



WASTEWATER MASTER PLAN AND CAPITAL IMPROVEMENT PLAN

(HAL Project No.: 139.03.300)

DRAFT

September 2026

LOGAN CITY
WASTEWATER COLLECTION SYSTEM MASTER PLAN
(HAL Project No.: 139.03.300)

DRAFT

Ridley Griggs, P.E.
Project Manager



September 2026

ACKNOWLEDGEMENTS

Successful completion of this master plan was made possible by the cooperation and assistance of many individuals, including those listed below:

Logan City Government

Mayor

Mark A. Anderson

City Council

Ernesto Lopez

Katie Lee-Koven

Mike Johnson

Jeannie Simmonds

Melissa Dahle

Water Advisory Board

Steve Harris

Loren Anderson

Michael Lasswell

Jeannie Simmonds

Jason Morgado

Troy Hatch

City Staff

Paul Lindhardt, Public Works Director

Darren Farar, City Engineer

Derek Kimball, Assistant City Engineer

Joseph Hawkes, Water Division Manager

Derek Holmstead, Water and Wastewater Engineer

Hansen, Allen & Luce, Inc.

Steven C. Jones, PE., CEO

Ridley Griggs, P.E., Project Manager

Megan Fernandez, Engineer

TABLE OF CONTENTS

TITLE	PAGE
ACKNOWLEDGEMENTS	i
TABLE OF CONTENTS	ii
LIST OF TABLES	iv
LIST OF FIGURES	v
EXECUTIVE SUMMARY	vi
PURPOSE OF STUDY	VI
PLANNING HORIZONS	VI
COMPONENTS OF A WASTEWATER COLLECTION SYSTEM	VI
METHODS	VI
EVALUATION CRITERIA	VII
SYSTEM VULNERABILITIES.....	VIII
CAPITAL FACILITY PLAN.....	IX
Infrastructure Replacement	xii
CONCLUSIONS	XII
 CHAPTER 1 INTRODUCTION	 1-1
BACKGROUND AND PURPOSE	1-1
SCOPE OF WORK.....	1-1
 CHAPTER 2 EXISTING WASTEWATER SYSTEM	 2-1
INTRODUCTION	2-1
SERVICE AREA.....	2-1
EXISTING WASTEWATER SYSTEM.....	2-1
Sources of Data	2-1
Collection Network	2-4
Wastewater Treatment Plant.....	2-4
Lift Stations	2-4
 CHAPTER 3 FLOW MONITORING	 3-1
FLOW MONITORING	3-1
LOGAN REGIONAL WASTEWATER TREATMENT FACILITY	3-1
 CHAPTER 4 FLOW CHARACTERIZATION	 4-1
METHODOLOGY	4-1
UNIT FLOWS	4-1
DAILY FLOW VARIATION.....	4-1
Peaking Factors	4-2
Member Communities	4-2
Land use	4-2
LOGAN REGIONAL WASTEWATER TREATMENT FACILITY	4-3
ANNUAL FLOW VARIATION.....	4-4
INFILTRATION AND INFLOW.....	4-5
Infiltration	4-6
Inflow	4-7
LONG TERM FLOW VARIATION	4-9
EXTRAORDINARY FLOWS	4-9
 CHAPTER 5 WASTEWATER FLOW PROJECTIONS	 5-1
PLANNING PERIOD	5-1

(TABLE OF CONTENTS - CONTINUED)

TITLE	PAGE
GROWTH PROJECTIONS	5-1
Logan City.....	5-1
Member Communities	5-2
FLOW PROJECTIONS.....	5-3
Utah State University	5-8
Future Infiltration	5-8
Future Inflow	5-8
Buildout Flows.....	5-8
CHAPTER 6 WASTEWATER COLLECTION SYSTEM EVALUATION.....	6-1
MODEL SELECTION	6-1
SYSTEM LAYOUT AND MODEL CONSTRUCTION	6-1
System Facilities	6-1
Collection Areas.....	6-2
Flow Allocation	6-2
Calibration.....	6-2
EVALUATION CRITERIA	6-2
MODEL SCENARIOS.....	6-6
PEAK HYDRAULIC LOADING	6-7
EXISTING DEFICIENCIES.....	6-7
FUTURE LIFT STATION CAPACITY.....	6-9
FUTURE IMPROVEMENTS	6-10
LOCATIONS TO MONITOR	6-15
CONTINUED MODEL UPDATES	6-15
CHAPTER 7 OPERATIONS AND MAINTENANCE ALTERNATIVES	7-1
SYSTEM MONITORING.....	7-1
FLOW MONITORING PROGRAM.....	7-1
PIPELINE IMPROVEMENTS.....	7-1
Grouting	7-1
Cleaning.....	7-1
Replacement Sewers	7-2
Bypass Sewers/Re-routing Flows.....	7-2
Rehabilitation of Sewers	7-2
New Sewers.....	7-2
Alternative Construction Technologies	7-2
COMPARISON OF IMPROVEMENT ALTERNATIVES	7-3
Sewers.....	7-3
Future Considerations.....	7-3
ELIMINATE UNNECESSARY WASTEWATER	7-3
CHAPTER 8 CAPITAL IMPROVEMENTS PLAN	8-1
PROJECT COST ESTIMATES.....	8-1
ACCURACY OF COST ESTIMATES.....	8-1
RECOMMENDED IMPROVEMENT PROJECTS.....	8-2
Crew Identified Projects	8-4
Infrastructure Replacement	8-5
ELIMINATE UNNECESSARY WASTEWATER	8-6
Direct Sewage.....	8-6
FINANCIAL CONSIDERATIONS.....	8-7
SUMMARY OF CAPITAL FACILITY RECOMMENDATIONS	8-7
Recommendations	8-7

(TABLE OF CONTENTS - CONTINUED)

TITLE	PAGE
REFERENCES	R-1

APPENDICES

Appendix A	Member Communities Service Agreements
Appendix B	Member Communities Diurnal Curves
Appendix C	Land Use Diurnal Curves
Appendix D	Growth Projections and Projected ERUs
Appendix E	Buildout Sewer System
Appendix F	Cost Estimates
Appendix G	Infrastructure Maintenance Plan
Appendix H	Member Communities Growth Projections
Appendix I	Member Communities Cost Sharing
Appendix J	USU Growth Projections
Appendix K	Crew Identified CIP Projects

LIST OF TABLES

TABLE	TITLE	PAGE
TABLE ES-1	EVALUATION CRITERIA.....	VII
TABLE ES-2	PIPE CAPACITY EVALUATION CRITERIA	VIII
TABLE ES-3	SYSTEM VULNERABILITIES	VIII
TABLE ES-4	PROPOSED SOLUTIONS TO SYSTEM VULNERABILITIES	IX
TABLE ES-5	EXISTING IMPROVEMENT PROJECTS AND COST ESTIMATES.....	X
TABLE ES-6	10-YEAR FUTURE IMPROVEMENT PROJECTS & COST ESTIMATES	XI
TABLE ES-7	SUMMARY OF PIPELINE REPLACEMENT COSTS	XII
TABLE 2-1	LIFT STATION INVENTORY	2-5
TABLE 4-1	LAND USE AND RESPECTIVE PATTERN CATEGORY.....	4-3
TABLE 4-2	WWTP MONTHLY AVERAGE FLOWS VS BILLED USAGE DATA.....	4-6
TABLE 5-1	LOGAN CITY ERU PROJECTIONS	5-2
TABLE 5-2	PROJECTED FUTURE ERU DENSITIES.....	5-4
TABLE 5-3	SYSTEM PEAK DAY FLOW PROJECTIONS (INCLUDING INFLOW)	5-10
TABLE 5-4	PEAK HOUR FLOW PROJECTIONS (EXCLUDING INFLOW).....	5-12
TABLE 5-5	MAXIMUM FLOW PROJECTIONS (INCLUDING INFLOW).....	5-12
TABLE 6-1	EVALUATION CRITERIA	6-5
TABLE 6-2	PIPE CAPACITY EVALUATION CRITERIA.....	6-6
TABLE 6-3	MODEL SCENARIOS	6-7
TABLE 6-4	EXISTING PIPE CAPACITY DEFICIENCIES AND SOLUTIONS.....	6-9
TABLE 6-5	FUTURE LIFT STATION REQUIREMENTS	6-10
TABLE 6-6	FUTURE 10-YEAR AND 40-YEAR IMPROVEMENT PROJECTS	6-10
TABLE 8-1	EXISTING IMPROVEMENT PROJECTS AND COST ESTIMATES.....	8-3
TABLE 8-2	10-YEAR FUTURE IMPROVEMENT PROJECTS & COST ESTIMATES	8-4
TABLE 8-3	SUMMARY OF PIPELINE REPLACEMENT COSTS.....	8-5

LIST OF FIGURES

FIGURE	TITLE	PAGE
FIGURE 2-1	EXISTING SEWER SYSTEM GRAVITY SEWERS	2-2
FIGURE 2-2	EXISTING SEWER SYSTEM FORCE MAINS.....	2-3
FIGURE 2-3	MILES OF SEWER MAINS AND FORCE MAINS BY DIAMETER.....	2-4
FIGURE 3-1	FLOW MONITORING LOCATIONS.....	3-2
FIGURE 4-1	COMPOSITE FLOW PATTERN	4-2
FIGURE 4-2	FLOWS TO LOGAN REGIONAL WASTEWATER TREATMENT FACILITY	4-4
FIGURE 4-3	LOGAN CITY ANNUAL FLOW VARIATION	4-4
FIGURE 4-4	INFLOW EVENT AT WASTEWATER TREATMENT PLANT	4-8
FIGURE 5-1	LOGAN CITY POPULATION PROJECTIONS	5-1
FIGURE 5-2	MEMBER COMMUNITIES' POPULATION PROJECTIONS	5-3
FIGURE 5-3	PROJECTED 10-YEAR GROWTH AREAS	5-5
FIGURE 5-4	PROJECTED 20-YEAR GROWTH AREAS	5-6
FIGURE 5-5	PROJECTED 40-YEAR GROWTH AREAS	5-7
FIGURE 5-6	USU ERU GROWTH PROJECTION	5-8
FIGURE 5-7	PLANNED FUTURE LAND USE.....	5-11
FIGURE 6-1	DELINEATED COLLECTION AREAS	6-3
FIGURE 6-2	MODELED INFILTRATION AND INFLOW LOCATIONS	6-4
FIGURE 6-3	EXISTING SYSTEM PROJECTS	6-8
FIGURE 6-4	10-YEAR GROWTH PROJECTS.....	6-12
FIGURE 6-5	20-YEAR GROWTH PROJECTS.....	6-13
FIGURE 6-6	40-YEAR GROWTH PROJECTS.....	6-14
FIGURE 8-1	COST OF PIPE REPLACEMENT BASED ON DECADE OF INSTALLATION	8-6

EXECUTIVE SUMMARY

PURPOSE OF STUDY

The purpose of this study is to help Logan City provide efficient and reliable wastewater collection service to its customers, both now and in the future, at the lowest reasonable cost. The master plan identifies a prioritized list of capital projects that can most efficiently accommodate existing users and future development at the City's selected level of service.

PLANNING HORIZONS

The ultimate planning horizon for this study is the buildout condition of Logan City. However, this report provides guidance applicable at the following time intervals:

- Near future: low-cost actions and best practices the City can implement to reduce costs and improve operations.
- 10-year: system improvements needed within 10 years to provide capacity for anticipated new development. The cost of these improvements will be used to set impact fees and guide the formulation of near-term budgets.
- 20-year: system improvements needed within 20 years to provide capacity for anticipated new development.
- 40-year: system improvements needed within 40 years to provide capacity for anticipated new development.
- Buildout: all system improvements necessary to serve the City when it is developed at the density defined by the City's current general plan and zoning ordinances. These recommendations will help the City secure key pieces of land and work with developers to properly plan for infrastructure that is compatible with the future system.

COMPONENTS OF A WASTEWATER COLLECTION SYSTEM

The following components of a wastewater collection system were analyzed to determine the capacity and ability of the system to meet existing and future loading:

1. Collection network – gravity and force mains that convey wastewater through the system.
2. Lift stations – used to pump wastewater from low-elevation points in the system up to higher-elevation gravity mains.

Each of these components must have enough capacity and capability to serve existing and future loading.

The focus of this master plan is the collection system owned and operated by Logan City. Wastewater collected by Logan City is treated at the Logan Regional Wastewater Treatment Facility. The Wastewater Treatment Facility maintains planning documents for their treatment system, and as such, treatment is not discussed in this report.

METHODS

The existing wastewater collection facilities, including pipelines and lift stations, were evaluated for performance. Flow monitoring was performed at a few locations in the City to assist with system evaluation and calibration. Flows within the collection system were characterized based on available data. Hydraulic models were then constructed to evaluate the system under existing and expected future scenarios.

EVALUATION CRITERIA

A range of potential evaluation criteria and values were suggested by HAL and reviewed by the City. The criteria and values adopted for this master plan and the modeling effort are included in Tables ES-1 and ES-2.

TABLE ES-1 EVALUATION CRITERIA

CRITERIA	VALUE OR ASSUMPTION
System Loading	Existing system loading was developed based on a level of service (LOS) of 210 gpd per ERU and observed infiltration and inflow. Future hydraulic loading was developed based on growth projections and the LOS of 210 gpd per ERU.
Daily Flow Variation	Diurnal curves were developed from winter drinking water production data, metered sewer flow rates, and data from the wastewater SCADA system.
Peak Flow	Peaking factors were developed from diurnal water demand curves and measured sewer flow rates. Predicted peak flows were developed from the AutoCAD SSA model.
Inflow and Infiltration	Inflow and infiltration values were estimated by reviewing flow data collected at the lift stations both for dry-weather periods and during storm events. Infiltration and inflow were distributed throughout the City. Modeled values are as follows: Existing Inflow = 10 MGD Buildout Inflow = 10 MGD Existing Infiltration = 8 MGD Buildout Infiltration = 0.12 gpm/acre for new development
Future Planning Periods	Years 2035 (10-year), 2045 (20-year), 2065 (40-year) and estimated buildout.
Land Use & Population Projections	Land uses in undeveloped areas were assumed to occur as specified in the Logan City General Plan. Where available, development plans were used to further refine projections for future land use. Population projections were based on historic trends and projected rates and timing of growth as identified by the Planning Department.

TABLE ES-2 PIPE CAPACITY EVALUATION CRITERIA

D Diameter (inches)	d Maximum Allowed Flow Depth (inches)	d/D Maximum Allowed Depth/Diameter	Minimum Slope
8	4	0.5	0.40%
10	5.5	0.55	0.28%
12	7.2	0.6	0.21%
15	9.75	0.65	0.15%
18	13.5	0.75	0.12%
21	15.75	0.75	0.10%
24	18	0.75	0.10%
27	20.25	0.75	0.10%
30	22.5	0.75	0.10%
36	28.8	0.8	0.10%
42	35.7	0.85	0.10%
48	40.8	0.85	0.10%
60	51	0.85	0.10%
72	61.2	0.85	0.10%

SYSTEM VULNERABILITIES

The system was analyzed to identify existing vulnerabilities and areas which will need improvements to support future growth. Table ES-3 contains a summary of system vulnerabilities. Further information about these vulnerabilities is described in subsequent sections.

TABLE ES-3 SYSTEM VULNERABILITIES

ID	Description	Notes
V1	Infiltration and Inflow	Based on recent measured flow data, significant inflow to the sewer system occurs during storm events. Infiltration also occurs, with significant increases noted during wet periods and irrigation season. Infiltration and inflow consume capacity in pipes and lift stations and lead to increased treatment volumes.
V2	Aging Infrastructure	Some wastewater collection infrastructure is reaching the end of its projected useful life and is increasingly at risk for failure.
V3	Pipe Capacity	The model identified several pipelines that provide adequate performance for existing conditions, but do not have capacity to support much additional development. Capital projects will be necessary if forecasted wastewater flows exceed available capacity in the pipe.

Recommended solutions to these vulnerabilities are shown in Table ES-4 and described in further detail in subsequent chapters.

**TABLE ES-4
PROPOSED SOLUTIONS TO SYSTEM VULNERABILITIES**

Description	Notes	Vulnerabilities Addressed
Modeling Reviews	Periodically conduct a review of hydraulic models to update them with new information and re-calibrate them to current conditions. Use updated models to help identify unknown deficiencies, determine timing of projected projects, and find any changes needed to the projected projects.	V1, V3
Infiltration and Inflow Mitigation	Reduce inflow by identifying areas where ponding occurs over sewer manholes during storms and improving stormwater conveyance in these areas. Consider discontinuing use of vented manholes in problem areas. Reduce infiltration by using video footage to identify pipes in poor condition with significant groundwater leakage. Continue grouting pipes in known problem areas. Reduce inflow by installing level sensors throughout the City to determine locations of severe inflow. Work with member communities to reduce their inflow into the Logan City system. Consider completing an inflow study to identify the best way to reduce inflow.	V1
Infrastructure Rehabilitation and Replacement	Identify pipes at highest risk for failure based on their condition. Conduct regular strategic rehabilitation and replacement based on the condition of the pipe and the most economically feasible strategy.	V2, V3

CAPITAL FACILITY PLAN

Projects necessary to support growth over the next 40 years are identified and described in the Capital Facility Plan. Conceptual-level cost estimates were prepared for each project. Projects recommended to address existing deficiencies are summarized in Table ES-5. Projects recommended to accommodate future growth in the next 10 years are summarized in Table ES-6. A summary of crew identified projects is included as Appendix K.

TABLE ES-5 EXISTING IMPROVEMENT PROJECTS AND COST ESTIMATES

PROJECT ID	LOCATION	ISSUE	RECOMMENDED SOLUTION	TOTAL COST ¹	MEMBER COMMUNITY COST	CITY COST	FUTURE GROWTH
E-1	1200 S between Legrand St and Main Street.	Surcharged pipe section.	Construct 1,100 ft of 15-inch gravity line parallel to the existing line	\$814,000	\$769,230 (94.5% Providence)	\$44,770 (5.5%)	6%
E-2	1200 S from Hwy 89/91 to Legrand Street	Surcharged pipe section.	Replace 800 ft of 12-inch gravity line with 18-inch gravity line.	\$628,000	\$575,876 (91.7% Providence)	\$52,124 (8.3%)	6%
E-3	2200 N to 1800 N (approx 600 W and 400 W), 1700 N to 1550 N (approx 700 W and 600 W), and 800 W between 1400 N to 1200 N.	d/D > 0.75 (0.90)	Construct approximately 7,100 ft of 48-inch gravity line.	\$9,393,000	\$6,011,520 (64% North Logan)	\$3,381,480 (36%)	18%
E-4	1200 W between 1000 N and 800 N.	d/D > 0.50 (0.78)	Replace 1,300 ft of existing 8-inch gravity line with 12-inch gravity line.	\$908,000	0%	\$908,000 (100%)	0%
E-5	300 E between Center St and 100 S.	Surcharged pipe section.	Replace 700 ft of existing 8-inch gravity line with 12-inch gravity line.	\$489,000	0%	\$489,000 (100%)	0%
E-6	200 E between 100 S and 200 S.	d/D > 0.50 (0.60)	Replace 700 ft of existing 8-inch gravity line with 10-inch gravity line.	\$469,000	0%	\$469,000 (100%)	0%
E-7	Main St between 200 S and 300 S. 200 S between 100 E and Main St.	Surcharged pipe section.	Replace 1,350 ft of existing 8-inch gravity line with 650 ft of 12-inch gravity line and 700 ft of 15-inch gravity line.	\$972,000	0%	\$972,000 (100%)	0%
E-8	300 S between 100 E and 200 E	d/D > 0.60 (0.78)	Replace 700 ft of existing 12-inch gravity line with 350 ft of 15-inch and 350 ft of 18-inch gravity line.	\$534,000	0%	\$534,000 (100%)	0%
E-9	Hwy 89 between 970 S and 100 W.	d/D > 0.60 (0.77)	Replace 700 ft of existing 12-inch gravity line with 15-inch gravity line.	\$518,000	\$492,100 (95% River Heights)	\$25,900 (5%)	0%
E-10	100 W between Hwy 89 and 970 S.	d/D > 0.65 (0.88)	Replace 900 ft of existing 12-inch and 15-inch gravity line with 18-inch gravity line.	\$706,000	\$261,220 (37% River Heights)	\$444,780 (63%)	0%
E-11	Park Ave between 600 S and 810 S.	d/D > 0.75 (0.94)	Replace 1,450 ft of existing 24-inch gravity line with 1,150 ft of 30-inch and 300 ft of 36-inch gravity line.	\$1,428,000	\$571,200 (40% River Heights)	\$856,800 (60%)	0%
E-12	Smithfield Lift Station.	Pumping Capacity	Install two new pumps. Upsize 8,250 ft of force main to 20-inch diameter pipe.	\$5,196,000	\$4,260,720 (59% Smithfield & 23% Hyde Park)	\$935,280 (18%)	77%
TOTAL				\$22,055,000	\$12,941,866	\$9,113,134	-

¹ All costs include 20% for engineering, administrative costs, and contingencies. Costs are shown in 2025 dollars.

TABLE ES-6 10-YEAR FUTURE IMPROVEMENT PROJECTS & COST ESTIMATES

PROJECT ID	LOCATION	ISSUE	RECOMMENDED SOLUTION	TOTAL COST ¹	PROVIDENCE COST	SMITHFIELD COST	HYDE PARK COST	NORTH LOGAN COST	RIVER HEIGHTS COST	NIBLEY COST	CITY COST	FUTURE GROWTH
10-1	Through the Golf Course between Highway 89 and the Providence Lift Station.	d/D > 0.75 (0.85)	Replace 5,150 ft of existing 18-inch gravity line with 4,900 ft of 24-inch and 250 ft of 30-inch gravity line.	\$4,502,000	\$4,411,960 (98%)	0%	0%	0%	0%	0%	\$90,040 (2%)	46%
10-2	Airport Rd between 1200 W and 550 W. 1200 W between Airport Rd and 1800 N.	Surcharged pipe section.	Replace 9,500 ft of existing 24-inch and 36-inch gravity line with 42-inch gravity line.	\$11,126,000	0%	\$6,564,340 (59%)	\$3,337,800 (30%)	0%	0%	0%	\$1,223,860 (11%)	76%
10-3	Providence Lift Station	Pumping Capacity	Expand capacity of the lift station and wet well. Switch force main to existing 14-inch diameter pipe.	\$4,440,000	\$3,330,000 (75%)	0%	0%	0%	0%	0%	\$1,110,000 (25%)	46%
10-4	1400 W between 200 S and 350 S.	Future development	Install approximately 1,800 feet of 8-inch gravity line. Equip Environmental Lift Station for 500 gpm. Abandon Equestrian Lift Station.	\$1,345,000	0%	0%	0%	0%	0%	0%	\$1,345,000 (100%)	69%
10-5	200 S 300 E	d/D > 0.6 (0.67)	Install weir in SM02564 to force more flow to the West	\$12,000	0%	0%	0%	0%	0%	0%	\$12,000 (100%)	3%
10-6	300 W at 175 N	Difficult Maintenance	Install a manhole at the end of the sewer line.	\$6,000	0%	0%	0%	0%	0%	0%	\$6,000 (100%)	0%
TOTAL				\$21,431,000	\$7,741,960	\$6,564,340	\$3,337,800	\$0	\$0	\$0	\$3,786,900	-

¹ All costs include 20% for engineering, administrative costs, and contingencies. Costs are shown in 2025 dollars.

Infrastructure Replacement

It is recommended that the City fund a pipeline replacement program based on the analysis completed in Appendix G. Table 8-3 summarizes the total costs to replace all the pipelines in the system. Pipe unit costs assume there will be some savings from pairing installations with road replace projects.

TABLE ES-7 SUMMARY OF PIPELINE REPLACEMENT COSTS

PARAMETER	VALUE
Total Cost	\$556,000,000
Years	100
Replacement Efficiency	25%
Cost per Year	\$4,170,000

It is assumed that the pipes would be replaced over a period of 100 years. An annual budget of about \$4,170,000 is recommended for pipeline replacement, with periodic adjustments made due to inflation, changing market conditions, or other factors.

CONCLUSIONS

Key conclusions from the master plan are as follows:

1. Capital projects are necessary to improve the performance of the existing system and accommodate future growth.
2. Much of the Logan City wastewater system is approaching the end of its useful life and will require replacement. A strategic replacement plan utilizing available conditions-related data about system facilities will maximize the efficiency of facility replacement and help reduce infiltration and inflow.
3. Infiltration and inflow contribute to flows in the wastewater collection system. Actions taken to reduce infiltration and inflow can extend the capacity of the collection system pipes and reduce treatment costs.

CHAPTER 1 INTRODUCTION

BACKGROUND AND PURPOSE

Logan City is centrally located in Cache County, Utah. Logan City maintains and operates a wastewater collection system consisting of pipelines, manholes, and lift stations. Once collected, the wastewater is conveyed to the Logan Regional Wastewater Treatment Facility. The City has several areas where future growth is anticipated. The system also conveys wastewater from Smithfield, Hyde Park, North Logan, Nibley, Providence, and River Heights cities to the wastewater treatment plant. Most of these additional communities are expected to have substantial growth in the future.

Recognizing the need for wastewater collection system planning, Logan City retained Hansen, Allen & Luce, Inc. (HAL) to prepare a wastewater collection system master plan. The purpose of the master plan is to 1) estimate wastewater generation and flow rates for the existing system, 2) evaluate the existing system's ability to convey existing wastewater flows, 3) prepare growth projections, 4) project growth areas with City input, 5) prepare future wastewater flow rate estimates based on projected growth, 6) evaluate future infrastructure needs, and 7) recommend projects that will create the additional needed wastewater conveyance capacity. Wastewater treatment is beyond the scope of this study and would be included in a separate master plan.

The results of this study are limited by the accuracy of the development projections and other assumptions used in preparing the master plan. It is expected that the City will continue to review and update this master plan every 5-10 years, or more frequently if the assumptions included in this effort change significantly.

SCOPE OF WORK

A summary of the scope of work is as follows:

1. Communicating and coordinating with City personnel and other relevant entities
2. Evaluating results of wastewater flow monitoring
3. Analyzing flow data and characterizing the flow
4. Defining level of service
5. Investigating and characterizing inflow and infiltration
6. Updating and calibrating existing hydraulic model
7. Identifying existing system deficiencies
8. Projecting future wastewater generation and flow rates in the sewer system
9. Creating future model scenarios
10. Identifying the capital facilities necessary to correct existing deficiencies and accommodate future growth
11. Developing infrastructure maintenance and replacement plan
12. Preparing the capital facilities plan

CHAPTER 2 EXISTING WASTEWATER SYSTEM

INTRODUCTION

A key component of this master plan is characterizing the existing system, including its physical facilities and their current performance. This section presents key information about the existing system.

SERVICE AREA

The service area of the City's wastewater collection system includes all land areas within the Logan City municipal boundary. It is anticipated that the service area boundary will change in the future per the City's Annexation Plan. The Annexation Plan was considered when evaluating future service areas.

The collection system also conveys wastewater generated from the following six surrounding communities:

- Smithfield
- Hyde Park
- North Logan
- River Heights
- Providence
- Nibley

See Appendix A for service agreements for the surrounding communities.

EXISTING WASTEWATER SYSTEM

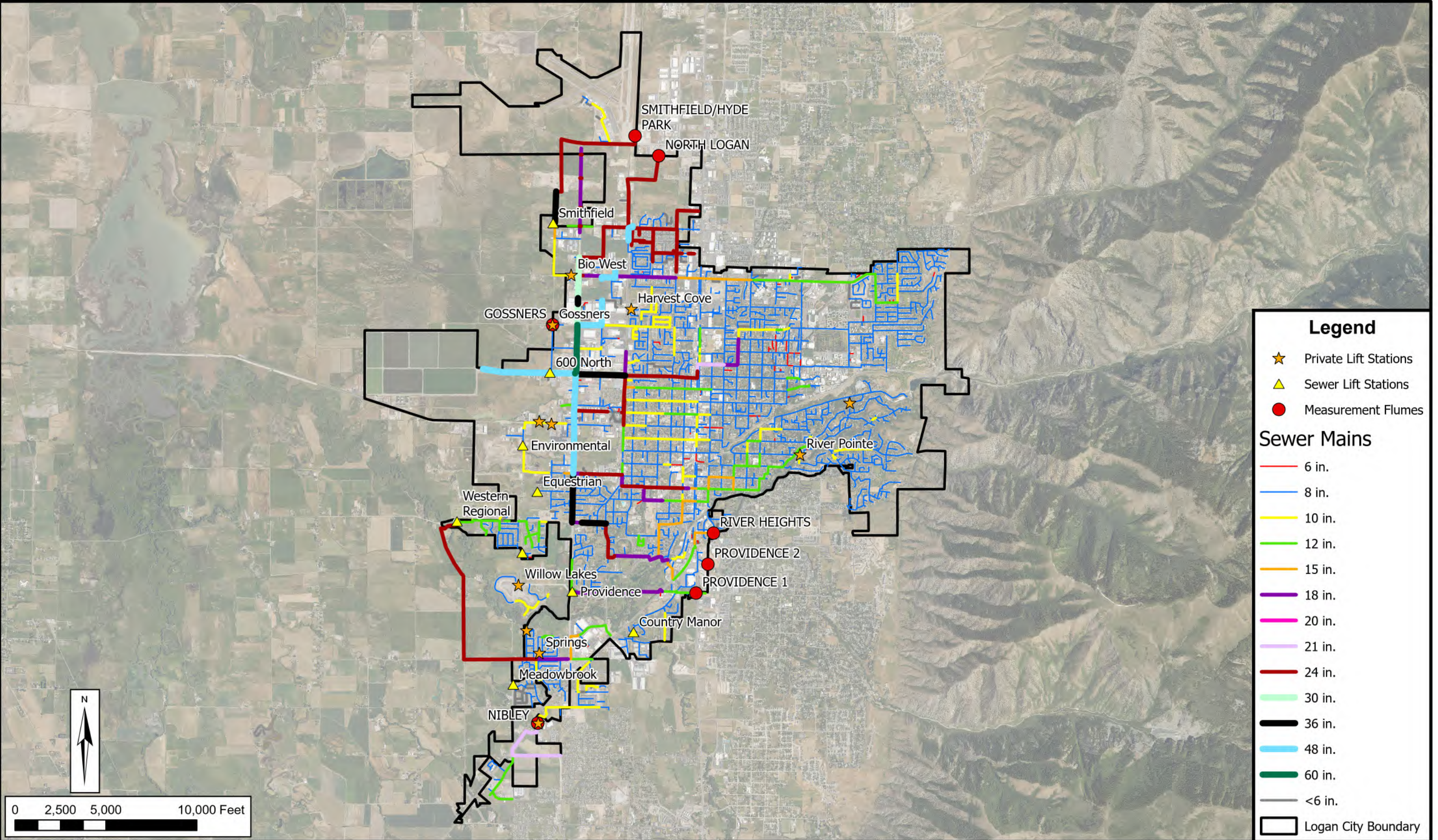
This master plan includes an evaluation of the existing wastewater collection system. The existing wastewater system consists of lift stations, force mains, and gravity sewers; including laterals, collectors, interceptors, and outfalls. The existing system, its service area, and areas draining to each lift station or outfall are shown in Figures 2-1 and 2-2.

Sources of Data

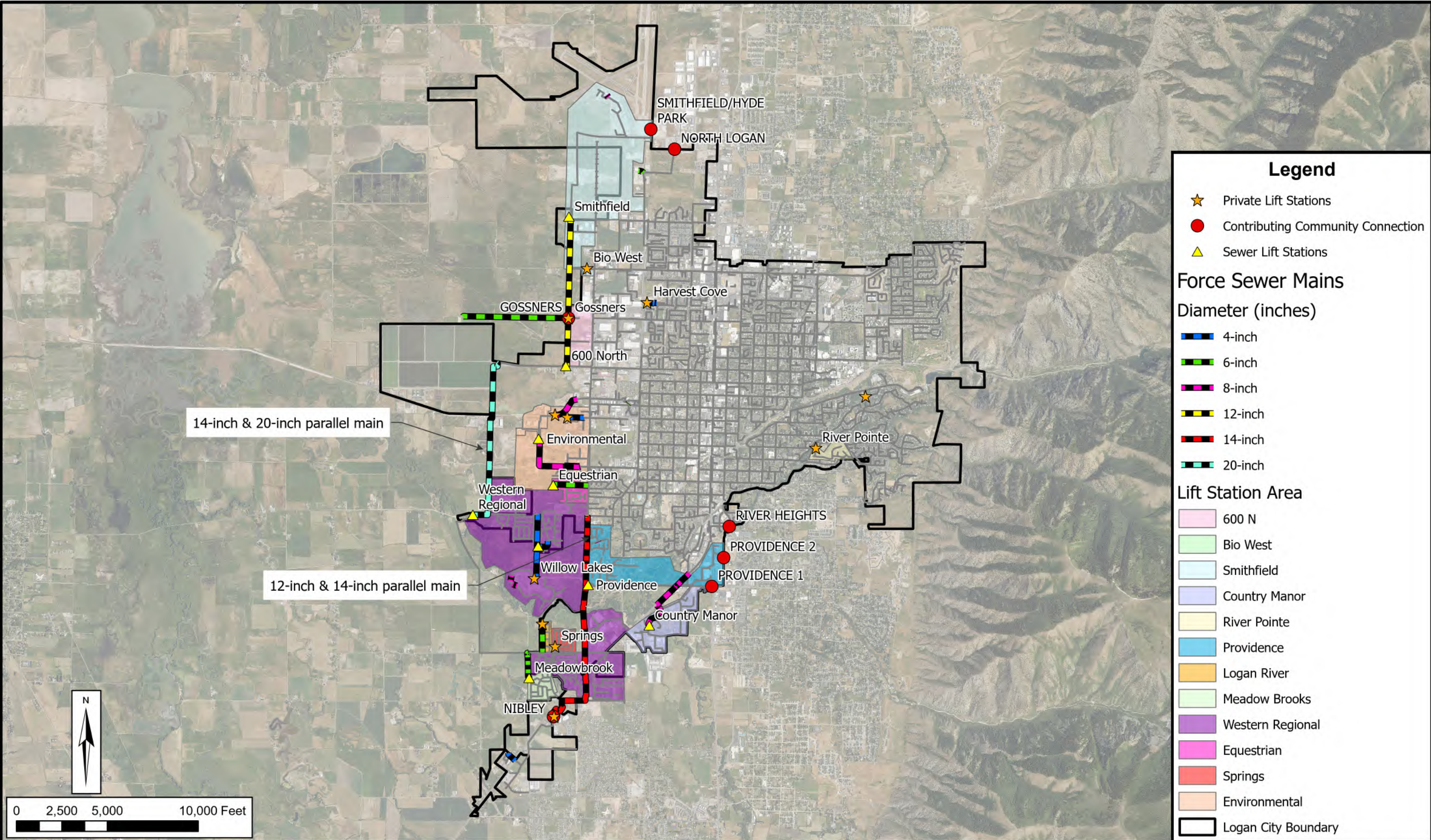
Data for the existing wastewater collection system facilities were provided by Logan City, including the following:

1. GIS files with information about manholes, sewers, lift stations, and force mains
2. Elevation data for manhole rims and inverts
3. Subdivision and project record drawings
4. Input from Logan City personnel

Date: 6/22/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



Date: 9/1/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



LOGAN CITY WASTEWATER MASTER PLAN

EXISTING SEWER SYSTEM
FORCE MAINS

Collection Network

The existing City wastewater collection system consists of approximately 200 miles of pipeline and 3,857 manholes. Pipes range from 6-inch to 60-inch diameter. The predominant diameter of the pipes in the system is 8 inches, totaling around 111 miles. Figure 2-3 displays how many miles of each diameter pipe are found in the City's system.

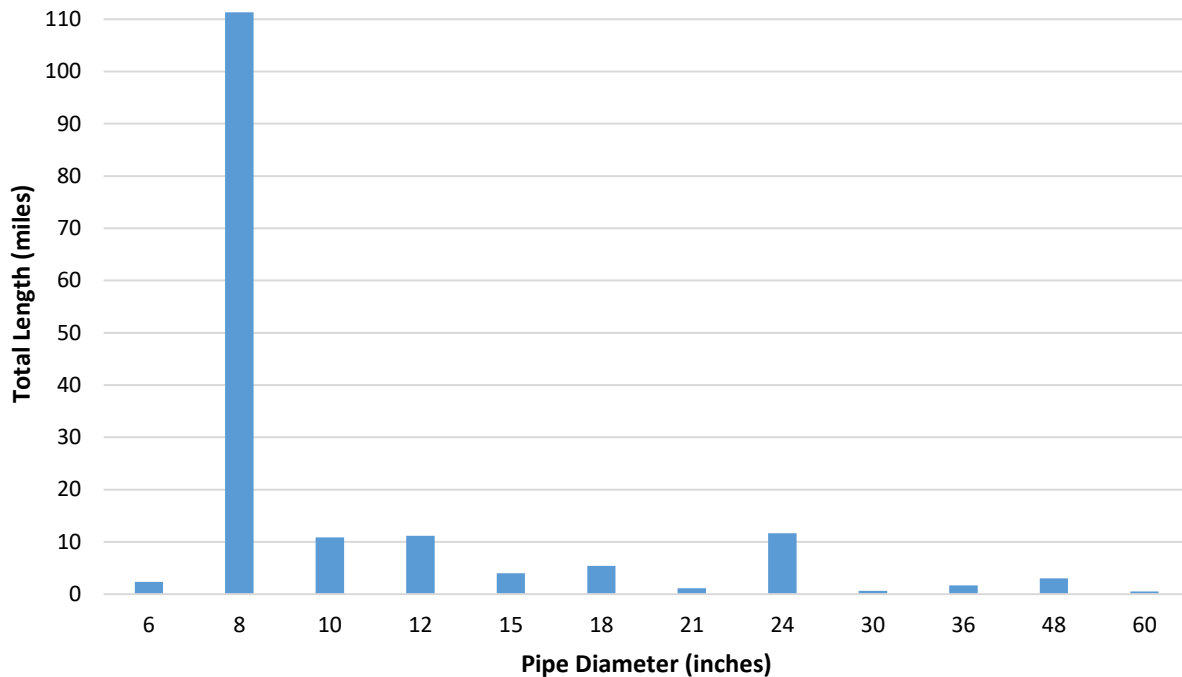


FIGURE 2-3 MILES OF SEWER MAINS AND FORCE MAINS BY DIAMETER

Wastewater Treatment Plant

Wastewater from Logan City and the six surrounding communities is conveyed to the Logan Regional Wastewater Treatment Facility where it is subsequently treated.

Lift Stations

Lift stations are used to pump wastewater through pressurized pipes (called force mains) from low-elevation points in the system to higher-elevation gravity mains.

Logan City owns and operates eight lift stations. Seven out of the eight lift stations have backup power, SCADA, and a variable frequency drive (VFD), which helps maintain a flow rate under a variety of hydraulic conditions. See Table 2-1 for details about each lift station.

