SOUTH SALT LAKE
CITY ON THE
MOVE

CITY COUNCIL
SHARLA BEVERLY
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IRVIN JONES
KEVIN D. RAPP
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South Salt Lake City Council
REGULAR MEETING AGENDA

Public notice is hereby given that the **South Salt Lake City Council** will hold a Regular Meeting on **Wednesday, August 13, 2014** in the City Council Chambers, 220 East Morris Avenue, commencing at **7:00 p.m.**, or as soon thereafter as possible.

Conducting: Kevin Rapp, District 2
Council Chair: Irvin H. Jones, Jr.
Sergeant at Arms: Jennifer Smartt

Opening Ceremonies

1. Welcome/Introductions — Kevin Rapp
2. Serious Moment of Reflection/Pledge of Allegiance — Michael Rutter
3. Special Recognition – Youth City Council Scholarship — Jennifer Allred

Approval of Minutes

July 16, 2014 Special Meeting
July 30, 2014 Work Meting
July 30, 2014 Regular Meeting

No Action Comments

1. Scheduling — City Recorder
2. Citizen Comments/Questions
   a. Response to Comments/Questions (at discretion of conducting council member)
3. Mayor Comments
4. City Attorney Comments
5. City Council Comments
6. Information – Update on Streetcar Zoning Ordinance — Frank Lilly

Action Items

Unfinished Council Business

1. A Resolution of the City Council of the City of South Salt Lake Adopting the Sanitary Sewer Master Plan — Dennis Pay
2. A Resolution of the City Council of the City of South Salt Lake Adopting the Water Conservation Plan — Dennis Pay
3. An Ordinance of the City of South Salt Lake City Council Amending the Future Land Use Map Designation of the General Plan from General Commercial to Medium Density Residential . Approx 137 & 115 West 303 South — Hayley Pratt
4. An Ordinance of the City of South Salt Lake City Council Amending the Land Use District Base Designation from Business Commercial (BC) to Residential Multiple (RM) and a Planned Unit Development Overlay in an Area Described Herein — Hayley Pratt

New Council Business

1. A Resolution Converting Property/Money in Policy Custody to Public Use — Paul Roberts

Motion for Closed Meeting

See Page Two for Continuation of Agenda

In accordance with State Statute and Council Policy, one or more Council Members may be connected via speakerphone.

Those needing auxiliary communicative aids or other services for this meeting should contact Craig Burton at 801 483-6027, giving at least 24 hours' notice.

Each of the Deseret News and Salt Lake Tribune was advised of the Agenda of the Regular Meeting of the City Council to be held Wednesday, August 13, 2014, by fax transmittal of the foregoing agenda on Friday, August 8, 2014.

Craig D. Burton, City Recorder
Dated this 8th day of August, 2014

Craig D. Burton, City Recorder

Citizen Comments/Question Policy

Time is made available for anyone in the audience to address the Council and/or Mayor concerning matters pertaining to City business. When a member of the audience addresses the Council and/or Mayor, he or she will come to the podium and state his or her name and address. Citizens will be asked to limit their remarks/questions to five (5) minutes each. The conducting Councilmember shall have discretion as to who will respond to a comment/question. In all cases the criteria for response will be that comments/questions must be pertinent to City business, that there are no argumentative questions and no personal attacks. Some comments/questions may have to wait for a response until the next regular council meeting. The conducting Councilmember will inform a citizen when he or she has used the allotted time. Grievances by City employees must be processed in accordance with adopted personnel rules.

CERTIFICATE OF COMPLIANCE WITH OPEN MEETING LAW

The undersigned, duly qualified and acting City Recorder of the City of South Salt Lake, does hereby certify that on the 8th day of August, 2014, pursuant to Utah Code Annotated Section 52-4-202 (1953), as amended, there was posted (at least 24 hours prior to the meeting time) at the regular meeting place of the City Council of the City of South Salt, written notice of the Agenda or the Regular Meeting of the Council, a copy of which is attached and incorporated herein as Exhibit "A". The undersigned does further certify that there was mailed or delivered to all persons shown on Exhibit "B", Notice of Agenda of the above mentioned regular meeting, a copy of which is attached hereto and incorporated herein.

Name: CRAIG D. BURTON
Title: CITY RECORDER

Signature:

Witnessed the 8th day of August, 2014 by
Name: SHERI MILLER

Signature:

CITY OF SOUTH SALT LAKE
CITY COUNCIL MEETING

COUNCIL MEETING	Wednesday, August 13, 2014 7:00 p.m.
CITY OFFICES	220 East Morris Avenue – Suite 200 South Salt Lake, Utah 84115
PRESIDING	Council Vice-Chair LeRoy Turner
CONDUCTING	Council Member Ryan Gold
SERIOUS MOMENT OF REFLECTION/ PLEDGE OF ALLEGIANCE	Council Member Debbie Snow

SPECIAL RECOGNITION – Youth City Council Scholarship
This item was moved to the end of the meeting.

SERGEANT AT ARMS Jennifer Smartt

COUNCIL MEMBERS PRESENT:
Sharla Beverly, Ryan Gold, LeRoy Turner
and Debbie Snow

COUNCIL MEMBERS EXCUSED:
Irvin H. Jones, Jr., Kevin Rapp and Michael Rutter

STAFF PRESENT:
Mayor Cherie Wood
Charee Peck, Chief of Staff
Lyn Creswell, City Attorney
Paul Roberts, Deputy City Attorney
Glenn Smith, Urban Livability Director
Mont Roosendaal, Public Assets Director
Dennis Pay, Public Works Director
Kari Cutler, Promise South Salt Lake Director
Hayley Pratt, City Planner
Craig Burton, City Recorder
Paula Melgar, Deputy City Recorder

OTHERS PRESENT:
See attached list

APPROVAL OF MINUTES

July 16, 2014 Special Meeting. Council Member Beverly moved to approve these minutes.

MOTION: Sharla Beverly
SECOND: Debbie Snow
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

July 30, 2014 Work Meeting. Council Member Beverly moved to approve these minutes.

MOTION: Sharla Beverly
SECOND: LeRoy Turner
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

July 30, 2014 Regular Meeting. Council Member Turner moved to approve these minutes.

MOTION: LeRoy Turner
SECOND: Sharla Beverly
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

NO ACTION COMMENTS

1. **SCHEDULING.** The City Recorder informed those at the meeting of upcoming events, meetings, activities, etc.

2. **CITIZEN COMMENTS/QUESTIONS.** None.

3. **MAYOR COMMENTS.** Mayor Wood advised that Head Start has offered to give Council Members a tour of their new facility.

4. CITY ATTORNEY COMMENTS. City Attorney, Lyn Creswell, advised that Fire Ops 101 is Saturday, August 23, for those who are signed up.

5. CITY COUNCIL COMMENTS. Council Member Beverly enjoyed the tour of the Head Start facility.

Council Member Gold enjoyed the fireworks show at the Chinatown opening. He took a tour of the grocery store and invited everyone to visit.

6. INFORMATION.

a. **Update on streetcar zoning ordinance.** Deputy Community Development Director, Frank Lilly, briefed the Council on the street car ordinance and its timeline. The City has received a technical assistance grant to help hire a facilitator and develop a form based code for the east streetcar corridor. The primary vision of the form base code is to codify the vision and concerns that have been expressed in the many neighborhood meetings, the Council and the Planning Commission. The details of the form base code will be presented to the Council in a work meeting on September 3, 2014. They anticipate the first reading of the ordinance will be on September 17 agenda and hope for approval on October 8, 2014. A plan to create a community development area will be presented in the month of October as well.

UNFINISHED COUNCIL BUSINESS

1. **A resolution of the City Council of the City of South Salt Lake adopting the Sanitary Sewer Mast Plan.**

   Council Member Turner moved to adopt this ordinance.

MOTION: LeRoy Turner
SECOND: Sharla Beverly
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

2. **A resolution of the City Council of the City of South Salt Lake adopting the Water Conservation Plan.**

   Council Member Beverly moved to approve this resolution.

MOTION: Sharla Beverly
SECOND: LeRoy Turner

Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

3. **An ordinance of the City of South Salt Lake City Council amending the Future Land Use Map designation of the General Plan from General Commercial to Medium Density Residential. At approximately 137 & 115 West 3030 South.**

Council Member Turner moved to approve this ordinance.

MOTION: LeRoy Turner
SECOND: Sharla Beverly
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Nay
Turner	Aye

The motion failed because State law requires four "aye" votes with a seven member council regardless of absences or vacancies on the council.

Council Member Beverly moved to bring this item back when they have more Council members present in two weeks.

MOTION: Sharla Beverly
SECOND: LeRoy Turner
Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Nay
Turner	Aye

The motion failed because it didn't received the required four "aye" votes.

City Attorney, Lyn Creswell, advised that in a future meeting any Council Member can make a motion to bring this item back as a new business item on a future agenda.

4. **An ordinance of the City of South Salt Lake City Council amending the Land Use District Base Designation from Business Commercial (BC) to Residential Multiple (RM) and a Planned Unit Development overlay in an area described herein.** Mr. Lilly reminded the Council that the General Plan exists as an advisory document and the Planning Commission recommended that this amendment take place prior to the approval of the final plat and rezone. He feels the item should be treated on its own merits.

   Council Member Snow said the General Plan states to have this area go commercial and not insert residential randomly in the middle of what is already warehouse and commercial.

   Mr. Lilly advised that at some point a zoning amendment was made establishing a transit oriented development area at this property so the zoning in consistent.

   Council Member Snow moved to deny this ordinance.

MOTION:	Debbie Snow
SECOND:	Ryan Gold
Voice Vote:	
Beverly	Nay
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

The motion failed because it didn't received the required four "aye" votes.

NEW COUNCIL BUSINESS

1. **A resolution converting property/money in police custody to public use.** Mr. Roberts advised the Council that police sometimes seize property for evidence or it comes in as lost property. Sometimes it's for safe keeping. Sometimes they know who the owner is and sometimes they don't. If they have contact information they try to notify them to come and pick it up. After a certain amount of time, if it's not picked up or they don't have owner information, the law permits them to convert it to public use. Mr. Roberts reviewed a list of the property with the Council. The list is attached to these minutes and incorporated by this reference. Staff proposed that the bicycles be donated to a local non-profit called the Bicycle Collective. They take bikes and repair them and provide them to under privileged youth. The other property was proposed to be auctioned and sold and the money put in the General Fund. The cases have been closed out on

the money that they've seized and no owners have come forward. Illegal drugs and firearms are destroyed.

Council Member Snow moved to put this on Unfinished Business for the August 13, 2014 City Council Meeting.

MOTION:	Debbie Snow
SECOND:	LeRoy Turner
Voice Vote:	
Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

The Council then went back to Opening Ceremonies item number three, Special Recognition on the agenda.

SPECIAL RECOGNITION – Youth City Council Scholarship. Julie Davis, President of the Association of Youth City Councils, reported that Alina Dahir of the South Salt Lake Youth City Council has been awarded a $2,500 academic scholarship for college and congratulated her on this accomplishment.

Motion for Closed Meeting

Council Member Turner moved to adjourn to Closed Meeting for attorney / client communication.

MOTION:	Sharla Beverly
SECOND:	LeRoy Turner
Voice Vote:	
Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

The Council adjourned to Closed Meeting at 7:55 p.m.

In accordance with U.C.A. Section 52-4-206, 1953, as amended by Chapter 180, Laws of Utah, 1987, as amended, a recording was made of the Closed Meeting. Such recordings are protected records under Title 63, Chapter 2, Government Records Access and Management Act.

Closed Meeting ended at 8:10 p.m. Council Members returned to Council Chambers.

Council Member Beverly moved to adjourn.

MOTION: Sharla Beverly
SECOND: Debbie Snow

Voice Vote:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

The meeting adjourned at 8:11 p.m.

Irvin H. Jones, Jr., Council Chair

Craig D. Burton, City Recorder

August 13, 2014

CITY COUNCIL - REGULAR MEETING
LIST OF ATTENDEES

NAME	ADDRESS	REPRESENTING
Charee Peck	220 E Morris Ave	Mayor's Office
Paul Roberts	220 E Morris	Atty Office
Glenn Smith	220 E Morris Ave	ULA
Mont Roosendaal	220 E Morris Ave	Public Assets
Dennis Pay	195 W. Oakland Ave	PW
Kari Cutler	220 E Morris Ave	Promise SSL
Jennifer Smartt	2535 S. Main St	Sgt at Arms
JEFF CLOUSE	137 W. 3030 S.	NATIONAL COMMERCIAL PROPERTIES, LLC
PEDRO SALVADOR	137 W 3030 S	NATIONAL COMMERCIAL PROPERTIES, LLC
Maya Ellis	174 E. Commonwealth Ave	SSL YCC
Spencer Mark	4128 Garden Ave	SSL YCC
Jennifer Allred	220 E. Morris Ave.	SSL Youth City Council
Julie Davis	1847 N. 725 W. Clinton Ut	Assoc of Y.C.
Tammy Nelson	1401 W 1425 N Clinton	Assoc of Y.C.
HAYLEY PRATT	615 E 700 S UNIT 4	Community Development

RESOLUTION NO. R2014-14

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SOUTH SALT LAKE ADOPTING THE SANITARY SEWER MATER PLAN PREPARED IN MAY 2014.

WHEREAS, the City provides sanitary sewer services to many residents and businesses located within the municipality, and

WHEREAS, the City must plan for the maintenance and upgrading of the existing system, as well as accommodate new development; and

WHEREAS, advance planning will best implement these goals; and

WHEREAS, the *City of South Salt Lake Sanitary Sewer Master Plan* has been prepared by the engineering firm Hansen, Allen, & Luce, Inc.; and

WHEREAS, the master plan has been reviewed and discussed during City Council meeting; and

WHEREAS, the public have been invited to provide comment on the plan,

NOW THEREFORE, BE IT RESOLVED by South Salt Lake Council that South Salt Lake adopts the *City of South Salt Lake Sanitary Sewer Master Plan* as this jurisdiction's plan.

(signatures appear on next page)

APPROVED AND ADOPTED by the City of South Salt Lake City Council, South Salt Lake, Utah, on this 13th day of August, 2014.

BY THE CITY COUNCIL:

Irvin H. Jones, Jr.
Council Chair

City Council Vote as Recorded:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

ATTEST:

Craig D. Burton
City Recorder

CITY OF SOUTH SALT LAKE
CORPORATE
Seal
SALT LAKE COUNTY, UTAH

SOUTH SALT LAKE

SANITARY SEWER MASTER PLAN

PROJECT No.: 126.28.100

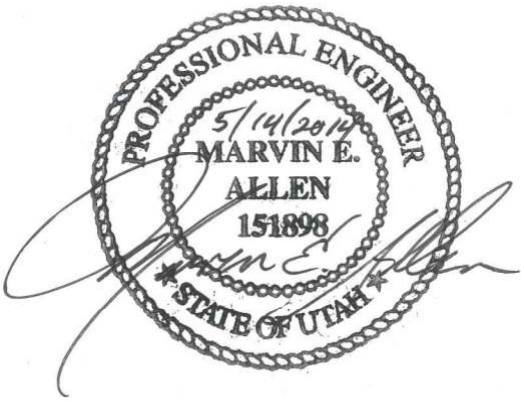
May 2014

HANSEN ALLEN & LUCE inc
ENGINEERS

CITY OF SOUTH SALT LAKE

SANITARY SEWER MASTER PLAN

(HAL Project No.: 126.28.100)



Marvin E. Allen, P.E.
Principal, Project Engineer

HANSEN ALLEN & LUCE INC
ENGINEERS

May 2014

ACKNOWLEDGEMENTS

Successful completion of this master plan was made possible by the cooperation and assistance of many individuals, including the Mayor of South Salt Lake, City Council Members, and City Staff personnel as shown below. We sincerely appreciate the cooperation and assistance provided by these individuals.

City of South Salt Lake

Mayor

Cherie Wood

City Council

Debbie A. Snow
Mike Rutter
Ryan Gold
Kevin Rapp
Sharla Beverly
Roy Turner
Irvin Jones

City Staff

Dennis Pay, Public Works Director
Ed Rufener, Deputy Director of Public Works
Corby Talbot, Wastewater/Stormwater Department Supervisor
Tory Laws, Wastewater Department Technician
Niels Melville, GIS Specialist

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CHAPTER I

INTRODUCTION

PURPOSE

The purpose of this master plan is to provide direction to The City of South Salt Lake (SSLC) regarding decisions that will be made during the next 35 years to provide an adequate sanitary sewer system for customers at the most reasonable cost.

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

BACKGROUND

The City of South Salt Lake is located in Salt Lake County. The City was incorporated in 1938 due to the need for water and sewer services (City of South Salt Lake, 2011). In 1998 SSLC annexed an area south of the City. The SSLC Sanitary Sewer System services areas of the City between Mill Creek and 2100 South.

The SSLC sanitary sewer system collects wastewater from a diverse mix of single and multi-family residences, commercial, and industrial areas. All wastewater collected by the sewer system is conveyed to Central Valley Water Reclamation Facility (CVWRF) where it is treated. CVWRF charges SSLC for treatment based on the flow quantity and the flow composition. The sewer system provides services to approximately 2,600 connections. Drinking water in the sewer service area is provided by South Salt Lake's Water Department, the Salt Lake City Department of Public Utilities, and private wells.

The 2010 US census states that SSLC's population in 2010 was above 23,600 (U.S. Census Bureau, 2010). Growth estimations used in the Drinking Water System Master Plan from the Governor's Office of Planning and Budget project a population of 44,560 for the year 2050 in SSLC (GOPB, 2008). This growth is expected to occur in four redevelopment areas in SSLC. The redevelopment areas are expected to add approximately 6,340 Equivalent Residential Connections (ERCs) to the City, 4,700 of which will contribute to the sanitary sewer system. Currently the population contributing to the sanitary sewer system is 7,780.

SCOPE

The scope of this Sanitary Sewer Master Plan includes the following:

1. Obtain and review existing sewer collection system data and information, review City staff goals for the project, and establish project management protocol.
2. Evaluate the existing wastewater collection system, develop and implement a flow monitoring plan, develop existing model, and identify deficiencies.
3. Project wastewater collection demand for the 5, 10, 15, and 35-year planning horizon.
4. Analyze available alternatives for system improvements through a future system model.
5. Prepare a capital improvement plan for the 5, 10, 15, and 35-year planning horizon, including operation and maintenance costs.
6. Make recommendations for more efficient operation of the wastewater collection system and identify any regulatory concerns for the collections system and facilities.
7. Review and update the sewer use ordinance.

AUTHORIZATION

The City of South Salt Lake selected Hansen, Allen, & Luce, Inc. (HAL) during August 2013 to complete a master plan of the City's wastewater system. Work began on the master plan during August 2013.

CHAPTER II

EXISTING WASTEWATER SYSTEM

SERVICE AREA

The service area of South Salt Lake's sanitary sewer system includes the area in the northern half of the City, extending south to Mill Creek (approximately 3000 South). The service area of the sewer system is not expected to expand, although future redevelopment will increase the loading in specific areas of the City.

EXISTING WASTEWATER SYSTEM

Information describing the sanitary sewer was compiled from GIS data provided by SSLC, a manhole survey provided by SSLC, and a manhole survey completed by Hansen, Allen, & Luce, Inc. The data were sorted and merged into GIS shapefiles of sewer manholes and sewer pipes. Additional features such as collection areas and pump locations were added to the GIS data by HAL. The existing SSLC sanitary sewer system is shown on Figure II-1.

Pipe Network

The existing SSLC sanitary sewer collection system consists of nearly 38 miles of pipeline and over 557 manholes as shown on Figure II-1. The pipe sizes range from 6-inch diameter to 33-inch diameter pipe. The system also has force main piping ranging from 4-inch diameter to 18-inch diameter pipe.

