP but within the next forty years. The main types of projects

included in this plan are projects related to the pipe age. All capacity and maintenance related projects will be complete before this time.

As discussed previously, Ogden City will have approximately \$6,000,000 per year for the years 21-40. No specific projects are listed for this funding period; however, as discussed in Section 6.6, pipe replacement due to age, which should be planned to cost about \$6,000,000 per year, should be done. The breakdown of funding for the forty-year CIP is shown in Table 7.9.

Table 7.9 – Forty-year CIP Cost Breakdown

| Project Type | Cost |
|--------------------------|---------------|
| Pipe Projects due to Age | \$120,000,000 |
| Total | \$120,000,000 |

The amount of sewer pipe that needs to be replaced during the forty-year span is 1,046,255 linear ft as shown in Table 6.9. The amount of pipe that will be replaced or slip-lined due to capacity and maintenance projects will be approximately 49,768 linear ft. To replace the remaining 996,487 linear ft in the 15 to forty-year funding period, about 39,860 linear ft of pipe would need to be replaced per year.

At \$155 per linear ft, the cost per year would equate to \$6.18 million per year. The capital facilities plan identifies \$6.0 million per year to be spent during the twenty–forty-year planning period. The City should have the budget necessary (within the margin of error for estimation) to execute the spending required for pipe replacement within this period.

8 REFERENCES

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APPENDIX A

CAPITAL IMPROVEMENT PROJECT WRITE-UPS AND MAPS

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1 IMPROVEMENT PROJECTS BY BASIN

After the sanitary sewer model was updated with information taken from Ogden City culinary water usage data, field data, and recent sewer projects, the system was analyzed under various conditions, including design condition, build-out and extreme weather. The design condition produced the largest flows for the system. Therefore, the 250 and 400 gpcd design scenario was used as a baseline to determine improvement projects for the system.

Current system conditions also weighed heavily in the improvement projects list. Ogden City provided a list of sewer improvement projects that are in needed in order to address problems and concerns discovered by their maintenance crew. The capital improvement projects listed in this section are a combination of projects that either do not meet system capacity under design criteria or have issues under field observation.

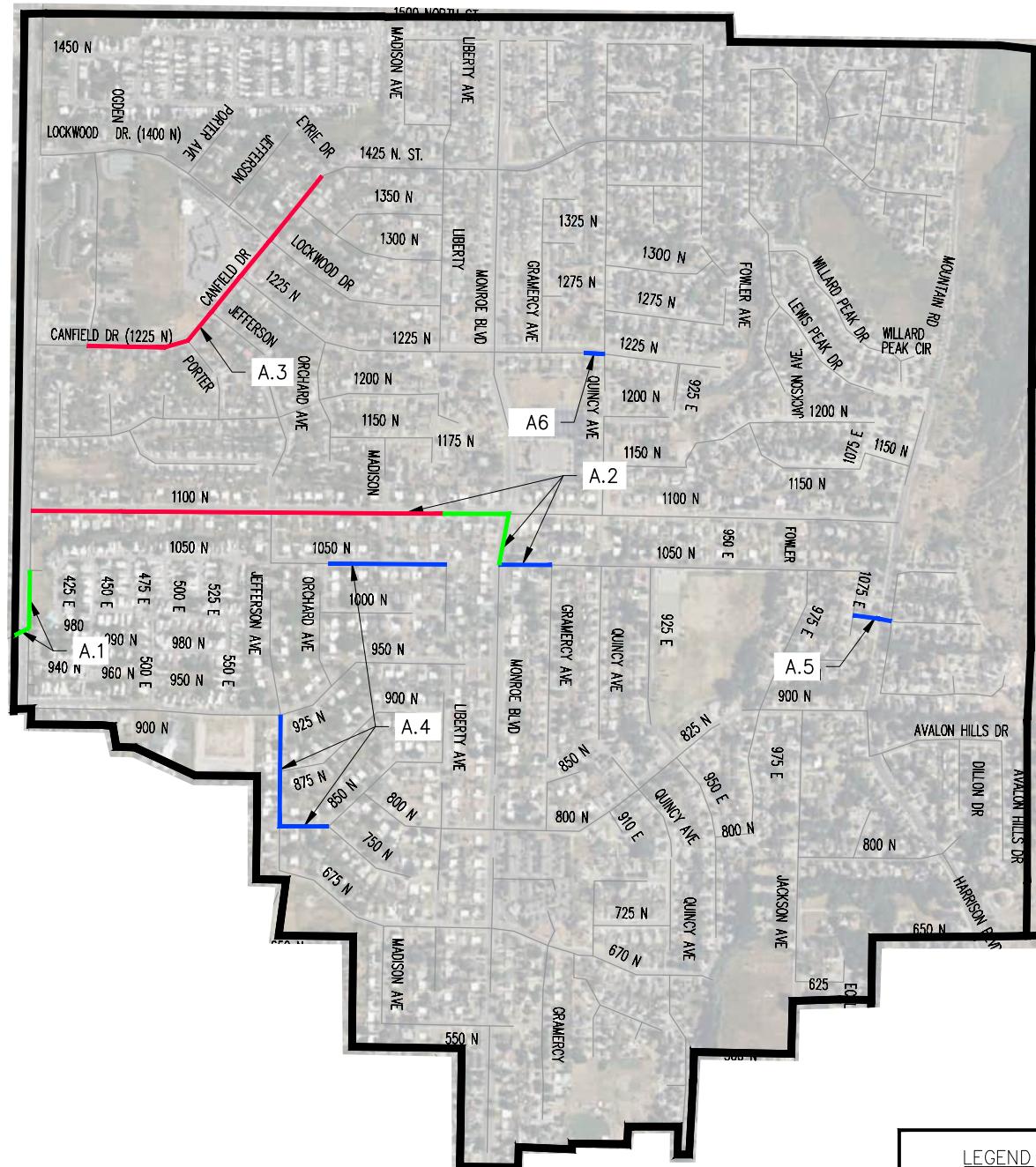
The projects are discussed according to the individual Basins throughout the system. The following four maps from the master plan indicate the existing sewer system attributes and proposed improvements to the sewer system. The maps are as follows:

- Existing system pipe diameters
- Existing system pipe age
- Existing system pipe material
- Proposed improvement projects

1.1 Basin A

Basin A is located in the northernmost portion of Ogden City. This basin is approximately 1.2 square miles and drains about 3,049 sanitary sewer connections. Inflow from North Ogden City and Harrisville also contribute to the flow. Sewer discharge from this entire basin accumulates downstream to a 15-in mainline which then outfalls to Central Weber Sewer Improvement District (CWSID). The majority of connections in this basin are anywhere from 3 to 60 years old and either concrete or PVC. Typical pipe diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin A-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN A-PRO

Capital Improvement Project A.1 – Capacity Related Project

Project A.1 is a capacity related project located at the intersection of Washington Blvd and Larsen Lane. The primary goal is to adjust the pipe slope of the existing 15 in. line and replace it with a 15-in PVC pipe. This existing line is a concrete sanitary sewer pipe. The current length of the existing line is 418 linear ft. Open trench cut method is the best fit for this repair.

Capital Improvement Project A.2 – Capacity Related Project

Project A.2 is a capacity related project located at 1100 N, from Washington to Monroe, Monroe Ave from 1050 N to 1100 N and 1050 N between Gramercy and Monroe. The existing line is an 8 in. concrete sanitary sewer pipe. The primary goal of this project is to upsize the existing line to 10 in. into account for increasing demand in this area, and adjust the slope from 1100 N to 1050 N on Monroe Blvd. The line has a length of 3,436 ft and should be replaced using an open trench cut.

Capital Improvement Project A.3 – Capacity Related Project

Project A.3 is a capacity related project located on Canfield Dr From 450 E St to 1425 N. The existing line is an 8 in. concrete sanitary sewer pipe. The primary goal of this project is to upsize the existing line to account for increasing demand in this area. The line has a length of 1,854 ft and should be replaced using an open trench cut method.

Capital Improvement Project A.4 – Maintenance Related Project

Project A.4 is a maintenance related project located on Jefferson Ave from 925 N to 850 N and another section on 1050 N from Orchard Dr to Liberty Ave. The primary goal for this project is to replace the 986 LF of 8 in. pipe and the 657 LF 12 in. pipe. The line has a total length of 1,643 LF and should be replaced using an open trench cut method.

Capital Improvement Project A.5 - Maintenance Related Project

Project A.5 is a maintenance related project located at 1075 E and Mountain Road. The major issues stem from the line having bellies and grease issues. To fix this issue, removal and replacement of the existing 8 in. pipe using an open trench cut method is required. The length of this section is approximately 230 linear ft.

Capital Improvement Project A.6 – Maintenance Related Project

Project A.6 is a maintenance related project located at 1225 N between Quincy and Gramercy. The primary goal of this project is to replace the existing 8 in. pipe. This project covers 120 linear ft, but additional length of repair may be required upon inspection. This project will eliminate a section of pipe performing poorly. The replacement method at this location should be an open trench cut installation.

Basin A Capital Improvement Project Summary

A summary of the recommended capital improvement projects for Basin A is shown in Table 1. This table does not include any improvement projects that are part of the yearly replacement due to age.

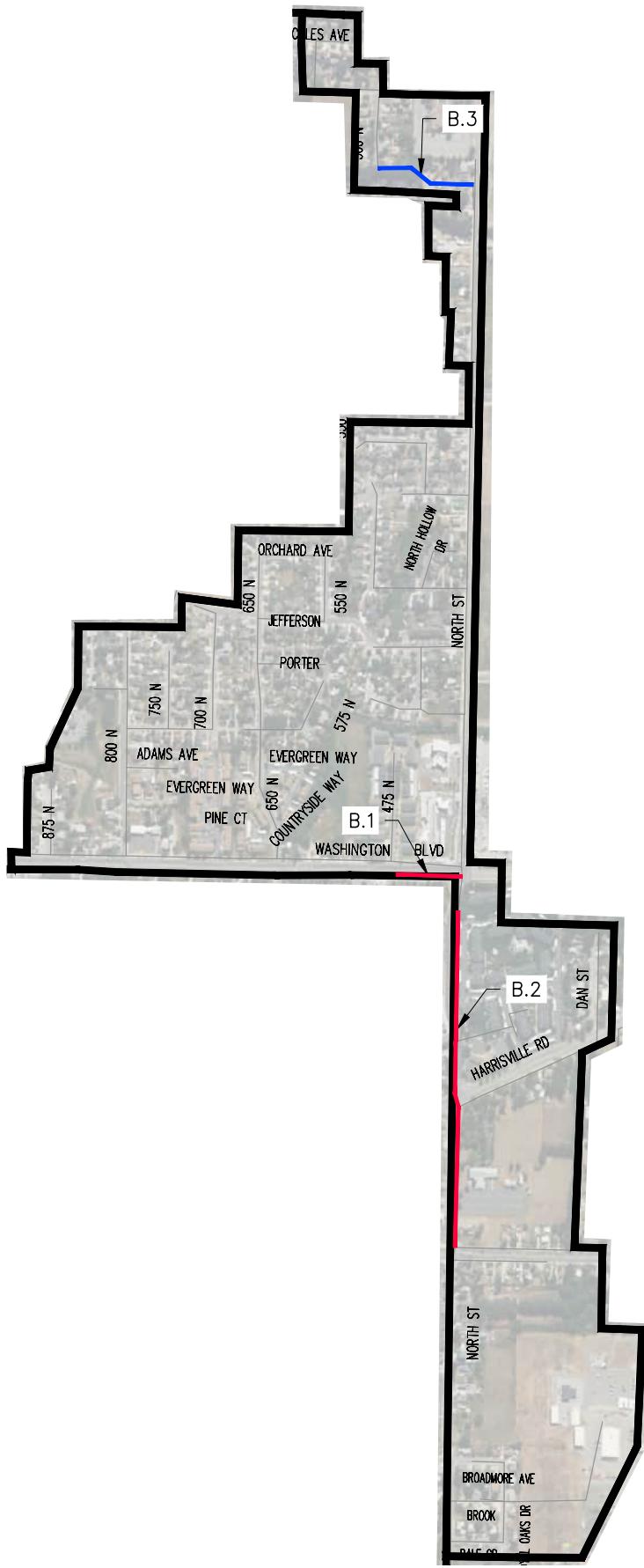
Table 1 - Basin A Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|--------------------------------|---|-------------|-----------|-----------|-------------|
| A.1 | Washington and Larson Capacity | Adjust slopes for 15-in line on Washington Blvd and Larsen Ln. (419 LF) | \$424,028 | \$41,147 | \$25,458 | \$490,633 |
| A.2 | E 1050 N Maintenance | Replace 10-in line on 1050 N from Gramercy to Monroe, and portions of Monroe and Gramercy. (3,437 LF) | \$3,361,386 | \$247,245 | \$111,858 | \$3,720,489 |
| A.3 | Canfield Capacity | Upsize 8-in line on Canfield Dr, from 450 E to Eyrie Dr. (1,854 LF) | \$1,813,212 | \$144,598 | \$73,763 | \$2,031,574 |
| A.4 | 1050 N Maintenance | Adjust slopes for 8-in and 12-in line on 1050 N, 750 N and Jefferson Ave. (1,643 LF) | \$1,591,403 | \$128,322 | \$67,917 | \$1,787,642 |
| A.5 | 1025 E Maintenance | Replace the 8-in line on 1000 N between 1025 E and Mountain Road. (228 LF) | \$217,740 | \$24,116 | \$15,804 | \$257,660 |
| A.6 | 1225 N Maintenance | Replace 8-in line leading west from Quincy on 1225 N. (120 LF) | \$114,600 | \$13,912 | \$9,851 | \$138,362 |

1.2 Basin B

Basin B is also located in the northern portion of Ogden City and is centered along North St. This basin is approximately 0.34 square miles and drains about 532 sanitary sewer connections. Inflow from Harrisville also contributes to the flow. Sewer discharge from this entire basin accumulates downstream to a 10-in. mainline and then to 15-in. discharge line which outfalls to CWSID. The majority of connections in this basin are anywhere from 3 to 60 years old and either concrete or PVC. Typical pipe diameters found in this basin are 8, 10, and 15-in. pipe.

Map Basin B-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



| LEGEND | |
|---|--------------------------------|
| — | CAPACITY PROJECT (UPSIZE) |
| — | CAPACITY PROJECT (SLOPE) |
| — | MAINTENANCE |
| — | EXISTING PIPES |
| BASIN B-PRO | |
|  | SUNRISE ENGINEERING |

Capital Improvement Project B.1 – Capacity Related Project

Project B.1 is a capacity related project located on the west side of Washington Blvd between 465 N and North St. The goal of this project is to upsize the existing 8 in. concrete sanitary sewer pipe to allow higher flow capacity. The line is 392 linear ft of piping. This project is suitable for open cut installation.

Capital Improvement Project B.2 – Capacity Related Project

Project B.2 is a capacity related project located on Washington Blvd between North St and 475 N. The primary goal of this project is to increase sewer capacity by upsizing the existing 10 in line. This project includes 1,995 linear ft of piping and is best accomplished with an open trench cut method.

Capital Improvement Project B.3 – Maintenance Related Project

Project B.3 is a maintenance related project located just east of Quincy through private properties from North St to 500 N. This segment is approximately 600 ft and very shallow. The goal of this project is to replace the existing 8 in. line to deepen the pipe. This project will be challenging due to the pipe extending through 6 parcels of private single-family properties. This project should be evaluated thoroughly and determine if a better alignment is available.

Basin B Capital Improvement Project Summary

A summary of the recommended capital improvement projects for Basin B is shown in Table 2 below. This table does not include any improvement projects that are part of the yearly replacement due to age.

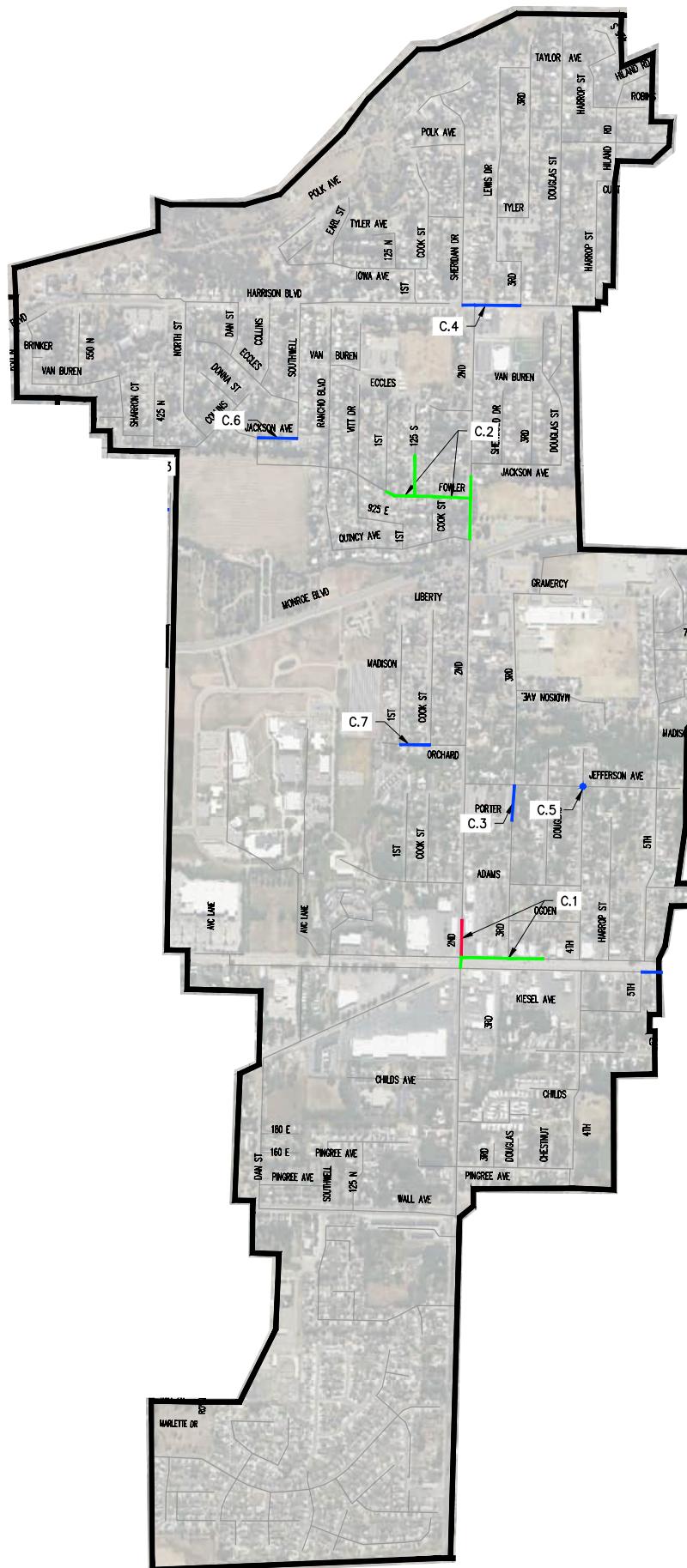
Table 2- Basin B Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|-------------------------------|--|-------------|-----------|----------|-------------|
| B.1 | Washington and North Capacity | Upsize 8-in line on Washington Blvd from North St to 475 N. (392 LF) | \$383,376 | \$38,017 | \$23,705 | \$445,098 |
| B.2 | North St Capacity | Upsize 10-in line on North St between Washington Blvd and Wall Ave. (1,995 LF) | \$1,973,055 | \$156,084 | \$77,428 | \$2,206,567 |
| B.3 | 500 N/North St Maintenance | Replace 8-in line extending from North St east of Quincy up to 500 N. (596 LF) | \$569,180 | \$51,928 | \$31,656 | \$652,764 |

1.3 Basin C

Basin C is also located in the northern portion of Ogden City and is centered along 2nd St. This basin is approximately 1.8 square miles and drains about 2,645 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to an 18-in. line and then discharges to CWSID directly or turns south into basin D and then drains to CWSID. The majority of connections in this basin are anywhere from 50 to 80 years old and typically concrete. Pipe diameters found in this basin are 8, 10, 12, 15, and 18-in. pipe.

Map Basin C-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN C-PRO

Capital Improvement Project C.1 – Capacity Related Project

Project C.1 is located on Washington Blvd from 2nd to 4th and the other running from Washington to Adams on 2nd St and Adams Ave. The primary goal of this project is to increase the capacity of the pipe in this segment by upsizing the existing 8 in. and 10 in line, and to increase slopes in some areas. The recommended size for the new segment is 15 in. pipe. The pipe length is 1,206 linear ft and should connect to the 15 in. line just before Washington Blvd.

Capital Improvement Project C.2 – Capacity Related Project

Project C.2 is located on Fowler Ave between 1st St and 2nd St. To increase the capacity in this segment, the existing 10 in line will need to be upsized and the pipe slope will need to be increased. Changing these elements of the pipe will allow this pipe segment to meet design criteria. The length of the existing segment is 268 linear ft.

Capital Improvement Project C.3 – Maintenance Related Project

Project C.3 is located on 3rd St that runs between Porter and Jefferson Ave. A new 8 in. sewer line should be installed between manhole #10960 and 10962 (332 ft). The existing 8 in. pipe is suspected of having I and I issues and could potentially be slip lined or replaced. This segment is approximately 351 ft in length. This replacement would decrease the monthly maintenance cost and resolve capacity issues. The total segment length is 683 linear ft.

Capital Improvement Project C.4 – Maintenance Related Project

Project C.4 is a maintenance-related project located on Harrison Blvd between Sheridan St and 3rd St. The purpose of this project is to remove and replace the existing 8 in. pipe. A new sewer line should be installed between Manhole #10960 and #10962 on 3rd St between Jefferson and Porter. This project should also be investigated to determine the best means to minimally impact the road since its last reconstruction was eight years ago. The length of the existing pipeline is approximately 540 linear ft.

Capital Improvement Project C.5 – Maintenance Related Project

Project C.5 is located at the intersection of Fourth St and Jefferson. The maintenance required here is the replacement of manhole #10954. The costs associated with this repair are mostly based on precast piece cost.

Capital Improvement Project C.6 – Maintenance Related Project

Project C.6 is a maintenance related project located on Jackson Ave between Southwell St to 253 N. The maintenance crew has to flush this pipe weekly, so the existing 8 in. pipe should be replaced using open trench cut methods. The improvement project is approximately 367 linear ft.

Capital Improvement Project C.7 – Maintenance Related Project

Project C.7 is a maintenance related project located on Orchard Ave from 1st St to Cook St. Due to bellies in the pipe, the goal of this project is to remove and replace the existing 8 in. sanitary sewer line to reduce clogging and decrease monthly-flushing costs. The pipe has a length of 281 linear ft and should be replaced using open trench cut methods.

Basin C Capital Improvement Project Summary

A summary of the recommended capital improvement projects for Basin C is shown in Table 3 below. Improvement projects that are part of the yearly replacement due to age are not included in this table.

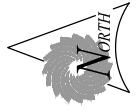
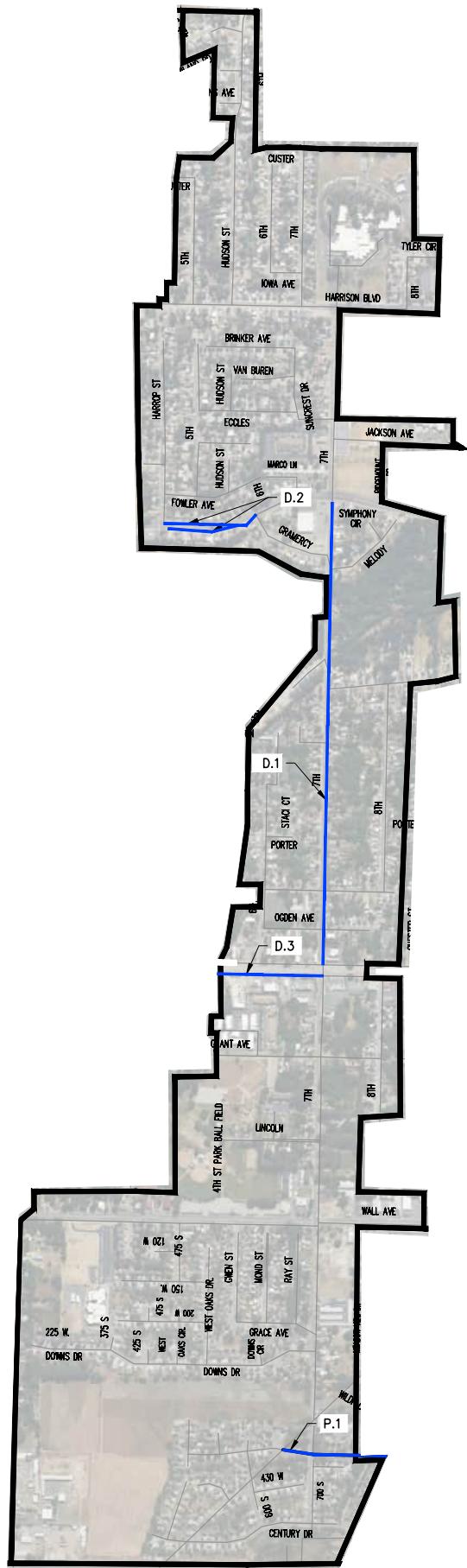
Table 3- Basin C Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|---------------------------------|---|--------------|-----------|----------|-------------|
| C.1 | 2nd and Washington Capacity | Sewer line upsizing and replacement, see project write up. (1,197 LF) | \$1,197,568 | \$98,452 | \$55,354 | \$1,351,374 |
| C.2 | Fowler Capacity | Adjust pipe slopes for 10-in lines around Fowler Ave. (1,742 LF) | \$1,703,676 | \$136,610 | \$70,987 | \$1,911,273 |
| C.3 | 3rd and Jefferson Capacity | Install new 8-in sewer line on 3rd St between Jefferson and Porter. (332 LF) CIPP 8-in line on 3rd St from Jefferson to first manhole to the east. (351 LF) | \$371,465.00 | \$37,146 | \$23,189 | \$431,800 |
| C.4 | 2nd St and Harrison Maintenance | Replace 8-in line on Harrison between 2nd and 3rd St. (535 LF) | \$510,925 | \$47,804 | \$29,011 | \$587,740 |
| C.5 | 4th and Jefferson Manhole | Replace manhole located at 4th St and Jefferson. | \$15,000.00 | \$1,845 | \$1,320 | \$18,165 |
| C.6 | N Jackson Ave Maintenance | Replace 8-in line on Jackson Ave from Southwell St to 253 N. (367 LF) | \$350,485 | \$35,562 | \$22,247 | \$408,295 |
| C.7 | Orchard Ave Maintenance | Replace 8-in line on Orchard Ave from 1st St to Cook St. (281 LF) | \$268,355 | \$28,772 | \$18,391 | \$315,518 |

1.4 Basin D

Basin D is also located in the northern portion of Ogden City and is centered along 7th St. This basin is approximately 1.0 square mile and drains about 1,655 sanitary sewer connections. No additional inflow is recorded from outside-city sources, but some flow arrives from other basins. Sewer discharge from this entire basin accumulates downstream to an 18-in. line, is combined with flow from Basin C (in a 22-in. line), and discharges through a 24-in. outfall to CWSID. The majority of connections in this basin are typically older than 60 years old and concrete material. Pipe diameters found in this basin are 8, 10, 12, 15, 18, 22, and 24-in. pipe.

Map Basin D-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN D-PRO



Capital Improvement Project D.1 – Maintenance Related Project

Project D.1 is a maintenance related project located on Seventh St from Washington Blvd to Monroe Blvd. The team will need to investigate the best way to resolve the capacity issue. The current recommendation is to slip line the existing 10 in and 12 in. pipe. The total length of the pipe section is 4,188 linear ft: 1,931 ft of 10 in pipe and 2,252 ft of 12 in. pipe.

Capital Improvement Project D.2 – Maintenance Related Project

Project D.2 is located on Monroe Blvd between Harrop St and 6th St. The primary goal is to remove and replace the existing 10 in and 8 in. pipes, while considering consolidating the pipeline into a single line. The 10 in line is approximately 135 linear ft while the 8 in. line is approximately 1,386 linear ft. (Approximately 1,521 ft total.)

Capital Improvement Project D.3 – Maintenance Related Project

Project D.3 is a capacity related project located on the west side of Washington Blvd between 5th St and 7th St, or manhole #443 to #471. The existing 8 in. pipe requires regular flushing due to inadequate slope and should be removed and replaced along the entire 1,090 LF length. Additionally, the new pipe should have an increased slope.

Basin D Capital Improvement Project Summary

As shown in the discussion above, Basin D has three Capital Improvement Projects. A summary of the recommended improvements is shown in Table 4 below. Improvement projects that are part of the yearly replacement due to age are not included in this table.

Table 4- Basin D Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|-----------------------------------|---|-------------|-----------|----------|-------------|
| D.1 | 7th St Maintenance/Capacity | CIPP 10-in and 12-in line on 7th St between Monroe Blvd and Washington Blvd. (4,183 LF) | \$737,487 | \$64,346 | \$38,810 | \$840,643 |
| D.2 | Monroe Maintenance | Replace 8-in and 10-in line in Monroe Blvd from Harrop St to 6-in St. (1,519 LF) | \$1,453,704 | \$118,019 | \$63,842 | \$1,635,565 |
| D.3 | Washington 5th to 7th Maintenance | Replace 8-in line on west side of Washington between 5th and 7th St and adjust slopes. (1,090 LF) | \$1,040,950 | \$86,228 | \$49,582 | \$1,176,760 |

1.5 Basin E

Basin E is located in the middle portion of Ogden City and is centered along Cross St. This basin is approximately 0.33 square miles and drains about 469 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 15-in. line and discharges into CWSID. The majority of connections in this basin are typically older than 80 years (with some updated pipe) and of concrete or PVC material. Pipe diameters found in this basin are 8, 10, and 15-in. pipe.

Map Basin E-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN E-PRO

Capital Improvement Project E.1 – Maintenance Related Project

Project E.1 is a maintenance related project located at 970 Adams Ave. This project involves replacing manhole #12449, and all of the connecting pipe sticks, to meet proper flowline characteristics.

Capital Improvement Project E.2 – Maintenance Related Project

Project E.2 is located on Grant Ave from Nineth St to Cross St. This project requires the removal and replacement of the existing 8 in. sanitary sewer pipe. A total of 355 linear ft of pipe should be replaced using an open cut trench and similarly sized pipe.

Capital Improvement Project E.3 – Maintenance Related Project

Project E.3 is a maintenance related project located on the west side of Washington Blvd north of Twelfth St. The existing 8 in. pipe will need to be upsized to a 10 in pipe. The length of the pipe is approximately 310 linear ft. Pipe bursting should be explored due to the extremely costly concrete road sections in the UDOT right of way.

Basin E Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 5 below.