TABLE 2-1 LIFT STATION INVENTORY

Lift Station Name	ADDRESS	PUMP CONFIGURATION	PUMP CAPACITY (GPM)	SCADA
600 North	1200 W 600 N	2 x 5 HP	442	Yes
Country Manor ¹	1490 S Country Manor Dr	2 x 10 HP 1 X 20 HP	550	Yes
Environmental	20 N 1400 W	2 x 10 HP	300	Yes
Equestrian	1330 W 350 S	2 x 7.5 HP	Unknown	Yes
Meadowbrook	2020 S 1600 W	2 x 5 HP	260	Yes
Providence	1180 S 1000 W	3 x 20 HP	1,650	Yes
Smithfield	1805 N 1200 W	3 x 100 HP	1,950	Yes
Western Regional	1970 W 600 S	3 x 30 HP	1,490	Yes

1. There is no backup to the 20 HP pump. The 10 HP pumps have a capacity of 330 gpm.

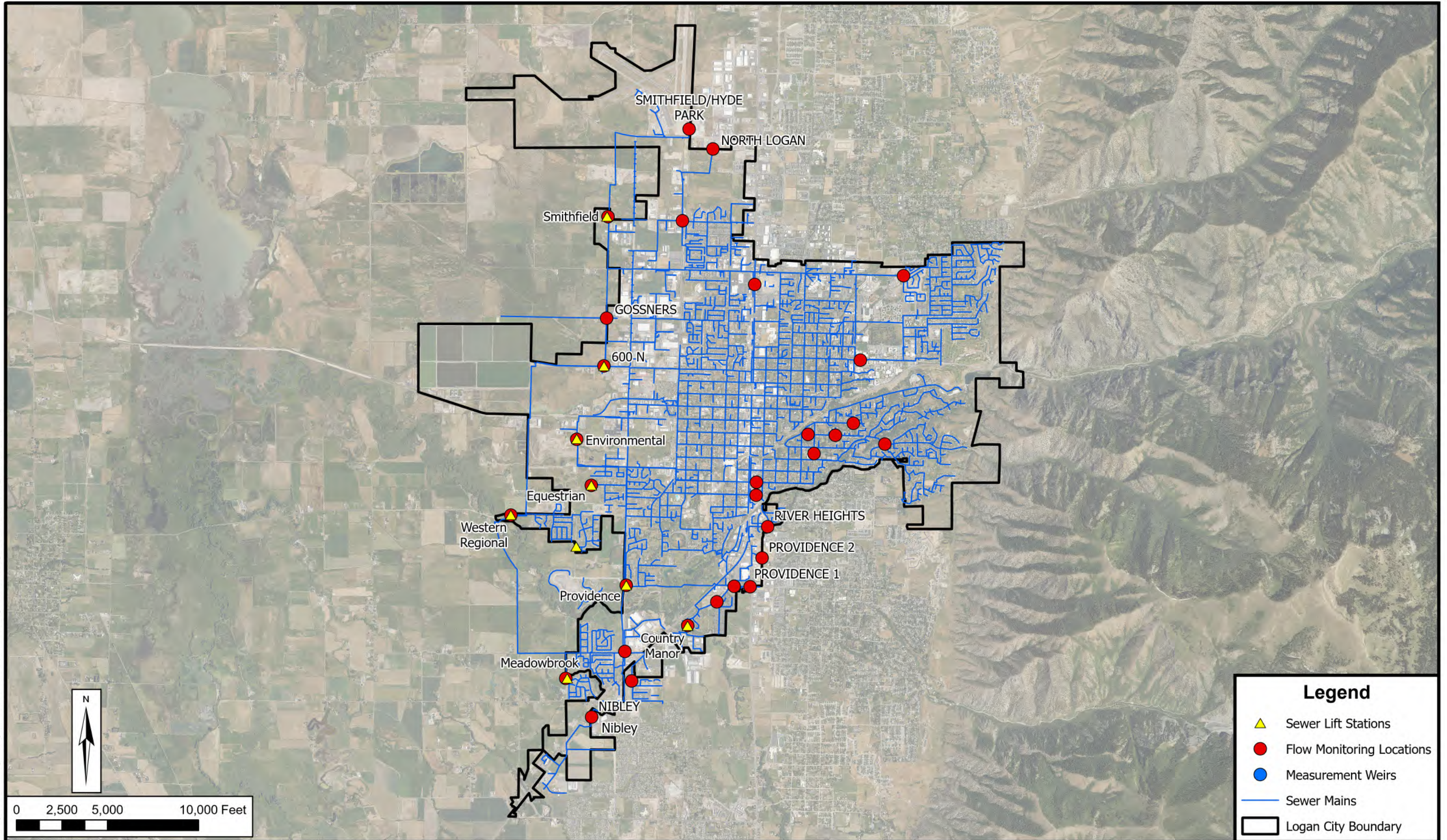
CHAPTER 3 FLOW MONITORING

FLOW MONITORING

The purpose of flow monitoring was to obtain flow data at several locations throughout the City to provide the basis for characterizing flow, constructing a model, and calibrating the model to field conditions. Several local temporary flow monitoring sites for the Master Plan were selected by the City and HAL to provide representative data to achieve the stated purposes. Selected flow monitor locations are shown on Figure 3-1.

LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

For this master planning effort, flow data from January 2015 to May 2026 was obtained from the Logan Regional Wastewater Treatment Facility Headworks. The meter is located at the Logan City wastewater collection system outfall and includes all wastewater flows from Logan City and member communities. Evaluation of flow data is included in subsequent chapters.



CHAPTER 4

FLOW CHARACTERIZATION

METHODOLOGY

The purpose of flow characterization is to determine the flow patterns and variations that may be experienced by a wastewater system so that sewer pipes, lift stations, and treatment facilities can be evaluated and sized appropriately. The following wastewater flow characteristics were evaluated:

- Unit Flows
- Daily flow variation
- Annual flow variation
- Long-term flow variation
- Infiltration
- Inflow
- Extraordinary flows

UNIT FLOWS

Unit flows were estimated for the City and are expressed in terms of Equivalent Residential Units (ERUs). An ERU is the average wastewater flow generation of an average residential unit. Flow generation for commercial, industrial, and other types of uses can be expressed in ERUs. For example, a commercial development that generates a flow 5 times that of an average residence will be designated as representing 5 ERUs. This does not account for inflow and infiltration.

A reasonable ERU flow rate was developed based on winter drinking water billing data. With little consumptive use of water indoors, it is assumed that the volume of water used indoors is roughly equal to the volume of water discharged to the wastewater collection system. This evaluation showed an average unit flow rate of 204 gpd/ERU. This flow rate was rounded up slightly to produce the following unit flow rate:

$$\text{Hydraulic Loading / ERU} = 210 \text{ gallons/day}$$

Existing flows for member communities were loaded into the model based on actual flow data recorded at the measurement flumes.

DAILY FLOW VARIATION

Flow in a wastewater collection system varies throughout the day. Available flow data were evaluated to determine the magnitude and timing of flow variation. Diurnal curves were developed from winter drinking water production data and validated using SCADA data from the wastewater collection system.

In Logan City, the minimum flow generally occurs during the early morning between midnight and 6:00 AM. Maximum or peak flow typically occurs in the late morning, between 8:00 AM and noon.

Peaking Factors

Peaking factors were developed for the City's wastewater collection system. The peaking factor is the ratio between the peak instantaneous flow and the average daily flow. These peaking factors were calculated based on winter drinking water production data and validated using SCADA data from the wastewater collection system. Figure 4-1 shows the composite flow pattern for all wastewater reaching the Logan Regional Wastewater Treatment Facility.

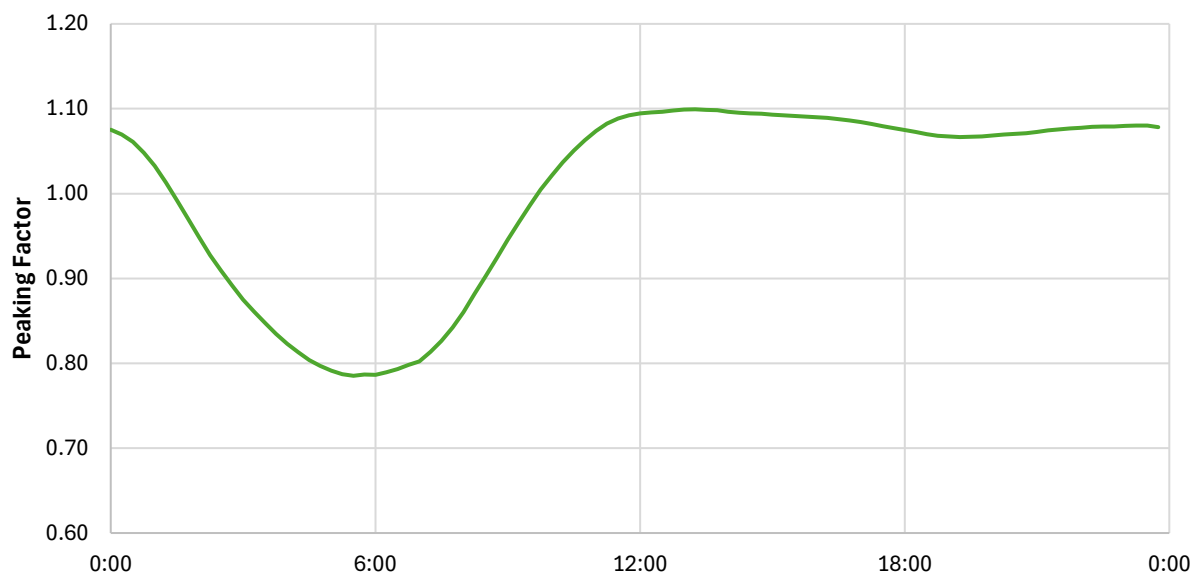


FIGURE 4-1 COMPOSITE FLOW PATTERN

A maximum peaking factor of 1.10 was identified for the system. The peaking factor is lower than what is observed in many wastewater collection systems in Utah due to the large size of the service area. In larger systems, flows travel for significant periods of time to reach the outfall, and attenuate over time. Additionally, Logan experiences high levels of infiltration in some portions of the city which also moderates the peaking factor.

Member Communities

Peaking factors were also identified for member communities. Using flow data collected from city outfall locations, flow patterns were developed. These flow patterns were used in the model calibration process. The patterns can be seen in Appendix B. The curves represent only sanitary flows and infiltration and do not include inflow.

Land use

Peaking factors were also identified for member communities. Using flow data collected from temporary flow locations, flow patterns for several land uses were developed. These flow patterns were used in the model calibration process. Patterns for the following five different land use categories were identified:

- Residential
- Mixed Residential
- Commercial
- Industrial
- USU

The patterns can be seen in Appendix C. The curves represent both sanitary flows and the effects of inflow and infiltration. The patterns were assigned to the loading added to the model based on the land uses from GIS provided by the city. The land uses associated with each curve is listed below in Table 4-1.

TABLE 4-1 LAND USE AND RESPECTIVE PATTERN CATEGORY

Land use Type	Pattern
Detached Residential	Residential
Mixed Residential	Mixed Residential
Mixed Use Center	
Town Center	
Airport	Commercial
Commercial	
Commercial Services	
Gateway	
Neighborhood Center	
Industrial Park	Industrial
Campus Residential	USU
Public	

LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

The Logan City wastewater collection system terminates at the Logan Regional Wastewater Treatment Facility. Hourly flow rate data was obtained from January 2015 to May 2026. The wastewater treatment plant flow records for 2024 through 2026 are shown in Figure 4-2. The weekly moving average wastewater flow rate and daily precipitation data are also shown.

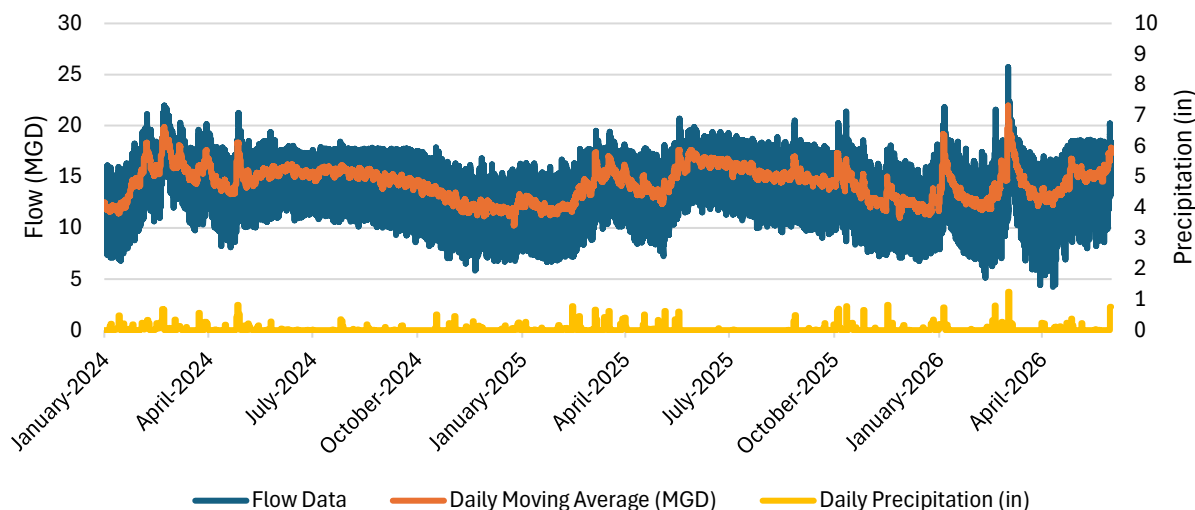


FIGURE 4-2 FLOWS TO LOGAN REGIONAL WASTEWATER TREATMENT FACILITY

Periods with greater average and peak daily flows than other times of year correspond to times of heavy and/or frequent precipitation events.

ANNUAL FLOW VARIATION

Some wastewater collection systems experience annual flow variations related to factors such as changing groundwater levels, rainfall, snowmelt, or seasonal changes in customer behavior. Flow records in the Logan system were evaluated to determine whether a clear seasonal trend exists. See Figure 4-3.

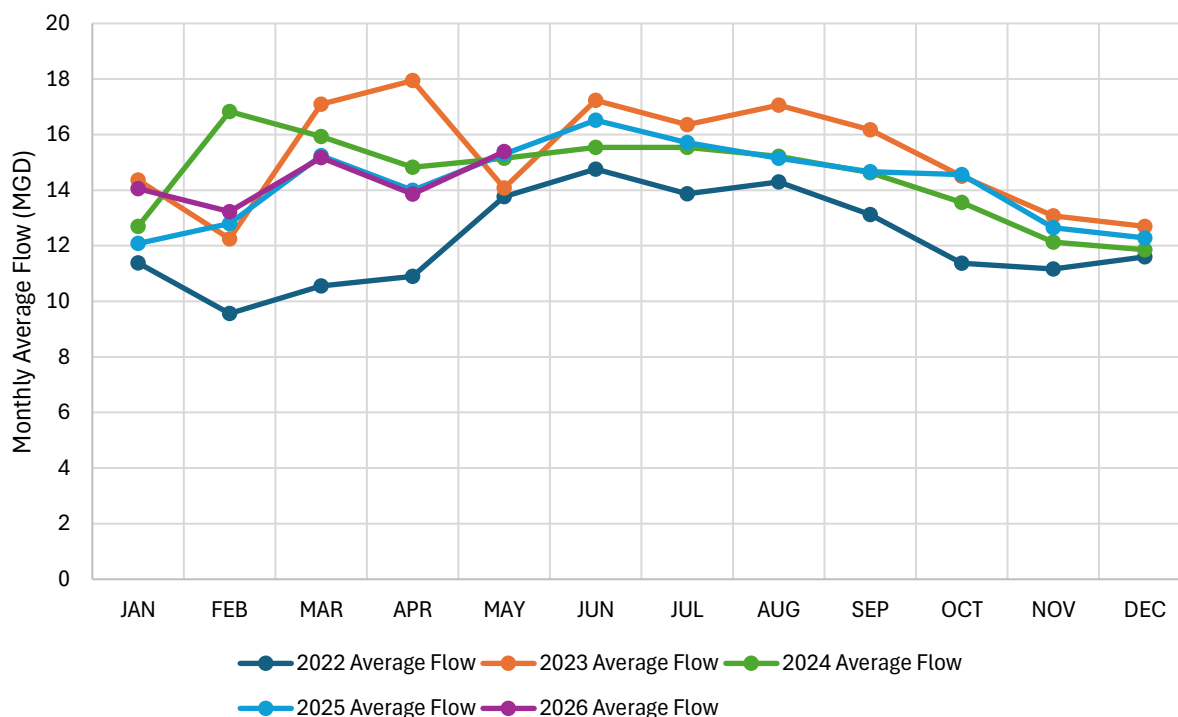


FIGURE 4-3 LOGAN CITY ANNUAL FLOW VARIATION

Observations from the data shown on Figure 4-3 are as follows:

- 2023 experienced higher flow rates than 2024-2026, most likely related to above normal precipitation and snowpack totals.
- The highest observed flow rates occurred in summer months, possibly related to higher infiltration due to increased irrigation or higher groundwater levels.
- There appears to be a significant seasonal trend in which flow rates are higher during the spring runoff season and summer than in the fall and winter.
- Variation among years appears to be influenced both by growth in population and weather and climate conditions.

It is important to note that Figure 4-3 only captures data from the last five years. As a result, not all historical flow events are shown in the figure. In February 2017, frozen ground conditions combined with existing snowpack, heavy rainfall, and rapid warming generated extreme inflows into the Logan City sewer system, overwhelming the headworks at the sewer lagoons as well as several lift stations. System flows were reported at two to three times normal levels. A sandbag wall and bypass pumps were deployed to divert flows over the berm and into the treatment lagoons.

The Country Manor Lift Station was significantly impacted, requiring continuous vac-truck support in addition to all onsite pumps operating at maximum capacity. The primary cause was the overflow pipe at Legrand Street, which normally diverts flow to the Providence Lift Station but instead sent excess flow to Country Manor Lift Station. This overflow connection has since been capped.

Both the Providence Lift Station and the Western Regional facility used inactive parallel force mains to manage the increased flows. At the Smithfield Lift Station, operators throttled incoming flow using the slide gate on the influent line to prevent the station from flooding. Additional backups occurred near 500 North; however, those were determined to be the result of a blockage in the pipe rather than high inflow conditions

Extraordinary flow events like the February 2017 storm are typically not used for design of normal operations, but emergency operating procedures utilized during those events should be understood and recorded to better react to rare exceptional events.

INFILTRATION AND INFLOW

Infiltration and inflow (commonly referred to as I&I) can contribute significantly to the flow within wastewater collection system pipes. Infiltration is defined as groundwater which enters a sewer system through joints and cracks in pipes, manholes, and building connections. It tends to be relatively constant in areas with consistent groundwater levels. Areas that experience seasonal variations in groundwater level tend to exhibit corresponding seasonal changes in infiltration.

Inflow is defined as surface water that suddenly enters a sewer system as a consequence of a storm event. Inflow may enter the system through roof, basement, foundation, yard, and area

drains. Inflow may also come from cooling water discharges, manhole covers, and cross connections from storm drains. Wastewater collection system pipes must have adequate capacity to handle both infiltration and inflow. The following subsections describe the extent of infiltration and inflow in the Logan wastewater collection system.

Infiltration

Variations in infiltration may occur due to seasonal increases in groundwater level or storm events. Some cities, particularly in the western United States where irrigation is commonly practiced, are subject to significant increases in infiltration during irrigation season. Sewers constructed near irrigation canals, rivers, or streams are especially prone to infiltration.

The amount of base infiltration was estimated by analyzing winter water use. During the winter, nearly all the water delivered by the public water system is used indoors and passes into the wastewater collection system. Seasonal infiltration was estimated by analyzing flow to the wastewater treatment plant during periods of heavy precipitation and runoff. Table 4-2 shows the breakdown between billed water use and flow to the treatment plant.

TABLE 4-2 WWTP MONTHLY AVERAGE FLOWS VS BILLED USAGE DATA

Month	Logan City Billed Sales (MGD)	Logan City Base Infiltration (MGD)	Logan City Seasonal Infiltration (MGD)	Member City Base Flows and Infiltration (MGD)	Member City Seasonal Infiltration (MGD)	Total (MGD)
February 2022 (lowest) Monthly Average	4.0	2.0	0	4.0	0	10.0
April 2023 (highest) Monthly Average	4.0	2.0	6.0	4.0	2.0	18.0

Available data suggests that infiltration in Logan City occurs at a rate of about 2.0 MGD during dry periods and about 8.0 MGD during wet periods. Member communities contribute a total flow rate (base flows and infiltration) of about 4.0 MGD during dry periods and about 6.0 MGD during wet periods, indicating additional seasonal infiltration of about 2.0 MGD from all member communities.

Much of the seasonal infiltration experienced by the Logan wastewater conveyance system is likely due to irrigation canals. Once turned on, irrigation canals cause a significant, measurable effect on flow rates to the wastewater treatment plant. Increasing groundwater levels caused by runoff can also contribute significantly to infiltration in wet years.

Reducing infiltration would provide several benefits to the sewer system:

- Available capacity in pipes is increased, which can delay or eliminate the need for future capital projects.
- The volume of wastewater pumped through lift stations is reduced, increasing their available capacity and reducing pumping costs.
- The volume of wastewater sent to the treatment facility is reduced, increasing its available capacity and reducing treatment costs.
- The risk of backups and overflow events is reduced.

Strategies to reduce infiltration include the following:

- Pipe grouting
- Pipe rehabilitation through lining
- Using land drain systems to reduce high groundwater levels
- Lining irrigation canals to reduce high groundwater levels caused by canal seepage

Logan City has a grouting program in place to reduce infiltration. Data recorded by the City's long-term flow meters indicate that the grouting program has successfully reduced infiltration. A combination of the above strategies, including continuation of the pipe grouting program, is recommended to reduce infiltration in the system.

Inflow

SCADA data for the years 2022 through 2024 were evaluated to identify the quantity of water entering the system before and immediately following major storm events. The largest inflow event in the period of analysis occurred on August 6, 2022. Figure 4-4 shows flow rates at the WTP during the August 6th inflow event, as well as a trendline for typical flows at the Wastewater Treatment Facility during a dry period.

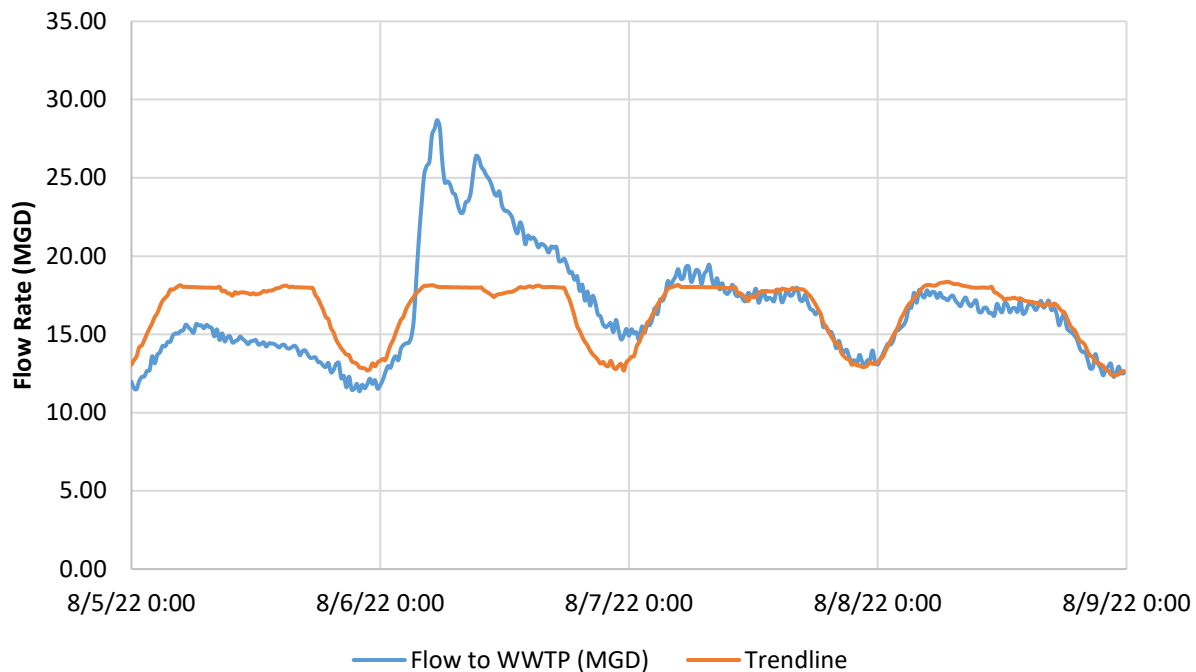


FIGURE 4-4 INFLOW EVENT AT WASTEWATER TREATMENT PLANT

Between approximately 4:00 AM and 5:30 AM, a short and intense rainstorm occurred, causing significant additional flows to the WWTP as compared to normal conditions. The difference between the flow rates during the storm event and the average flow rates during dry weather is estimated as the rate of inflow from the storm. The estimated flow rate for this storm event is 10 MGD for the system, including all member communities.

Similar patterns were observed during other storm events, suggesting that inflow regularly occurs during precipitation events. After analyzing the flow data and discussing with City personnel, it was decided that a 10.0 MGD inflow event on top of the dry weather diurnal curve would represent the design flow for the model. Inflow is believed to occur throughout the system.

Reducing inflow would provide several benefits to the sewer system:

- Available capacity in pipes is increased, which can delay or eliminate the need for future capital projects.
- The volume of wastewater pumped through lift stations is reduced, increasing their available capacity and reducing pumping costs.
- The volume of wastewater sent to the treatment facility is reduced, increasing its available capacity and reducing treatment costs.
- The risk of backups and overflow events is reduced.

Strategies to reduce inflow include the following:

- Reduce or discontinue use of vented manholes, particularly in areas where stormwater ponding occurs.
- Prevent stormwater ponding over manholes by improving stormwater drainage infrastructure.
- Educate public and businesses on differences between stormwater and sewer system and the implications/challenges from storm water entering sewer system/treatment system.
- Installing long-term flow meters and analyzing trends in flow during and after storm events can help identify areas of high inflow. Field observations during rain events can also provide clues about where ponding occurs on top of sewer manholes.

LONG TERM FLOW VARIATION

Average annual wastewater flow rates typically vary from year to year. The most predictable changes in average annual flows are typically associated with changes in population.

Changes in weather patterns can result in changes in infiltration and water use patterns. Decreased precipitation results in lower groundwater levels and less infiltration. Water conservation measures implemented during droughts may result in a reduction in both indoor and outdoor water use. A reduction in indoor use results in less domestic wastewater generation. A reduction in outside use for watering lawns and gardens may lead to lowering of the groundwater table and less infiltration.

In the case of Logan City, weather conditions significantly affect flow in the wastewater collection system (see Figure 4-3). Long-term flow projections were based on the best available data and growth projections (see Chapter 5) and potential for high infiltration and inflow during wet years.

EXTRAORDINARY FLOWS

Extraordinarily high flows may occasionally occur due to industrial activities or large gatherings of people. Some communities experience higher flows or unusual peaks on Thanksgiving, Christmas, Super Bowl Sunday, or other similar events. HAL evaluated the City's flow data and did not find any unusual flows except those attributable to storms. It is recommended that some excess capacity be included in the sewers for such unexpected events (see further discussion in Chapter 6).

CHAPTER 5 WASTEWATER FLOW PROJECTIONS

PLANNING PERIOD

The periods of time evaluated using the hydraulic model include existing conditions, year 2035 (10-year scenario), year 2045 (20-year scenario), year 2065 (40-year scenario) and the projected buildout condition. Growth areas and growth projections were developed based on the best available data and in cooperation with City personnel.

GROWTH PROJECTIONS

Logan City

Future wastewater generation rates were estimated based on an evaluation of expected future land uses as indicated by Logan City planning documents and personnel from the Community Development Department. See Figure 5-1 for estimated growth in population throughout the planning period for the Logan City system. Details regarding these projections are included in this chapter and in Appendix D.

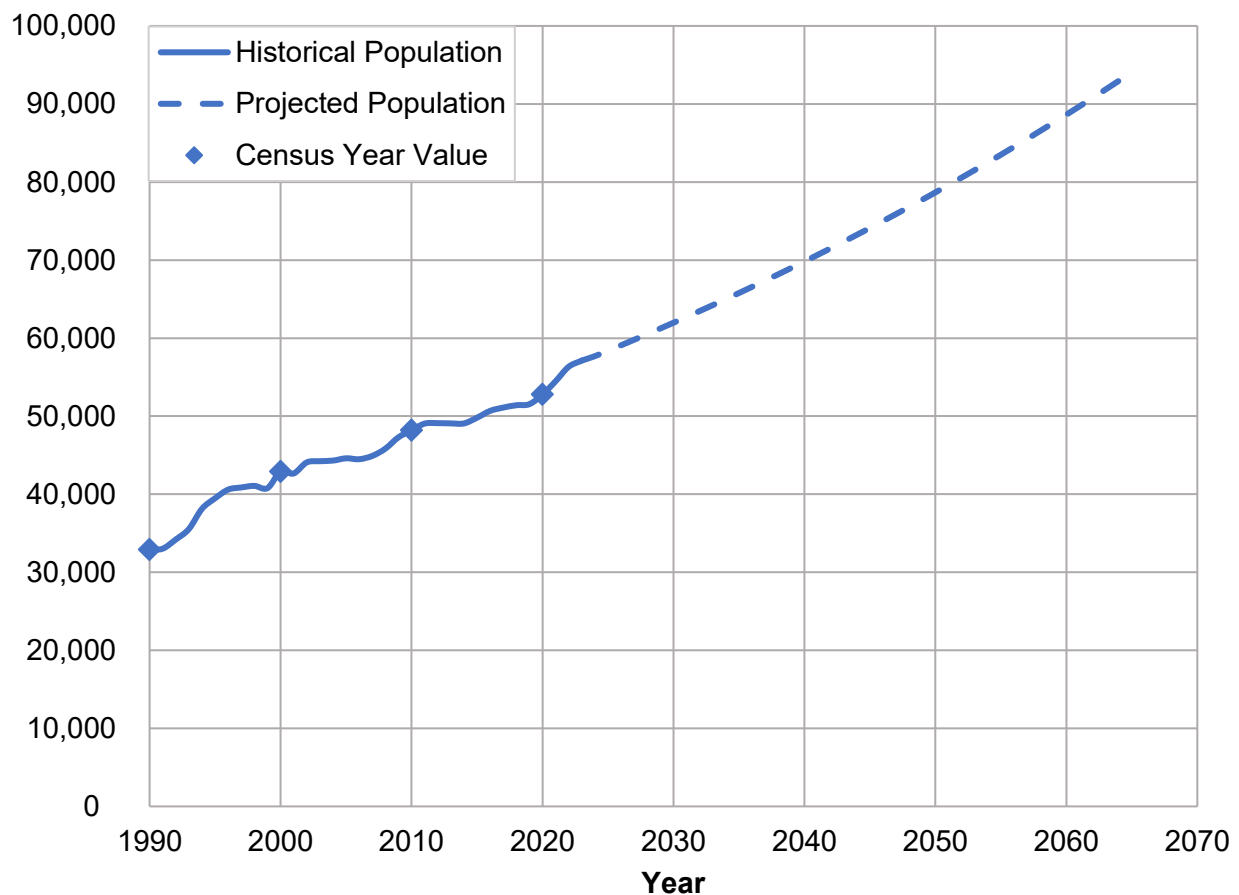


FIGURE 5-1 LOGAN CITY POPULATION PROJECTIONS

Total ERUs in the wastewater collection system were projected for each planning period. See Table 5-1. Projections by year are listed in Appendix D.

TABLE 5-1 LOGAN CITY ERU PROJECTIONS

Year	Total ERUs	Cumulative Additional ERUs	Description
2025	23,133	0	Existing System
2035 (10-Year)	25,126	1,993	10-Year Development
2045 (20-Year)	26,573	3,440	20-Year Development
2065 (40-Year)	30,042	6,909	40-Year Development
Buildout	54,544	31,411	System at Buildout

The following section includes discussion about the projections listed in Table 5-1.

Member Communities

Population data and growth projections for each member community were taken from Wastewater Master Plans where available and from General Plans when master plans were not available. See Figure 5-2 for estimated growth in population throughout the planning period for the six member communities. Details regarding these projections are included in this chapter and in Appendix H.

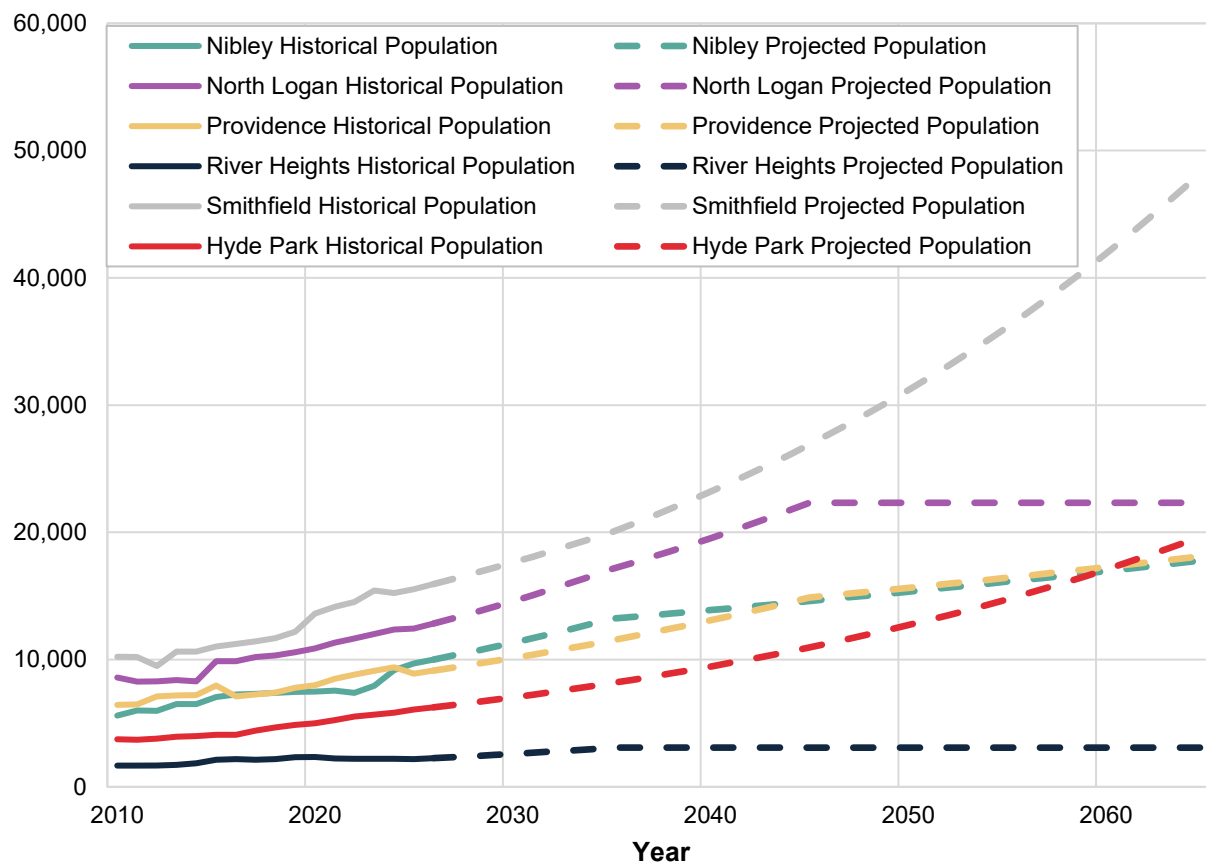


FIGURE 5-2 MEMBER COMMUNITIES' POPULATION PROJECTIONS

FLOW PROJECTIONS

For purposes of this Master Plan, “loading” is defined as the allocation of flows to a wastewater system or model. The magnitude and location of projected future wastewater flows were determined based on future land use projections, the acreage of projected future development areas, the estimated wastewater generation for each land use type (expressed as ERUs/acre), and the level of service of 210 gpd/ERU.

Table 5-2 shows the projected ERU densities for future development. See Figures 5-3 through 5-5 for locations where growth is projected to occur within the next 40 years.

TABLE 5-2 PROJECTED FUTURE ERU DENSITIES

Future Land Use Type	Assumed Maximum Future Land Use Density (ERUs/Acre)
Commercial (COM)	10
Campus Residential (CR)	40
Commercial Service (CS)	10
Detached Residential (DR)	6
Gateway (GW)	11
Industrial Park (IP)	5
Mixed Residential (MR)	20
Mixed Use Center (MUC)	25
Neighborhood Center (NC)	10
Recreation (REC)	0.5
Town Center – 1 (TC)	26
Town Center – 2 (TC)	16

Summary					
	Planned Growth*	Additional Growth		Total Growth	
Type	Units or Acres	Units	Acres	Units	Acres
DR	450 Units	22 Units	3.7 Acres	472 Units	310.5 Acres‡
MR	1,135 Units	56 Units	2.8 Acres	1,191 Units	68.5 Acres
MUC	1,067 Units†	52 Units	1.7 Acres	1,119 Units†	34.1 Acres
COM	94.9 Acres‡	n/a	15.3 Acres	n/a	130.2 Acres‡
IP	28.3 Acres	n/a	41.8 Acres	n/a	166.3 Acres
CS	0 Acres	n/a	20.1 Acres	n/a	19.6 Acres
TOTAL	2,652 Units	130 Units	104.7 Acres	2,782 Units	670 Acres

*Planned units/acres being those approved for development by the City.
†Includes 524 units from planned COM development.
‡Includes 27.1 ac redevelopment and 32.1 ac from planned MUC development.
‡Includes some DR-DX land and sub-max density development.

Legend

10-Year Build Areas

Land Use Description

APP

COM

CR

CS

DR

DR-DX

GW

GW-DX

IP

IP-DX

MR

MUC

NC

PUB

RCA

REC

RRA

TC

Logan Border

Annexation Area

Date: 7/10/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Future Growth Areas\Future Growth Areas.aprx

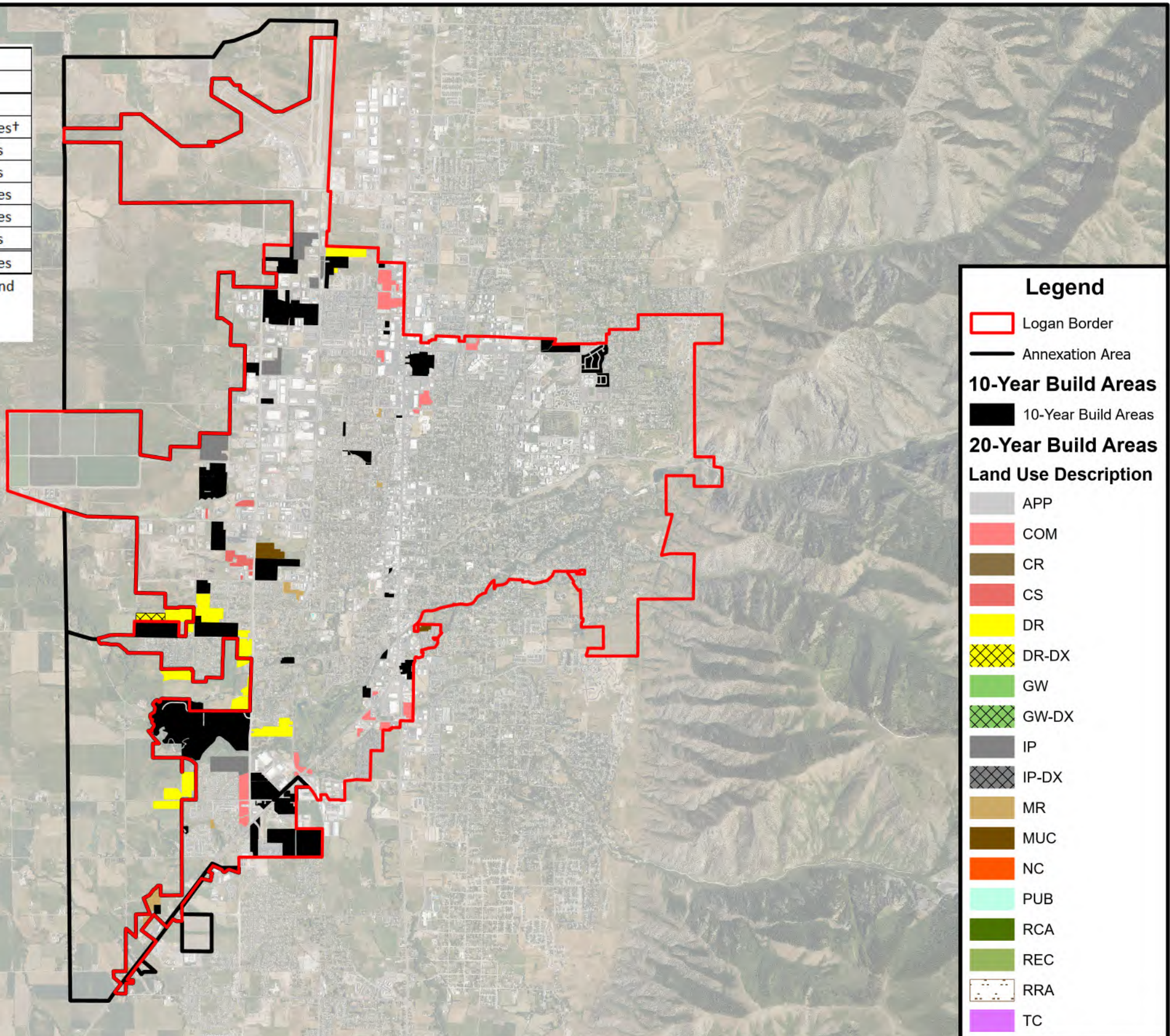
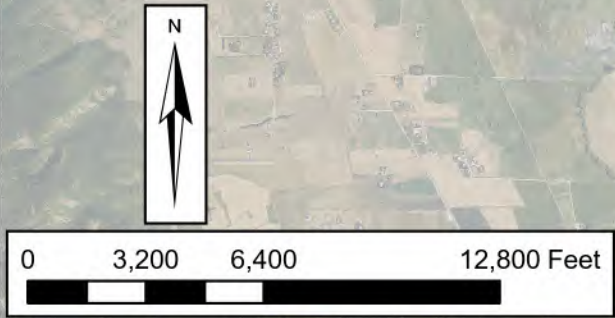


Date: 7/10/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Future Growth Areas\Future Growth Areas.aprx

Summary					
	Planned Growth*	Additional Growth		Total Growth	
Type	Units or Acres	Units	Acres	Units	Acres
DR	0 Units	1,142 Units	190.4 Acres	1,142 Units	197.8 Acres†
MR	0 Units	586 Units	29.3 Acres	586 Units	29.3 Acres
MUC	491 Units	1,059 Units	22.2 Acres	1,059 Units	22.3 Acres
COM	22.2 Acres	n/a	98.2 Acres	n/a	118.9 Acres
IP	0 Acres	n/a	78.7 Acres	n/a	115.9 Acres
CS	0 Acres	n/a	22.7 Acres	n/a	22.6 Acres
TOTAL	491 Units	2,787 Units	441.5 Acres	3,278 Units	484.6 Acres

*Planned units/acres being those residential units present in COM development, and COM acreage present in MUC development.