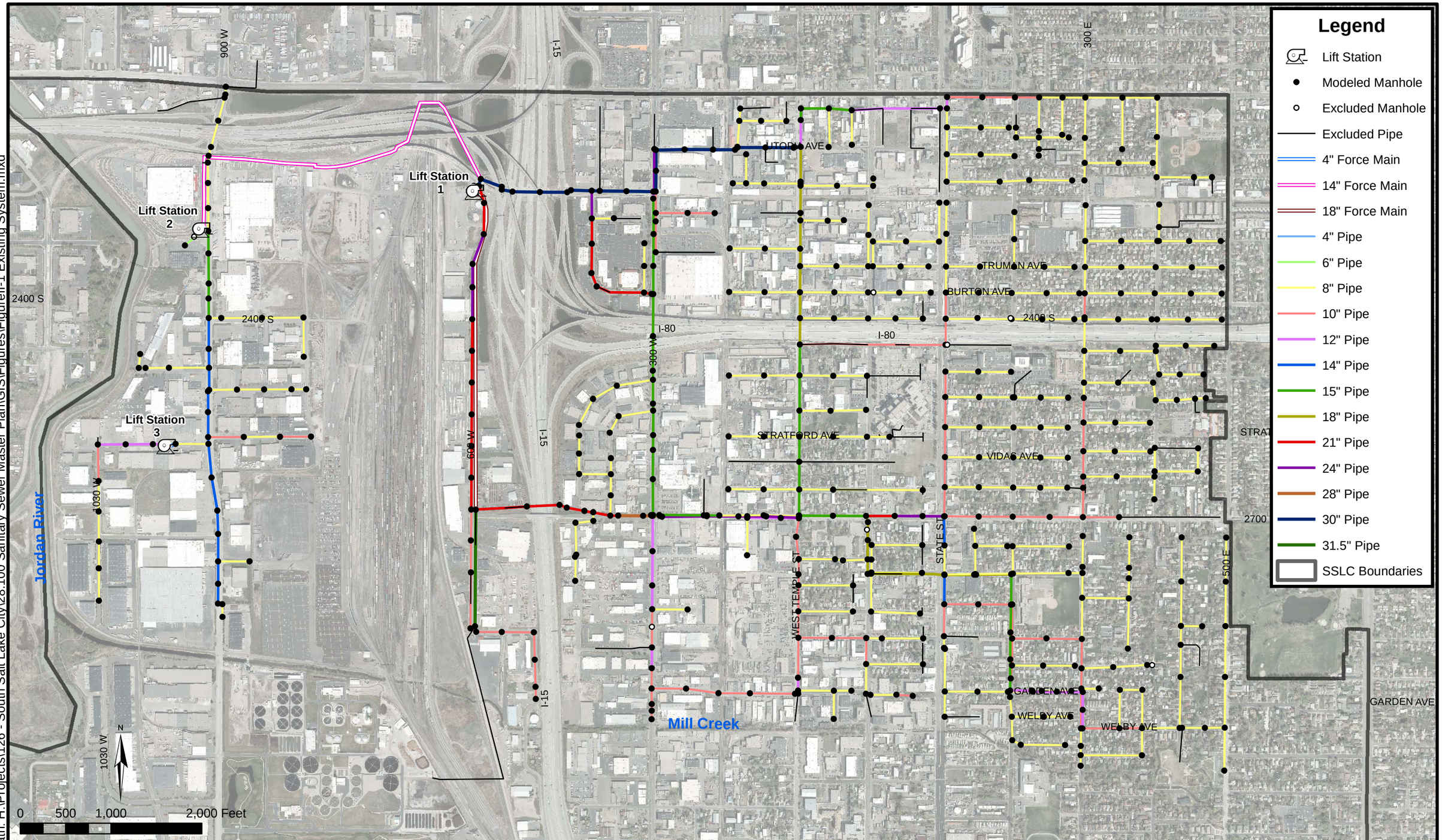
HAL met with SSLC staff to determine the correct flow direction in areas where bypass connections made the flow direction unclear.

Treatment Plant

The wastewater in the sanitary sewer system flows to the Central Valley Water Reclamation Facility (CVWRF) located at approximately 800 West Central Valley Road in SSLC. CVWRF was organized in 1978 and has a current capacity of 75 million gallons per day (CVWRF, 2008). CVWRF treats wastewater from Cottonwood Improvement District, Granger Hunter Improvement District, Kearns Improvement District, Murray City, Mt. Olympus Improvement District, The City of South Salt Lake, and Taylorsville-Bennion Improvement District.

Pump Stations

Due to the relatively flat topography of SSLC and the configuration of the original sewer system, the sanitary sewer system has three pump stations. All three pump stations are in a series with the third pump station upstream from the second pump station which is upstream from the main lift station. The locations of the pump station are shown on Figure II-1. Approximately 40% of the service area flows by gravity to the CVWRF with the rest of the service area flowing through pump stations before reaching the water reclamation facility. Table II-1 is a list of each pump station with addresses, pump capacities in gpm, the total dynamic head (TDH) at the pump in feet of water, and the pump horsepower.



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HANSEN ALLEN & LUCE inc ENGINEERS

SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

EXISTING SYSTEM

FIGURE
II-1

TABLE II-1
PUMP STATION INVENTORY

ID	PUMP TYPE	LOCATION	PUMP CAPACITY	PUMP TDH (ft)	HORSEPOWER (hp)
1	ABS	2250 S 600 W	4,100 gpm	39 ft	67 hp
	ABS		4,100 gpm	39 ft	67 hp
2	Flygt	2280 S 900 W	1,100 gpm	40 ft	15 hp
3	Flygt	949 W 2610 S	260 gpm	15 ft	2.3 hp

CHAPTER III

FLOW MONITORING

COLLECTION AREAS

A collection area is defined as a geographic area that contributes flow to a common point in the collection system. Collection areas were delineated using sewer manholes, topography, parcels, and water meters. Water meters were used in the collection area delineation because sewer flow rates were estimated using winter water use data. The collection areas provide information on where the flow from each existing water meter was assigned in the wastewater collection system model.

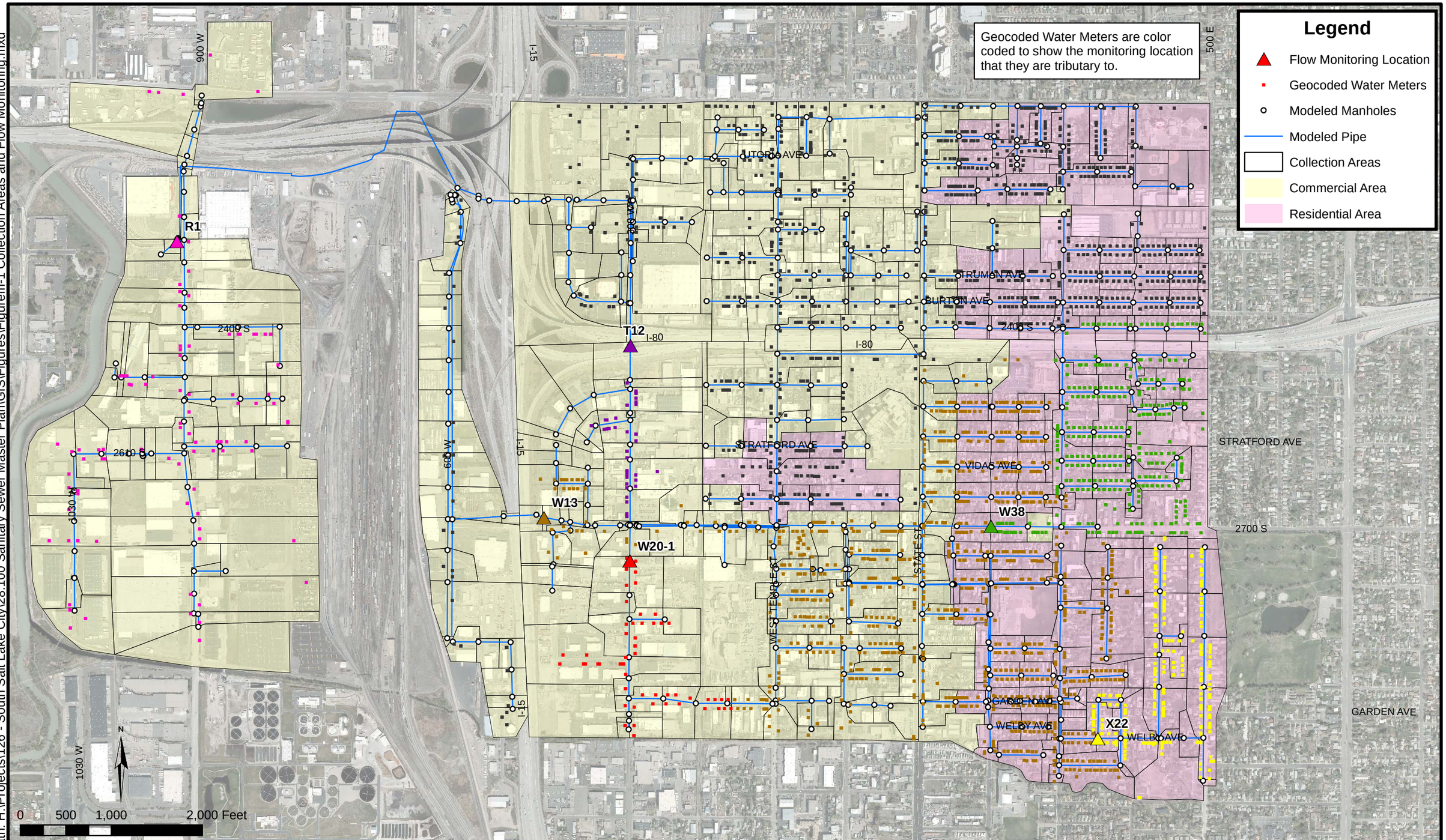
City personnel reviewed the collection areas to verify the water meters were in the correct collection area. The delineated collection areas are shown on Figure III-1.

FLOW MONITORING

The purpose of flow monitoring is to obtain flow data at several locations throughout the city to provide the basis for flow characterization, construction of a model, and calibration of the model to real values. Flow monitoring sites for this master plan were selected by the City and HAL to provide representative data to achieve the stated purposes. Selected flow monitoring locations are shown on Figure III-1.

The flow monitoring was accomplished using one American Sigma 910 Flow Meter owned by Hansen, Allen, & Luce, Inc. and five Marsh-McBirney FLO-DAR meters with HACH FL900 Flow Loggers procured by SSLC. Both the Sigma 910 and the FLO-DAR meters determine average flow velocity and flow depth. The flow rate Q is calculated based on the equation $Q = VA$, where V is the velocity and A is the flow area calculated from the measured depth of flow and the diameter of the pipe. A typical Sigma 910 meter installation is shown on Figure III-2 and a typical FLO-DAR meter installation is shown on Figure III-3. The Sigma 910 includes a data logger and a sensor connected by a data cable with an air tube. The sensor is attached to a ring that is inserted in the pipe. The ring is adjusted to fit tightly against the inner walls of the pipe with the pressure sensor located at the flow line or invert of the pipe. The FLO-DAR meter uses digital Doppler radar to sense the velocity in the open channel and ultrasonic pulse echo sensing to measure the depth in the open channel. This information is sent to the flow logger where the flow rate is calculated based on the flow area and velocity.

A flow meter was installed at each site for approximately one week. Metering data were used to create the diurnal curve used in the model and to calibrate the model. Graphs showing the recorded flow data used in the report for the six monitoring locations are located in Appendix A.



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SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

COLLECTION AREAS AND FLOW MONITORING LOCATIONS

FIGURE III-1

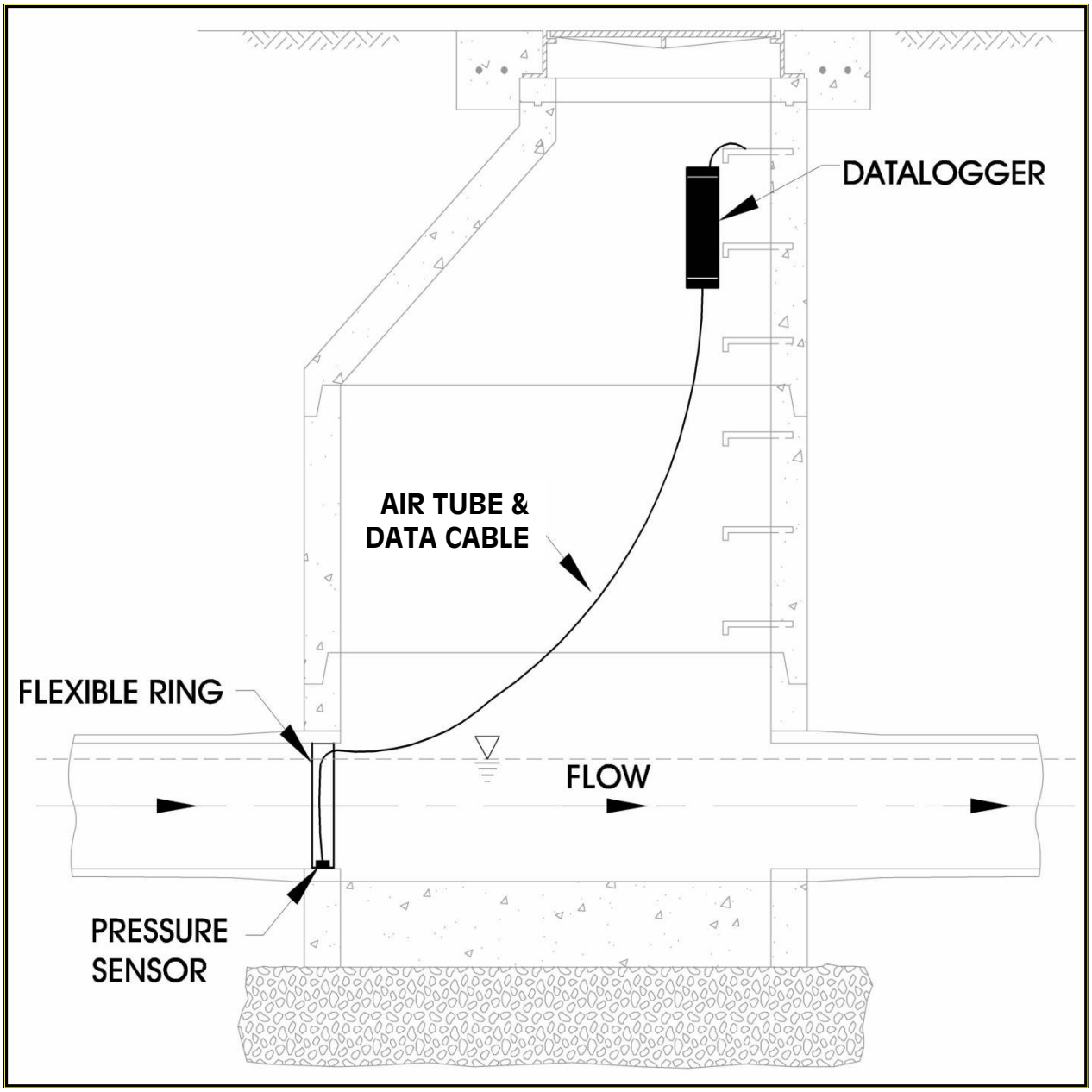


FIGURE III-2: TYPICAL SIGMA 910 FLOW METER INSTALLATION

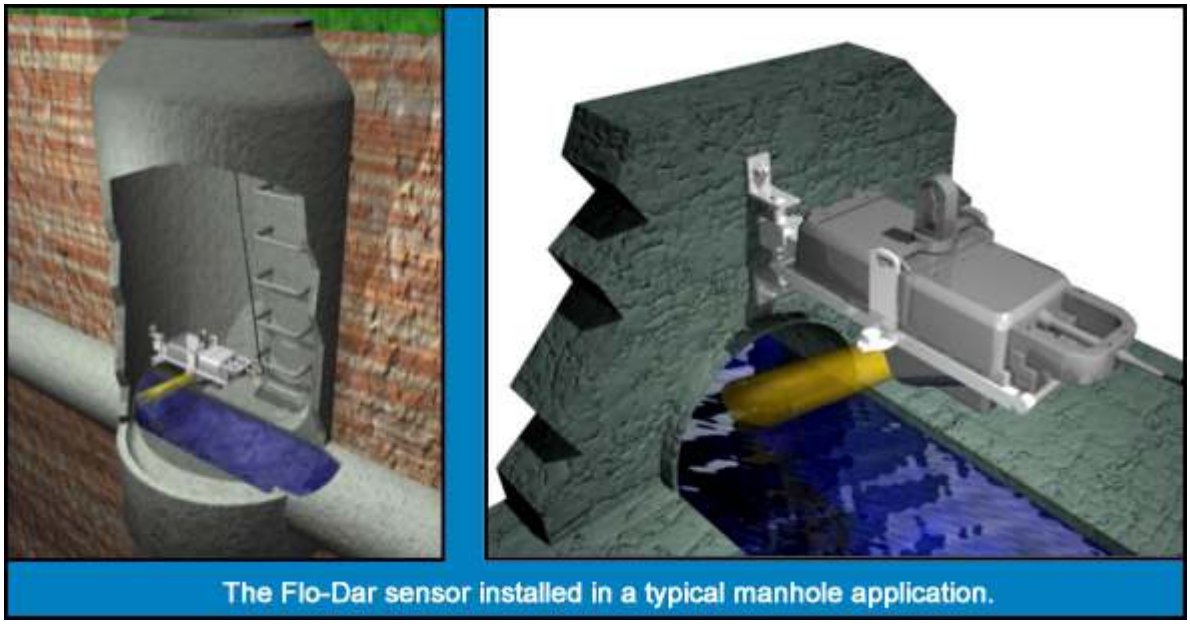


FIGURE III-3: TYPICAL FLO-DAR METER INSTALLATION (HACH COMPANY, 2014)

CHAPTER IV

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 pipelines, pump stations, and the treatment facility can be evaluated and sized appropriately. The methodology used in this master planning effort included evaluation of the following wastewater flow characteristics:

- Unit Flows
- Daily Flow Variation
- Annual Flow Variation
- Long Term Flow Variation
- Extraordinary Flows

UNIT FLOWS

Unit flows were calculated and compared to the State Requirements which are in units of gallons per capita per day (gpcd). Because only a fraction of SSLC's population contributes to the sanitary sewer system, the Equivalent Residential Connections (ERCs) were calculated for the entire sewer system based on the ERC to connection ratio developed in the Drinking Water System Master Plan (Hansen, Allen, & Luce, Inc., 2013). Once the ERCs were calculated for the sewer system, the design system flow per ERC could be calculated. Average flow per capita per day was calculated using the average household size of 2.46 people per household (U.S. Census Bureau, 2010). The average flow was calculated to be over 250 gpcd based on the total system measured flow. This can be compared to the less conservative design requirement of 100 gpcd according to the Utah Administrative Code R317-3-2. Therefore, the actual system loading with additional baseflow was used as the design flow for the sanitary sewer system.

DAILY FLOW VARIATION

Flow in a wastewater collection system varies continuously throughout the day. In SSLC the minimum flow generally occurs during the early morning between 1:00 and 5:00 AM. Maximum or peak flow typically occurs during the morning between 7:00 AM and 11:00 AM with a smaller peak in the evening between 5:00 and 8:00 PM.

Peaking factors were used to determine whether SSLC's daily flow variation was in agreement with those of other similar entities in the State and to create diurnal curves for the Autodesk Storm and Sanitary Analysis (SSA) model. Diurnal curves were used to quantify daily flow variations in the model.

Peaking Factors

The peaking factor is the ratio between the peak instantaneous flow and the average daily flow. Flow monitoring data downstream of residential and commercial areas were evaluated to determine the flow patterns at each flow monitoring site. The data were averaged throughout the week to create an average day pattern made of 15-minute increments. The flow rates were then divided by the average daily flow to determine a peaking factor at each time interval, essentially creating a diurnal curve. The diurnal curves were input into the model and adjusted

to account for attenuation until the model hydrograph at the flow monitoring location matched the flow monitoring data. The diurnal curves can be seen on Figure IV-1.

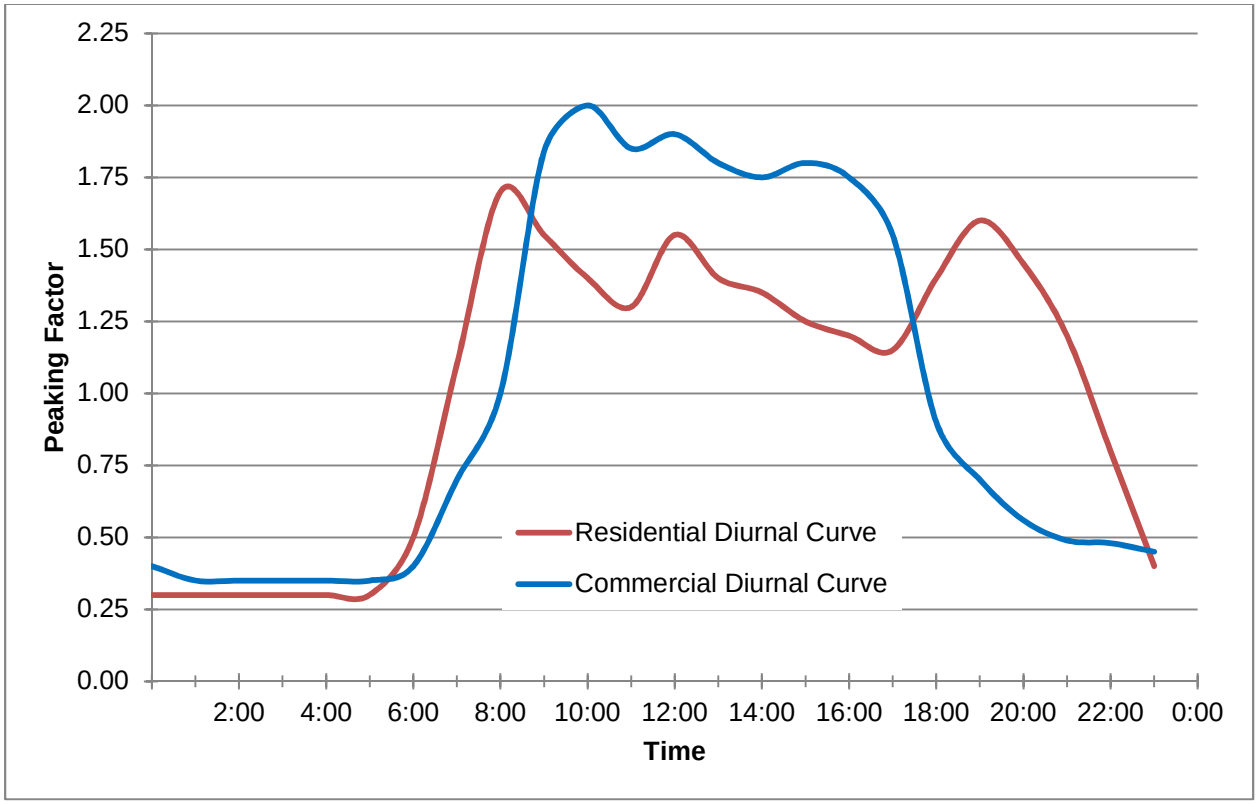


FIGURE IV-1 DIURNAL CURVES

Peaking factors based on average flow for each flow monitoring site were plotted against the average daily flow on a log-log graph. The SSLC peaking factors were compared to peaking factors developed for past HAL master planning efforts for Murray City, Springville City, Orem City, and Granger Hunter Improvement District as shown on Figure IV-2. Differences between communities can be explained by a variety of factors, including variations in infiltration and water use patterns. Possible explanations for the lower peaking factors seen in SSLC include a larger than average infiltration rate and an average household size smaller than the other cities.