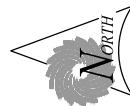
Table 5- Basin E Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|---------------------------------|--|--------------|----------|----------|------------|
| E.1 | 970 Adams Manhole Replacement | Replace manhole at approximately 970 Adams Ave. | \$ 15,000.00 | \$1,845 | \$1,320 | \$18,165 |
| E.2 | 9th St and Grant Maintenance | Replace 8-in line on Grant from 9th St to Cross St. (355 LF) | \$339,025 | \$34,671 | \$21,714 | \$395,411 |
| E.3 | 12th St and Washington Capacity | Upsize 8-in on the west side of Washington Blvd between 12th St and 1135 south. (303 LF) | \$296,334 | \$31,191 | \$19,645 | \$347,170 |

1.6 Basin F

Basin F is located in the middle portion of Ogden City and is centered along 12th St. This basin is approximately 0.19 square miles and drains about 374 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 12-in. line, flows into a larger 42-in. main line, then discharges into CWSID. The majority of connections in this basin are no older than 40 years (with minor stretches of older pipe). The pipe material is typically concrete, PVC, or clay material, and pipe diameters are 8, 10, and 12-in.es.

Map Basin F-PRO shows the basin configuration, but no improvement projects are currently suggested.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

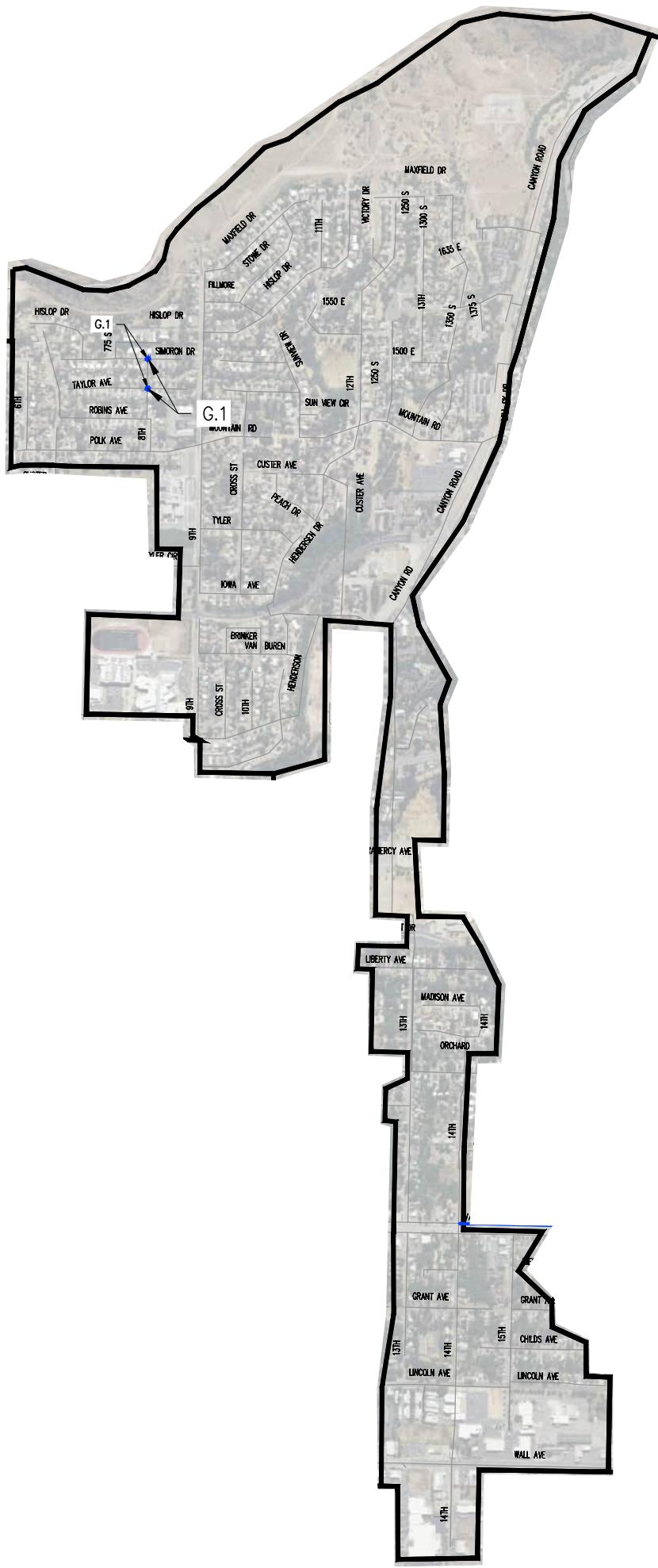
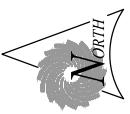
BASIN F-PRO



1.7 Basin G

Basin G is located in the middle portion of Ogden City and is centered along Canyon Rd. as well as 13th St. This basin is approximately 1.0 square mile and drains about 1,492 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 15-in. line, flows across basin Q in an 18-in. line, discharges into the city 42-in. mainline, and outfalls into CWSID. The majority of connections in this basin are 40 to 60 years old and concrete material. Pipe diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin G-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN G-PRO



Capital Improvement Project G.1 – Maintenance Related Project

Project G.1 is a maintenance project for replacing manhole #11185, located on 825 Simaron St, and manhole #11186, located on 815 Taylor St. both manholes need to be replaced to accommodate adequate flowline characteristics.

Basin G Capital Improvement Project Summary

A summary of the recommended Capital Improvement Project for this Basin is shown in Table 6 below,

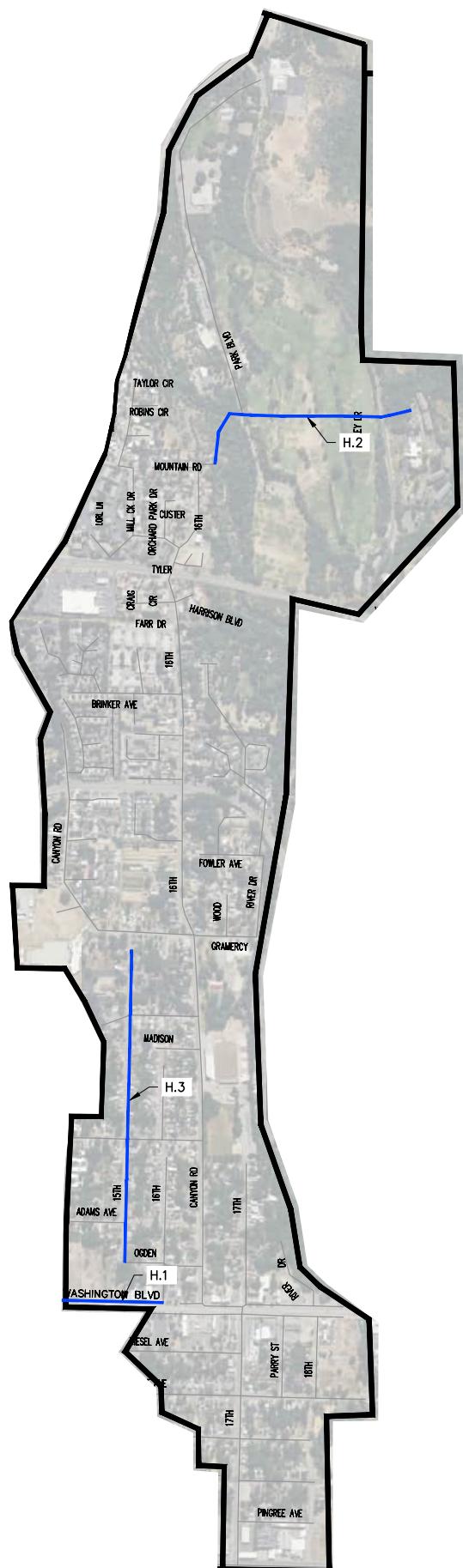
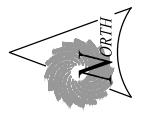
Table 6- Basin G Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|-----------------------------|--|--------------|---------|---------|------------|
| G.1 | 825 Simoron/Taylor Manholes | Replace MH 11185 and MH 11186 at 825 Simoron and 815 Taylor Ave. | \$ 15,000.00 | \$1,845 | \$1,320 | \$18,165 |

1.8 Basin H

Basin H is located in the middle portion of Ogden City and is centered along 16th St. This basin is approximately 0.92 square miles and drains about 1,246 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 15-in. line, flows across basin Q in an 18-in. line, discharges into the city 42-in. mainline, and outfalls into CWSID. The majority of connections in this basin are 40 to 60 years old with pipes older than 80 years near Washington Blvd. Pipe material is typically concrete, and diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin H-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN H-PRO



Capital Improvement Project H.1 - Maintenance Related Project

Project H.1 is a maintenance related project located on the east side of Washington Blvd between Fourteenth St and Sixteenth St. The existing 10 in concrete line is in poor condition and needs to be replaced using the open trench cut method. The section length is approximately 950 linear ft.

Capital Improvement Project H.2 – Maintenance Related Project

Project H.2 is located at the last length of the pipe exiting from the north side of the El Monte Golf Course. Approximately 65 ft of 8in. pipe will need to be removed and replaced between manhole #283 to #282. Upstream from there is a 470 ft of 8 in. pipe that will need to be slip lined, and downstream, 612 ft of 12 in. pipe that will need to be slip lined as well. In total this project covers approximately 1,200 linear ft of pipe.

Capital Improvement Project H.3 – Maintenance Related Project

Project H.3 is located along Fifteenth St between Ogden Ave and 826 E. This section of pipe is experiencing I and I issues that should be corrected by increasing the existing pipe size from 8 in. to 10 in along the entire 2,844 linear ft. The adjustments will help with pipe capacity and infiltration.

Basin H Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 7 below.

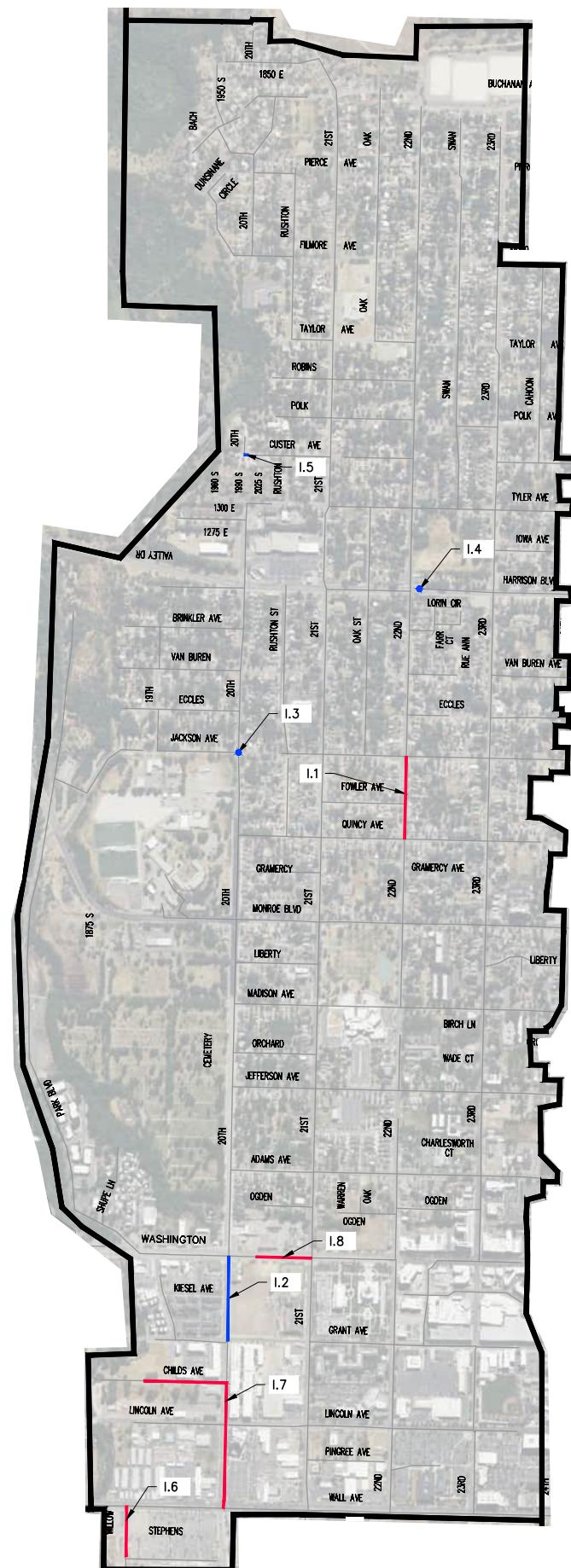
Table 7- Basin H Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|--|---|-------------|-----------|----------|-------------|
| H.1 | Washington Blvd 14th to 16th Maintenance | Replace 10-in line on the east side of Washington Blvd from 14th St to 16th St. (935 LF) | \$914,430 | \$77,463 | \$45,458 | \$1,037,350 |
| H.2 | El Monte Maintenance | Replace 8-in line north of the El Monte golf course; CIPP 8-in and 12-in lines upstream and downstream of the 8-in line. (2,146 LF) | \$403,602 | \$39,495 | \$24,562 | \$467,658 |
| H.3 | 15th St Capacity/Infiltration | Upsize 8-in line on 15th St between Ogden Ave and approximately 826 E. | \$2,781,432 | \$211,039 | \$97,608 | \$3,090,079 |

1.9 Basin I

Basin I is located in the middle portion of Ogden City and is aligned along 21st and 22nd St. This basin is approximately 1.7 square miles and drains about 3,344 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 12-in. line, flows across basin Q in a 20-in. line, discharges into the city 36-in. mainline, and outfalls into CWSID to the north. The majority of connections in this basin are older than 80 years or unknown. Pipe material is typically concrete or clay, and diameters found in this basin are 8, 10, and 12-in. pipe.

Map Basin I-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN I-PRO

Capital Improvement Project I.1 - Capacity Related Project

Project I.1 is a capacity related project located on 22nd St Between Quincy and Jackson. The critical pipe in the existing 8 in. stretch of pipe shows capacity deficiency under design criteria. Replacing the existing 759 linear ft of 8 in. line with a 12 in. sewer line gives the critical pipe in this section a reserve capacity.

Capital Improvement Project I.2 - Maintenance Related Project

Project I.2 is a maintenance related project on Twentieth St between Grant and Washington. There are two sewer lines that run on Twentieth street, one serving the north side of the street and the other servicing the south side. Crews report that the northern line is newer and in better condition. The primary goal of this project is to remove the southern line of Twentieth St and consolidate the northern and southern lines by connecting the southern laterals to the northern line. This repair applies to 778 linear ft of pipe.

Capital Improvement Project I.3 - Maintenance Related Project

Project I.3 is located at the intersection of Twentieth St and Jackson. This project is in conjunction with the in-house design of the Twentieth St Phase 2 reconstruction and will be part of the reconstruction.

Capital Improvement Project I.4 - Maintenance Related Project

Project I.4 is located at 2202 Harrison Blvd. The goal of this project is to replace existing manhole #2598 with one of similar size. This project impacts one manhole and all connecting pipes, and it should be accomplished through open trench methods.

Capital Improvement Project I.5 - Maintenance Related Project

Project I.5 is a maintenance related project located at 201 Custer Ave. The 8 in. pipe in this intersection needs removal and replacement of the existing 8 in. pipe and the manhole it connects to (MH #12014). The length of the segment needing replacement is 31 linear ft. Open cut installation is proposed for this project.

Capital Improvement Project I.6 - Capacity Related Project

Project I.6 is a capacity related project located on Willow Street. The existing 8 in. pipe needs to be upsized to a 10 in. pipe from MH #734 to MH #733. The length of the segment needing replacement is 484 linear ft. Open cut installation is proposed for this project.

Capital Improvement Project I.7 - Capacity Related Project

Project I.7 is capacity related project located at 20th St and Childs Ave. The existing 8 in. pipe on Childs Ave needs to be upsized to a 12 in. pipe from MH #12383 to MH #10461. The length of the segment needing replacement is 760 linear ft. The existing 10 in. pipe on 20th St needs to be upsized to a 15 in. pipe from MH #10461 to MH #738. The length of the segment needing replacement is 1,151 linear ft. Open cut installation is proposed for this project.

Capital Improvement Project I.8 - Capacity Related Project

Project I.8 is a capacity related project located on Washington Ave. The existing 10 in. pipe on needs to be upsized to a 15 in. pipe from MH #1554 to MH #667. The length of the segment needing replacement is 511 linear ft. Open cut installation is proposed for this project.

Basin I Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 8 below.

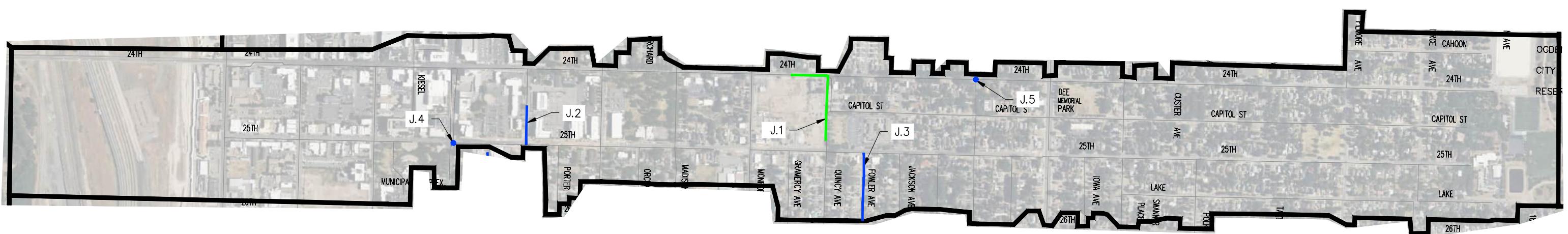
Table 8- Basin I Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|----------------------------|---|--------------|-----------|----------|-------------|
| I.1 | 22nd St Capacity | Upsize 8-in line on 22nd St between Quincy Ave and Jackson Ave. (759 LF) | \$753,699 | \$53,298 | \$39,028 | \$846,025 |
| I.2 | 20th St Consolidation | Consolidate the two sewer mains on 20th St between Grant and Washington. (778 LF) | \$760,884 | \$66,031 | \$39,864 | \$866,779 |
| I.3 | 20th and Jackson Manhole | Replace MH 1248 at 20th and Jackson. | \$15,000.00 | \$1,845 | \$1,320 | \$18,165 |
| I.4 | 2202 Harrison Manhole | Replace MH 2598 at approximately 2202 Harrison Blvd. | \$ 15,000.00 | \$1,845 | \$1,320 | \$18,165 |
| I.5 | Custer Ave Maintenance | Replace 8-in line at 2001 Custer Ave. (31 LF) | \$29,605 | \$3,641 | \$2,605 | \$35,852 |
| I.6 | Willow St Capacity | Upsize 8" line on Willow St, from MH734 to MH733. (484 LF) | \$473,352 | \$45,000 | \$27,486 | \$545,837 |
| I.7 | 20th & Childs Capacity | Upsize 8" line on Childs Ave (760 LF), and upsize 10" line on 20th St from Childs to Wall Ave. (1,151 LF) | \$1,916,452 | \$152,040 | \$76,183 | \$2,144,675 |
| I.8 | Washington & 21st Capacity | Upsize 10" line on Washington Blvd, from south of 20th St to 21st St. (511 LF) | \$517,132 | \$48,256 | \$29,299 | \$594,687 |

1.10 Basin J

Basin J is located in the middle portion of Ogden City and is centered along Capitol and 25th St. This basin is approximately 0.63 square miles and drains about 1,334 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 12-in. line, flows across basin Q in a 20 and 21-in. line, discharges into the city 30-in. mainline, and outfalls into CWSID to the north. The majority of connections in this basin are older than 80 years or unknown. Pipe material is typically clay, and diameters found in this basin are 8, 10, and 12-in. pipe.

Map Basin J-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN J-PRO

SUNRISE
ENGINEERING

Capital Improvement Project J.1 - Capacity Related Project

Project J.1 is a capacity related project located on Quincy St between 24th St and 25th St. The existing line is a 10 in sewer line that experiences surcharges under design criteria simulation. The goal of this project is to upsize the 10 in line and increase the pipe slope sufficiently to increase the capacity and meet the minimum velocity. The length of the pipeline is approximately 1,155 linear ft.

Capital Improvement Project J.2 – Maintenance Related Project

Project J.2 is a maintenance related project located on Adams Ave from 25th St to 2550. The existing 8 in. pipe has severe calcium deposits that restrict access for maintenance and video inspections. The 399 ft of line should be removed and replaced using open trench cut methods from manhole #11993 to manhole #12928.

Capital Improvement Project J.3 – Maintenance Related Project

Project J.3 is located on Fowler Ave between 25th St and 26th St. The goal for this project is to upsize the existing 6 in line to an 8 in. line. The segment covers approximately 692 linear ft and should be replaced using an open trench cut method.

Capital Improvement Project J.4 – Maintenance Related Project

Project J.4 is a maintenance related project located at the intersection of 25th St and Washington Blvd. The goal for this project is to replace manhole #681 with a manhole that has adequate flowline characteristics.

Capital Improvement Project J.5 – Maintenance Related Project

Project J.5 is a maintenance related project located at the intersection of 24th St and Van Buren. The goal for this project is to replace the existing manhole with a manhole that has adequate flowline characteristics.

Basin J Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 9 below.

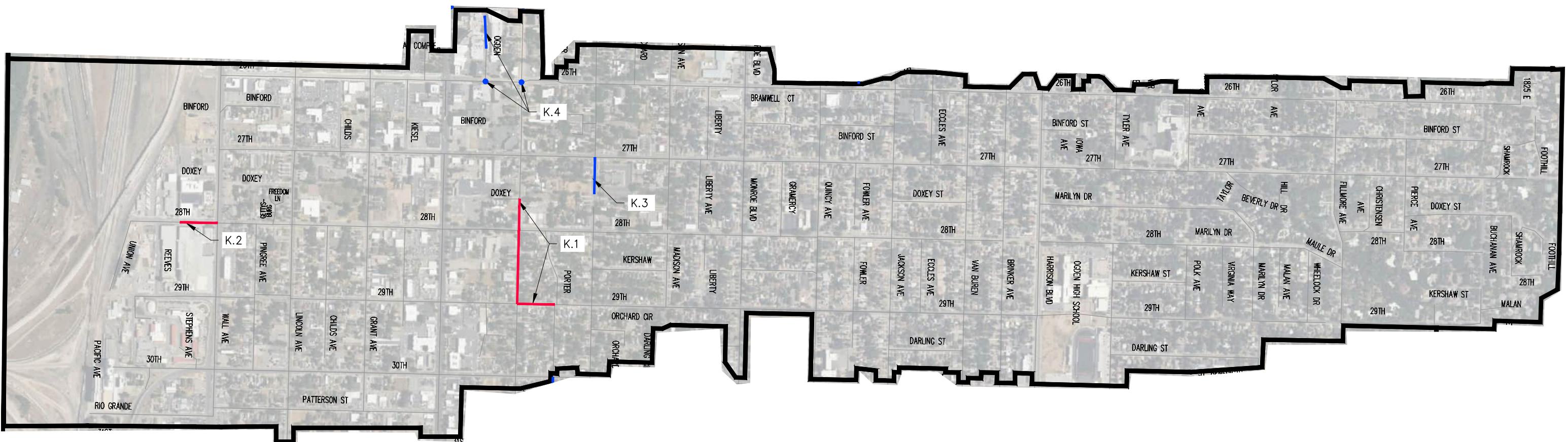
Table 9- Basin J Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|-----------------------------|--|-------------|----------|----------|-------------|
| J.1 | Quincy and 24th Capacity | Adjust slopes for 10-in and 12-in line on Quincy Ave and 24th St. (1,042 LF) | \$1,023,256 | \$84,835 | \$48,902 | \$1,156,993 |
| J.2 | 25th and Adams Maintenance | Replace 8-in line on Adams from 25th to 2550. (399 LF) | \$381,045 | \$37,848 | \$23,605 | \$442,498 |
| J.3 | Fowler Ave Capacity | Upsize 6-in line on Fowler between 25th and 26th. (692 LF) | \$660,860 | \$58,673 | \$35,543 | \$755,076 |
| J.4 | 25th and Washington Manhole | Replace MH 681 on the east side of 25th and Washington. | \$ 15,000 | \$1,845 | \$1,320 | \$18,165 |
| J.5 | 24th and Van Buren Manhole | Replace MH 11979 at Van Buren and 24th St. | \$ 15,000 | \$1,845 | \$1,320 | \$18,165 |

1.11 Basin K

Basin K is located in the middle portion of Ogden City and is centered along 27th and 28th St. This basin is approximately 1.2 square miles and drains about 3,494 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to 12 and 15-in. lines, flows across basin Q in an 18-in. line, discharges into the city 24-in. mainline, and outfalls into CWSID to the north. The majority of connections in this basin are older than 80 years. Pipe material is typically clay, and diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin K-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN K-PRO



Capital Improvement Project K.1 - Capacity Related Project

Project K.1 is a capacity related project located on Adams Ave between 2850 and 29th St as well as 67 linear ft of piping going south from Doxey. The primary goal of this project is to increase the capacity of the existing line by upsizing the existing 10 in pipe and increasing the pipe slope as required. The total length of pipe is approximately 1,460 linear ft. All pipe replacement will be done using open trench cut methods.

Capital Improvement Project K.2 - Capacity Related Project

Project K.2 is a capacity project located on 28th St between Reeves St and Wall St. Replacing the existing 8 in. pipe with a 10 in pipe increases the residual capacity of the line. Additionally, these 385 linear ft sections of pipe should be adjusted to increase the pipe slope. Pipe replacement will be accomplished using open trench cut methods.

Capital Improvement Project K.3 - Maintenance Related Project

Project K.3 is a capacity project located on Jefferson Ave between 27th and 28th St. The primary goal of this project is to replace the existing 8 in. pipe due to the severe calcium deposits in the area. Additionally, these 377 linear ft sections of pipe should be adjusted to increase the pipe slope. Pipe replacement will be accomplished using open trench cut methods.

Capital Improvement Project K.4 – Maintenance Related Project

Project K.4 is a maintenance related project located at the intersection of 26th St and Ogden Ave, the intersection of 26th St and Adams St, and Ogden Ave from 2550 to 26th St. The existing manholes at the intersections listed need to be replaced with properly sized manholes with adequate flowline characteristics. The section of pipe listed needs to be spot repaired. All replacement and repairs should be accomplished using an open trench cut.

Basin K Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 10 below.

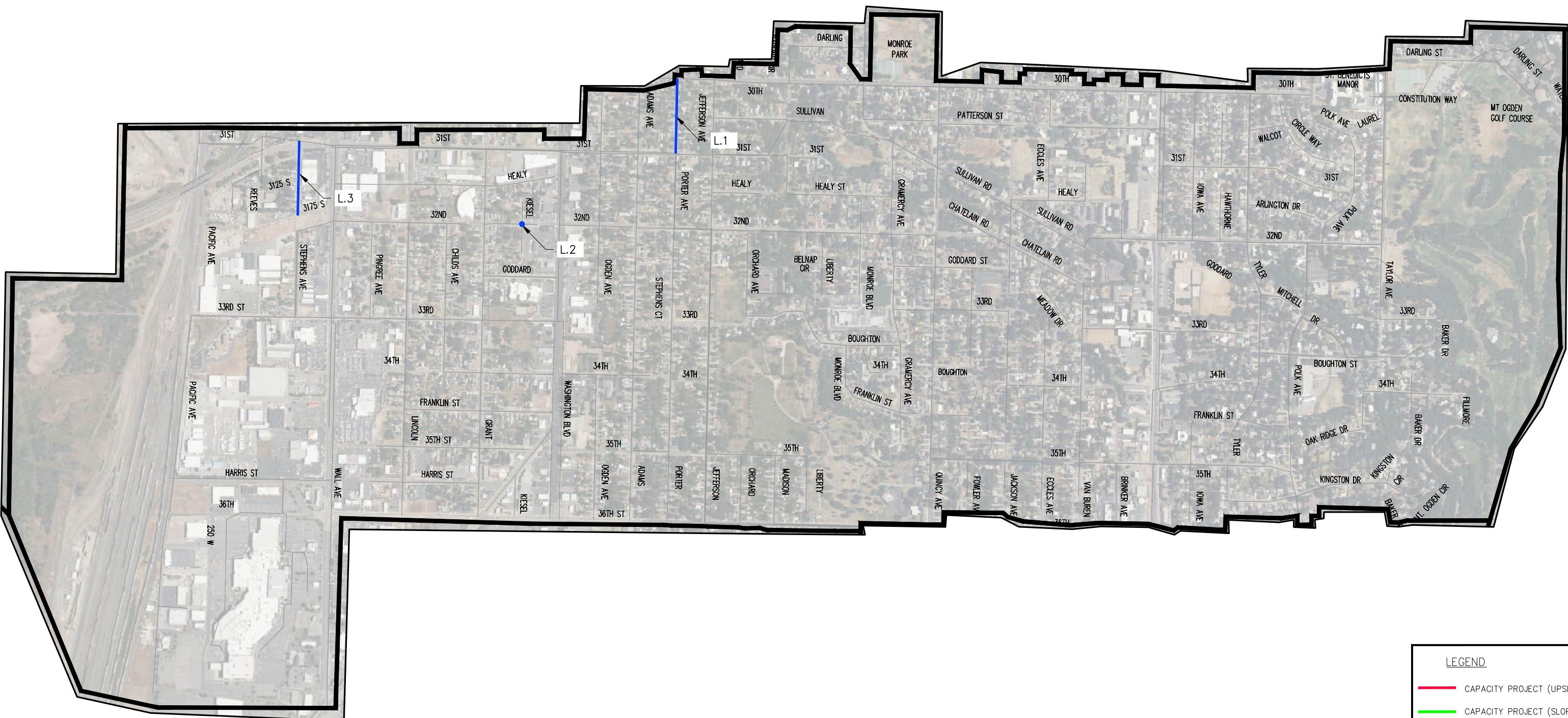
Table 10- Basin K Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|--------------------------------|--|-------------|-----------|----------|-------------|
| K.1 | 29th and Adams Capacity | Upsize 8-in and 10-in line on 29th from Jefferson to Adams, and Adams from 29th to Doxey. (1,460 LF) | \$1,439,716 | \$116,964 | \$63,409 | \$1,620,089 |
| K.2 | 28th and Wall Capacity | Upsize 8-in line on 28th St from Wall Ave to Union Ave. (386 LF) | \$377,508 | \$37,590 | \$23,453 | \$438,551 |
| K.3 | 27th and Jefferson Maintenance | Replace 8-in line on Jefferson Ave from 27th St to 2750 S. (377 LF) | \$360,035 | \$36,291 | \$22,682 | \$419,007 |
| K.4 | 26th and Ogden Maintenance | Replace MH 12164 and MH 12163; and pipeline spot repair at approximately 2525 Ogden Ave. | \$30,000 | \$3,690 | \$2,640 | \$36,330 |

1.12 Basin L

Basin L is located in the southern portion of Ogden City and is centered along 33rd St. This basin is approximately 2.6 square miles and drains about 4,118 sanitary sewer connections. Inflow from South Ogden also contributes to the flow. Sewer discharge from the eastern portion of the basin accumulates downstream to 18 and 21-in. lines, collects into the city 21-in. mainline (along Wall Ave.), and outfalls westward to CWSID. The western portion of the basin collects into the 21-in. mainline directly and outfalls to CWSID. The majority of connections in this basin are between 60 and 80 years old. Pipe material is typically concrete or clay, and diameters found in this basin are 8, 10, 12, 15, 18, 21 and 24-in. pipe.

Map Basin L-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



Capital Improvement Project L.1 – Maintenance Related Project

Project L.1 is located on Porter Ave from 30th St to 31st St. The existing line is an 8 in. clay line of 759 linear ft and will need to be removed and replaced. Maintenance crews plan to include this project to be bid out in Fall 2023. The existing line will be removed and replaced using open trench cut methods.