†Includes some DR-DX land.



Legend

Logan Border

Annexation Area

10-Year Build Areas

10-Year Build Areas

20-Year Build Areas

Land Use Description

APP

COM

CR

CS

DR

DR-DX

GW

GW-DX

IP

IP-DX

MR

MUC

NC

PUB

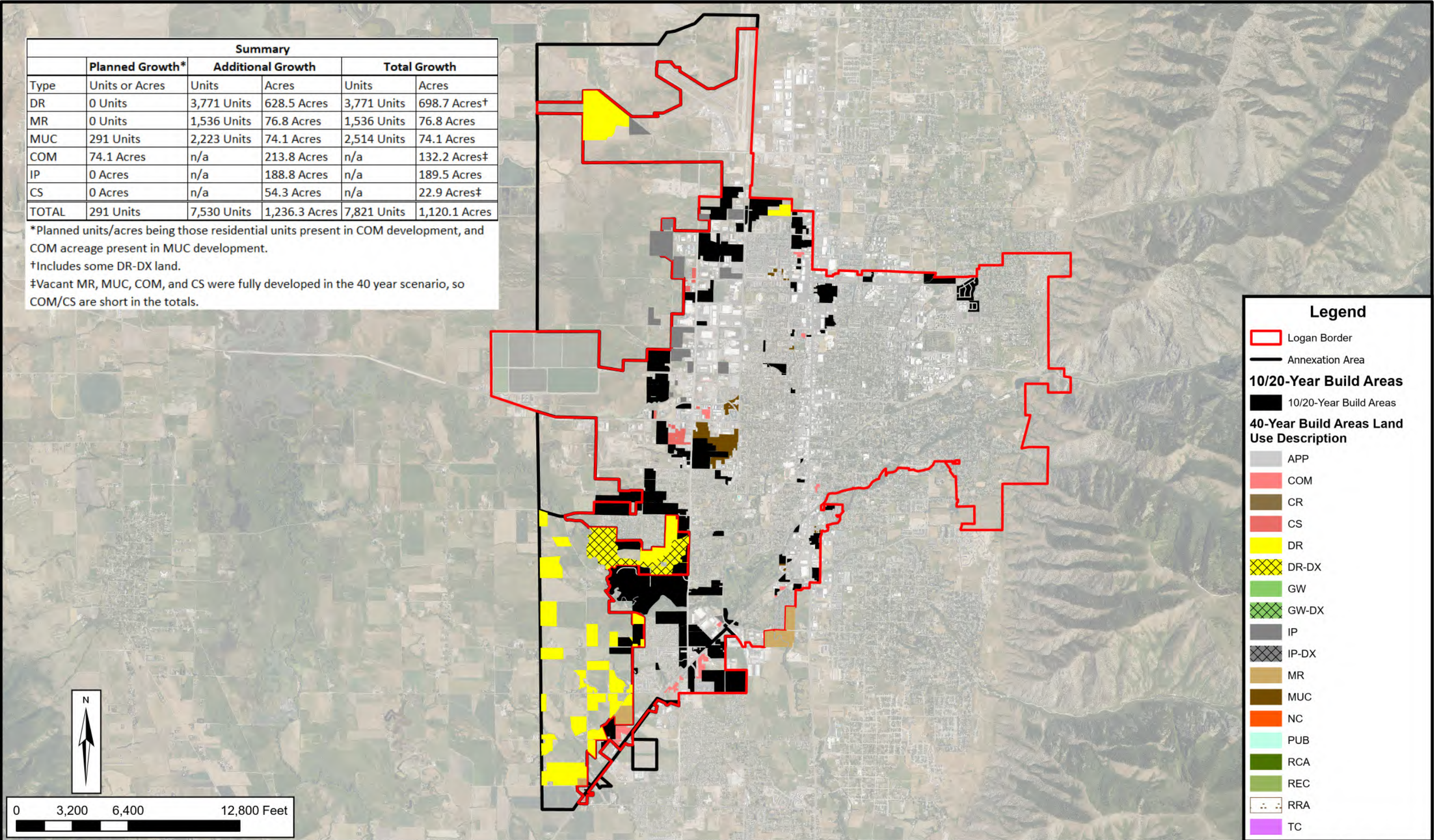
RCA

REC

RRA

TC

Date: 7/10/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Future Growth Areas\Future Growth Areas.aprx



Utah State University

Utah State University (USU) is located in Logan City's service area and is expected to experience growth over the next 20 years. As part of this study, USU projected flowrates were estimated using the Utah State Utility Master Plan and loaded into the model. See Appendix J for further details. See Figure 5-6 for USU's estimated growth in ERUs.

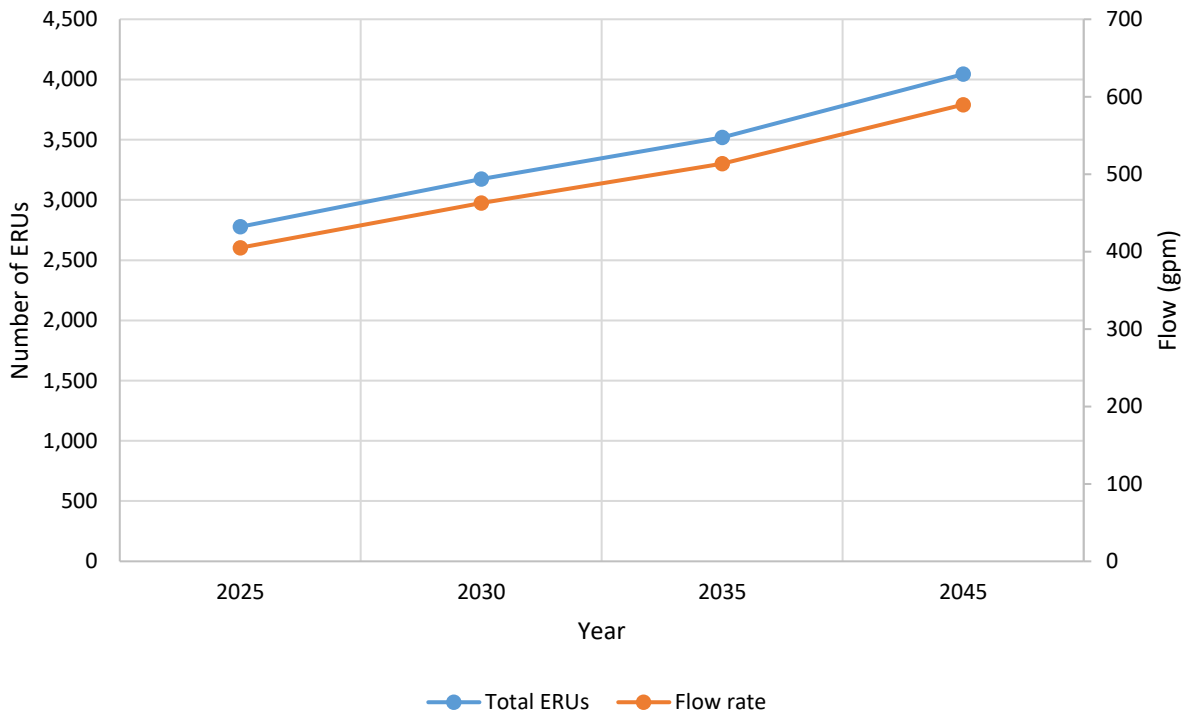


FIGURE 5-6 USU ERU GROWTH PROJECTION

Future Infiltration

As growth occurs, infiltration is expected to increase as the number of manholes and length of pipes in the system increases. Infiltration for future development areas was added to the model at a rate of 0.12 gpm per acre and was assigned to its corresponding basin. The City has implemented a grouting program that has successfully reduced infiltration in specific areas and plans to continue grouting to manage infiltration.

Future Inflow

As noted in Chapter 4, the estimated inflow to the Regional Wastewater Treatment Facility is 10 MGD. It is assumed that the level of service will account for any increase in inflow due to growth. For purposes of system modeling and planning, inflow will remain at 10 MGD.

Buildout Flows

Future wastewater flow rates were projected for the entire service area at the buildout condition. Projections were based on areas and planned land use types as identified by Logan City and the ERU densities outlined in Table 5-2. See Figure 5-5 for projected land uses at the buildout condition.

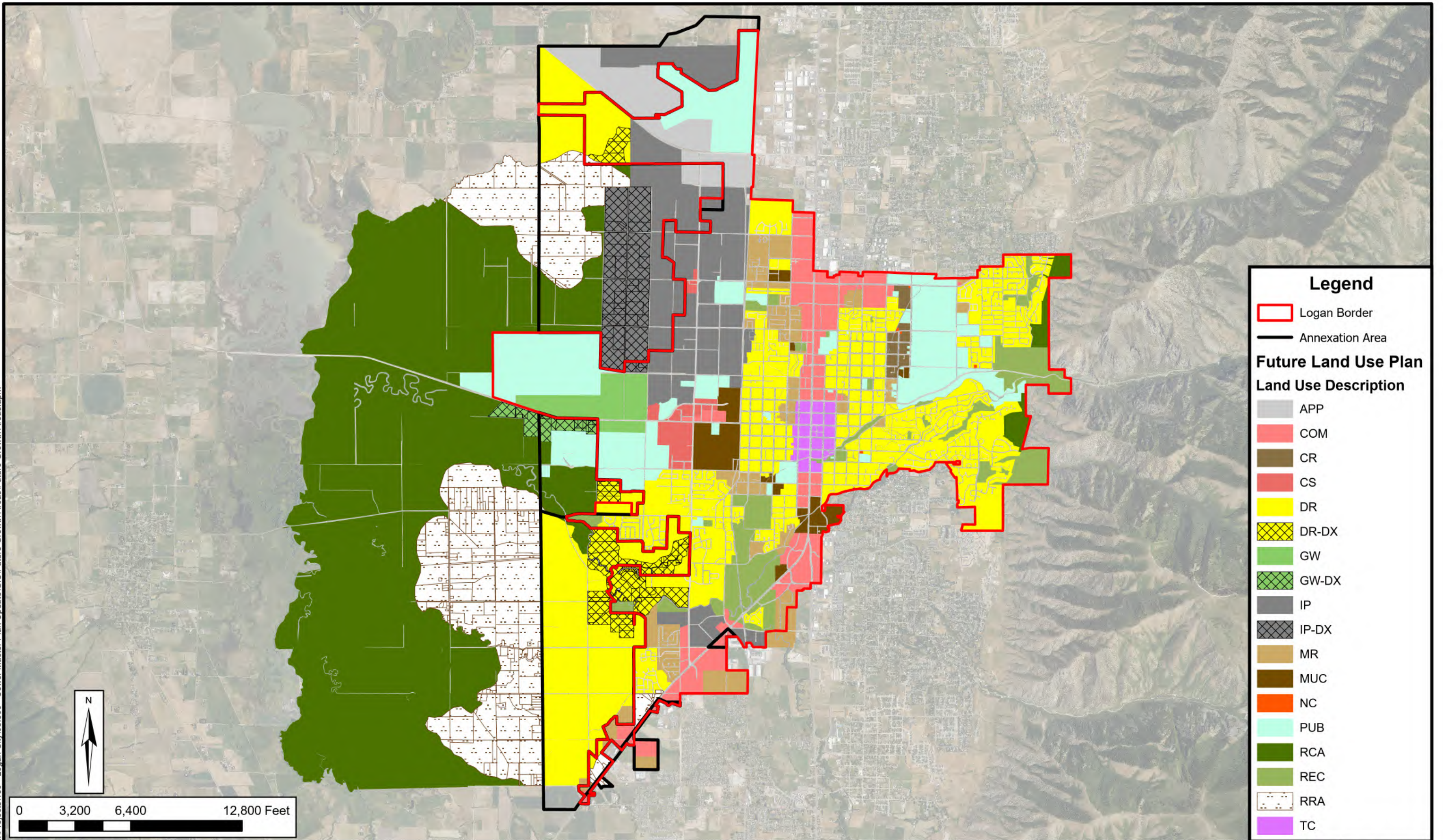
Table 5-3 shows the existing and projected future peak day wastewater generated based on the established hydraulic loading and ERU projections for the areas served by the Logan Regional Wastewater Treatment Facility.

TABLE 5-3 SYSTEM PEAK DAY FLOW PROJECTIONS (INCLUDING INFLOW)

Year	Logan City ERUs	Logan Flow Generation (MGD)	Logan Infiltration (MGD)¹	Logan Inflow (MGD)	Nibley Flow Generation (MGD)	North Logan Flow Generation (MGD)	Providence Flow Generation (MGD)	River Heights Flow Generation (MGD)	Smithfield/Hyde Park Flow Generation (MGD)	Peak Day Flow (MGD)
2025	23,133	4.9	8	10	0.9	2.2	1.0	0.3	1.6	28.9
2035 (10-year)	25,126	5.3	8.1	10	1.2	3.8	1.1	0.5	3.3	33.3
2045 (20-year)	26,573	5.6	8.2	10	1.3	5.0	1.4	0.5	4.4	36.4
2065 (40-Year)	30,042	6.3	8.3	10	1.6	5.0	2.4	0.5	7.9	42.0
Buildout	54,544	11.5	9.2	10	3.2	5.0	2.7	0.5	8.5	50.6

1. Logan infiltration includes 2.0 MGD base infiltration and 6.0 MGD seasonal infiltration. Infiltration is expected to increase as additional pipes are installed.

2. Member community flow generation projections account for increased infiltration in member communities.



Projected peak daily flows in the system are projected to increase from 28.9 MGD under existing conditions to 50.6 MGD at future buildout conditions.

Projected peak hour flows in the system are shown in Table 5-4.

TABLE 5-4 PEAK HOUR FLOW PROJECTIONS (EXCLUDING INFLOW)

Year	Peak Day Flow (MGD)	System Peaking Factor	Peak Hour Flow (MGD)
2025	18.9	1.10	20.7
2035 (10-Year)	23.3	1.10	25.6
2045 (20-Year)	26.4	1.10	29.0
2065 (40-Year)	32.0	1.10	35.2
Buildout	40.6	1.10	44.7

Projected peak hour flows are projected to increase from 20.7 MGD under existing conditions to 44.7 MGD at buildout.

A summary of maximum projected flow (peak hour flow plus inflow) is shown in Table 5-5.

TABLE 5-5 MAXIMUM FLOW PROJECTIONS (INCLUDING INFLOW)

Year	Peak Hour Flow (MGD)	Inflow (MGD)	Maximum Flow (MGD)
2025	20.7	10.0	30.7
2035 (10-Year)	25.6	10.0	35.6
2045 (20-Year)	29.0	10.0	39.0
2065 (40-Year)	35.2	10.0	45.2
Buildout	44.7	10.0	54.7

A maximum potential flow rate to the treatment facility (including inflow) of 54.7 MGD is projected at buildout.

CHAPTER 6

WASTEWATER COLLECTION SYSTEM EVALUATION

This chapter describes the steps involved in evaluating the wastewater collection system, including developing the model. The steps are as follows:

- Choosing the model software
- Establishing the system layout in the model
- Developing the design criteria for the collection system
- Calibrating the model
- Creating different scenarios in the model
- Performing Modeling
- Reviewing and evaluating results
- Developing solutions

MODEL SELECTION

HAL and City personnel decided to use the Autodesk Storm and Sanitary Analysis (SSA) Model Software for the master plan hydraulic analysis. SSA uses the EPA Storm Water Management Model (SWMM) software for computations and allows the model to be directly exported to EPA SWMM, which can be used with the EPA's free public software license. This allows the City to import the model into their Aquanuity Software.

SYSTEM LAYOUT AND MODEL CONSTRUCTION

Information about how the model was built and calibrated is included in this section.

System Facilities

The wastewater collection system layout was provided by the City in a GIS data format. The GIS database included information about the material and diameter of collection system pipes, as well as invert elevations of pipes and manhole rim elevations. Each of these elements was imported and represented in the model.

Design drawings and documentation were used to represent the geometry of each wet well and the performance of each lift station pump. Where data was missing or inconsistent, HAL and City personnel coordinated to correct identified errors or collect additional data to add to the model.

Collection Areas

A collection area is defined as a geographic area that contributes flow to a common point in the collection system. Collection areas in the collection system were defined based on pipe configuration at a resolution where the ERU count was generally 400 or less. This level of detail is standard in wastewater master planning. Delineated collection areas are shown in Figure 6-1. The existing or projected future wastewater flow rate associated with each collection area was assigned to an associated model node in its respective model scenario.

Flow Allocation

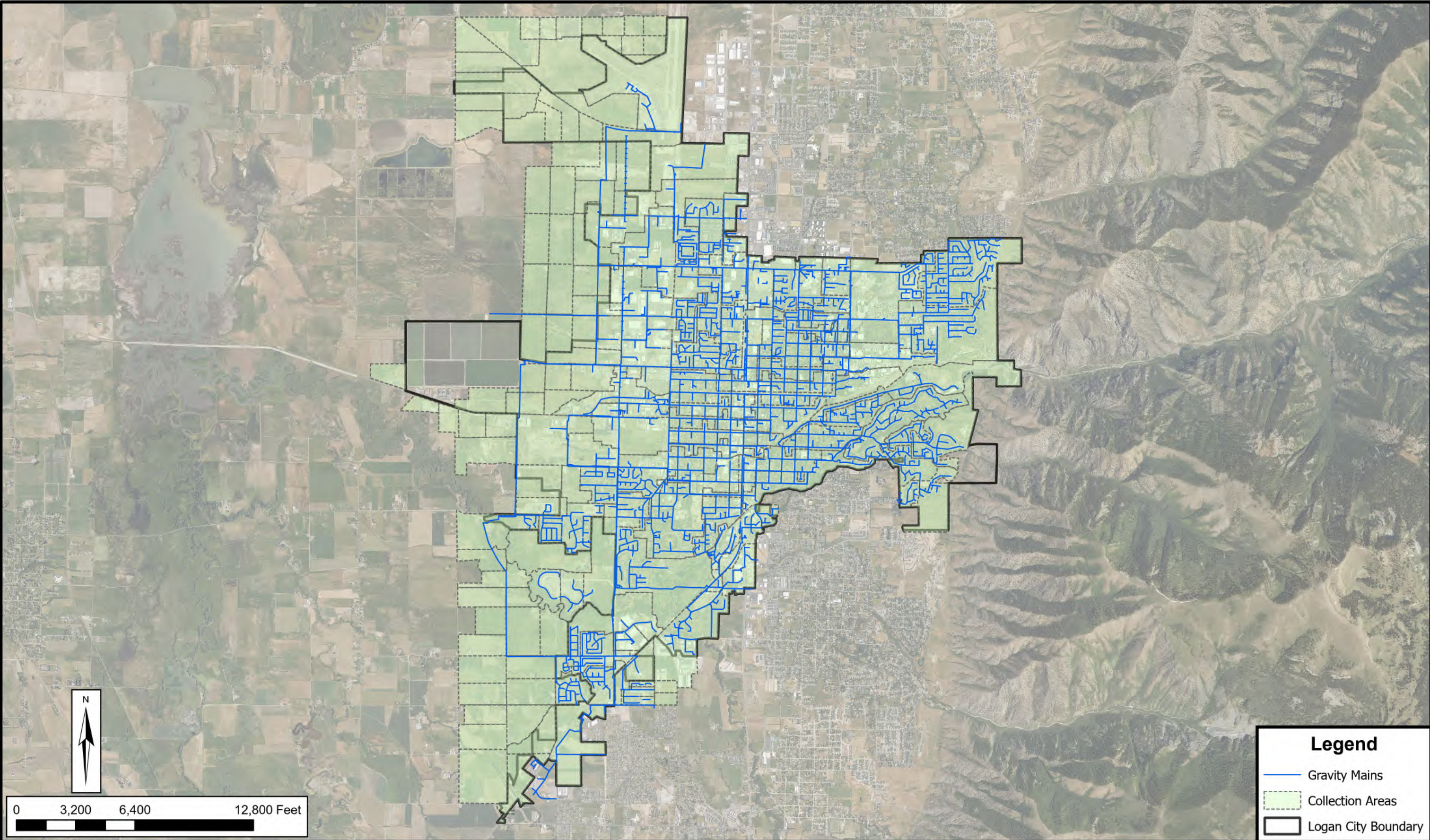
Wastewater flow was spatially allocated in the model to match flow values and projections listed in Chapter 5. Infiltration and inflow were distributed across the system at locations shown in Figure 6-2. For future projections, wastewater flow generated by customers was allocated based on the planned future land use of the area and the projected density of ERUs per acre for each land use type. For the existing model, flows were distributed using billed wintertime drinking water sales data.

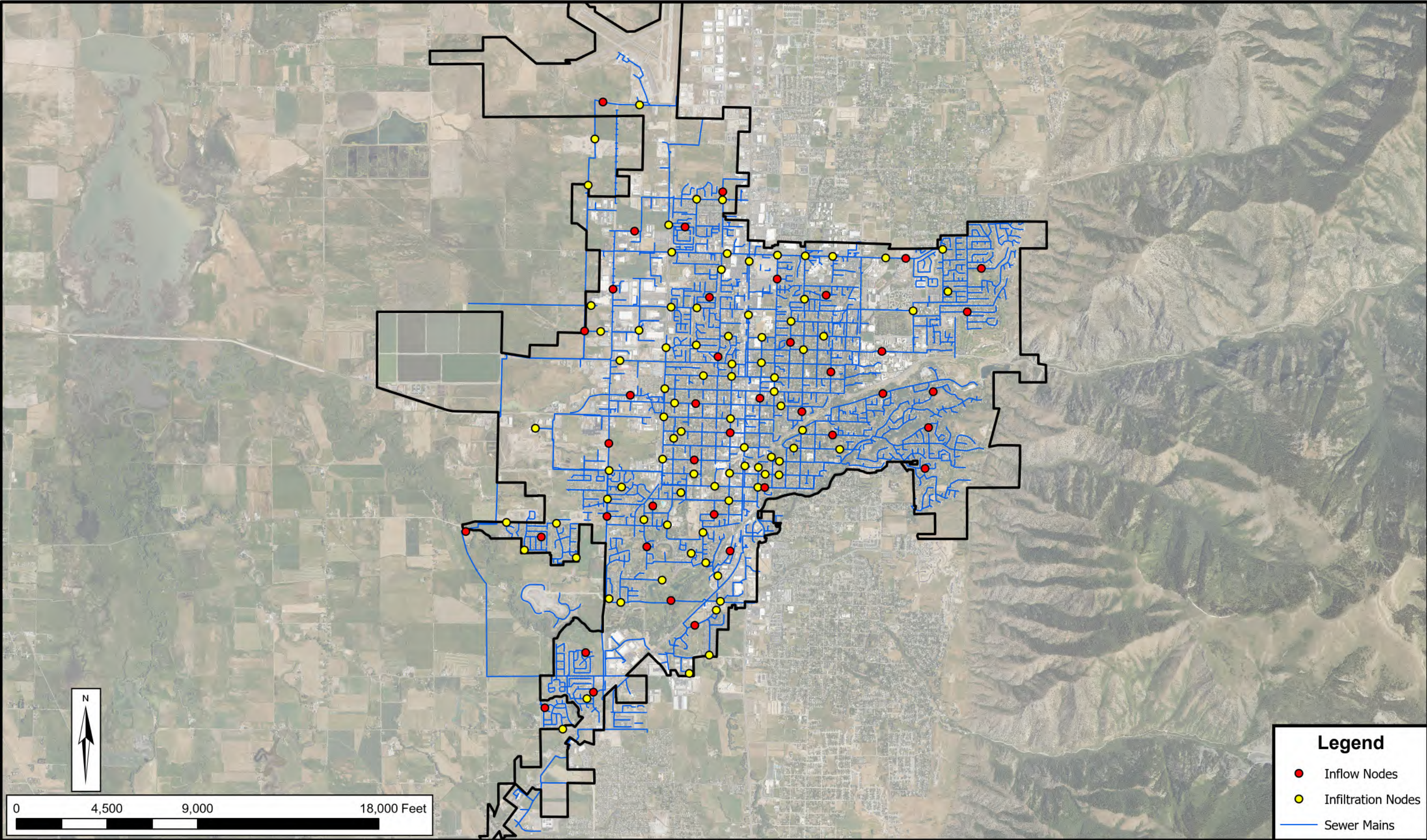
Calibration

After the model was initially constructed, its output was compared to available SCADA data and recorded flow data to investigate how closely the model matched reality. Lift station pump curves were adjusted to better match observed flow rates. Scale factors were applied to the billed drinking water sales data to better match the amount discharged to the wastewater system rather than sold through the drinking water meter. Rates of inflow and infiltration were adjusted to better match measured flow rates. After making these adjustments, a reasonable match was achieved.

EVALUATION CRITERIA

A range of potential evaluation criteria and values were suggested by HAL and reviewed by the City. The criteria and values adopted for modeling are included in Table 6-1.





Legend

- Inflow Nodes
- Infiltration Nodes
- Sewer Mains

TABLE 6-1 EVALUATION CRITERIA

CRITERIA	VALUE OR ASSUMPTION
System Loading	Existing system loading was developed based on a level of service (LOS) of 210 gpd per ERU and observed infiltration and inflow. Future hydraulic loading was developed based on growth projections and the LOS of 210 gpd per ERU.
Daily Flow Variation	Diurnal curves were developed from winter drinking water production data, metered sewer flow rates, and data from the wastewater SCADA system.
Peak Flow	Peaking factors were developed from diurnal water demand curves and measured sewer flow rates. Predicted peak flows were developed from the AutoCAD SSA model.
Inflow and Infiltration	Inflow and infiltration values were estimated by reviewing flow data collected at the lift stations both for dry-weather periods and during storm events. Infiltration and inflow were distributed throughout the City. Modeled values are as follows: Existing Inflow = 10 MGD Buildout Inflow = 10 MGD Existing Infiltration = 8 MGD Buildout Infiltration = 0.12 gpm/acre for new development
Future Planning Periods	Years 2035 (10-year), 2045 (20-year), 2065 (40-year) and estimated buildout.
Land Use & Population Projections	Land uses in undeveloped areas were assumed to occur as specified in the Logan City General Plan. Where available, development plans were used to further refine projections for future land use. Population projections were based on historic trends and projected rates and timing of growth as identified by the Planning Department.

Additionally, pipe capacity (depth/diameter) was evaluated based on the parameters listed in Table 6-2.

TABLE 6-2 PIPE CAPACITY EVALUATION CRITERIA

D Diameter (inches)	d Maximum Allowed Flow Depth (inches)	d/D Maximum Allowed Depth/Diameter	S Minimum Pipe Slope
8	4	0.5	0.40%
10	5.5	0.55	0.28%
12	7.2	0.6	0.21%
15	9.75	0.65	0.15%
18	13.5	0.75	0.12%
21	15.75	0.75	0.10%
24	18	0.75	0.10%
27	20.25	0.75	0.10%
30	22.5	0.75	0.10%
36	28.8	0.8	0.10%
42	35.7	0.85	0.10%
48	40.8	0.85	0.10%
60	51	0.85	0.10%
72	61.2	0.85	0.10%

MODEL SCENARIOS

Nine modeling scenarios were developed and evaluated for the City's wastewater collection system as shown in Table 6-3.

TABLE 6-3 MODEL SCENARIOS

SCENARIO	DESCRIPTION
Existing	The existing scenario was used to identify deficiencies in the wastewater collection system, and to establish a baseline for evaluation of future conditions.
2035 (10-Year)	The 2035 (10-Year) scenario was used to identify areas where the 10-Year projected flows exceed the existing pipe capacity criteria.
2035 Corrected	The 2035 (10-year) scenario with additional infrastructure projects installed as needed to maintain adequate system performance
2045 (20-Year)	The 2045 (20-Year) scenario was used to identify areas where the 20-Year projected flows exceed the existing pipe capacity criteria.
2045 Corrected	The 2045 (20-year) scenario with additional infrastructure projects installed as needed to maintain adequate system performance
2065 (40-Year)	The 2065 (40-Year) scenario was used to identify areas where the 40-Year projected flows exceed the existing pipe capacity criteria.
2065 Corrected	The 2065 (40-year) scenario with additional infrastructure projects installed as needed to maintain adequate system performance
Buildout	The buildout scenario includes projected future wastewater flows but only existing infrastructure. It was used to identify areas where the buildout projected flows exceed the existing pipe capacity criteria or lift station capacity.
Buildout Corrected	The corrected scenario includes system improvements that accommodate all projected buildout flows.

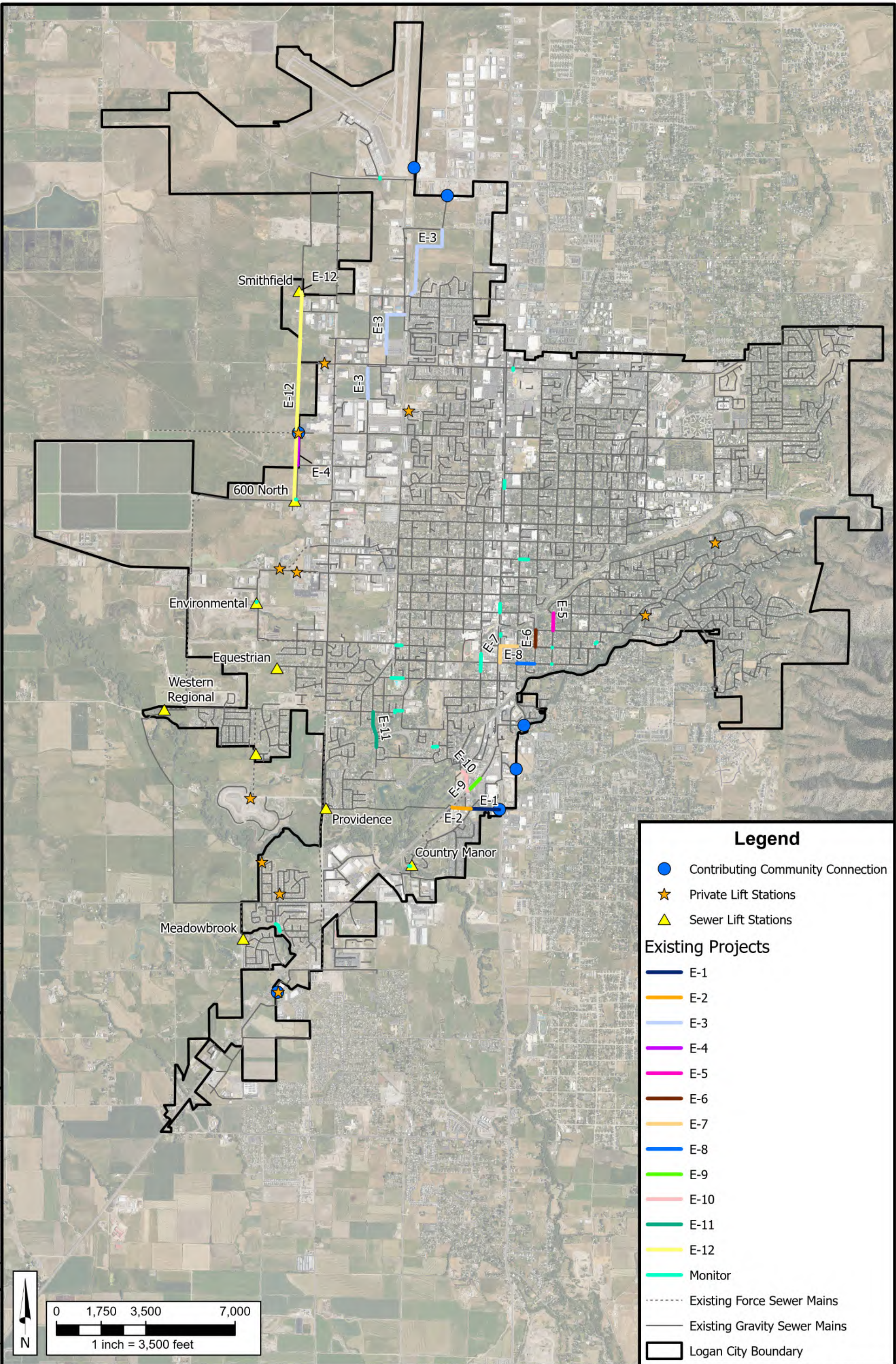
PEAK HYDRAULIC LOADING

The hydraulic models were used to analyze the collection system. For each scenario, projected average daily flow rates, infiltration, and inflow were spatially allocated in the model. The models applied peaking factors to generate maximum flow rates as previously described in Table 5-5.

EXISTING DEFICIENCIES

The maximum depth ratio is the ratio between the maximum flow depth in the sewer and the diameter of the pipe (d/D). Pipes were considered deficient if they did not meet the criteria listed in Table 6-2. Pipe capacity deficiencies identified in the Existing Scenario models are summarized in Table 6-4 along with the recommended solutions. Existing deficiencies are shown in Figure 6-3.

Date: 7/10/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



0 1,750 3,500 7,000
1 inch = 3,500 feet

TABLE 6-4 EXISTING PIPE CAPACITY DEFICIENCIES AND SOLUTIONS

PROJECT ID	LOCATION	ISSUE	RECOMMENDED SOLUTION
E-1	1200 S between Legrand St and Main Street.	Surcharged pipe section.	Construct 1,100 ft of 15-inch gravity line parallel to the existing line
E-2	1200 S from Hwy 89/91 to Legrand Street	Surcharged pipe section.	Replace 800 ft of 12-inch gravity line with 18-inch gravity line.
E-3	2200 N to 1800 N (approx 600 W and 400 W), 1700 N to 1550 N (approx 700 W and 600 W), and 800 W between 1400 N to 1200 N.	$d/D > 0.75$ (0.90)	Construct approximately 7,100 ft of 48-inch gravity line.
E-4	1200 W between 1000 N and 800 N.	$d/D > 0.50$ (0.78)	Replace 1,300 ft of existing 8-inch gravity line with 12-inch gravity line.
E-5	300 E between Center St and 100 S.	Surcharged pipe section.	Replace 700 ft of existing 8-inch gravity line with 12-inch gravity line.
E-6	200 E between 100 S and 200 S.	$d/D > 0.50$ (0.60)	Replace 700 ft of existing 8-inch gravity line with 10-inch gravity line.
E-7	Main St between 200 S and 300 S. 200 S between 100 E and Main St.	Surcharged pipe section.	Replace 1,350 ft of existing 8-inch gravity line with 650 ft of 12-inch and 700 ft of 15-inch gravity line.
E-8	300 S between 100 E and 200 E	$d/D > 0.60$ (0.78)	Replace 700 ft of existing 12-inch gravity line with 350 ft of 15-inch and 350 ft of 18-inch gravity line.
E-9	Hwy 89 between 970 S and 100 W.	$d/D > 0.60$ (0.77)	Replace 700 ft of existing 12-inch gravity line with 15-inch gravity line.
E-10	100 W between Hwy 89 and 970 S.	$d/D > 0.65$ (0.88)	Replace 900 ft of existing 12-inch and 15-inch gravity line with 18-inch gravity line.
E-11	Park Ave between 600 S and 810 S.	$d/D > 0.75$ (0.94)	Replace 1,450 ft of existing 24-inch gravity line with 1,150 ft of 30-inch and 300 ft of 36-inch gravity line.
E-12	Smithfield Lift Station	Pumping Capacity	Install two new pumps. Upsize 8,250 ft of force main to 20-inch diameter pipe.

1. Lengths are approximate. Alignments should be refined with further study.
2. See Table 8-1 on Page 8-3 for breakdown of cost sharing percentages.

FUTURE LIFT STATION CAPACITY

Table 6-5 shows future lift station rated capacity, buildout requirements, and future surplus or deficit capacity.

TABLE 6-5 FUTURE LIFT STATION REQUIREMENTS

Lift Station ¹	Rated Capacity (gpm)	Existing Peak Hour (gpm)	10-Year Peak Hour (gpm)	20-Year Peak Hour (gpm)	40-Year Peak Hour (gpm)	Buildout Peak Hour (gpm)	Future Surplus/ Deficit (gpm)
600 N	442	400	400	405	430	500	-58
Country Manor	550	160	160	165	210	250	300
Environmental	300	160	310	340	390	500	-200
Meadowbrook	260	40	40	40	40	125	135
Providence	1,650	1,500	1,600	1,850	2,600	5,000	-3,350
Smithfield	1,950	2,250	3,950	4,900	8,150	9,800	-7,850
Western Regional	1,490	750	750	950	1,450	3,700	-2,210

1. Equestrian lift station is not shown in the table because it will be decommissioned with project 10-4.

It is recommended that the City monitor flows in Western Regional as growth occurs and increase pump capacity when demand nears capacity. Smithfield's deficiency is addressed by project E-12.