Hydrographs

The loading for the model was developed by averaging the winter drinking water use for individual water meters throughout the City, and then assigning those flows to a wastewater manhole based on the collection areas. This method assumes that winter water use is representative of indoor water use, and that there is little consumptive use of water indoors allowing us to equate the sewer loading and the indoor water use. The diurnal curves developed for the residential and commercial areas are then applied to each sewer manhole load. Additional baseflows representing infiltration and inflow were also added to each manhole based on the measured baseflow at the flow monitoring location and the size of the manhole's collection area. The diurnal curves for each of the hydrographs can be seen on Figure IV-1. Graphs showing the calibration of the model to actual flows at the monitoring locations can be seen in Appendix A.

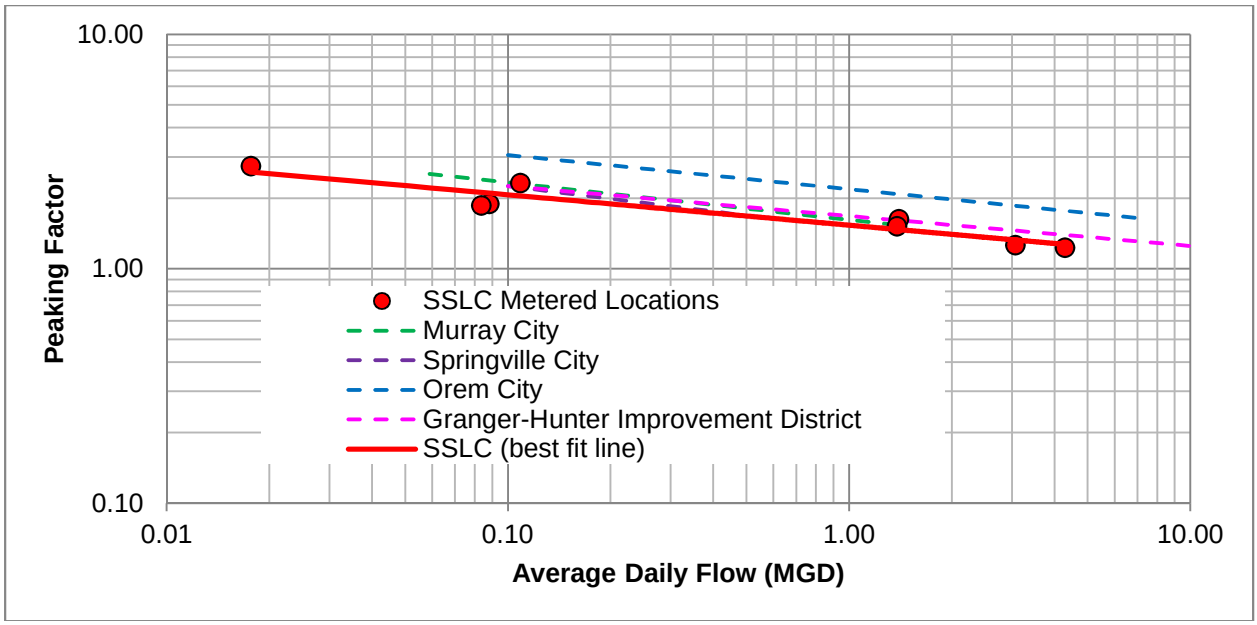


FIGURE IV-2 PEAKING FACTOR CITY COMPARISON

ANNUAL FLOW VARIATION

Wastewater systems can experience annual flow variation due to infiltration and other seasonal inflows such as irrigation or precipitation events. SSLC experiences a significant amount of annual flow variation due to infiltration and inflow. Daily flows from the SSLC sanitary sewer system between March 2013 and December 2013 were plotted against daily precipitation recorded at the Salt Lake International Airport on Figure IV-3 to determine the magnitude and variation of annual flows due to infiltration and inflow.

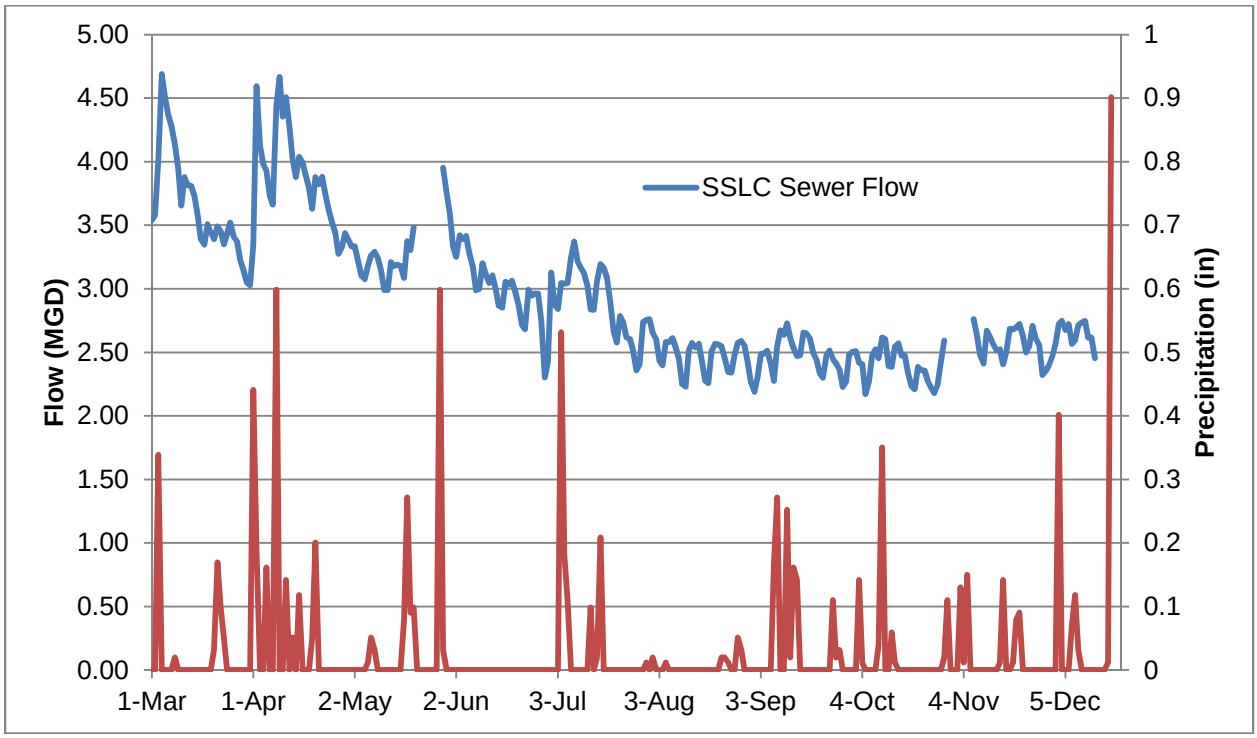


FIGURE IV-3 2013 SSLC SEWER FLOW VS. PRECIPITATION

The highest flows in the SSLC sanitary sewer system occur during significant precipitation events during the spring runoff when the water table is seasonally high. The existing system design flow was chosen to conservatively represent seasonally high flows seen in April.

According to R317-3-2, an average per capita per day flow rate of 100 gallons is required when sizing sewer pipes which "includes an allowance for infiltration/inflow." However, the actual flow, including baseflow, throughout the City exceeds the flow rate of 100 gallons per capita per day. A more conservative value representing measured baseflows during spring precipitation events was used in the SSLC sanitary sewer model.

Infiltration

Figure IV-4 shows hourly flow data during April of 2012. Water use in most systems is very minimal during the night. Therefore, the majority of flow below the lowest amount of system flow is made up of inflow and infiltration. This figure shows the large amount of baseflow, approximately 1.5 times as large as the fluctuation seen in the system.

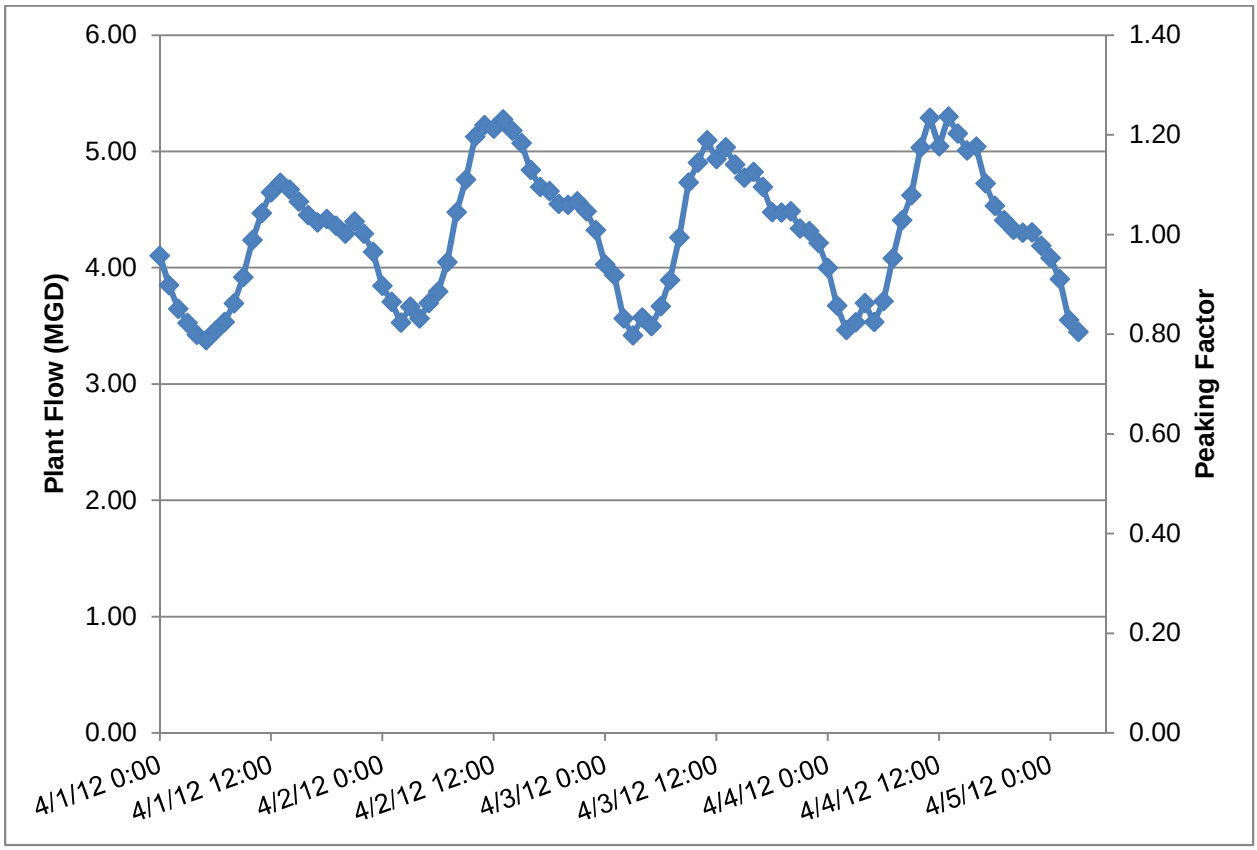


FIGURE IV-4 CVWRF HOURLY FLOWS FROM SSLC

Infiltration is defined as groundwater which enters a sewer system through pipe joints, cracks in the pipe, and leaks in manholes or building connections. Upon review of Figure IV-3 it is clear that high water table levels during the spring melt contribute to infiltration into the sanitary sewer system. Precipitation events that raise the water table contribute to infiltration.

Infiltration does not occur uniformly throughout the sanitary sewer system. The flow monitoring at the six different locations throughout the City showed that infiltration amounts depended upon the water table depth, proximity to surface water, sewer depth, and condition of the sewer pipe.

The average flow monitored was compared to the loading based on winter water use to determine the amount of baseflow (predominantly from infiltration).

Inflow

Inflow is defined as surface water that enters a sewer system (including building connections) through roof leaders, cellars, foundations, yards, area drains, cooling water discharges, manhole covers, cross connections from storm drains, etc. According to SSLC personnel, the wastewater collection system does experience inflow due to precipitation events. Inflow was especially noticeable during flow monitoring for the Market Station Sewer (Hansen, Allen, & Luce, Inc., 2008) when a precipitation event of 0.8 inches drastically peaked flows through the area. Although precipitation events did not affect the flow monitoring collected for this master plan, general precipitation inflow was accounted for when choosing a design flow for the model.

LONG TERM FLOW VARIATION

Average annual wastewater flows usually vary from year to year, although the variation between years is typically not extreme. The most predictable changes in average annual flows are typically associated with changes in population. Long term flow variations may also be caused by changes in weather patterns which may last several years.

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 result in reduction in both indoor and outdoor water use. A reduction in indoor use results in less domestic wastewater. A reduction in outside use for watering lawns and gardens may lead to lowering of the groundwater table and less infiltration. Weather pattern changes are not expected to significantly impact the long term flow rates of the SSLC sanitary sewer system.

Population change is the largest factor in estimating long term flow variation. The population projection for SSLC for the year 2050 is 44,560 (GOPB, 2008). This population projection was used with the winter water meter usage and baseflow to assess the system's ability to handle future loading and design for new growth.

EXTRAORDINARY FLOWS

Extraordinary flows may include flow anomalies such as the "Superbowl Sunday halftime flush," and holidays such as Thanksgiving. According to Utah Regulation 317-3-2, "laterals and collectors shall be designed for 400 gallons per capita per day," and "interceptor and outfall sewers shall be designed for 250 gallons per capita per day." HAL was able to determine the peak loading per capita using the ERC per connection ratio in the Drinking Water System Master Plan, the average number of people per household, the design flow rates, and the diurnal curves created for the model. Peak flows were conservatively estimated to be above the state standards. Therefore, when considering extraordinary flows the April design flows were used to represent the projected peak flow for SSLC. Calculations of the per capita flow based on actual flow rates can be seen in Appendix B.

CHAPTER V

WASTEWATER FLOW PROJECTIONS

PLANNING PERIOD

It was determined that the planning period for the Sanitary Sewer Master Plan should match the planning period for the Drinking Water System Master Plan. Both Master Plans project system growth through the year 2050. To better manage Capital Improvement Projects, system deficiencies were identified for the 5, 10, 15, and 35 year loading conditions.

Years modeled included 2013 for existing loading conditions and 2050 for future conditions. Areas of future growth were designated in cooperation with City Staff during the creation of the Drinking Water System Master Plan. Growth is focused in areas of redevelopment called Transit Oriented Development (TOD) areas.

EXISTING CONNECTIONS AND LOADING

Wastewater typically consists of two components: sewage directly from the connection and inflow/infiltration. Wastewater loading was calculated using winter water use and the area contributing to each manhole to account for inflow and infiltration.

Drinking water usage data were obtained from SSLC and Salt Lake City for the winter of 2012-2013. Sewer billing data were also obtained from SSLC to show users that provide their own water through private wells and are connected to the SSLC sewer system. The drinking water usage data and sewer billing data were geocoded to create a point shapefile showing the address based location and the amount of winter water use.

Geocoded water use data were linked to sewer manholes based on relative location. The compiled water use data were used to represent direct sewer loads at each individual manhole. Monitoring data were used to determine inflow and infiltration loads at each manhole based on the size of the manhole's collection area.

Equivalent Residential Connections

Equivalent Residential Connection (ERC) is a measure used to compare flow from non-residential connections to residential connections. For example, a nonresidential connection that had a winter water bill with water usage twice that of the residential average would have an ERC of 2.

Direct calculation of ERCs for the SSLC sewer system proved to be difficult because the sewer system does not service the entire City and because the sewer system provides services to many commercial and industrial customers. Therefore, ratios developed in the Drinking Water System Master Plan were used to calculate ERCs for the sewer system. The Drinking Water System Master Plan found that there were approximately 1.91 ERCs per drinking water connection (Hansen, Allen, & Luce, Inc., 2013). The City has approximately 2,590 water meter connections that contribute to the sewer system. The water meter connections and ERC per connection ratio were multiplied to calculate 4,954 ERCs for the existing sewer system (See Appendix B for calculations).

ERCs were calculated to compare the overall system flow to the state standards seen in R317-3, but were not used to represent actual loads in the model. Model loads were created from water meter and calibration data.

CONNECTIONS PROJECTED IN 2050

Future loading projections were developed to match the future number of ERCs estimated in the Drinking Water System Master Plan (Hansen, Allen, & Luce, Inc., 2013). However, the state standards for drinking water are not directly applicable to sewer flows. State standards require an average loading of 100 gpcd for sewer design, which includes inflow and infiltration. However, redevelopment in the TOD areas is not expected to increase inflow and infiltration. In coordination with SSLC it was determined that 80 gpcd would realistically estimate average sewer use from future users. With approximately 2.5 people per household in SSLC (U.S. Census Bureau, 2010), it was determined that the future loading be 200 gallons per future ERC.

The TOD areas can be seen on Figure V-1. The number of estimated new ERCs contributing to the sewer system in the year 2050 based on growth estimated in the Drinking Water System Master Plan was calculated to be approximately 4,700 (Hansen, Allen, & Luce, Inc., 2013).

FLOW PROJECTIONS

Actual flow rates were compared to the state standards to determine which flow rates would be the most conservative for future and existing model loading. As mentioned above, 4,954 existing ERCs were calculated to be tributary to the sewer system. With approximately 2.5 people per household in SSLC a virtual existing population of 12,188 was calculated for the sewer system loading. The design flow for the model was approximately 4.3 MGD. Therefore, the average flow per capita in April of 2012 was 350 gpcd which can be compared to the state design standard of 100 gpcd. The peak flow at the outfall of the existing model was 5.2 MGD or 423 gpcd, which is greater than the state outfall standard of 250 gpcd and greater than the state lateral standard of 400 gpcd. The flow rates exceed the state standards significantly because of the very large amount of inflow and infiltration seen in SSLC. Past studies performed by HAL show that the average flow of 100 gpcd has an inflow and infiltration component of approximately one third of the direct wastewater from the customer. SSLC has an inflow and infiltration component estimated to be over 3 times the direct wastewater from customers during the spring runoff season. It was determined that actual flow data should be used as the design flow instead of the less conservative state standards due to inflow and infiltration.

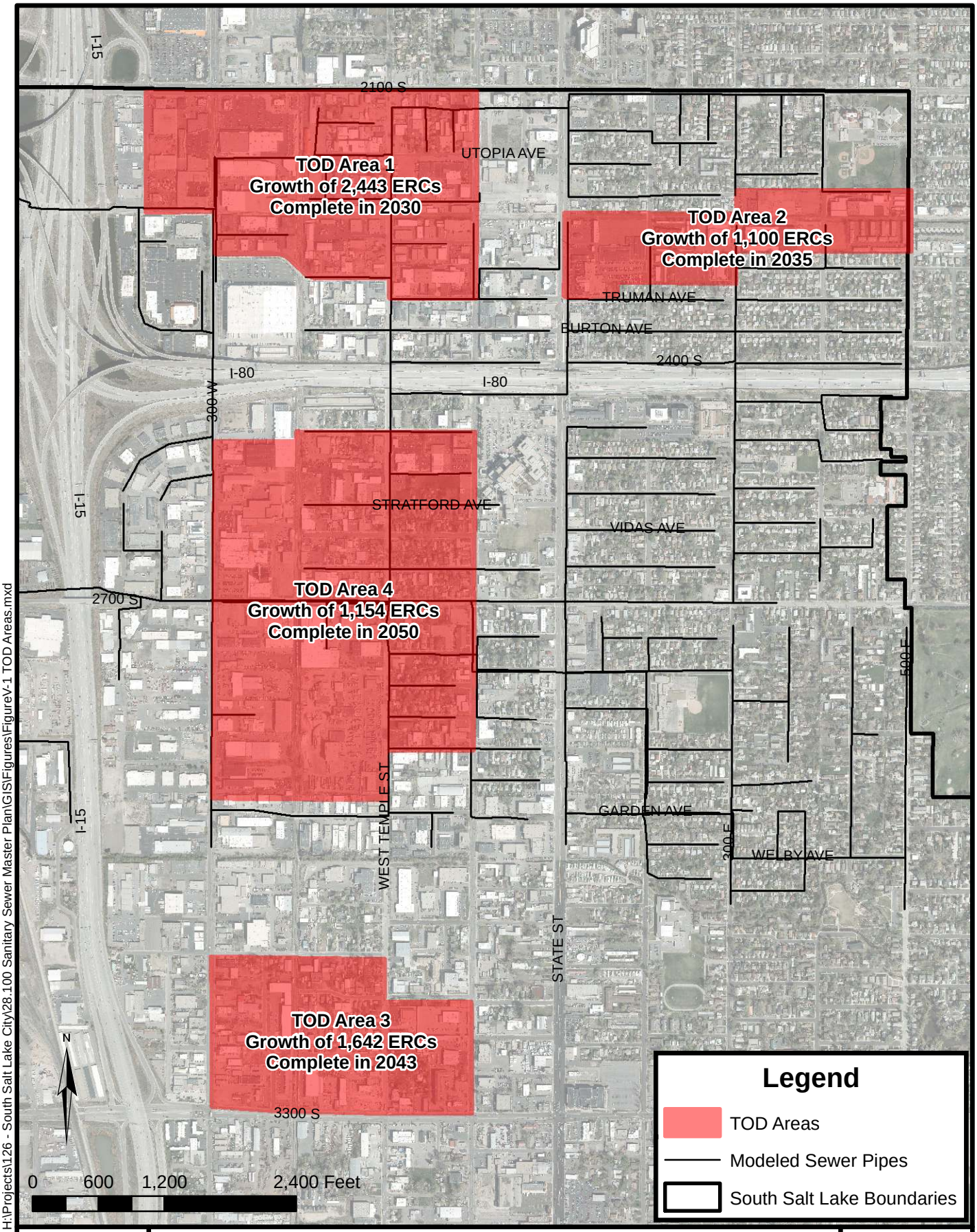
Table V-1 shows the existing and future flows per capita compared with the state standards seen in R317-3. The average flow per capita and peak flows were generated by the model using the calibrated system loading and the diurnal curves.