Capital Improvement Project L.2 – Maintenance Related Project

Project L.2 is a maintenance related project located at the intersection of 32nd St and Kiesel. The existing manhole (#10119) needs to be replaced with a properly sized manhole with adequate flowline characteristics. Additionally, the connections to the manhole need to be replaced to obtain adequate flowline characteristics.

Capital Improvement Project L.3 – Maintenance Related Project

Project L.3 is located on Stephens Ave between 32nd St and 31st St. A portion of this 8 in. sewer line replacement was accomplished in conjunction with the previous Master Sewer Plan, but progress was stopped because of issues with DOT. This project includes 759 linear ft and should be revisited when UDOT elects to do some work in that area.

Basin L Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 11 below.

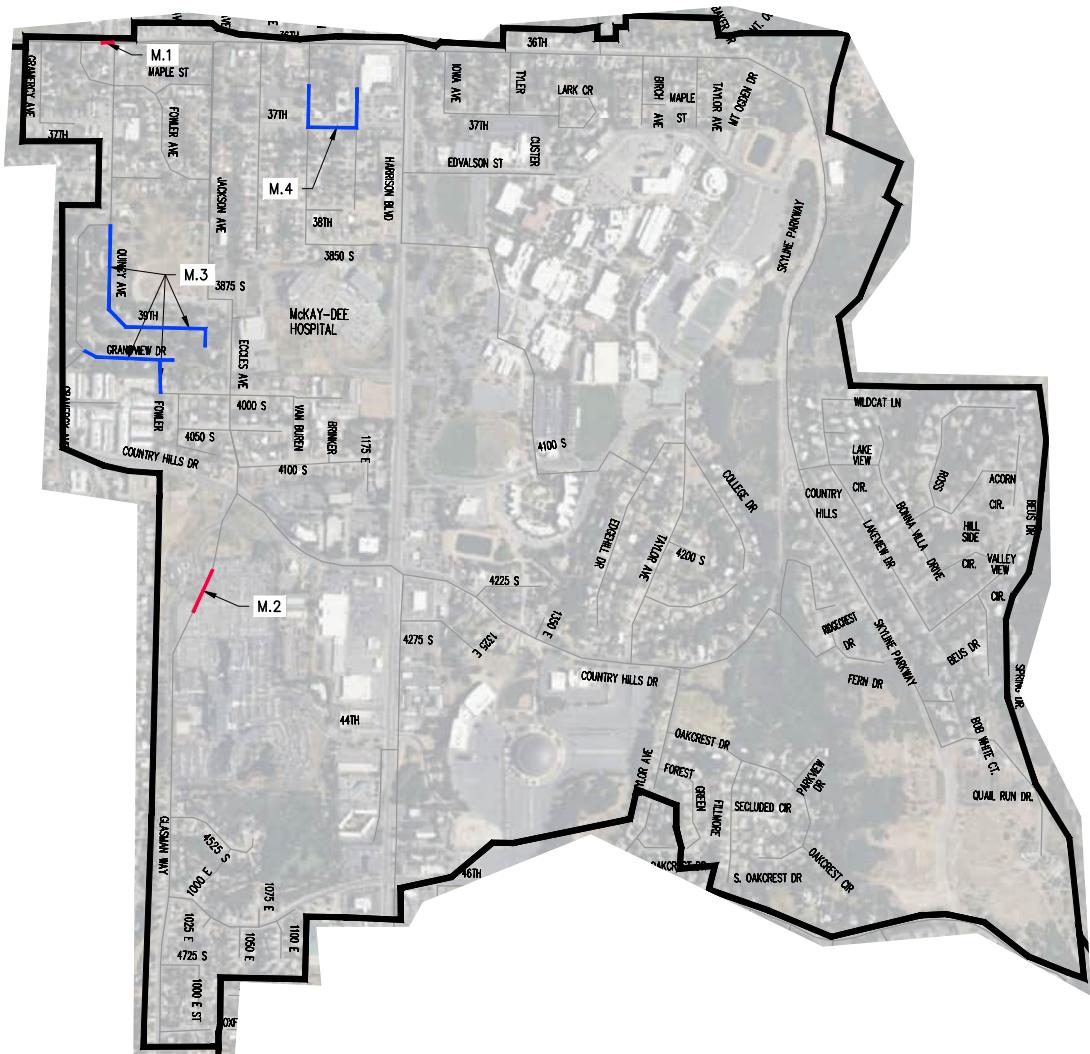
Table 11- Basin L Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|------------------------------|---|-------------|----------|----------|------------|
| L.1 | 29th and Porter Maintenance | Replace 8-in line on Porter from 29th to 30th. (759 LF) | \$724,845 | \$63,426 | \$38,237 | \$826,508 |
| L.2 | 32nd and Kiesel Manhole | Replace MH 10119 at 32nd and Kiesel. | \$ 15,000 | \$1,845 | \$1,320 | \$18,165 |
| L.3 | Stephens Maintenance Phase 2 | Replace 8-in line from 32nd St to 31st St. (759 LF) | \$724,845 | \$63,426 | \$38,237 | \$826,508 |

1.13 Basin M

Basin M is located in the southern portion of Ogden City and is found from Skyline Parkway on the east (around Weber State University) to about Gramercy Ave. on the west. This basin is approximately 1.6 square miles and drains about 1,374 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to 12 and 15-in. lines, flows across basin L in an 18-in. line, discharges into the city 21-in. mainline, and outfalls into CWSID to the west. The majority of connections in this basin are 60 years old. Pipe material is typically concrete or PVC, and diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin M-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN M-PRO



Capital Improvement Project M.1 - Capacity Related Project

Project M.1 is a capacity related project located on 36th St starting at Quincy and going to quarter way to Gramercy Ave. The goal for this project is to increase the capacity by upsizing the existing 10 in pipe to a 15 in. pipe. The total length of pipe is 101 linear ft, and all pipe removal must be accomplished using open trench cut methods.

Capital Improvement Project M.2 – Capacity Related Project

Project M.2 is a capacity project located under the northwest portion of the McKay Dee Hospital Parking Lot. The existing 8 in. pipe needs to be removed and replaced with a larger pipe. The length of the pipe segment is 368 linear ft. All pipe replacement will be performed using open trench cut methods.

Capital Improvement Project M.3 – Maintenance Related Project

Project M.3 is a maintenance project located on Grandview Drive between Gramarcy Drive and Fowler Ave, with another section on Quincy Ave that rounds the corner until it runs parallel to Jackson Ave. The goal of this project is to remove and replace the existing 8 in. pipe along the 2,591 linear ft length. All pipes should be replaced using open trench cut methods.

Capital Improvement Project M.4 – Maintenance Related Project

Project M.4 is a maintenance related project located on 37th St between Brinker Ave and Van Buren with portions of this project extending onto Brinker and Van Buren between 36th St and 37th St. The purpose of this project is to remove and replace the existing 8 in. pipe using open trench cut methods. The pipe is approximately 1,022 linear ft in length.

Basin M Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 12 below.

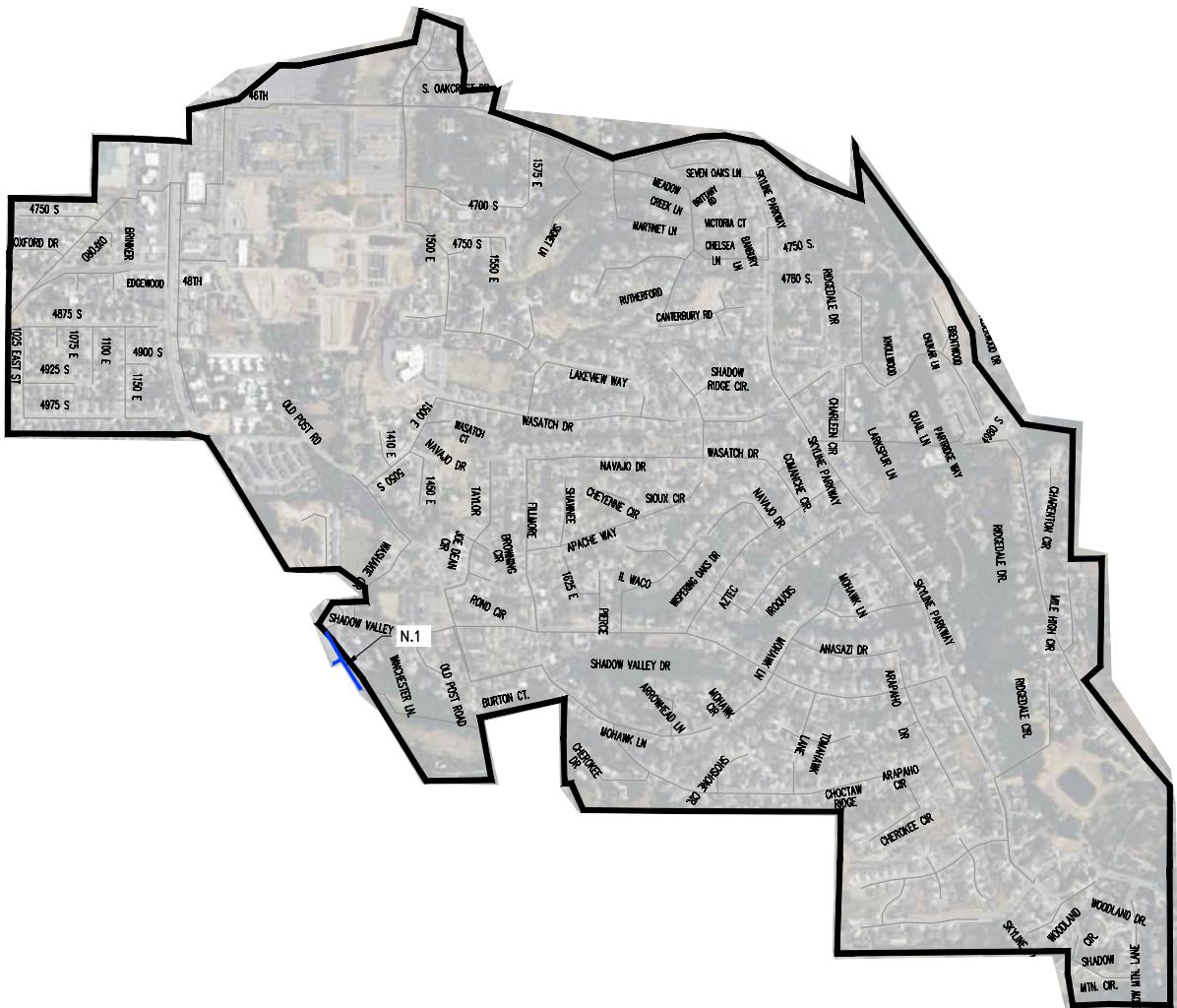
Table 12- Basin M Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|---|--|-------------|-----------|----------|-------------|
| M.1 | 36th and Quincy Capacity | Upsize 10-in line on 36th St from east of Maple St to Quincy. (101 LF) | \$99,889 | \$12,286 | \$8,790 | \$120,966 |
| M.2 | McKay Dee Hospital Capacity | Upsize 8-in line by McKay-Dee Hospital. (368 LF) | \$359,904 | \$36,281 | \$22,676 | \$418,860 |
| M.3 | Grandview Acres Phase 2 and 930 E 40th St Maintenance | Replace 8-in lines near Grandview Park, see project write up. (2,591 LF) | \$2,474,405 | \$190,783 | \$90,632 | \$2,755,820 |
| M.4 | Van Buren M Maintenance | Replace 8-in line on Brinker, 37th and 1100 E. (1,022 LF) | \$976,010 | \$81,477 | \$47,317 | \$1,104,804 |

1.14 Basin N

Basin N includes the southernmost portion of Ogden City and is on the east bench between Harrison Blvd. and Ridgedale Dr. This basin is approximately 1.4 square miles and drains about 1,433 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to 8 and 12-in. lines and discharges into both South Ogden and Uintah sewer systems to the south and southwest. The majority of connections in this basin are 3 to 60 years old. Pipe material is typically concrete or PVC, and diameters found in this basin are 8, 10, and 12-in. pipe.

Map Basin N-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

BASIN N-PRO



Capital Improvement Project N.1 – Maintenance Related Project

Project N.1 is a maintenance related project located on Harrison Blvd between Old Post Road and Shadow Valley Drive. The goal of this project is to replace the existing 12 in. pipe due to deterioration. The segment of pipe is 610 linear ft and should be replaced using open trench cut methods.

Basin N Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 13 below.

Table 13- Basin N Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|--|---|-------------|----------|----------|------------|
| N.1 | 5151 S Harrison Blvd Maintenance | Replace 12-in line on Harrison Blvd, south of Shadow Valley Dr. (610 LF) | \$603,290 | \$54,256 | \$33,141 | \$690,688 |

1.15 Basin O

Basin O (also known as BDO) is located in the northwest portion of Ogden City centered on ward avenue, which runs diagonally northeast through the basin. This basin is approximately 2.7 square miles and drains only 302 sanitary sewer connections. No additional inflow is recorded from outside-city sources; however, sewer discharges from this entire basin and from basins A through K, and P through R, accumulate downstream to outfall in the CWSID mainline. Several other outfalls to CWSID lines are also recorded in this Basin. There is also a BDO Lift Station which pumps flow towards the west. The majority of connections are upward of 10 years old or unknown age. Pipe material is typically PVC, and diameters found in this basin are 8, 10, 12, 15, 18, and 24-in. pipe (in addition to the large CWSID mainlines).

Map Basin O-PRO shows the basin configuration, but no improvement projects are currently suggested.



LEGEND

- CAPACITY PROJECT (UPSIZE)
- CAPACITY PROJECT (SLOPE)
- MAINTENANCE
- EXISTING PIPES

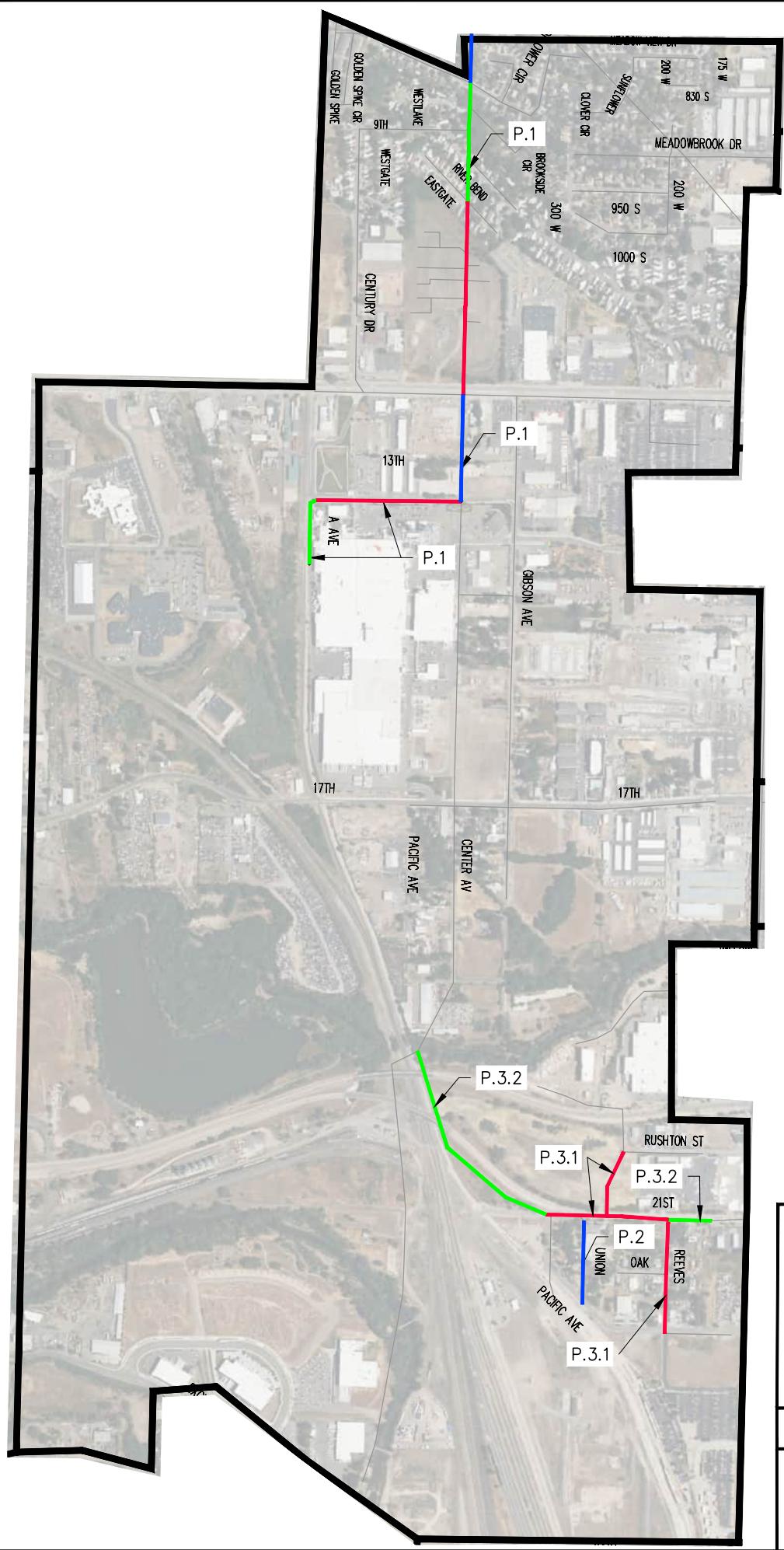
BASIN Q-PRO



1.16 Basin P

Basin P is located in the middle portion of Ogden City and centered along 17th St. west of Washington Blvd. This basin is approximately 1.5 square miles and drains approximately 778 sanitary sewer connections. No additional inflow is recorded from outside-city sources. Sewer discharge from this entire basin accumulates downstream to a 24-in. line and discharges into the CWSID line heading northwest. The majority of connections are between 40 and 80 years old. Pipe material is typically concrete, clay, or PVC, and diameters found in this basin are 8, 10, 12, 15, 18, 20, 21, and 24-in. pipe.

Map Basin P-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



Capital Improvement Project P.1 - Capacity Related Project

Project P.1 is a capacity related project located on Center Ave between Ward Ave and 13th St. The primary goal of this project is to increase the capacity of the existing line by upsizing the existing 456 ft of 10 in pipe to 15 in., 971 ft of 18 in. pipe to 21 in, and 3,753 ft of 24in pipe to 30 in, and increasing the pipe slope as required for each. The total length of pipe to be replaced is 3,760 linear ft. All pipe replacement will be done using open trench cut methods.

Capital Improvement Project P.2 - Maintenance Related Project

Project P.2 is a maintenance related project located on Union Ave from Pacific St up to 21st St. The primary goal of this project is to remove, replace and deepen the existing 8 in. pipe. The existing pipe starts extremely shallow at approximately four ft in depth. The total length of pipe is approximately 560 linear ft. All pipe replacement will be done using open trench cut methods.

Capital Improvement Project P.3.1 - Capacity Related Project

Project P.3.1 is a capacity related project located on 21st St and Gibson Ave. The primary goal of this project is to increase the capacity of the existing line by upsizing the existing 1,217 ft of 8 in pipe to 12 in., 416 ft of 12 in. pipe to 15 in, and 407 ft of 15in pipe to 18 in, and increasing the pipe slope as required for each. All pipe replacement will be done using open trench cut methods.

Capital Improvement Project P.3.2 - Capacity Related Project

Project P.3.2 is a capacity related project located on 21st St. The primary goal of this project is to increase the capacity of the existing line by upsizing the existing 1,484 ft of 18 in pipe to 24 in. and increasing the pipe slope for the existing 290 ft of 8 in pipe. All pipe replacement will be done using open trench cut methods.

Basin P Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 14 below.

Table 14- Basin P Recommended Capital Improvement Projects

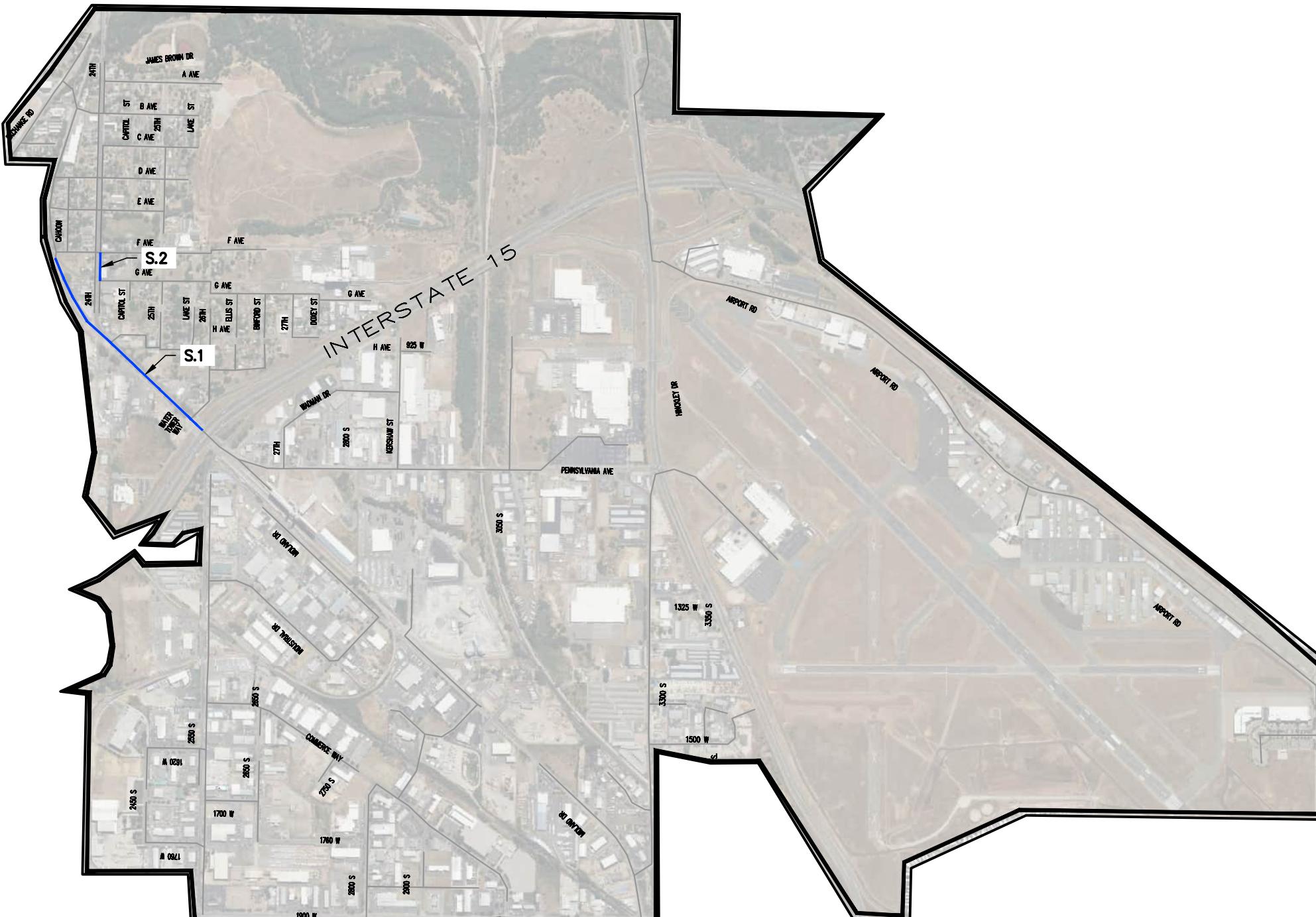
| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|--|---|-------------|-----------|-----------|-------------|
| P.1 | 12th St Trunk Line Capacity | Upsize Fresenius sewer mains, see project write up. (5,180 LF) | \$6,217,385 | \$404,292 | \$185,008 | \$6,806,685 |
| P.2 | Union Ave Maintenance | Adjust slopes of 8-in line on Union Ave from Pacific to 20th St. (559 LF) | \$533,845 | \$49,459 | \$30,068 | \$613,372 |
| P.3.1 | Gibson & 21st St & Reeves Ave Capacity | Upsize 8" line from MH10252 to MH10261 and from MH1099 to MH1813 (1,217 LF). Upsize 12" line on 21st Street from MH10261 to MH1813 (416 LF). Upsize 12"& 15" line on 21st Street from MH1813 to MH10257 (407 LF). | \$2,050,734 | \$161,592 | \$79,458 | \$2,291,784 |
| P.3.2 | 21st St Capacity | Upsize 18" line from MH10257 to MH1081 (1,484 LF). Adjust | \$1,933,094 | \$153,232 | \$76,555 | \$2,162,880 |

| | | | | | | |
|--|--|--|--|--|--|--|
| | | slopes of 8" line from MH740 to MH10261 (290 LF). | | | | |
|--|--|--|--|--|--|--|

1.17 Basin S

Basin S is located at the southwest end of Ogden City and is centered around the airport, I-15, and Commerce Way. This basin is approximately 4.1 square miles and drains about 976 sanitary sewer connections. Inflow from Roy City also contributes to the flow. Sewer discharge from this basin accumulates in 10 and 12-in. lines west of I-15 and outfalls into CWSID lines heading west. Several other discharge points from the center of the basin and the Roy inflow also discharge into CWSID lines located on the east end of the basin through 8 and 15-in. lines. The majority of connections in this basin are anywhere between 3 and 80+ years old. Pipe material is typically concrete, PVC or CIPP, and diameters found in this basin are 8, 10, 12, and 15-in. pipe.

Map Basin S-PRO shows suggested improvement projects that will address capacity deficiency and maintenance issues in the system.



| LEGEND | |
|---------------------------|------------------------|
| CAPACITY PROJECT (UPSIZE) | |
| CAPACITY PROJECT (SLOPE) | |
| MAINTENANCE | |
| EXISTING PIPES | |
| BASIN S-PRO | |
| | SUNRISE ENGINEERING |

Capital Improvement Project S.1 - Maintenance Related Project

Project S.1 is a maintenance related project located on Midland Drive from I-15 to F Ave. The goal of this project is to evaluate the capacity of the 15 in. 2,701 LF sewer line. Based on the findings from preliminary investigation, the 15 in. pipeline should be slip lined.

Capital Improvement Project S.2 - Maintenance Related Project

Project S.2 is located west of 24th St between F Ave and G Ave. The existing 8 in. pipe should be removed and replaced. The line is 330 linear ft and should be replaced using an open trench cut method.

Basin S Capital Improvement Project Summary

A summary of the recommended Capital Improvement Projects for this Basin is shown in Table 15 below.

Table 15- Basin S Recommended Capital Improvement Projects

| Project | Name | Description | Const. Cost | Design | CM | Total Cost |
|---------|------------------------------|--|-------------|----------|----------|------------|
| S.1 | Pennsylvania Ave Maintenance | CIPP 15-in line from I-15 running Northeast to F Ave. (2,701 LF) | \$551,004 | \$50,670 | \$30,845 | \$632,519 |
| S.2 | W 24th St Maintenance | Replace 8-in line on 24th St from F to G Ave. (330 LF) | \$315,150 | \$32,757 | \$20,561 | \$368,468 |

APPENDIX B

COSTS, PUBLIC WORKS LIST, PIPE SURVIVAL, AGREEMENTS, STATE FORMS,
PREVENTATIVE MAINTENANCE PROGRAM, EMERGENCY CALLS
PROCEDURES, SANITARY SEWER OVERFLOW ACTION PLAN

CIPP 8"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|--------------------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 6,047.15 | \$ 6,047.15 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 8" Pipe | 500 | LF | \$ 54.00 | \$ 27,000.00 |
| 6 | 8" Sewer By-Pass | 500 | LF | \$ 6.26 | \$ 3,131.50 |
| 7 | Pipe Cleaning | 500 | LF | \$ 3.00 | \$ 1,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 66,518.65 | |
| | | | | LF 500 | |
| | | | | \$/LF \$ 134.00 | |
| | | | | 15% Contingency \$ 20.10 | |
| | | | | Total \$/LF \$ 155.00 | |

CIPP 10"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|--------------------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 6,470.36 | \$ 6,470.36 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 10" Pipe | 500 | LF | \$ 59.00 | \$ 29,500.00 |
| 6 | 10" Sewer By-Pass | 500 | LF | \$ 9.73 | \$ 4,863.58 |
| 7 | Pipe Cleaning | 500 | LF | \$ 3.00 | \$ 1,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 71,173.94 | |
| | | | | LF 500 | |
| | | | | \$/LF \$ 143.00 | |
| | | | | 15% Contingency \$ 21.45 | |
| | | | | Total \$/LF \$ 165.00 | |

CIPP 12"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|--------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 7,284.00 | \$ 7,284.00 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 12" Pipe | 500 | LF | \$ 71.00 | \$ 35,500.00 |
| 6 | 12" Sewer By-Pass | 500 | LF | \$ 14.00 | \$ 7,000.00 |
| 7 | Pipe Cleaning | 500 | LF | \$ 3.00 | \$ 1,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 80,124.00 | |
| LF | | | | 500.00 | |
| \$/LF | | | | \$ 161.00 | |
| 15% Contingency | | | | \$ 24.15 | |
| Total \$/LF | | | | \$ 186.00 | |

CIPP 14"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|-----------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 7,589.46 | \$ 7,589.46 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 14" Pipe | 500 | LF | \$ 72.67 | \$ 36,335.00 |
| 6 | 14" Sewer By-Pass | 500 | LF | \$ 18.44 | \$ 9,219.58 |
| 7 | Pipe Cleaning | 500 | LF | \$ 3.00 | \$ 1,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 83,484.04 | |
| | | | | LF | 500.00 |
| | | | | \$/LF | \$ 167.00 |
| | | | | 15% Contingency | \$ 25.05 |
| | | | | Total \$/LF | \$ 193.00 |

CIPP 15"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|--------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 8,041.94 | \$ 8,041.94 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 15" Pipe | 500 | LF | \$ 73.50 | \$ 36,750.00 |
| 6 | 15" Sewer By-Pass | 500 | LF | \$ 20.66 | \$ 10,329.37 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 88,461.31 | |
| LF | | | | 500.00 | |
| \$/LF | | | | \$ 177.00 | |
| 15% Contingency | | | | \$ 26.55 | |
| Total \$/LF | | | | \$ 204.00 | |

CIPP 18"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 9,388.43 | \$ 9,388.43 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 18" Pipe | 500 | LF | \$ 91.50 | \$ 45,750.00 |
| 6 | 18" Sewer By-Pass | 500 | LF | \$ 29.59 | \$ 14,794.35 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 103,272.78 | |
| LF | | | | \$ 500.00 | |
| \$/LF | | | | \$ 207.00 | |
| 15% Contingency | | | | \$ 31.05 | |
| Total \$/LF | | | | \$ 239.00 | |

CIPP 20"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 10,404.20 | \$ 10,404.20 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 20" Pipe | 500 | LF | \$ 104.00 | \$ 52,000.00 |
| 6 | 20" Sewer By-Pass | 500 | LF | \$ 37.40 | \$ 18,702.03 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 114,446.24 | |
| LF | | | | \$ 500.00 | |
| \$/LF | | | | \$ 229.00 | |
| 15% Contingency | | | | \$ 34.35 | |
| Total \$/LF | | | | \$ 264.00 | |