FUTURE IMPROVEMENTS

Future improvements were identified using the hydraulic model and are designed to accommodate projected future wastewater flows. Pipe capacity improvements required to serve projected future growth are shown in Figures 6-4, 6-5, and 6-6 and are summarized in Table 6-6

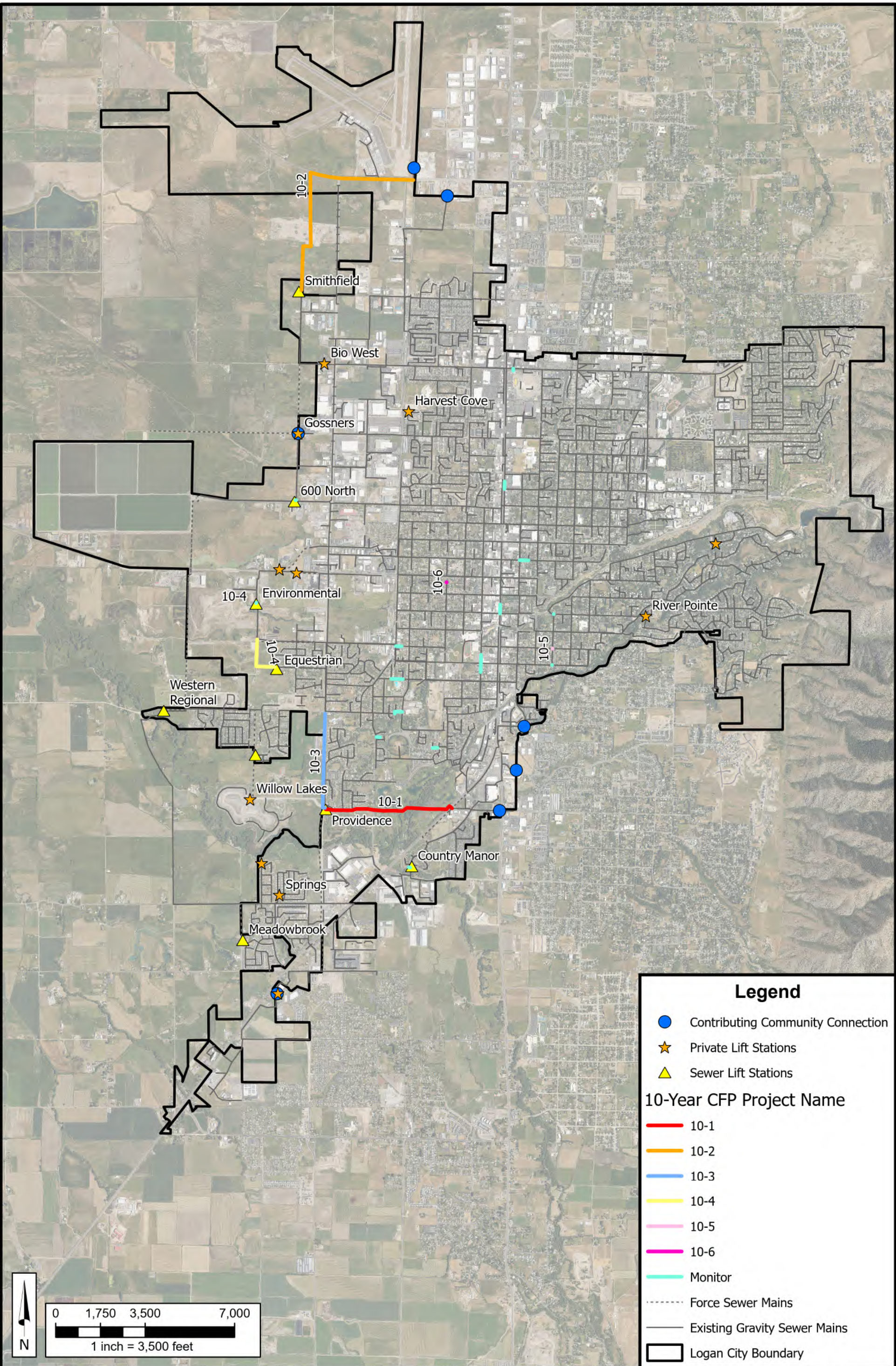
TABLE 6-6 FUTURE 10-YEAR AND 40-YEAR IMPROVEMENT PROJECTS

PROJECT ID	LOCATION	ISSUE	SOLUTION
10-Year Projects			
10-1	Through the Golf Course between Highway 89 and the Providence Lift Station.	d/D > 0.75 (0.85)	Replace 5,150 ft of existing 18-inch gravity line with 4,900 ft of 24-inch and 250 ft of 30-inch gravity line.
10-2	Airport Rd between 1200 W and 550 W. 1200 W between Airport Rd and 1800 N.	Surcharged pipe section.	Replace 9,500 ft of existing 24-inch and 36-inch gravity line with 42-inch gravity line.
10-3	Providence Lift Station	Pumping Capacity	Expand capacity of the lift station and wet well. Switch force main to existing 14-inch diameter pipe.
10-4	1400 W between 200 S and 350 S.	Future development	Install approximately 1,800 feet of 8-inch gravity line. Equip Environmental lift for 500 gpm. Abandon Equestrian Lift Station.

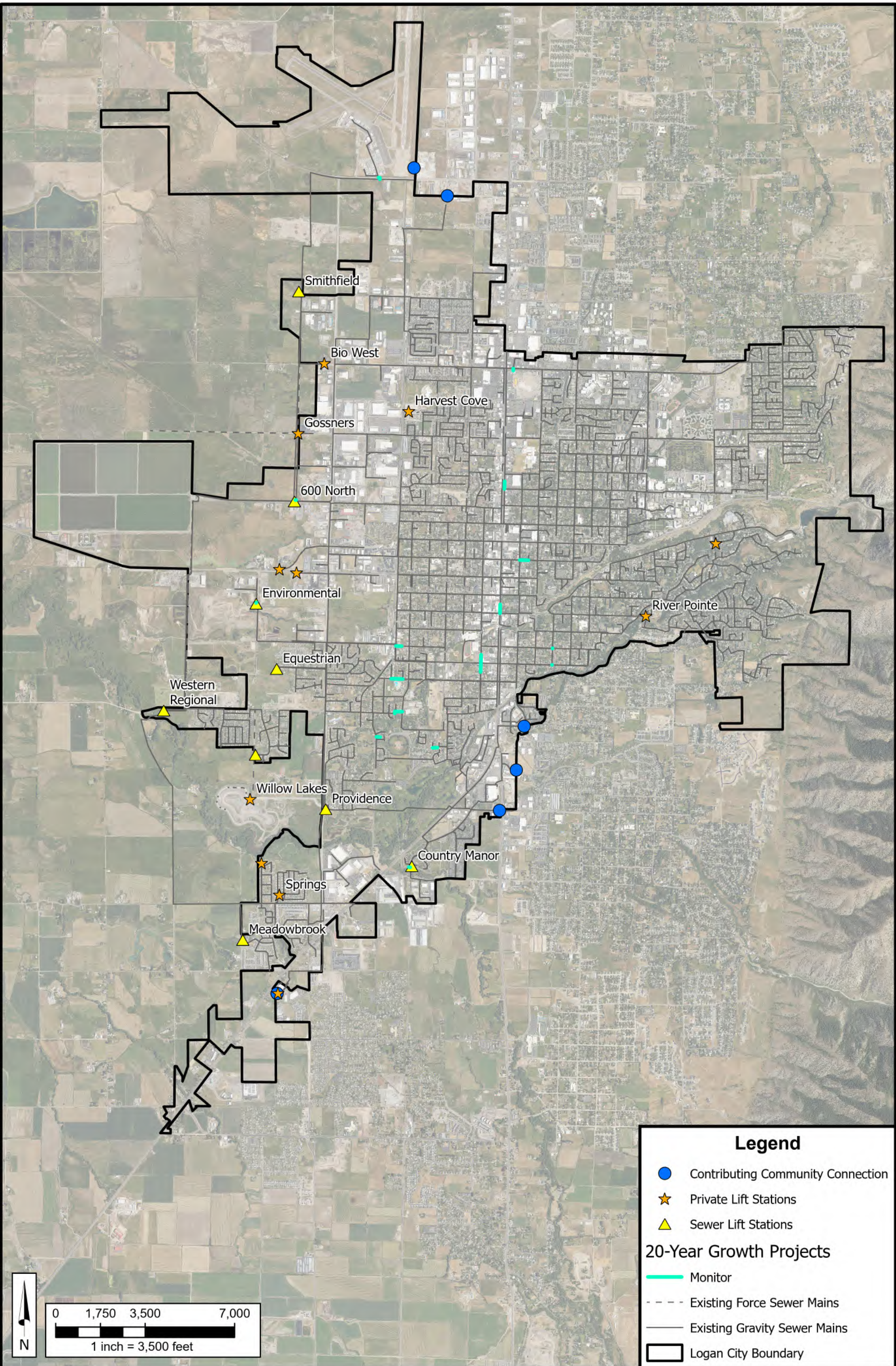
PROJECT ID	LOCATION	ISSUE	SOLUTION
10-5	200 S 300 E	d/D > 0.6 (0.67)	Install weir in SM02564 to force more flow to the west.
10-6	300 W and 175 N	Difficult Maintenance	Install a manhole at the end of the sewer line.
20-Year Projects			
No 20-Year Projects were identified.			
40-Year Projects			
40-1	1000 W between 200 S and 600 N.	d/D > 0.85 (0.90)	Replace 5,500 ft of existing 48-inch gravity line with 60-inch gravity line.
40-2	2400 W between 1200 S and 600 S. 600 S between 2400 W and 2000 W.	Future development	Install approximately 4,300 ft of 8-inch gravity line.
40-3	2400 W between 1400 S and 3000 S.	Future development	Install approximately 4,400 ft of 8-inch gravity line, 2,250 ft of 10-inch gravity line, 3,250 ft of 12-inch gravity line and 850 ft of 15-inch gravity line.
40-4	2200 S between 1600 W and 2400 W.	Future development	Install approximately 2,500 ft of 8-inch gravity line and 2,700 ft of 10-inch gravity line.
40-5	2000 W between 2200 S and 3000 S.	Future development	Install approximately 5,000 ft of 8-inch gravity line.
40-6	Approximately west of 1400 W and south of Mendon Rd.	Future development	Install approximately 6,600 ft of 8-inch gravity line, 800 ft of 12-inch gravity line and 400 ft of 15-inch gravity line. Abandon Willow Lakes Lift Station.
40-7	Approximately 2500 N between 1900 W and 2400 W.	Future development	Install approximately 3,600 ft of 10-inch gravity line.
40-LS1	Approximately 2500 N 2400 W.	Future development	Build new lift station.
40-LS1-FM	From new LS1 to 600 N.	Future development	Install approximately 14,400 ft of 8-inch force main.
40-LS2	Approximately 1800 S 2400 W.	Future development	Build new lift station.
40-LS2-FM	From new LS2 to 2000 W.	Future development	Install approximately 2,500 ft of 8-inch force main.

1. Lengths are approximate and will be refined further as development plans in these areas are better defined.
2. This study only analyzed pipeline upsizing. Parallel pipe alignments may also be an alternative. Selected alternatives should be refined as development plans are better defined.

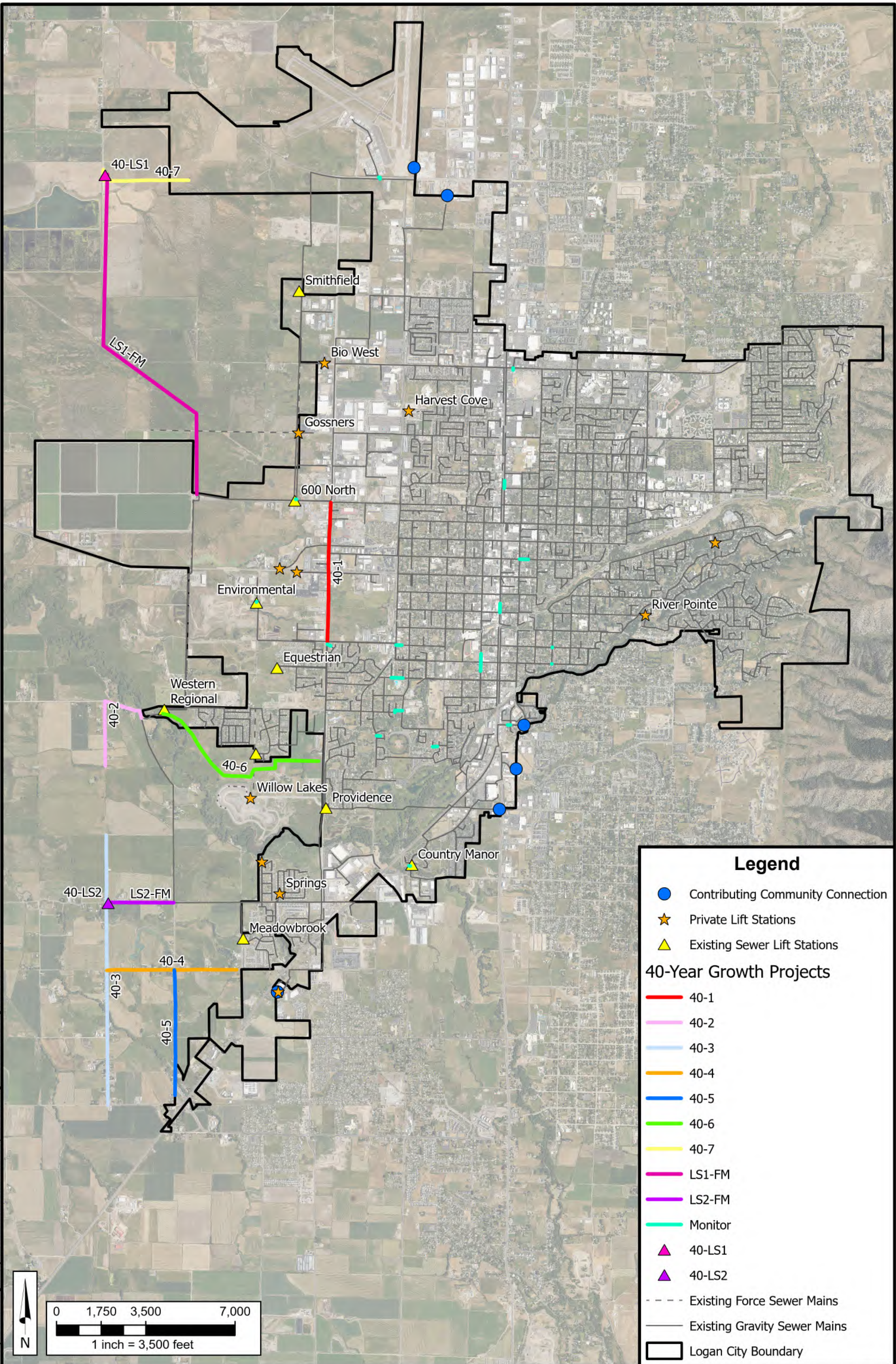
Date: 9/1/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



Date: 1/9/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



Date: 1/9/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024.aprx



No 20-year projects were identified. Member communities have near-term needs that will be addressed with the 10-year projects. The proposed projects are sized to address longer-term growth, meeting needs beyond 20 years.

LOCATIONS TO MONITOR

The model shows several areas that show slight deficiencies related to pipe slope. These may be actual deficiencies or may be the result of limitations in the accuracy of available data. These pipes are not creating any significant issues in the system; however, flow monitoring is recommended to verify the occurrence or extent of any deficiency. Elevation data should also be verified to confirm that the model represents the pipes correctly. The pipe locations recommended for monitoring are shown in Figures 6-4, 6-5, and 6-6.

CONTINUED MODEL UPDATES

To make best use of the hydraulic model, it should continually be updated with new information and re-calibrated to match current conditions. The model can then continue to be used to evaluate planned developments and refine the timing and characteristics of master planned projects as additional information becomes available. The City will plan to develop an internal process to update the model at regular intervals, with new infrastructure added at least annually and model loading updated every 1 to 2 years.

CHAPTER 7

OPERATIONS AND MAINTENANCE ALTERNATIVES

Recommendations for key operations and maintenance procedures have been developed. Many of these recommendations are a continuation of procedures already in effect. A discussion is included below, along with a recommendation for continued practice.

SYSTEM MONITORING

It is difficult to determine the condition of the wastewater collection system based on age alone. The typical design life for a sanitary sewer is between 50 and 100 years. Factors affecting design life may include pipe material, soil conditions and quality of construction. The City uses sewer video inspection technology to evaluate the structural integrity of the pipes in the sewer network. Sewer video inspection is very useful at identifying cracks, holes, offset joints, erosion, low points in pipes, and significant inflow/infiltration. It is recommended that the City continue the system video schedule and use the inspection to plan for future repair projects.

FLOW MONITORING PROGRAM

The City currently maintains portable wastewater flow meters and uses them to measure and record flows throughout the system. The flow monitoring program is critical in that it allows the system operators to verify the effects of growth and development on the sewer system and to verify that the results of the hydraulic model are accurate. Flow monitoring also allows operators to view the performance of the system and gives them the ability to observe changes in the system, including those that may be unexpected. Continued flow monitoring is recommended, with a particular focus on areas where upcoming capital projects are scheduled.

PIPELINE IMPROVEMENTS

The following improvement alternatives are typically considered when addressing pipeline deficiencies.

Grouting

Grouting sewer pipelines extends their lifespan and reduces infiltration. The City's grouting efforts have significantly reduced infiltration in certain areas.

Cleaning

If the slope of the pipe is insufficient to provide adequate flow velocity, deposition of solids will occur. Solids deposition decreases pipe capacity. Several locations within the City's collection system are relatively flat, resulting in slopes less than that necessary to produce scour velocity. It is recommended that City crews continue cleaning pipes in the system on a regular schedule. Problem areas should be cleaned more frequently.

Replacement Sewers

Historically, where pipe capacity has been identified as being insufficient, the typical solution has been to provide additional capacity by replacing the existing sewer with a larger sewer. Portions of the recommended projects are replacement projects.

Bypass Sewers/Re-routing Flows

While replacement of an existing sewer may be appropriate when the existing sewer is structurally inadequate, construction of a bypass or parallel sewer to supplement the capacity of the existing sewer may be a less expensive alternative if the existing sewer is in good condition.

Rehabilitation of Sewers

It is often more cost-effective to rehabilitate old sewer pipelines by installing liners inside the pipe than it is to replace them. Lining pipes can increase structural integrity, prevent root intrusion, and decrease infiltration. As such, pipes with corrosion problems, root intrusion problems, or high infiltration should be prioritized for lining.

New Sewers

New sewers are often the only option to collect flows from future development or previously inaccessible areas. Because some future growth within City's service area is expected to occur in some areas without existing sewer networks, new sewer networks are expected to be constructed to accommodate new development.

Alternative Construction Technologies

Within the last few years, several alternative technologies have become popular when sewers need to be replaced, when pipeline capacity needs to be increased, or when there are significant constraints to more conventional construction methods. Typical alternative technologies include:

New Construction

- Steered Auger Boring (Directional Drilling)
- Micro-tunneling

Sewer Pipe Rehabilitation

- Cured-in-Place Pipe
- Slip Lining
- Pipe Bursting
- Pipe Eating (drilling away the old pipe as a new pipe is installed)
- Thermoforming (fold and form)

COMPARISON OF IMPROVEMENT ALTERNATIVES

Sewers

For the purposes of this report, sewer replacements were assumed to be open-cut to provide conservative cost estimates for budgeting purposes.

Future Considerations

During design of the recommended improvements, the City will review all assumptions, compare improvement alternatives, and will decide on the most cost-effective and appropriate improvement method at that time.

ELIMINATE UNNECESSARY WASTEWATER

One way to increase capacity and reduce treatment costs in the wastewater collection system is to identify and eliminate inflow and infiltration. The City produces about 10 MGD of inflow and another 8 MGD of infiltration. During a peak event, approximately 18 MGD out of 28.9 MGD, or 62% of the wastewater collected comes from inflow and infiltration.

The City's grouting efforts have significantly reduced infiltration in specific areas. Grouting efforts will continue to reduce system infiltration.

The largest amounts of inflow typically occur where ponding occurs on top of sewer manholes during storm events. During storms, field personnel should identify these areas. In areas where ponding occurs, vented manholes should not be used except where necessary. Improvements should be made to the stormwater system to eliminate ponding. The City is currently working on a stormwater master plan and should use results from the master plan and stormwater models to identify areas where inflow is most likely occurring.

Illegal connections of sump pumps to the sewer can also increase inflow during storm events. In older portions of Logan City with a high groundwater table, there may be significant illegal sump pump connections present. Implementing an educational program or a City-led program to route these sump pumps to the storm drainage system could help reduce inflow.

CHAPTER 8

CAPITAL IMPROVEMENTS PLAN

Recommended capital improvements and their estimated construction costs were identified based on the findings described in the previous chapters. These recommendations are intended to correct existing deficiencies and support population growth and development.

PROJECT COST ESTIMATES

Typical representative unit costs were used to develop the project construction cost estimates. Sources of typical unit costs included HAL's bid tabulation records for similar recent projects in Utah, and the 2025 RS Means Heavy Construction Cost Index. Project cost estimates and related material are included in Appendix F.

ACCURACY OF COST ESTIMATES

When considering cost estimates, there are several levels or degrees of accuracy, depending on the purpose of the estimate and the percentage of detailed design that has been completed. The following levels of accuracy are typical:

<u>Type of Estimate</u>	<u>Accuracy</u>
Master Plan	-50% to +100%
Preliminary Design	-30% to +50%
Final Design or Bid	-10% to +10%

For example, at the master plan level (or conceptual or feasibility design level), if a project is estimated to cost \$1,000,000, then the accuracy or reliability of the cost estimate would typically be expected to range between approximately \$500,000 and \$2,000,000. While this may not seem very accurate, the purpose of master planning is to develop general sizing, location, cost and scheduling information on several individual projects that may be designed and constructed over a period of many years. Master planning also typically includes the selection of common design criteria to help ensure uniformity and compatibility among future individual projects. Details such as the exact capacity of individual projects, the level of redundancy, the location of facilities, the alignment and depth of pipelines, the extent of utility conflicts, the cost of land and easements, the construction methodology, the types of equipment and material to be used, the time of construction, interest and inflation rates, permitting requirements, etc., are typically developed during the more detailed levels of design.

At the preliminary design level, some of the aforementioned information will have been developed. Major design decisions such as the size of facilities, selection of facility sites, pipeline alignments and depths, and the selection of the types of equipment and material to be used during construction, will typically have been made. At this level of design, the accuracy of the cost estimate for the same \$1,000,000 project would typically be expected to range between approximately \$700,000 and \$1,500,000.

After the project has been completely designed, and is ready to bid, all design plans and technical specifications will have been completed and nearly all of the significant details about the project should be known. At this level of design, the accuracy of the cost estimate for the same \$1,000,000 project would typically be expected to range between approximately \$900,000 and \$1,100,000.

RECOMMENDED IMPROVEMENT PROJECTS

Factors considered as recommended projects were identified including the following:

- Input by City sewer system operation personnel regarding their experience with, and opinions regarding, the deficiency and potential solutions.
- Input from City management regarding a wide range of issues, including development schedules, budgeting issues and coordination with other public works projects.
- Priority indicated by hydraulic modeling
- Project cost estimates

Table 8-1 identifies projects recommended to correct existing deficiencies. Table 8-2 identifies projects recommended to provide capacity for projected future 10-year flows in the wastewater system.

TABLE 8-1 EXISTING IMPROVEMENT PROJECTS AND COST ESTIMATES

PROJECT ID	DESCRIPTION	TOTAL COST¹	MEMBER COMMUNITY COST	CITY COST	FUTURE GROWTH
E-1	Construct 1,100 ft of 15-inch gravity line parallel to the existing line	\$814,000	\$769,230 (94.5% Providence)	\$44,770 (5.5%)	6%
E-2	Replace 800 ft of 12-inch gravity line with 18-inch gravity line.	\$628,000	\$575,876 (91.7% Providence)	\$52,124 (8.3%)	6%
E-3	Install 7,100 ft of 48-inch gravity line.	\$9,393,000	\$6,011,520 (64% North Logan)	\$3,381,480 (36%)	18%
E-4	Install 1,300 ft of 12-inch gravity line.	\$908,000	0%	\$908,000 (100%)	0%
E-5	Install 700 ft 12-inch gravity line.	\$489,000	0%	\$489,000 (100%)	0%
E-6	Install 700 ft of 10-inch gravity line.	\$469,000	0%	\$469,000 (100%)	0%
E-7	Install 650 ft of 12-inch gravity line and 700 ft of 15-inch gravity line.	\$972,000	0%	\$972,000 (100%)	0%
E-8	Install 350 ft of 15-inch gravity line and 350 ft of 18-inch gravity line.	\$534,000	0%	\$534,000 (100%)	0%
E-9	Install 700 ft of 15-inch gravity line.	\$518,000	\$492,100 (95% River Heights)	\$25,900 (5%)	0%
E-10	Install 900 ft of 18-inch gravity line.	\$706,000	\$261,220 (37% River Heights)	\$444,780 (63%)	0%
E-11	Install 1,150 ft of 30-inch gravity line and 300 ft of 36-inch gravity line.	\$1,428,000	\$571,200 (40% River Heights)	\$856,800 (60%)	0%
E-12	Install two new pumps. Upsize 8,250 ft of force main to 20-inch diameter pipe.	\$5,196,000	\$4,260,720 (59% Smithfield & 23% Hyde Park)	\$935,280 (18%)	77%
TOTAL		\$22,055,000	\$12,941,866	\$9,113,134	-

¹ All costs include 20% for engineering, administrative costs, and contingencies. Costs are shown in 2025 dollars.

TABLE 8-2 10-YEAR FUTURE IMPROVEMENT PROJECTS & COST ESTIMATES

PROJECT ID	DESCRIPTION	COST¹	MEMBER COMMUNITY COST	LOGAN CITY COST	FUTURE GROWTH
10-Year Projects					
10-1	Install 4,900 ft of 24-inch and 250 ft of 30-inch gravity line.	\$4,502,000	\$4,411,960 (98% Providence)	\$90,040 (2%)	46%
10-2	Install 9,500 ft of 42-inch gravity line.	\$11,126,000	\$9,902,140 (59% Smithfield, 30% Hyde Park)	\$1,223,860 (11%)	76%
10-3	Expand capacity of the lift station and wet well. Switch force main to existing 14-inch diameter pipe.	\$4,440,000	\$3,330,000 (75% Providence)	\$1,110,000 (25%)	46%
10-4	Install approximately 1,800 feet of 8-inch gravity line. Equip Environmental Lift Station for 500 gpm. Abandon Equestrian Lift Station.	\$1,345,000	0%	\$1,345,000 (100%)	69%
10-5	Install weir in SM02564 to force more flow to the West	\$12,000	0%	\$12,000 (100%)	3%
10-6	Install manhole at the end of the sewer line.	\$6,000	0%	\$6,000 (100%)	0%
TOTAL		\$21,431,000	\$17,644,100	\$3,786,900	-

¹ All costs include 20% for engineering, administrative costs, and contingencies. Costs are shown in 2025 dollars.

While it is anticipated that the final construction of these projects will be completed as shown, additional information may become available during the design process or conditions may change prior to construction. Therefore, it is recommended that before constructing each of these projects, a local specific study should be performed prior to design to verify current conditions and the applicability of the project. A land survey should also be completed to verify elevations, as well as current flow studies be completed to verify future flow conditions.

Crew Identified Projects

Several pipelines have been identified by the Logan City Crew that need linings and/or repairs. These projects have been included in Appendix K.

Infrastructure Replacement

As part of the master planning effort, a methodology was developed to determine priority for pipeline replacement. Each pipe is given a score based on factors including slope, material, age, peak flow depth, observed failing condition, and difficulty of replacement. Details regarding this methodology are included in Appendix G. Pipes will be evaluated and scored annually. Scores will be considered along with other factors (such as compatible road projects) to determine replacement projects.

It is recommended that the City fund a pipeline replacement program based on the analysis completed in Appendix G. Table 8-3 summarizes the total costs to replace all the pipelines in the system. Pipe unit costs assume there will be some savings from pairing installations with road replace projects.

TABLE 8-3 SUMMARY OF PIPELINE REPLACEMENT COSTS

PARAMETER	VALUE
Total Cost	\$556,000,000
Years	100
Replacement Efficiency	25%
Cost per Year	\$4,170,000

It is assumed that the pipes would be replaced over a period of 100 years. An average annual budget of about \$4,170,000 is proposed for pipeline replacement, with periodic adjustments made due to inflation, changing market conditions, or other factors.

A more detailed breakdown of cost of replacement per decade of pipe installed is shown on Figure 8-1. The replacement value of pipes installed more than 100 years ago is roughly \$45 million, indicating a need for proactive replacement for pipes already beyond their service life.

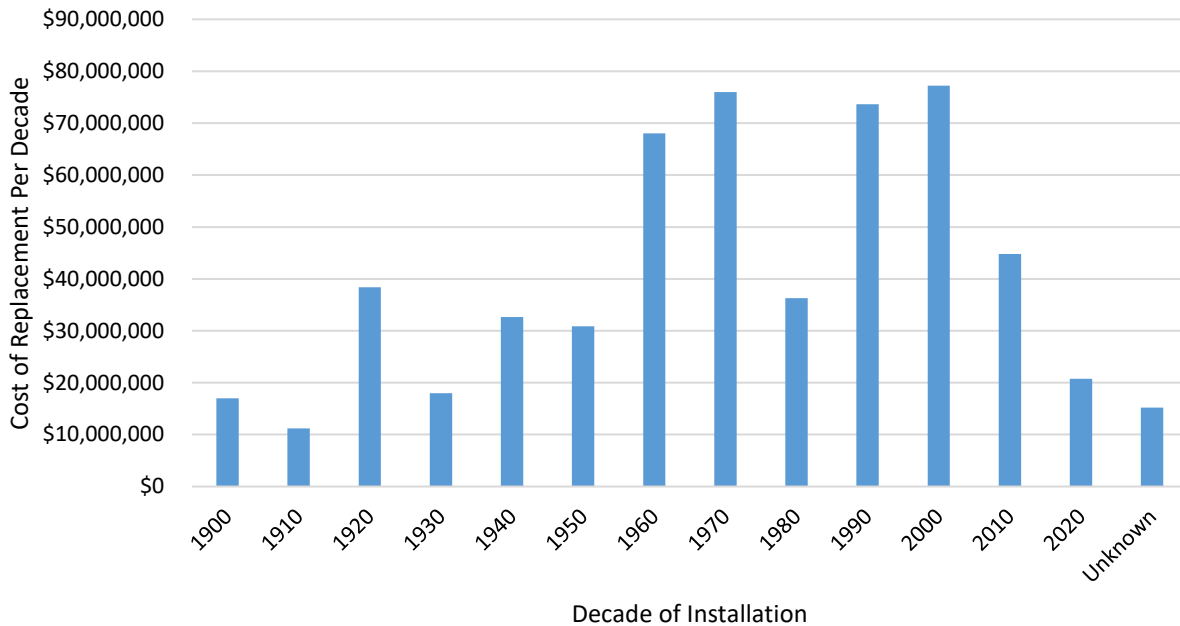


FIGURE 8-1 COST OF PIPE REPLACEMENT BASED ON DECADE OF INSTALLATION

ELIMINATE UNNECESSARY WASTEWATER

One way to increase capacity in the wastewater collection system is to identify and eliminate the unnecessary generation of wastewater. Flow in the collection system consists of inflow, infiltration, and direct sewage. The City produces about 10 MGD of inflow and another 8 MGD of infiltration. An effort should be made to reduce inflow and infiltration because during a peak event, approximately 18 MGD out of 28.9 MGD, or 62% of the wastewater collected comes from inflow and infiltration.

This is a significant amount of inflow and infiltration. Eliminating unnecessary wastewater through grouting and inflow reduction will not only increase the capacity of the system, but it will also lower the expected treatment costs.

Direct Sewage

Another example of eliminating unnecessary wastewater is to offer incentives to homeowners for replacing older water wasting fixtures and appliances with new water efficient models. Not only do efficient fixtures and appliances save drinking water, they also reduce wastewater flow. It is recommended that the City offer incentives for installing water-wise fixtures and appliances.

FINANCIAL CONSIDERATIONS

Cost for construction, materials, and labor have changed significantly in the last several years. To maintain adequate funding for the wastewater collection system, the following actions are recommended:

- Periodically review and update sanitary sewer rates
- Regularly update impact fees to fund projects to meet future needs

SUMMARY OF CAPITAL FACILITY RECOMMENDATIONS

Recommendations

- Plan for and allocate funds for the recommended projects.
- Maintain and replace aging or inadequate infrastructure. See Infrastructure and Maintenance Plan included as Appendix G.
- Periodically review sanitary sewer user rates.
- Regularly update impact fees to fund projects to meet future needs.
- Periodically perform model reviews.
- Update the master plan and capital facilities plan regularly and on an as-needed basis.
- Eliminate infiltration and inflow to reduce flows and increase capacity.
- Monitor flows in areas of concern and where projects are recommended.

REFERENCES

- Burns & McDonnell (2017). *Utility Master Plan*. Prepared for Utah State University.
<https://www.usu.edu/facilities/files/planning-design-and-construction/UtilityMasterPlan10NOV2017.pdf>
- Cache-Landmark Engineering. (2024). *North Logan City Sewer Master Plan (Draft)*. Prepared for North Logan City.
- J-U-B Engineers, Inc. (2014). *2014 Sewer Collection Master Plan Update*.
<https://cms9files.revize.com/loganut/departments/pubworks/water/Sewer%20Master%20Plan%20Report%20and%20Appendices.pdf>
- J-U-B Engineers, Inc. (2021). *2021 Sewer Master Plan*. Prepared for Nibley City.
- Logan City. (2022). *Logan City 2022 Annexation Policy Plan*.
<https://cms9files.revize.com/loganut/departments/comdev/Plans%20&%20Projects/Annexation%20Policy%20Plan%202022%206%2021%2022.pdf?t=20220627102949074&t=20220627102949074>
- River Heights Planning Commission. (2025). *General Plan for River Heights City, Utah*.
<https://riverheights.gov/wp-content/uploads/2025/09/GENERAL-PLAN-2025.pdf>
- RS Means, 2025. *RS Means Heavy Construction Cost Data*. Norwell, MA: Construction Publishers & Consultants.
- Smithfield City. (2025). *Smithfield City General Plan 2025*.
https://smithfieldutah.gov/sites/default/files/fileattachments/community_development/page/2881/30_general_plan_update_11-03-25.pdf
- Sunrise Engineering, Inc. (2023). *Hyde Park City Culinary Water Master Plan*.
https://cdn.prod.website-files.com/6616b8ec51f8108615e6c28f/66639f1bf1dbe50b3c1b8cfb_HydeParkCulinaryWaterMasterPlan_Final_DocOnly.pdf
- Utah Division of Administrative Rules. (2023). *Utah Administrative Code, R317-3*. The Department of Administrative Services.
- Utah Division of Water Rights (DWRi). *Public Water Supplier Information Database*. Hyde Park Culinary Water System, Nibley City (Culinary), North Logan City Culinary System, Providence City Corp. Water, River Heights City Water System, Smithfield City Municipal Water System (Culinary). Accessed 06/30/2026.
- Wasatch Front Regional Council. (2024). *Population Projections (TAZ)*.
<https://wfrc.maps.arcgis.com/home/item.html?id=2e97653f537b4309a04dda0a7c35cfb9>

APPENDIX A

Member Communities Service Agreements

INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT

This Agreement, made and entered into this 4th day of December, 1991, by and between the City of Logan, hereinafter "LOGAN" and Hyde Park City, hereinafter "HYDE PARK":

WITNESSETH:

WHEREAS, HYDE PARK presently has no sewage disposal system and the governing body of HYDE PARK desires to install a collection system for sewage in HYDE PARK; and

WHEREAS, LOGAN has a sewage lagoon treatment facility, presently upgraded and capable of handling and treating the sewage of HYDE PARK; and

WHEREAS, the parties of this agreement desire to enter into an agreement in writing, whereby and whereunder LOGAN will accept and treat sewage from HYDE PARK;

NOW THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated to which each party hereby binds and commits itself, it is agreed as follows:

1. Transportation to Logan. HYDE PARK will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole cost and expense and by separate agreement with Smithfield City will acquire the right to access the Smithfield Trunkline for transportation of its sewage to Logan City for treatment. The sewage will be discharged into the existing Logan City system at the point previously approved by the Logan City Engineer, where there will be sufficient capacity to handle the sewage.

2. Ownership/Maintenance/Connections. (Omitted - not applicable)

3. Meter. (Omitted - not applicable - Reference as to meter maintenance, responsibility, etc., is hereby made to the Smithfield/Logan Inter-City Sewage Treatment Service Agreement and the Smithfield City/Hyde Park Agreement dated May __, 1991)

4. Acceptance of Sewage Permits. LOGAN agrees to accept the sewage wastes from HYDE PARK so long as said sewage conforms with all requirements of State and Federal Laws and Regulations, including Pretreatment and Local Limits Standards. HYDE PARK agrees to set up sewage collection and treatment ordinances that equal or exceed EPA and State requirements, as well as LOGAN standards. HYDE PARK also agrees to the establishment of user charges associated with the treatment of industrial and/or commercial wastes and that permits for the above be administered and approved by LOGAN. HYDE PARK hereby agrees to provide all necessary data to enable LOGAN to administer said permits.

5. Payments. HYDE PARK agrees to pay LOGAN, and LOGAN agrees to accept from the same for accepting, conveying, treating and disposing of wastes, a regular fee as outlined in Resolution 89-45 of the Logan Municipal Council attached hereto as Exhibit A and incorporated herein by this reference, based on the flow through the meter at the HYDE PARK collection point(s) to the Smithfield collector line. *Need to have Base Rates*

These rates are based on \$0.175/1000 gallons of waste measured at the metering station, up to a maximum each month of 150 gallons per capita per day. Excess usage above this amount will be charged at \$0.35/1000 gallons. Any LOGAN connections above the metering station shall be deducted at the same rate. (See resolution 89-45 attached hereto and incorporated herein by this reference). LOGAN agrees to provide all necessary data to enable HYDE PARK to bill its residents.

6. Regulated Users. Regulated users must have a permit from LOGAN to enable Logan to monitor wastes or substances that cause problems with collection and/or treatment systems (SEE SEWAGE PRETREATMENT ORDINANCE). Any charges for testing, sampling, or other charges to an individual regulated user, in addition to the base rate and charges made pursuant to Exhibit "A", including surcharge fees, will be billed and collected directly by LOGAN with a copy of the billing to HYDE PARK.

7. Rate Charges. It is agreed that fees charged to HYDE PARK may be adjusted on the same basis as rates may be adjusted to LOGAN and HYDE PARK users for capital and/or operation and maintenance costs for treatment and/or appropriate main line costs, unless special circumstances exist that would make collection and treatment of HYDE PARK'S waste more expensive than LOGAN'S waste, or if the rate, charged to LOGAN'S users is subsidized by other LOGAN funds or operations, in which case rates charged HYDE PARK may be adjusted separately to reflect the different circumstances. All information relied upon to substantiate the rate change shall be made available to the HYDE PARK Officials. In the event the HYDE PARK Council adopts resolution objecting to the rate change on the basis that the underlying figures do not substantiate said rate change, the increase or amount reflected by the rate change which is not concurred in by HYDE PARK shall nevertheless be paid but may be submitted to arbitration as provided below in paragraph 15. The rates set by LOGAN shall not exceed actual anticipated costs of collecting and treating said waste. In no event will rates be established in excess of reasonable projected operating costs or established such that excess revenues are created to subsidize other LOGAN operations other than collection and/or treatment. No proposed rate increase which would have the effect of causing HYDE PARK connections to be charged a different rate than LOGAN connections shall become effective for 45 days after notice to HYDE PARK. During said 45 days all information relied upon to substantiate the rate differential shall be made available to HYDE PARK Officials. In the event the HYDE PARK Council adopts a resolution objecting to the rate increase on the basis that the figures do not substantiate said increase, the increase or amount reflected by the increase which is not concurred in by HYDE PARK,

shall nonetheless be paid, but may be submitted to arbitration as provided below in paragraph 15.

8. Capital Improvements. Capital improvement costs for repair, replacement or maintenance (other than routine maintenance) of lift stations and trunk lines from the Main Collection Point to the main 600 North trunk line in LOGAN shall be shared on the basis of the relative number of connections within each entity (LOGAN, Smithfield and HYDE PARK) that are served by said trunk line and lift station appurtenances.

Capital improvement costs for maintenance, repair or replacement of the treatment lagoons, out-fall ditch and LOGAN'S main 600 North trunk line shall be shared based on the relative number of connections from each entity which has sewage accepted by and/or treated by LOGAN at the time such capital improvement is finally agreed upon and approved for construction.

9. Severability of Agreement - Savings Clause. If any of this agreement is found to be in violation of law or unenforceable then notwithstanding any other provision of this agreement, the remaining provisions of the agreement shall remain effective and be interpreted consistent with the remaining provisions to give effect to the mutual intent of the parties to the maximum extent allowed by law.

10. Uniform User Rules. HYDE PARK and LOGAN agree that wherever practicable, uniform rules and regulations will be established, including but not limited to the discharge of harmful substances into the sewage system in excess of minimum standards prescribed; the use of food wastes disposal units for domestic and commercial food wastes entering the sanitary sewer system; to prevent storm, surface or groundwater from entering the sewer system; and to provide adequate inspection of building, sewer and street construction to prevent such items from entering the sewer system.

11. Effective Period. This agreement shall remain in effect for a period of twenty (20) years from the date hereof. It shall continue in effect for two-year periods thereafter unless terminated by any party giving the other parties two year's written notice.