TABLE V-1
SYSTEM FLOW RATES

Flow Condition	Existing Model	State Standard
Average Flow per Capita (gpcd)	171	100
Peak Flow at Outfall per Capita (gpcd)	415	250
Peak Flow at Lateral per Capita (gpcd)	423	400

System Flow Projections

Sewer flow rates for 2050 from SSLC are projected to reach about 5.4 MGD from the current April flow rates of 4.3 MGD. It is important to note that flow rates to the plant fluctuate significantly throughout the year due to inflow and infiltration which can be seen in Figure IV-3.



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ENGINEERS

SSLC SANITARY SEWER MASTER PLAN
TRANSIT ORIENTED DEVELOPMENT (TOD) AREAS

FIGURE
V-1

April flows were conservatively selected as the design flow because of the large amount of inflow and infiltration. Central Valley Water Reclamation Facility is expected to have enough capacity to handle growth in SSLC through the year 2050.

Pump Station Flow Projections

Table V-2 shows the capacities of the pump stations compared to the future projected flow rates to the pump stations. Because no redevelopment is expected west of I-15, only flow rates to the Main Lift are expected to increase due to future growth. The projected design flows are expected to be within the capacity of each pump station. It is recommended that SSLC monitor flows to the pump stations in order to analyze pump capacities during precipitation events.

TABLE V-2
PUMP STATION FLOW RATE PROJECTIONS

ID	Pump Station	Pump Manufacturer	Capacity	Existing Modeled Peak Flow	Future Modeled Peak Flow
1	Main Lift	ABS	4,100 gpm	2,545 gpm	3,582 gpm
2	2280 S. Lift	Flygt	1,100 gpm	673 gpm	673 gpm
3	2610 S. Lift	Flygt	260 gpm	92 gpm	92 gpm

Projection Schedule

System ERC growth will occur at the same rate as the population growth seen on the Governor's Office of Planning and Budget Population Projects (GOPB, 2008). System growth over the planning horizon and at complete redevelopment of the TOD areas can be seen on Table V-3. Calculations of the year in which growth will be complete in the TOD areas can be seen in Appendix B. The projected growth completion year can also be seen on Figure V-1.

TABLE V-3
SYSTEM ERC PROJECTIONS

Projected Years	Approximate Year	Additional ERCs	Total ERCs	Description
0	2015	0	4,954	Existing System
5	2020	897	5,851	Partial Re-development in TOD 1
10	2025	746	6,596	Partial Re-development in TOD 1
15	2030	746	7,342	Partial Re-development in TOD 1
15.3	2030	55	7,397	Full Re-development in TOD 1
20.5	2035	1100	8,497	Full Re-development in TOD 2
28.8	2043	(1642) Out of Service Area	8,497	Full Re-development in TOD 3 Out of Service Area
35	2050	1,154	9,651	Full Re-development in TOD 4

As stated in the Scope, wastewater collection loads will be projected to 5, 10, 15, and 35-year planning horizon. However, capacity issues and projects will be determined by the completely re-developed TOD areas instead of the less conservative 5, 10, 15, and 35-year planning horizons.

CHAPTER VI

WASTEWATER COLLECTION SYSTEM EVALUATION

MODEL SELECTION

It was decided by HAL and South Salt Lake's personnel to use Autodesk Storm and Sanitary Analysis (SSA) Model for the Master Plan because of the model's ability to import GIS data, export models to EPA SWMM, and because the model runs on an Autodesk platform.

SYSTEM LAYOUT

The layout of the wastewater collection system was provided by SSLC based on a GIS data inventory of the collection system. A map of the SSLC wastewater collection system, as included in the model, is shown on Figure II-1. Wastewater loading allocation within the model was performed using GIS. Billing addresses were used to link winter drinking water meter demand data to meter location, which were then linked to sewer manholes as a load. Inflow and infiltration loads were determined using flow data from the monitoring locations and the size of each manhole's collection area. HAL met with SSLC personnel to determine flow direction in locations with bypass pipes and multiple connections. HAL also collaborated with SSLC to retrieve additional system data during the model creation.

Pipe and manhole data were imported into the SSA model from GIS Shapefiles. The SSA files were exported to an EPA SWMM format and are on a CD in Appendix C. Some of the smaller collectors and laterals were not modeled because of the lack of survey data for less significant manholes (see Figure III-1).

MODELING CRITERIA

A range of potential modeling criteria and values were suggested by HAL and reviewed by SSLC. The criteria and values adopted for this modeling effort are included in Table VI-1.

TABLE VI-1
MODELING CRITERIA

CRITERIA	VALUE OR ASSUMPTION
System Loading	System loading was developed using winter water use data for each meter and inflow/infiltration based on the tributary area of each manhole with flow data for collection areas. This was determined to be more conservative than the design unit flow of 100 gpcd per State Code R317-3-2.
Daily Flow Variation	Diurnal curves were developed from flow monitoring (see Figure IV-1)
Peak Flow	Peaking factors were developed with diurnal curves and peak flows were developed from the AutoCAD SSA model
Inflow and Infiltration	SSLC experiences very significant inflow and infiltration due to the seasonal water table fluctuation and precipitation. Inflow and infiltration were estimated using meter data for collection areas and the size of areas tributary to each manhole.
Extraordinary Flows	Due to the significant amount of inflow and infiltration, extraordinary flows were modeled using a design flow representative of a high water table with a recent precipitation event. The design flow, based on historic flows, was determined to be more conservative than the state standards of 400 gpcd for laterals and 250 gpcd for interceptors (R317-3-2).

(TABLE VI-1 CONTINUED)

CRITERIA	VALUE OR ASSUMPTION
Model Calibration	The model was calibrated by comparing the modeled flow rates to the measured flow rates at the metered locations throughout the City
Planning Period	~5 years, ~10 years, ~15 years, ~35 years (2020, 2025, 2030, 2050)
Land Use & Population Projections	Provided by SSLC for the 2013 Drinking Water System Master Plan (Hansen, Allen, & Luce, Inc., 2013)
Wastewater Flow Projections	Estimated from future ERC projections from the Drinking Water System Master Plan and created using 80 gpcd as the average flow to eliminate the inflow and infiltration component, with the residential diurnal curve to estimate the peak flow rates
Pipe Capacity	Roughness Coefficient = 0.013 Manning's n Recommended Maximum d/D = 0.75 for pipe diameters over 12 inches Recommended Maximum d/D = 0.50 for pipe diameters 12 inches and less
Pipe Velocity	Sewer pipe design generally recommends slopes where flows reach a velocity of 2 fps during high flow periods to remove any deposited sediment in the pipe. However, because of the age of the SSLC sewer system and minimal elevation drop across the system, many pipes in the system do not experience velocities of 2 fps during normal operations. Existing connections make it implausible to change slopes in most areas. Therefore, sediment deposition is managed through system cleaning instead of flow velocity.
Pump Stations	Pump types and curves were provided by the City in the Operation and Maintenance Manual (Hansen, Allen, & Luce, Inc., 2010). Because the two larger pumps in the system have variable speed drives, they were modeled as theoretical pumps.

MODEL CALIBRATION

Model calibration includes comparing hydrographs generated by the model with actual flows measured in the collection system, followed by making adjustments to the model to better reflect measured flows. The model was calibrated to December 2013 flow rates to match the metering data and then was amplified and calibrated to April 2013 flows to match the overall system flow to the design flow. As discussed in Chapter III, flow data observations and the total wastewater flow were available at each of the flow monitoring sites. Flow monitoring locations can be seen on Figure III-1. Graphs showing the measured flows compared to metered flows can be seen in Appendix A.

Metered Location R1

Metering at this location was not used to determine diurnal curves, but was used to determine the total flow to pump station 2 (2280 South Lift), especially the inflow and infiltration component. Flow in this area is often sporadic due to use pattern variations in industrial areas.

Metered Location T12

Metering at this location was used to determine the diurnal curve for commercial areas as well as amounts of inflow and infiltration for the area. Variations between weekend and weekday commercial usage are easily seen at this location. This site also has a bypass pipe connected to pipes in 2700 S. No extreme bypass flows were noticed in the metering data. The model reflects the recorded flows closely at this site.

Metered Location W13

Metering at location W13 was used to determine inflow and infiltration contributing to the 2700 S pipeline. This location was not used to determine diurnal curve because of the mixed water use contributing to this site, but the meter data give an honest assessment of the validity of the diurnal curves and system loading.

Metered Location W20-1

Metering at location W20-1 was used to develop diurnal curves for commercial use areas. The model hydrographs for this area very closely match the meter data at this site. Because of the low flow at this location, some metered peaks exceed the model hydrograph but do not represent general flow patterns.

Metered Location W38

Metering at location W38 was used to develop diurnal curves for residential use areas. Flow data at this site show the variation in use between weekday and weekends. The model flows closely match the metered flows at this site.

Metered Location X22

This metering location used a Sigma 910 meter while monitoring flow while the other locations used Flo-Dar. Data from the Sigma 910 had more “noise” or unstable readings than the Flo-Dar meters, so the data were only used to determine inflow and infiltration.

Other Metering

Meter data from CVWRF were used to determine system-wide sewer loads. Flow was also metered at 48 East Robert Avenue and in West Temple underneath I-80 to verify flow amounts projected in flagged problem areas.

MODEL SCENARIOS

Four modeling scenarios were developed and evaluated for the SSLC wastewater collection system as shown in Table VI-2.

TABLE VI-2
MODEL SCENARIOS

SCENARIO	DESCRIPTION
Existing	The Existing scenario was used to identify deficiencies in the wastewater collection system under April and December 2013 development conditions, and to establish a baseline for evaluation of future conditions.
Future	The Future scenario was used to identify deficiencies in the wastewater collection system under 2050 development conditions.
Projects	This scenario was used to verify the effectiveness of the primary capital improvements recommended in Chapter VIII under 2050 development conditions.
Upsize	This scenario was used to verify the effectiveness of alternative capital improvements recommended in Chapter VIII under 2050 development conditions.

EXISTING DEFICIENCIES

Deficiencies were identified through modeling, past maintenance, and CCTV inspections. Pipe capacity deficiencies identified in the Existing Scenario model are summarized in Table VI-3. Maintenance issues noted by SSLC personnel are summarized in Table VI-4. Deficiencies with an ID starting with "CE" refer to an existing capacity deficiency. Deficiencies with an ID starting with "M" refer to a maintenance issue. Pipe capacity deficiencies and maintenance issues are shown on Figure VI-1.

Many of the maintenance issues are due to low velocities. In places where the maximum pipe velocity is less than 2 feet per second, sediment will begin to settle out of the flow. Figure VI-2 shows the existing maximum pipe velocities from the model and the maintenance issues. The figure demonstrates the many low velocities throughout the entire system. Due to elevation restrictions, replacement of the pipes will not always increase the maximum velocities. Therefore, it is recommended that SSLC continue their system cleaning schedule to manage sedimentation in the system, with select locations cleaned more frequently as needed.

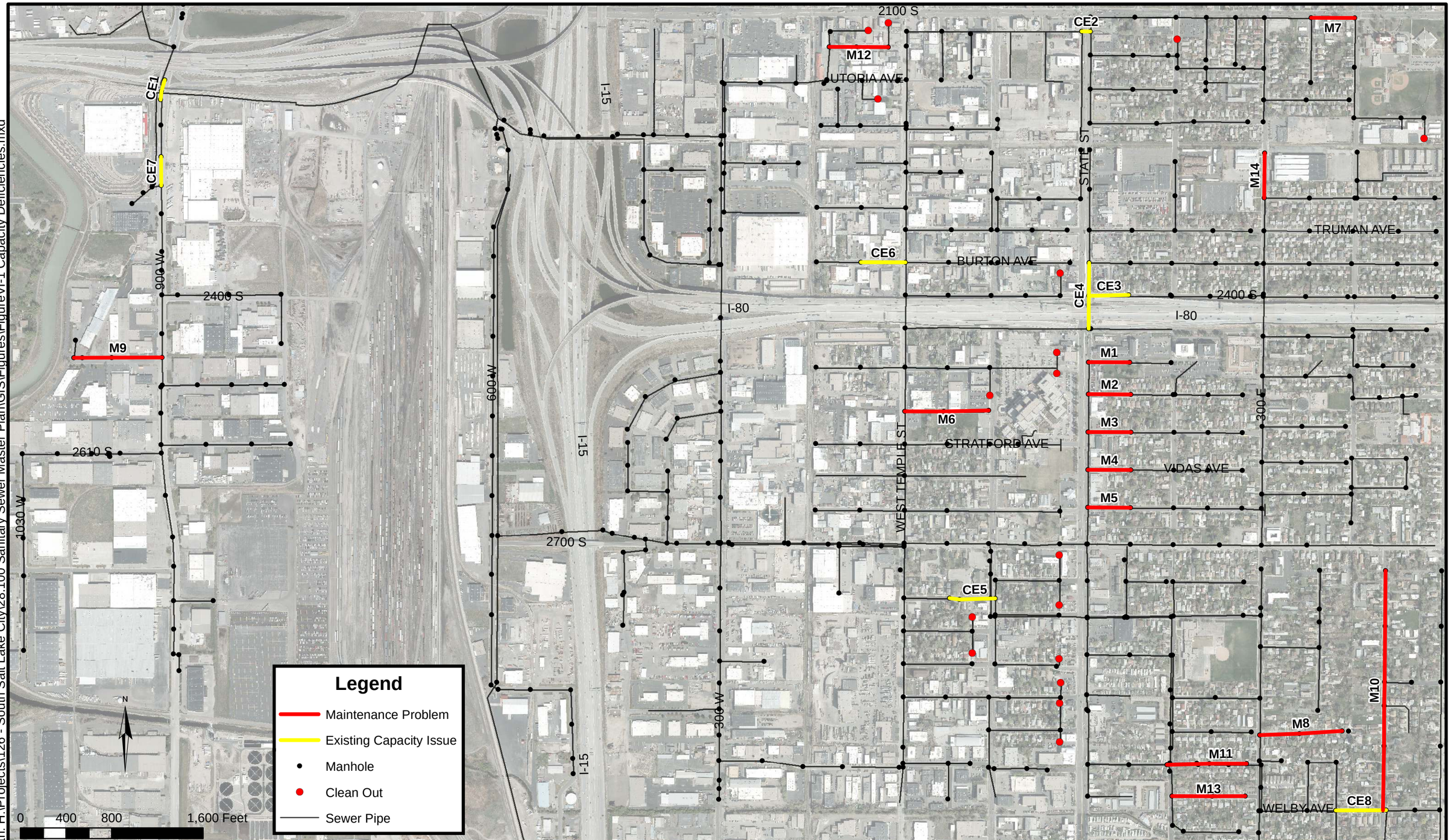
According to the repair data from SSLC there are 9 pipes which need to be replaced (3,170 ft), 60 pipes which need liners (18,025 ft), and 39 pipe which need point repairs (244 ft of repair lengths). The repair locations can be seen on Figure VI-3.

The maximum depth ratio is the ratio of the maximum depth in the pipe and the diameter of the pipe. The maximum depth ratio was collected from the Existing Model and was used to evaluate the capacity of the pipe. A flow depth of 50% is considered full for sewers 12 inches in diameter and smaller while a flow depth of 75% is considered full for sewers larger than 12 inches in diameter.

TABLE VI-3
EXISTING PIPE CAPACITY DEFICIENCIES

ID	LOCATION	DIAMETER LENGTH	ISSUE	MAX DEPTH RATIO
CE1	900 West and approximately 2200 South at manhole R2-3	8-in 175 ft	Manhole elevation creates flatter slopes and concerning depths in the manhole	0.57 (Manhole)
CE2	State Street and approximately 2125 South	12-in 80 ft	Minor adverse slope creates capacity issues across State St.	0.51
CE3	2400 South from 50 East to State St.	8-in 350 ft	Higher flows create capacity issues	0.51
CE4	State St. from Burton Ave. to Robert Ave.	10-in 575 ft	Flatter slopes and higher flows create capacity issues	0.52, 0.55*
CE5	Shelley Ave. from Main St. to 50 West	8-in 400 ft	Flatter slopes create minor capacity issues	0.54, 0.55*
CE6	Burton Ave. from 150 West to West Temple St.	8-in 395 ft	Flatter slopes create minor capacity issues	0.59
CE7	900 West from approximately 2200 South to 2225 South	8-in 250 ft	High flows create capacity issues	0.60
CE8	Welby Ave from Adams Cir. to Blair St.	8-in 445 ft	Flatter slopes create minor capacity issues	0.63, 0.52*

*Multiple Max Depth Ratios for multiple pipes. Ratio ranges from upstream to downstream are shown.



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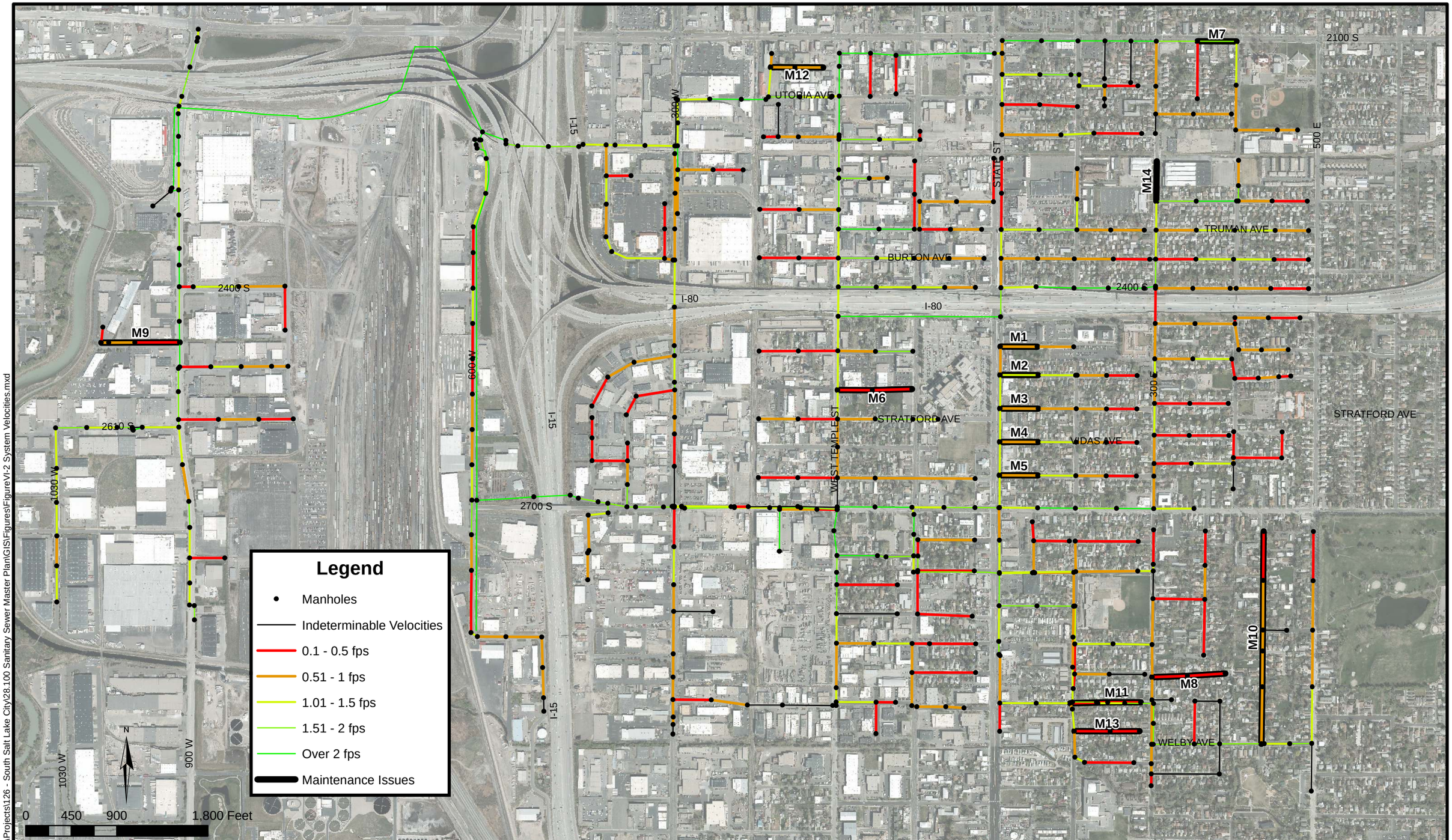
SANITARY SEWER MASTER PLAN