CIPP 21"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 10,899.59 | \$ 10,899.59 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 21" Pipe | 500 | LF | \$ 110.00 | \$ 55,000.00 |
| 6 | 21" Sewer By-Pass | 500 | LF | \$ 41.31 | \$ 20,655.88 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 119,895.47 | |
| LF | | | | \$ 500.00 | |
| \$/LF | | | | \$ 240.00 | |
| 15% Contingency | | | | \$ 36.00 | |
| Total \$/LF | | | | \$ 276.00 | |

CIPP 22"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|-----------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 11,416.14 | \$ 11,416.14 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 22" Pipe | 500 | LF | \$ 116.67 | \$ 58,335.00 |
| 6 | 22" Sewer By-Pass | 500 | LF | \$ 44.97 | \$ 22,486.41 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 125,577.55 | |
| | | | | LF | 500.00 |
| | | | | \$/LF | \$ 252.00 |
| | | | | 15% Contingency | \$ 37.80 |
| | | | | Total \$/LF | \$ 290.00 |

CIPP 24"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|-----------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 12,448.75 | \$ 12,448.75 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 24" Pipe | 500 | LF | \$ 130.00 | \$ 65,000.00 |
| 6 | 24" Sewer By-Pass | 500 | LF | \$ 52.29 | \$ 26,147.48 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 136,936.23 | |
| | | | | LF | 500.00 |
| | | | | \$/LF | \$ 274.00 |
| | | | | 15% Contingency | \$ 41.10 |
| | | | | Total \$/LF | \$ 316.00 |

CIPP 30"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|--------------|
| 1 | Mobilization | 1 | LS | \$ 16,303.85 | \$ 16,303.85 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 30" Pipe | 500 | LF | \$ 170.00 | \$ 85,000.00 |
| 6 | 30" Sewer By-Pass | 500 | LF | \$ 89.40 | \$ 44,698.48 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 179,342.33 | |
| LF | | | | \$ 500.00 | |
| \$/LF | | | | \$ 359.00 | |
| 15% Contingency | | | | \$ 53.85 | |
| Total \$/LF | | | | \$ 413.00 | |

CIPP 33"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|---------------|
| 1 | Mobilization | 1 | LS | \$ 18,774.99 | \$ 18,774.99 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 33" Pipe | 500 | LF | \$ 200.00 | \$ 100,000.00 |
| 6 | 33" Sewer By-Pass | 500 | LF | \$ 108.82 | \$ 54,409.87 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 206,524.86 | |
| LF | | | | 500.00 | |
| \$/LF | | | | \$ 414.00 | |
| 15% Contingency | | | | \$ 62.10 | |
| Total \$/LF | | | | \$ 477.00 | |

CIPP 36"

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|---------------|---------------|
| 1 | Mobilization | 1 | LS | \$ 21,246.13 | \$ 21,246.13 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 36" Pipe | 500 | LF | \$ 230.00 | \$ 115,000.00 |
| 6 | 36" Sewer By-Pass | 500 | LF | \$ 128.24 | \$ 64,121.26 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 233,707.39 | |
| LF | | | | \$ 500.00 | |
| \$/LF | | | | \$ 468.00 | |
| 15% Contingency | | | | \$ 70.20 | |
| Total \$/LF | | | | \$ 539.00 | |

CIPP 42'

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|------------------------|------|----------|-----------------|---------------|
| 1 | Mobilization | 1 | LS | \$ 25,347.33 | \$ 25,347.33 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 4 | Service Connections | 20 | EA | \$ 232.00 | \$ 4,640.00 |
| 5 | 42" Pipe | 500 | LF | \$ 265.00 | \$ 132,500.00 |
| 6 | 42" Sewer By-Pass | 500 | LF | \$ 175.27 | \$ 87,633.35 |
| 7 | Pipe Cleaning | 500 | LF | \$ 9.00 | \$ 4,500.00 |
| 8 | Manhole Lining | 2 | EA | \$ 6,200.00 | \$ 12,400.00 |
| Sub-Total Price | | | | \$ 278,820.68 | |
| | | | | LF | 500.00 |
| | | | | \$/LF | \$ 558.00 |
| | | | | 15% Contingency | \$ 83.70 |
| | | | | Total \$/LF | \$ 642.00 |

Open Trench 8" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 37,721.98 | 37,721.98 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 6.26 | 3,131.50 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 8" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 161.51 | 80,755.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 414,941.82 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 830.00 |
| 15% Contigency | | | | | 124.50 |
| Total \$/LF | | | | | 955.00 |

Open Trench 10" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|--------------|---------------|
| 1 | Mobilization | 1 | LS | \$ 38,197.19 | \$ 38,197.19 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | \$ 1,500.00 | \$ 30,000.00 |
| 4 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 5 | SWPPP | 500 | LF | \$ 14.00 | \$ 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | \$ 9.73 | \$ 4,863.58 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | \$ 30.00 | \$ 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | \$ 60.00 | \$ 30,000.00 |
| 9 | 10" PVC (ASTM D3034) Sewer Pipe | 500 | LF | \$ 167.55 | \$ 83,775.00 |
| 10 | 60" Manhole | 2 | EA | \$ 8,000.00 | \$ 16,000.00 |
| 11 | Service Tap | 20 | EA | \$ 2,500.00 | \$ 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | \$ 122.00 | \$ 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | \$ 60.00 | \$ 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | \$ 16.67 | \$ 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | \$ 150.00 | \$ 30,000.00 |
| 16 | Landscaping | 500 | LF | \$ 20.00 | \$ 10,000.00 |
| Sub-Total Price | | | | | \$ 420,169.11 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 850.00 |
| 15% Contingency | | | | | 127.50 |
| Total \$/LF | | | | | 978.00 |

Open Trench 12" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|--------------|---------------|
| 1 | Mobilization | 1 | LS | \$ 38,783.33 | \$ 38,783.33 |
| 2 | Pre-Construction Video | 500 | LF | \$ 2.00 | \$ 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | \$ 1,500.00 | \$ 30,000.00 |
| 4 | Traffic Control | 500 | LF | \$ 21.60 | \$ 10,800.00 |
| 5 | SWPPP | 500 | LF | \$ 14.00 | \$ 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | \$ 14.00 | \$ 7,000.00 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | \$ 30.00 | \$ 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | \$ 60.00 | \$ 30,000.00 |
| 9 | 12" PVC (ASTM D3034) Sewer Pipe | 500 | LF | \$ 175.00 | \$ 87,500.00 |
| 10 | 60" Manhole | 2 | EA | \$ 8,000.00 | \$ 16,000.00 |
| 11 | Service Tap | 20 | EA | \$ 2,500.00 | \$ 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | \$ 122.00 | \$ 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | \$ 60.00 | \$ 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | \$ 16.67 | \$ 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | \$ 150.00 | \$ 30,000.00 |
| 16 | Landscaping | 500 | LF | \$ 20.00 | \$ 10,000.00 |
| Sub-Total Price | | | | | \$ 426,616.67 |
| LF | | | | | \$ 500.00 |
| \$/LF | | | | | \$ 860.00 |
| 15% Contigency | | | | | \$ 129.00 |
| Total \$/LF | | | | | \$ 989.00 |

Open Trench 15" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 39,696.77 | 39,696.77 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 20.66 | 10,329.37 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 15" PVC (ASTM F-679) Sewer Pipe | 500 | LF | 186.61 | 93,305.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | 436,664.48 | |
| LF | | | | 500.00 | |
| \$/LF | | | | 880.00 | |
| 15% Contingency | | | | 132.00 | |
| Total \$/LF | | | | 1,012.00 | |

Open Trench 18" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----|--|------|----------|-----------------|-------------|
| 1 | Mobilization | 1 | LS | 40,921.77 | 40,921.77 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 29.59 | 14,794.35 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 18" PVC (ASTM F-679) Sewer Pipe | 500 | LF | 202.18 | 101,090.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| | | | | Sub-Total Price | 450,139.45 |
| | | | | LF | 500.00 |
| | | | | \$/LF | 910.00 |
| | | | | 15% Contingency | 136.50 |
| | | | | Total \$/LF | 1,047.00 |

Open Trench 21" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 42,529.92 | 42,529.92 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 41.31 | 20,655.88 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 21" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 222.62 | 111,310.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 467,829.13 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 940.00 |
| 15% Contigency | | | | | 141.00 |
| Total \$/LF | | | | | 1,081.00 |

Open Trench 24" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 44,036.58 | 44,036.58 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 52.29 | 26,147.48 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 24" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 241.77 | 120,885.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 484,402.40 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 970.00 |
| 15% Contigency | | | | | 145.50 |
| Total \$/LF | | | | | 1,116.00 |

Open Trench 27" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 46,090.05 | 46,090.05 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 67.26 | 33,632.12 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 27" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 267.87 | 133,935.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 506,990.50 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 1,020.00 |
| 15% Contigency | | | | | 153.00 |
| Total \$/LF | | | | | 1,173.00 |

Open Trench 30" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 49,126.18 | 49,126.18 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 89.40 | 44,698.48 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 30" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 306.46 | 153,230.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 540,388.00 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 1,090.00 |
| 15% Contigency | | | | | 163.50 |
| Total \$/LF | | | | | 1,254.00 |

Open Trench 36" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 54,454.96 | 54,454.96 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 128.24 | 64,121.26 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 36" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 374.19 | 187,095.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 599,004.55 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 1,200.00 |
| 15% Contingency | | | | | 180.00 |
| Total \$/LF | | | | | 1,380.00 |

Open Trench 42" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 60,905.67 | 60,905.67 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 175.27 | 87,633.35 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 42" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 456.18 | 228,090.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 669,962.35 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 1,340.00 |
| 15% Contigency | | | | | 201.00 |
| Total \$/LF | | | | | 1,541.00 |

Open Trench 48" Pipe Per 500' Segment

| No. | Description | UNIT | QUANTITY | UNIT PRICE | TOTAL PRICE |
|-----------------|--|------|----------|------------|-------------|
| 1 | Mobilization | 1 | LS | 68,238.34 | 68,238.34 |
| 2 | Pre-Construction Video | 500 | LF | 2.00 | 1,000.00 |
| 3 | Service Lateral Cleanout | 20 | EA | 1,500.00 | 30,000.00 |
| 4 | Traffic Control | 500 | LF | 21.60 | 10,800.00 |
| 5 | SWPPP | 500 | LF | 14.00 | 7,000.00 |
| 6 | Bypass Pumping & Televising | 500 | LF | 228.72 | 114,360.10 |
| 7 | Imported Pipe Bedding - Drain Gravel | 500 | LF | 30.00 | 15,000.00 |
| 8 | Imported Trench or Structural Backfill | 500 | LF | 60.00 | 30,000.00 |
| 9 | 48" PVC (ASTM D3034) Sewer Pipe | 500 | LF | 549.38 | 274,690.00 |
| 10 | 60" Manhole | 2 | EA | 8,000.00 | 16,000.00 |
| 11 | Service Tap | 20 | EA | 2,500.00 | 50,000.00 |
| 12 | 4" Service Stub | 600 | LF | 122.00 | 73,200.00 |
| 13 | Remove/Replace Curb & Gutter | 200 | LF | 60.00 | 12,000.00 |
| 14 | Removal Bituminous Surfacing | 500 | LF | 16.67 | 8,333.33 |
| 15 | 4" Hot Plant Mix Bituminous Surfacing | 200 | TN | 150.00 | 30,000.00 |
| 16 | Landscaping | 500 | LF | 20.00 | 10,000.00 |
| Sub-Total Price | | | | | 750,621.77 |
| LF | | | | | 500.00 |
| \$/LF | | | | | 1,510.00 |
| 15% Contigency | | | | | 226.50 |
| Total \$/LF | | | | | 1,737.00 |

2. Sanitary Sewer Design Standards

All Sanitary Sewer installation and design shall comply with Ogden City's Sanitary Sewer Master Plan.

1. New sewer lines shall be inspected by closed circuit television after completion of the backfill and finish grading, but prior to the placement of pavement or other resurfacing.
 - a. Sewer lines less than eight feet (8') in length, and can be visually inspected, are not required to be televised.
 - b. All closed circuit television work shall be done at the expense of the contractor.
 1. CCTV personnel are to be certified under the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP).
 2. Ogden City reserves the right to have any portion of the pipe televised again, at the Contractor's expense, based on inaccurate or unclear information.

A. Sewer Pipe Main Standards

2. Minimum mainline size shall be 8" in diameter.
3. Allowable sanitary sewer main pipe material for all projects in the City of Ogden:
 - a. PVC (Polyvinyl Chloride) SDR 35 or other approved wall thickness for mainlines and laterals. Sewer main shall be green in color.
 - b. HDPE (High Density Polyethylene) SDR 19 or SDR 17 or approved equal for other wall thickness (corrugated HDPE pipe is not approved for use).
 1. HDPE material must be approved by the City Engineer prior to being installed.
 - c. CIPP Lining (Cure in Place Pipe) can be used to repair a main with the approval of the City Engineer.
 1. Installation and material tests of cured-in-place-pipe (CIPP) must meet the minimum requirements demonstrated in the following ASTM standards:
 2. ASTM F-1216 Standard Practice for the Installation of C.I.P.P. Pipe by Inversion Lining
 3. ASTM D-638 Test Method for Tensile Properties of Plastics Tensile Strength 3,000 psi
 4. ASTM D-790 Test Method of Flexural Properties of Plastic Flexural Strength 4,500 psi Flexural Modulus 250,000 psi
 5. NASSCO Wastewater Collection Systems Maintenance and Rehabilitation- 10th Edition: Chapters titled "TV Inspection" and "Sewer Line Cleaning."
4. Sewer mainlines shall be marked with a six inch (6") detectable green colored locator tape, and shall display "Sanitary Sewer", or "Underground Utility" on it.
5. Standard sewer mainline alignment within the public Right-of-Way shall be 10 feet (10') west or 10 feet (10') south of the roadway centerline.
6. Minimum depth of the sewer mainlines shall be 7 feet (7') of cover to the finish grade. Maximum depth will be set forth by the manufacturer recommendations and will need to be verified if over 12 feet.
7. Horizontal clearance to any culinary water line shall be at least 10 feet (10').
 - a. Any other utility crossing the sewer main shall do so as close to a right angle as possible.

- b. Perpendicular or skewed crossings between other utilities and sewer mains shall have a minimum clearance of 18 inches (18") (or as approved by the Utah Department of Health).
 - 1. Closer tolerances require a protection between the mains/services in combination with no mechanical joints on either utility within a 10 foot (10') radius of the crossing. All crossings must have the approval of the City Engineer.

8. Sewer Mainline grades shall provide a minimum velocity of 2.5 feet per second (2.5 ft/sec) when flowing 3/4 full are as follows: (grades less than what is listed below may be acceptable upon submittal, and approval by the City Engineer, of a detailed hydraulic analysis proving the minimum velocity can be met.)

| Example Minimum Pipe Slope to Ensure Table 2.5 feet per second (2.5 ft/sec) Velocity in Sanitary Sewer Flowing 3/4 Full (n=0.011 for PVC Pipe) | | |
|---|----------------------------|----------------------|
| Pipe Size (inch) | 3/4 Pipe Flow (cfs) | Minimum Slope |
| 8 | 0.70 | 0.40% |
| 10 | 1.11 | 0.32% |
| 12 | 1.60 | 0.24% |
| 15 | 2.48 | 0.18% |
| 18 | 3.63 | 0.14% |
| 21 | 5.03 | 0.12% |
| 24* | 6.50 | 0.10% |

**Note: Any mainline 12" and larger must be approved by the City Engineer*

Table 1- Minimum Sewer Main Pipe Slope

B. Manhole Design Standards

- 1. Sewer manholes shall be installed:
 - a. At a maximum spacing of 400 feet (400').
 - b. At all changes in pipe size, slope, or alignment.
 - c. At any junction with other sewer lines
- 2. No drop manholes shall be allowed.
- 3. Sewer manholes shall be sized based on the following:
 - a. Four foot (4') diameter for:
 - 1) In-line manholes.
 - 2) Pipes under 12 inches (12") in diameter.
 - b. Five foot (5') diameter shall be required for the following:
 - 1) The deflection angle between pipes is greater than or equal to 45 degrees.
 - 2) When the manhole services three (3) or more lines.
 - 3) For pipes with a diameter of 12 inches (12") or greater.
 - 4) When the cover is greater than 15 feet (15').

Sewer Project List for Master Plan 2023 from Public Works

1. 12th Street Trunk Line Capacity. Line from 12th Street MH #337 north to the CWSD trunk line on 375 West at MH #379 needs to be upsized from 24" pipe to at least 30" pipe. Approximately 3,100 linear feet of pipe removal/replacement or pipe bursting required, 11 manholes. **P.1**
2. Washington Blvd 14th to 16th Maintenance. 10" concrete sewer on the east side of Washington boulevard from 14th Street to 16th Street is deteriorated and must be removed/replaced or pipe burst with new pipe. Approximately 950 linear feet of 10" pipe, 4 manholes. **H.1**
3. A.4 from previous master plan, 1050 N maintenance. Specifically, the lines around 800N and Jefferson Avenue. **A.4**
4. 25th & Adams Maintenance. 8" line on Adams from 25th to 2550 has severe calcium deposits and can no longer be video inspected or maintained. Line should be removed and replaced from MH11993 to 12928. 365 linear feet, 2 manholes. **J.2**
5. 27th & Jefferson Maintenance, line on Jefferson Avenue from 27th Street to 2750S has severe deposits and can no longer be video inspected or maintained. This line is not shown on our GIS google earth map, but would extend from MH 12932 south to the next manhole on Jefferson to the south. Approximately 365 linear feet of removal and replacement of 8" pipe. **K.3**
6. 5151 S Harrison Boulevard Maintenance. 12" concrete pipe on Harrison from MH 2541 to 13898 is severely deteriorated and must be removed & replaced or pipe burst. The 12" line crossing Harrison from MH#2545 to N-SO-5 must also be replaced. Approximately 625' of removal and replacement, 4 manholes. **N.1**
7. 29th & Porter Maintenance. 8" clay line on Porter from 29th to 30th requires removal & replacement, from MH#10495 to 13772. Approximately 760 linear feet of removal & replacement. We will look to include this section in the existing liberty & porter maintenance projects from the previous master plan, which we are currently planning on bidding out this Fall. **L.1**
8. 970 Adams Manhole Replacement. MH#12449 at approximately 970 Adams Avenue needs to be replaced with a new manhole with proper flowline characteristics. **E.1**
9. 9th Street & Grant Maintenance. 8" line on Grant from 9th Street to Cross Street needs to be removed & replaced. MH#10457 to #424. Approximately 355 linear feet, 2 manholes. **E.2**
10. 3rd & Jefferson Capacity. A new sewer line should be installed between MH 10960 and 10962 on 3rd Street between Jefferson and Porter. Currently, the flow is directed south to Douglass Street and then west. We suspect that infiltration from the canal leads to reported surcharges in this area. The line between MH

10960 and 10976 should be investigated for I&I and possibly lined to help prevent this. Approximately 335 linear feet of new sewer installation, 2 manholes. **C.3**

11. 7th Street Maintenance/Capacity. The line on 7th Street between Monroe Blvd and Washington Blvd should be investigated for capacity issues and either upsized or sliplined. MH#602 to #442. **D.1**
12. Pennsylvania Avenue Maintenance. The 15" line from I-15 running northeast to F Avenue needs to be evaluated for capacity and either up-sized or sliplined. This extends from MH#1136 to #12436. We are already working on design for the D avenue capacity project which will replace the line from 12436 east to D avenue and then connect north into Exchange Road. We have determined a price for CIPP installation on this run of approximately \$250,000 for C&L to complete the work. Approximately 2,500 linear feet, 10 manholes. **S.1**
13. 500 N/North Street Maintenance. The line extending from North Street just east of Quincy up through private property to 500N is shallow and requires replacement. This is from MH#13188 to #582. Approximately 600 linear feet of 8" pipe, 4 manholes. This will be uniquely challenging since it extends through at least 6 parcels of private single family property. This should be evaluated and determined if a better alignment is available. **B.3**
14. M.3 Van Buren M Maintenance. Project from previous master plan. We need to replace from MH 11912 to 11913 on Brinker, from 10649 to 11913 on 37th, and from 10852 to 10649 on 1100 East. **M.4**
15. El Monte Maintenance. The final length of pipe coming out the north side of El Monte golf course needs to be removed and replaced from MH#283 to #282. We should also evaluate the sections of pipe leading north under the river for CIPP, as well as the rest of the sewer line running through El Monte to the south for CIPP installation. **H.2**
16. 12th Street & Washington Capacity. The 8" line on the west side of Washington Blvd between 12th Street and 1135 south has been reported to be at capacity and must be up-sized. This extends from MH#323 to #1535. Approximately 310 linear feet, 2 manholes. Pipe bursting should be explored due to the extremely costly concrete road sections in the UDOT right of way. **E.3**
17. Monroe Maintenance. Both sewer lines in Monroe Blvd from Harrop Street down to 6th Street need to be replaced. This extends from MH #598 to #590. It is worth exploring the option of consolidating these lines into a single sewer main. Approximately 135 linear feet of 10" r/r, 1450 linear feet of 8" r/r, 9 manholes. **D.2**
18. 2nd Street & Harrison Maintenance. The sewer main in Harrison between 2nd and 3rd street is in need of replacement. MH# 2099 to #177. Approximately 540 linear feet of 8" pipe, 4 manholes. This should be investigated to determine the

best means of accomplishing this with minimal impacts to the road, since it was reconstructed less than 8 years ago. **C.4**

- 19. 20th Street consolidation. Maintenance crews report that we need to eliminate one line on 20th between Grant and Washington blvd. There are two sewer mains on 20th between Grant and Washington, with one serving the north side of the street and one serving the south. Crews report that the northern line is newer and in better condition, so we should look to connect any laterals from the south main into the north one to consolidate into a single sewer main on this road. **I.2**
- 20. 1025 East Maintenance. The line on 1000N between 1025 East and Mountain Road has bellies and grease issues and must be replaced from MH 2470 to 2417. Approximately 230 linear feet, 3 manholes. **A.5**
- 21. Union Avenue Maintenance. The line on Union Avenue from Pacific up to 20th Street starts out extremely shallow, under 4' in depth. MH 10253 to 10254. The manhole to the north on 20th street has proper depth, so the line should be re-ran deeper so that flows are better through this stretch. Approximately 560 linear feet, 3 manholes. **P2**
- 22. 1225 North Maintenance. Line leading west from Quincy on 1225 North needs to be replaced from MH 11784 to at least MH 12551. At least 125 linear feet, 2 manholes. Additional length of repair may be required upon inspection. **A.6**
- 23. Fowler Avenue Capacity. Existing 6" main on Fowler between 25th and 26th needs to be upsized to at least 8" pipe. Approximately 700 linear feet, 4 manholes. **J.3**
- 24. 26th & Ogden Avenue Manhole. MH 12164 at the intersection of 26th & Ogden Avenue needs to be replaced with a properly sized manhole with adequate flowline characteristics. **K.4**
- 25. Ogden Avenue Maintenance. Crews report a required spot repair at approximately 2525 Ogden Avenue, between MH 12161 and 12162. Can probably be combined with the 26th & ogden manhole project previously listed. **K.4**
- 26. 26th & Adams Manhole. MH 12163 at Adams and 26th Street needs to be replaced with a properly sized manhole with adequate flowline characteristics. Can probably be combined with the ogden avenue and 26th/ogden manhole projects previously listed. **K.4**
- 27. 20th & Jackson Manhole. Manhole 1248 at 20th & Jackson needs to be removed & replaced. We are currently starting in-house design on the 20th Street phase 2 reconstruction from Quincy to Harrison, so this will be included in that project. **I.3**
- 28. 25th & Washington Manhole. Manhole 681 on the east side of 25th & Washington needs to be replaced with a properly sized manhole with adequate flowline characteristics. **J.4**

29. 2202 Harrison Manhole. Crews report that we need to install or replace the manhole #2598 located at approximately 2202 Harrison Blvd. **I.4**
30. 4th & Jefferson Manhole. Manhole 10954 at 4th Street and Jefferson needs to be replaced with a properly sized manhole with adequate flowline characteristics. **C.5**
31. 32nd & Kiesel Manhole. Manhole 10119 at 32nd & Kiesel needs to be replaced with a properly sized manhole with adequate flowline characteristics. **L.2**
32. 15th Street Capacity/Infiltration. The line on 15th Street between Ogden Avenue and approximately 826 East fills up with infiltration during rain and runoff events. We need to increase the pipe size to accommodate for the higher flows. MH 13994 to MH 14034. Approximately 2900 linear feet, 10 manholes. This should be investigated to see if the I&I can be mitigated as well. **H.3**
33. 930 E 40th Street maintenance. The line between Grandview Drive and 40th Street from MH 10701 to 10689 needs to be removed and replaced. Approximately 265 linear feet, 2 manholes. **M.3**
34. North Jackson Avenue Maintenance. Line on Jackson Avenue from southwell Street to 253 North needs to be removed and replaced. MH 10889 to 10888. Approximately 370 linear feet, 2 manholes. **C.6**
35. Orchard Avenue Maintenance. Line on Orchard avenue from 1st Street to Cook Street needs to be removed and replaced due to bellies in the pipe. MH 10900 to 10902. Approximately 280 linear feet, 2 manholes. **C.7**
36. Custer Avenue Maintenance. The short run at 2001 Custer Avenue between MH 12014 and 12015 needs to be replaced. MH 12014 is also reported to be in need of replacement. Approximately 30 linear feet, at least 1 manhole. **I.5**
37. E 1050 North Maintenance. Line between gramercy and Monroe on 1050 N nees to be removed and replaced from MH 109 to 11475. Approximately 310 linear feet, 2 manholes. **A.2**
38. 24th and Van Buren Manhole. MH 11979 at van buren & 24th Street needs to be replaced with a properly sized manhole with adequate flowline characteristics. **J.5**
39. Grandview Acres Phase 2. Phase one of this project is now complete and the line was replaced on Grandview drive between Quincy and Gramercy due to extremely severe root infiltration. We will need to follow up and finish replacing the rest of the sewer mains through this subdivision on Grandview drive, 39th and Quincy avenue. Approximately 2300 linear feet, 11 manholes. We were able to protect in place the existing maholes with phase 1, since they were still in acceptable condition. This same option should be pursued for phase 2, where we simply remove and replace the pipes in place at the same grades. This can be combined with the 930 east 40th street maintenance project listed above. **M.3**

40. Washington 5th to 7th Maintenance. The line on the west side of Washington between 5th and 7th street has inadequate grades, and we should explore options to help alleviate the regular flushing maintenance it requires. MH 443 to 471. Approximately 1100 linear feet, 4 manholes. **D.3**
41. 825 Simoron/Taylor Manholes. MH 11185 and 11186 at 825 Simoron and 815 taylor Avenue respectively need to be removed and replaced. **G.1**
42. W 24th Street maintenance. The line on 24th Street between F and G avenue needs to be removed and replaced. MH 1126 to 1128. Approximately 330 linear feet, 2 manholes. **S.2**
43. Stephens Maintenance Phase 2. This was a previous master plan project that we completed between 33rd and 32nd Street. We originally planned to go all the way up to 31st Street and install a manhole at the direct tie in location into the CWSD 33" trunk line, but we found that that DTI location is right in the middle of 31st Street in the travel lanes and 20+ feet deep. This will be a UDOT nightmare. We can include it in the master plan from MH 1674 to DTI-8 but we may need to wait until UDOT elects to do some work in that area or completely realigns their arterial road network. Approximately 760 linear feet, 4 manholes. **L.3**

How to deal with aging sewers? - Statistical Life Data Analysis of Sewer-

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National Institute for Land and Infrastructure Management, MLIT

1. Introduction

Japan has invested over 80 trillion yen in wastewater infrastructure. Sewer length has reached above 380,000 km. Some 2000 wastewater treatment plants are under operation. In recent years, sewer cave-ins have been reported in increasing numbers. It brings safety concerns among stakeholders. Preventive maintenance and asset management are being cried out. In this paper, statistical life data analysis of sewer is presented. It enables local governments, which are wastewater operators, to project future investment needs for sewer rehabilitation and replacement.

2. Method

Statistical life data analysis was conducted with 2-parameter Weibull distribution. Weibull functions are shown in Table 1 for sewers at the age of t .

Table 1 Weibull Distribution

| definition | Weibull Function | |
|-------------------------------------|--|--|
| death rate | $\lambda(t) = \frac{f(t)}{R(t)} = \frac{b}{a} \cdot \left(\frac{t}{a}\right)^{b-1}$ | |
| probability density on death | $f(t) = \frac{\partial F(t)}{\partial t} = -\frac{\partial R(t)}{\partial t} = \frac{b}{a} \cdot \left(\frac{t}{a}\right)^{b-1} \cdot e^{-\left(\frac{t}{a}\right)^b}$ | |
| cumulative distribution on survival | $R(t) = 1 - F(t) = e^{-\left(\frac{t}{a}\right)^b}$ | |
| cumulative distribution on death | $F(t) = 1 - R(t) = 1 - e^{-\left(\frac{t}{a}\right)^b}$ | |

In the case of sewers, death is defined by having them rehabilitated or replaced. Rehabilitated or replaced sewers get 50 year of useful life newly in the account book. To know the death rate, a questionnaire survey was conducted to all the local

governments with sewer systems on August 2006. The questions were how many kilometers of sewers survived and died during FY 2005 by age and material. The surveyed materials were concrete, clay, and PVC, which are the majority.

3. Result & Discussion

As of FY 2005 end, entire sewer length was 383,031 km. Out of this, 342,290 km, 89% of the total was analyzed, whose ages were identified and which agreed with any of the three materials. Coefficient **a** and **b** resulted in 99.30 and 3.048

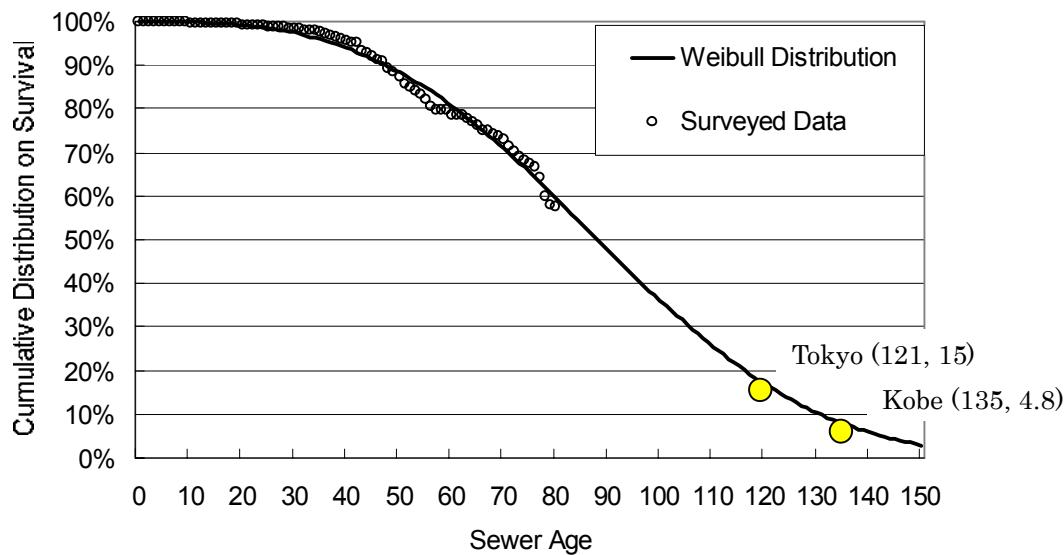


Figure 1 Survival Curve

To know the applicability of the curve to the more aged sewers, the oldest brick sewer data from two municipalities, Tokyo and Kobe were plotted. They are close to the approximation line. This analysis ignores specific factors influencing lives of sewers such as quality of the works, sewer standard of the times and how well or badly each sewer has been maintained. However, the curve is considered effective to project overall future investment needs if future investment decision is made similarly to the one in FY 2005.