12. Adoption and Compliance with Rules and Ordinances. So long as such rules or ordinances are reasonably related to State and Federal Regulations governing the treatment of sewage Hyde Park agrees to adopt rules and ordinances that equal or exceed those of LOGAN as they presently exist and as they may from time to time be amended or added upon, governing the discharge of water or materials of any kind into HYDE PARK'S collection system and to be responsible for the administration and enforcement of said rules or ordinances. Nothing herein shall, however, require HYDE PARK to require the removal by its residents from septic tanks, the use of which are discontinued when users connect to LOGAN'S sewage collection system. If HYDE PARK fails to enforce, or if any of its residents fail to enforce or comply with said rules or ordinances,

then in that event, upon 48 hours written notice by LOGAN or Smithfield requesting compliance and/or enforcement, LOGAN may cease its acceptance of HYDE PARK'S waste at the collection point until enforcement or compliance is effected. If 48 hours appears too short a period within which HYDE PARK or its residents could enforce or comply due to circumstances beyond their control, then HYDE PARK may respond in writing to LOGAN within said 48-hour period stating what a reasonable period within which enforcement or compliance effected would be, setting forth in detail the facts and circumstances justifying the same. In no event shall the breach, failure to comply or enforce remain in existence for a period in excess of ninety (90) days.

13. Damages and Expenses. All costs, damages and expenses, (including but not limited to attorney's fees and the reasonable value of equipment and employee time) incurred by a non breaching party because of a default or a breach by one party or its residents' failure to abide by this agreement or failure to comply with applicable rules and ordinances regulating discharge of materials into the sewage collection system, shall be born and paid by the defaulting party.

14. System Responsibility. Each party shall be responsible for their own collection system and trunk lines and each agrees to indemnify and hold the others harmless for loss, damage, or claims of any kind arising from their own acts or neglect.

15. Arbitration. In the event any disagreement arises in the interpretation or performance of this Agreement the parties agree to enter into binding arbitration in accordance with the rules and regulations of the American Arbitration Association and the statutes and case law of the State of Utah.

CITY OF LOGAN

by

Mayor

ATTEST:

City Recorder

HYDE PARK CITY CORPORATION

by

Mayor

ATTEST:

City Recorder

APPROVED AS TO FORM:

Hyde Park City Attorney

Logan City Attorney

agree\hydepark.inter

R E S O L U T I O N

BE IT RESOLVED BY THE LOGAN MUNICIPAL COUNCIL AS FOLLOWS:

In accordance with Sec. 13.12.040 of the Logan Municipal Code, the following rate schedule is hereby adopted for regulated industries in the sewer pretreatment classifications identified below:

1. Sewer Pretreatment Classifications:

<u>Regulated users</u>	<u>Inspection or sample frequency</u>	<u>Class</u>
Categorical users	monthly or greater	I
Categorical users	less than monthly	II
Significant users permitted for local limits	monthly or greater	II
Users required to sample for local limit that are not significant users	every 3 months or greater	III
Users required to have one or more of the following: sump grease trap clarifiers chemical trap lint filter	every 3 months or greater less than every 3rd month	III IV
Film developer (silver)	any time	V

2. Rate Schedule for the foregoing classifications is as follows:

<u>Class</u>	<u>Monthly Rate</u> (includes min. monthly sewer rate of \$8.25)
I	\$48.25
II	\$43.25
III	\$38.25

Class

IV

V

Rebate
Monthly Rate

\$33.25

\$18.25

2nd PASSED BY THE LOGAN MUNICIPAL COUNCIL, STATE OF UTAH THIS
DAY OF *Nov*, 1989.

Fred Duersch Jr.
Fred Duersch Jr., Chairman

ATTEST:

Lois Price
Lois Price, City Recorder

PRESENTATION TO MAYOR

The foregoing resolution was presented by the Logan
Municipal Council to the Mayor for his approval or disapproval
on the *2nd* day of *Nov*, 1989.

Fred Duersch Jr.
Fred Duersch Jr., Chairman

MAYOR'S APPROVAL OR DISAPPROVAL

The foregoing resolution is hereby *approved*
this *2nd* day of *Nov*, 1989.

Newel G. Daines Jr.
Newel G. Daines Jr., Mayor

Hyde Park City Corporation

P.O. Box 489
Hyde Park, Utah 84318

November 3, 1992

Mr. Rod Blossom
Public Works Director
Logan City
255 North Main
Logan, Utah 84321

Dear Rod,

Enclosed is a copy of our agreement with Logan City. You may note it has been signed by all affected parties already. I am sorry you don't have a copy of this, but this was a requirement prior to our receiving permission to start on our project.

At this time we are anticipating starting to hook our residents up somewhere around the middle of November. We've been working with Jim Gass on the Smithfield connection. I hope this might answer any questions you have concerning our intentions.

If we need to coordinate our hook-up fees and times with any of your personnel at Logan City, please advise us what you would like us to do.

Sincerely,



Robert J. Balls
Mayor

RJB/jh
enclosure

CITY OF LOGAN

255 NORTH MAIN STREET

LOGAN, UTAH 84321

(801) 750-9800

MEMO TO: Scott Barrett
Mayor Fjeldsted

FROM: Rod Blossom

DATE: November 9, 1992

I have just received a copy of a sewer agreement between the cities of Logan and Hyde Park.

There is a major problem on page 2 under #5 Payments. Hyde Park's attorneys have substituted "a regular fee as outlined in Resolution 89-45...." for the regular base fees contained in our other sewer agreements and is not consistent with prior correspondence with Hyde Park.

I believe that the Hyde Park attorneys assumed that Resolution 89-45 covered the same types of fees, but it actually refers only to "regulated industries" for pretreatment. Therefore, no base rates for residential and commercial and industrial connections are listed.

I will speak to both Joe Chambers and Bob Balls to see if this can be corrected. If not, then I assume, you will have to resolve it.

INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT

THIS AGREEMENT, made and entered into this 3 day of Feb, 2000, by and between the CITY OF LOGAN, hereinafter "LOGAN", and the CITY OF NIBLEY, hereinafter "NIBLEY":

WITNESSETH:

WHEREAS, NIBLEY presently has no sewage disposal system, and the governing body of NIBLEY desires to install a collection system for sewage in NIBLEY; and,

WHEREAS, LOGAN has a sewage lagoon treatment facility, presently upgraded and capable of handling and treating the sewage of NIBLEY; and

WHEREAS, the parties to this Agreement desire to enter into an agreement in writing, whereby and whereunder LOGAN will accept and treat sewage from NIBLEY.

NOW THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated to which each party hereby binds and commits itself, it is agreed as follows:

1. Because of the uncertainty associated with the feasibility of incorporating the area known as Young and College Wards in Cache County, Utah, as filed with the Cache County Clerk in November, 1999, the terms and conditions of this agreement are conditional on the following actions taking place.
 - A. If the community of College and Young Ward is determined to be appropriate and legal to incorporate and is recognized by the State of Utah as an incorporated City or Town, then all capital costs for installation and construction of sewage lines, lift stations, and other appurtenances associated with delivery of sewage to the existing sewage collection system main trunk at 600 North street of LOGAN will be borne by NIBLEY. In addition, any other costs associated with this agreement shall be borne by NIBLEY, except for the costs of day to day maintenance and operation of the LOGAN sewage treatment system.
 - B. If the community of College and Young Ward is determined to NOT be appropriate and legal to incorporate as required and determined by the State of Utah, then NIBLEY agrees to not annex into its City boundaries any area of Cache County identified and proposed for future annexation into the City of Logan and as shown on the City of Logan Master Annex Policy Declaration Map, adopted by the Logan City Municipal Council December 4, 1996 and amended on November 16, 1999 (Copy Attached as Exhibit B). The property now owned by the mayor of NIBLEY, and constituting the extreme southeast corner of the land area defined in the Logan Master Policy Declaration Map is exempted. If NIBLEY should annex any portion of those lands identified as being within the Master Annexation Policy Declaration of Logan City, as amended herein, the full costs of all improvements to the sewage collection and pumping systems as identified elsewhere in this document will be borne by NIBLEY and the appropriate costs of improvements borne by LOGAN will be reimbursed to LOGAN within 60 days. LOGAN reserves the right to

terminate this agreement if NIBLEY annexes within the proposed boundaries as defined in the City of Logan Master Annex Policy Declaration Map, as amended herein.

- C. NIBLEY will grant appropriate enforcement authority to LOGAN, to act as the agent and representative of NIBLEY, to enforce pre-treatment requirements prior to operation of the NIBLEY sewer collection system. This includes the ability and legal authority to impose fines, penalties, and other actions as necessary to assure the integrity and safe operation of the sewage treatment system.
2. Transportation to LOGAN Trunk Line. NIBLEY will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole cost and expense, and a trunk line extending from the collection system to a point agreed upon by both parties (as shown on Exhibit "A" attached hereto) where a measuring device will be installed. (This point is hereinafter referred to as the Main Collection Point.) NIBLEY will further install at its own expense such gravity sewer lines, pump station and pressure sewer lines as shown and agreed upon by both parties. (Size and capacity of lines and pumps to be approved by the Logan City Engineer.) The sewage will be discharged (whether gravity or pressure) into the existing Logan City system at a point approved by the Logan City Engineer, where there will be sufficient capacity to handle the sewage. (See Exhibit "A").
 3. South Regional Lift Station. This sewage lift station will be jointly constructed by NIBLEY and LOGAN and used to pump the sewage collected. The cost ratio estimate is 12.62% for LOGAN and 87.38% for NIBLEY. Discharge from the lift station will be into a pressurized sewer line along Highway 89-91 to 1000 West Street and North to 600 South Street in Logan. The pressurized sewage discharge line will be financed jointly upon the basis of estimated costs and percentage of involvement as proposed by J.U.B. Engineering (per September 10, 1999 letter at attachment 1), and subject to the conditions in paragraph 1 of this agreement. LOGAN will also participate in a portion of the cost of a sewer line that will run along 2200 South from about 800 West to the lift station based on estimated usage, i.e., 49.9% for LOGAN and 50.1% for NIBLEY, subject to the conditions in paragraph 1 of this agreement. Ownership, maintenance, replacement and repair costs shall be shared by both parties for both the lift station and 2200 South sewer line based on the same percentage prorations, until new or different percentage prorations are determined by the parties to be appropriate.
 4. Ownership/Maintenance. It is agreed that all lines above or on the NIBLEY side of the main collection point (the metering station) shall be owned and maintained by NIBLEY. The ownership of pumps and metering station equipment at the main collection point shall be jointly owned by LOGAN and NIBLEY based on the percentages of paragraph 2. Maintenance shall be performed by LOGAN with costs shared on a pro rata basis. All lines (gravity and pressure), below or on the LOGAN side of said Main Collection Point (the metering station) shall be turned

over to and maintained by LOGAN after the Logan City Public Works Director's acceptance of the same. LOGAN reserves the right to connect to main lines above the Main Collection Point so long as there is adequate line capacity, the sewage in-flow is metered and there is mutual agreement as to any cost sharing that may be involved.

5. Meter. The measuring devices installed at any collection points, including the Main Collection Point, shall be installed by NIBLEY and owned on a prorated basis by NIBLEY and LOGAN, as stated above. However, NIBLEY agrees to pay or reimburse LOGAN for all reasonable costs to operate, maintain, repair and/or replace said devices, and shall have the right to verify the meter readings and the devices at any time.
6. Acceptance of Permits and Sewage Waste. LOGAN agrees to accept the sewage waste from NIBLEY so long as said sewage conforms with all requirements of State and Federal Laws and Regulations, including pre-treatment and Local Limits Standards. NIBLEY agrees to set up sewage collection and treatment ordinances that equal or exceed EPA and State requirements, as well as LOGAN standards. NIBLEY also agrees to the establishment of user charges associated with the treatment of industrial and/or commercial wastes and that permits for the above be administered and approved by LOGAN. NIBLEY hereby agrees to provide all necessary data to enable LOGAN to administer said permits. As a condition of connecting to the domestic sewer system, NIBLEY will require industrial and commercial users to allow random, unannounced on-site inspections of pre-treatment facilities. NIBLEY also grants to LOGAN authority to perform unannounced on-site, random inspections for pre-treatment purposes, as necessary, and to charge the sewage client for the same, and to allow LOGAN to charge pre-treatment clients with the costs of administering the program, at the same rate charged to LOGAN clients. NIBLEY agrees to inform Logan City Public Works Department once every month for any new industries, businesses and any other commercial entities that could discharge materials that are subject to pre-treatment standards. NIBLEY will also require these businesses to obtain pre-treatment permits from Logan City Permits and Compliance Division before NIBLEY will issue building permits and licenses to do business in NIBLEY.
7. Payments. NIBLEY agrees to pay LOGAN, and LOGAN agrees to receive from NIBLEY, for accepting, conveying, treating and disposing of sewage wastes, a regular fee schedule as established in agreements with other cities in their Inter-City Sewage Treatment Agreement, an example of which is attached hereto as attachment 2. The provisions of this paragraph will be amended when new resolutions or ordinances are passed by the LOGAN City Council affecting the sewage rate schedule. LOGAN ordinances pertaining to the sewer system will have precedence and legal binding authority on all parties to this agreement.

8. Regulated Users. Regulated users must obtain a permit from LOGAN to enable LOGAN to monitor wastes or substances that cause problems with collection and/or treatment systems (See Logan Municipal Council Resolution 99-95, in accordance with Section 13.12.040 of Logan Municipal Code and subsequent revisions.) Any charges for testing, sampling or other charges to an individual regulated user, in addition to the base rate and charges made pursuant to attachment 2, including surcharge fees, will be billed and collected directly by LOGAN, with a copy of the billing to NIBLEY.
9. Rate Changes. It is agreed that fees charged to NIBLEY will be adjusted to the same basis as rates may be adjusted to LOGAN users for capital and/or operation and maintenance costs for treatment, treatment facilities, and/or appropriate main line costs, unless special circumstances exist that would make collection and treatment of NIBLEY'S waste more expensive than LOGAN'S waste, or if the rate charged to LOGAN'S users is subsidized by other LOGAN funds or operations, in which case rates charged NIBLEY may be adjusted separately to reflect the different circumstances. All information relied upon to substantiate the rate change shall be made available to NIBLEY officials. The rates set by Logan shall not exceed actual costs of collecting, treating, maintaining and restoring capital facilities, operating costs, environmental costs, and depreciation of capitalized equipment and facilities to treat said waste. In no event will rates be established in excess of reasonable projected operating costs or established such that excess revenues are created to subsidize other LOGAN operations other than collection and/or treatment, direct environmental compliance costs, and maintenance of treatment facilities. Any proposed rate increase which would have the effect of causing NIBLEY connections to be charged a different rate than LOGAN connections shall become effective 30 days after notice to NIBLEY. During said 30 days, all information relied upon to substantiate the rate change shall be made available to NIBLEY officials upon request.
10. Capital Improvements.
 - A. Capital improvement costs for repair, replacement or maintenance (other than routine maintenance) of lift stations and trunk lines from the Main Collection Point to the main 600 North trunk line in LOGAN shall be shared on the basis of the relative number of connections within each entity that are proposed to be served by said trunk line and lift station appurtenances (see attachment 1 and paragraph 3 above).
 - B. Capital improvement costs for maintenance, repair or replacement of the treatment lagoons, sewage treatment equipment, sewage treatment facilities, out-fall ditch and LOGAN'S main 600 North trunk lines or other applicable main lines shall be shared based on the relative number of connections from each entity which has sewage accepted by and/or treated by LOGAN.
11. Severability of Agreement – Savings Clause. If any provision of this Agreement is found to be in violation of law or unenforceable, then notwithstanding any other

provision of this Agreement, the remaining provisions of the Agreement shall remain effective and be interpreted consistent with the remaining provisions to give effect to the mutual intent of the parties to the maximum extent allowed by law.

12. Uniform User Rules. NIBLEY and LOGAN agree that wherever practicable, uniform rules and regulations will be established to regulate, including but not limited to, the discharge of harmful substances into the sewage system in excess of minimum standards prescribed; the use of food waste disposal units for domestic and commercial food wastes entering the sanitary sewer system; the prevention of storm, surface or groundwater from entering the sewer system; and the provision of adequate inspection of building, sewer and street construction to prevent such items from entering the sewer system. Enforcement of these provisions will be the responsibility of the City owning the collection system.
13. Effective Period. This Agreement shall remain in effect for a period of twenty (20) years from the date hereof. It shall continue in effect for two-year periods thereafter unless terminated by either party by giving the other party two years written notice. In the event of a material breach of this agreement by either party, this agreement can be terminated with a two year notice. A material breach is defined as intentional or willful neglect of any of the provisions of this agreement. In the event of a major change in projected growth rates and subsequent sewage flows, both cities mutually pledge to renegotiate the terms of this agreement.
14. Adoption and Compliance with Rules and Ordinances. So long as such rules or ordinances are in compliance with Logan City standards, regional, State and Federal Regulations governing the treatment of sewage, NIBLEY agrees to adopt rules and ordinances that equal or exceed those of LOGAN as they presently exist and as they may be amended or added upon, governing the discharge of water or materials of any kind into NIBLEY'S collection system and to be responsible for the administration and enforcement of said rules or ordinances. Nothing herein shall, however, require NIBLEY to require the removal by its residents of septic tanks, the use of which are discontinued when users are connected to the city sewage collection and treatment system or within 24 months of the installation of the sewer system. If NIBLEY fails to enforce, or if any of its sewage clients fail to enforce or comply with said rules or ordinances, then upon 48 hours written notice by LOGAN or NIBLEY requesting compliance and/or enforcement, LOGAN may cease to accept NIBLEY'S waste at the collection point until enforcement or compliance is effected.
15. Damages and Expenses. All costs, damages and expenses (including but not limited to attorney's fees and the reasonable value of equipment and employee time) incurred by a non-breaching party because of a default or a breach by one party of this Agreement or its residents' failure to abide by this Agreement or failure to comply with applicable rules and ordinances regulating discharge of

materials into the sewage collection system, shall be born and paid by the defaulting party.

16. System Responsibility. Each party shall be responsible for their own collection system and trunk lines, and each agrees to indemnify and hold the others harmless for loss, damage or claims of any kind arising from their own acts or neglect relating to the installation or use of these collection system and trunk lines.
17. Environmental Liability. NIBLEY agrees to share, on a pro-rated basis based on population served with all other users of the sewage treatment system, in all existing or future environmental liabilities associated with sewage treatment related facilities due to changes in law, statute or federal or state policy or due to treatment capacity restrictions or limitations. LOGAN will provide a letter to NIBLEY defining the baseline conditions of the sewage treatment system at the time of connection to establish subsequent environmental liability participation.
18. Capital Funds Accrual. To adequately provide capital funds for future expansion of sewage treatment facilities due to inadequate capacity, and to preclude all capital costs being borne by LOGAN citizens alone through bond financing measures, NIBLEY agrees that a fixed percentage of all revenues from the sewage treatment charges shall be maintained in a reserve account for capital project expansion, improvement, replacement or restoration of sewage treatment facilities, equipment and shared facilities. All participating cities with agreements to jointly use the LOGAN sewage treatment facilities will be equally charged per type of customer to support this capital improvement fund. LOGAN will determine the percentage amount to be applied to the Capital Funds Accrual account and will notify all participating cities with agreements of this amount on an annual basis.
19. Authorization. The undersigned representative of each City confirms his or her authority to execute this agreement and represents that his or her governing body has authorized this agreement by resolution.

ATTEST:

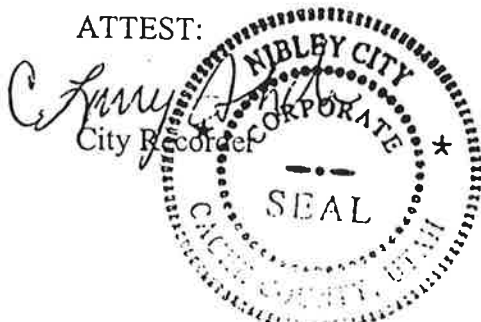
Laistree
City Recorder

CITY OF LOGAN

By

Douglas Thompson
Douglas Thompson, Mayor

ATTEST:



NIBLEY CITY CORPORATION

By

H. Jay Nelson
H. Jay Nelson, Mayor

APPROVED AS TO FORM:

Logan City Attorney

Nibley City Attorney

ADDENDUM #1
INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT

THIS ADDENDUM, made and entered into this 1st day of August, 2001, shall amend the original "INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT" between the City of Logan and Nibley City dated 3 February, 2000.

WHEREAS, the Utah Division of Water Quality is issuing bonds to Nibley city to finance Nibley's waste water collection system for a term of thirty (30) years and the above referenced agreement between the City of Logan and Nibley city is for a term of 20 years, the Division of Water Quality feels that the terms should coincide.

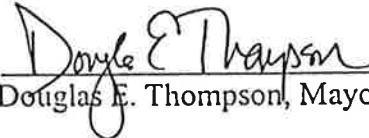
NOW THEREFORE, each City hereby agrees to the following amendment to section 13 changing the length of the effective period from twenty (20) years to thirty (30) years:

Section 13. Effective Period. This Agreement shall remain in effect for a period of thirty (30) years from the date hereof. It shall continue in effect for two-year periods thereafter unless terminated by either party by giving the other party two year written notice. In the event of a material breach of this agreement by either party, this agreement can be terminated with a two year notice. A material breach is defined as intentional or willful neglect of any of the provisions of this agreement. In the even of a major change in projected growth rates and subsequent sewage flows, both cities mutually pledge to renegotiate the terms of this agreement.

ATTEST:

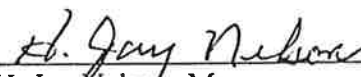

City Recorder

CITY OF LOGAN

By 
Douglas E. Thompson, Mayor



CITY OF NIBLEY

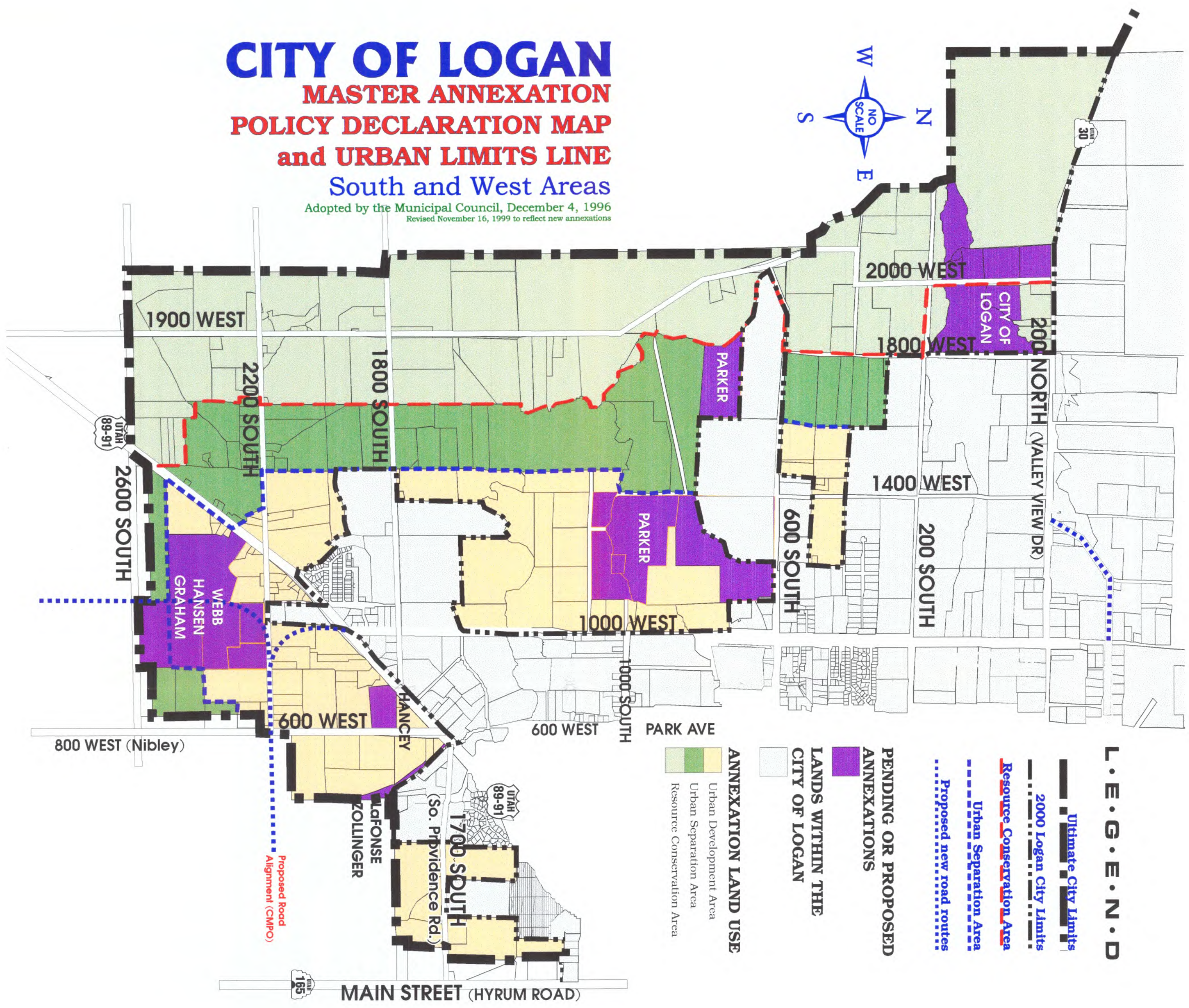
By 
H. Jay Nelson, Mayor

CITY OF LOGAN

MASTER ANNEXATION POLICY DECLARATION MAP and URBAN LIMITS LINE

South and West Areas

Adopted by the Municipal Council, December 4, 1996
Revised November 16, 1999 to reflect new annexations



L.E.G.E.N.D

- Ultimate City Limits
- 2000 Logan City Limits
- Resource Conservation Area
- Urban Separation Area
- Proposed new road routes

PENDING OR PROPOSED ANNEXATIONS

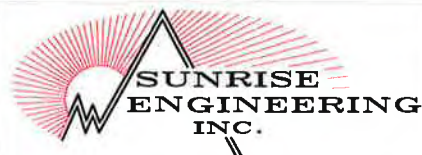
LANDS WITHIN THE
CITY OF LOGAN

ANNEXATION LAND USE

- Urban Development Area
- Urban Separation Area
- Resource Conservation Area



SUNRISE ENGINEERING, INC.
CONSULTING ENGINEERS & LAND SURVEYORS
12227 So. Business Park Dr., Suite 220 Draper, Ut. 84020



INTER-CITY SEWAGE TREATMENT
SERVICE AGREEMENT
EXHIBIT A

(AN INTER-CITY AGREEMENT FOR SEWAGE TREATMENT SERVICES)

AGREEMENT

THIS AGREEMENT, made and entered in the 30th day of August, 19 79, by and between the CITY OF LOGAN, a Utah Municipal Corporation, hereinafter referred to as Logan, and NORTH LOGAN CITY CORPORATION, a Utah Municipal Corporation, hereinafter referred to as North Logan.

W I T N E S S E T H:

THAT WHEREAS, North Logan has no sewage disposal system and the governing body of said City desires to install a collection system for sewage in North Logan; and

WHEREAS, Logan has a sewage lagoon and treatment facility presently of sufficient capacity to receive and treat the sewage of the inhabitants of North Logan;

WHEREAS, the parties to this Agreement desire to enter into an agreement in writing whereby Logan will accept and treat the sewage of the inhabitants of North Logan;

NOW, THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated, to which each party hereby binds and commits itself, it is agreed as follows:

1. TRUNK LINE

That North Logan will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole expense and a trunk line extending from its sewage collection system to a point at the intersection of 10th West and 14th North. A measuring device will be installed at the intersection of this trunk line and the existing North Logan West boundary line. This point shall be referred to hereinafter as the "Main Collection Point".

Following the completion and final inspection by North Logan City and/or their representatives of the above referenced trunk line, it shall become the property of Logan City and all future connection fees to said line, if accessed, shall also be the sole property of Logan City.

2. COST SHARING-TRUNK LINE

If during the time this Agreement or any extension thereof of amended version thereof is in effect, the twenty-four inch (24") trunk line along 10th West from 6th North to 14th North becomes inadequate to handle the sewage flowing through it, then the parties agree that Logan will participate in the cost of increasing the capacity of said trunk line by paying for seventy percent (70%) of the cost thereof and North Logan will participate by paying thirty percent (30%) of the cost thereof.

3. COST SHARING-TREATMENT FACILITY

The parties shall also share in the cost of capital improvements to the treatment facilities including but not limited to the lagoon system such as adding a chlorination system or increasing the capacity of the lagoons, or otherwise. The formula for sharing the cost for such improvements shall be based upon the relative number of total hookups to the system which North Logan has as compared to the number of total hookups to the system which Logan has. North Logan shall keep accurate records of all of said hookups and make the same available to Logan upon request.

The cost sharing formula for all construction costs relating to the removal of Suspended Solids (i.e. Sand Filtration) shall be determined using E.P.A. guidelines at the time of the required project construction.

4. NEW CONNECTION POINTS

It is further agreed that at such later times and locations as are mutually agreeable between Logan and North Logan, Logan may, in its sole discretion, allow North Logan, at its sole expense, to install additional "collection points" and install the lines from North Logan running thereto. At these collection points, North Logan agrees to install at its sole cost and expense, to specifications acceptable to the Logan City Engineer, collection boxes and measuring

devices with attached recorders or total meters to measure the volume of waste discharged through said trunk lines into Logan trunk lines. However, in no event shall North Logan install such "additional collection points" and thereby utilized Logan's collection system until after North Logan has installed its own collection system and placed it into actual operation.

5. MEASURING DEVICES

The measuring devices installed at the collection points shall be under the control of and shall be maintained by Logan. North Logan agrees to pay the reasonable cost and expense of maintaining such devices and shall have the right to verify the meter readings and otherwise inspect said devices at any time.

6. LOGAN CONNECTIONS

In the event Logan deems it advantageous to connect to any of North Logan's trunk lines mentioned above, it may do so only with the written approval of North Logan, and the actual cost of connecting shall be Logan's sole responsibility. If any line within North Logan's collection system becomes filled to capacity by the additional flows from Logan, then both cities shall share in the cost of installing larger lines where necessary. The ratio of participation shall be based on the number of connections each city has contributing to the flow of sewage causing the pipe overload.

7. TERMINATION-REIMBURSEMENT

In the event North Logan participates in adding capital improvements to the treatment facilities only as indicated above, and then for some reason this Agreement is terminated and North Logan no longer uses Logan's lagoon system, then Logan agrees to reimburse North Logan for its share of said added capital improvements cost less depreciation based upon the average estimated life of said improvements and the number of years said improvements have been in existence at the date North Logan discontinues its use of Logan's lagoon

system. The average estimated life for purposed of this paragraph shall be twenty years.

8. SERVICE AREA RESTRICTIONS

Logan agrees to accept the waste passed through said measuring devices at the collection points and from said points to be solely responsible for conveying said waste to Logan's sewage treatment facility and for the treatment and disposal of said waste. However, Logan reserves the right to accept or not to accept sewage from any residence, or business, or from any other source if the residence, business or other source originates from an area outside of the city limits of North Logan. North Logan shall not allow any such hookups to its collection system without Logan's express written consent.

9. TREATMENT FEES

Except as otherwise herein stated, North Logan agrees to pay Logan, and Logan agrees to accept from North Logan, as consideration for Logan accepting, conveying, treating and disposing of residential waste a regular fee equal to eleven cents (11¢) for each one thousand (1,000) gallons of waste measured at the collection points up to a maximum each month equivalent to one hundred fifty (150) gallons per capita per day based on the average population of North Logan during the month for which regular fee is paid. The number of gallons of culinary water measured under paragraph 11 to determine commercial or industrial waste shall be deducted from the gross gallonage measured at the collection points. Said fee shall be paid monthly on or before the 10th day of each month for the prior month, commencing with the month following the first month that sewage is delivered to the collection point by North Logan. In no event shall the

regular residential waste fee charged by Logan be less than One Dollar Fifty Cents (\$1.50) for each single family dwelling, apartment or living unit. The number of presently existing single family dwellings, apartments and dwelling units is 532. It is agreed that North Logan's present population is 2,070. Population numbers, dwellings, and apartment or living unit numbers may be adjusted as deemed necessary, but not more often than every six (6) months. The expenses incurred in counting and adjusting said numbers shall be paid by North Logan.

10. EXCESS USAGE FEES

North Logan agrees to pay a residential excess-usage fee at twenty-two (22¢) for each one thousand (1,000) gallons of waste received each month by Logan in excess of the monthly equivalent of one hundred fifty (150) gallons per capita per day on the population basis determined above. Such fee will be computed and will be payable on the same monthly basis as the regular fee.

11. COMMERCIAL USAGE FEES

In addition to the payment made to Logan under the foregoing paragraphs 9 and 10, North Logan shall pay additional charges for commercial and industrial users as follows: Commercial and industrial users including public elementary and high schools, public entities, churches, boarding houses, fraternity and sorority houses shall pay a monthly minimum charge of Three Dollars (\$3.00) per month based on the first twenty thousand (20,000) gallons of metered water used per month, then Eleven Cents (11¢) per thousand (1,000) gallons based on all water used in excess of twenty thousand (20,000) gallons per month. Logan shall have the right at any time to review North Logan's records and check the accuracy of the

of the amounts paid under this schedule. In the event a commercial user has a very high water consumption rate, with a low sewer usage (i.e. greenhouses), said commercial user may install, at his own expense, a sewage measuring device for recording accurate sewage flows. This device must meet the appropriate specifications of the Logan City Engineer. Maintenance of said sewage recording device shall be the responsibility of the said commercial user. North Logan shall not charge a commercial overage fee less than that charged by Logan.

12. WASTEWATER QUALITY

For the purpose of controlling the degree of quality of wastewater coming from pollution sources within North Logan, it is agreed that North Logan will comply with the Environmental Protection Agency (E.P.A.) requirements for pretreatment standards for existing and new sources of pollution, industrial cost recovery systems, and the establishment of user charges associated with the treatment of the industrial waste. North Logan hereby agrees to provide the necessary cost data to enable Logan to calculate those costs associated with the treatment of the industrial wastes over and above the quantity cost mentioned elsewhere in this Agreement. North Logan agrees that if E.P.A. or any other state or federal agency required that sewage treatment costs should be calculated by some formula other than as herein set forth, then North Logan agrees that Logan may amend its fee structure to meet said requirements if Logan deems it necessary.

If any of the rates charged by Logan to North Logan hereunder are found to be in violation of law or unenforceable then this Agreement shall become immediately terminable by either party giving the other party a one (1) year written notice of its intent to so terminate.

13. UNIFORM RULES

North Logan and Logan agree that wherever practicable, uniform rules and regulations will be established, including but not limited to the discharge of harmful substances into the sewage system in excess of minimum standards prescribed, to prohibit storm, surface or groundwater from entering the sewer system; and to provide adequate inspection of building, sewer, and street construction to prevent such from entering the sewer system. Logan's restrictions for the use of food wastes entering the sanitary sewer system shall be adopted by North Logan.

14. FEE ADJUSTMENT

Except as mentioned above, it is further agreed that the fees chargeable to North Logan by Logan may be adjusted only by reason of an upward adjustment of charges to Logan users for the treatment of sewage after the date of this Agreement. Such adjustment in fees is limited to the same proportional increase in rates charged to Logan users, unless special circumstances exist which would make collection and treatment of North Logan users more expensive than Logan users, or unless the rate charged to Logan users is subsidized by other Logan City funds or operations. In either event the rate change for North Logan users may be greater than the adjustment in rates to Logan users, if any, based upon the justified difference in cost for treatment or the amount or extent of the subsidy. Logan's current rates are attached hereto and marked exhibit "A". *Logan's* *current rates* *are attached hereto and marked exhibit "A".*

15. TERM

A. This Agreement shall remain in effect for a period of twenty (20) years from the date hereof. It shall continue in effect for two (2) year periods thereafter unless terminated by either party by giving the other party three (3) year's written notice.

B. If any part of this Agreement is found to be unenforceable or if North Logan breaches any part of the same and fails to remedy the same within a reasonable time (if the breach is of a nature that can be remedied), then Logan shall

have the option to terminate this Agreement by giving North Logan no less than one (1) year's notice of its intent to so terminate.

16. ADOPTION AND ENFORCEMENT OF ORDINANCES

North Logan agrees to adopt rules and ordinances identical to those of Logan as they presently exist and as they may from time to time be amended or added upon, governing the discharge of water or materials of any kind into North Logan's collection system and to administer and enforce said rules or ordinances. Nothing herein shall, however, require North Logan to require the removal by its residents of septic tanks, the use of which are discontinued when users connect to North Logan sewage collection system. If North Logan fails to enforce, or if any of its residents fail to enforce or comply with said rules or ordinances, and in the event, upon forty-eight (48) hours written notice by Logan requesting compliance and/or enforcement, Logan may cease its acceptance of North Logan's waste at the collection point until enforcement of compliance is effected. If forty-eight (48) hours appears too short a period within which North Logan or its residents could enforce or comply due to circumstances beyond their control, then North Logan may respond in writing to Logan with said forty-eight (48) hours period stating what a reasonable period within which enforcement or compliance effected would be, setting forth in detail the facts and circumstances justifying the same. In no event shall the breach, failure to comply or enforce remain in existence for a period in excess of ninety (90) days.

17. DAMAGES

All costs, damages, and expenses, including but not limited to administration costs, attorney's fees and the reasonable value of Logan City equipment and employee time incurred by Logan because of North Logan's or its residents' failure to abide by this Agreement or failure to comply with applicable rules and ordinances regulating discharge of materials into the sewage collection system, shall be born and paid

by North Logan.

18. SURPLUS REVENUES

Both North Logan and Logan shall utilize any surplus revenues from their 1979-80 budgets to meet any financial obligations they may have under this Agreement if their present budgets are inadequate to meet said needs. For the fiscal years following, each party will adopt appropriate budgets or utilize appropriate bonding methods to finance the costs of services rendered or improvements contemplated by this Agreement.

19. LIABILITIES

Each party shall be responsible for their own collection system and trunk lines and each agrees to indemnify and hold the other harmless for loss, damage, demands or claims of any kind arising from their own acts or neglect.

IN WITNESS WHEREOF, these presents are executed the day and year first above written.

CITY OF LOGAN

By Walter N. Nickel
WALTER N. NICKEL, MAYOR

ATTEST:

Venal Jones
VENAL JONES, CITY RECORDER

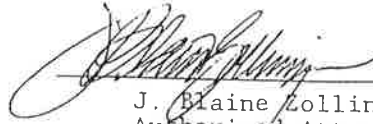
NORTH LOGAN CITY CORPORATION

By Carl G. Johnson
CARL G. JOHNSON, MAYOR

ATTEST:

Vance Waite
VANCE WAITE, CITY RECORDER

THIS AGREEMENT as executed is hereby approved as being
in proper form and compatible with the laws of the State
of Utah.

A handwritten signature in cursive script, appearing to read "J. Blaine Zollinger", is written over a horizontal line.

J. Blaine Zollinger
Authorized Attorney for
the City of Logan

INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT

This Agreement, made and entered into this 20th day of September, 19 88, by and between the City of Logan, hereinafter called "First Party," and Providence City, Utah, hereinafter called "Second Party":

WITNESSETH:

WHEREAS, Second Party presently has no sewage disposal system and the governing body of Second Party desires to install a collection system for sewage in Providence City; and

WHEREAS, First Party has a sewage lagoon treatment facility, presently being upgraded to be capable of handling and treating the sewage of Second Party; and

WHEREAS, the parties to this agreement desire to enter into an agreement in writing, whereby and whereunder Logan will accept and treat sewage from Second Party;

NOW THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated, to which each party hereby binds and commits itself, it is agreed as followed:

1. Trunkline. Second Party will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole cost and expense and a trunk line extending from the collection system to a point agreed upon by both parties (as shown on Exhibit A attached hereto) where a measuring device will be installed. (This point is hereinafter referred to as the Main Collection Point.) Second Party will further install at its own expense such gravity sewer lines, pump station and pressure sewer lines as shown and agreed upon by both parties. (Size and capacity of lines and pumps to be approved by the Logan City Engineer). The sewage will be discharged (whether gravity or pressure) into the existing Logan City system at a point approved by the Logan City Engineer, where there will be sufficient capacity to handle the sewage. (See Exhibit A.)