EXISTING CAPACITY DEFICIENCIES AND MAINTENANCE ISSUES

FIGURE VI-1



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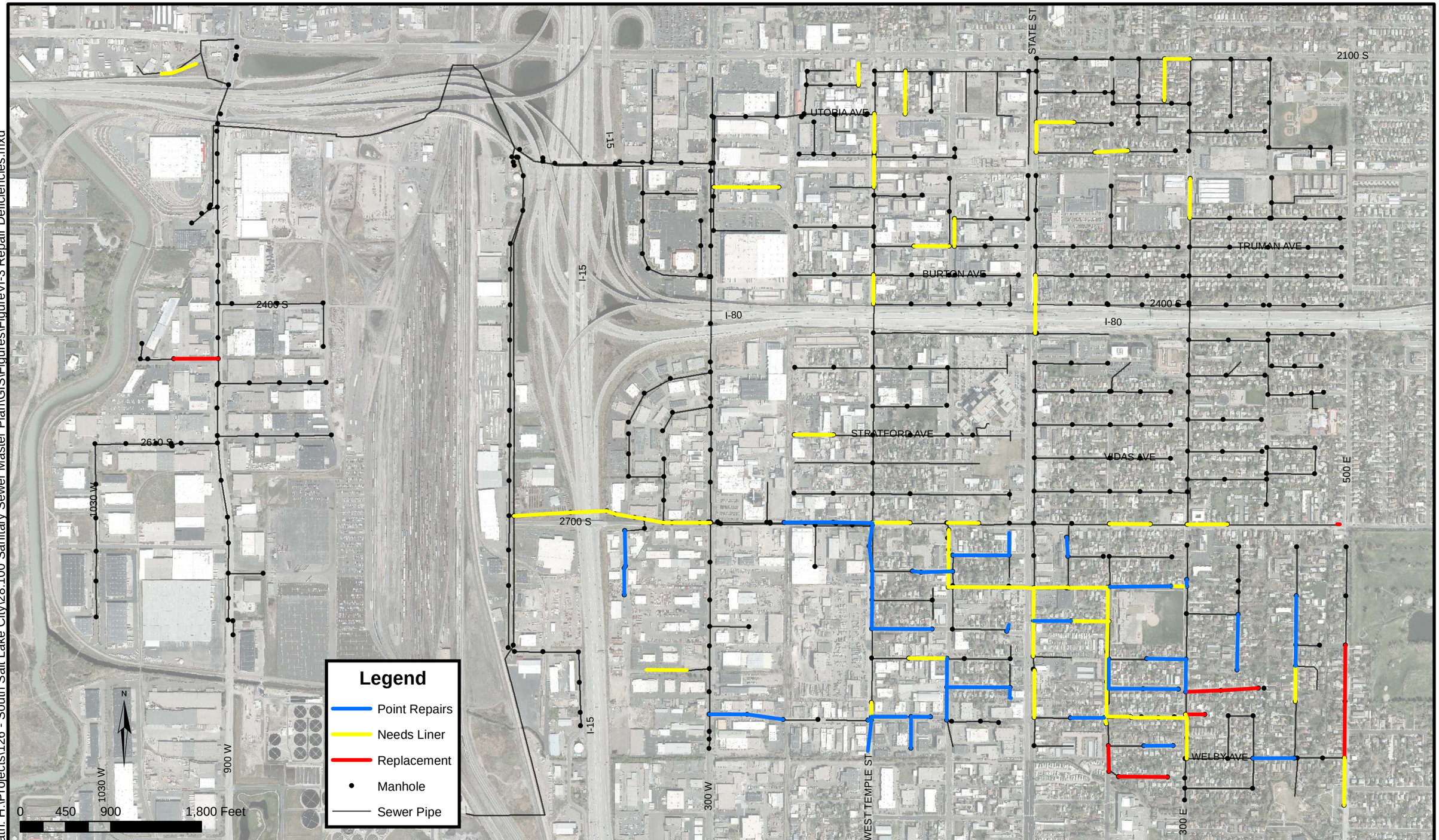
SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

EXISTING SYSTEM VELOCITIES

FIGURE
VI-2



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SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

REPAIR ISSUES

FIGURE VI-3

TABLE VI-4
EXISTING MAINTENANCE ISSUES

ID	LOCATION	DIAMETER LENGTH	MAINTENANCE ISSUES
M1	Oakland Ave. from 150 East to State St.	8-in 360 ft	Flat slope and presence of roots require frequent cleaning
M2	Whitlock Ave. from 150 East to State St.	8-in 370 ft	Flat slope requires frequent cleaning
M3	Beryl Ave. from 150 East to State St.	8-in 375 ft	Flat slope requires frequent cleaning
M4	Vidas Ave. from 150 East to State St.	8-in 375 ft	Flat slope requires frequent cleaning
M5	Leslie Ave. from 150 East to State St.	8-in 375 ft	Flat slope requires frequent cleaning
M6	Whitlock Ave. from Main St. to West Temple St.	8-in 735 ft	High grease load requires frequent cleaning
M7	2100 South from 400 East to Blair St.	8-in 385 ft	Flat slope requires frequent cleaning
M8	Maxwell Ln. from 400 East to 300 East	8-in 725 ft	Flat slope requires frequent cleaning
M9	Beardsley Pl. from 1000 West to 900 West	8-in 775 ft	Flat slope requires frequent cleaning
M10	Adams St. from 2725 South to Welby Ave.	8-in 2,095 ft	Flat slope requires frequent cleaning
M11	Garden Ave. from 290 East to 200 East	8-in 700 ft	Flat slope requires frequent cleaning
M12	Commonwealth Ave. from 125 East to 175 East	8-in 520 ft	High grease load requires frequent cleaning
M13	Welby Ave. from 290 East to 200 East	8-in 645 ft	Flat slopes and high grease load require frequent cleaning
M14	300 East from 2200 South to Haven Ave.	8-in 390 ft	60 ft long belly in pipe requires frequent cleaning

FUTURE DEFICIENCIES

The deficiencies identified in the Future Scenario model are predicted problems that will occur if development occurs as projected by the City, without system improvements. Pipe capacity deficiencies identified in the future scenario model are shown on Figure VI-4 and summarized in Table VI-5. All of the previously identified existing deficiencies, maintenance issues, and repair issues are also problems in the future scenarios although they may not be individually specified. The maximum depth ratios of existing deficiencies are often larger for future deficiencies due to increased flow from future redevelopment. Deficiencies with an ID starting with “CF” refer to a future capacity deficiency.

TABLE VI-5
FUTURE DEFICIENCIES

ID	LOCATION	DIAMETER LENGTH	ISSUE	MAX DEPTH RATIO
CF1	900 West and approximately 2200 South at manhole R2-3	8-in 175 ft	Manhole elevation creates flatter slope and concerning depths in the manhole	0.57 (Manhole)
CF2	State Street and approximately 2125 South	12-in 80 ft	Minor adverse slope creates minor capacity issues across State St.	0.58
CF3	2400 South from 250 East to State St.	8-in 1,065 ft	Higher flows create capacity issues	0.50, 0.73*
CF4	State St. from Haven Ave. to Robert Ave.	8-in, 10-in 1,220 ft	Flat slopes and higher flows create capacity issues	0.61, 0.77*
CF5	Shelley Ave. from Main St. to 50 West	8-in 400 ft	Flatter slopes create minor capacity issues	0.55
CF6	Burton Ave. from 150 West to West Temple St.	8-in 391 ft	Flatter slopes create minor capacity issues	0.67
CF7	900 West from approximately 2200 South to 2225 South	8-in 250 ft	High flows create minor capacity issues	0.60
CF8	Welby Ave from Adams Cir. to Blair St.	8-in 445 ft	Flatter slopes create minor capacity issues	0.63, 0.52*
CF9	Robert Ave. from State St. to West Temple St.	10-in 1,610 ft	High flows create minor capacity issues	0.54
CF10	300 East from Haven Ave. to Burton Ave.	8-in 575 ft	Flatter slopes create minor capacity issues	0.62, 0.66*
CF11	Truman Ave. from 150 East to State St.	8-in 375 ft	Minor Capacity Issue – Downstream depths create backwater effect	0.69
CF12	State St. from 2100 South to 2125 South	12-in 125 ft	High flows and downstream issues create minor capacity issue	0.50
CF13	West Temple from Senior Way to 2260 South	18-in 80 ft	High flows and flat slope create capacity issue	0.76

*Multiple Max Depth Ratios for multiple pipes. Ratio ranges from upstream to downstream are shown.

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SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

FUTURE CAPACITY DEFICIENCIES

FIGURE
VI-4

CHAPTER VII

IMPROVEMENT ALTERNATIVES & PROJECTS

SYSTEM AGING

Pipe age can be used to identify areas that might require more repairs. 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. Because of the variability of these factors, it is difficult to determine the condition of the wastewater collection system based on age alone. SSLC uses sewer video inspection technology to evaluate the structural integrity of the pipes in the sewer network. SSLC personnel record the sewer network every four years. 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 SSLC continue the system video schedule and use the inspection to plan for future repair projects.

PIPELINE IMPROVEMENTS

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

Cleaning

If the slope of the pipe is insufficient to provide adequate flow velocity, deposition of solids will occur. Solids deposition lessens pipe capacity. Many locations in SSLC are relatively flat where sewers have slopes less than desired. It is recommended that SSLC continue their cleaning schedule where the entire system is cleaned every other year, with specific locations being cleaned more frequently as needed.

Clean outs are sometimes installed to clean sewer pipes. However, cleanouts are easily buried or often become unusable. Access manholes are preferred for cleaning and maintenance purposes. According to the GIS data provided by the city, there are 17 locations through the system where sewer laterals dead-end without an access manhole. It is recommended that access manholes be installed at any clean out locations for cleaning and maintenance purposes. The locations of the clean outs can be seen on Figure VI-1.

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. Several 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 is generally a less expensive alternative.

SSLC has several existing locations where bypass sewer connections allow excessive flow to be carried in alternate sewer lines.

New Sewers

New sewers are often the only option to collect flows from future development or previously inaccessible areas. Because future growth in SSLC is expected to occur in areas of the City with existing sewer networks, new sewer networks are not necessary in SSLC for the foreseeable future.

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:

<u>New Construction</u>

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

<u>Sewer Pipe Rehabilitation</u>

- Cured-in-Place Pipe
- Slip Lining
- Pipe Bursting
- Pipe Eating
- Thermoforming (Fold and Form)

A description of these alternative construction technologies is included in Appendix D.

COMPARISON OF IMPROVEMENT ALTERNATIVES

Sewers

For the purposes of this report, most of the sewer replacements were assumed to be open-cut to provide conservative cost estimates for budgeting purposes. Locations where alternative construction methods were assumed are specified. Replacement sewers, bypass sewers and re-routing of flow were discussed with the City and recommendations were made on a case by case basis.

Pump Stations

The three pump stations in SSLC have sufficient capacity with the design April flow for both existing and future scenarios. However, the design flows were determined from daily flow data for 2013 which are not refined enough to show sudden peaks from direct precipitation inflow. No significant precipitation events occurred during the calibration metering period. Therefore, sudden peaks due to direct inflow during precipitation events are still a concern. It is recommended that SSLC install meters at pump stations 1 and 2 to monitor flows during significant precipitation events. Peak inflows should be compared to the existing capacity of the pump stations.

Efforts should also be made to identify any cross connections between storm drains and the sewer system. Some cities implement smoke detection programs to find illegal or old drain

connections. However, smoke detection can be controversial and is generally viewed negatively by the public. Any use of smoke detection should include a strong public awareness campaign to inform the public of the process.

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.

RECOMMENDED SYSTEM PROJECTS

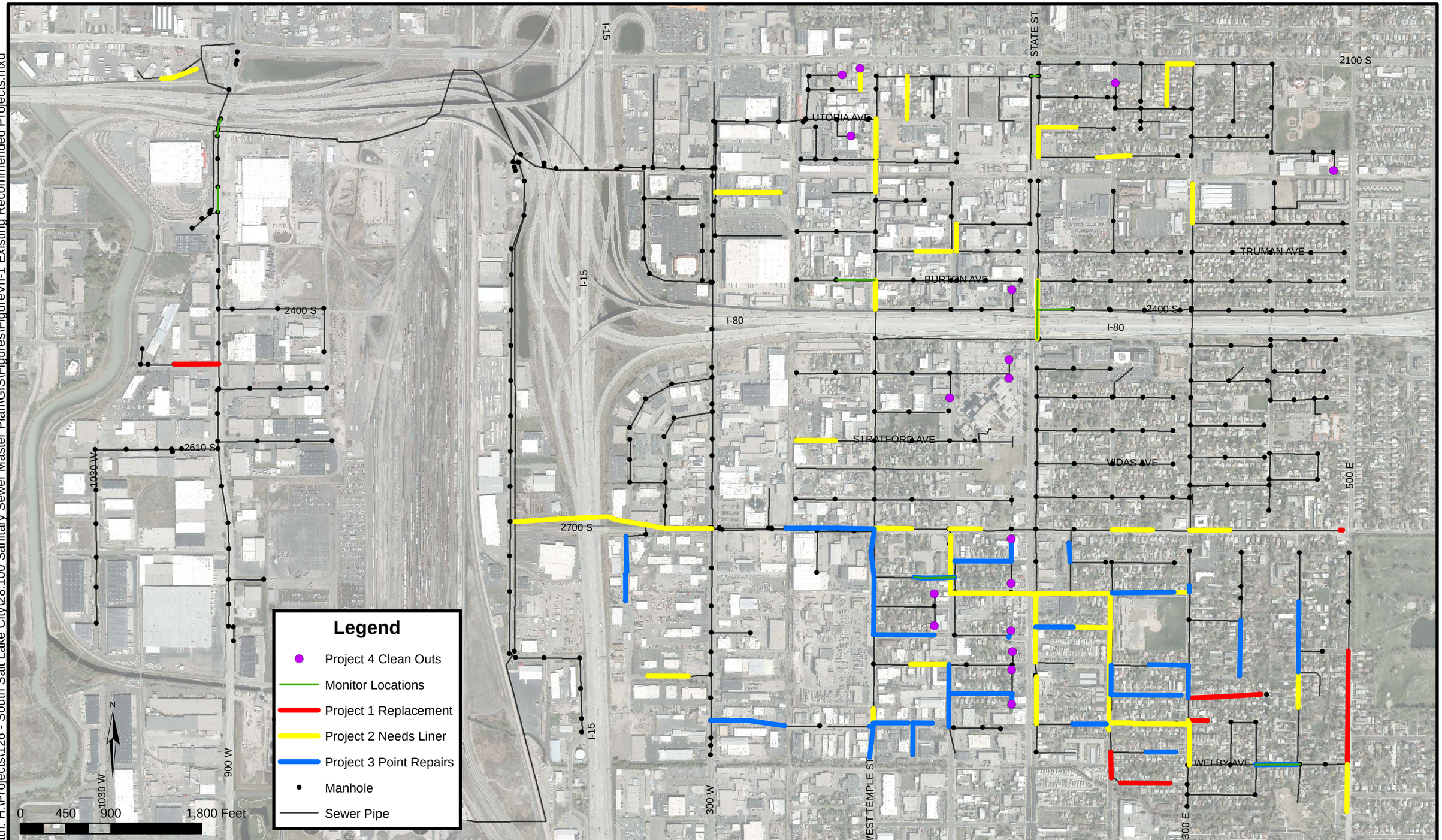
Tables VII-1 and VII-2 present the suggested projects to solve existing and future deficiencies in the City. The projects can also be seen on Figures VII-1 and VII-2.

Priority of the existing recommended projects should be determined by the severity of the problem and the severity of the system impact if a failure occurred. The project priority should be determined by the Wastewater Department Supervisor in conjunction with the mapping and additional projects provided in this Master Plan. HAL recommends that the projects be completed within the designated time frame phase. The rate study should be consulted to determine funding availability and to verify project timing for the existing recommended projects.

TABLE VII-1
EXISTING RECOMMENDED PROJECTS

PROJECT ID	DESCRIPTION	SOLUTION	ADDRESSED DEFICIENCY	PHASE
1	Replace 3,170 feet of pipe identified by SSLC at approximately 9 different locations	Replacement	Repair Issues	5-yr
2	Install liner in 18,025 feet of pipe identified by SSLC at approximately 60 different locations	Liner	Repair Issues	5-yr
3	Repair approximately 73 different locations in need of point repairs as identified by SSLC	Point Repair	Repair Issues	5-yr
4	Replace 17 clean outs with access manholes	Replacement	Maintenance	35-yr
5	Monitor minor capacity issues identified in existing deficiencies. If issues become significant, implement future recommended project	Monitor	CE1-CE8	Ongoing

The future recommended projects are comprised of A alternatives and B alternatives (denoted after the Project ID with an “a” or “b”). A alternatives are preferred due to the lower cost. However, some of the B alternatives may prove to be more beneficial over the A alternatives if complications arise with the A alternative or if the B alternative coincides with a repair or maintenance issue.



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SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

EXISTING RECOMMENDED PROJECTS

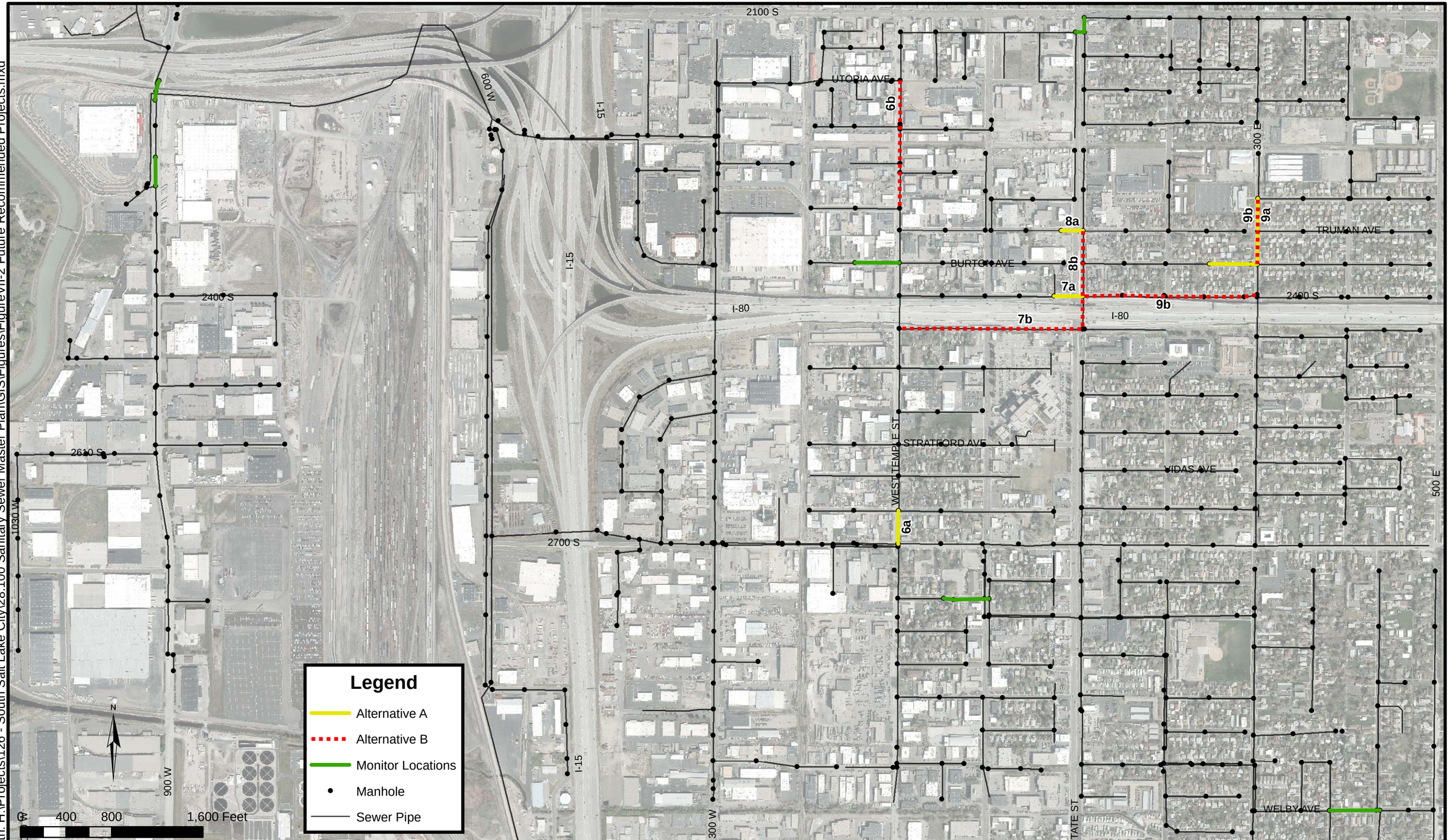
FIGURE
VII-1

TABLE VII-2
FUTURE RECOMMENDED PROJECTS

PROJECT ID	DESCRIPTION	SOLUTION	ADDRESSED DEFICIENCY	PHASE
6a	Replace 292 ft of 15-in pipe in West Temple St. from Malvern Ave. to 2700 South to reverse the grade so that Malvern Ave. flows to 2700 South	Change Slope/Re-Routing	CF13	15-yr
6b	Replace 1,121 ft of 18-in pipe with 24-in pipe in West Temple St. from Haven Ave. to Utopia Ave. to increase pipe capacity, repair cracks, and prevent I&I	Increase Diameter	CF13 Liner Repairs	15-yr
7a	Install 252 ft of 8-in pipe across State St. in 2400 South using trenchless technology to divert partial flows west	New Pipe/Re-Routing	CF3, CF4, CF9	15-yr
7b	Replace 1,608 ft of 10-in pipe with 12-in pipe in Robert Ave. from State St. to West Temple to increase pipe capacity	Increase Diameter	CF4, CF9	15-yr
8a	Install 193 ft of 8-in pipe across State St. in Truman Ave. using trenchless technology to divert partial flows west	New Pipe/Re-Routing	CF4, CF11	15-yr
8b	Replace 862 ft of 10-in and 8-in pipe with 12-in pipe in State St. from Truman Ave. to Robert Ave. to increase pipe capacity, repair cracks, and prevent I&I	Increase Diameter	CF3, CF4, CF11 Liner Repairs	15-yr
9a	Replace 995 ft of 8-in pipe in 300 East from Haven Ave. to Burton Ave. and in Burton Ave. from 300 East to 250 East to increase the grade and re-route flows west	Change Slope/Re-Routing	CF10	15-yr
9b	Replace 575 ft of 8-in pipe with 10-in pipe in 300 East from Haven Ave. to Burton Ave and replace 1,531 ft of 8-in pipe with 10-in pipe in 2400 South from 300 East to State St to increase pipe capacity	Increase Diameter	CF3, CF10	15-yr
10	Monitor minor issues identified in future deficiencies. If issues become significant, increase pipe capacity or re-route flows to alleviate issues	Monitor	CF1, CF2, CF5, CF6, CF7, CF8, CF12	Ongoing

Recommended Project Schedule

As discussed in Chapter V, the rate of growth of the future ERCs will match the rate of growth of the population (GOPB, 2008). As growth in one TOD area is completed, it is expected to continue in the next TOD area. Therefore, projects due to growth in an area need to be completed before growth starts in that area. All projects due to growth are due to TOD Area 2's Growth. Growth is expected to stop in TOD area 1 and continue into the TOD area 2 in 15 years (2030), so the dependent projects should be completed before the year 2030.