Reference

Weibull distribution, http://en.wikipedia.org/wiki/Weibull_distribution

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WHOLESALE WASTEWATER TREATING CONTRACT
(Ogden City)

THIS AGREEMENT is made and entered into between the Central Weber Sewer Improvement District, an improvement district (hereinafter the "District"), and Ogden City, a municipality (hereinafter "Ogden City").

RECITALS:

A. WHEREAS, the parties were each created and established pursuant to and under the laws of the State of Utah, with power and authority to construct, operate and maintain systems for the collection of sewage and to provide for the treatment and disposition of sewage.

B. WHEREAS, under the provisions of Title 17B, Chapter 2a, Section 403, Title 10, Chapter 8, Sections 14 and 38, and Title 11, Chapter 8, Section 1, UTAH CODE ANN., 1953, as amended, the parties are authorized and empowered to contract with each other for the purpose of providing for the treatment and disposition of sewage.

C. WHEREAS, UTAH CODE ANN. § 10-8-38(2)(a) declares that, "[i]n order to defray the cost of constructing, reconstructing, maintaining, or operating a sewer system or sewage treatment plant, a municipality may: (i) require connection to the sewer system if the sewer is available and within 300 feet of the property line of a property with a building used for human occupancy; and (ii) make a reasonable charge for the use of the sewer system."

D. WHEREAS, the District owns and operates sewage treatment works and facilities.

E. WHEREAS, Ogden City owns and operates a sewage collection system.

F. WHEREAS, sewage collected by Ogden City is transported to one or more main outfall lines owned and operated by the District and the sewage is treated by the District.

G. WHEREAS, the District is planning for the construction of a major upgrade to its sewage treatment plant which will require the issuance of bonds.

H. WHEREAS, it is anticipated that one or more holders of bonds issued or to be issued by the District will require the District's wholesale customers to have executed acceptable written contracts with the District covering, among other things, the responsibility of Ogden City to pay for sewage treatment and disposal services provided by the District.

I. WHEREAS, the District is willing to continue to accept and treat sewage collected by Ogden City on a "wholesale" basis upon the satisfaction of the District's requirements including, but not limited to, adherence to the District's Wastewater Control Rules and Regulations and, for new service, the payment of an impact fee by the owner of the property being served or other responsible person.

Ogden City

2009-133

J. WHEREAS, Ogden City is responsible to install, maintain, operate and own such sewage collection lines and other facilities as are necessary to deliver untreated wastewater collected within the boundaries of Ogden City to one or more designated Outfall lines owned and operated by the District and to otherwise act as a "retail" service provider for sanitary sewage connections within Ogden City.

K. WHEREAS, the parties desire to enter into this Agreement under which sewage collected by Ogden City will be treated and disposed of by the District.

L. WHEREAS, the terms "wastewater" and "sewage", as used in this Agreement, have the same meaning.

M. WHEREAS, the parties, through their respective governing bodies, have determined that the interests and welfare of the public will best be served by entering into this Agreement.

NOW, THEREFORE, for and in consideration of the mutual covenants and agreements herein contained and other good and valuable consideration, the sufficiency of which is hereby acknowledged, the parties agree as follows:

I. COLLECTION AND TREATMENT OF SEWAGE

A. Purpose

The purpose of this Agreement is to provide for the treatment by the District of wastewater collected by Ogden City. Ogden City will collect wastewater originating within Ogden City (the "Service Area"). That wastewater will be delivered by Ogden City to outfall lines installed, operated and owned by the District. To the extent Ogden City utilizes connecting sewer lines owned and operated by any other wholesale customer of the District, Ogden City will be obligated to make appropriate arrangements with the other wholesale customer, and the District shall have no obligation or responsibility with respect to the same. Once the wastewater has been delivered to its outfall lines, the District will transport the wastewater to the District's sewage treatment plant and treat and dispose of the wastewater, pursuant to the provisions of this Agreement.

B. Definition of the Outfall Lines

The District's "outfall lines" include all main outfall and trunk lines and all pumps, lift stations, and any pressure line to the District's treatment plant, together with all related appurtenances and facilities that are designed to deliver wastewater from collection lines to the District's sewage treatment plant, including necessary real and personal property, rights-of-way, permits and easements. By entering into this Agreement, the District shall not be deemed to have committed to install outfall lines in addition to those outfall lines in existence as of the effective date of this Agreement. However, should the District elect to install additional outfall lines, such lines shall be included in the definition of "outfall lines" as provided herein.

C. Definition of the Collection Lines

The “collection lines” consist of sewage collection lines and other pipelines required to deliver sewage to the District’s outfall lines (excluding main trunk lines and outfall lines installed by the District) together with all related appurtenances and facilities that are designed to deliver wastewater collected within the Service Area to the outfall lines, including necessary real and personal property, rights-of-way, permits and easements.

D. Term of Agreement

The parties are entering into this Agreement under the Interlocal Cooperation Act, UTAH CODE ANN. § 11-13-101, *et seq.* (the “Act”) and it is their intent that this Agreement conform with the requirements of the Act. Should it fail to do so, however, this Agreement shall nevertheless be valid and enforceable. The term of this Agreement shall commence immediately upon the Agreement having been approved by both parties and shall terminate on the 50th anniversary of the effective date, unless extended by subsequent agreement of the parties. This Agreement may be terminated prior to the end of its term by the mutual written consent of the parties, which consent must be approved by each party with the same formality as the approval of this Agreement. Upon termination, all collection lines shall remain the property of Ogden City and all outfall lines and the treatment plant shall remain the property of the District.

E. Administration, Ownership and Operation

1. No Legal or Administrative Entity. No separate legal or administrative entity or administrative body is created by this Agreement. The District shall be responsible for planning, designing, financing, constructing, insuring, contracting, administering, owning, maintaining and operating the outfall lines and all other real and personal property obtained by the District in conjunction with or in furtherance of the purposes of this Agreement. Ogden City shall be responsible for planning, designing, financing, constructing, insuring, contracting, administering, owning, maintaining and operating the collection lines and all other real and personal property obtained by Ogden City in conjunction with or in furtherance of the purposes of this Agreement. It is recognized by the parties that Ogden City, in undertaking the financing, planning, construction, acquisition, operation and maintenance of the collection lines, and the District, in undertaking the financing, planning, construction, acquisition, operation and maintenance of the outfall lines, sewage treatment plant and other facilities, must comply with all licenses, permits and regulatory approvals necessary for the same. Ogden City’s activities pursuant to this Agreement will be administered by the Mayor or City Manager, as appropriate, subject to oversight by Ogden City Council where required by law, and the District’s activities pursuant to this Agreement shall be administered by the District’s General Manager, subject to oversight by the District Board of Trustees.

2. Maintenance of City Sewers. Ogden City shall have primary authority and responsibility for the collection lines and sewer laterals and other facilities within Ogden City’s Service Area. Nevertheless, pursuant to the District’s Wastewater Control Rules and Regulations, Ogden City acknowledges that the District has the authority to insure proper installation, testing and inspection of new and rehabilitated sewers in Ogden City’s system.

F. Sewage Treatment

1. Rules and Regulations

The District agrees to treat and dispose of all wastewater delivered into the outfall lines by Ogden City in accordance with this Agreement and the District's rules, regulations and other requirements as they presently exist or as they may be modified or amended in the future by the District. The satisfaction of the District's rules, regulations and other requirements and the payment of all fees and costs required to be paid to the District shall be a condition precedent to the District's obligation and responsibility to provide service. From time to time, the District shall have the right to adopt and modify wastewater control rules and regulations and other rules, regulations and requirements and applicable fees and costs in accordance with the requirements of state law. The District's rules, regulations, requirements, fees and costs shall apply to Ogden City and all sanitary sewer customers of Ogden City and be incorporated into and become a part of this Agreement from and after their respective effective dates. From and after the effective date of this Agreement, Ogden City agrees to include in all new contracts and commitments of Ogden City to provide "retail" sanitary sewer services to its customers a requirement that the customers are subject to and will be bound by the District's applicable rules, regulations and other requirements as they may be amended or modified by the District from time to time.

2. Payment Formula

At present, most cities and governmental entities served by the District are billed quarterly based upon a formula utilizing the property valuation, for county property tax purposes, the population of the area being served, and the District's annual operation and maintenance (O&M) budget, which may include capital replacement, debt service and reserves in addition to other operation and maintenance expenses. Pursuant to the formula, the District will establish an annual O&M budget, from which will be deducted miscellaneous revenues (excluding amounts billed to wholesale customers such as Ogden City), and the resulting balance is billed as follows: one-half of the remaining O&M balance, as reflected in the annual budget, is allocated to the District's wholesale customers based upon assessed property value within the wholesale customer's service area expressed as a percentage of the assessed property value of property lying within the District and within all of the District's wholesale customers that fall under this billing formula. The other half of the remaining balance is allocated to the affected wholesale customers based upon each wholesale customer's population expressed as a percentage of the total population falling under the assessment formula. Some wholesale customers of the District, particularly those with a limited number of connections, may not be included in the foregoing formula but may be required to pay based upon a monthly use charge applied to the number of equivalent residential units (ERUs) that are being served. The income received from such wholesale customers is treated as miscellaneous revenue and neither the assessed valuation nor the population of such wholesale customers factor into the billing methodology for the District's other wholesale customers. Ogden City agrees to pay its proportionate share of the cost of operating the District pursuant to the formula mentioned above or pursuant to any other formula, rate or methodology adopted by the Board of Trustees of the District after having first held a public hearing and otherwise having satisfied applicable requirements of Utah Code Ann. § 17B-1-643, as it may be amended, superceded or replaced. Since the initial billing methodology under this Agreement is based upon the District's

annual O&M budget, the parties recognize that costs may be greater or less than the amount budgeted and the District's miscellaneous revenues also may differ from the budget. As a consequence of those and other factors, the assessment formula may generate more money or less money than is actually required by the District. Should the District receive excess revenues, some amount may be rebated to wholesale customers, may be credited against future payments required to be made by wholesale customers, may be placed into one or more reserve accounts, or may otherwise be handled as determined by the District Board of Trustees. Conversely, should the District's revenues not be adequate, Ogden City agrees to pay its proportionate share of supplemental assessments as determined to be necessary from time to time by the District Board of Trustees. All payments from Ogden City to the District shall be due and payable on or before the 15th day of the month immediately following the calendar quarter, month, or other applicable time period to which the payment relates.

3. Payment Due Date

The first payment due under this Agreement shall be made by Ogden City on or before the 15th day of the month immediately after the applicable payment period during which this Agreement becomes effective. That payment shall consist of all amounts due for the prior applicable payment period and all time periods prior thereto that have not already been paid. Payment shall be due under this Agreement upon the District providing an invoice to Ogden City. Any amount owed to the District by Ogden City which is not paid when due shall bear interest thereafter at the rate of twelve percent (12%) per annum until paid.

4. City's Customers

Ogden City shall be responsible for billings and collections for all residences, commercial structures, schools, churches and other connections within the Service Area that deliver wastewater to Ogden City's collection lines or directly into the District's outfall lines ("retail customers", "retail connections" or "connections"). Ogden City shall solely be responsible for establishing rates and collecting from its retail customers and the amounts to be paid to the District pursuant to this Agreement shall be independent from amounts collected by Ogden City. Although the retail customers will be customers of Ogden City, rather than customers of the District, they will be required to abide by applicable rules and regulations of the District as well as other applicable laws and ordinances and, in particular, any retail industrial customers shall be subject to the District's permitting and pretreatment requirements as provided in Article III of this Agreement.

G. Enforcement Powers

1. Fee Collections. Except as otherwise provided in this Agreement, Ogden City shall be responsible for billing to and collecting from all retail connections within the Service Area and the District shall have no right or obligation to do so. Ogden City acknowledges that the District assesses impact fees upon new retail connections receiving service from the District through Ogden City in such amount as may be established from time to time by the District Board of Trustees. The District and Ogden City have entered into an Interlocal Cooperation Agreement dated "the 21st day of December, 1998" pursuant to which Ogden City collects applicable District impact fees, which Agreement is recognized and is not intended to be superceded or replaced by this

Agreement provided, however, that the provision stating conditions for an automatic termination appearing at the end of paragraph 3 of the 1998 Agreement is hereby deleted. Prior to allowing a connection to any outfall line, Ogden City shall notify the District enough in advance to enable the District to review and approve plans before the connection is made and to inspect and, at the District's option, supervise the connection. No connection may be made to any District outfall line unless that connection satisfies all design and installation criteria of the District, has been inspected and approved by the District, and an appropriate inspection fee has been paid to the District. Ogden City agrees to collect, on behalf of the District, any applicable inspection or other fee or charge imposed upon Ogden City's customers by the District. The Ogden City Council and the District Board of Trustees shall each have the right and power to change their respective impact and service fees from time to time in the sole discretion of the Ogden City Council or the Board of Trustees, as appropriate.

2. District Rules and Regulations. Ogden City recognizes and acknowledges the District's legal right to enforce applicable rules and regulations within Ogden City's Service Area including, but not limited to, the right, power and authority to require industrial customers to obtain and abide by a discharge permit issued by the District as a condition to receiving service and the District's right to assess charges to Ogden City's retail customers, including penalties for violation of the District's rules and regulations and/or other applicable state, federal and local laws, ordinances, rules and regulations. In that regard, to the extent necessary to satisfy the requirements of law as provided in Article III of this Agreement, Ogden City delegates to the District all of the foregoing rights, powers and authority relative to retail industrial customers. Ogden City agrees to assist and cooperate with the District in the enforcement of applicable laws, ordinances, rules and regulations. In particular, but not by way of limitation, at the request of the District, Ogden City agrees to disconnect from service any retail customer of Ogden City that fails to abide by the District's rules, regulations and other requirements or fails to pay any fee or charge (such as industrial pretreatment charges) assessed by the District. The parties acknowledge that the District does not possess general police powers, whereas Ogden City does possess such powers. To the extent allowed by law, Ogden City agrees to exercise its general police powers to enforce the District's pretreatment program and discharge permits issued by the District to retail industrial customers within Ogden City's service area, including, but not limited to, the enforcement of time limitations and requirements and assessed penalties.

3. Industrial User Inventory. The District and Ogden City agree to work together to insure that all industries within Ogden City's Service Area are inspected before the industry is issued a business license in order to confirm that the retail industrial customer will not have an adverse effect on the District, outfall lines, or the District's sewage treatment facilities before the industry discharges wastewater into Ogden City's collection system or directly into an outfall line. The District may develop written procedures to be used in updating the industrial user survey and may mandate additional procedures to be used in identifying retail industrial users, including a requirement that Ogden City send business license applications to the District before the business is issued a license. Ogden City agrees to cooperate with and actively participate in all such efforts as requested by the District.

4. CMOM Program. The District is subject to an Environmental Protection Agency (EPA) Capacity, Management, Operations, and Maintenance (CMOM) Program which

requires an annual audit of the collection system. The CMOM audit requirements extend to all collection lines within the area served by the District. Ogden City agrees to perform an annual self audit of the collection lines in conjunction with the District's annual CMOM Program self audit, as requested by the District.

H. Present Customers

The District prefers that connections receive retail service from an entity other than the District. Consequently, should it come to light that any connections within Ogden City are receiving "retail" service from the District, Ogden City will either assume and thereafter serve those existing retail customers or make arrangements for another wholesale customer of the District to do so.

I. Future Customers/Assignment

As Ogden City expands its Service Area, all new areas served shall be subject to the requirements of this Agreement including, but not limited to, the requirement that the areas annex into the District as a condition precedent to receiving service. In the alternative, Ogden City may directly or indirectly organize a special service district or a local district in accordance with applicable legal requirements to provide that service. The parties agree that this Agreement may be assigned by Ogden City, in whole or in part, to any such special service district or local district organized for the purpose of providing sewage service in any area covered by this Agreement conditioned upon such special service district or local district acknowledging, in writing, its obligations under this Agreement and the validity and enforceability of this Agreement with respect to the areas served by such special service district or local district. Notwithstanding any such assignment, however, Ogden City shall remain obligated to collect impact fees for and remit impact fees to the District and to utilize its general police powers as provided in Section I.G. of this Agreement.

II. **ANNEXATION**

Notwithstanding anything to the contrary in this Agreement or elsewhere, the parties agree that all properties receiving sewer service pursuant to this Agreement must be annexed into the District as a condition to receiving and continuing to receive sewer service. The parties recognize that "checkerboard" annexations into the District are not desirable. To that end, Ogden City agrees to cooperate with and actively assist the District, if possible, in annexing into the District as necessary to connect gaps and minimize or prevent checkerboarding. The parties agree to actively cooperate with and assist each other as necessary to satisfy legal requirements for such annexations. Should, for any reason, any property within the Service Area receive sewer service from the District prior to annexation into the District, Ogden City agrees to terminate sewer service to any such property the owner of which fails or refuses to submit and support a petition to annex the property into the District in accordance with applicable law.

III. CLEAN WATER STANDARDS

A. Pretreatment Authority

1. Rulemaking Authority. To the extent allowed by law, subject to the requirements of this Agreement, the District is expressly authorized and empowered to adopt, apply and enforce within the Service Area rules, regulations and surcharges and other penalties which are deemed necessary to prevent excessive treatment costs, to control industrial wastes and to limit additional treatment wherever possible. The District may require certain industrial customers to obtain and abide by a discharge permit issued by the District as a condition of receiving service. The District may sample industrial wastes at or before the point of introduction into any District outfall line.

2. Refusal of Service. At the request of the District, Ogden City agrees to refuse service to users if pretreatment requirements are not met and to condition the provision of wastewater collection services upon such pretreatment requirements and restrictions as are lawfully established by the District in a discharge permit or otherwise.

B. Compliance with Federal and State Requirements

The parties agree to cooperate in complying with all applicable federal, state and local health department and other laws, ordinances, rules and regulations.

C. Compliance with Wastewater Control Rules and Regulations

All retail customers of Ogden City shall be required to comply with applicable Wastewater Control Rules and Regulations and other rules and regulations established from time to time by the District.

IV. TERMINATION OF AGREEMENT

A. Mutual Agreement

This Agreement may be terminated at any time with the mutual written consent of the parties.

B. Bondholder Consent Required

Notwithstanding anything in this Agreement to the contrary, no party may terminate its participation under this Agreement and this Agreement shall not be terminated if, at the time of such desired withdrawal or termination, there are any outstanding bonds issued by either party unless (a) all bondholders first consent in writing to such withdrawal or termination or (b) the underlying bond documents do not require bondholder consent to the withdrawal or termination.

V. MISCELLANEOUS

A. Amendment and Modification

This Agreement shall not be modified or amended except in writing, which shall be signed by the duly authorized representative of each of the parties after the adoption of a resolution by the governing body of each party approving the modification or amendment.

B. Binding on Successors

This Agreement shall be binding upon each of the parties and their respective permitted successors-in-interest and assigns provided, however, that no party may assign this Agreement or any interest herein without having first obtained the written consent of the other party, except that an assignment may be made without such consent to a successor governmental entity with which the assigning party is consolidated, merged or replaced.

C. Required Formalities

This Agreement shall not be effective until approved by a resolution of the governing body of each party and each party shall provide the other with copies of appropriate resolutions by their respective governing bodies authorizing the execution of this Agreement and the adoption of its terms. Each party agrees that a signed copy of this Agreement will be filed with the keeper of public records of said party. As a condition precedent to this Agreement's entry into force, it shall be submitted to an authorized attorney for each party who shall approve the Agreement as being proper in form and compatible with the laws of the State of Utah.

D. Compliance with Laws

This Agreement is made and entered into subject to the provisions of the laws of the State of Utah, which laws shall control the enforcement of this Agreement. The parties also recognize that certain federal laws may be applicable. In the event of any conflict between this Agreement and any applicable state or federal law now or hereafter in effect, the said state or federal law shall control.

E. Additional Documents

Each party agrees to execute such other and further documents and instruments as may be reasonably necessary or proper to consummate the transactions contemplated by this Agreement and to implement the intent of the parties as expressed herein.

F. Severability

Whenever possible, each provision of this Agreement shall be interpreted in such manner as to be valid under applicable law; but, if any provision of this Agreement shall be held, in a final judicial determination, to be invalid or prohibited under applicable law, such provision shall be ineffective to the extent of such invalidity or prohibition without invalidating the remainder of

such provision or the remaining provisions of this Agreement. Notwithstanding the foregoing, however, should such judicially determined invalidity of any provision of this Agreement frustrate the intent and purpose of the parties, as expressed herein, such invalidity shall cause this Agreement to be terminated, with the parties, to the extent possible, to be restored to the status quo as though this Agreement had not been signed.

G. Notices

Any notice, demand or request from one party to the other shall be made in writing and shall be deemed properly served, given, or made if delivered in person or sent by registered or certified mail, postage prepaid, addressed as follows:

If to the District:

Central Weber Sewer Improvement District
2618 West Pioneer Road
Marriott-Slaterville, Utah 84404
Attention: General Manager

If to Ogden City:

Ogden City
2549 Washington Boulevard
Ogden City, Utah 84401
Attention: Mayor or City Manager

H. Construction

The section and paragraph headings of this Agreement are for purposes of reference only and shall not limit or define the meaning hereof. The singular tense herein shall include the plural and any gender shall include all other genders. This Agreement shall be construed only by the contents hereof and there shall be no presumption or construction in favor of or against any party.

I. Waiver

The failure on the part of a party at any time to require the performance by the other party of any term of this Agreement shall not in any way affect such party's right to enforce its terms, nor shall any waiver by a party of any term hereof be taken or held to be a waiver of any other term or of any breach hereof. Except as otherwise specifically stated, no right under this Agreement may be waived and no modification or amendment of this Agreement may be made except by a written agreement executed by the party against whom such enforcement of a waiver, modification or amendment is sought.

J. Counterparts

This Agreement may be executed in any number of counterparts, all of which together shall serve as one Agreement.

K. Entire Agreement

The parties agree that this document contains the entire agreement and understanding between them respecting the subject matter hereof and constitutes their entire agreement with respect to the specific issues contained herein and supersedes any and all prior oral or written representations and agreements.

L. Hold Harmless

Should Ogden City terminate or refuse sewer service to any retail customer of Ogden City at the request of the District as provided in this Agreement, the District shall defend, indemnify and hold Ogden City and its elected officials and employees free and harmless from and against any liability to the affected retail customer or any resident or occupant of the retail customer's property arising as a result of the termination or refusal of service at the District's request and for the District's benefit.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by and through their duly authorized representatives on the date(s) set forth below.

CENTRAL WEBER SEWER
IMPROVEMENT DISTRICT

Date: 3/19/2009



Date: 6/3/2009

By: Mark C. Allen
Mark C. Allen, Chairman

ATTEST:

John E. Cardon
John E. Cardon, Clerk

OGDEN CITY

By: Mark D. Ryall
Mayor

ATTEST:

Eric Mansell
City Recorder

AUTHORIZED ATTORNEYS' APPROVAL

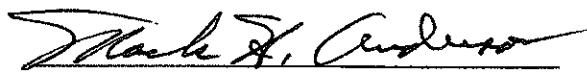
WHEREAS, the foregoing Agreement between Central Weber Sewer Improvement District and Ogden City has been submitted by the respective parties to their authorized attorneys; and

WHEREAS, the respective authorized attorneys were asked to review the Agreement to see if the form is proper and that the Agreement is compatible with state law; and

WHEREAS, the respective authorized attorneys have completed their review of the Agreement.

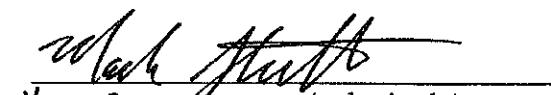
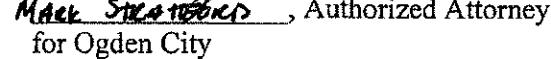
NOW, THEREFORE, the authorized attorneys of the respective parties hereby approve the foregoing Agreement, as being in proper form and compatible with the laws of the State of Utah.

Date: March 19, 2009



Mark H. Anderson, Authorized Attorney for
Central Weber Sewer Improvement District

Date: May 1, 2009

Mark H. Anderson, Authorized Attorney
for Ogden City

RESOLUTION NO. 2009-15

A RESOLUTION OF THE OGDEN CITY COUNCIL APPROVING AN INTERLOCAL AGREEMENT FOR WASTEWATER TRANSPORT AND TREATMENT.

WHEREAS, the Utah Interlocal Cooperation Act, Title 11, Chapter 13, Utah Code Annotated, 1953 as amended, permits governmental units to enter into agreements one with another for the purpose of exercising on a joint and cooperative basis powers and privileges that will benefit the public and make the most efficient use of their resources; and

WHEREAS, Title 11, Chapter 13, Section 202.5 of the Utah Code Annotated, 1953 as amended, requires that governing bodies of public agencies, including cities, adopt resolutions approving interlocal agreements before such agreements become effective; and

WHEREAS, Ogden City and Central Weber Sewer Improvement District have negotiated an agreement, attached as Exhibit "A", for the transport and treatment of sewage and wastewater after it has left the city's collection system; and

WHEREAS, the City Council has reviewed the attached agreement and determined such agreement to be in the best interest of the City.

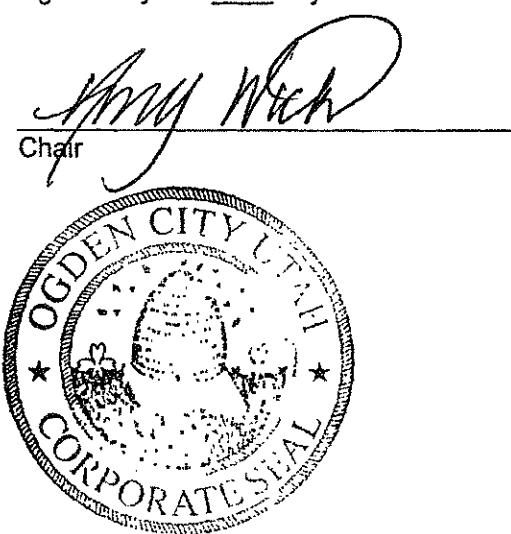
NOW THEREFORE BE IT RESOLVED by the Council of Ogden City, Utah that the Wholesale Wastewater Treating Contract between Ogden City and the Central Weber Sewer Improvement District providing for the transport and treatment of sewage and wastewater after it has left the city's collection system is hereby approved; and the Mayor is authorized to execute the same.

PASSED AND ADOPTED by the Council of Ogden City this 2nd day of June, 2009.

ATTEST:

Cindi Mansell, City Recorder

APPROVED AS TO FORM: 
LEGAL DATE
5/1/09



0001
#94

A G R E E M E N T

THIS AGREEMENT entered into this 21st day of May, 1969, by and between OGDEN CITY, a Municipal Corporation and HARRISVILLE TOWN.

IT IS AGREED between the parties as follows:

1. Ogden City owns, operates and maintains a sanitary sewer line along Larsen Lane which is within the corporate limits of Harrisville. That sewer line is marked in red on the attached plat which is made a part hereof by reference.

2. Harrisville is constructing sanitary sewer lines along the west side of Washington Boulevard both north and south of Larsen Lane and along 400 North Street, which is sometimes referred to as North Street, from Washington Boulevard west to Harrisville Road. Ogden City owns, operates and controls a ten (10) inch sanitary sewer line which extends from the west side of Harrisville Road to and across Wall Avenue connecting to an outfall line owned and operated by Central Weber Sewer Improvement District. The lines constructed and to be constructed by Harrisville are marked in green on the attached plat and the City line for Harrisville Road to Wall Avenue is marked in blue on said plat.

3. The parties desire to keep the construction, operation and maintenance costs as low as possible and make the sewers owned by them available on a cooperative basis to supply the users thereof whether they reside in Ogden City or Harrisville. Ogden City agrees that Harrisville may connect its sewer constructed along the west side of Washington Boulevard and North of Larsen Lane into the Ogden Larsen Lane sewer at the intersection of Larsen Lane and Washington Boulevard and that the Harrisville sewer so connected may be used to service up to 40 single residence family connections or the equivalent flow of 1% of the capacity of the Larsen Lane sewer at that point. In consideration of the right to make this connection, Harrisville

agrees to pay Ogden \$225.00.

4. Ogden retains full ownership and control over the Larsen Lane sewer and will continue to have the right and duty to operate and maintain the same. No further charge will be made to Harrisville for the herein granted right to connect to and use the Ogden Larsen Lane sewer. The parties acknowledge that there is a present existing agreement under which the Larsen Lane sewer was constructed and under which the franchise for the construction thereof was issued by Weber County which controls as to connection fees to that sewer and service charges for the use of that sewer. That agreement remains in full force and effect and Ogden City is the full beneficial owner thereof, it having purchased all of the interest of Simmons and Wiberg in and to that sewer. All future connection fees and service charge fees payable for connecting to the Ogden Larsen Lane sewer shall belong to Ogden. All connection fees for connecting to the sewer constructed by Harrisville on the west side of Washington Boulevard belong to Harrisville. Harrisville shall also collect all service charges for the use of this Washington Boulevard sewer and shall save Ogden City harmless from any charges made by the Central Weber Sewer Improvement District for its processing sewage delivered through that portion of the Harrisville sewer.

5. 400 North (North Street Sewer): Ogden City has constructed a ten (10) inch sewer which connects to the Central Weber Sewer Improvement District, at or near Wall Avenue, which runs east to the west side of Harrisville Road a distance of 831 feet. Harrisville will construct a ten (10) inch sewer from the east end of Ogden's sewer at the west side of Harrisville Road along North Street and North Street extended to a point 223 feet west of Washington Boulevard which is a distance of 1,160 feet, and Harrisville will also construct an eight (8) inch sewer from that point to Washington Boulevard.

Ogden will pay Harrisville for increasing the pipe size for Ogden's benefit from eight (8) inches to ten (10) inch

diameter at the rate of \$0.45 per foot for the part of the sewer constructed by Harrisville, that is, 1,160 feet X \$0.45 = \$522.00.

Harrisville will pay Ogden for increasing the pipe size for Harrisville's benefit from eight (8) inches to ten (10) inches in diameter at the rate of \$0.45 per foot for the part of the sewer constructed by Ogden, that is 831 feet X \$0.45 = \$373.95.

6. Operation, maintenance and connections to North Street Sewer. It is understood that the property on the north side of North Street and North Street extended west of Washington Boulevard is in Harrisville and the property on the south side is in Ogden. It is agreed that the connection fees to this sanitary sewer, whether constructed by Harrisville or Ogden from Washington Boulevard west to Wall Avenue shall belong to Ogden for connections made to serve land within Ogden and shall belong to Harrisville for connections to serve land within Harrisville. Likewise, the service charges for the use of that sewer and for processing the effluent shall be collected by and paid to Ogden for land served in Ogden and it shall be paid to and collected by Harrisville for land served in Harrisville. Payments to Central Weber Sewer District for processing the effluent shall be paid by Ogden City for land served in Ogden and by Harrisville for land served within Harrisville.