2. Ownership/Maintenance. It is agreed that all lines above the main collection point (meter) shall be owned and maintained by Second Party. The ownership of all lines (gravity and pressure), pumps and metering station below said metering station shall be turned over to and maintained by Logan City after the Logan City Engineer's acceptance of same. Logan City reserves the right to connect to main lines above the main collection point at no charge.

3. Meter. The measuring devices installed at the collection points shall be owned and maintained by Logan, as stated above. Second Party agrees to pay all reasonable costs to operate, maintain, repair and/or replace said devices, and shall have the right to verify the meter readings and the devices at any time.

4. Acceptance of Sewage Permits. First Party agrees to accept all sewage wastes from Second Party so long as said sewage meets all requirements of Logan's ordinances, including Pretreatment and Local Limits Standards. Second Party agrees to set up sewage collection and treatment ordinances that comply with EPA and State requirements, as well as Logan City standards. Second Party also agrees to the establishment of user charges associated with the treatment of industrial and/or commercial wastes and that permits for the above be administered and approved by the City of Logan. Second Party hereby agrees to provide all necessary data to enable Logan to administer said permits.

5. Payments. Second Party agrees to pay First Party, and First Party agrees to accept from the same for accepting, conveying, treating and disposing of wastes, a regular fee of:

\$4.00/connection + \$0.175/1,000 gal./mo. for residential wastes
\$8.00 + 0.175/1,000 gal. for commercial and
industrial use (including schools, churches, boarding
houses, etc.);
and \$18.00 + 0.175/1,000 gal. for all regulated users

These rates are based on \$0.175/1,000 gallons of waste measured at the metering station, up to a maximum average each month of 150 gallons per capita per day. Excess usage above this amount will be charged at \$0.35/1,000 gallons. Any Logan City connections above the metering station shall be deducted at the same rate.

6. Regulated users must have a permit from the City of Logan to enable Logan to monitor wastes or substances that cause problems with collection and/or treatment systems (SEE SEWAGE PRETREATMENT ORDINANCE). Any charges for testing, sampling, or other charges to an individual regulated user, in addition to the \$18.00 + \$0.175/1,000 gal. including surcharge fees, will be billed and collected directly by Logan.

7. Rate Charges. It is agreed that fees charged to Second Party may be adjusted on the same basis as rates may be adjusted to Logan City users for capital and/or operation and maintenance costs for treatment and/or appropriate main line costs, unless special circumstances exist that would make collection and treatment of Second Party's wastes more expensive than Logan's waste, or if the rate, charged to Logan's users is subsidized by other Logan City funds or operations.

8. Capital Improvements. Capital improvement costs for repair, replacement or maintenance (other than routine maintenance) of lift stations and trunk lines from the Main Collection Point to the main 600 North trunk line shall be shared on the basis of the relative number of connections within each entity that are served by said trunk line and lift station appurtenances. All connections above the main collection shall participate on a per connection basis for main line costs above the main collection point.

Capital improvement costs for maintenance, repair or replacement of the treatment lagoons, outfall ditch and main 600 North trunk line shall be shared based on the relative number of connections from each entity.

These costs can be budgeted for and paid by Second Party or charged as mutually agreed upon by both parties.

9. If any part of this agreement is found to be in violation of law or unenforceable then this agreement shall become terminable by either party giving the other party a one (1) year written notice of its intent to so terminate.

10. Second Party and First Party agree that wherever practicable, uniform rules and regulations will be established, including but not limited to the discharge of harmful substances into the sewage system in excess of minimum standards prescribed; the use of food waste disposal units for domestic and commercial food wastes entering the sanitary sewer system; to prevent storm, surface or groundwater from entering the sewer system; and to provide adequate inspection of building, sewer and street construction to prevent such from entering the sewer system.

11. This Agreement shall remain in effect for a period of 20 years from the date hereof. It shall continue in effect for two-year periods thereafter unless terminated by either party by giving the other party two year's written notice.

12. Second Party agrees to adopt rules and ordinances identical to those of Logan as they presently exist and as they may from time to time be amended or added upon, governing the discharge of water or materials of any kind into Second Party's collection system and to be responsible for the administration and enforcement of said rules or ordinances. Nothing herein shall, however, require Second Party to require the removal by its residents of septic tanks, the use of which are discontinued when users connect to First Party's sewage collection system. If Second Party fails to enforce, or if any of its residents fail to enforce or comply with said rules or ordinances, then in that event, upon 48 hours written notice by Logan requesting compliance and/or enforcement, Logan may cease its acceptance of Second Party's waste at the collection point until enforcement or compliance is effected. If 48 hours appears too short a period within which Second Party or its residents could enforce or comply due to circumstances beyond their control, then Second Party may respond in writing to Logan within said 48-hour period stating what a reasonable period within which enforcement or compliance effected would be, setting forth in detail the facts and circumstances justifying the same. In no event shall the breach, failure to comply or enforce remain in existence for a period in excess of ninety (90) days.

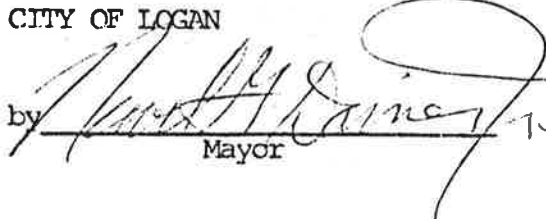
13. All costs, damages, and expenses, including but not limited to attorney's fees and the reasonable value of Logan City equipment and employee time incurred by Logan because of Second Party or its residents' failure to abide by this agreement or failure to comply with applicable rules and ordinances regulating discharge of materials into the sewage collection system, shall be born and paid by Second Party.

14. Each party shall be responsible for their own collection system and trunk lines and each agrees to indemnify and hold the other harmless for loss, damage, demands, or claims of any kind arising from their own acts or neglect.

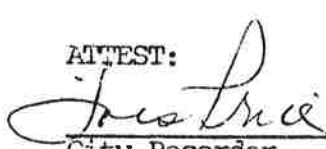
IN WITNESS WHEREOF, these presents are executed the day and year first above written.

CITY OF LOGAN

by

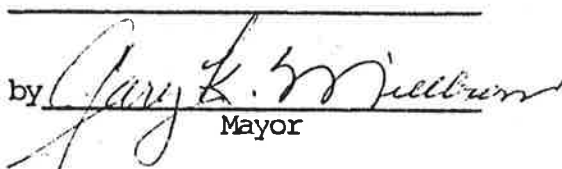

Mayor

ATTEST:


City Recorder

CITY OF PROVIDENCE

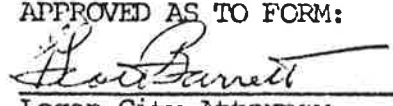
by

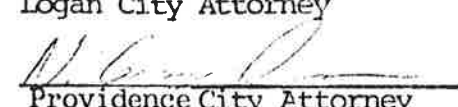

Mayor

ATTEST:


City Recorder

APPROVED AS TO FORM:


Logan City Attorney


Providence City Attorney

SEWAGE/ENG2

AGREEMENT

THIS AGREEMENT, made and entered into the 12th day of July, 1975, by and between LOGAN CITY CORPORATION, a Utah Municipal Corporation, hereinafter referred to as Logan, and RIVER HEIGHTS CITY CORPORATION, a Utah Municipal Corporation, hereinafter referred to as River Heights.

WITNESSETH:

THAT WHEREAS, River Heights City, Utah has no sewage disposal system and the governing body of said City desires to install a collection system for sewage in River Heights City; and

WHEREAS, Logan has a sewage lagoon and treatment facility of sufficient capacity to receive and treat the sewage of the inhabitants of River Heights City; and

WHEREAS, the parties to this Agreement desire to enter into an agreement in writing whereby and whereunder Logan will accept and treat the sewage of the inhabitants of River Heights;

NOW THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated, to which each party hereby binds and commits itself, it is agreed as follows:

1. That River Heights will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole cost and expense and will install at its sole cost and expense a trunk line extending from its sewage collection system to a point 1700 ft. east of the intersection of 7th South Street and U. S. Highway 91, where a connection will be made to a planned Logan City fifteen-inch sewer trunk line. This point shall

be referred to hereinafter as the "collection point." Logan agrees to complete installation of said fifteen-inch trunk line to the collection point at Logan's cost and expense on or before the date River Heights is ready to connect thereto.

2. At this collection point, River Heights agrees to install at its sole cost and expense, to specifications acceptable to Logan City Engineer, a collection box and measuring device with attached recorder or totaling meter to measure the volume of waste discharged through said trunk line into Logan City trunk line.

3. The measuring device installed at the collection point shall be under the control of and shall be maintained by Logan. River Heights agrees to pay the reasonable cost and expense of maintaining said device and shall have the right to verify the meter readings and otherwise inspect said device at any time during business hours and otherwise in case of emergency.

4. Logan agrees to accept the waste passed through said measuring device at the collection point and from said point to be solely responsible for conveying said waste to Logan's sewage treatment facility and for the treatment and disposal of said waste. However, Logan will not accept sewage from any River Heights resident or business or from any other source if that residence, business or other source originates from an area north of the township line between township 11 North and township 12 North, Salt Lake Base. A copy of a map showing the present boundaries of River Heights is attached hereto.

5. River Heights agrees to pay Logan, and Logan agrees to

accept from River Heights, as sole consideration for Logan accepting, conveying, treating, and disposing of said waste a regular fee equal to \$0.10 for each 1,000 gallons of waste as measured at the collection point up to a maximum each month equivalent to 150 gallons per capita per day based on the average population of River Heights during the month for which the regular fee is paid. Said fee shall be paid monthly on or before the 10th day of each month for the prior month, commencing with the month following the first month that sewage is delivered to the collection point by River Heights.

6. River Heights agrees to pay an excess-usage fee of \$0.20 for each 1,000 gallons of waste received each month by Logan in excess of the monthly equivalent of 150 gallons per capita per day on the population basis determined above. Such fee will be computed and will be payable on the same monthly basis as the regular fee.

7. It is further agreed that the said regular fees may be adjusted only by reason of an adjustment in the present rate as of the date of this Agreement charged to Logan residential users for like collection and treatment of sewage. Further, that such an adjustment in fees is limited to the same proportional increase or decrease in rates charged to said Logan users, unless special circumstances exist which would make collection and treatment of River Heights users sewage more expensive than Logan users.

8. This agreement shall remain in effect for a period of fifty years from the date hereof. It shall continue in effect from year to year thereafter unless terminated by either party by

giving the other party twelve months written notice.

9. At intervals not exceeding ten years, the contracting parties may review the provisions hereof and may propose changes or amendments to any such provision, provided, however, that the provisions contained herein shall remain in full force and effect until such proposed changes or amendments are agreed upon by both contracting parties.

10. River Heights agrees to adopt rules and ordinances identical to those of Logan as they presently exist and as they may from time to time be amended or added upon, governing the discharge of water or materials of any kind into River Heights' collection system and to be responsible for the administration and enforcement of said rules or ordinances. Nothing herein shall, however, require River Heights to require the removal by its residents of septic tanks, the use of which are discontinued when users connect to River Heights sewage collection system. If River Heights fails to enforce, or if any of its residents fail to enforce or comply with said rules or ordinances, then in that event, upon 48 hours written notice by Logan requesting compliance and or enforcement, Logan may cease its acceptance of River Heights waste at the collection point until enforcement or compliance is effected. If 48 hours appears too short a period within which River Heights or its residents could enforce or comply due to circumstances beyond their control, then River Heights may respond in writing to Logan within said 48 hour period stating what a reasonable period within which enforcement or compliance effected would be, setting forth in detail the facts and circum-

stances justifying the same. In no event shall the breach, failure to comply or enforce remain in existence for a period in excess of 30 days.

11. All costs, damages, and expenses, including but not limited to the reasonable value of Logan City equipment and employee time incurred by Logan because of River Heights' or its residents' failure to abide by this agreement or failure to comply with applicable rules and ordinances regulating discharge of materials into the sewage collection system, shall be born and paid by River Heights.

12. Both River Heights and Logan shall utilize any surplus revenues from their 1974-75 budgets to meet any financial obligations they may have under this agreement if their present budgets are inadequate to meet said needs. For the fiscal years following, each party will adopt appropriate budgets to finance the costs contemplated by this agreement.

13. Each party shall be responsible for their own collection system and trunk lines from and to the collection point, and each agrees to indemnify and hold the other harmless for loss, damage, demands, or claims of any kind arising from their own acts or neglect.

14. This agreement is expressly made subject to the approval as to form, of the Utah Attorney General.

IN WITNESS WHEREOF, these presents are executed the day and year first above written.

LOGAN CITY CORPORATION

By  Mayor

ATTEST:

Evelyn J. Davis
Evelyn R. Crosbie
City Recorder

RIVER HEIGHTS CITY CORPORATION

By *Ralph D. Olson*
Mayor

ATTEST:

Evelyn R. Crosbie
City Recorder

Approved as to form this 20 day of June
1975.

James H. Barber
Utah Attorney General

INTER-CITY SEWAGE TREATMENT SERVICE AGREEMENT

This Agreement, made and entered into this 9th day of November, 19 87, by and between the City of Logan, hereinafter called "First Party," and Smithfield City, Utah, hereinafter called "Second Party":

WITNESSETH:

WHEREAS, Second Party presently has no sewage disposal system and the governing body of Second Party desires to install a collection system for sewage in Smithfield; and

WHEREAS, First Party has a sewage lagoon treatment facility, presently being upgraded to be capable of handling and treating the sewage of Second Party; and

WHEREAS, the parties to this agreement desire to enter into an agreement in writing, whereby and whereunder Logan will accept and treat sewage from Second Party;

NOW THEREFORE, in consideration of the mutual covenants and undertakings hereinafter stated, to which each party hereby binds and commits itself, it is agreed as followed:

1. Trunkline. Second Party will, upon obtaining necessary financing, install a sewage collection system within its corporate limits at its sole cost and expense and a trunk line extending from the collection system to a point agreed upon by both parties (as shown on Exhibit A attached hereto) where a measuring device will be installed. (This point is hereinafter referred to as the Main Collection Point.) Second Party will further install at its own expense such gravity sewer lines, pump station and pressure sewer lines as shown and agreed upon by both parties. (Size and capacity of lines and pumps to be approved by the Logan City Engineer). The sewage will be discharged (whether gravity or pressure) into the existing Logan City system at a point approved by the Logan City Engineer, where there will be sufficient capacity to handle the sewage. (See Exhibit A.)

2. Ownership/Maintenance. It is agreed that all lines above the main collection point (meter) shall be owned and maintained by Second Party. The ownership of all lines (gravity and pressure), pumps and metering station below said metering station shall be turned over to and maintained by Logan City after the Logan City Engineer's acceptance of same. Logan City reserves the right to connect to main lines above the main collection point at no charge.

3. Meter. The measuring devices installed at the collection points shall be owned and maintained by Logan, as stated above. Second Party agrees to pay all reasonable costs to operate, maintain, repair and/or replace said devices, and shall have the right to verify the meter readings and the devices at any time.

4. Acceptance of Sewage Permits. First Party agrees to accept all sewage wastes from Second Party so long as said sewage meets all requirements of Logan's ordinances, including Pretreatment and Local Limits Standards. Second Party agrees to set up sewage collection and treatment ordinances that comply with EPA and State requirements, as well as Logan City standards. Second Party also agrees to the establishment of user charges associated with the treatment of industrial and/or commercial wastes and that permits for the above be administered and approved by the City of Logan. Second Party hereby agrees to provide all necessary data to enable Logan to administer said permits.

5. Payments. Second Party agrees to pay First Party, and First Party agrees to accept from the same for accepting, conveying, treating and disposing of wastes, a regular fee of:

\$4.00/connection + \$0.175/1,000 gal./mo. for residential wastes
\$8.00 + 0.175/1,000 gal. for commercial and
industrial use (including schools, churches, boarding
houses, etc.);
and \$18.00 + 0.175/1,000 gal. for all regulated users

These rates are based on \$0.175/1,000 gallons of waste measured at the metering station, up to a maximum average each month of 150 gallons per capita per day. Excess usage above this amount will be charged at \$0.35/1,000 gallons. Any Logan City connections above the metering station shall be deducted at the same rate.

6. Regulated users must have a permit from the City of Logan to enable Logan to monitor wastes or substances that cause problems with collection and/or treatment systems (SEE SEWAGE PRETREATMENT ORDINANCE). Any charges for testing, sampling, or other charges to an individual regulated user, in addition to the \$18.00 + \$0.175/1,000 gal. including surcharge fees, will be billed and collected directly by Logan.

7. Rate Charges. It is agreed that fees charged to Second Party may be adjusted on the same basis as rates may be adjusted to Logan City users for capital and/or operation and maintenance costs for treatment and/or appropriate main line costs, unless special circumstances exist that would make collection and treatment of Second Party's wastes more expensive than Logan's waste, or if the rate, charged to Logan's users is subsidized by other Logan City funds or operations.

8. Capital Improvements. Capital improvement costs for repair, replacement or maintenance (other than routine maintenance) of lift stations and trunk lines from the Main Collection Point to the main 600 North trunk line shall be shared on the basis of the relative number of connections within each entity that are served by said trunk line and lift station appurtenances. All connections above the main collection shall participate on a per connection basis for main line costs above the main collection point.

Capital improvement costs for maintenance, repair or replacement of the treatment lagoons, outfall ditch and main 600 North trunk line shall be shared based on the relative number of connections from each entity.

These costs can be budgeted for and paid by Second Party or charged as mutually agreed upon by both parties.

9. If any part of this agreement is found to be in violation of law or unenforceable then this agreement shall become terminable by either party giving the other party a one (1) year written notice of its intent to so terminate.

10. Second Party and First Party agree that wherever practicable, uniform rules and regulations will be established, including but not limited to the discharge of harmful substances into the sewage system in excess of minimum standards prescribed; the use of food waste disposal units for domestic and commercial food wastes entering the sanitary sewer system; to prevent storm, surface or groundwater from entering the sewer system; and to provide adequate inspection of building, sewer and street construction to prevent such from entering the sewer system.

11. This Agreement shall remain in effect for a period of 20 years from the date hereof. It shall continue in effect for two-year periods thereafter unless terminated by either party by giving the other party two year's written notice.

12. Second Party agrees to adopt rules and ordinances identical to those of Logan as they presently exist and as they may from time to time be amended or added upon, governing the discharge of water or materials of any kind into Second Party's collection system and to be responsible for the administration and enforcement of said rules or ordinances. Nothing herein shall, however, require Second Party to require the removal by its residents of septic tanks, the use of which are discontinued when users connect to First Party's sewage collection system. If Second Party fails to enforce, or if any of its residents fail to enforce or comply with said rules or ordinances, then in that event, upon 48 hours written notice by Logan requesting compliance and/or enforcement, Logan may cease its acceptance of Second Party's waste at the collection point until enforcement or compliance is effected. If 48 hours appears too short a period within which Second Party or its residents could enforce or comply due to circumstances beyond their control, then Second Party may respond in writing to Logan within said 48-hour period stating what a reasonable period within which enforcement or compliance effected would be, setting forth in detail the facts and circumstances justifying the same. In no event shall the breach, failure to comply or enforce remain in existence for a period in excess of ninety (90) days.

13. All costs, damages, and expenses, including but not limited to attorney's fees and the reasonable value of Logan City equipment and employee time incurred by Logan because of Second Party or its residents' failure to abide by this agreement or failure to comply with applicable rules and ordinances regulating discharge of materials into the sewage collection system, shall be born and paid by Second Party.

14. Each party shall be responsible for their own collection system and trunk lines and each agrees to indemnify and hold the other harmless for loss, damage, demands, or claims of any kind arising from their own acts or neglect.

IN WITNESS WHEREOF, these presents are executed the day and year first above written.

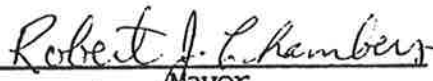
CITY OF LOGAN

by 
Mayor

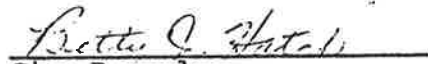
ATTEST:


City Recorder

SMITHFIELD CITY CORPORATION

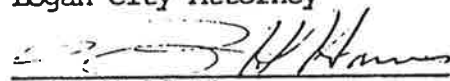
by 
Mayor

ATTEST:


City Recorder

APPROVED AS TO FORM:


Logan City Attorney


Smithfield City Attorney

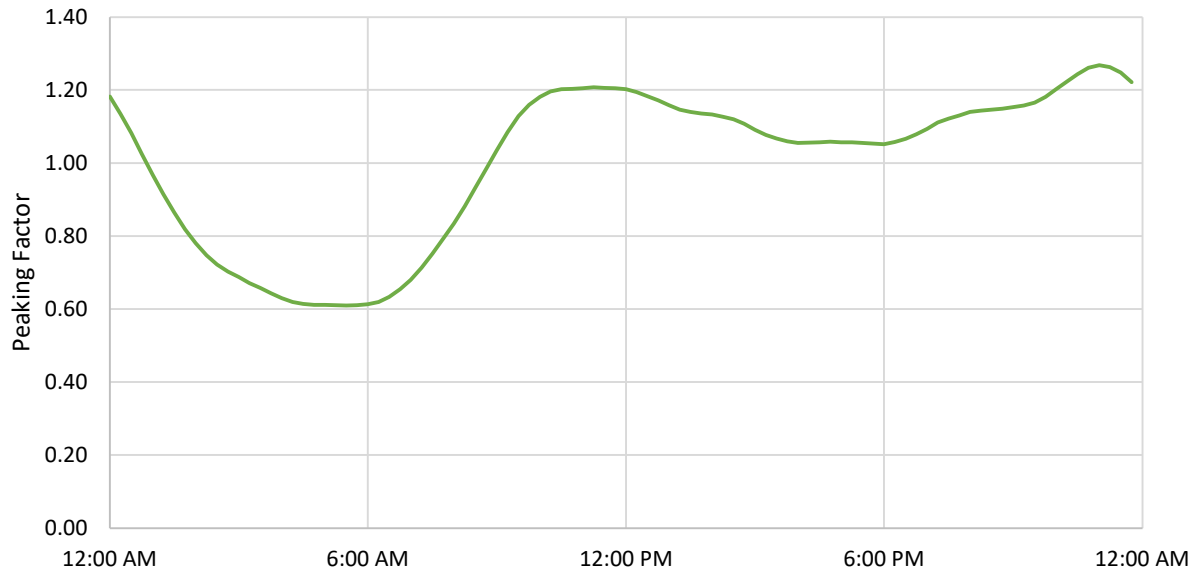
SEWAGE/ENG2

APPENDIX B

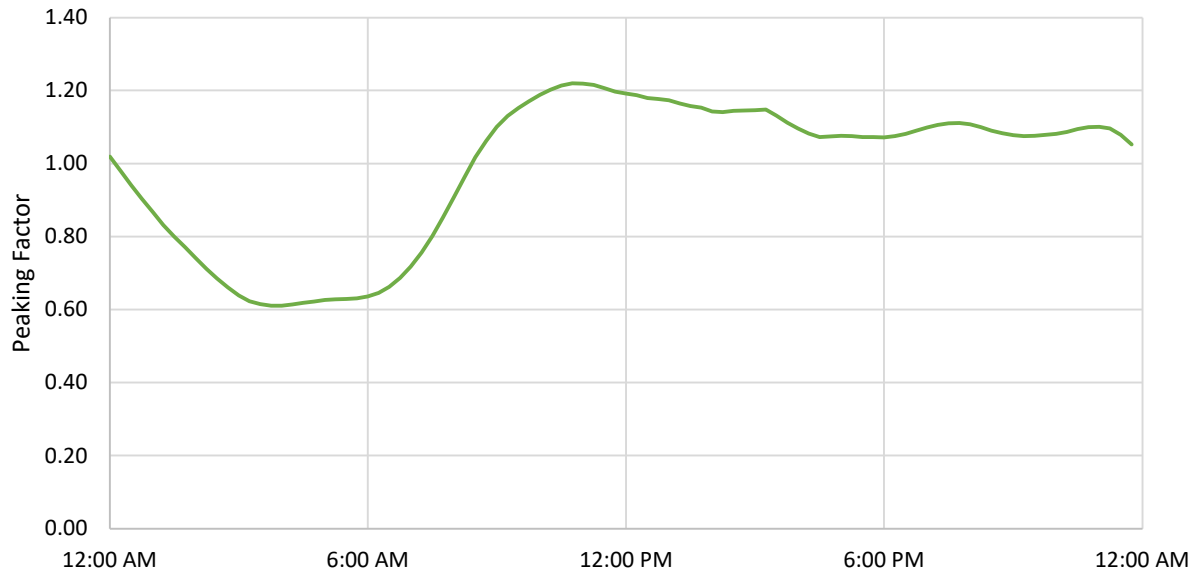
Member Communities Diurnal Curves



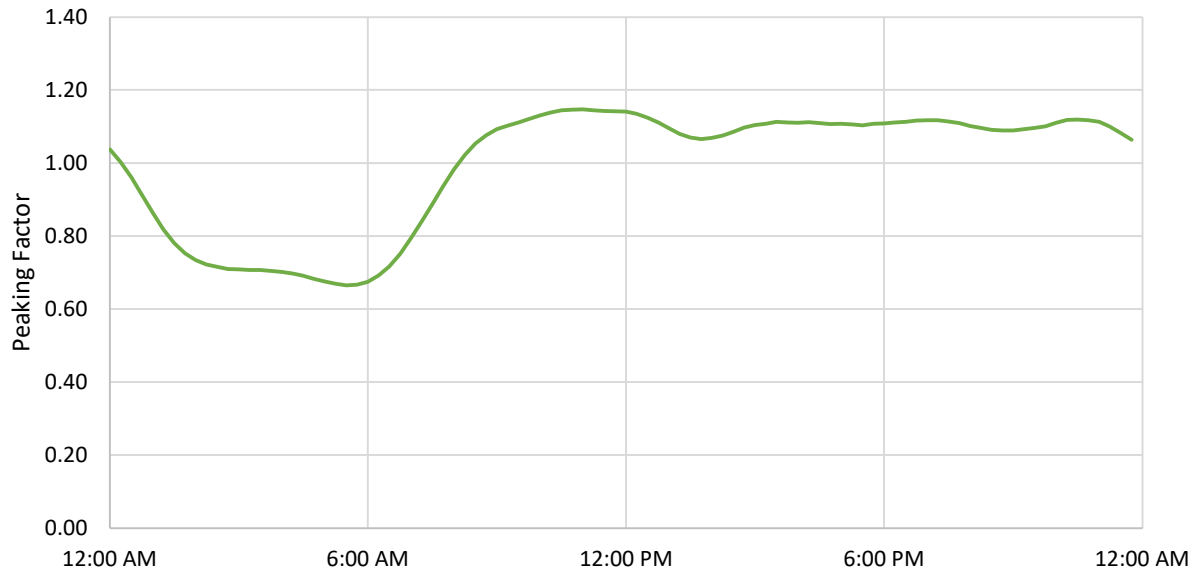
Nibley Diurnal Pattern



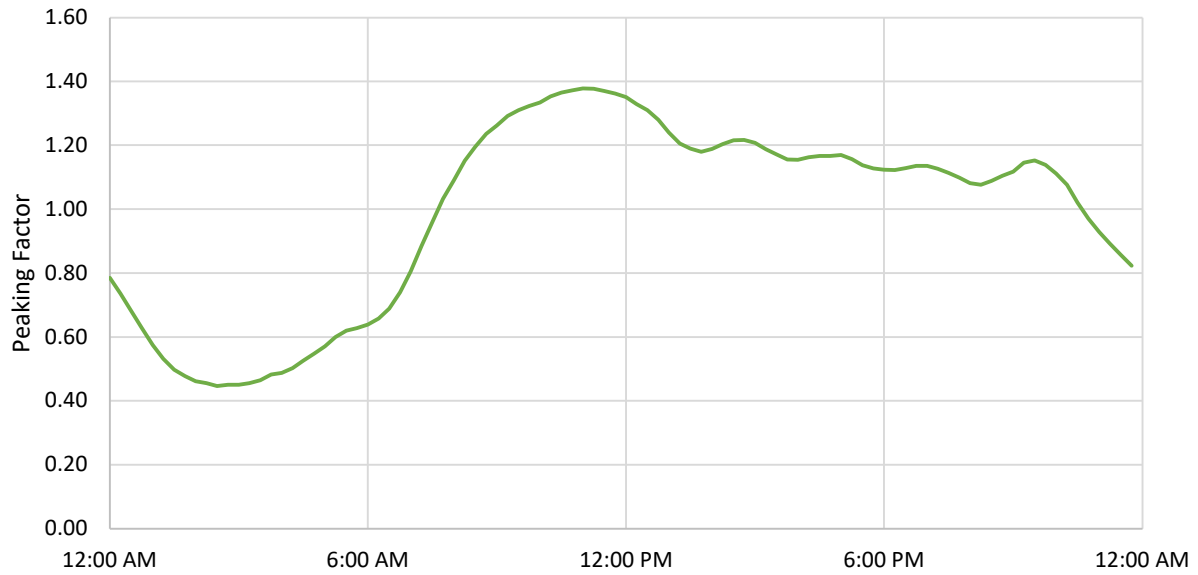
North Logan Diurnal Pattern



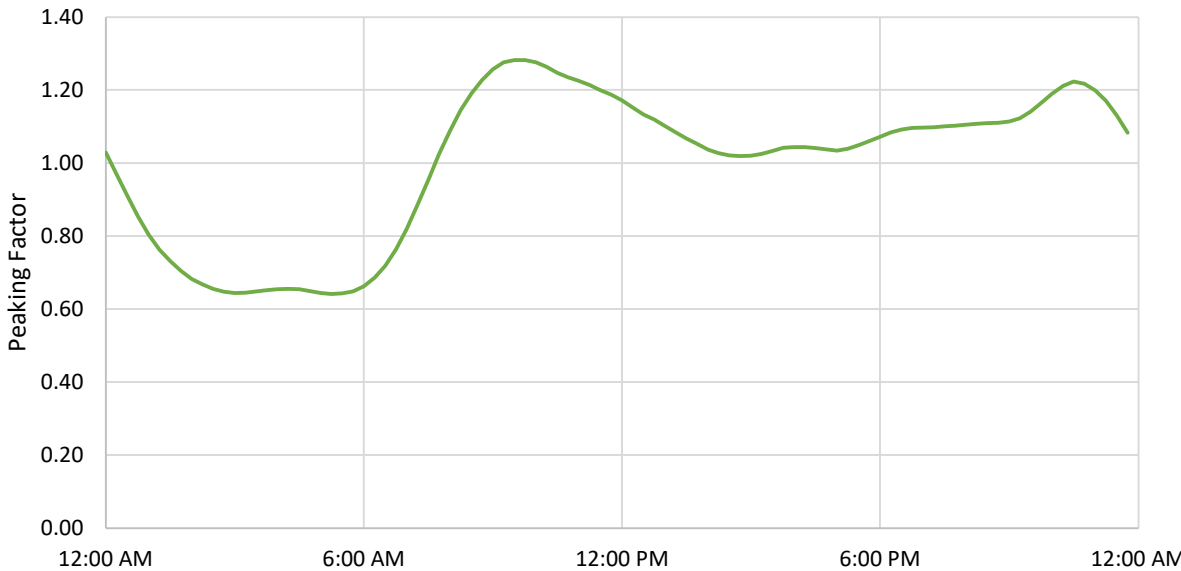
Providence I Diurnal Pattern



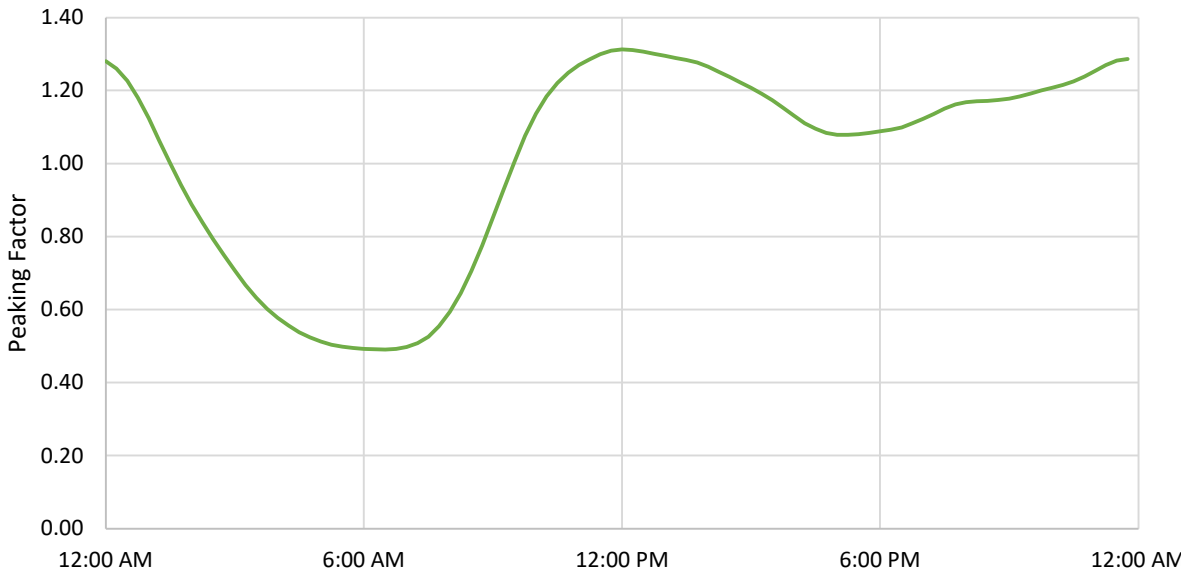
Providence II Diurnal Pattern



River Heights Diurnal Pattern



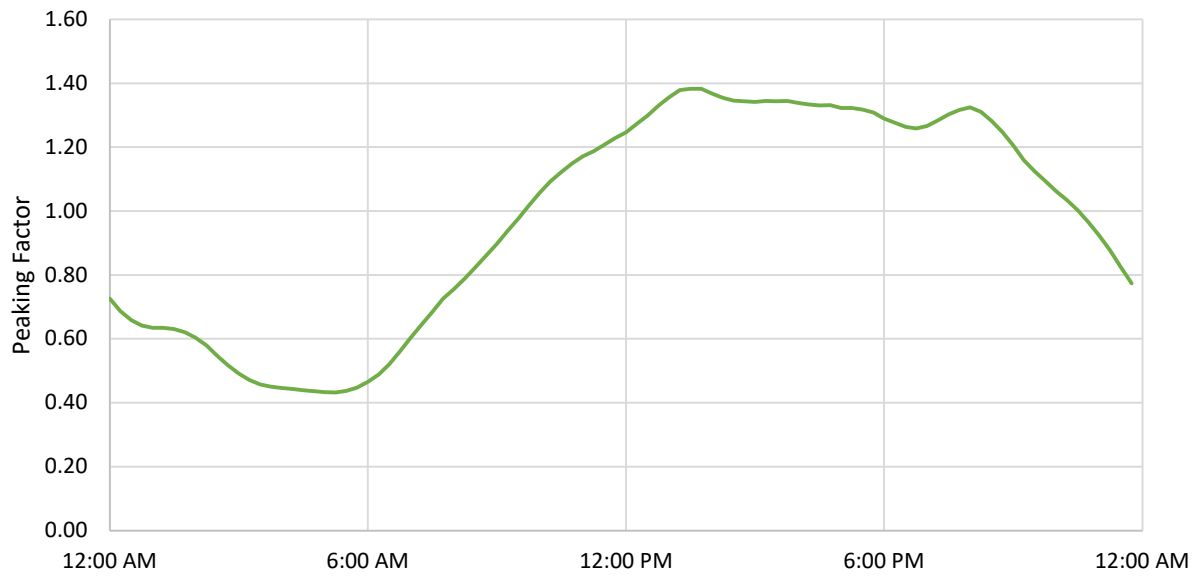
Smithfield Diurnal Pattern



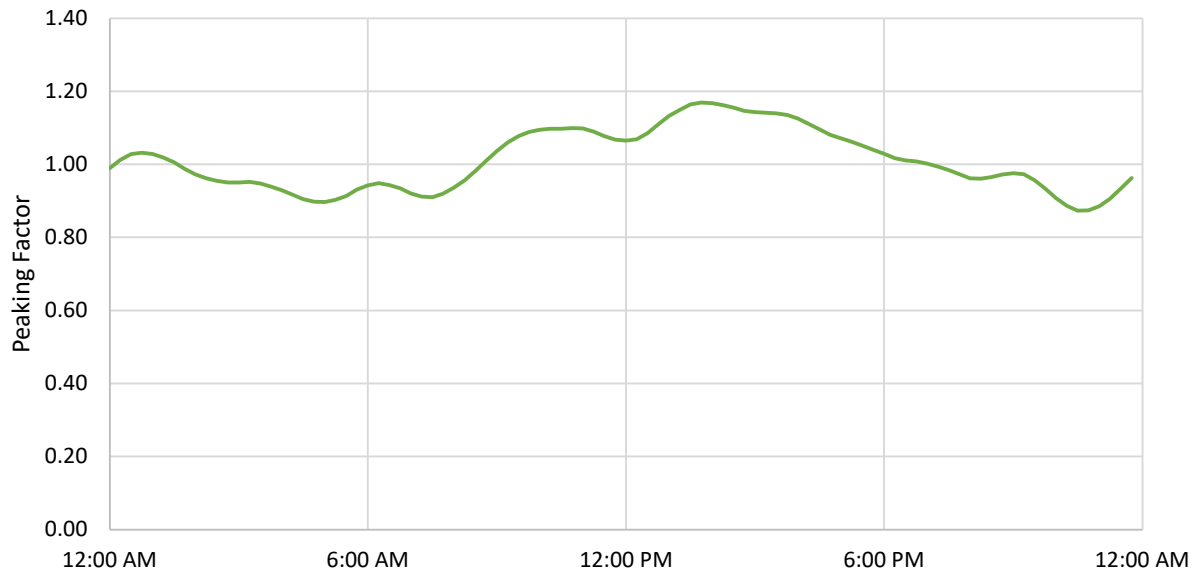
APPENDIX C

Land Use Diurnal Curves

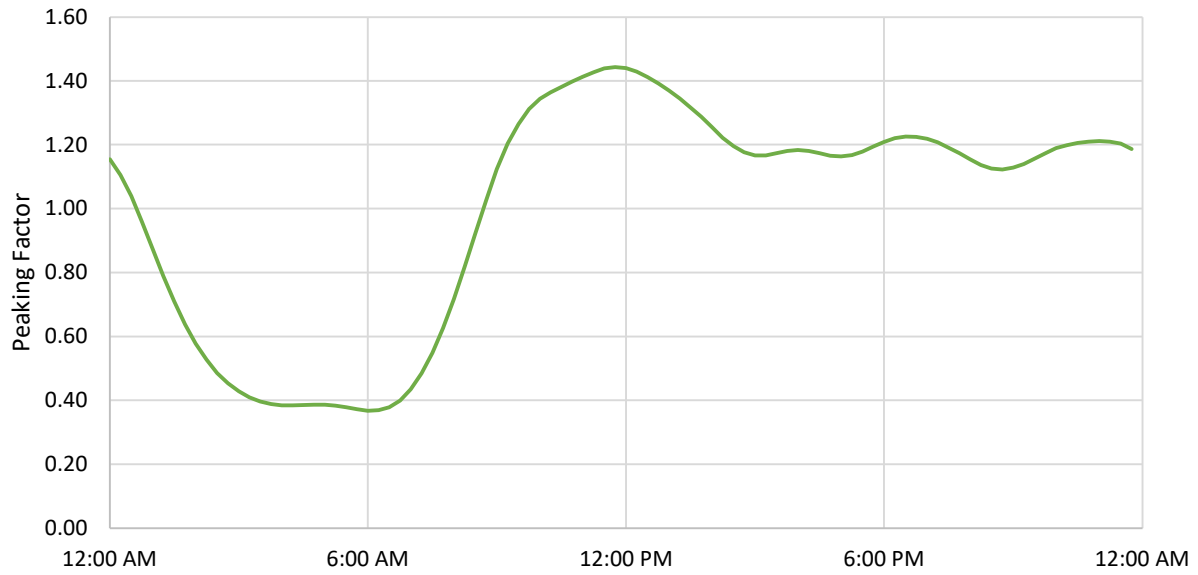
Commercial Pattern



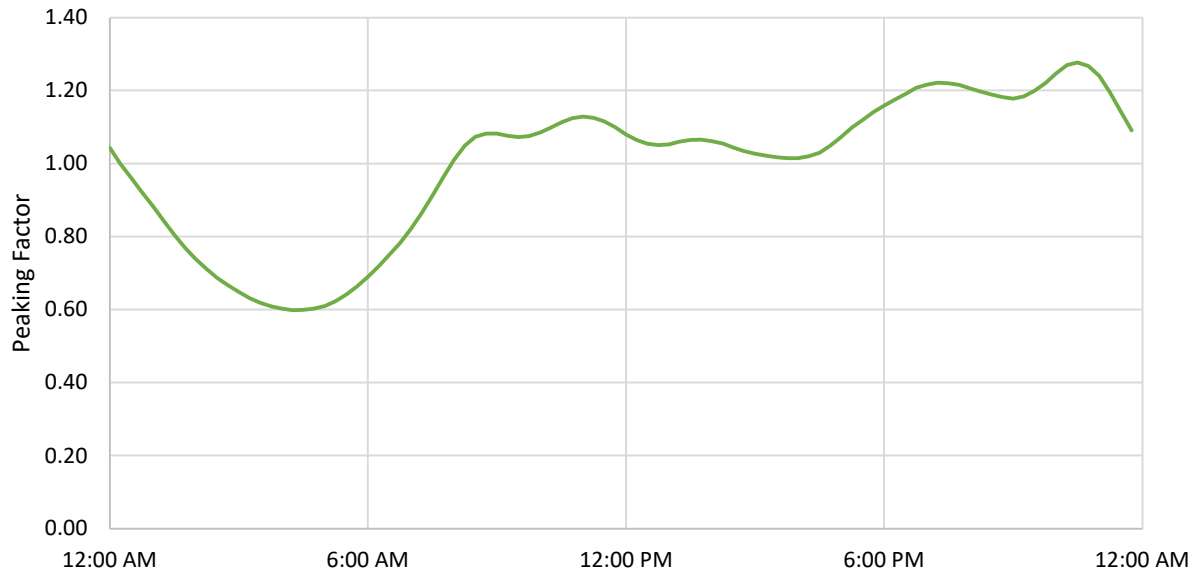
Industrial Pattern



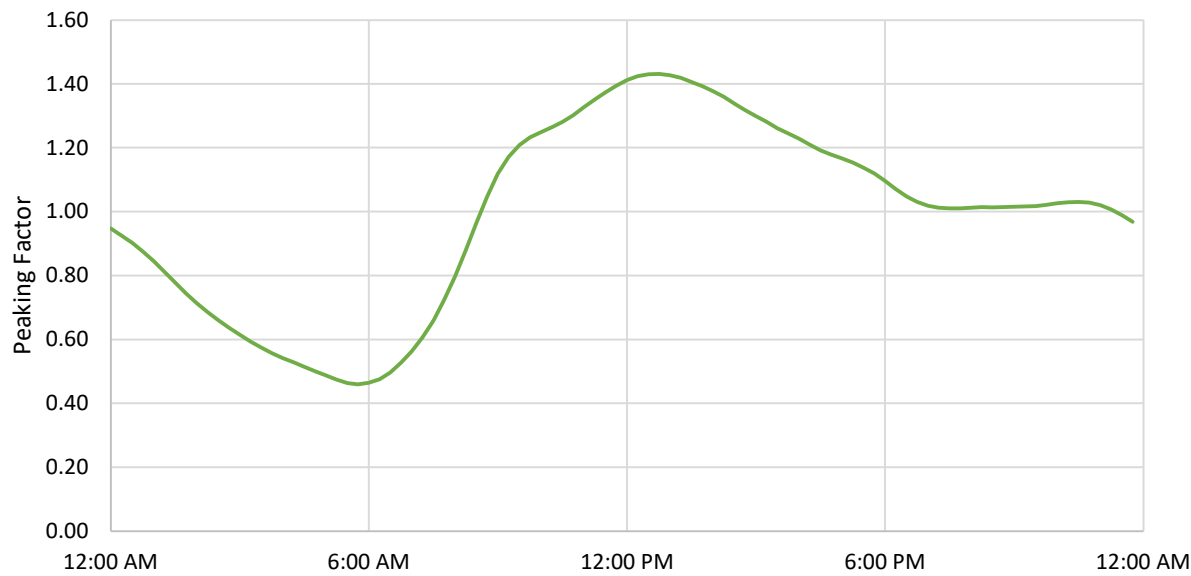
Residential Pattern



Mixed Residential Pattern



USU Pattern



APPENDIX D

Growth Projections and Projected ERUs



Year	Projected Population	Projected ERUs	Annual Growth (ERUs)
2025	57,905	23,133	-
2026	58,474	23,333	200
2027	59,049	23,533	200
2028	59,629	23,733	200
2029	60,215	23,932	199
2030	60,806	24,131	199
2031	61,404	24,330	199
2032	62,007	24,529	199
2033	62,616	24,728	199
2034	63,232	24,927	199
2035	63,853	25,126	199
2036	64,619	25,271	145
2037	65,395	25,416	145
2038	66,179	25,561	145
2039	66,973	25,706	145
2040	67,777	25,851	145
2041	68,590	25,996	145
2042	69,413	26,141	145
2043	70,246	26,285	144
2044	71,089	26,429	144
2045	71,942	26,573	144