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SOUTH SALT LAKE CITY
SANITARY SEWER MASTER PLAN

FUTURE RECOMMENDED PROJECTS

FIGURE
VII-2

CHAPTER VIII

CAPITAL IMPROVEMENTS PLAN

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:

Type of Estimate	Accuracy
Master Plan	-50% to +50%
Preliminary Design	-30% to +30%
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 $1,500,000. While this may not seem very accurate, the purpose of master planning is to develop general sizing, location, cost and scheduling information on a number of 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 $1,300,000.

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.

PROJECT COST ESTIMATES

As discussed in Chapter VII, for cost estimating purposes it was assumed that most of the sewer improvements would be completed utilizing conventional (open-cut) construction.

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 RS Means 2014 Heavy Construction Cost Data. SSLC provided cost estimates for select projects. Project cost estimates and related material are included in Appendix E.

RECOMMENDED IMPROVEMENT PROJECTS

Development of the recommended improvement projects includes consideration of a number of factors 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, coordination with other public works projects, etc.
- Priority indicated by the consulting engineer's modeling efforts and by the operational personnel's experience with the repair projects
- Consulting engineer's project cost estimates

Tables VIII-1 through VIII-4 identify the recommended improvement projects to correct deficiencies in the wastewater system and the estimated cost associated with each project.

TABLE VIII-1
EXISTING RECOMMENDED IMPROVEMENT PROJECTS

PROJECT ID	DESCRIPTION	COST[1]
1	Replace 3,170 feet of pipe identified by SSLC at approximately 9 different locations	**$ 840,000**
2	Install liner on 18,025 feet of pipe identified by SSLC at approximately 60 different locations	**$ 1,184,000**
3	Repair approximately 73 different locations in need of point repairs as identified by SSLC	**$ 198,000**
4	Replace 17 clean outs with access manholes	**$ 91,000**
5	Monitor minor capacity issues identified in existing deficiencies. If issues become significant, implement future recommended project	**NA**
	TOTAL	**$ 2,313,000**

1 All costs include 30% for engineering, administrative costs, and contingencies. Costs are shown in 2014 dollars.

TABLE VIII-2
ALTERNATIVE A RECOMMENDED IMPROVEMENT PROJECTS

PROJECT ID	DESCRIPTION	COST[1]
6a	Replace 292 ft of 15-in pipe in West Temple St. from Malvern Ave. to 2700 South to reverse the grade so that Malvern Ave. flows to 2700 South	**$ 102,000**
7a	Install 252 ft of 8-in pipe across State St. in 2400 South using trenchless technology to divert partial flows west	**$ 100,000**
8a	Install 193 ft of 8-in pipe across State St. in Truman Ave. using trenchless technology to divert partial flows west	**$ 84,000**
9a	Replace 995 ft of 8-in pipe in 300 East from Haven Ave. to Burton Ave. and in Burton Ave. from 300 East to 250 East to increase the grade and re-route flows west	**$ 256,000**
10	Monitor minor issues identified in future deficiencies. If issues become significant, increase pipe capacity or re-route flows to alleviate issues	**NA**
	TOTAL	**$ 542,000**

1 All costs include 30% for engineering, administrative costs, and contingencies. Costs are shown in 2014 dollars.

TABLE VIII-3
ALTERNATIVE B RECOMMENDED IMPROVEMENT PROJECTS

PROJECT ID	DESCRIPTION	COST[1]
6b	Replace 1,121 ft of 18-in pipe with 24-in pipe in West Temple St. from Haven Ave. to Utopia Ave. to increase pipe capacity, repair cracks, and prevent I&I	**$ 442,000**
7b	Replace 1,608 ft of 10-in pipe with 12-in pipe in Robert Ave. from State St. to West Temple to increase pipe capacity	**$ 497,000**
8b	Replace 862 ft of 10-in and 8-in pipe with 12-in pipe in State St. from Truman Ave. to Robert Ave. to increase pipe capacity, repair cracks, and prevent I&I	**$ 251,000**
9b	Replace 575 ft of 8-in pipe with 10-in pipe in 300 East from Haven Ave. to Burton Ave and replace 1,531 ft of 8-in pipe with 10-in pipe in 2400 South from 300 East to State St to increase pipe capacity	**$ 589,000**
	TOTAL	**$ 1,779,000**

1 All costs include 30% for engineering, administrative costs, and contingencies. Costs are shown in 2014 dollars.

TABLE VIII-4
RECOMMENDED IMPROVEMENT PROJECTS SUMMARY

PROJECT IDs	PROJECTS	COST
1-5	**Existing Recommended Improvement Projects**	**$ 2,313,000**
6a-9a, 10	**Alternative A Future Recommended Improvement Projects**	**$ 542,000**
6b-9b	**Alternative B Future Recommended Improvement Projects**	**$ 1,779,000**

WASTEWATER COLLECTION SYSTEM CLEANING

Wastewater collection system maintenance problems can occur in sewers with flatter slopes that need cleaning regularly, sewers with root problems, and sewers with grease problems. Costs for maintenance and replacement of these sewers should be included in the sewer budget.

SEWER SYSTEM OPERATION AND MAINTENANCE

SSLC has budgeted $974,500 for 2014 to operate and maintain the sewer system. This budget includes the cost of wastewater treatment at the CVWRF, employee compensation, equipment costs, office expenses, line repair costs, professional services, training costs, and utility costs. The line repair costs are budgeted at $77,000 and is used to maintain the system (cleaning, video inspection, emergency repairs, pump repairs, etc.).

UTAH SEWER MANAGEMENT PROGRAM

The State of Utah Water Quality Board has developed a Utah Sewer Management Program (USMP) to reduce sanitary sewer overflows (SSO) by giving added emphasis to collection system maintenance, collection system analysis and program documentation. The USMP is intended to meet forthcoming Capacity, Management, Operation, and Maintenance requirements (CMOM) of the Environmental Protection Agency (EPA). The USMP prohibits SSOs, outlines enforcement, and guidelines for reporting SSOs when they occur. It requires all public agencies that own or operate sanitary sewer collection systems in Utah to enroll for

coverage with the Utah State Division of Water Quality (DEQ) under the USMP. The enrollees are required to provide a plan and schedule to properly manage, operate, and maintain all parts of the sanitary sewer system to help reduce and prevent SSOs as well as mitigate any SSOs that do occur. Enrollees must prepare, submit, and certify this Sewer System Management Plan (SSMP) to the DEQ within the time period specified in the USMP after its adoption. Enrollees must then take all feasible steps to comply with the conditions of the USMP and follow their own SSMP including: report SSOs, submit an annual report as part of the Utah Municipal Wastewater Planning Program, and resubmit an updated SSMP at least every five years (R317-801). It is recommended that SSLC enroll in and comply with the USMP.

Sewer Ordinance

It is recommended that SSLC add text to municipal code 13.36.020 specifying that the size, slope alignment, materials of construction of a POTW sewer, and the methods to be used in excavating, placing of the pipe, jointing, testing and backfilling the trench shall all conform to the requirements set forth in Utah Administrative Code R317-3.

It is also recommended that SSLC update municipal code 13.24.040 so it is in agreement with the findings and recommendations of the rate study. Municipal code 13.24.040 defines the terms and conditions for sewer billings and rates, including the minimum monthly charge, the monthly charge for new customers, and the charge for customers with their own water supply (City of South Salt Lake, 2013).

ELIMINATE UNNECESSARY WASTEWATER

One way to increase capacity in the wastewater collection system is to identify and eliminate the unnecessary generation of wastewater. Wastewater is made up of inflow, infiltration, and direct sewage. A meaningful effort should be made to reduce inflow and infiltration because the sewer system experiences a significant amount of inflow and infiltration. Eliminating unnecessary wastewater will not only increase the capacity of the system, but it will also lower the expected treatment costs from CVWRF.

Inflow

Inflow often occurs from cross connections with storm drains, accidental drainage into the system, or from illegal connections at homes. Strategic metering will often reveal the general location of precipitation related inflow. Smoke testing can also identify problematic connections to the sewer system. If connections to the storm drain are identified, efforts should be made to separate storm drain and sewer piping.

Infiltration

Locations where significant infiltration enters the system can be identified through metering and videoing sewer pipes. Because infiltration appears to be the largest unnecessary wastewater source, it is recommended that efforts should be undertaken to identify and repair locations with infiltration. Many locations with infiltration have already been identified in the Repair Issues and are identified in Appendix E.

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 SSLC offer incentives for installing water wise fixtures and appliances.

FUNDING OPTIONS

Funding options for the recommended projects, in addition to sewer use fees, could include the following options: general obligation bonds, revenue bonds, State/Federal grants and loans, and impact fees. In reality, the City may need to consider a combination of these funding options. The following discussion describes each of these options.

Sewer Service Fees

The sewer service fee is used to pay for the operation and maintenance of the sewer system. As part of the maintenance of the sewer system, it is recommended that sewer systems set aside a part of the budget (including depreciation) into a capital facilities replacement account.

Zions Bank has prepared a rate study for the SSLC Sanitary Sewer System in collaboration with this Master Plan. A more detailed description of the sewer service fees can be seen in the rate study.

General Obligation Bonds

This form of debt enables the City to issue general obligation bonds for capital improvements and replacement. General Obligation (GO) Bonds would be used for items not typically financed through the Revenue Bonds. GO bonds are debt instruments backed by the full faith and credit of the City which would be secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds. GO bonds are the lowest-cost form of debt financing available to local governments and can be combined with other revenue sources such as specific fees, or special assessment charges to form a dual security through the City's revenue generating authority. These bonds are supported by the City as a whole, so the amount of debt issued for the sewer system is limited to a fixed percentage of the real market value for taxable property within the City.

Revenue Bonds

This form of debt financing is also available to the City for utility related capital improvements. Unlike GO bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the sewer service charge revenues of a Sewer Utility. Revenue bonds present a greater risk to the investor than do GO bonds, since repayment of debt depends on an adequate revenue stream, legally defensible rate structure and sound fiscal management by the issuing jurisdiction. Due to this increased risk, revenue bonds generally require a higher interest rate than GO bonds, although current interest rates are historically very low. This type of debt also has very specific coverage requirements in the form of a reserve fund specifying an amount, usually expressed in terms of average or maximum debt service due in any future year. This debt service is required to be held as a cash reserve for annual debt service payment to the benefit of bondholders. Typically, voter approval is not required when issuing revenue bonds.

State/Federal Grants and Loans

Historically, both local and county governments have experienced significant infrastructure funding support from state and federal government agencies in the form of block grants, direct grants in aid, interagency loans, and general revenue sharing. Federal expenditure pressures and virtual elimination of federal revenue sharing dollars are clear indicators that local government may be left to its own devices regarding infrastructure finance in general. However,

state/federal grants and loans should be further investigated as a possible funding source for needed sewer system improvements.

It is also important to assess likely trends regarding federal/state assistance in infrastructure financing. Future trends indicate that grants will be replaced by loans through a public works revolving fund. Local governments can expect to access these revolving funds or public works trust funds by demonstrating both the need for and the ability to repay the borrowed monies, with interest. As with the revenue bonds discussed earlier, the ability of infrastructure programs to wisely manage their own finances will be a key element in evaluating whether many secondary funding sources, such as federal/state loans, will be available to the City.

Impact Fees

Impact fees can be applied to water related facilities under the Utah Impact Fees Act. The Utah Impacts Fees Act is designed to provide a logical and clear framework for establishing new development assessments. It is also designed to establish the basis for the fee calculation which the City must follow in order to comply with the statute. However, the fundamental objective for the fee structure is the imposition on new development of only those costs associated with providing or expanding water infrastructure to meet the capacity needs created by that specific new development.

SUMMARY OF RECOMMENDATIONS

1. Continue to clean the entire system every other year.
2. Continue to use video inspection on the entire system every four years to identify repair and inflow/infiltration issues.
3. Work to conform to the proposed Utah Sanitary Sewer Management Plan to minimize sewer overflows.
4. Monitor pump stations 1 and 2 to analyze capacity during significant precipitation events.
5. Implement the recommended improvement projects to solve existing and future issues in the Capital Facilities Plan (Tables VII-1 and VII-2).
6. Identify sources of infiltration into the wastewater collection system and work on eliminating or reducing points of infiltration.
7. Identify and eliminate sources of precipitation based inflow into the wastewater collection system.
8. Offer incentives for installing water wise fixtures.
9. Work on installing manholes to replace clean-outs as identified in project 4 during road maintenance and other opportunities of convenience.
10. It is recommended that SSLC add text to municipal code 13.36.020 specifying that the size, slope alignment, materials of construction of a POTW sewer, and the methods to be used in excavating, placing of the pipe, jointing, testing and backfilling the trench shall all conform to the requirements set forth in Utah Administrative Code R317-3. It is also recommended that the City update the sewer ordinance to reflect the findings and recommendations provided in the rate study.

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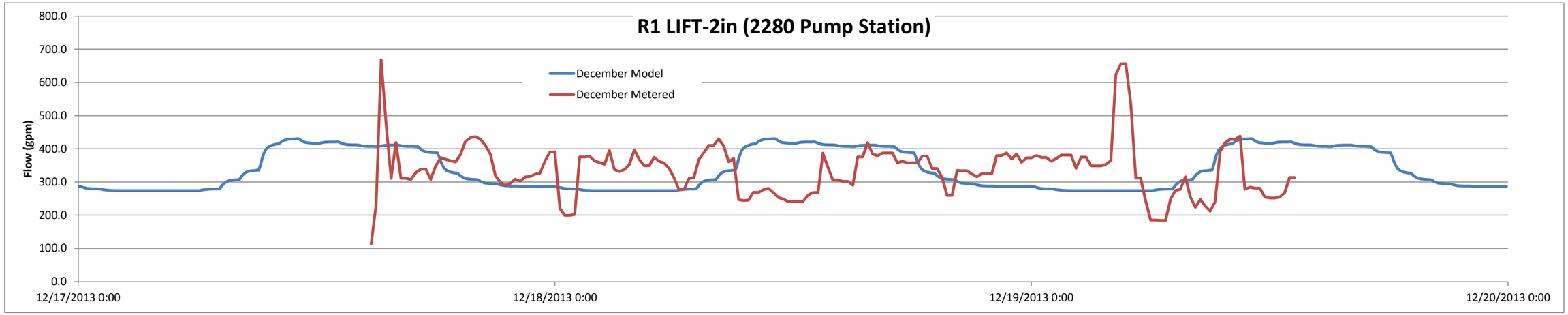
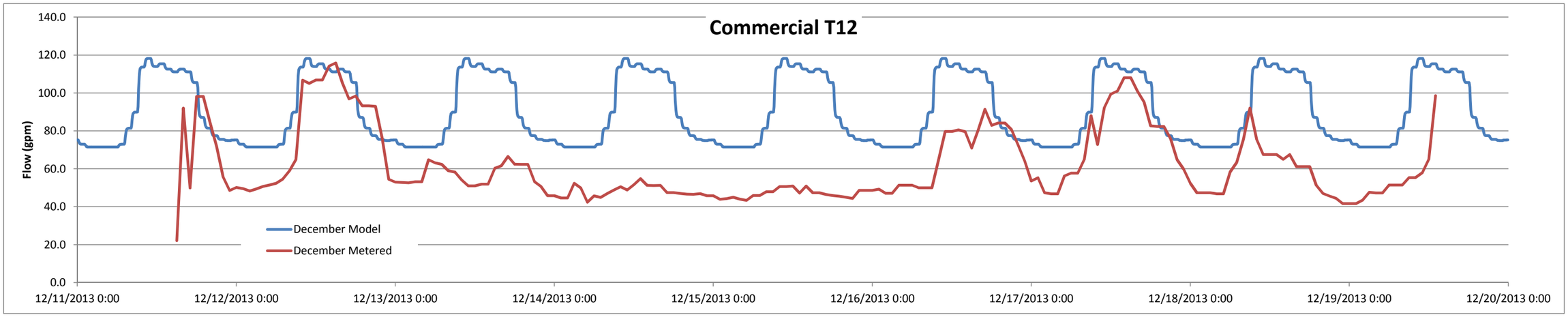
APPENDIX A

System Flow and Calibration


R1 LIFT-2in (2280 Pump Station)
Flow (gpm)
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
December Model
December Metered
12/17/2013 0:00
12/18/2013 0:00
12/19/2013 0:00
12/20/2013 0:00


Commercial T12
Flow (gpm)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
December Model
December Metered
12/11/2013 0:00
12/12/2013 0:00
12/13/2013 0:00
12/14/2013 0:00
12/15/2013 0:00
12/16/2013 0:00
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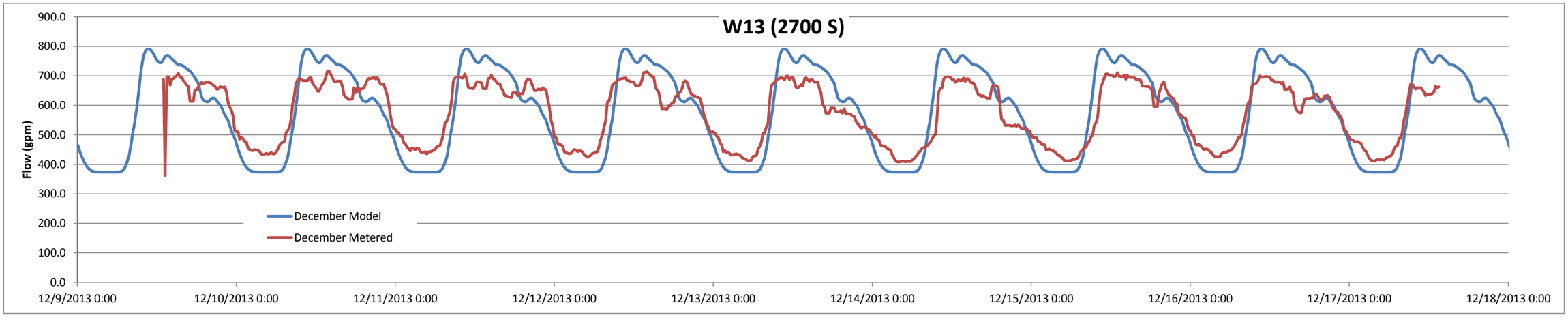
12/19/2013 0:00
12/20/2013 0:00