Ogden City agrees to clean and maintain and repair the entire length of the sewer from Wall Avenue to Washington Boulevard without further charge for that service to Harrisville. The parties agree that no connection shall be made to any part of that sewer unless the person connecting obtains a permit therefor from the Ogden City Public Works Director and pays the usual and standard tapping fee. Ogden will tap the sewer line with its tapping machine and the tapping fee shall belong to Ogden. This tapping requirement applies to both land within Harrisville and within Ogden which is being so connected directly to this sewer.

7. It is estimated that Harrisville's use of the North Street sewer from Washington to Wall will be approximately 15% of the total capacity thereof. Ogden will own the additional capacity and it has the full right without further payment or agreement with Harrisville to extend the sewer eastward from Washington Boulevard to serve areas now within Ogden or which may hereafter be annexed to Ogden east of the east line of Washington Boulevard.

8. It is agreed that Ogden is entitled to an additional credit from Harrisville in the amount of \$293.60 for increasing the pipe size across Wall Avenue from ten (10) inches to fifteen (15) inches in diameter.

9. Recapitulation of Costs.

Harrisville City to Ogden City

| | |
|---|---------------|
| Larsen Lane Connection..... | \$225.00 |
| Increase pipe size Wall Avenue to Harrisville Road 831 feet @ \$0.45..... | 373.95 |
| Increased pipe size across Wall Avenue..... | <u>293.60</u> |
| TOTAL | \$892.55 |

Ogden City to Harrisville City

| | |
|---|----------|
| Increased pipe size Harrisville Road to Washington Boulevard 1,160 feet @ \$0.45..... | \$522.00 |
| BALANCE - Harrisville City to Ogden City..... | \$370.55 |

It is agreed that this sum shall be paid to Ogden By Harrisville within thirty (30) days after the signing of this agreement.

10. The parties acknowledge that there is land on the east side of Washington Boulevard north of North Street extending approximately to 1000 North Street, Ogden, which is not now in the city limits of Ogden City or the town boundaries of Harrisville. In the event that land is annexed to Harrisville, this agreement does not provide for sewer service through either the Ogden Larsen Lane sewer or the North Street sewer and another agreement covering serving that land will have to be negotiated between

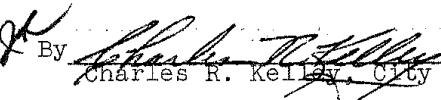
the parties. However, if sewer service to that land is arranged by Ogden that service could be supplied by Ogden under its rights in either or both the North Street sewer or the Larsen Lane sewer.

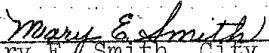
11. During the construction of the sewer or sewers by Harrisville, either no connection will be made to any Ogden sewer until the Harrisville construction is completed, or any construction made will be securely plugged to prevent dirt or debris from being discharged into the existing sewers and to prevent any accidental or other flooding from irrigation water or otherwise. The Ogden Public Works Department will be timely notified during flushing of the new Harrisville lines and at the time they are connected to the city lines so Ogden can have an inspector check the work and approve the connections.

IN WITNESS WHEREOF the parties have hereunto set their hands as of the day and year first above written.

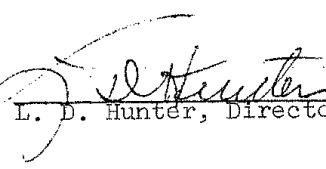
OGDEN CITY, a Municipal Corporation

ATTEST:

By  Charles R. Kelley, City Manager


Mary E. Smith, City Recorder

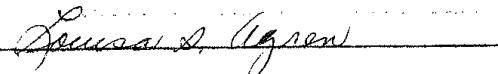
APPROVED:


L. D. Hunter, Director of Finance

HARRISVILLE ^{City} _{TOWN}

ATTEST:

By 
Leland R. Saunders
Mayor


Dennis S. Agnew

October 11, 2012

Ronald Chandler
North Ogden City Manager
505 East 2600 North
North Ogden, UT 84414

Re: Interlocal Agreement for Provision of Sanitary and Storm Sewer for
Silver Springs Subdivision

Ron,

I am the Director of Ogden City's Public Services Department. Several days ago, our public ways and parks manager and our assistant city attorney met with Bryan Steele, the North Ogden City finance director, to discuss the status of an interlocal agreement, dated June 26, 1998, between North Ogden City and Ogden City dealing with the provision of sanitary and storm sewer services to the Silver Springs Subdivision. A copy of the agreement was left with Bryan for him to review.

That agreement allows up to 61 residential, single family lots in North Ogden City to have access to the Ogden City sanitary sewer and storm sewer system. In exchange, North Ogden City pays a fee to Ogden City of 72% of the base monthly charge assessed to Ogden City residents for those services. It is our belief that the final development of the Silver Springs subdivision actually resulted in 58 residential single-family lots actually using the Ogden City infrastructure.

Since the date the agreement was signed, Ogden City has begun charging a storm sewer fee to its residents in addition to the sanitary sewer fee. Although Ogden City did not charge fees for storm sewer at the time the interlocal agreement was signed, the agreement provides for the payment of a proportionate share of that fee once it was imposed on Ogden City residents. The monthly fees for both services have also increased since the agreement was signed.

It appears that Ogden City has not provided North Ogden with any notice of the new or increased fees. The purpose of this letter not to seek any retroactive payments. The contract is quite clear that North Ogden City is only required to pay additional or higher fees after it has received written notice from Ogden City that its sanitary sewer or storm sewer charges have increased. At this time, Ogden City would like to provide you with the information required to start paying the currently effective charges. The charges described in this letter are based on the fees made to a home in Ogden with a $\frac{3}{4}$ inch water service line. Currently, Ogden City assesses the following base charges:

| | |
|----------------|--------------------|
| Sanitary Sewer | \$27.50 per month |
| Storm Sewer | \$ 7.10 per month |
| Total | \$ 34.60 per month |

Because the interlocal agreement calls for payment to be based on 72% of the fee, the monthly charge per lot in North Ogden is \$24.91 and the total monthly charge for 58 lots is \$1,444.78. For your information,

this charge will increase in the future based on planned rate increases already approved by the Ogden City Council and changes in the consumer price index. Ogden City will send an updated notice when those changes go into effect.

The interlocal agreement calls for North Ogden to make quarterly payments. Historically, these payments have been made to our city treasurer. During the meeting with Bryan, however, Ogden City explained that it would be simpler to reconcile with our billing system if we could send North Ogden a monthly bill and receive a monthly payment at our public services building. Bryan seemed to think this approach would not be a problem and we would request North Ogden's cooperation in making monthly payments. The interlocal agreement also requires Ogden City to provide 60 days notice of any change in rates, so we intend to begin billing the increased rate in December 2012.

I believe that this agreement is a good example of how our two cities are able to work together for the joint benefit of our citizens. If you have any questions or concerns, please feel free to contact me at (801) 629-8215.

Sincerely,

Jay Lowder
Ogden City Public Services Director

cc: Chris Allen
 Perry Huffaker

3/2/20
4/1/20

INTERLOCAL COOPERATION AGREEMENT

COME NOW ROY CITY, hereinafter referred to as "Roy," and OGDEN CITY, hereinafter referred to as "Ogden," and

WHEREAS, Roy and Ogden have determined it is in each city's mutual best interest to cooperate in the installation, maintenance and use of sanitary sewer lines in the area along 4400 South Street and Airport Road adjacent to and at the Ogden City Airport, and

NOW, THEREFORE, It is agreed between the parties as follows:

1. The purpose of this agreement is for Roy and Ogden to work cooperatively to provide sanitary sewer services for the above-referenced area without establishing separate duplicate lines or systems for those purposes.

2. The duration of this agreement shall be for 20 years.

3. No new legal or administrative entity is being created hereby and the provisions for administering the joint and cooperative undertaking shall be as set forth hereinafter.

4. Roy City hereby agrees to install at its expense a 10" sanitary sewer line from the area at or near an existing sanitary sewer lift station on 4400 South Street in Roy City with the line running from that point on a gravity flow basis as agreed upon by the Roy City and Ogden City engineers to a point approximately 4,150 feet from the existing lift station where it can connect to an existing Ogden sanitary sewer line. Ogden agrees to make available any and all easements necessary to accommodate the above sanitary sewer line. Roy City agrees upon installation of the sewer line to convey said line to Ogden City.

5. Ogden hereby agrees to maintain the above sanitary sewer line.

11-22
168.38

line after its installation and all additional lines necessary to transport sanitary sewage from its collection point along that line to a point of connection with Central Weber Sewer Improvement District outfall line. Routine maintenance of this line to be installed by Roy shall be performed by Ogden at no cost to Roy. Any future cost incurred for repairs of this line which exceed the sum of One Thousand Dollars (\$1,000.00) for any single repair shall be shared between the cities with Ogden paying 70% of the cost of repair and Roy City paying 30% of the cost of repair.

6. Ogden hereby agrees that as any sanitary sewer line which extends beyond the line which will be installed by Roy City and is under Ogden City jurisdiction and reaches capacity or otherwise hinders or interferes with the sanitary sewer flow, Ogden shall upgrade the extension lines by replacing with larger lines or otherwise installing or causing the lines to carry all of the sewerage collected by the system in a timely manner.

7. It is anticipated by the parties that there shall be future development in Roy and at the Ogden Airport for which, in addition to the Herefordshire area and any other properties which are presently being serviced by the sanitary sewer lift station on 4400 South, it is the intent of this agreement to create a sanitary sewer collector system which will be capable of collecting and transporting the sewage from the present lift station and additional growth and development in the area not to exceed 200 gallons per minute.

8. This Interlocal Cooperation Agreement shall be effective upon approval by resolution of each city council and upon endorsement of approval as to form by the city attorney for each party and upon

execution by the appropriate officials of each city.

DATED THIS 31 DAY OF April, 1988.

OGDEN CITY, a municipal corporation

By John M. T. G.

Attest:

James Adams

ROY CITY, a municipal corporation

By Willard J. Cragun
Willard J. Cragun
Mayor Pro tem

Attest:

John F. S.

APPROVED AS TO FORM:

Norman J. H.

Roy City Attorney

APPROVED AS TO FORM:

Norman J. H.

Ogden City Attorney

A G R E E M E N T

THIS AGREEMENT entered into this 17th day of May, 1965, by and between OGDEN CITY, a municipal corporation and SOUTH OGDEN CITY, a municipal corporation.

IT IS AGREED between the parties as follows:

1. South Ogden has constructed a sanitary sewer line as shown in blue on the attached plat, which plat is made a part hereof by reference.
2. South Ogden hereby agrees to construct other sewer lines as shown in red on the attached plat so that when said proposed construction is completed, there will be a sanitary sewer line extending from an outfall line belonging to the Central Weber Sewer District on 40th Street at its intersection with Palmer Drive, thence easterly through South Ogden to the vicinity of 785 East Street, thence dividing into two branches and extending through a portion of Weber County to the west boundary limits of Ogden City as shown on the attached plat.
3. It is agreed that the cost to South Ogden of that portion of the outfall line already constructed is \$49,924.00.
4. South Ogden agrees to construct the new sewer and it hereby grants and guarantees to Ogden City the use in perpetuity of 4.5 second feet capacity of said sewers from the Central Weber Sewer outfall line through and along the said sewer with 2 second feet of that capacity applicable to the south extension and 2.5 second feet applicable to the north extension east of the junction.
5. Ogden City agrees to pay to South Ogden 35% of the \$49,924.00 the already constructed portion costs, together with 35% of the cost of the additional construction necessary to complete the lines as shown on the attached plat. These costs, as to future construction, shall include the cost of right-of-way and engineering costs together with the bid price or prices for the construction thereof. The payments by Ogden City shall be made to South Ogden on partial payment requests by contractors constructing the sewer

yet to be installed, which estimates are to be approved for payment by the South Ogden City Engineer and the Ogden City Engineer. Ogden City will pay all of said estimates until it has paid \$17,473.40, representing its share of the sewer already installed and thereafter, it will pay 35% of said estimates until the entire sewer has been constructed and accepted by South Ogden, at which time, Ogden City will pay 35% of the engineering and right-of-way costs.

In no event shall Ogden City's obligation under this paragraph be in excess of \$65,000, except with the agreement of both parties.

6. South Ogden agrees to, in good faith, proceed with dispatch to have the entire sewer as shown on the attached plat installed and ready for use on or before November 1, 1965.

7. All construction of said sewer shall be made on plans and specifications prepared by the South Ogden City Engineer and approved by the Ogden City Engineer, and work shall be let for public bid by South Ogden City and be awarded to the lowest responsible bidder.

The sewer involved, together with the rights of way on which it is located, shall at all times belong to South Ogden and South Ogden shall have exclusive control and management thereof and shall have all liabilities arising from the ownership and management thereof. Ogden City shall have only the use right as herein defined.

South Ogden agrees to maintain, repair and operate said sewer, reserving at all times to Ogden City 4.5 cubic feet per second of the capacity therein.

8. Ogden City agrees to pay South Ogden a part of the costs of the maintenance, repair and cleaning of the sewer as shown on the attached plat. The portion to be paid by Ogden City shall be that part of the flow of the sewer measured at point (a) on the attached plat as is produced by the sum of the flows measured at points (b) and (c) on the plat. The flow measurements shall be made at the same time, according to generally accepted engineering practices and shall be made once every two years and the ratio so determined shall apply to these costs for the two years following the measurement and until another measurement is made.

9. Replacements or major repair costs by calamity or act of God shall be paid for 35% by Ogden City and 65% by South Ogden City.

10. Each of the parties undertake to protect the line from damage by contractors connecting thereto or action by the parties, their employees or agents. Each of the parties agree to pay in full for any repairs resulting from damages resulting by themselves or by contractors in their respective cities.

11. The parties agree that this sewer shall be used only for sanitary sewer purposes and that all laterals, extensions and connections thereto, or fitting therein, shall be made and maintained according to generally accepted good engineering practices and according to applicable codes and the rules and regulations of the Central Weber Sewer District.

12. Neither party shall allow any connection to this sewer except within the parties accepted city boundary as they now exist or may hereafter be extended.

IN WITNESS WHEREOF the parties have executed this agreement as of the day and year first above written.

OGDEN CITY, A Municipal Corporation

By James R. Eide
James R. Eide, Assistant City Manager

ATTEST:

Mary E. Smith
Mary E. Smith, City Recorder

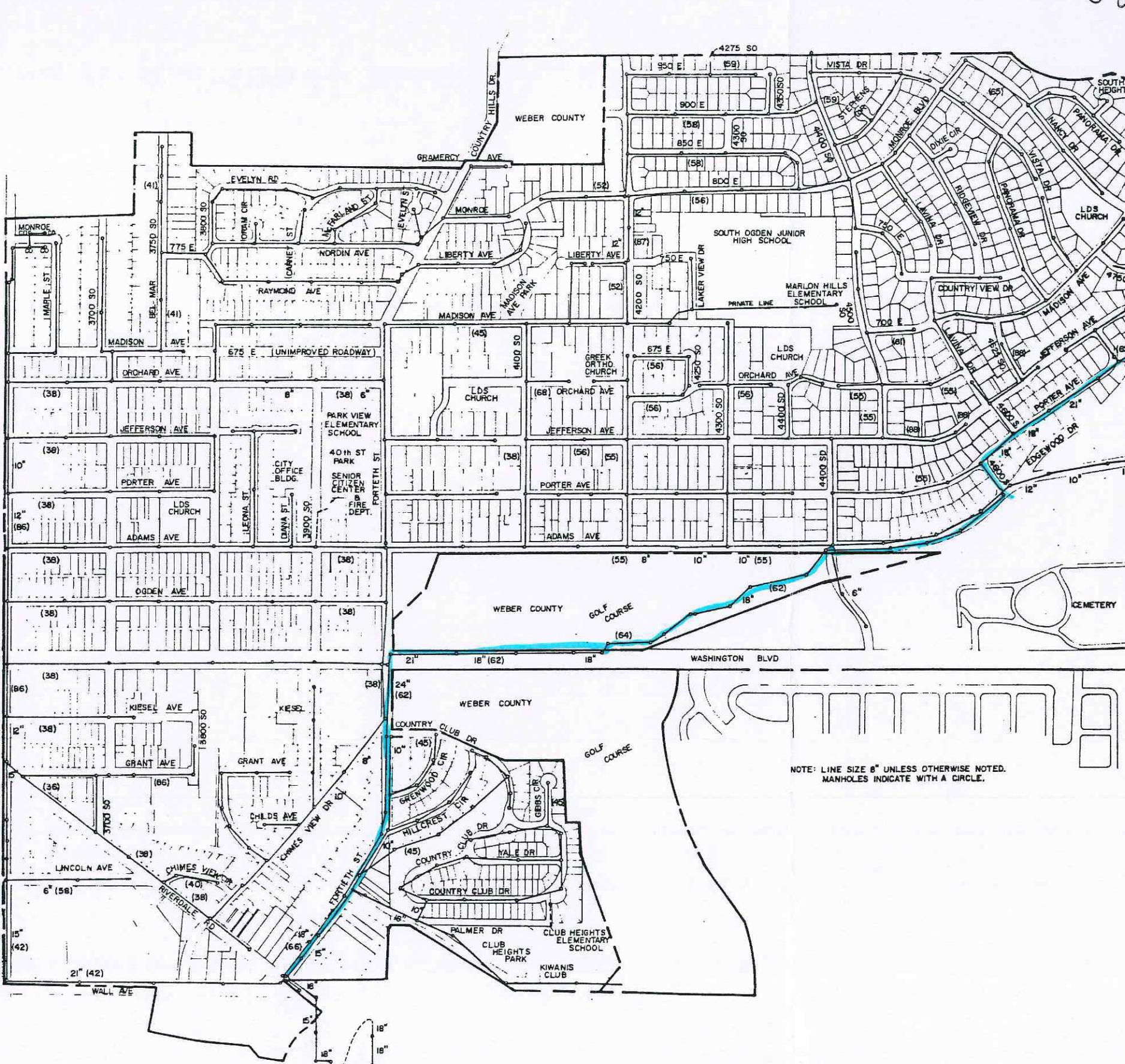
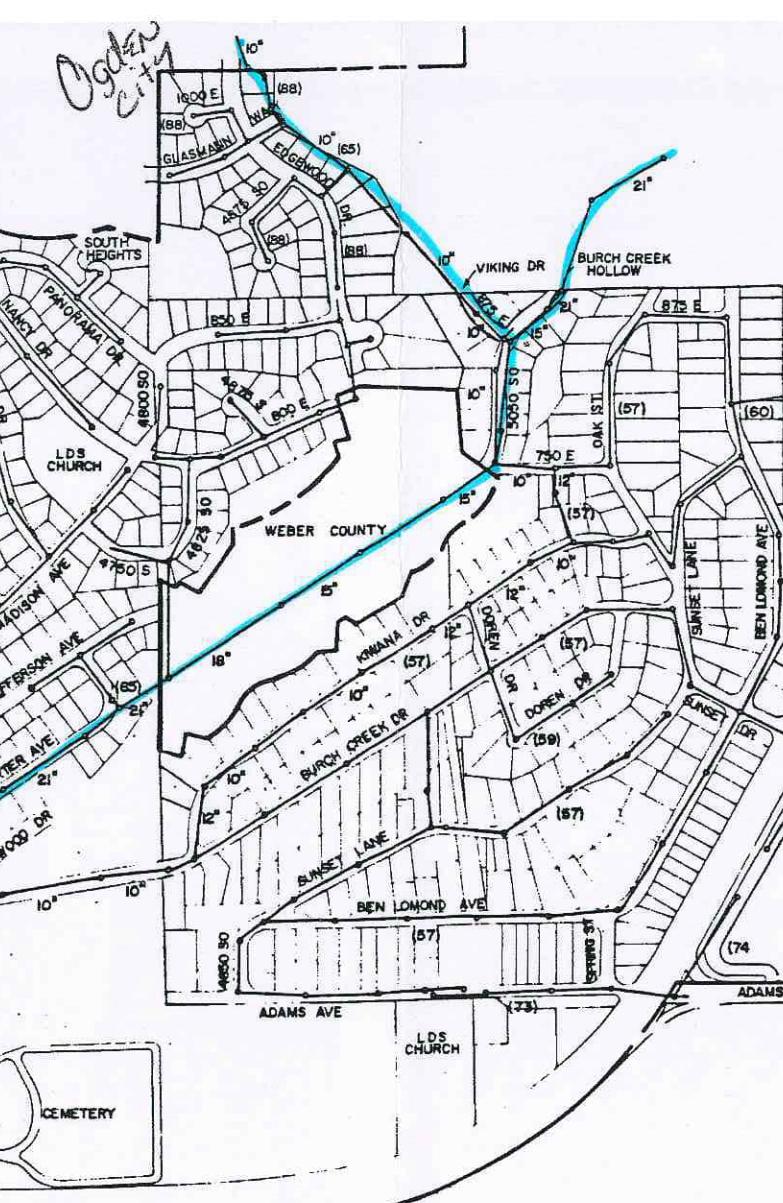
Director of Finance
or Finance Director

SOUTH OGDEN CITY, A Municipal Corporation

By Fred L. Martinway
Fred L. Martinway
Mayor

ATTEST:

Lee H. Stauffer



NOTE: LINE SIZE 8" UNLESS OTHERWISE NOTED.
MANHOLES INDICATE WITH A CIRCLE.

| | | | | | |
|---------|-------------|-------|----------------|--------------|-----------------|
| date by | description | scale | designed by | drawn by | checked by |
| | | 1:400 | John N. Nelson | Gary S. Karr | N. Scott Nelson |

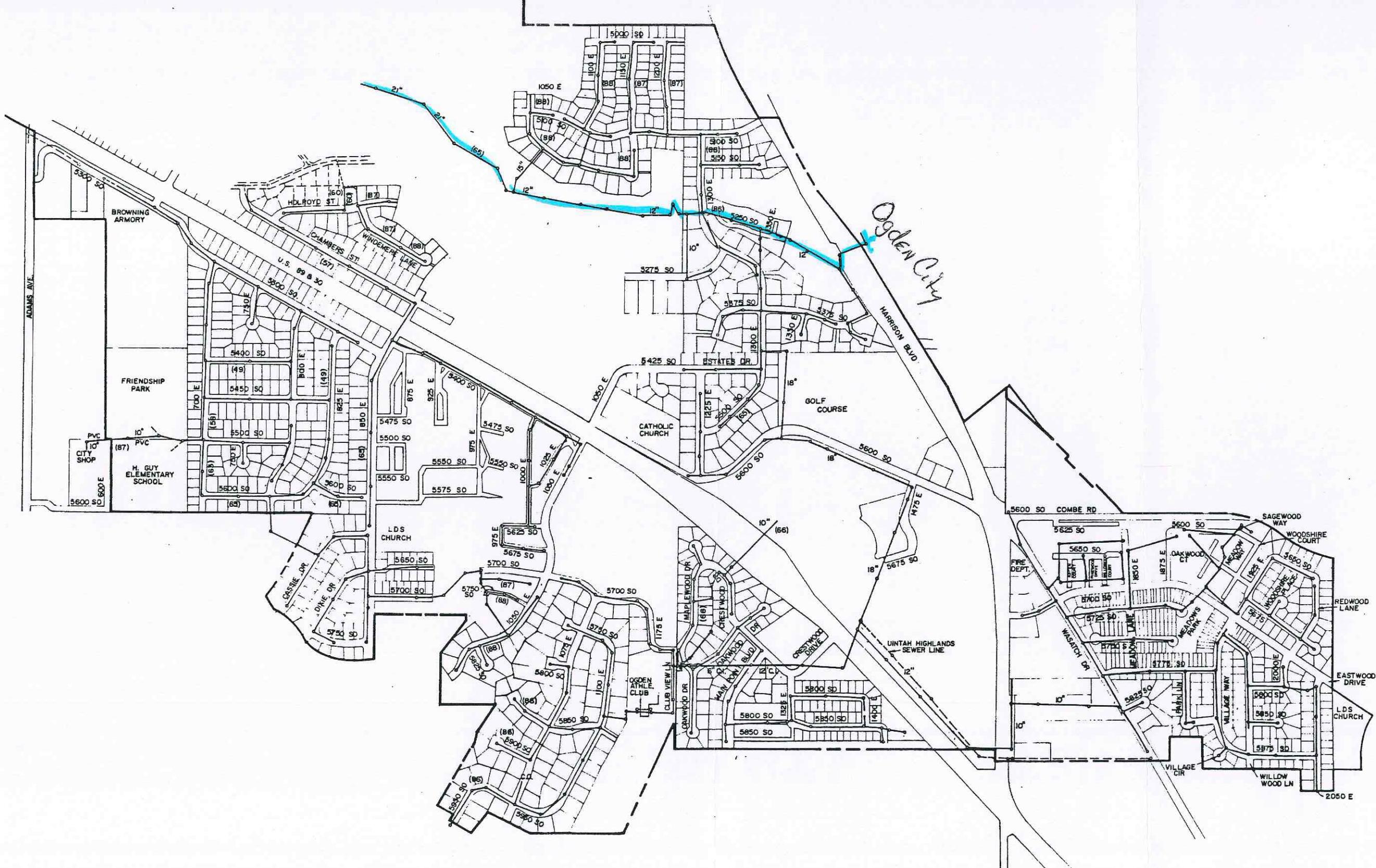


SOUTH OGDEN CITY
560 - 39th Street
South Ogden City, Utah 84103

South Ogden City
SANITARY SEWER SYSTEM

sheet
1
of
2
sheet

2

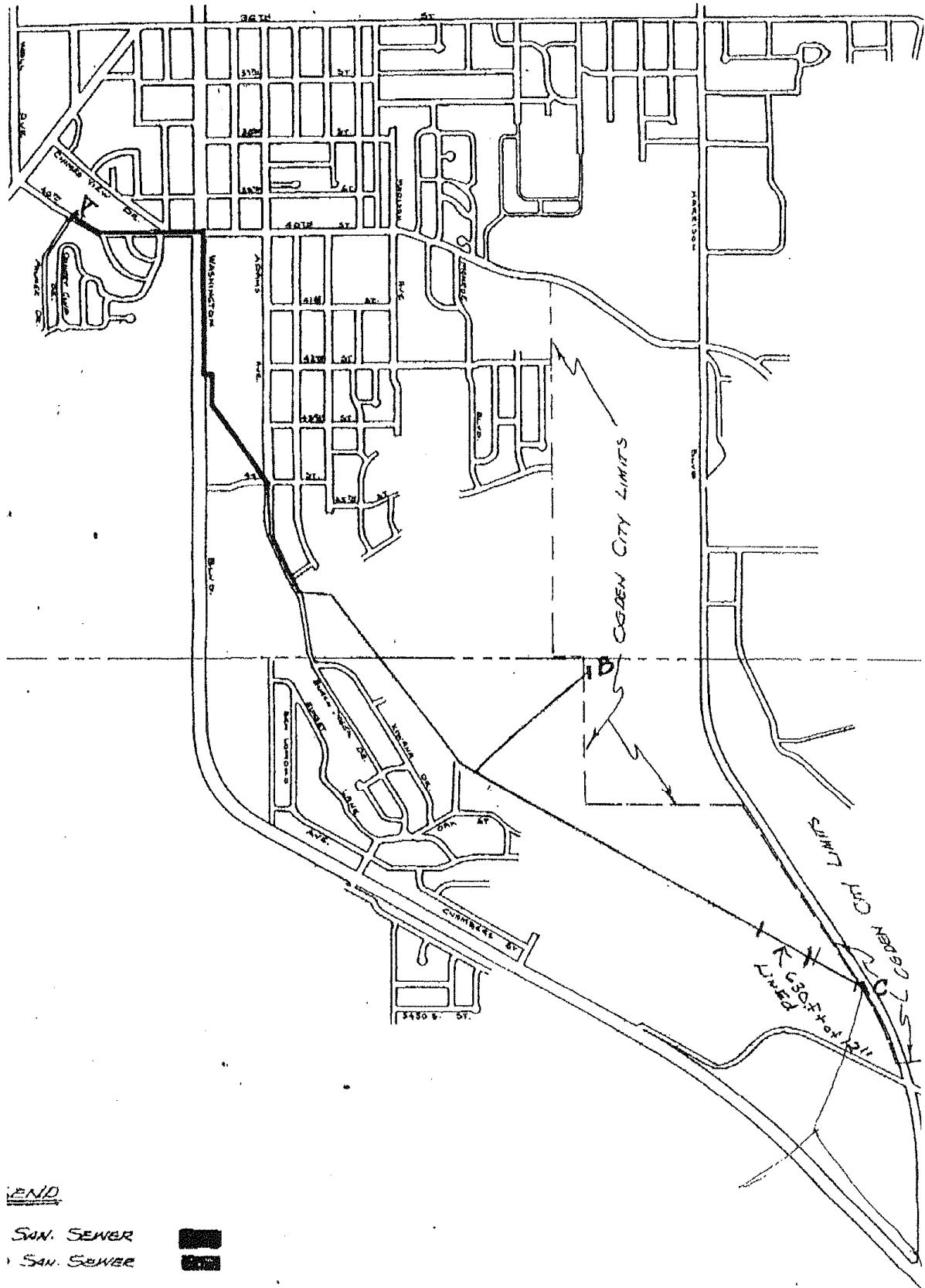


SOUTH OGDEN CITY

560 - 39th Street
South Ogden City, Utah 8440

South Ogden City

SANITARY SEWER SYSTEM



END

SAN. SEWER
1 SAN. SEWER

INTERLOCAL COOPERATION AGREEMENT

AN AGREEMENT BETWEEN OGDEN CITY AND THE UINTAH HIGHLANDS IMPROVEMENT DISTRICT PROVIDING FOR SANITARY SEWER COLLECTION AND TREATMENT SERVICES FOR A PRUD DEVELOPMENT IN OGDEN CITY KNOWN AS THE HAMPTONS

THIS INTERLOCAL COOPERATION AGREEMENT is made and entered into effective as of this 25th day of October, 1999, pursuant to authority of the Interlocal Cooperation Act, §11-13-1 et seq., U.C.A., 1953, as amended (the "Act"), by and between OGDEN CITY, a Utah Municipal Corporation (hereinafter the "City"), and UNTAH HIGHLANDS IMPROVEMENT DISTRICT, a water, sewer and storm drain improvement district organized and existing pursuant to the provisions of §17A-3-301 et seq., U.C.A., 1953, as amended (hereinafter the "District"). (The City and the District may hereinafter be referred to singularly as a "Party" or together as the "Parties.")