APPENDIX E

Buildout Sewer System

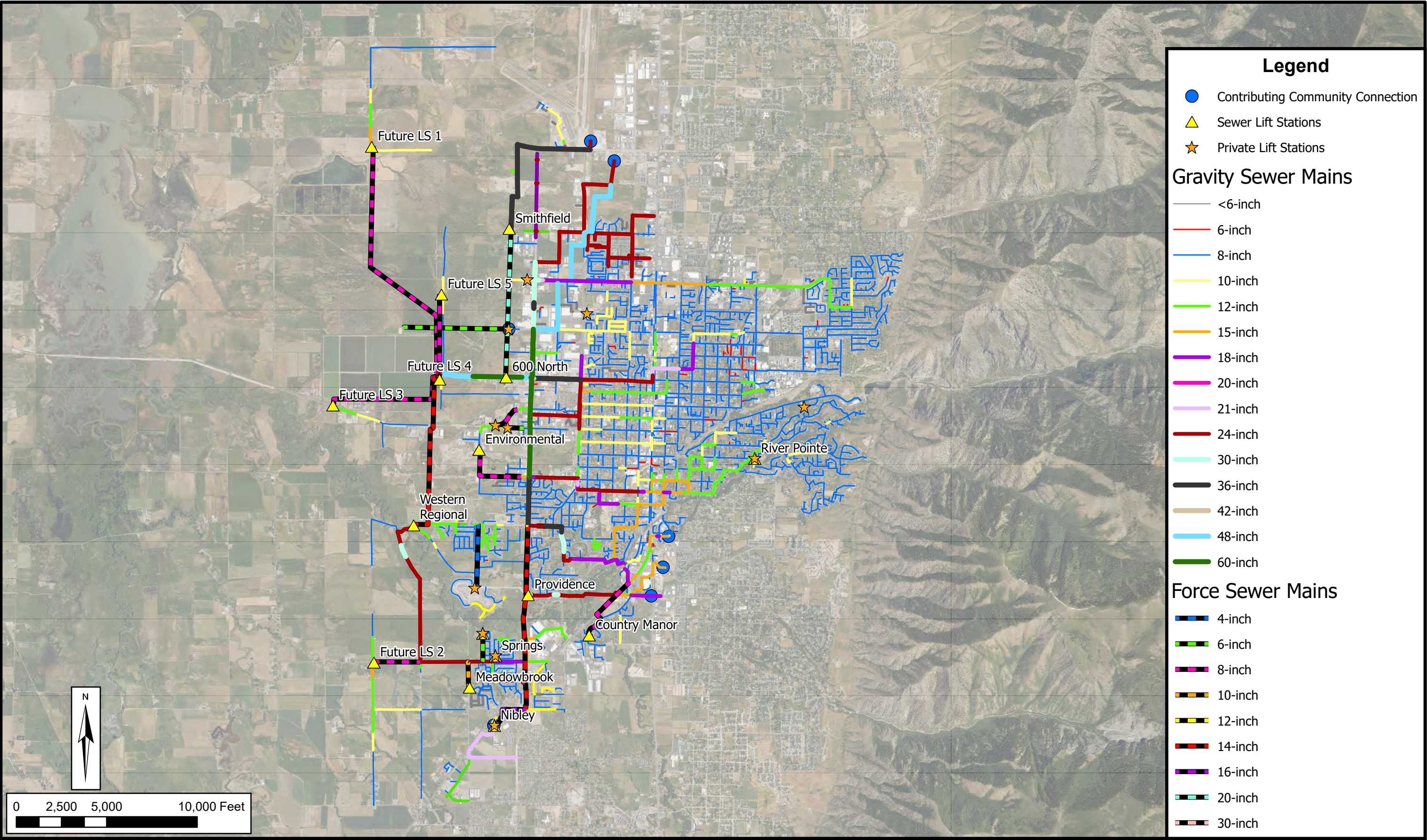
Date: 9/3/2026
Document Path: H:\Projects\139 - Logan City\03.300 - Sewer Master Plan Update\GIS\Logan Sewer 2024\Logan Sewer 2024.aprx



LOGAN CITY WASTEWATER MASTER PLAN

BUILDOUT SEWER SYSTEM

APPENDIX
E



APPENDIX F

Cost Estimates

**Logan City Capital Facility Plan
Wastewater Existing Recommended Improvements
Preliminary Engineers Cost Estimates**

	Item	Unit	Unit Price	Quantity	Total Price
E-1.	<i>Sewer Line Along 1200 S Between Legrand St and Main St</i>				
	Install 15" gravity line	LF	\$ 617	1,100	\$ 678,700
	Total				\$ 678,700
	Engineering & Admin. (10%)				\$ 67,870
	Contingency (10%)				\$ 67,870
	Total to Sewer Line Along 1200 S Between Legrand St and Main St				\$ 814,000
E-2.	<i>Sewer Line Along 1200 S from Hwy 89/91 to Legrand St.</i>				
	Install 18" gravity line	LF	\$ 654	800	\$ 523,200
	Total				\$ 523,200
	Engineering & Admin. (10%)				\$ 52,320
	Contingency (10%)				\$ 52,320
	Total to Sewer Line Along 1200 S from Hwy 89/91 to Legrand St.				\$ 628,000
E-3.	<i>Sewer Line From North Logan Connection</i>				
	Install 48" gravity line	LF	\$ 1,102	7,100	\$ 7,827,182
	Total				\$ 7,827,182
	Engineering & Admin. (10%)				\$ 782,718
	Contingency (10%)				\$ 782,718
	Total to Sewer Line From North Logan Connection				\$ 9,393,000
E-4.	<i>Sewer Line Along 1200 W between 1000 N and 800 N</i>				
	Install 12" gravity line	LF	\$ 582	1,300	\$ 756,288
	Total				\$ 756,288
	Engineering & Admin. (10%)				\$ 75,629
	Contingency (10%)				\$ 75,629
	Total to Sewer Line Along 1200 W between 1000 N and 800 N				\$ 908,000
E-5.	<i>Sewer Line Along 300 E between Center St and 100 S</i>				
	Install 12" gravity line	LF	\$ 582	700	\$ 407,232
	Total				\$ 407,232
	Engineering & Admin. (10%)				\$ 40,723
	Contingency (10%)				\$ 40,723
	Total to Sewer Line Along 300 E between Center St and 100 S				\$ 489,000
E-6.	<i>Sewer Line Along 200 E Between 100 S and 200 S</i>				
	Install 10" gravity line	LF	\$ 559	700	\$ 391,202
	Total				\$ 391,202
	Engineering & Admin. (10%)				\$ 39,120
	Contingency (10%)				\$ 39,120
	Total to Sewer Line Along 200 E Between 100 S and 200 S				\$ 469,000
E-7.	<i>Sewer Line Along Main St and 200 S</i>				
	Install 12" gravity line	LF	\$ 582	650	\$ 378,144
	Install 15" gravity line	LF	\$ 617	700	\$ 431,844
	Total				\$ 809,988
	Engineering & Admin. (10%)				\$ 80,999
	Contingency (10%)				\$ 80,999
	Total to Sewer Line Along Main St and 200 S				\$ 972,000
E-8.	<i>Sewer Line Along 300 S Between 100 E and 200 E</i>				
	Install 15" gravity line	LF	\$ 617	350	\$ 215,922
	Install 18" gravity line	LF	\$ 654	350	\$ 228,732
	Total				\$ 444,654
	Engineering & Admin. (10%)				\$ 44,465
	Contingency (10%)				\$ 44,465
	Total to Sewer Line Along 300 S Between 100 E and 200 E				\$ 534,000

**Logan City Capital Facility Plan
Wastewater Existing Recommended Improvements
Preliminary Engineers Cost Estimates**

	Item	Unit	Unit Price	Quantity	Total Price
E-9.	Sewer Line Along Hwy 89 Between 970 S and 100 W				
	Install 15" gravity line	LF	\$ 617	700	\$ 431,844
	Total				\$ 431,844
	Engineering & Admin. (10%)				\$ 43,184
	Contingency (10%)				\$ 43,184
	Total to Sewer Line Along Hwy 89 Between 970 S and 100 W				\$ 518,000
E-10.	Sewer Line Along 100 W between Hwy 89 and 970 S				
	Install 18" gravity line	LF	\$ 654	900	\$ 588,168
	Total				\$ 588,168
	Engineering & Admin. (10%)				\$ 58,817
	Contingency (10%)				\$ 58,817
	Total to Sewer Line Along 100 W between Hwy 89 and 970 S				\$ 706,000
E-11.	Sewer Line Along Park Ave Between 600 S and 810 S				
	Install 30" gravity line	LF	\$ 799	1,150	\$ 918,298
	Install 36" gravity line	LF	\$ 905	300	\$ 271,608
	Total				\$ 1,189,906
	Engineering & Admin. (10%)				\$ 118,991
	Contingency (10%)				\$ 118,991
Total to Sewer Line Along Park Ave Between 600 S and 810 S				\$ 1,428,000	
E-12.	Smithfield Lift Station				
	Install 20" force main	LF	\$ 440	8,250	\$ 3,630,000
	Install new pumps (5,000 gpm)	LS	\$ 350,000	2	\$ 700,000
	Total				\$ 4,330,000
	Engineering & Admin. (10%)				\$ 433,000
	Contingency (10%)				\$ 433,000
Total to Smithfield Lift Station				\$ 5,196,000	
Total Costs					\$ 22,055,000

**Logan City Capital Facility Plan
Wastewater 10-Year Recommended Improvements
Preliminary Engineers Cost Estimates**

	Item	Unit	Unit Price	Quantity	Total Price
10-1	Line Through Golf Course between Legrand Street and Providence Lift Station				
	Install 24" gravity line	LF	\$ 725	4,900	\$ 3,552,402
	Install 30" gravity line	LF	\$ 799	250	\$ 199,630
	Total				\$ 3,752,032
	Engineering & Admin. (10%)				\$ 375,203
	Contingency (10%)				\$ 375,203
	Total to Line Through Golf Course between Legrand Street and Providence Lift Station				\$ 4,502,000
10-2	Sewer Line Along Airport Rd and 1200 W				
	Install 42" gravity line	LF	\$ 976	9,500	\$ 9,271,810
	Total				\$ 9,271,810
	Engineering & Admin. (10%)				\$ 927,181
	Contingency (10%)				\$ 927,181
	Total to Sewer Line Along Airport Rd and 1200 W				\$ 11,126,000
10-3	Providence Lift Station				
	Install new pumps (3,000 gpm)	LS	\$ 350,000	2	\$ 700,000
	Building modification and new wetwell	LS	\$ 3,000,000	1	\$ 3,000,000
	Total				\$ 3,700,000
	Engineering & Admin. (10%)				\$ 370,000
	Contingency (10%)				\$ 370,000
	Total to Providence Lift Station				\$ 4,440,000
10-4	1400 W between 350 S and 200 S				
	Install 8" gravity line	LF	\$ 539	1,800	\$ 970,884
	Install new pumps (500 gpm)	LS	\$ 50,000	3	\$ 150,000
	Total				\$ 1,120,884
	Engineering & Admin. (10%)				\$ 112,088
	Contingency (10%)				\$ 112,088
	Total to 1400 W between 350 S and 200 S				\$ 1,345,000
10-5	200 S 300 E				
	Install weir	LS	\$ 10,000	1	\$ 10,000
	Total				\$ 10,000
	Engineering & Admin. (10%)				\$ 1,000
	Contingency (10%)				\$ 1,000
	Total to 200 S 300 E				\$ 12,000
10-6	300 W and 175 N				
	Install manhole	LS	\$ 5,000	1	\$ 5,000
	Total				\$ 5,000
	Engineering & Admin. (10%)				\$ 500
	Contingency (10%)				\$ 500
	Total to 300 W and 175 N				\$ 6,000
	Total Costs				\$ 21,431,000

APPENDIX G

Infrastructure Maintenance Plan

MEMORANDUM

DATE: July 2, 2026
TO: Joe Hawkes, P.E.
Derek Holmstead, P.E.
450 N 1000 W
Logan, UT 84321

FROM: Ridley Griggs, P.E.
Joshua Hortin, P.E.
Hansen, Allen & Luce, Inc. (HAL)
859 West So. Jordan Pkwy – Suite 200
South Jordan, Utah 84095

SUBJECT: Infrastructure Maintenance and Replacement Plan
PROJECT NO.: 139.03.300

DRAFT

BACKGROUND

Logan City retained Hansen, Allen, and Luce (HAL) to complete the 2024 Sewer Master Plan Update. As part of the update, Logan City desired to create an infrastructure maintenance and repair plan to systematically replace and upgrade segments of the system. Parts of Logan City's sewer system are over 100 years old.

AVAILABLE DATA

Logan City provided a geodatabase containing sewer system pipes and their associated properties. For each pipe, the following associated properties were stored in the geodatabase:

- Material
- Slope
- Diameter
- Install Date
- Flow Type (Gravity or Pressurized)

The completeness of the dataset was also evaluated. A slope was available 85% of the time. Figure 1 shows that diameter was available for 83% of pipes and material was available for 72% of pipes. Altogether, 62% of pipes had all three attributes while 7% had none of those three. Twenty percent of pipes were missing a material only, and seven percent had a material but were missing the other two attributes. The remaining portion of pipes were missing either a slope or diameter.

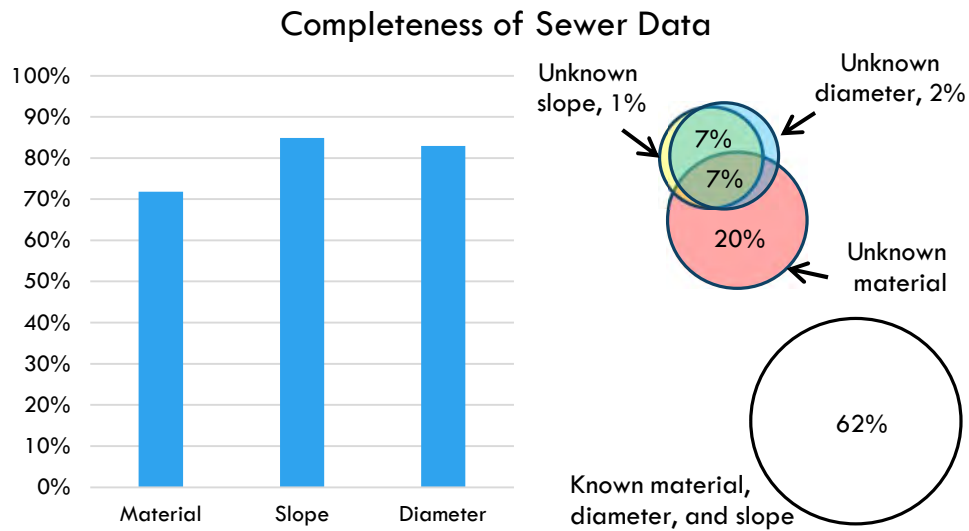


Figure 1: Completeness of Sewer Data

Two other variables, age and type (gravity or pressure), were available 96-97% of the time. All 5 variables were available 62% of the time, similar to Figure 1, showing that these two variables did not significantly change the overall completeness of the dataset. It is worth noting that age is an approximate figure as about 1/3 of installation dates were listed as “pre-(year)” and so the age is estimated.

HAL added modeled peak flow and calculated depth. These variables were fully available, although it was assumed that small tributaries upstream of more major conveyances were not constrained by capacity for the purposes of the infrastructure maintenance plan.

APPROACH

Each pipeline property in the geodatabase was evaluated for interrelations with other properties. Output from the City’s hydraulic model was also incorporated into the data set and evaluated. An equation was then developed to compute a replacement score for each system pipe, with a higher score indicating higher replacement priority.

After the first draft of the replacement scoring equation was developed, preliminary results were discussed with City personnel. Further adjustments were made to the equation to best align with the City’s priorities and goals. This memorandum includes a summary of the methodology used to develop the equation and summary findings.

SYSTEM PROPERTIES

The dataset attributes were analyzed for both general properties and statistical connections between attributes. Figure 2 shows the cumulative length (miles) of pipe by material installed per decade. It can be seen that the earliest system dates to the 1900s and was primarily vitrified clay pipe at the time. The system underwent slow growth through the 1910s, moderate growth from the 1920s to 1950s, and rapid growth from the 1960s to the 2010s. As of the present, about 200 miles of pipe are installed. Most of the system dates between the 1960s and 2010s.

Three main categories make up almost 1/3 of the system each: CP (29%, primarily installed between 1940s and 1970s), PVC (29%, primarily installed between 1980s and 2020s) and unknown (29%, this category occurring throughout the entire history, but primarily since the 1970s). The remaining materials are VCP (7%), miscellaneous plastics (3%), or asbestos concrete (2%). These materials form a minority of the system.

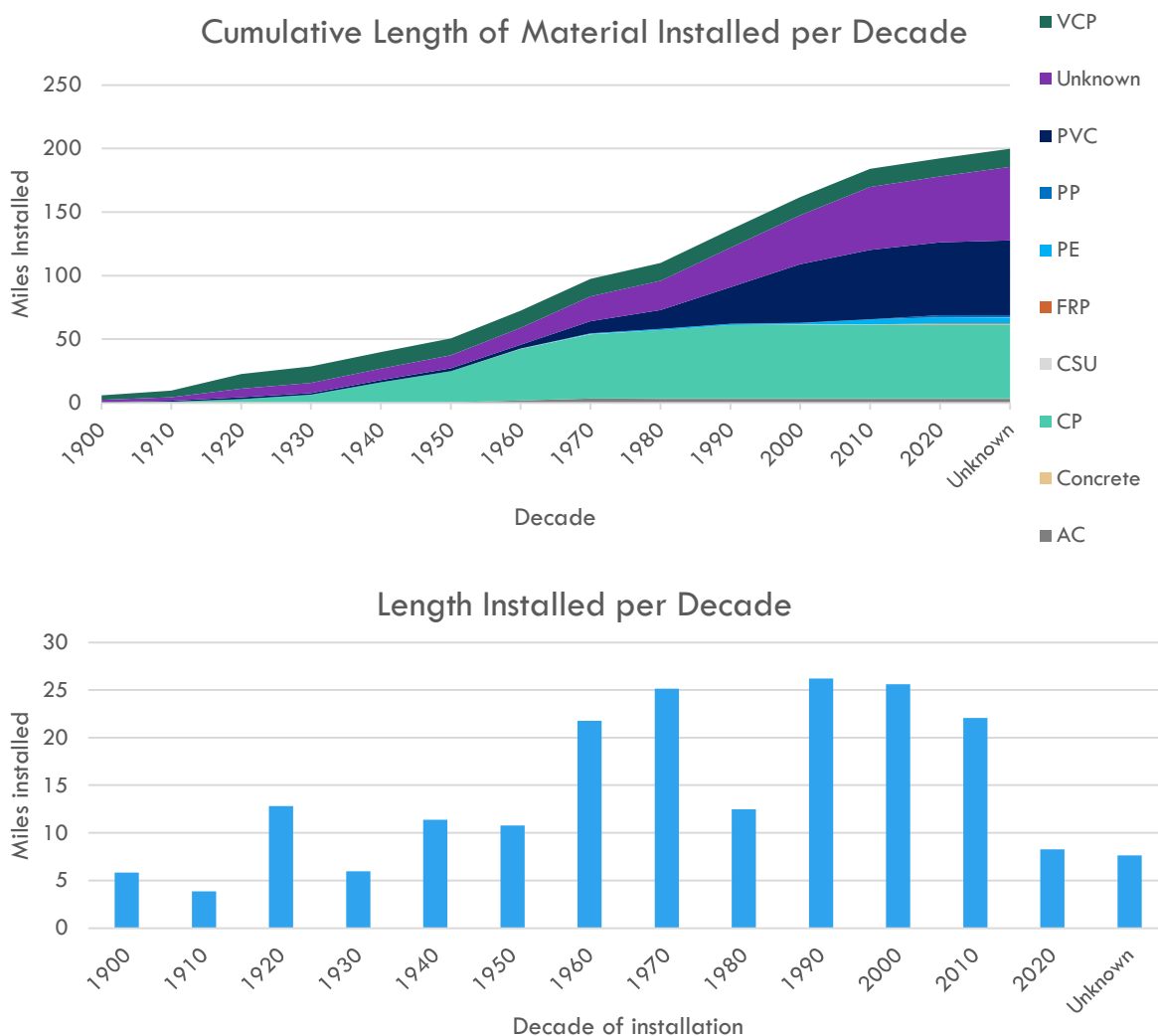


Figure 2: General Properties of Logan City Water System

Figure 3 shows the length installed by diameter. Pipes with eight-inch (0.667 ft) diameter form a little over half of the system. Eight-inch diameter pipes are about 38% concrete, 31% PVC, 9% vitrified clay, and 18% unknown material.

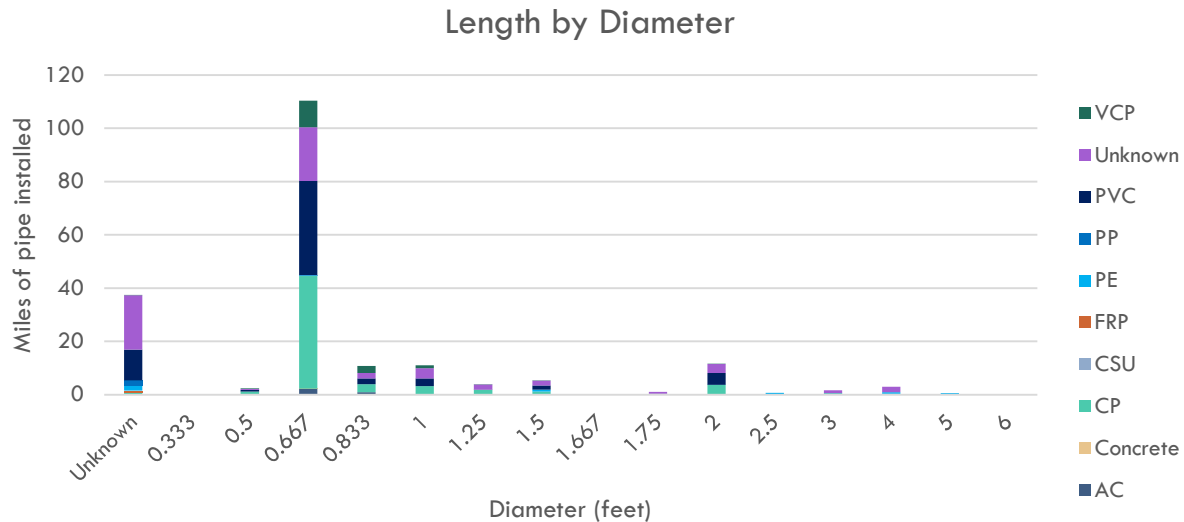


Figure 3: Length of Pipe Installed by Diameter

It is known that flatter slopes, clay/cement materials, older age, and high flow depths are associated with failures. Statistical relationships among these variables were examined. Age, diameter, and material were statistically significant in influencing slope. Six and eight inch pipes tended to have steeper slopes, on average, than other pipe sizes. Polyethylene and polypropylene pipes tended to have shallower slopes, on average, than cement, PVC, and vitrified clay pipes. Most eight inch pipes are also cement, PVC, or vitrified clay pipes, which all tend towards higher slopes. These interrelationships may show up in the final model and over- or under-estimate replacement score if not accounted for.

SELECTION OF RANKING CRITERIA

Based on Logan City recommendation, **slope, material, age, peak flow depth, observed failing condition, and difficulty of replacement** were selected for inclusion in a ranking. Material was eliminated from the rankings during calibration, so it is not shown in the final table.

CALIBRATION OF RANKING CRITERIA

Each of the six ranking criteria was assigned a formula to calculate a component of the ranking based on the data analysis performed previously. The components were equally weighted to start. The formula was structured such that a higher score corresponds to a higher replacement priority and was data-driven. The slope and modelled peak flow depth could be easily incorporated because they were already numerical data from the dataset. Age is also a numeric value, but was grouped into decades for simplification similar to the drinking water master plan. Material was a categorical value instead of an integer, so each material was assigned a score of 1 or 0 based on a binary risk classification for materials, except for unknown materials, which were assigned a score for the material category relating to age (since age is correlated to material type). Finally, observed condition and difficulty of replacement were included as binary factors (i.e., assigned a score of 1 or 0 based on condition or difficulty of replacement).

In order to calibrate the ranking, a case study of 20 pipes was created and ranked by engineering judgment. Several of the fictitious pipes created were deliberately chosen to challenge the first iteration of the ranking system; for example, a relatively new PVC pipe with a median slope would normally score very low in the ranking, but this pipe was assigned a high d/D (indicating a problematic segment despite being relatively new). Likewise, relatively old pipes of flatter slopes (which would normally score higher in the rankings) but low d/D were also included. Table 1 contains a summary of the case study pipes.

Table 1
Case Study Pipes and Calculated Score Compared to Engineer Ranking

Pipe	Decade	Slope, ft/ft	Material ¹	d/D	Failing	Difficult	Calculated Score	Engineer Rank
1	1950	0.000	AC	0.00	YES	YES	125.4	3
2	1990	0.000	PVC	0.37	YES	YES	123.8	2
3	1910	Unknown	CP	0.00	NO	YES	101.8	1
4	1910	0.003	CP	0.00	YES	NO	91.8	4
5	2010	Unknown	PVC	0.38	YES	NO	65.9	5
6	1900	-0.003	VCP	0.08	NO	NO	59.1	6
7	1910	0.001	Unknown	0.00	NO	NO	51.8	7
8	1910	0.003	CP	0.00	NO	NO	51.8	8
9	1910	Unknown	CP	0.00	NO	NO	51.8	9
10	1950	0.009	Unknown	0.36	NO	NO	49.7	12
11	1950	Unknown	CSU	0.35	NO	NO	49.3	11
12	2020	Unknown	PVC	0.90	NO	NO	42.6	10
13	1970	0.000	CP	0.37	NO	NO	42.0	14
14	1970	Unknown	PE	0.36	NO	NO	41.5	15
15	1950	0.000	AC	0.00	NO	NO	35.4	13
16	1990	0.000	PVC	0.37	NO	NO	33.8	16
17	1990	0.200	Unknown	0.37	NO	NO	32.4	17
18	2010	0.005	CP	0.38	NO	NO	25.9	19
19	2010	Unknown	PVC	0.38	NO	NO	25.9	18
20	2020	0.000	CP	0.39	NO	NO	22.3	20

1.VCP = Vitrified Clay Pipe; CP = Concrete Pipe; AC = Asbestos Cement; PE = Polyethylene; PVC = Polyvinyl Chloride

Calibration was applied by assigning a coefficient to each of the four terms and varying them between 0.25 and 6 until the deviation of the calculated rankings from the engineering judgment rankings was minimized. Table 2 shows the finalized ranking criteria with the applied coefficients. Material dropped out during this process for failing to improve the calibration at any level. This is likely because material is correlated to both slope and decade and may have been repeating or overemphasizing information already contained in other variables to an extent that other related variables did not.

Table 2
Final Ranking Criteria Score and Summary Statistics

Ranking Criteria	Score	Coefficient	Maximum Score	Average Score	Minimum Score
Age	(1 – (decade number/13)) * coefficient , where decade number = 1 for 1900's, 2 for 1910's, etc. Unknown decade = 8.	4	3.7	1.54	0
d/D	d/D (decimal percent) * coefficient.	3	3	0.3	0
Slope	(1 – slope) * coefficient. Unknown slope = 0.006.	0.5	0.54	0.49	-0.043
Failing	1 if YES, 0 if NO	40	40	N/A	0
Difficult	1 if YES, 0 if NO	50	50	N/A	0
Total	(Age Score + d/D Score + Slope Score) * 100/7.5 + Failing Score + Difficulty Score	N/A	150.1	33.9	6.6

INFRASTRUCTURE MAINTENANCE AND REPLACEMENT PLAN AS OF MAY 2024

Figure 5 shows a histogram of scores resulting from the maintenance and replacement plan as of May 2024. Most pipes have a low score (i.e., < ~60). The pipes which score higher than 60 tend to be older, concrete or clay, have a high peak d/D, and/or are observed to be failing or in a difficult location.

Figure 6 shows a map of the top 100 (the value of 100 was chosen arbitrarily) scored segments. As can be seen, these are almost all under Highway 91 or other difficult locations such as neighborhoods east of Utah State University.

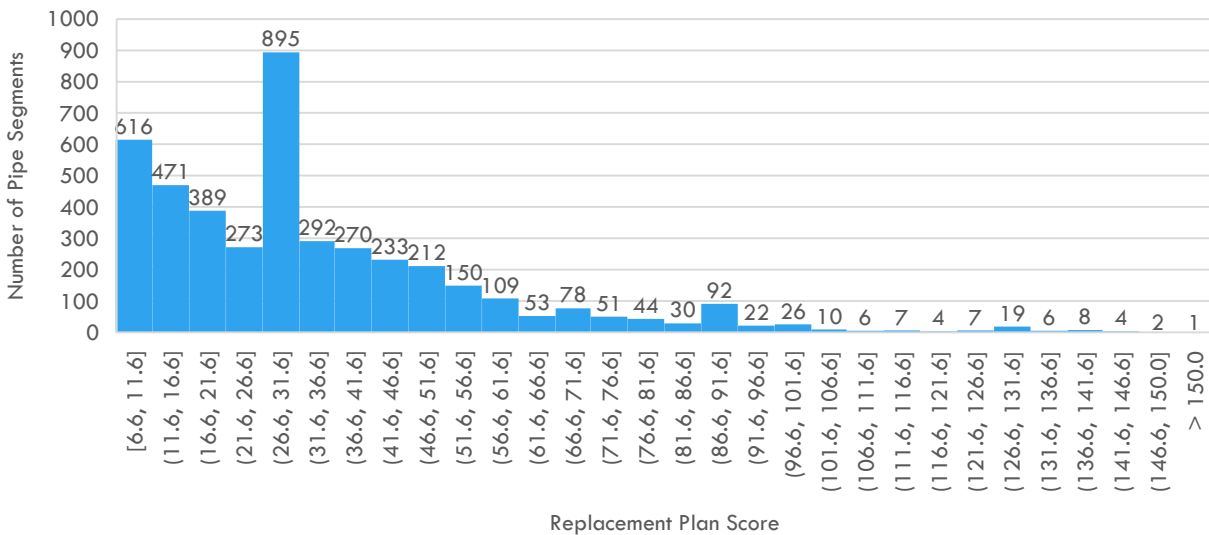


Figure 5: Histogram of Pipe Segment Replacement Plan Scores

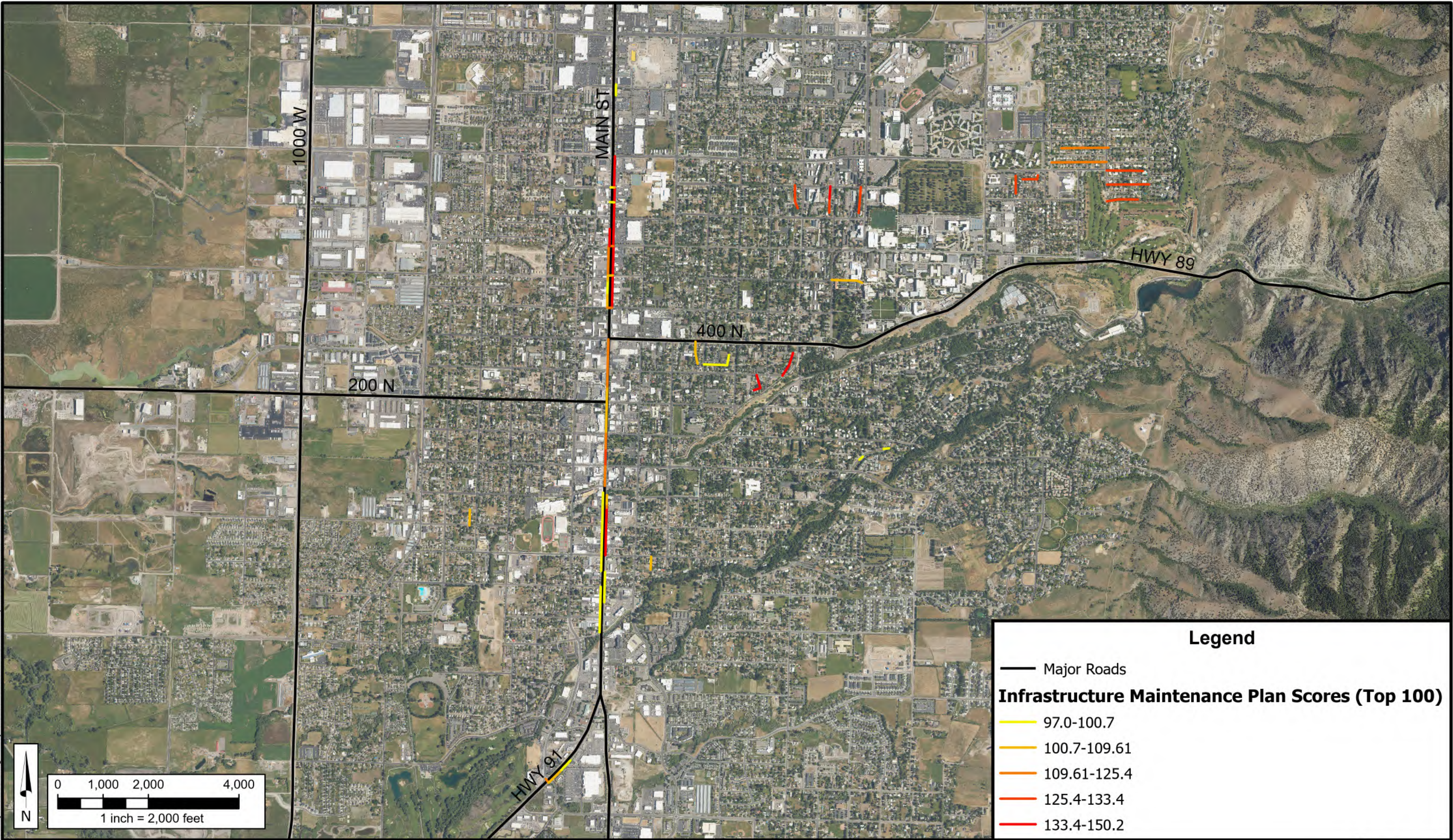
USE OF THE REPLACEMENT SCORE

The replacement score is a guide for City staff to select the most-needed pipe repairs to minimize future sewer pipe failures. The score heavily weights the age, modelled d/D, and failing conditions to flag the pipes most likely to fail in the future for replacement. The criticality of a pipe to the system is also a factor in the sense that tributary pipes do not have a modelled d/D, and instead score 0 in that category. Interestingly, material type dropped out of the final replacement score. This is likely because it is correlated with pipe age, and there is a lack of data between pipe failures and material type.

When a pipe is replaced, the accompanying GIS segment should be updated with the new material and installation date. New pipes should also be added to the GIS shapefile and the hydraulic water collection model. Both of these updates will require periodic updates of the replacement score. Updating the replacement score can easily be performed by exporting the pipe shapefile attribute table, ensuring the necessary attribute columns are filled in, and using the generic formula provided.