W13 (2700 S)
Flow (gpm)
900.0
800.0
700.0
600.0
500.0
400.0
300.0
200.0
100.0
0.0
December Model
December Metered
12/9/2013 0:00
12/10/2013 0:00
12/11/2013 0:00
12/12/2013 0:00
12/13/2013 0:00
12/14/2013 0:00
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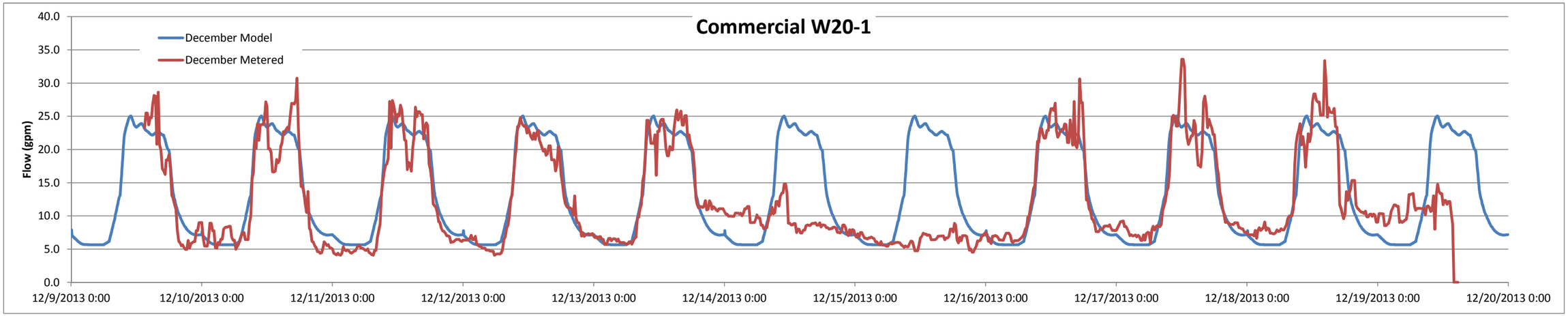
12/17/2013 0:00
12/18/2013 0:00


Commercial W20-1
December Model
December Metered
Flow (gpm)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
12/9/2013 0:00
12/10/2013 0:00
12/11/2013 0:00
12/12/2013 0:00
12/13/2013 0:00
12/14/2013 0:00
12/15/2013 0:00
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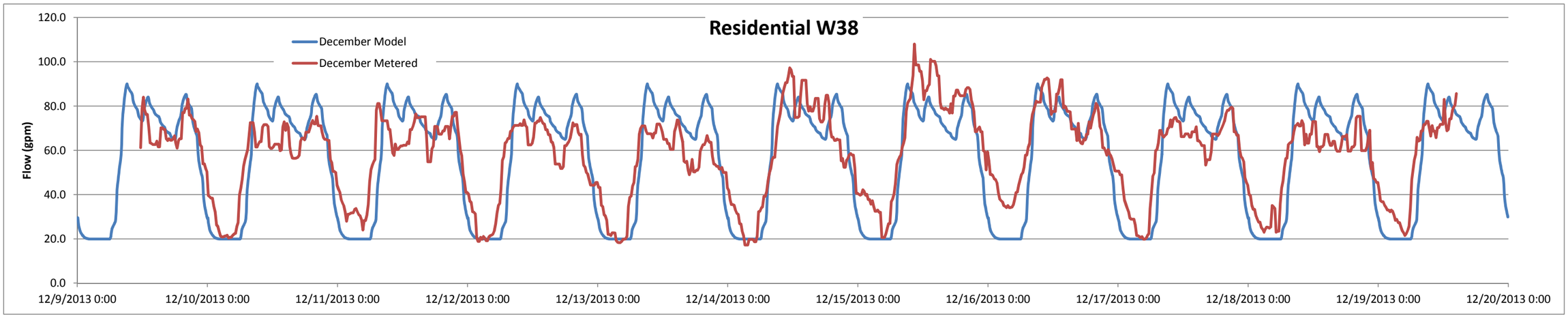
12/19/2013 0:00
12/20/2013 0:00


Residential W38
December Model
December Metered
Flow (gpm)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12/9/2013 0:00
12/10/2013 0:00
12/11/2013 0:00
12/12/2013 0:00
12/13/2013 0:00
12/14/2013 0:00
12/15/2013 0:00
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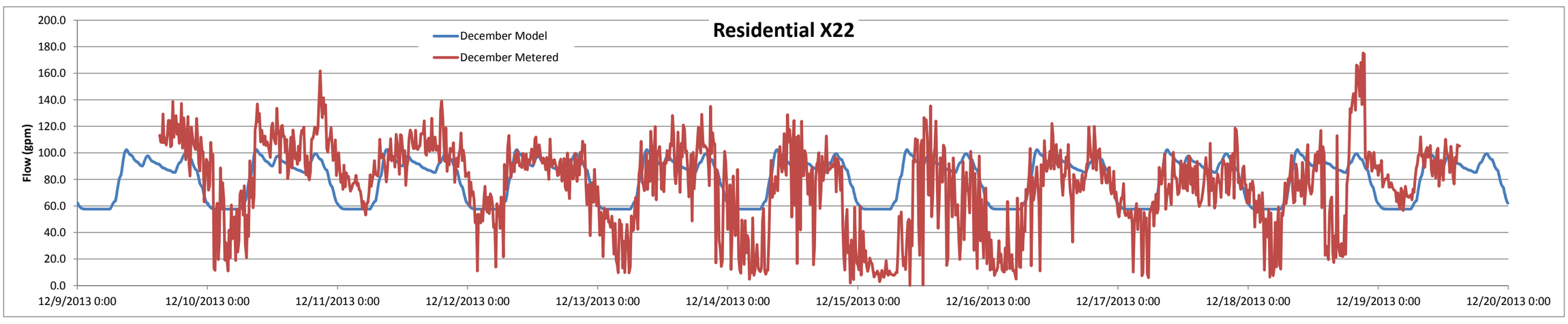
12/19/2013 0:00
12/20/2013 0:00


Residential X22
December Model
December Metered
Flow (gpm)
200.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
12/9/2013 0:00
12/10/2013 0:00
12/11/2013 0:00
12/12/2013 0:00
12/13/2013 0:00
12/14/2013 0:00
12/15/2013 0:00
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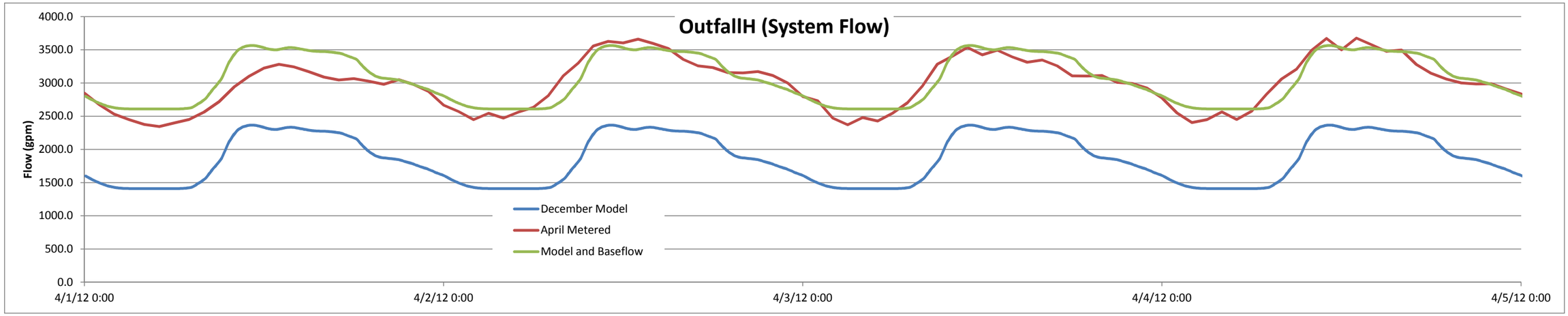
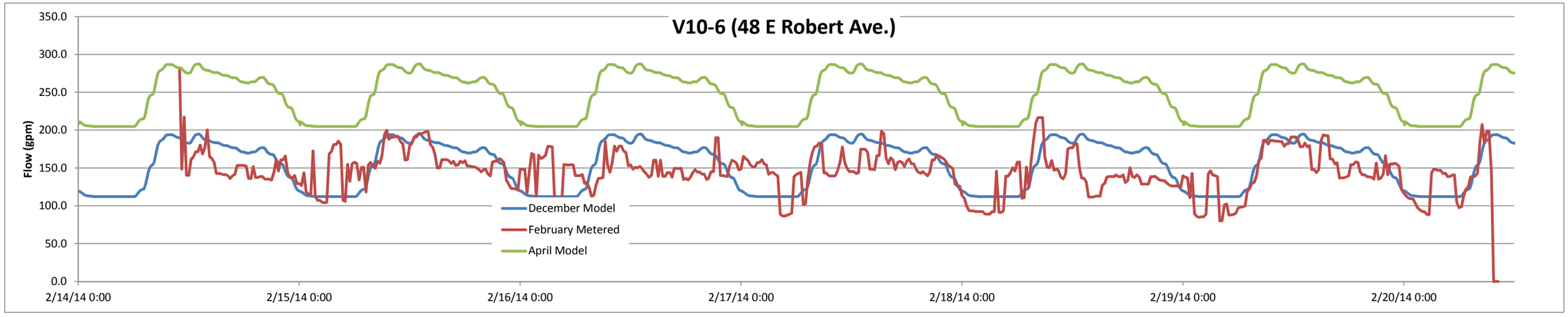
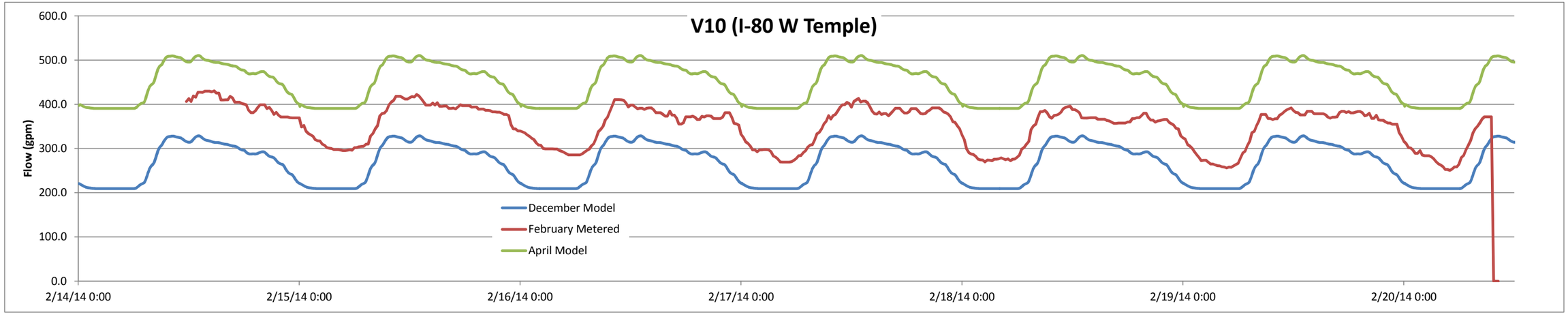
12/19/2013 0:00
12/20/2013 0:00


OutfallH (System Flow)
Flow (gpm)
4000.0
3500.0
3000.0
2500.0
2000.0
1500.0
1000.0
500.0
0.0
4/1/12 0:00
4/2/12 0:00
4/3/12 0:00
4/4/12 0:00
4/5/12 0:00
December Model
April Metered
Model and Baseflow


V10-6 (48 E Robert Ave.)
Flow (gpm)
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
2/14/14 0:00
2/15/14 0:00
2/16/14 0:00
2/17/14 0:00
2/18/14 0:00
2/19/14 0:00
2/20/14 0:00
December Model
February Metered
April Model


V10 (I-80 W Temple)
Flow (gpm)
600.0
500.0
400.0
300.0
200.0
100.0
0.0
2/14/14 0:00
2/15/14 0:00
2/16/14 0:00
2/17/14 0:00
2/18/14 0:00
2/19/14 0:00
2/20/14 0:00
December Model
February Metered
April Model

South Salt Lake City
Sanitary Sewer Master Plan
Calculations of per Capita Flow
126.28.100

3/11/2014

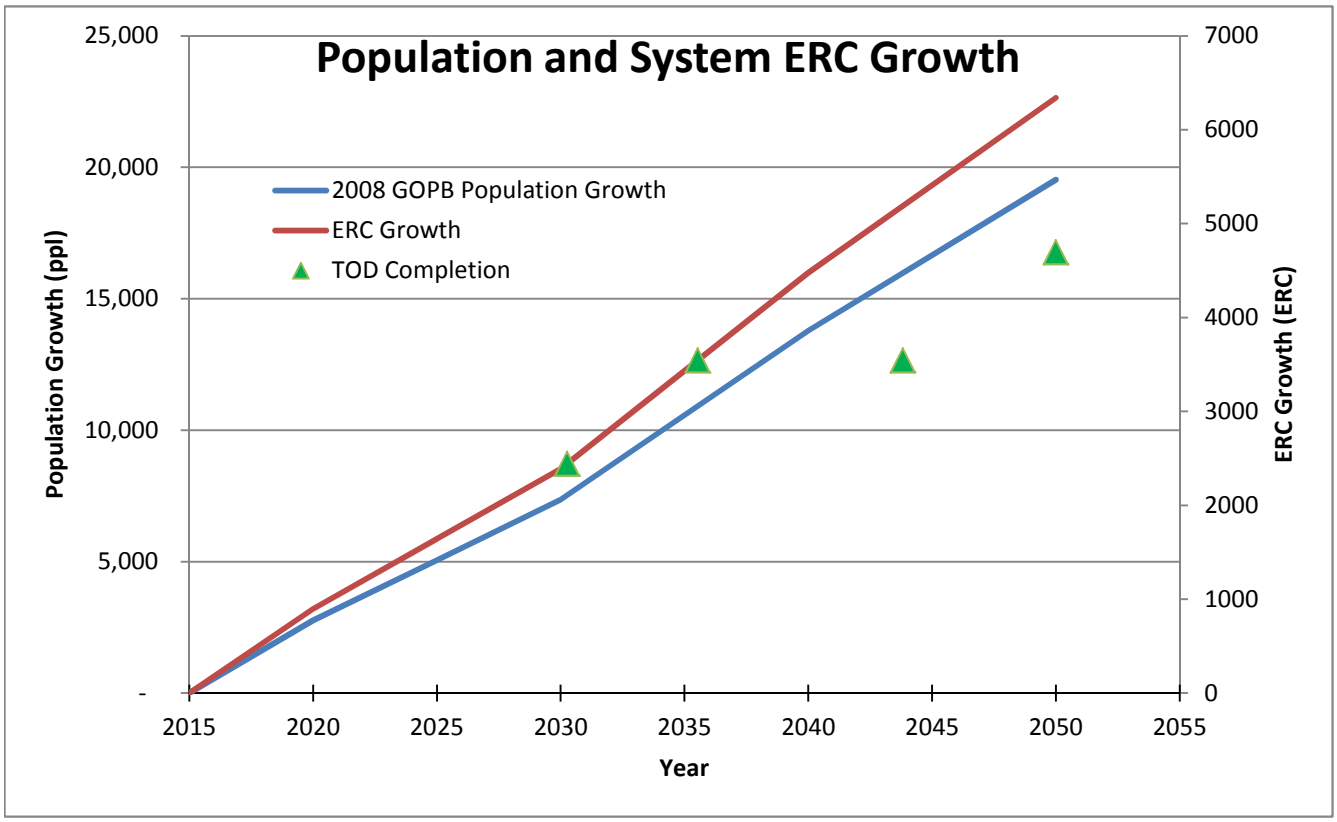
Existing System Comparison to R317 Standards			
Drinking Water System Connections	3,314	conn.	
Drinking Water ERCs	6,337	ERCs	
Drinking Water ERC/Connection	1.91	ERC/conn.	Drinking Water ERCs / Drinking Water System Connections
Actual Meter Connections	2,591	conn.	
Sewer System ERCs	4,954	ERCs	Actual Contributing Meter Connections x Drinking Water ERC/Connection
Average Household Size 2010	2.46	ppl	(U.S. Census Bureau, 2010)
Calculated Virtual Capita	12,188	ppl	Sewer System ERCs x Average Household Size 2010
April 2012 Design Average Flow	4.30	MGD	
Average Flow per Capita	**352.5**	**gpcd**	April 2012 Design Average Flow x 1,000,000 gal per MGD / Calculated Capita
R317 Average Standard	**100**	**gpcd**	
Model Peak Flow at Outfall	5.1	MGD	
Model Peak Flow per Capita	**415**	**gpcd**	Model Peak Flow at Outfall x 1,000,000 gal per MGD / Calculated Capita
R317 Outfall Standard	**250**	**gpcd**	
Local Peaking Load	5.2	MGD	
Local Peak Flow per Capita	**423**	**gpcd**	Local Peaking Load x 1,000,000 gal per MGD / Calculated Capita
R317 Lateral Standard	**400**	**gpcd**	

2008 Baseline City Population Projections
Governor's Office of Planning & Budget
All data is based off of January 2008

3/11/2014

South Salt Lake Population and ERC Growth Estimates

	Census		Interpolate		Interpolate			
	2000	**2010**	2015	2020	2025	2030	2040	**2050**
Population	**22,038**	**22,274**	25,036	**27,799**	30,095	**32,391**	**38,818**	**44,560**
Population Growth (Pop. - Pop. 2015)			-	2,762	5,059	7,355	13,782	19,524
% Total Growth			0	0.14	0.26	0.38	0.71	1.00
Incremental % Growth			0	0.14	0.12	0.12	0.33	0.29
ERC Growth			0	897	746	746	2,087	1,864
Cumulative ERCs			0	897	1,642	2,388	4,475	6,339
years			0	5	10	15	25	35



TOD Growth Schedule

	Growth ERC	System ERCs	Total ERCs	*Years Out	Year	
Area 1	2443	2443	2443	15.3	2030.3	
Area 2	1100	3543	3543	20.5	2035.5	
Area 3	1642	3543	5185	28.8	2043.8	Doesn't Contribute to Sewer
Area 4	1154	4697	6339	35	2050	

*Years to complete calculated by interpolating along ERC Growth Line

APPENDIX B

System Flow Calculations

South Salt Lake City
Sanitary Sewer Master Plan
Calculations of per Capita Flow
126.28.100

3/11/2014

Existing System Comparison to R317 Standards			
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Drinking Water ERCs	6,337	ERCs	
Drinking Water ERC/Connection	1.91	ERC/conn.	Drinking Water ERCs / Drinking Water System Connections
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Governor's Office of Planning & Budget
All data is based off of January 2008

3/11/2014

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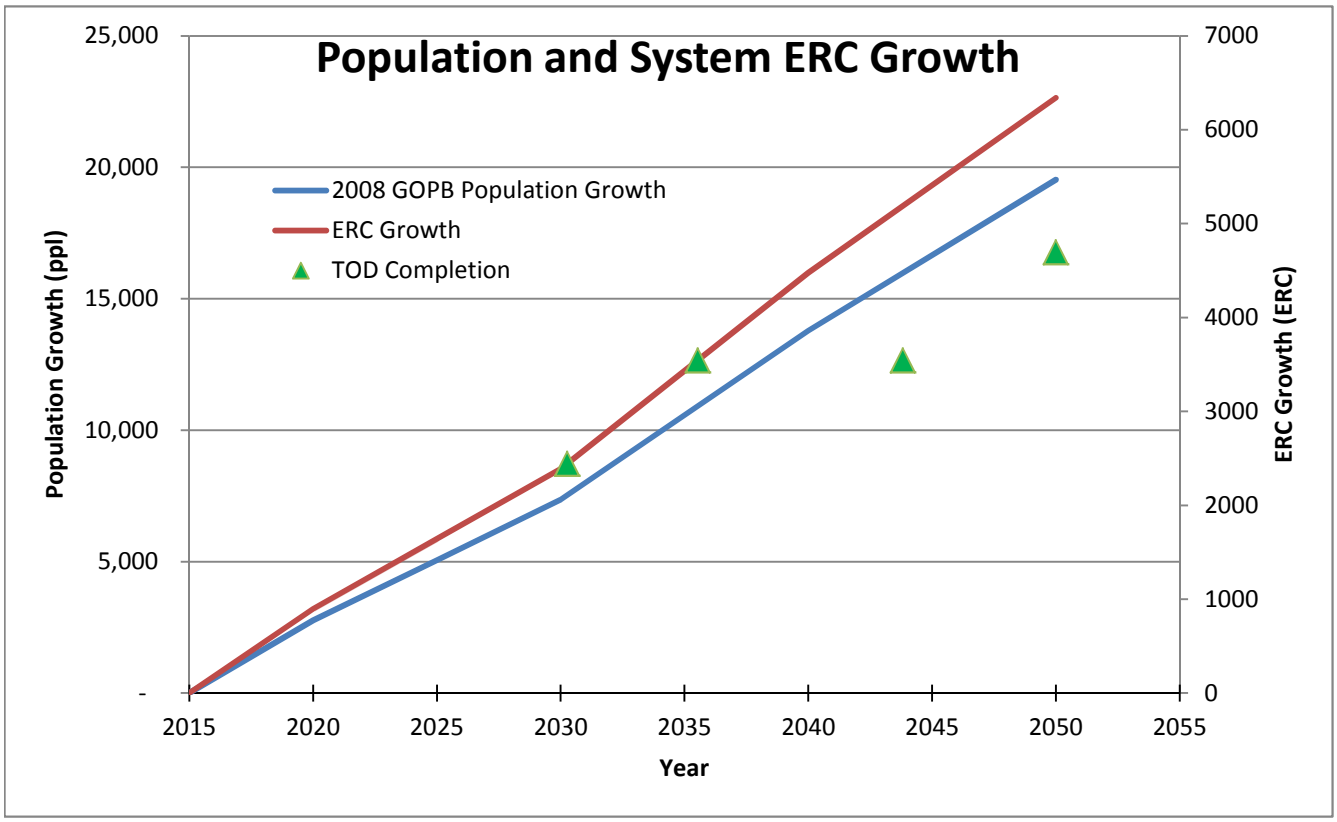

TOD Growth Schedule

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Area 4	1154	4697	6339	35	2050	

*Years to complete calculated by interpolating along ERC Growth Line

APPENDIX C

Electronic Data

SEE DISK

APPENDIX D

Trenchless Technologies

TRENCHLESS TECHNOLOGIES

TRENCHLESS TECHNOLOGIES OVERVIEW

Trenchless technologies are divided into two main categories, construction methods and renewal methods. Construction methods involve installation of a new pipeline, while renewal methods involve rehabilitating existing pipelines. The various technologies used in gravity flow applications on small to mid-size pipe diameters are briefly described in the following sections.