RECITALS:

WHEREAS, pursuant to the provisions of the Act, any power or powers, privileges or authority exercised or capable of exercise by a public agency of the state (defined as any political subdivision of the state including municipalities and special districts of various kinds) may be exercised and enjoyed jointly with any other public agency, and any two or more public agencies may enter into agreements with one another for joint or cooperative action pursuant to the Act; and

WHEREAS, a certain residential real estate development delineated by the developer thereof as The Hamptons, a PRUD (hereinafter "The Hamptons") is proposed to be developed upon property which is situated within corporate boundaries of the City and is more particularly described and depicted on the Map attached as EXHIBIT "A" hereto and incorporated by reference herein; and

WHEREAS, the City is currently unable to provide sanitary sewer collection and treatment service to The Hamptons, and

WHEREAS, the District is capable and willing to collect the sewage generated within the Hamptons and to transport the sewage through its sanitary sewer systems for treatment in conjunction

with sewage generated within the District, all in conformance with the terms and provisions of this Agreement;

NOW, THEREFORE, in consideration of the foregoing and the mutual covenants contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

ARTICLE 1

SANITARY SEWER COLLECTION AND TREATMENT SERVICES

1.1 Pursuant to the legal authority set forth in §17A-2-313, Utah Code Ann., 1990, the District shall provide sanitary sewer collection and treatment services to The Hamptons, on a wholesale basis, as provided in this Agreement.

1.2 All sanitary sewer lines situated within the streets, easements and other rights-of-way within the subdivision up to the lot line of each subdivision lot within The Hamptons, and all equipment and facilities related thereto (the "Internal City Sewer System"), shall be the sole and separate property of the City, and the City shall be solely and separately responsible for the operation, maintenance, repair and replacement of the Internal City Sewer System, at its sole cost and expense. The sanitary sewer system of the District shall be connected to the Internal City Sewer System at a point of connection to be determined by the mutual agreement of the Parties prior to connection (the "Connection Point"). The District shall be solely and separately responsible for the operation, maintenance, repair and replacement of its sanitary sewer system on its side of the Connection Point, at its sole cost and expense.

1.3 Sewage generated within The Hamptons shall be transported by the District from the Connection Point through the District's sanitary sewer system for treatment in conjunction with sewage generated within the District.

1.4 The City shall immediately notify the District of the connection of each lot to the Internal City System within The Hamptons.

1.5 The City shall pay for sanitary sewer collection and treatment services provided by the District as follows:

(a) The City shall pay for sewer collection and treatment services provided by the District at the rate of \$28.16 per month for each lot within The Hamptons which is connected to the

Internal City Sewer System (the "Sewer Service Rate"). The Sewer Service Rate to be charged hereunder is calculated based upon that portion of the District's total cost of providing sanitary sewer service to its customers within the District which is attributable only to sewer collection and treatment, as set forth in EXHIBIT "B" which attached hereto and incorporated by reference herein.

(b) Payment shall be due on a quarterly basis, as billed by the District. The City shall provide payment within thirty (30) days after submission by the District of the quarterly statement.

(c) The Sewer Service Rate is subject to subsequent reasonable adjustment by the District. Any such adjustment shall be proportionate to and consistent with sanitary sewer service rate adjustments imposed by the District upon its sanitary sewer customers within the District. The amount of the adjustment shall be based upon that portion of the District's costs which are attributable to sewer collection and treatment services in the same manner as delineated in EXHIBIT "B" hereto. If within one year from the effective date of this Agreement the District adjusts the sanitary sewer service rate to its customers within the District due to anticipated revenue losses attributable to adjustments in connection fees required by state law such adjustments shall not result in any adjustment to Sewer Service Rate during said one-year period.

1.6 The Parties expressly understand and agree that the District shall have no equipment, facilities or means within The Hamptons on The Hamptons' side of the Connection Point with which to collect, manage, control, transport or dispose of sewage, and that the District shall have no responsibility or liability or expense or obligation, in any way whatsoever, for the collection, management, control transportation or disposition of sewage within The Hamptons on The Hamptons' side of the Connection Point, nor shall the District exercise or attempt to exercise any right or control over the Internal City System within The Hamptons.

ARTICLE 2

SERVICES TO BE PROVIDED BY THE CITY

Except for the storm drainage collection and sewer collection and treatment services enumerated in this Agreement, the City shall provide all other municipal services to The Hamptons.

ARTICLE 3

INDEMNIFICATION

The City shall indemnify, defend and hold the District and its respective officers, officials, employees, agents and representatives harmless from and against any and all claims, demands, suits, actions, losses, costs, damages, expenses and liabilities, of whatsoever nature or kind (including but not limited to reasonable attorneys fees, litigation and court costs, amounts paid in settlement and amounts paid to discharge judgments), howsoever caused, directly or indirectly resulting from, arising out of or otherwise related, in any way, to the existence, operation, use, maintenance, repair and/or replacement of the Internal City System within The Hamptons on The Hamptons' side of the Connection Point; provided, however, that the indemnification provided hereby shall not extend to any claims, demands, suits, actions, losses, costs, damages, expenses and liabilities to the extent that they are caused by, result from or are otherwise attributable to the negligence of the District.

ARTICLE 4

CONSTRUCTION AND INSPECTION

Plans for physical connection by the City of the Internal City System to the District's sanitary sewer system at the Connection Point shall first be approved by the District; whereupon, the construction work necessary to complete such connection shall all be accomplished in conformance with the District's specifications, rules and regulations. No service shall be provided hereunder unless and until the connection has been inspected and approved, in writing, by the District.

ARTICLE 5

RIGHTS OF THIRD PARTIES

This Agreement is not intended to be a third party beneficiary contract for the benefit of the retail customers of the City within The Hamptons, or otherwise, or of any other third parties, and no such third party shall have any cause of action against the District for any breach or default by the District hereunder. In addition, no third party shall have any rights hereunder which could in any way restrict the Parties' right to modify or terminate this Agreement at any time or in any manner. The City agrees to indemnify, defend and hold the District harmless from and against the claim of any customer of the City arising hereunder.

ARTICLE 6

TERM

This Agreement shall continue for a period of fifty (50) years commencing on the effective date of this Agreement, if approved by appropriate resolution of each Party. Prior to the expiration of the foregoing contract term, the Parties shall in good faith negotiate a new agreement for the continuation of the provision of services described herein.

ARTICLE 7

MATTERS BEYOND THE CONTROL OF THE DISTRICT

The District does not warrant against, and shall not incur any liability for or arising out of, any adverse claims, acts of God, or other matters beyond the District's reasonable control, which may prevent the District from collecting and treating sewage as provided herein.

ARTICLE 8

BINDING EFFECT

This Agreement shall inure to the benefit of and be binding upon the Parties hereto, and their respective successors and assigns.

ARTICLE 9

INTEGRATION

This Agreement constitutes the entire understanding and agreement by and among the Parties hereto, and supersedes all prior agreements, representations or understandings by and between them, whether written or oral, pertaining to the subject matter hereof.

ARTICLE 10

AMENDMENTS

This Agreement may only be changed, modified or amended in writing upon mutual agreement of the Parties.

ARTICLE 11

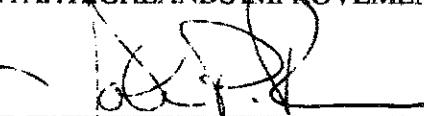
EFFECTIVE DATE OF AGREEMENT/PASSAGE OF RESOLUTIONS

This Agreement shall be come effective as set out above, provided it has been approved by appropriate resolutions of the Ogden City Council and the Board of Trustees of the District prior to

the effective date, and in accordance with the provisions of §11-13-9, Utah Code Annotated, 1953, as amended, and be submitted to and approved by an authorized attorney for each Party.

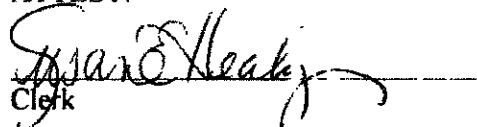
IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed as of the day and year first above written.

UINTAH HIGHLANDS IMPROVEMENT DISTRICT

By: 

Chairman, Board of Trustees

ATTEST:


Clerk

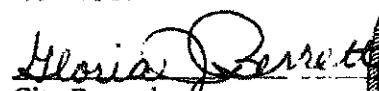
APPROVED AS TO FORM:


Attorney for Uintah Highlands
Improvement District

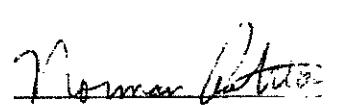
OGDEN CITY, a Utah Municipal Corporation



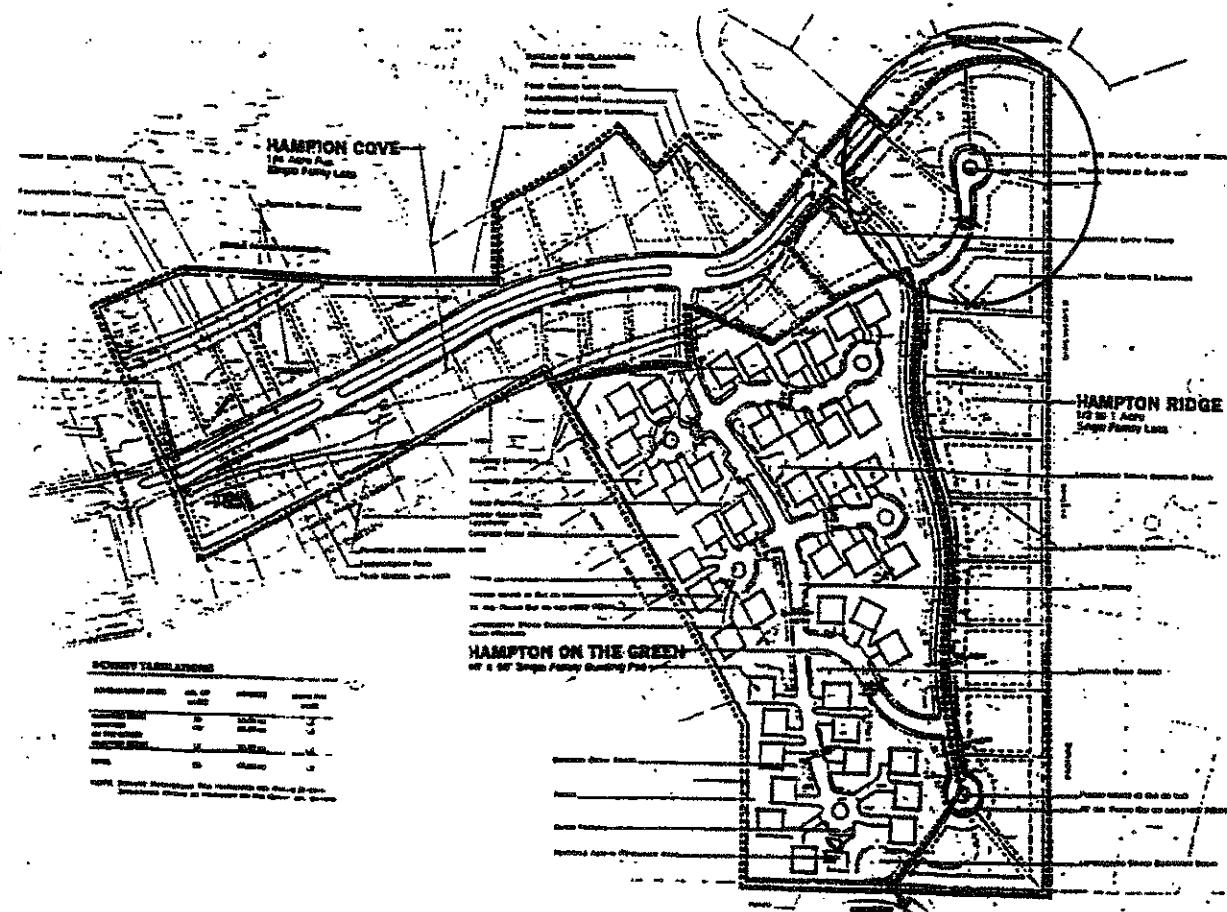
ATTEST:


City Recorder

APPROVED AS TO FORM:


Ogden City Attorney





↖ N.

ATTACHMENT A

EXHIBIT "B"
CULINARY WATER

Per Lot/month

| | |
|---|----------------------|
| District Water--based on Weber Basin Water Contract (for comparison purposes only) [\$19,313.58 (WBWCD @ \$17,765.16 + Combe Spr. @ \$1,548.42) divided by 730* homes (existing number of homes served in District divided by 12 months)] | \$2.20 |
| O&M (Maintenance, repair, and replacement expense as per 1994 actual expenditures, based on O&M for 1/12th of linear system, and pro rate share of O&M for reservoir and pumps. Delivery lines - \$0.47, Supply lines - 2.91) | \$3.38 |
| General Fund (Administrative and other general expenses as per 1994 actual expenditures (less meter reading, supplies and salary cost, and to the extent such costs can be isolated, less any other costs attributable to billing & collection and direct customer services) divided by 730* homes divided by 12 months x 1/2 (See Sewer)) | \$2.98 |
| Capital Improvements Reserve (1994 actual divided by 730* homes divided by 12 months) | \$1.81 |
| Debt Service (Annual payment on water bonds divided by 730* homes divided by 12 = \$0.91 principal and \$0.22 interest; debt terminated by end of 1997.) | \$1.13 |
| TOTAL BASE RATE (charged for use of 0 - 12,499 gallons per month) | <hr/> \$ 9.30 |
| Overage Charges (in Addition to Base Rate) | |
| District charges | |
| 12,499 to 20,499 gallons used | \$0.90/1,000 gallons |
| 20,500 + gallons used | \$2.50/1,000 gallons |
| Wheeling overage charge--based on ratio of 9.3/11.5 (admin. cost/cost of water + admin. cost) as applied to initial overage charge (cost of water not a factor) # of lots x 12,499 + | \$0.73/1,000 gallons |

*Number of existing lots currently receiving culinary water services from District; sufficient increase in number of lots, including increase applicable by reason of this agreement could result in a reduction of per\lot charges.

ORIGINAL

RESOLUTION NO. 2005-03
INTERLOCAL AGREEMENT PROVIDING FOR
SEWER COLLECTION SERVICES
(Shadow Mountain Estates Subdivision)

THIS INTERLOCAL AGREEMENT ("Agreement"), is made and entered into as of this 21st day of July, 2005, pursuant to authority of the Utah Interlocal Cooperation Act, Title 11, Chapter 13, Utah Code Annotated, 1953, as amended (the "Act"), by and between **Uintah Highlands Water and Sewer Improvement District**, a water and sewer improvement district organized and existing pursuant to the provisions of § 17A-2-301, *et seq.*, U.C.A., 1953, as amended (the "District"), and **Ogden City Corporation**, a Utah municipal corporation (the "City"). (The District and the City are sometimes referred to herein individually as a "Party" and collectively as the "Parties.")

R E C I T A L S

WHEREAS, pursuant to the Act, any power or powers, privileges or authority exercised or capable of exercise by a public agency of the state (defined as any political subdivision of the state, including special districts of various kinds) may be exercised and enjoyed jointly with any other public agency, and any two or more public agencies may enter into agreements with one another for joint or cooperative action pursuant to the Act; and

WHEREAS, the District and the City have previously entered into an interlocal agreement entitled: *An Agreement between Ogden City and the Uintah Highlands Improvement District, Whereby the District Agrees to Delivery Culinary Water and Provide Sewage and Storm Drainage Collection Services to the City, on a Wholesale Basis, for the Use and Benefit of the Shadow Mountain Estates Development*, dated August 1, 1995, (the "Prior Agreement"), pursuant to which the District has provided culinary water to, and sewage and storm drainage collection services for, the Shadow Mountain Estates Subdivision ("Shadow Mountain"), which is located within the City; and

WHEREAS, circumstances have significantly changed since the Prior Agreement was executed by the Parties in that Shadow Mountain has been disconnected from the District's culinary water system and is now receiving culinary water service from the City through the City's culinary water system, and the District's storm drainage collection system has been taken over and is now being operated by Weber County as part of the County's storm drainage collection system so that the District is no longer providing storm drainage collection services for Shadow Mountain or otherwise within the District; and

WHEREAS, given the topography of Shadow Mountain and the inability of the City to provide sanitary sewage collection service, it remains necessary for the District to continue to provide sanitary sewage collection service to Shadow Mountain, and the District is able and willing to continue to do so in conformance with and subject to the provisions of this Agreement;

Ogden City

2005 - 394

WHEREAS, the board of trustees of the District and the city council of the City have determined that it is in the best interest of the Parties to terminate the Prior Agreement and replace it with this Agreement which accurately sets forth the respective, on-going obligations of the Parties with respect to Shadow Mountain;

NOW, THEREFORE, in consideration of the foregoing and the mutual covenants contained herein, and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, it is agreed as follows:

AGREEMENT

1. SANITARY SEWAGE COLLECTION SERVICE. The District shall provide sanitary sewage collection service to Shadow Mountain in conformance with the following:

(a) Sewage from Shadow Mountain shall be collected by the District at a point of connection (the "Sewer Connection Point"), of the District's main sanitary sewer collection system (the "District Sewer System") with the City's internal sanitary sewer collection system within Shadow Mountain (the "Shadow Mountain Sewer System"). The Sewer Connection Point shall be the District's sewer manhole which is located in the proposed street extension for Skyline Drive nearest the common boundary line of the District and the City at the south end of Shadow Mountain Subdivision.

(b) The District Sewer System, and all equipment and facilities related thereto situated on the District's side of Sewer Connection Point, and facilities and equipment utilized in making the connection at the Sewer Connection Point, shall be the sole and separate property of the District, and the District shall be solely and separately responsible for the operation, maintenance, repair and replacement of the same at its sole cost and expense. The Shadow Mountain Sewer System, and all equipment and facilities related thereto, situated on the Shadow Mountain side of the Sewer Connection Point shall be the sole and separate property of the City, and the City shall be solely and separately responsible for the operation, maintenance, repair and replacement of the same at its sole cost and expense.

(c) Except for sanitary sewage collection service which is to be provided by the District for Shadow Mountain pursuant to this Agreement, the City shall provide all other municipal services to Shadow Mountain.

(d) The City shall pay for services provided by the District hereunder at the initial rate of \$34.19 per month per connection to the Shadow Mountain Sewer System (the "Service Charge"), based upon the costs and calculated as set forth in the schedule attached as EXHIBIT "A" hereto. The amount of the Service Charge is subject to reasonable adjustment by the District at the sole discretion of the District's board of trustees; except that any such adjustment in the Service Charge shall be proportionate to and consistent with similar adjustments made in the service charge for sanitary sewer service provided by the District to its sanitary sewer customers for those costs attributable to the services

provided herein and as described in EXHIBIT "A". The District shall provide sixty (60) days advance notice to the City of any adjustment in the amount of the Service Charge in addition to any notice required under applicable state law pertaining to the adjustment of rates and charges by special districts.

(e) The District does not warrant against, and shall not incur any liability for or arising out of, any adverse claims, acts of God, or other matters beyond the District's reasonable control, which may prevent the District from collecting sewage from Shadow Mountain as provided herein.

(f) The District shall have no responsibility to provide facilities for the collection of sewage within the Shadow Mountain Sewer System, nor shall the District exercise or attempt to exercise any right or control over the Shadow Mountain Sewer System. Notwithstanding the foregoing, the City hereby agrees that it will monitor and regulate the construction and/or installation of improvements or changes to and the use of all equipment and facilities within the Shadow Mountain Sewer System in an effort to prevent any obstruction occurring within and/or damage to the District Sewer System. The City shall indemnify the District, and hold its officers, employees and agents harmless from and against any and all losses, expenses, costs (including without limitation court costs and attorneys' fees), claims, actions, demands, damages, proceedings and liabilities imposed or claimed to be imposed upon the District, its officers, employees and agents, for damage to the District Sewer System, and for bodily injuries, death or damage to any person or property, real and personal, which are determined to arise out of, or are otherwise determined to be attributable, in any way, to the use of the Shadow Mountain Sewer System and/or to any construction activities within Shadow Mountain.

(g) The City shall pay for all sanitary sewer collection services rendered by the District pursuant to this Agreement, on a quarterly basis, as billed by the District. The City shall provide payment within thirty (30) days after submission by the District of the quarterly statement.

2. INDEMNIFICATION. The City shall indemnify the District and its respective officers, officials, employees, agents and representatives harmless from and against any and all claims, demands, suits, actions, losses, costs, damages, expenses and liabilities, of whatsoever nature or kind (including but not limited to reasonable attorneys fees, litigation and court costs, amounts paid in settlement and amounts paid to discharge judgments), howsoever caused, directly or indirectly resulting from, arising out of or otherwise related, in any way, to the existence, operation, use, maintenance, repair and/or replacement of the Shadow Mountain Sewer System; provided, however, that the indemnification provided hereby shall not extend to any claims, demands, suits, actions, losses, costs, damages, expenses and liabilities to the extent that they are caused by, result from or are otherwise attributable to the negligence of the District.

3. RIGHTS OF THIRD PARTIES. This Agreement is not intended to be a third party beneficiary contract for the benefit of the retail customers of the City within Shadow Mountain, or

otherwise, or of any other third parties, and no such third party shall have any cause of action against the District for any failure by the District to provide service or for any breach or default by the District hereunder. In addition, no third party shall have any rights hereunder which could in any way restrict the Parties' right to modify or terminate this Agreement at any time or in any manner. The City agrees to indemnify the District harmless from and against the claim of any customer of the City arising in connection with sanitary sewage service provided by the District hereunder.

4. TERM. This Agreement shall continue for the maximum period authorized by law for interlocal agreements pursuant to the Act, as amended from time-to-time, commencing on the dated date hereof, subject to prior termination upon the mutual written agreement of the Parties.

5. BINDING EFFECT. This Agreement shall inure to the benefit of and be binding upon the Parties hereto, and their respective successors and assigns.

6. INTEGRATION. This Agreement constitutes the entire understanding and agreement by and among the Parties, and supersedes all prior agreements, representations or understandings by and between them, whether written or oral, pertaining to the subject matter hereof.

7. AMENDMENTS. This Agreement may only be changed, modified or amended in writing upon mutual agreement of the Parties.

8. EFFECTIVE DATE OF AGREEMENT/PASSAGE OF RESOLUTION. This Agreement shall become effective as set out above, provided it has been approved by a resolution of the Ogden City Council on behalf of the City and by a resolution of the Board of Trustees of the District on behalf of the District prior to the effective date, and in accordance with the provisions of §11-13-9, Utah Code Annotated, 1953, as amended, and be submitted to and approved by an authorized attorney for each Party.

9. PRIOR AGREEMENT SUPERSEDED. This Agreement shall replace and supersede the Prior Agreement in its entirety.

10. DISCONNECTION OF WATER SERVICE. In terminating water services under the prior agreement, the parties determined that the infrastructure for the provision of such services should remain in place in the event of emergency, with necessary provision made for the installation of valves, blow-off assemblies and locks as agreed by the parties. It is understood and agreed, however, that no water service is to be provided to the City without the express permission of the District and without provision being made for the payment of such services. At the point of disconnection (the master meter vault located at approximately 2390 E. Woodland), the City shall be responsible for maintaining in an operable condition the north valve and all pipe fittings from the north valve inside the vault, through the cement wall continuing to Ogden City's boundary, and shall keep the north gate valve locked and in the closed position. All other valves, pipes, and locks located in the master meter vault at the point of

disconnection, and necessary for the provision of such emergency services, shall be maintained in an operable condition by the District

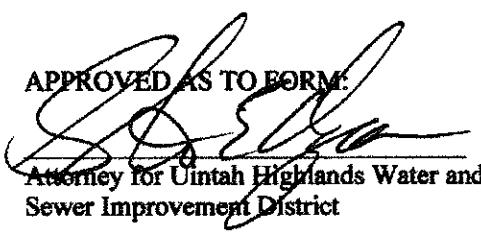
11. FILING OF AGREEMENT. Executed copies of this Agreement shall be deposited with and remain in the office of the District and the City during the effective term hereof.

IN WITNESS WHEREOF the Parties have caused this Agreement to be executed as of the day and year first above written.

**UINTAH HIGHLANDS WATER AND
SEWER IMPROVEMENT DISTRICT**

By 
Chair, Board of Trustees

APPROVED AS TO FORM:


Attorney for Uintah Highlands Water and
Sewer Improvement District

OGDEN CITY Corporation, a Utah municipal
corporation

By 
Matthew R. Godfrey, Mayor

ATTEST:


Gloria Bennett
City Recorder

APPROVED AS TO FORM:

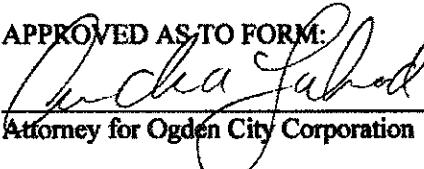

Linda J. Abrahad
Attorney for Ogden City Corporation



EXHIBIT "A"
SANITARY SEWER RATE
Based on 2004 Financial Statement and Connections

| | <u>Per Lot/Month</u> |
|---|----------------------|
| South Ogden Wheeling Charge [Annual payment ÷ by 777* connections ÷ by 12 months] | \$.65 |
| Sewer O & M / Depreciation [2004 actual Sewer O & M Expense / Depreciation ÷ by 777* connections ÷ by 12 months] | \$ 7.91 |
| General Fund [Administrative and other general expenses from 2004 actual expenditures – Less specific water or sewer related expenses attributable to billing & collection or other direct customer services not provided under this agreement ÷ by 777* connections ÷ by 12 months x ½ (water = ½ / sewer = ½)] | \$ 3.94 |
| Central Weber Sewer Improvement District [Annual Fee ÷ 777* connections ÷ by 12 months] | \$ 6.44 |
| Debt Service [Bond Payment ÷ by 777* connections ÷ by 12 months] | \$ 15.25 |
| Total Monthly Rate | <hr/> \$ 34.19 |

* Number of existing lots currently receiving sanitary sewer services from District; increase in number of lots would result in a reduction of per lot charges

SEWER TRANSFER AGREEMENT

This Sewer Transfer Agreement (hereafter referred to as the "Agreement") is entered and effective this 11th day of October, 2008, by and between Ogden City and Marriott-Slaterville City.

RECITALS:

WHEREAS, Ogden City and Marriott-Slaterville City (collectively referred to as the "Cities") are both municipal corporations duly organized and existing under the laws of the state of Utah;

WHEREAS, the Cities currently operate under the alternative council-mayor form of government provided in Title 10, Chapter 3, Section 1209 of the Utah Code Annotated, 1953 as amended;

WHEREAS, Ogden City became aware of a 10" sanitary sewer line running east and west located on the north side of 12th Street along or near the mutual border of the Cities (hereafter referred to as the "sewer line");

WHEREAS, the sewer line is presumed to be owned and operated by Ogden City, but only services approximately four users;

WHEREAS, a review of this sewer line has been made by the Cities' Engineer to determine its current condition;

WHEREAS, the review made by the Cities' Engineer shows that the sewer line is in need of immediate maintenance and repair;

WHEREAS, that staff from the Cities have met and recommend that the sewer line be transferred to Marriott-Slaterville City for ownership, operation, and maintenance;

WHEREAS, that the Cities desire to formalize the recommendations of staff as set forth herein;

NOW, THEREFORE, in consideration of the mutual agreements contained herein the parties hereto agree as follows:

- 1. Transfer and Limitations.** That all ownership, operation, and maintenance relating to the sewer line identified as a 10" sanitary sewer line running east and west located on the north side of 12th Street along or near the mutual border of the Cities further identified on the attached Exhibit "A" is hereby perpetually transferred from Ogden City to Marriott-Slaterville City. Said transfer includes all rights and duties associated with said sewer line, including, but not limited to: any actual or prescriptive easements, line upgrades, line extension, additional connections, and so forth. This transfer is limited to the sewer line identified in Exhibit "A" and does not include any laterals or similar private facilities nor does it include any real property interest. Any real property interest that Ogden City

2008 - 535

Retention: Perm

has (whether express or implied), if any, associated with the sewer line may be used in its entirety by Marriott-Slaterville City as if Marriott-Slaterville were a joint tenant, contractor, employee or representative of Ogden City.

2. **Fiscal Year 2009 Upgrades and Repairs.** That based upon the recommendations of the engineers of the Cities, the sewer line is in need of immediate upgrade and repair which can be accomplished by the insertion of a "slip lining" into the sewer line pipe. Marriott-Slaterville City agrees to pay Ogden City \$29,000 toward this slip lining in fiscal year 2009. Payment shall be made to Ogden City upon written notice to Marriott-Slaterville City that the slip lining has been completed. Ogden City agrees to include the slip lining of the entire sewer line identified in Exhibit "A" as part of its in fiscal year 2009 upgrade schedule and capital improvement projects contract, paying all costs for the same, subject to the \$29,000 to be paid to Ogden City by Marriott-Slaterville City.
3. **Ongoing Maintenance and Operation.** Marriott-Slaterville agrees to perpetually maintain the sewer line, including the continuation of service to all of the current users located on said sewer line within the boundaries of Ogden City. Marriott-Slaterville City does not anticipate using more than 85% of the full capacity of the sewer line as it is presently constructed. Marriott-Slaterville City shall maintain the excess capacity of 15% of the total usable capacity of the sewer line for future users in Ogden City and will allow future users in Ogden City to connect to the sewer line up to that excess capacity. Marriott-Slaterville City is solely responsible to collect its own impact, connection, service, and service fees imposed by Marriott-Slaterville City. Ogden City retains the exclusive right to collect any of its fees from users located within Ogden City. Any future users in Ogden City who connect directly to the sewer line shall pay a connection fee to Marriott-Slaterville City based on the fee schedule in effect at the time of connection. All other fees of future users in Ogden City, including service fees, shall be collected and retained by Ogden City.
4. **Consideration.** In consideration for Marriott-Slaterville City accepting the transfer and associated liabilities relating to this sewer line, Ogden City agrees to flush said sewer line as identified on Exhibit "A" as requested by Marriott-Slaterville City. In the event the sewer line is extended, Marriott-Slaterville may contract separately with Ogden City to flush such extensions. Additionally, Ogden City agrees to pay Marriott-Slaterville City a prorated cost to replace or upgrade said sewer line representing the portion of the sewer lined used by users within Ogden City at the time of the replacement or upgrade.
5. **Interpretation and Intent.** Terms, words, and phrases used in this Agreement shall have the meanings given in accordance with standard rules of interpretation of contracts. This Agreement constitutes the entire Agreement of the parties. This Agreement terminates and supersedes all prior understandings or agreements on the subject matter hereof. This Agreement may be modified only by a further writing that is duly executed by both Cities. This Agreement shall be construed and enforced in accordance with the laws of the state of Utah.

Sewer Transfer Agreement
Ogden City and Marriott-Slaterville City

FOR OGDEN CITY:

MRG
MRG
Matthew R. Godfrey
Mayor

CM
CM ATTEST:

Cindi Mansell
City Recorder
Cindi Mansell

Approved as to Form:

Matthew R. Godfrey
City Attorney



FOR MARRIOTT-SLATERVILLE CITY

Keith H. Butler
Keith H. Butler
Mayor

ATTEST:

Becky Burt
City Recorder
Becky Burt

Approved as to Form:

William M. Morris
William M. Morris
City Attorney





*Municipal Wastewater Planning Program (MWPP)
Annual Report
for the year ending 2022
OGDEN CITY*

Collections System Section

Form completed by:

May Receive Continuing Education /units (CEUs)

Justin Anderson P.E.

Part I: SYSTEM DESCRIPTION

What is the largest diameter pipe in the collection system (diameter in inches)?

42"

Ian says 60", but sewer master plan says that the largest one is 42" ... with a dotted line showing CWSID lines. Checked with Bill and confirmed that we do not maintain the 60" line Ian was thinking.