The replacement projects do not necessarily need to proceed in order of the replacement score; City staff can use judgment to prioritize certain projects based on budgets, planned road projects, etc.

As older pipes are replaced, in theory unexpected failures will be reduced. The replacement score will be a useful tool in achieving this goal.



TOP 100 SCORED PIPE SEGMENTS

LOGAN CITY

FIGURE
6

FORMULA FOR THE REPLACEMENT SCORE IN EXCEL

The procedure for updating the infrastructure maintenance and repair plan shapefile is detailed below. The equation for scoring pipe segments uses pipe age,

1. Export the attribute table as a csv.
2. Open the attribute table in excel and identify the columns for installation decade, modelled flow depth, slope, crew identified projects, and difficult locations.
3. Enter the following formula and click Calculate:

```
=((1-IFS([@Est_Decade]=1900,1,[@Est_Decade]=1910,2,[@Est_Decade]=1920,3,[@Est_Decade]=1930,4,[@Est_Decade]=1940,5,[@Est_Decade]=1950,6,[@Est_Decade]=1960,7,[@Est_Decade]=1970,8,[@Est_Decade]=1980,9,[@Est_Decade]=1990,10,[@Est_Decade]=2000,11,[@Est_Decade]=2010,12,[@Est_Decade]=2020,13,[@Est_Decade]="",8/13)*4 + [@RT_FL_DP])*3 + ((1 - IF([@CalcSlope]="Unknown",0.006,[@CalcSlope]))*0.5) * (100/7.5) + IF([@Crew]="NO",0*40,1*40)+IF([@Difficult]="NO",0*50,1*50)
```

Where Est_Decade = column containing decade information, RT_FL_DP = column containing modelled depth of flow location, CalcSlope = column containing pipe slope information, Crew = column containing crew identified projects flag, and Difficult = column containing difficult location flag.

In order to import the new scores into the GIS shapefile, sort the FID field in ascending order in both GIS and excel, enter editing mode in GIS and open the attribute table, and directly copy and paste the new scores into the GIS shapefile (be sure that the destination shapefile and the excel file contain the same number of records in the same order before performing this procedure). Another way to do this would be to import the excel file table into GIS and perform a join function using the FID field.

Sometimes the Infrastructure Maintenance and Repair Plan shapefile will need to be updated with new pipes. In this case the decade of installation column [Est_Decade] will need to be updated based on the installation date. In general these will be relatively few features and can be updated with the following procedure depending on complexity:

1. In the latest pipe shapefile, select only the newly added features, for example by using Select by Attribute to choose those features with an FID higher than the last pipe updated.
2. Right click on the shapefile in the table of contents and export the selected features as a new shapefile.
3. Merge the new shapefile with the most updated Infrastructure Maintenance and Repair Plan shapefile.
4. Open the attribute table of the newly merged shapefile.
5. Click on Show Selected Records at the bottom of the attribute table. No records should be showing after this.
6. Click Select by Attribute and enter [Est_Decade] = 0.

7. Right click on the shapefile and begin editing mode.
8. If few enough records, manually enter correct values. If all new pipes are the same installation decade (which is likely, since new additions to the model are likely to be pipes installed within the last year), then right click on the column, select Field Calculator, and simply enter the value (i.e., 2020). This will update only the selected records.
9. Exit editing mode.

Gravity Pipelines			
Pipeline Diameter (in)	Length (ft)	Unit Cost (\$/LF)	Total Cost
4	916	\$499	\$457,322
6	14,831	\$521	\$7,720,592
8	645,328	\$539	\$348,076,860
10	64,912	\$559	\$36,276,829
12	62,196	\$582	\$36,183,347
15	20,822	\$617	\$12,845,399
18	28,392	\$654	\$18,554,619
21	11,159	\$700	\$7,807,058
24	61,849	\$725	\$44,839,535
30	3,447	\$799	\$2,752,694
36	8,784	\$905	\$7,952,898
48	19,068	\$1,102	\$21,020,445
60	2,699	\$1,452	\$3,918,086
Total			\$548,405,685

Force Mains			
Pipeline Diameter (in)	Length (ft)	Unit Cost (\$/LF)	Total Cost
4	8,100	\$90	\$728,982
6	11,183	\$90	\$1,006,487
8	10,217	\$90	\$919,543
12	12,575	\$105	\$1,320,403
14	20,151	\$105	\$2,115,890
20	9,521	\$125	\$1,190,147
Total			\$7,281,453

Total Cost for Gravity and Force Mains	\$555,687,137
Assumed Design Life (years)	100
Value Per Year	\$5,556,871
Assumed Replacement Efficiency*	25%
Budget Cost Per Year	\$4,167,654

*Replacement efficiency is defined as the percent of typical construction cost saved by coordinating pipe replacement in conjunction with other capital projects.

APPENDIX H

Member Communities Growth Projections

	Member Community	LOS (GPD / POP)	Population				Buildout	Peak Day (GPD)				Buildout
			2025	2035	2045	2065		2025	2035	2045	2065	
			Existing	10	20	40		Existing	10	20	40	
Master Plans	Nibley	90	9696	13216	14598	17813	35600	872,678	1,189,405	1,313,843	1,603,139	3,204,000
	North Logan	224	12431	17108	22322	22322	22322	2,784,808	3,832,555	5,000,602	5,000,602	5,000,602
	Providence	95	8902	11507	14875	24854	28000	842,102	1,088,525	1,407,058	2,351,036	2,648,649
	River Heights											
	Smithfield											
	Hyde Park											
Total								4.50	6.11	7.72	8.95	10.85
MGD												
	Member Community	LOS (GPD / POP)	Existing	10	20	40	Buildout	Existing	10	20	40	Buildout
General Plans	Nibley											
	North Logan											
	Providence											
	River Heights	175	2,180	3,075	3,080	3,080	3,080	381,156	537,657	538,513	538,513	538,513
	Smithfield	116	15540	20007	26888	48564	48564	2,499,691	3,257,865	4,378,328	7,907,890	8,518,700
	Hyde Park		6067	8154	10958	19792	25072					
Total								2.88	3.80	4.92	8.45	9.06
MGD												

Member Community	MGD				
	2025 (Actual)	2035	2045	2065	Buildout
Nibley	0.90	1.19	1.31	1.60	3.20
North Logan	2.20	3.83	5.00	5.00	5.00
Providence	1.00	1.09	1.41	2.35	2.65
River Heights	0.30	0.54	0.54	0.54	0.54
Smithfield/Hyde Park	1.60	3.26	4.38	7.91	8.52
Total	6.00	9.91	12.64	17.40	19.91

Existing flows were loaded into the model based on on actual flow data recorded at the measurement flumes. An additional 2 MGD was split up and allocated to the existing model at each Member Community connection accordingly. To project future flow data, the peak recorded flow was divided by the population during that respective year to get the gpd/pop. Population data and growth projections were taken from Wastewater Master Plans where available and from General Plans when Master Plans were not available. Future flow projections include the influence of infiltration and inflow because they take into account peak flow values.

APPENDIX I

Member Communities Cost Sharing

The buildout model was used to compare the flow through the pipes with and without member community flows. To understand existing projects and what projects add capacity, a scenario in the existing model was created to determine pipe sizes that would meet existing needs without factoring in future growth.

Existing Project Flows

Project Number	Logan City Flow (gpm)	Providence Flow (gpm)	Smithfield/Hyde Park Flow (gpm)	North Logan Flow (gpm)	River Heights Flow (gpm)	Nibley Flow (gpm)	Total Flow
E-1	0	2703.63					2703.63
E-2	59.81	3434.6					3494.41
E-3	2386.73			4236.11			6622.84
E-4	Logan will be 100% responsible for these projects.						
E-5							
E-6							
E-7							
E-8							
E-9	28.59				584.35		612.94
E-10	746.94				444.45		1191.39
E-11	750				501		1251
E-12	1691.34		7697.54				9388.88

Existing Project Percent Responsible

Project Number	Logan City Flow (%)	Providence Flow (%)	Smithfield Flow (%)	Hyde Park Flow (%)	North Logan Flow (%)	River Heights Flow (%)	Nibley Flow (%)
E-1 ^a	5.5%	94.5%	0%	0%	0%	0%	0%
E-2 ^a	8.3%	91.7%	0%	0%	0%	0%	0%
E-3	36%	0%	0%	0%	64%	0%	0%
E-4	100%	0%	0%	0%	0%	0%	0%
E-5	100%	0%	0%	0%	0%	0%	0%
E-6	100%	0%	0%	0%	0%	0%	0%
E-7	100%	0%	0%	0%	0%	0%	0%
E-8	100%	0%	0%	0%	0%	0%	0%
E-9	5%	0%	0%	0%	0%	95%	0%
E-10	63%	0%	0%	0%	0%	37%	0%
E-11	60%	0%	0%	0%	0%	40%	0%
E-12	18%	0%	59%	23%	0%	0%	0%

- a. Percentages for projects E-1 and E-2 are based on agreements made previously with Providence. Others are based on relative flow distribution.

Existing Project Cost Sharing

Project Number	TOTAL COST ¹	Logan City Cost	Providence Cost	Smithfield Flow Cost	Hyde Park Cost	North Logan Cost	River Heights Cost	Nibley Cost
E-1	\$814,000.00	\$44,770.00	\$769,230.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-2	\$628,000.00	\$52,124.00	\$575,876.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-3	\$9,393,000.00	\$3,381,480.00	\$0.00	\$0.00	\$0.00	\$6,011,520.00	\$0.00	\$0.00
E-4	\$908,000.00	\$908,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-5	\$489,000.00	\$489,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-6	\$469,000.00	\$469,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-7	\$972,000.00	\$972,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-8	\$534,000.00	\$534,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
E-9	\$518,000.00	\$25,900.00	\$0.00	\$0.00	\$0.00	\$0.00	\$492,100.00	\$0.00
E-10	\$706,000.00	\$444,780.00	\$0.00	\$0.00	\$0.00	\$0.00	\$261,220.00	\$0.00
E-11	\$1,428,000.00	\$856,800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$571,200.00	\$0.00
E-12	\$5,196,000.00	\$935,280.00	\$0.00	\$3,065,640.00	\$1,195,080.00	\$0.00	\$0.00	\$0.00
Total	\$22,055,000	\$9,113,134	\$1,345,106	\$3,065,640	\$1,195,080	\$6,011,520	\$1,324,520	\$0

Pipe Diameters Needed With Existing Flows vs Future Growth

Project Number	Size with no growth	Size with growth	Percent to Existing	Percent to Future	Methodology for Percent to Future
E-1	Parallel 12 and 12-inch	Parallel 12 and 15-inch	94%	6%	Difference in unit cost between 12-inch and 15-inch pipe
E-2	15	18	94%	6%	Difference in unit cost between 15-inch and 18-inch pipe
E-3	36	48	82%	18%	Difference in unit cost between 36-inch and 48-inch pipe
E-4	12	12	100%	0%	
E-5	12	12	100%	0%	
E-6	10	10	100%	0%	
E-7	10,12, &15	10,12, &15	100%	0%	
E-8	15 & 18	15 & 18	100%	0%	
E-9	15	15	100%	0%	
E-10	18	18	100%	0%	
E-11	30 & 36	30 & 36	100%	0%	
E-12	12	20	23%	77%	Difference between existing peak flows (2,250 gpm) and buildout peak flows (9,800 gpm). See Table 6-5.

10-Year Project Flows

Project Number	Logan City Flow (gpm)	Providence Flow (gpm)	Smithfield/Hyde Park Flow (gpm)	North Logan Flow (gpm)	River Heights Flow (gpm)	Nibley Flow (gpm)	Total Flow
10-1	59.8	3031.2					3091
10-2	972.38		8194.5				9166.88
10-3	763.71	2327.29					3091
10-4	*No member communities. Developer responsible for 8-inch minimum and Logan 10-inch upsize						
10-5	*No member communities. Logan 100%						
10-6	*No member communities. Logan 100%						

10-Year Percent Responsible

Project Number	Logan City Flow (%)	Providence Flow (%)	Smithfield Flow (%) ¹	Hyde Park Flow (%)	North Logan Flow (%)	River Heights Flow (%)	Nibley Flow (%)
10-1	2%	98%	0%	0%	0%	0%	0%
10-2	11%	0%	59%	30%	0%	0%	0%
10-3	25%	75%	0%	0%	0%	0%	0%
10-4	*No member communities. Developer responsible for 8-inch minimum and Logan 10-inch upsize						
10-5	*No member communities. Logan 100%						
10-6	*No member communities. Logan 100%						

- At buildout, Smithfield is projected to have 66% of the contributing flow and Hyde Park is projected to have 34% of the contributing flow at their shared outfall.

10-Year Cost Sharing

Project Number	Project Cost	Logan City Cost	Providence Cost	Smithfield Flow Cost	Hyde Park Cost	North Logan Cost	River Heights Cost	Nibley Cost
10-1	\$4,502,000	\$90,040	\$4,411,960	\$0	\$0	\$0	\$0	\$0
10-2	\$11,126,000	\$1,223,860	\$0	\$6,564,340	\$3,337,800	\$0	\$0	\$0
10-3	\$4,440,000	\$1,110,000	\$3,330,000	\$0	\$0	\$0	\$0	\$0
10-4	\$1,345,000	\$1,345,000	\$0	\$0	\$0	\$0	\$0	\$0
10-5	\$12,000	\$12,000	\$0	\$0	\$0	\$0	\$0	\$0
10-6	\$6,000	\$6,000	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$21,431,000	\$3,786,900	\$7,741,960	\$6,564,340	\$3,337,800	\$0	\$0	\$0

Flow Distribution for 10-year Projects

Project Number	Existing flow rate	Future flow rate	Existing %	Future %
10-1	1663.06	3091	54%	46%
10-2	2237.98	9519.95	24%	76%
10-3	1663.06	3091	54%	46%
10-4	14	45	31%	69%
10-5	469.4	485	97%	3%
10-6	2	2	100%	0%

APPENDIX J

USU Growth Projections

USU Growth Summary Table

Year	Flow Rate (gpm)	Cumulative Additional Flow (gpm)	Total ERUs	Cumulative Additional ERUs	Description
2025	405	0	2,777	0	Existing System
2030	463	58	3,174	397	5-Year Development
2035	513	108	3,520	743	10-Year Development
2045	590	185	4,044	1,267	20-Year Development

Demand Assumptions

USU Residential

Avg apartment size	700 sq. ft.
Avg occupants per apt.	6
Indoor use per apartment	180 gpd/unit
Occupancy days per year	313
AYD use per apartment	0.228229467

USU Commercial

80% Retail
20% Restaurant
100% Total

Retail	333.333333 sq ft per employee
Retail	25 gpd/employee
Total retail	75 gpd per 1000 square feet

Restaurant	11.03896104 seats per 1,000 square feet (from previous analysis of similar restaurants)
Restaurant	35 gpd/seat (state standards)
Total restaurant	386 gpd per 1,000 square feet

Blended average	137.2 gpd per 1,000 square feet
-----------------	---------------------------------

Working days	6 per week on average
Average yearly demand	0.131368018 ac-ft/yr per 1,000 square feet

USU Academic

50% Classroom
50% Office (faculty, staff, etc.)
100% Total

Academic workdays	200 per year
Office space	3 Employees per 1000 square feet
Office peak day use	25 gpd/employee per R309
Office peak day use	75 gpd/1000 square feet peak day
Peak day/avg day	1.825 R309-510 says 2 but that more stringent can be used. Using academic days.
Office AYD	0.04603331 ac-ft/yr/1000 square feet AYD

Student classroom days	157 per year
Student use pdd	15 gpd/student per R309
Student density	9 students per 1,000 square feet
PDD water use	135 gpd per 1,000 square feet
Student AYD	0.065045067 ac-ft/yr/1000 square feet AYD

Blended average PDD	105 gpd/1000 square feet
Blended average AYD	0.038552897 ac-ft/yr/1000 square feet

USU Recreational

Summer Gym Days	40
School Gym Days	75
Gym Space	20 participants per 1,000 square feet
Gym Peak Day Use	10 gpd/participant
Gym Peak Day Use	200 gpd/1,000 square feet peak day
Gym AYD	0.070584408

Building	SQ FT	Demand (gpd/unit or gpd/1,000 sqft)	Projected Demand (gpd)	Projected Demand (gpm)	USU Subbasin
Alumni Relations	14,700	94.5	1,389.2	1.0	13
Vet Science	106,000	94.5	10,017.0	7.0	3
Janet Quinney Lawson	26,000	94.5	2,457.0	1.7	3
Distance Ed	40,000	94.5	3,780.0	2.6	3
Industrial Science	36,195	94.5	3,420.4	2.4	12
Theater/fine arts	114,000	94.5	10,773.0	7.5	1
East Campus Office	11,800	94.5	1,115.1	0.8	0
Facilities	60,000	94.5	5,670.0	3.9	0
Alumni	10,819	67.5	730.3	0.5	1
HR	4,970	67.5	335.5	0.2	1
Bullen Hall	33,150	162	7,671.9	5.3	1
Richards Hall	66,824	162	15,465.0	10.7	12
Canyon Crest Suites	129,000	162	29,854.3	20.7	12
Central Suites	130,000	162	30,085.7	20.9	12
Mountain View Tower	77,245	162	17,876.7	12.4	12
Intermountain	23,000	94.5	2,173.5	1.5	12
Human Services	121,000	94.5	11,434.5	7.9	3
Edith Bowen	82,900	94.5	7,834.1	5.4	3
Academic	100,000	94.5	9,450.0	6.6	3
College of Education	65,000	94.5	6,142.5	4.3	3
Cain College of Arts	3,612	67.5	243.8	0.2	1
Biology and NR	50,000	94.5	4,725.0	3.3	2
Natural Resources	10,000	94.5	945.0	0.7	2
Biotechnology Center	30,000	94.5	2,835.0	2.0	2
Life Sciences	103,000	94.5	9,733.5	6.8	2
University Inn	59,000	94.5	5,575.5	3.9	2
Taggart Student Center	23,000	94.5	2,173.5	1.5	2
David B. Haight Center (DBHC)	2,600	94.5	245.7	0.2	2
Living Learning Comm	64*	162	10,368.0	7.2	2
Nutrition and Food	73,000	94.5	6,898.5	4.8	4
Ground Main	10,000	94.5	945.0	0.7	4
Info. Tech services	28,000	94.5	2,646.0	1.8	4
Forestry Science Lab	8,500	94.5	803.3	0.6	4
Aggie Village	192*	162	31,104.0	21.6	5
Aggie Townhomes	76*	162	12,312.0	8.6	5
Housing office	18,000	94.5	1,701.0	1.2	5
Veterinary Dia. Lab	22,000	94.5	2,079.0	1.4	5
Teaching greenhouse	1,800	94.5	170.1	0.1	5
Office Space	25,000	94.5	2,362.5	1.6	5
Early childhood ed	65,000	94.5	6,142.5	4.3	7
Rec Center	105,000	180	18,900.0	13.1	7
HPER	100,000	94.5	9,450.0	6.6	7
Spectrum	71,000	180	12,780.0	8.9	8
Energy Plant	25,000	94.5	2,362.5	1.6	8
Eccles Business	80,000	94.5	7,560.0	5.3	9
Huntsman Hall	125,000	94.5	11,812.5	8.2	9
Family Life	46,745	94.5	4,417.4	3.1	9
Anthropology	156,000	94.5	14,742.0	10.2	9
Technology	34,000	94.5	3,213.0	2.2	10
Merrill Hall	15,805	162	3,657.7	2.5	11
Engineering Building	106,483	94.5	10,062.6	7.0	11
Engineering Innovation	43,896	94.5	4,148.2	2.9	11
engineering lab	156,345	94.5	14,774.6	10.3	11
science engineering research	14,600	94.5	1,379.7	1.0	11
Library	305,000	94.5	28,822.5	20.0	11
Eccles Conference Center	15,000	94.5	1,417.5	1.0	11
Ag Sciences	125,000	94.5	11,812.5	8.2	11
geology	91,000	94.5	8,599.5	6.0	11
animal sciences	27,090	94.5	2,560.0	1.8	11
Widtsoe Hall	59,670	94.5	5,638.8	3.9	11
Military Science	10,000	94.5	945.0	0.7	13
Field House	56,365	180	10,145.7	7.0	13
Wasatch Hall	5,117	162	1,184.1	0.8	14
Summit Hall	5,081	162	1,175.8	0.8	14
San Juan Hall	5,113	162	1,183.3	0.8	14
Snow Hall	5,100	162	1,180.3	0.8	14
Lundstrom LLC	3,800	94.5	359.1	0.2	14
Aggie Village	24*	162	3,888.0	2.7	15
Aggie Village	252*	162	40,824.0	28.4	16
Rich Hall	5,089	162	1,177.8	0.8	16
Morgan Hall	5,116	162	1,183.9	0.8	16
Davis Hall	5,087	162	1,177.3	0.8	16
Jones Hall	5,119	162	1,184.7	0.8	16
West Stadium Villa	Numbers came from billing data rather than projections		3,071.4	2.1	17
Blue Square Housing	92*	162	14,904.0	10.4	17
Athletics Academics Complex	69,000	180	12,420.0	8.6	18
Student Health and Wellness	27,000	94.5	2,551.5	1.8	19
Public Safety	22,000	94.5	2,079.0	1.4	20
Stan Laub Training Center	110,000	180	19,800.0	13.8	21
poisonous plant research	31,800	94.5	3,005.1	2.1	21
Total	-	-	583,236	405	-

*Actual number of units was known and was used in lieu of square footage

LOS 210 gpd/ERU

USU Basin	gpd	gpm	ERUs
Basin 0	6,785.1	4.7	32
Basin 1	19,754.4	13.7	94
Basin 2	36,601.2	25.4	174
Basin 3	51,115.1	35.5	243
Basin 4	11,292.8	7.8	54
Basin 5	49,728.6	34.5	237
Basin 6	0.0	0.0	0
Basin 7	34,492.5	24.0	164
Basin 8	15,142.5	10.5	72
Basin 9	38,531.9	26.8	183
Basin 10	3,213.0	2.2	15
Basin 11	92,873.7	64.5	442
Basin 12	98,875.6	68.7	471
Basin 13	12,479.9	8.7	59
Basin 14	5,082.6	3.5	24
Basin 15	3,888.0	2.7	19
Basin 16	45,547.8	31.6	217
Basin 17	17,975.4	12.5	86
Basin 18	12,420.0	8.6	59
Basin 19	2,551.5	1.8	12
Basin 20	2,079.0	1.4	10
Basin 21	22,805.1	15.8	109
Total	583,235.5	405.0	2,777

h Projections

1-5 Years

Building Name	SQ FT	Demand (gpd/unit or gpd/1,000 sqft)	Projected Demand (gpd)	Projected Demand (gpm)	USU Subbasin
Growth					
University Reserve	17,403.0	94.5	1,644.0	1.1	1
15A	116,000.0	94.5	10,962.0	7.5	3
106A	110,000.0	162.0	25,451.1	17.7	12
HPER	80,000.0	180.0	14,400.0	10.0	7
BMR Addition	10,000.0	94.5	7,560.0	5.3	2
Life Sciences	100,000.0	94.5	9,450.0	6.6	2
CHASS	50,000.0	94.5	4,725.0	3.3	9
Future Housing 1	110,000.0	162.0	25,451.1	17.7	12
Future Museum	12,000.0	123.5	1,482.0	1.0	1
Future Admin (405)	5,847.0	67.5	894.7	0.3	4
Demo					
Demo 105 (Mountain View)	77,345.0	162.0	12,526.3	12.4	12
Demo 12C (Office Space)	5,274.0	67.5	356.0	0.2	9
Projected Growth					
			101,532.3	70.5	
			18,232.7	12.7	
			63,299.6	37.8	

5-10 Years

Building Name	SQ FT	Demand (gpd/unit or gpd/1,000 sqft)	Projected Demand (gpd)	Projected Demand (gpm)	USU Subbasin
Growth					
Student Rec	200,000.0	180.0	36,000.0	25.0	1
Spectrum Add	46,000.0	180.0	8,280.0	5.8	3
Future Housing 2	26,000.0	162.0	6,017.1	4.2	12
Future Housing 1	69,000.0	162.0	15,981.6	11.1	12
Future Housing 3	46,000.0	162.0	10,452.0	7.4	12
Future Academic 1	75,000.0	94.5	7,087.5	4.9	12
Future Commercial	34,000.0	123.5	4,198.3	2.9	12
Demo					
Demo 76 (Richards Hall)	66,824.0	162.0	15,465.0	10.7	12
			88,197.2	61.2	
			15,465.0	10.7	
			72,732.2	50.5	

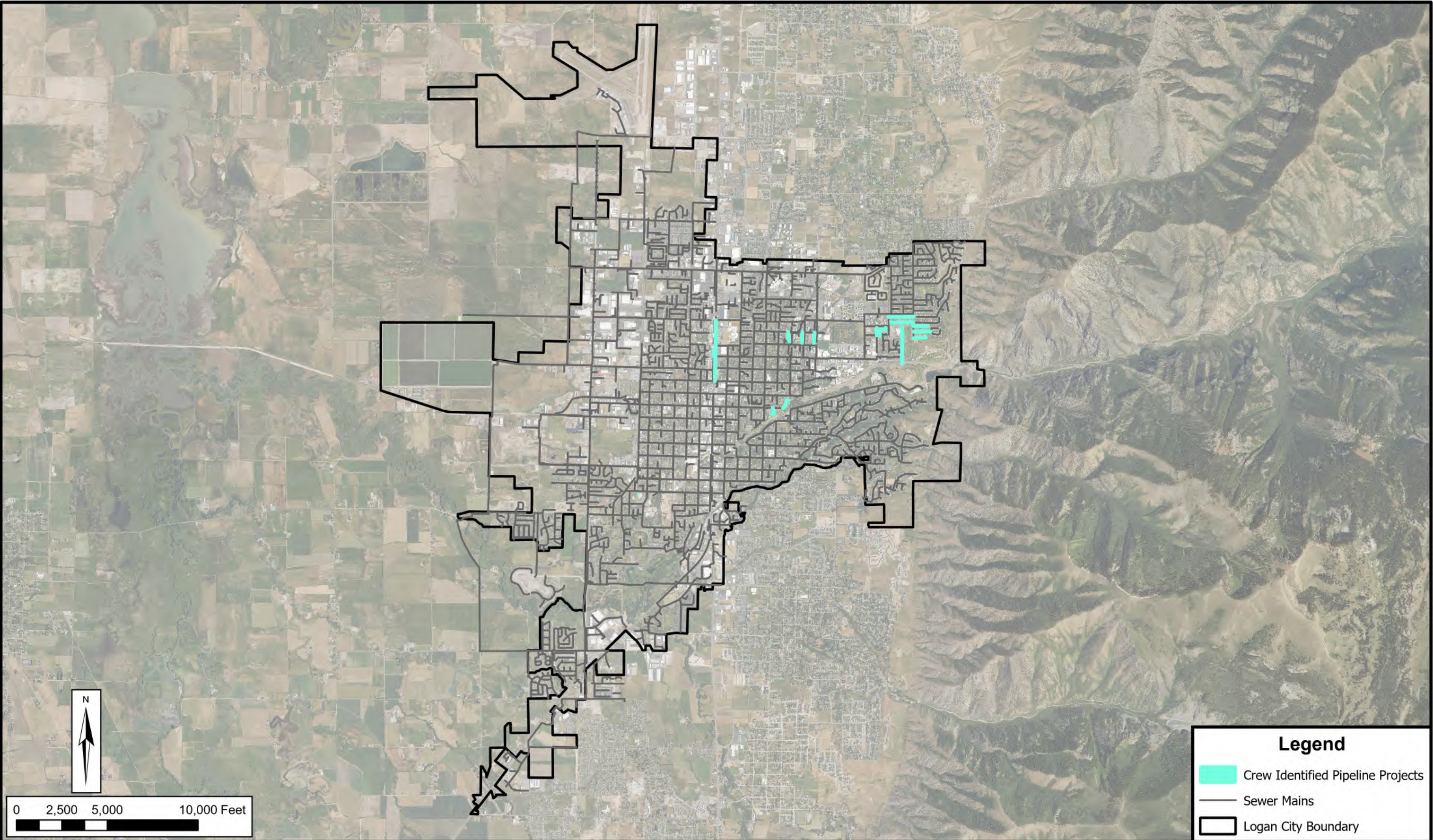
10-20+ Years

Building Name	SQ FT	Demand (gpd/unit or gpd/1,000 sqft)	Projected Demand (gpd)	Projected Demand (gpm)	USU Subbasin
Growth					
Future Academic 2	79,000.0	94.5	7,465.5	5.2	7
Future Academic 3	95,000.0	94.5	8,977.5	6.2	9
Future Academic 4	80,000.0	94.5	7,560.0	5.3	1
Future Dining	60,000.0	347.4	20,844.0	14.5	1
Industrial and Tech	168,000.0	94.5	15,876.0	11.0	10
South Residence	108,000.0	162.0	24,994.3	17.4	11
Future Housing (13)	20,216.0	162.0	4,683.2	3.3	11
Future Academic (7)	47,547.0	94.5	4,493.3	3.1	1
Future Housing (33)	13,146.0	162.0	3,042.4	2.1	10
Future Housing (32)	33,435.0	162.0	7,737.8	5.4	10
Future Housing (11)	15,077.0	162.0	3,489.2	2.4	14
Future Housing (12)	15,101.0	162.0	3,494.8	2.4	10
Future Housing (34)	8,593.0	162.0	1,588.7	1.4	10
Future Housing (26)	4,724.0	162.0	1,093.3	0.8	10
Future Housing (24)	5,001.0	162.0	1,157.1	0.8	10
Future Housing (23)	5,000.0	162.0	1,157.1	0.8	10
Future Housing (25)	5,000.0	162.0	1,157.1	0.8	10
Future Housing (37)	4,733.0	162.0	1,093.0	0.8	10
Future Housing (16)	5,000.0	162.0	1,157.1	0.8	10
Future Housing (31)	3,422.0	162.0	791.9	0.5	10
Future Housing (15)	4,939.0	162.0	1,140.7	0.8	10
Future Housing (28)	3,422.0	162.0	791.9	0.5	10
Future Housing (12)	5,000.0	162.0	1,157.1	0.8	14
Future Academic (47)	10,040.0	94.5	948.8	0.7	11
Future Academic (39)	7,418.0	94.5	704.8	0.5	2
Future Academic (41)	12,713.0	94.5	1,201.4	0.8	10
Future Academic (40)	3,252.0	94.5	307.3	0.2	1
Future Academic (45)	38,106.0	94.5	3,601.0	2.5	1
Future Academic (46)	27,039.0	94.5	2,555.3	1.8	1
Future Commercial (54)	10,287.0	123.5	1,270.2	0.9	0
Future Mixed Use (52)	13,810.0	123.5	1,709.3	1.2	0
Future Mixed Use (111)	13,572.0	123.5	1,675.9	1.2	0
Future Mixed Use (51)	13,763.0	123.5	1,699.5	1.2	0
Future Housing (76)	15,079.0	162.0	3,489.7	2.4	10
Future Housing (101)	10,835.0	162.0	2,897.3	1.7	10
Future Housing (58)	19,151.0	162.0	4,432.1	3.1	10
Future Housing (57)	19,578.0	162.0	4,530.9	3.1	10
Future Housing (55)	8,980.0	162.0	1,872.3	1.3	10
Future Housing (56)	15,079.0	162.0	3,489.7	2.4	14
Demo					
Future Housing (88,87,80,91,92,89,93,95,98)	42,508.0	162.0	9,837.1	6.8	3
Future Housing (86,73,97,99,71,84)	30,007.0	162.0	6,944.5	4.8	10
Future Housing (84,61,100,70)	18,902.0	162.0	4,374.5	3.0	3
Future Housing (62)	5,001.0	162.0	1,157.4	0.8	5
Future Housing (86, 69,65)	15,000.0	162.0	3,471.4	2.4	1
Future Housing (63,64)	9,448.0	162.0	2,186.5	1.5	3
Future Housing (1607)	4,032.0	162.0	933.1	0.6	10
Future Housing (60)	5,005.0	162.0	1,158.1	0.8	1
Future Housing (95)	4,029.0	162.0	932.4	0.6	10
Future Housing (36)	4,723.0	162.0	1,093.0	0.8	10
Future Housing (38)	4,726.0	162.0	1,093.7	0.8	10
Future Housing (18)	5,001.0	162.0	1,157.4	0.8	10
Future Housing (19)	5,000.0	162.0	1,157.1	0.8	10
Future Housing (35)	5,000.0	162.0	1,157.1	0.8	10
Demo					
Demo 67 (HR - Office)	4,970.0	67.5	335.5	0.2	1
Demo 78 (Academic)	3,612.0	94.5	341.3	0.2	1
Demo P9 (Academic)	10,819.0	94.5	1,022.4	0.7	1
Merrill Hall	15,805.0	162.0	3,657.7	2.5	11
Rich Hall	5,089.3	162.0	1,177.8	0.8	10
Morgan Hall	5,115.8	162.0	1,183.9	0.8	10
Davis Hall	5,087.2	162.0	1,177.3	0.8	10
Jones Hall	5,119.2	162.0	1,184.7	0.8	10
Wasatch Hall	5,116.7	162.0	1,184.1	0.8	14
Summit Hall	5,080.3	162.0	1,175.8	0.8	14
San Juan Hall	5,112.9	162.0	1,183.3	0.8	14
1st half of Aggie Village	34,603.7	162.0	32,771.1	22.8	10
2nd half of Aggie Village	110,163.8	162.0	25,499.0	17.7	3
USC	19,625.9	162.0	4,495.7	3.1	14
Forage and Range Research, Lab, etc.	41,693.6	94.5	3,940.0	2.7	1
Demo 77 (Buller Hall)	33,150.0	162.0	7,871.9	5.3	1
			157,888.8	117.5	
			87,987.7	61.1	
			109,901.0	76.4	

USU Basin	Existing Flow (gpd)	Existing Flow (gpm)	Existing ERUs	Cumulative Flow (gpd)	Cumulative Flow (gpm)	Cumulative ERUs	Total Future (gpd)	Total Future (gpm)	Total Future ERUs
Basin 0	6,785.1	4.7	32.3	10,844.0	7.5	50	17,629.1	12.3	83.0
Basin 1	18,754.4	13.7	94.1	33,660.3	23.4	160	53,414.7	37.1	254.4
Basin 2	36,602.2	25.4	174.1	53,714.8	37.3	254	90,316.0	62.7	426.1
Basin 3	51,115.1	35.5	243.4	10,962.0	7.6	52	62,077.1	43.1	295.6
Basin 4	11,292.8	7.8	53.8	394.7	0.3	2	11,687.4	8.1	55.7
Basin 5	49,726.6	34.5	236.8	-3,309.8	-2.3	-10	46,416.8	32.2	221.0
Basin 6	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0
Basin 7	34,492.5	24.0	164.3	21,865.5	15.2	104	56,358.0	39.1	268.4
Basin 8	15,142.5	10.5	72.1	8,280.0	5.8	39	23,422.5	16.3	111.5
Basin 9	18,511.9	16.8	183.5	4,369.0	3.0	21	42,900.9	29.8	204.3
Basin 10	3,213.0	2.2	15.3	17,077.4	11.9	81	20,290.4	14.1	96.4
Basin 11	92,873.7	64.5	442.2	26,968.5	18.7	128	119,842.2	83.2	570.7
Basin 12	98,875.4	68.7	470.8	61,489.9	42.7	289	160,365.3	111.4	761.6
Basin 13	12,479.9	8.7	59.4	0.0	0.0	0	12,479.9	8.7	59.4
Basin 14	5,082.6	3.5	24.2	97.2	0.1	0	5,179.8	3.6	24.7
Basin 15	3,888.0	2.7	18.5	0.0	0.0	0	3,888.0	2.7	18.5
Basin 16	45,547.8	31.6	216.9	19,609.4	13.6	93	65,157.2	45.2	310.3
Basin 17	17,975.4	12.5	85.6	0.0	0.0	0	17,975.4	12.5	85.6
Basin 18	12,420.0	8.6	59.1	0.0	0.0	0	12,420.0	8.6	59.1
Basin 19	2,551.5	1.8	12.2	0.0	0.0	0	2,551.5	1.8	12.2
Basin 20	2,079.0	1.4	9.9	0.0	0.0	0	2,079.0	1.4	9.9
Basin 21	22,805.1	15.8	108.6	0.0	0.0	0	22,805.1	15.8	108.6
Total	583,235.5	405.0	2,777	266,022.7	184.7	1,267	849,258.2	589.8	4,044

APPENDIX K

Crew Identified CIP Projects



A	Shape	ID	Type_Metho	Source	Sched_Yr	Size_in	Status	Comments	Name	Location	Fire	Growth	Maint	Distr	YrLabel	SrcLabel	BUFF_DIST	ORIG_FID	OBJECTID_1	FacilityID	Owner	LinePrior	Method	Notes	AddNotes	Schedule	Dia_in	Cost_Yr	Total_Cost	Discipline	PriorityRa	Cost_Notes	Cost_Updat	PlannedPer	Shape_Leng	Shape_Area			
0	Polygon	WW-8	Lining	CIP xls	2023	0			1500 E from Hwy 89 to Ellendale Ave	974 N 1500 E		0	0	0	0		10	1	0	SM00597	Logan	9	Lining	CIP Spreadsheet	Spot repair locations	2023	0	0	0	0	Wastewater	0		0	0	2025-2030	4028.94015	39974.56298	
1	Polygon	WW-23	Lining	Crew	0	0		Calculated	470 E from 250 N to 300 N	287 N 500 E		0	0	0	0		10	81	0	SM01573	Logan	0	Lining			0	0	0	0	0	Wastewater	0		0	0	2025-2030	955.746933	9262.136643	
2	Polygon	WW-32	Lining	Crew	2024	0			Main St from 750 N to 700 N			0	0	0	0		10	141	0	SM02993		0	Lining			2024	8	0	0	0	Wastewater	0		0	0	2025-2030	821.252797	7898.307938	
3	Polygon	WW-33	Lining	Crew	2024	0			Hillcrest Ave from Ellendale to 900 N			0	0	0	0		10	142	0			0	Lining			2024	8	0	0	0	Wastewater	0		0	0	2025-2030	1596.1555	15684.91591	
4	Polygon	WW-52	Lining	Crew	0	0				Evergreen DR.	1300 E 900 N		0	0	0	0		10	168	0		Logan		0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	846.091692	8146.728381
5	Polygon	WW-53	Lining	Crew	0	0				1080 N	1400 E to 1600 E		0	0	0	0		10	169	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	2876.709989	28452.58611
6	Polygon	WW-54	Lining	Crew	0	0				University Dr	1400 E to 1600 E		0	0	0	0		10	170	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	2495.940077	24644.93737
7	Polygon	WW-55	Lining	Crew	0	0		Crew		Sunset Dr.	1600 E		0	0	0	0		10	171	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	1437.86466	14064.53047
8	Polygon	WW-62	Lining	Crew	0	0				900 N	770 E		0	0	0	0		10	179	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	1212.830665	11814.06945
9	Polygon	WW-63	Lining	Crew	0	0				675 E	900 N		0	0	0	0		10	180	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	1234.525151	12031.11564
10	Polygon	WW-64	Lining	Crew	0	0				575 E	900 N		0	0	0	0		10	181	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	1097.537078	10661.40497
11	Polygon	WW-65	Lining	Crew	0	0				Mainstreet	1000 N to 500 N		0	0	0	0		10	182	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	6791.853648	67646.58711
12	Polygon	WW-66	Lining	Crew	0	0				Country Club Dr	Sunset Dr		0	0	0	0		10	183	0				0	Lining			0	0	0	0	Wastewater	0		0	0	2025-2030	1938.76791	19073.39434
13	Polygon	WW-67	Lining	Crew	0	0				Saddle Hill Dr		0	0	0	0		10	184	0				0	Lining		0	0	0	0	Wastewater	0		0	0	2025-2030	1657.963647	16265.319		
14	Polygon	WW-68	Lining	Crew	0	0				Boulevard	300 N		0	0	0	0		10	185	0				0	Lining		0	0	0	0	Wastewater	0		0	0	2025-2030	1179.507182	11480.96562	