What is the average depth of the collection system (in feet)?

8ft

What is the total length of sewer pipe in the system (length in miles)?

276.5

How many lift/pump stations are in the collection system?

2

What is the largest capacity lift/pump station in the collection system (design capacity in gallons per minute)?

2332 gpm

Do seasonal daily peak flows exceed the average peak daily flow by 100 percent or more?

- Yes
- No**

What year was your collection system first constructed (approximately)?

1900

In what year was the largest diameter sewer pipe in the collection system constructed, replaced or renewed? (If more than one, cite the oldest)

1990

PART II: DISCHARGES

How many days last year was there a sewage bypass, overflow or basement flooding in the system due to rain or snowmelt?

0. There were three sewer overflows last year, but all of them were due to clogs in the main (roots, baby wipes, or grease)

How many days last year was there a sewage bypass, overflow or basement flooding due to equipment failure (except plugged laterals)?

3 (potentially 4). See details below:

01/03/2022: 1235 Grant Ave. - Grease in main caused by KFC (impacted 1 house)

04/26/2022: 3621 Iowa Ave. - Flows from manholes, baby wipes

06/30/2022: 3833 Grandview Dr. - Roots (impacted 1 house)

*2022: 974 Grant Ave. - Baby wipes and grease buildup in main

*Bill said that he had this in his records but Libby has no record of it

The Utah Sewer Management Program defines two classes of sanitary sewer overflows (SSOs):

Class 1– a Significant SSO means a SSO or backup that is not caused by a private lateral obstruction or problem

that:

- (a) affects more than five private structures;
- (b) affects one or more public, commercial or industrial structure(s);
- (c) may result in a public health risk to the general public;
- (d) has a spill volume that exceeds 5,000 gallons, excluding those in single private structures; or
- (e) discharges to Waters of the state.

Class 2 - a Non-Significant SSO means a SSO or backup that is not caused by a private lateral obstruction or problem that does not meet the Class 1 SSO criteria.

Below include the number of SSOs that occurred in year: 2022

| | Number |
|---|---------------------------------|
| Number of Class 1 SSOs in Calendar year | 0 |
| Number of Class 2 SSOs in Calendar year | 3 (potentially 4) Details above |

Please indicate what caused the sso(s) in the previous question.

Grease discharges from food service establishment (FSE) exited the FSE lateral and plugged the City sewer main.
Baby wipes and roots were other causes of SSOs.

Please specify whether the SSOs were caused by contract or tributary community, etc.

They were not.

Part III: NEW DEVELOPMENT

Did an industry or other development enter the community or expand production in the past two years, such that flow or wastewater loadings to the sewerage system increased by 10% or more?

Yes

No

Are new developments (industrial, commercial, or residential) anticipated in the next 2 – 3 years that will increase flow or BOD5 loadings to the sewerage system by 25% or more?

Yes

No

Number of new commercial/industrial connections in the last year

CWSID said that they do a 50 unit apartment complexa s 50 residential connections. - Kevin Hall can get the number from Ogden City. for Commercial/industrial. Camille Cook will be there tomorrow and she can call me directly with this information. Annual average user charge for district-wide service area.. but unsure for each individual City... however, Ogden

is about 39% of the total. User charge probably includes all commercial/industrial.

See Jeff's spreadsheet: 628 commercial connections

Jeff said that all apartment complexes, multifamily homes, townhomes, etc. are considered commercial per CWSID. However, if a single townhome unit is broken off and sold to someone as a residence rather than a rental, then it becomes considered a residential.....

Very confusing.

Number of new residential sewer connections added in the

(A single commercial development with 50 units is counted as 50 connections)

last year

See Jeff's spreadsheet: 138 residential connections
(includes town homes broken down by # of units)

<https://www.lawinsider.com/dictionary/equivalent-residential-connection#:~:text=Equivalent%20Residential%20Connection%20means%20a%20unit%20of%20potable%20water%2C%20reclaimed,time%20by%20the%20County%20Manager>:

Equivalent Residential Connection means a unit of wastewater capacity which is equivalent to the annual average number of gallons per day of service that is attributable to a detached single family residence

Equivalent residential connections⁷ served

Barton Brierley directed me to the following census site which gives detail son number of housing units. I belive the value that would be most applicable to this question is the Estimated number of 1-unit, detached houses in Ogden (**21,989**). Ian thinks that the Equivalent residential connections would be considered the total residential units (**35,120**).
[https://data.census.gov/table?q=DP04:+SELECTED+HOUSING+CHARACTERISTICS+IN+THE+UNITED+STATES&g=0400000US49\\$50015_160XX00US4955980&tid=ACSDP1Y2021.DP04](https://data.census.gov/table?q=DP04:+SELECTED+HOUSING+CHARACTERISTICS+IN+THE+UNITED+STATES&g=0400000US49$50015_160XX00US4955980&tid=ACSDP1Y2021.DP04)

This website further defines each term used in the Census site above:
<https://blog.cubitplanning.com/2013/02/apartment-statistics-that-you-can-get-from-the-us-census/>

However, I think thought apartment units are considered commercial connections.

How many collection system operators do you employ?

7

Approximate population served

90,000

State of Utah Administrative Rules requires all public system operators considered to be in Direct Responsible Charge (DRC) to be appropriately certified at least at the Facility's Grade.

List the designated Chief Operator/DRC for the Collection System below:

| | Name | Grade | Email |
|--------------------|---------------------|-------|---------------------------------|
| | First and Last Name | | Please enter full email address |
| Chief Operator/DRC | Bill Simpson | IV | Billsimpson@ogd |

List all other Collection System operators with DRC responsibilities in the field, by certification grade, separate names by commas:

| | |
|----------------------------|---------------------------|
| | Name separate by comma |
| SLS ¹⁷ Grade I: | |

Name

separate by comma

Collection Grade I:

Collection Grade II:

Collection Grade III:

Collection Grade IV:

Bill Simpson, Randy Stain,

List all other Collection System operators by certification grade, separate names by commas:

Name

separate by comma

SLS¹⁷ Grade I:

Collection Grade I:

| | |
|--------------------------------------|--|
| | Name separate by comma |
| Collection Grade II: | |
| Collection Grade III: | |
| Collection Grade IV: | Keith Hellewell, Trevor Patchett |
| No Current Collection Certification: | Jason Obrien, Ryan Vansweden, Matthew Williams |

Is/are your collection DRC operator(s) currently certified at the appropriate grade for this facility?

- Yes
- No

Part V: FACILITY MAINTENANCE

Yes

No

Yes No

Have you implemented a preventative maintenance program for your collection system? **Heather to compile documents here that Bill's crew has and put it in the Master Plan / Management Plans folder for Sewer.**

Have you updated the collection system operations and maintenance manual within the past 5 years?

Do you have a written emergency response plan for sewer systems?

Do you have a written safety plan for sewer systems?

Is the entire collections system TV inspected at least every 5 years?

Is at least 85% of the collections system mapped in GIS?

Part VI: SSMP EVALUATION

Yes No

Has your system completed a Sewer System Management Plan (SSMP)?

Has the SSMP been adopted by the permittee's governing body at a public meeting?

Has the completed SSMP been public noticed?

Yes

No

During the annual assessment of the SSMP, were any adjustments needed based on the performance of the plan?

During 2022, was any part of the SSMP audited as part of the five year audit?

Yes

No

Have you completed a System Evaluation and Capacity Assurance Plan (SECAP) as defined by the Utah Sewer Management Program?

Yes

No

Part VII: NARRATIVE EVALUATION

This section should be completed with the system operators.

Describe the physical condition of the sewerage system: (lift stations, etc. included)

Ian: Many of the more critical trunk lines and larger diameter pipes have been replaced within the past 20-30 years, however, the majority of smaller diameter sewer mains through residential sewer areas are aging and producing maintenance issues for Ogden.

What sewerage system capital improvements³ does the utility need to implement in the next 10 years?

Ian: CIPP Lining of critical sections of trunk lines and sewer mains. Capacity upgrades to ensure future development can be accommodated. The addressing of critical maintenance issues throughout the city. Implementation of projects as indicated by the City Sewer System Management Plan (Master Plan).

What sewerage system problems, other than plugging, have you had over the last year?

Ian: Issues with Fats, Oils, and Grease (FOG), pests, failure of shared laterals, structural failure(s) of concrete pipe and manhole, I&I, and failure of old clay pipes.

Is your utility currently preparing or updating its capital facilities plan²?

Yes

No

Does the municipality/district pay for the continuing education expenses of operators?

100% Covered

Partially cover

Does not pay

Is there a written policy regarding continuing education

IS THERE A written policy regarding continuing education

and training for wastewater operators?

Yes

No

Any additional comments?

This is the end of the Collections System questions

To the best of my knowledge, the Collections System section is completed and accurate.

Yes

Save & View Table of Contents

NOTE: This questionnaire has been compiled for your benefit to assist you in evaluating the technical and financial needs of your wastewater systems. Completion of the collection section meets the annual reporting requirement for the USMP. If you received financial assistance from the Water Quality Board, annual submittal of this report is a condition of that assistance. Please answer questions as accurately as possible to give you the best evaluation of your facility. If you need assistance, please send an email to wqinfodata@utah.gov and we will contact you as soon as possible. You may also visit our [Frequently Asked Questions](#) page.

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*Municipal Wastewater Planning Program (MWPP)
Annual Report
for the year ending 2022
OGDEN CITY*

Financial Evaluation Section

Form completed by:

Justin Anderson

Part I: GENERAL QUESTIONS

Yes

No

Are sewer revenues maintained in a dedicated purpose enterprise/district account?

| | Yes | No |
|--|-----------------------|-----------------------|
| Are you collecting 95% or more of your anticipated sewer revenue? | <input type="radio"/> | <input type="radio"/> |
| Are Debt Service Reserve Fund ⁶ requirements being met? | <input type="radio"/> | <input type="radio"/> |

What was the annual average User Charge¹⁶ for 2022?

I am waiting to hear back from either Brant McFarland or Justin Sorensen on this information. Kathleen will pull all bills from all months and all users and then I was able to find the following information from prior Annual Reports:

2017 Ogden \$14.53 + Central Weber \$14.94 = \$29.47
 2018 Ogden \$14.98 + Central Weber \$15.40 = \$30.38
2022 Ogden \$17.41 + Central Weber \$17.90 = \$35.31

Do you have a water and/or sewer customer assistance program* (CAP)?

Yes

No

Part II: OPERATING REVENUES AND RESERVES

| | Yes | No |
|--|-----|----|
|--|-----|----|

| | Yes | No |
|--|-----------------------|-----------------------|
| Are property taxes or other assessments applied to the sewer systems ¹⁵ ? | <input type="radio"/> | <input type="radio"/> |
| Are sewer revenues ¹⁴ sufficient to cover operations & maintenance costs ⁹ , and repair & replacement costs ¹² (OM&R) at this time? | <input type="radio"/> | <input type="radio"/> |
| Are projected sewer revenues sufficient to cover OM&R costs for the next five years ? | <input type="radio"/> | <input type="radio"/> |
| Does the sewer system have sufficient staff to provide proper OM&R? | <input type="radio"/> | <input type="radio"/> |
| Has a repair and replacement sinking fund ¹³ been established for the sewer system? | <input type="radio"/> | <input type="radio"/> |
| Is the repair & replacement sinking fund sufficient to meet anticipated needs? | <input type="radio"/> | <input type="radio"/> |

Part III: CAPITAL IMPROVEMENTS REVENUES AND RESERVES

| Yes | No |
|-----|----|
|-----|----|

| | Yes | No |
|--|-----------------------|-----------------------|
| Are sewer revenues sufficient to cover all costs of current capital improvements ³ projects? | <input type="radio"/> | <input type="radio"/> |
| Has a Capital Improvements Reserve Fund ⁴ been established to provide for anticipated capital improvement projects? | <input type="radio"/> | <input type="radio"/> |
| Are projected Capital Improvements Reserve Funds sufficient for the next five years ? | <input type="radio"/> | <input type="radio"/> |
| Are projected Capital Improvements Reserve Funds sufficient for the next ten years ? | <input type="radio"/> | <input type="radio"/> |
| Are projected Capital Improvements Reserve Funds sufficient for the next twenty years ? | <input type="radio"/> | <input type="radio"/> |

Part IV: FISCAL SUSTAINABILITY REVIEW

| | Yes | No |
|---|-----------------------|-----------------------|
| Have you completed a Rate Study ¹¹ within the last five years? | <input type="radio"/> | <input type="radio"/> |
| Do you charge Impact fees ⁸ ? | <input type="radio"/> | <input type="radio"/> |

| Yes | No |
|-----|----|
|-----|----|

Yes No

Have you completed an Impact Fee Study in accordance with UCA 11-36a-3 within the last five years?

Do you maintain a Plan of Operations¹⁰?

Have you updated your Capital Facility Plan² within the last five years?

Yes No

Do you use an Asset Management¹ system for your sewer systems?

Describe the Asset Management System (check all that apply)

- Spreadsheet
- GIS**
- Accounting Software**
- Specialized Software**
- Other

Yes No

Do you know the total replacement cost of your sewer system capital assets?

2022 Replacement Cost =

Ian: I've estimated our total replacement cost at about \$341,000,000. The master plan from 2013 indicated that to replace 1.6% of the system annually, it would require a cost of \$2,820,000 per year. Stretching this out to find the total replacement cost 10 years ago yields \$176,250,000. Construction costs are about 50-55% more expensive than they were at the time, and I added an additional 25% contingency since some of the larger and deeper pipes or pipes located under state routes tend to have much higher prices. This brought me to the \$341M figure.

This also means that the 1% estimate for annual percentage is pretty accurate. Justin says... This likely included all the costs of lines... but what else is in the sewer system besides lines? Manholes, lift stations. Justin's gut says to add about 80M. He adjusted it to \$420Million.

Yes No

Do you fund sewer system capital improvements annually with sewer revenues at 2% or more of the total replacement cost?

What is the sewer/treatment system annual asset renewal* cost as a percentage of its total replacement cost?

What is the sewer/treatment system annual asset renewal* cost as a percentage of its total replacement cost?

Ian: Guess of about 1%

Part V: PROJECTED CAPITAL INVESTMENT COSTS

Cost of projected capital improvements

| | Cost Please enter a valid numerical value | Purpose of Improvements | | |
|----------------|--|--------------------------|--------------------------|--------------------------|
| | | Replace/Restore | New Technology | Incre Cap |
| 2023 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2023 thru 2027 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2028 thru 2032 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2033 thru 2037 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2038 thru 2042 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

From Ian:

Per the CIP brief and 5 year project list:
 FY2023 – About \$5,600,000 depending on how 21st Street bid process goes.
 FY2024 - \$1,600,000
 FY2025 - \$3,410,000
 FY2026 - \$2,266,000
 FY2027 - \$3,130,000
 FY2028 - \$4,600,000
 FY2029-2034 estimate \$18,400,000
 FY2035-2039 estimate \$23,420,000.

I of the Financial questions
 FY2029 - \$3,066,666
 FY2030 - \$3,066,666
 FY2031 - \$3,066,666
 FY2031 - \$3,066,666
 FY2032 - \$3,066,666
 FY2033 - \$3,066,666
 FY2034 - \$3,066,666
 FY2035 - \$5,855,000
 FY2036 - \$5,855,000
 FY2037 - \$5,855,000
 FY2038 - \$5,855,000
 FY2039 - \$5,855,000

To the best of my knowledge, the Financial sect completed and accurate.

Yes

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NOTE: This questionnaire has been compiled for your benefit to assist you in evaluating the technical and financial needs of your wastewater systems. Completion of the collection section meets the annual reporting requirement for the USMP. If you received financial assistance from the Water Quality Board, annual submittal of this report is a condition of that assistance. Please answer questions as accurately as possible to give you the best evaluation of your facility. If you need assistance, please send an email to wqinfodata@utah.gov and we will contact you as soon as possible. You may also visit our [Frequently Asked Questions](#) page.

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Ogden city sanitary sewer preventative maintenance program

Since 1959, wastewater from the Ogden City area had been collected and discharged into Central Weber Sewer Improvement District (CWSID) wastewater treatment facilities. Sanitary sewer mains and trunk sewers within the Ogden City boundaries, comprising the sewer collection system, are generally owned, operated and maintained by Ogden City.

The Ogden City sanitary sewer collection system consists of approximately 300 miles of public sanitary sewer mains and approximately 4,000 manholes. Sewer mains in the collection system range in size from 8" inches to 48" inches in diameter. Building laterals consisting of 4"inch and 6"inch diameter pipe are not considered a part of the public sewer system.

Following is a summary of the maintenance plan:

1. Every two years or less, we "hydro-flush" all of our sewer mains. Past history has shown us completion from 12 to 17 month's. Completed areas are documented on a map daily.

(During the "hydro-flushing" operation all of the manholes are inspected for necessary repairs. These repairs are prioritized and completed as time and resources allow).

2. Every six-month we cut roots out of specific areas.
3. Every three-month we flush grease out of specific areas.
4. Every week we flush problem areas.
5. Every week we inspect and distribute poison for rodent control.
6. As needed we poison for roach control.
7. We core and install saddles onto the sewer main for building laterals.
8. We locate sewer mains and provide building lateral information for individuals, contractors and developers.
9. We have a written confined space policy that we adhere to.

William Simpson
Page 2
March 18, 2024

- 10 We have an on-going T.V. inspection program where we document problem areas and needed repairs.
11. We now have a flow monitor that we plan to start doing regular testing for pipe capacity.
12. Our crews are equipped and trained to make minor emergency repairs, all others are done by contractors and coordinated through the Ogden City Engineering Division.

Our Federal mandatory certification requirement is satisfied as follows:

Direct Responsible Charge (DRC) Operator: William Simpson - Grade IV Collection - Certificate # 1340E05154C (DRC)

Crew leader has Grade IV Collection certification # 1533E05154C.
(Only a grade III is required for this position)

Other sewer employees are certified as follows:

Randy Stain - Collection IV Operator - Certificate # 1533E05154C
William Simpson - Collection IV Operator - Certificate # 1340E05154C – (DRC)

All of our operators have a CDL class A drivers license.

Procedures for sewer standby Emergency calls.

- ◆ First when you get the call get as much information as possible location, How many houses, how often does it backup, is it only when you flush your toilet or run water in your tub or is it constantly coming up have you had a plumber out etc.
Make sure if it is dark out that you have a flashlight.
- ◆ Make sure you have a lid puller on your truck.
- ◆ Make sure you have something to right with and right on.
- ◆ When you get to the address First thing is to pull the lid that is upstream from where the address is to see if the city's main is backed up.
- ◆ If it is backed up you want to go to the manhole down stream from the address and start flushing the line.
- ◆ Make sure that when you start that you set your footage counter so that you know about where the plug was when you break it or when you stop.
- ◆ Make sure to watch the debris so you can tell what it was that caused the backup Tree roots, grease, etc.
- ◆ Then you can go talk to the Homeowner. Make sure that you introduce yourself as an Ogden City employee and you are here responding to a backup call. Make sure there are two people when you go in the house so there is no confusion on what happened.
- ◆ If the city's main is not backed up you will still run the main you will just talk to the customer before you run it. Letting them know that the city's main is running good and they may need to get a private contractor to run there line.
- ◆ If there is significant damage caused by the city main you will need to call a supervisor so that he can get the camera and get photos of the damage.
- ◆ When you get back to the yard / home be sure and make out a report while it is fresh in your mind.
- ◆ Don't ever admit fault. Let the supervisor do an investigation and determine what caused the problem and take care of it.

OGDEN CITY CORP,

Sanitary Sewer Overflow Action Plan

Whenever sanitary sewage leave the confines of the piping system, immediate action is necessary to prevent environmental, public health or financial damage from occurring. In addition, quick action is normally needed to mitigate damage which may have already occurred. For the purpose of this section, the following are part of the emergency action plan.

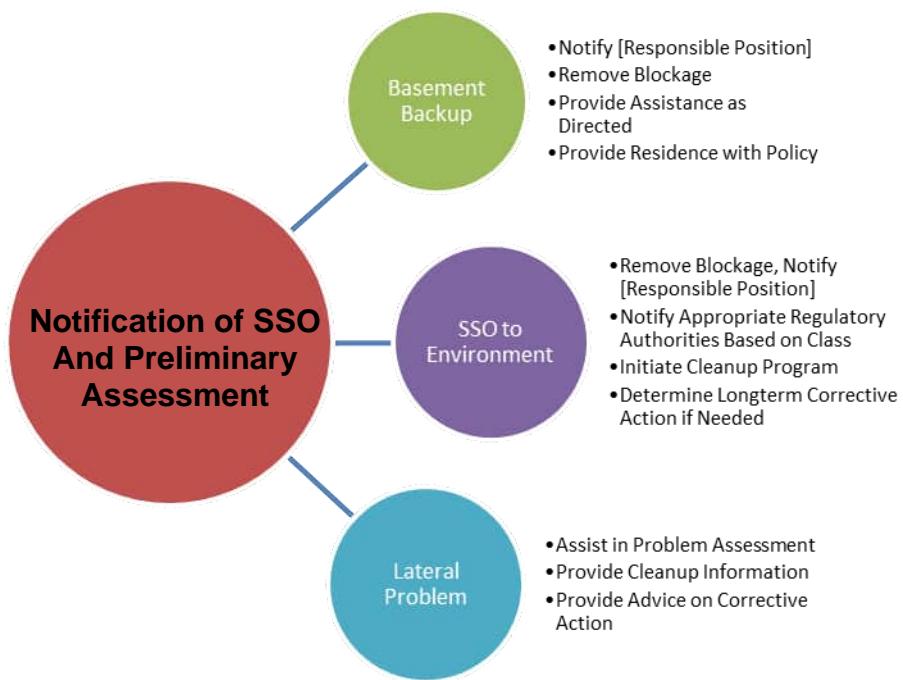
1. Basement backups
2. Sanitary sewer overflows
3. Sanitary sewer breaks which remain in the trench
4. Sewer lateral backups

All of the above conditions are likely to cause some damage. Each should be treated as an emergency, and corrective actions taken in accordance with Ogden city directions. Items 1 & 2 above should be reported immediately based on whether they constitute a Class 1 or Class 2 SSO. As stated in the definition section of the SSMP Introduction, a Class 1 SSO is an overflow which affects more than five private structures; affects a public, commercial or industrial structure; results in a significant public health risk; has a spill volume more than 5,000 gallons; or has reached Waters of the State. All other overflows are Class 2 SSO's. All Class 1 SSO's should be reported immediately. Class 2 SSO's should be documented and reported in the annual SSMP report and included in the Municipal Wastewater Planning Program submitted to the State. Item 3 may be reported to the local health department if, in the opinion of the responsible staff member there is potential for a public health issue. An example of where a public health issue may be present is when an excavator breaks both a sewer and a water line in the same trench. In such cases, the local health department representatives should be contacted and the situation explained. If the health representative requests further action on the part of the Ogden city staff should try and comply. If, in the opinion of the responsible staff member, the health department request is unreasonable, The Manager should be immediately notified. Care should always be taken to error on the side of protecting public health over financial considerations. When a basement backup occurs, the staff member responding should follow the Basement Backup Program procedures. Lateral backups, while the

responsibility of the property owner, should also be treated as serious problems. Care should be taken to provide advice to the property owner in such cases, but the property owner is ultimately the decision maker about what actions should be taken.

Response Activities

There are specific steps that should be followed once a notification is received that an overflow may be occurring. The following figure outlines actions that could be taken when Ogden city receives notice that a possible overflow has or is occurring.



General Notification Procedure

When a Class 1 SSO occurs specific notification requirements are needed. In such cases the following Notification procedure should be followed and documented. Failure to comply with notification requirements is a violation of R317-801.

Agency Notification Requirements

Both the State of Utah Division of Water Quality and the local health department should be immediately notified when an overflow is occurring. Others that may require notification include local water suppliers, affected property owners and notification may

be required to Utah Division of Emergency Response and Remediation if hazardous materials are involved. The initial notification must be given within 24 hours. However, attempts should be made to notify them as soon as possible so they can observe the problem and the extent of the issue while the problem is happening. A notification form is provided to document notification activities. After an SSO has taken place and the cleanup has been done, a written report of the event should be submitted to the State DEQ within five days (unless waived). This report should be specific and should be inclusive of all work completed. If possible the report should also include a description of follow-up actions such as modeling or problem corrections that has or will take place.

Public Notification

When an SSO occurs and the extent of the overflow is significant and the damage cannot be contained, the public may be notified through proper communication channels. Normally the local health department will coordinate such notification. Should Ogden city need to provide notification it could include press releases to the local news agencies, publication in an area paper, and leaflets delivered to home owners or citizens in the area of the SSO. Notification should be sufficient to insure that the public health is protected. When and if Federal laws are passed concerning notification requirements, these legal requirements are incorporated by reference in this document. In general, notification requirements should increase as the extent of the overflow increases.

Overflow Cleanup

When an overflow happens, care should be taken to clean up the environment to the extent feasible based on technology, good science and financial capabilities. Cleanup could include removal of contaminated water and soil saturated with wastewater and toilet paper, disinfection of standing water with environmentally adequate chemicals or partitioning of the affected area from the public until natural soil microbes reduce the hazard. Cleanup is usually specific to the affected area and may differ from season to season. As such, this guide does not include specific details about cleanup. The responsible staff member in conjunction with the State DEQ, the local health department and the owner of real property should direct activities in such a manner that they are all satisfied with the overall outcomes. If, during the cleaning process, the responsible staff member believes the State or the County is requesting excessive actions, the Manager should be contacted.

Corrective Action

All SSO's should be followed up with an analysis as to cause and possible corrective actions. An SSO which is the result of grease or root plug may be placed on the preventative maintenance list for more frequent cleaning. Serious or repetitive plugging problems may require the reconstruction of the sewer lines. An overflow that results from inadequate capacity should be followed by additional system modeling and either flow reduction or capacity increase. If a significant or unusual weather condition caused flooding which was introduced to the sanitary sewer system incorrectly, the corrective action may include working with other agencies to try and rectify the cross connection from the storm sewer to the sanitary sewer or from home drainage systems and sump pumps. Finally, should a problem be such that it is not anticipated to reoccur, no further action may be needed.

Technical Memo

Ogden City Unserved Areas – Sewer Master Plan

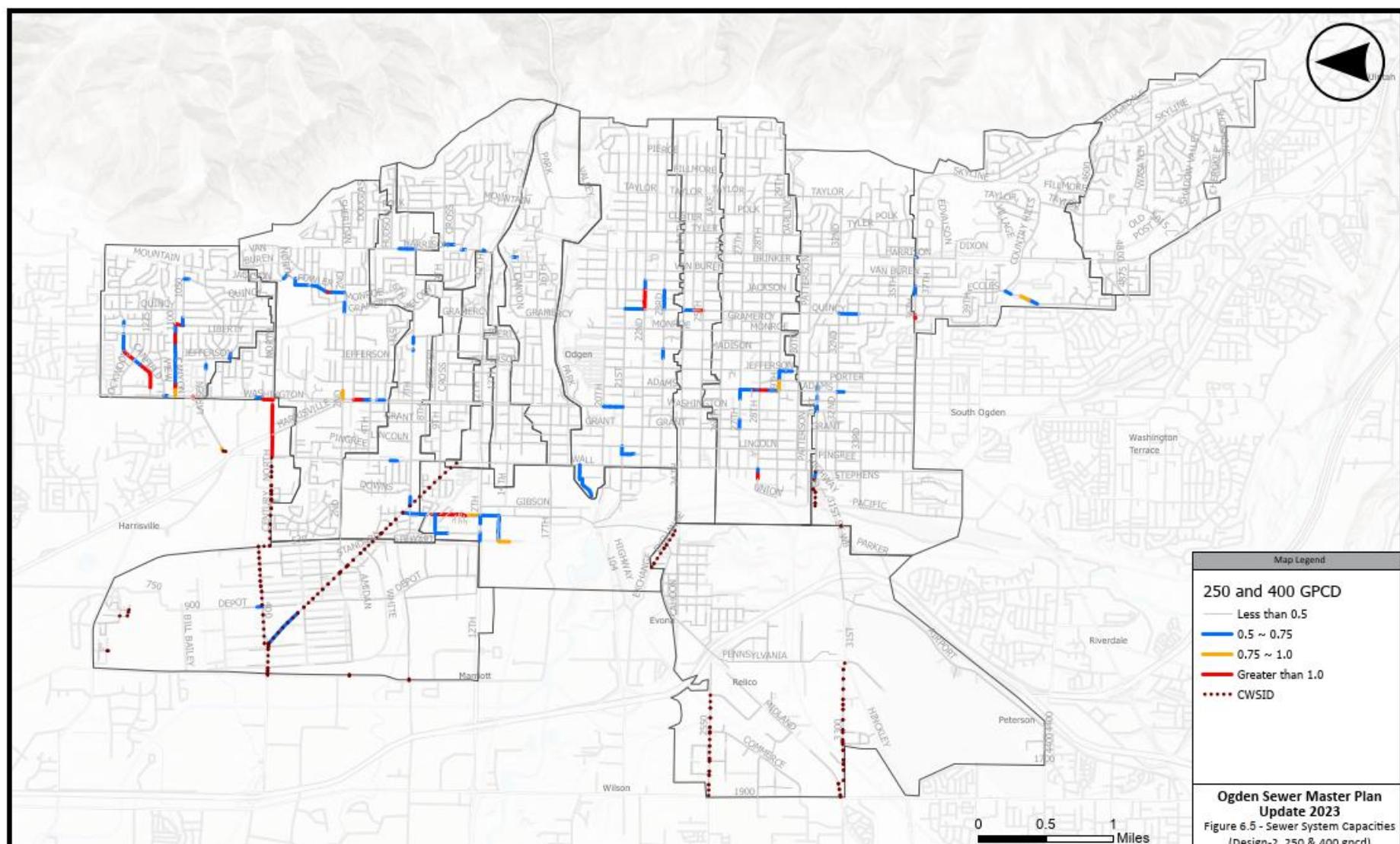
The Ogden City Sewer Master Plan is a general plan for the overall sewer system it does not address unserved areas directly because it is unknown how these areas will be developed in the future. The Master Plan projects future growth throughout the system in order to analyze the large interceptor/collector lines. The Master Plan projected population for 2060 is 106,934. The increase in population is projected to increase the flows in the system by 22%. The increased flows were applied to the sewer model throughout the system to simulate flows during buildout condition.

Three design flows were modeled in the Master Plan.

- 100 gallons per capita per day (gpcd) represents average day demand to a treatment source.
- 250 gpcd to analyze large diameter pipes that are interceptors and outfall sewers.
- 400 gpcd to analyze collector pipes.

The different flows reflect the probability of all connections peaking at the same time. Fewer connections to a sewer main a greater probability they could peak at the same time. Figure 6.5 in the Master Plan shows the existing systems capacities.

The sewer model allows the unserved areas to be evaluated as development occurs in each area and the capacity of the existing system. As development is proposed for each unserved area the City will use the Ogden City Sewer model to evaluate development and determine which sewer main would need to be extended to the area based on capacity, elevation, and demand. Ogden City's large interceptors and collectors have capacity for additional service areas based on the model build out scenarios. The local collector lines may be affected depending on the demand of the proposed development. If the development is below the elevation of the existing sewer mains a lift station will be needed to lift the sewer to Ogden City's gravity system.



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