NEW PIPE CONSTRUCTION

Steered Auger Boring (Directional Boring)

Steered auger boring is a method of installing a steel casing pipe where it crosses a road, highway, or railroad track. This process simultaneously jacks a steel casing from a drive pit through the earth while removing the spoil inside the encasement by means of a rotating flight auger. The auger is a flighted tube having couplings at each end that transmit torque to the cutting head from the power source located in the bore pit and transfers spoil back to the machine. The casing supports the soil around it as spoil is being removed. Usually, after installation of the casing, a product pipe is installed and the annular space is filled with grout.

Microtunneling

Microtunneling boring machines are mainly used for installation of a gravity pipeline for wastewater or storm drain. These machines are laser-guided, remotely controlled, and permit accurate monitoring and adjusting of the alignment and grade as the work proceeds so that the pipe can be installed on a precise line and grade.

Microtunneling is not commonly used in Utah.

PIPE RENEWAL

Cured-In-Place

The cured-in-place process involves the insertion of a resin-impregnated fabric tube into an existing pipe by the use of water or air inversion or winching. Usually, the fabric is polyester felt material, fiberglass reinforced, or similar. Normally, water or air is used for the inversion process with hot water or steam used for the curing process. The pliable nature of the resin-saturated fabric prior to curing allows installation around curves, filling of cracks, bridging of gaps, and maneuvering through pipe defects. The cured-in-place process can be applied for structural and non-structural purposes. Additionally, systems using felt impregnated polyester resin or fiberglass provide very good corrosion resistance. The cured-in-place process also has excellent strength, and can be designed as a stand-alone system to sustain entire loading on an existing pipe.

Advantages

- Grouting is not normally required.
- No joints, so very smooth interior improves hydraulic capacity.
- Conforms to non-circular shapes, bends, and deformations.
- Can be inserted via existing manholes or through minor excavations.

Limitations

- The tube or hose must be custom-constructed for each project.
- The existing flow must be rerouted during the installation process.
- Sealing may be required at liner pipe ends to prevent infiltration.
- The amount and type of resin is a contractor's function, so specifications and inspection are required to ensure proper resin quality and handling.
- The curing process must be carefully monitored, inspected, and tested.
- Chemical contaminants are introduced into the curing water during the curing process that cannot be discharged into the environment. Discharging the curing water to a POTW is acceptable.
- Obstructions in the existing pipeline inhibit the lining process.
- The cost of the cured-in-place process is relatively expensive.

Slip Lining

Slip lining is mainly used for structural applications when the existing pipe does not have joint settlements or misalignments. In this method, a new pipeline of smaller diameter is inserted into the existing pipeline and usually the annulus space between the existing pipe and new pipe is grouted.

Advantages

- No specialized equipment is required.
- The same jacking pipes and fittings, as used in other trenchless construction methods, may be used.
- It is a conceptually simple technique.
- It can be used for structural and non-structural applications.
- The existing flow can be maintained (live insertion) during the installation process.

Limitations

- Less hydraulic capacity, due to smaller diameter, than the original larger pipeline had when it was new.
- Pit excavation is required.
- Grouting is generally required.

Pipe Bursting

Pipe bursting is considered when the capacity of an existing pipeline is determined to be inadequate. Pipe bursting uses a hammer to break the old pipe and force particles into the surrounding soil while a new pipe is simultaneously pulled and/or pushed in its place.

Advantages

- It can be used on a wide range of existing pipe materials and diameters.
- The new pipeline can be larger than the existing pipeline if there is enough cover.
- The existing pipeline serves as a guide to for the new pipeline.

Limitations

- Drive and reception excavations are required.
- Above-ground working space is required for ancillary construction equipment.
- Laterals must be replaced by open excavations.
- The existing flow must be rerouted during the installation process.
- Ground movement and vibration could damage nearby facilities.

Pipe Eating

Pipe eating is considered when the capacity of an existing pipeline is determined to be inadequate. Pipe eating is performed using a boring machine. In this method, the old pipe is broken into small pieces and taken out by means of slurry or auger.

Advantages

- It can be used on a wide range of existing pipe materials and diameters.
- The new pipeline can be larger than the existing pipeline if there is enough cover.
- The existing pipeline serves as a guide to for the new pipeline.

Limitations

- Drive and reception excavations are required.
- Above-ground working space is required for ancillary construction equipment.
- Laterals must be replaced by open excavations.
- The existing flow must be rerouted during the installation process.

Thermoforming

Thermoforming involves inserting a folded (for reduced cross section) pipeline into an existing pipeline and subsequently heating the inserted pipeline to conform to the existing pipeline dimensions. The inserted folded pipeline is made of either polyvinyl chloride or polyethylene.

Advantages

- Very smooth interior improves hydraulic capacity.

- Few field joints, so construction is faster.
- It is a chemically-inert process.
- It solves corrosion problems.
- It controls groundwater infiltration, product exfiltration, and root intrusion.
- The new pipe is structurally-independent.
- Installation can be accomplished via existing manholes.
- It can be used on large radius bends.
- Internal lateral connections are possible

Limitations

- A large above-ground working space is required for laying out the string of butt-fused pipeline.
- The existing flow must be rerouted during the installation process.
- For water mains, valves and connections usually require excavation.

SUMMARY OF BENEFITS OF TRENCHLESS TECHNOLOGY

- Minimizes the need to disturb the existing environment, traffic, or congested living and working areas.
- Uses predetermined paths provided by existing piping, thereby reducing the steering and control problems associated with open-cut.
- Requires less space underground, thereby minimizing chances of interfering with existing utilities or abandoned pipelines.
- Provides the opportunity to upsize a pipeline (within technology limits) without open trench construction.
- Requires less-exposed working area, and therefore, is safer for both workers and the community
- Eliminates the need for spoil removal and minimize damage to the pavement (the life expectancy of pavements have been observed to be reduced by up to 60 percent with open-cut repairs), and disturbance to other utilities.

TABLE 1 - COMPARISON OF TRENCHLESS TECHNOLOGIES

Method	Diameter Range (in)	Maximum Installation (ft)	Pipe Material[1]	Accuracy (in)
New Pipe Construction				
Steered Auger Boring	4 to 60	600	Steel	± 12
Microtunneling	6 to 136	500 to 1,500	RCP, GRP, VCP, DIP, Steel, PCP	± 1
Pipe Renewal				
Cured-In-Place	4 to 108	3,000	All	Not Applicable
Slip Lining	4 to 63	1,000	PE, PP, PE/EPDM, PVC	Not Applicable
Pipe Bursting	4 to 48	1,500	PE, PP, PVC, GRP	Not Applicable
Pipe Eating	4 to 36	300	PE, PP, PVC, GRP	Not Applicable
Thermoform	4 to 30	1,500	HDPE, PVC	Not Applicable

1. RCP = Reinforced Concrete Pipe
   GRP= Glass Reinforced Plastic
   VCP=Vitrified Clay Pipe
   DIP=Ductile Iron Pipe
   PCP=Polymer Concrete Pipe
   PE=Polyethylene
   PP=Polypropylene
   EPDM=Ethylene Propylene Diene Monomer
   PVC=Polyvinyl Chloride
   HDPE=High Density Polyethylene

APPENDIX E

Cost Estimates

AVERAGE SEWER PIPE COST PER FOOT 2014

Diameter (in)	Diameter (ft)	Outside Diameter (ft)	Pipe Material & Installation (1)	Excavation	Imported Bedding Installed	Hauling Excess Native Mat'l	Trench Backfill Installed (3)	Trench Box per Day (2)	Average Daily Output	Trench Box Cost	Top Trench Width (ft)	Road Repair Width (ft)	Asphalt Cost	Manhole Cost	Trench Dewatering (4)	Total Cost per Foot of Pipe	Adjusted Cost per foot	Cost Out of Street (3)	No Manhole	No Manhole Adjusted
DIA_IN	DIA_FT	OD_FT	MAT_INST	EXCAVATION	BEDDING	HAULING	BACKFILL	TRCHBX_DAY	TRCHBX_OUT	TRCHBX_FT	TRENCHW_FT	ROAD_FT	ROAD_DPFT	MH_DPFT		TOTAL_DPFT	ADJ_DPFT			
4	0.3	0.39	$5.65	10.08	13.36	12.39	70.42	210.00	190	1.11	5.19	9.19	36.51	**22.53**	14.30	$186.34	$162.00	$161.75	$163.81	$142.00
6	0.5	0.58	$7.95	10.71	15.31	13.17	73.69	210.00	190	1.11	5.38	9.38	37.17	**22.53**	14.79	$196.43	$170.00	$171.62	$173.90	$151.00
8	0.7	0.78	$12.10	11.36	17.29	13.97	76.96	210.00	190	1.11	5.58	9.58	37.83	**22.53**	15.28	$208.43	$181.00	$183.41	$185.90	$161.00
10	0.8	0.97	$18.50	12.03	19.30	14.78	80.24	210.00	130	1.62	5.77	9.77	38.50	**22.53**	18.41	$225.90	$196.00	$200.66	$203.37	$177.00
12	1.0	1.17	$20.00	12.71	21.35	15.62	83.51	210.00	115	1.83	5.97	9.97	39.16	**22.53**	19.99	$236.70	$205.00	$211.24	$214.17	$186.00
15	1.3	1.46	$22.50	13.76	24.50	16.92	88.43	210.00	100	2.10	6.26	10.26	40.16	**22.53**	22.14	$253.02	$220.00	$227.24	$230.49	$200.00
18	1.5	1.75	$26.50	14.85	27.71	18.26	93.34	210.00	94	2.23	6.55	10.55	41.15	**22.53**	23.57	$270.15	$234.00	$244.04	$247.62	$215.00
21	1.8	2.04	$33.50	15.98	31.01	19.65	98.25	210.00	88	2.39	6.84	10.84	42.15	**22.53**	25.09	$290.55	$252.00	$264.11	$268.02	$233.00
24	2.0	2.33	$40.50	17.15	34.38	21.08	103.16	210.00	88	2.39	7.13	11.13	43.15	**22.53**	25.83	$310.18	$269.00	$283.41	$287.65	$250.00
30	2.5	2.92	$36.50	19.60	41.36	24.09	112.99	210.00	72	2.92	7.72	11.72	45.14	27.33	30.05	$339.97	$295.00	$312.56	$312.65	$271.00
36	3.0	3.50	$46.50	22.21	48.65	27.29	122.81	210.00	72	2.92	8.30	12.30	47.13	27.33	31.53	$376.36	$327.00	$348.30	$349.04	$303.00

Reference: 2014 RS Means Heavy Construction Cost Data Updated By: JGH

Assumptions:

y	**Total Import Trench Backfill? (Y/N)**	
y	**Dewatering? (Y/N)**	
y	**Manholes? (Y/N)**	
	One side of street C&G is regraded (30' street).	
10	v :1h trench side slope (use trench boxes)	
10	' average depth to top of pipe	
0.33	' thick asphalt road covering	
0.75	' thick untreated base course	
200	' Average distance between manholes	
3	+ Outside Diameter = Bottom trench width	
1	' bedding over pipe	
0.5	' bedding under pipe	
87%	Salt Lake City Total Cost Index	

Costs:

$ 57.42	/CY Import Trench Backfill - use Imported Select Fill
$ 57.42	/CY Imported Select Fill - sec 31 23 23.16 (0200, 0500) 31 23 23.20 (4022): Sand, dead or bank w/ hauling (20 CY, 6 mi) and compaction. ($32.00/LCY + $5.35/LCY)*1.39 LCY/ECY + $5.50/ECY
$ 6.05	/CY Excavation - sec 31 23 16.13 (1375): 10-14 ft deep, 1 CY excavator, Trench Box.
$ 30.73	/SY 4" Asphalt Pavement -sec 32 11 23.23 (0390) 32 12 16.13 (0130, 0390) 31 23 23.20 (4022): 9" Bank Run GravelBase Course ($8.00/SY), 2" Binder ($9.50/SY), 2" Wear ($10.55/SY [4"=$20/SY]) and Hauling ($5.35/LCY * 1.39LCY/ECY * 0.361CY/SY)
$ 2.56	/LF 4" Asphalt cutting - sec 02 41 19.25 (0015): Saw cutting asphalt up to 3" deep ($1.67/LF), each additional inch of depth ($0.93/LF)
$ 3,380.00	/EA 4' Manhole (for pipes =< 2.5' diameter) - sec 33 49 13.10 (1130, 1140, 1300): Precast 8' deep ($2,325/ea), Slab top 8" thick ($505/ea), each add'l foot of depth ($275/VLF)
$ 5,465.00	/EA 5' Manhole (for pipes > 2.5' and <= 3.5') - sec 33 49 13.10 (1170, 1180, 1400): Precast 8' deep ($3,850/ea), Slab top 8" thick ($695/ea), each add'l foot of depth ($460/VLF)
$ 7,570.00	/EA 6' Manhole (for pipes > 3.5' and <= 4.5') - sec 33 49 13.10 (1210, 1220, 1500): Precast 8' deep ($5,325/ea), Slab top 8" thick ($955), each add'l foot of depth ($645/VLF)
$ 10,000.00	/EA 6'x9' Cleanout Box (for pipes > 4.5') From Murray Winchester Project ($10,000/ea)
$ 210.00	/day Trench Box sec 31 52 16.10 (4500): 7' deep, 16' x 8'
$ 7.44	/CY Hauling - sec 31 23 23.20 (4022): 20 CY dump truck, 6 mile round trip and conversion from loose to compacted volume. $5.35/LCY * 1.39 LCY/ECY
$ 68.54	/CY Stabilization Gravel - sec 31 23 23.16 (0050, 0500) 31 23 23.20 (4022): Bank Run Gravel ($40/LCY * 1.39 LCY/ECY) plus compaction ($5.50/ECY) and hauling ($5.35/LCY * 1.39 LCY/ECY)
$ 1,082.00	/day Dewatering - sec 31 23 19.20 (1000, 1020): 4" diaphram pump, 2 hrs attended ($955/day). Second pump ($127/day)

NOTES:

(1) Assumes PVC SDR 35 for 4" to 24" (sec 33 31 13.25) and HDPE Type S (sec 33 31 13.20) for 30" and larger.

(2) 7' deep trench box (16' x 8') - on page 274 31 52 16.10

(3) Backfill Material & Installation assumes in street. For out of street unit costs, the backfill material cost has been added in place of base course and asphalt.

(4) Dewatering assumes 1' stabilization gravel at the bottom of the trench plus dewatering pumps

(5) Conversion from loose to compacted volumes assumes 125 PCF for compacted density and 90 PCF for loose density. Or (125 PCF/ECY)/(90 PCF/LCY) = 1.39 LCY/ECY

(6) Conversion from cubic yards to square yards for hauling of asphalt paving assumed a total thickness of 13". 3 ft x 3 ft x (13 in)/(12 in/ft) = 0.361 CY/SY

Abbreviations:

VLF	vertical lineal foot
PCF	pounds per cubic foot
LCY	loose cubic yard
ECY	embankment cubic yard

RSMeans
33 01 30.72
Relining Sewers

With Cement, Including Bypass and Cleaning

87% Salt Lake City Total Cost Index

Code	Diameter in	Cost $/LF	Adjusted Cost $/LF
0020	6	$57.00	$49.48
0020	8	$57.00	$49.48
0020	10	$57.00	$49.48
0050	12	$61.00	$52.95
0070	14	$65.50	$56.85
0070	15	$65.50	$56.85
0070	16	$65.50	$56.85
0100	18	$78.50	$68.14
0100	20	$78.50	$68.14
0100	21	$78.50	$68.14
0200	24	$83.50	$72.48
0200	28	$83.50	$72.48
0200	30	$83.50	$72.48
0200	36	$83.50	$72.48

Cured in Place Pipe Cost Estimates From PEC, Inc.

Diameter in	Cost/ Foot
8	26
10	28
12	32
15	50
21	75
24	110
27	140

3-Mar-14

33 01 30.74
HDPE Pipe Lining
Excludes cleaning and video inspection

Pipe relined with one size smaller than original

Code	Original Dia. in	Cost $/LF	Adjusted Cost $/LF
0100	6	$10.85	$9.42
0150	8	$15.30	$13.28
0200	10	$18.00	$15.62
0250	12	$31.50	$27.34
0300	14	$34.00	$29.51
Extrp.	15	$35.25	$30.60

Power Rodder Cleaning

Code	Cost $/LF	Adjusted Cost $/LF		Total Adjusted Cost $/LF
6140	$3.90	$3.39		$12.80
6140	$3.90	$3.39		$16.67
6140	$3.90	$3.39		$19.01
6140	$3.90	$3.39		$30.73
6190	$4.56	$3.96		$33.47
	$4.56	$3.96		$34.56
6110, 6120	$5,700	$4,948	Mobilization	
9060	$820	$712	Video	

REPLACEMENT REPAIR PROJECTS FROM SSLC PERSONNEL									
Upstream MH	**Downstream MH**	**Section Length**	**Size in**	**Mat.**	**Comments**	**Cost/ LF**	**Pumping Cost**	**Cost/lf +Pumping**	**Project Cost**
R9-1	R9	440	8	VCP	Bad repair/Belly	$181	7%	$194	$85,215
X12-7	X12-6	362	8	VCP	Maxwell	$181	7%	$194	$70,109
X12-6	X12-5	343.8	8	VCP	Maxwell	$181	7%	$194	$66,584
X19-2	X19-1	191.3	8	VCP	Maxwell	$181	7%	$194	$37,049
X8-13	X8-10	239.5	8	VCP	Lots of repairs	$181	7%	$194	$46,384
W40-4		MH	8	VCP	Lower flowline	NA	7%	NA	$3,911
X26-2	X26	553.7	8	VCP	Cracks and I&I, Belly	$181	7%	$194	$107,235
X8-15	X8-14	483	8	VCP	CRACKS, BELLY, I & I	$181	7%	$194	$93,543
X26-3	X26-2	554.5	8	VCP	Cracks and I&I	$181	7%	$194	$107,390
	Total Length	**3,168**						**Total Cost**	**$617,419**

LINER REPAIR PROJECTS FROM SSLC PERSONNEL						
Upstream MH	**Downstream MH**	**Section Length**	**Size in**	**Mat.**	**Comments**	**Project Cost**
X24-2	X24-1	350.6	8	VCP	Cracks and I&I	**$9,116**
W27-19	w27-18	378	10	VCP	Surfrace Agg. Cracks and I&I	**$10,584**
X8-34	X8-33	213.4	8	VCP	Surface Aggregate	**$5,548**
X8-15	X8-5	26.2	8	VCP	Surface Aggregate	**$681**
X19	X18	279.8	12	RCP	Surface Aggregate	**$8,954**
X19-1	X19	36.5	8	RCP	Surface Aggregate	**$949**
X2	X1	210.5	8	RCP	Surface Aggregate	**$5,473**
W30	W29	370.1	15	RCP	Cracks and I&I	**$18,505**
V3	V2	298.5	18	VCP	Cracks and I&I	**$18,806**
V10-9	V10-6	283.2	10	VCP	Cracks and I&I	**$7,930**
S9-3	S9-2	348.1	10	NRCP	I%I	**$9,747**
S18-1	S18	396.8	8	VCP	Roots and Cracks	**$10,317**
S13-6	S13-3	213.9	8	VCP	Cracks and I&I	**$5,561**
X26-1	X26	451.1	8	VCP	SurfaceAgg. Cracks and I&I	**$11,729**
X21	X20	203.2	12	RCP	Surface Aggregate	**$6,502**
X20	X19	195	12	RCP	Surface Aggregate	**$6,240**
X18	X17	264.2	12	RCP	Surface Aggregate	**$8,454**
X12	X11	326.8	15	RCP	Surface Aggregate	**$16,340**
X11	X10	382.1	15	RCP	Surface Aggregate	**$19,105**
X10	X8-25	21.1	15	RCP	Surface Aggregate	**$1,055**
X8-25	X8-24	324.7	15	RCP	Surface Aggregate	**$16,235**
X8-24	X7	117.8	15	RCP	Surface Aggregate	**$5,890**
X5	X4	40.9	15	RCP	Surface Aggregate	**$2,045**
X4	X3	155.9	15	RCP	Surface Aggregate	**$7,795**
X3	X2	210.5	15	RCP	Surface Aggregate	**$10,525**
X8-1	W35-2	318.5	12	VCP	Cracks and I&I	**$10,192**
X8-3	X8-18	463.1	8	VCP	Cracks and I&I	**$12,041**
V6-2	V6-1	346.3	8	VCP	Cracks and I&I	**$9,004**
V1	S15	377.4	18	VCP	Cracks and I&I	**$23,776**
V13-2	V13-1	386.2	8	VCP	Cracks and I&I	**$10,041**
V10-34	V10-9	286.7	10	VCP	Cracks and I&I	**$8,028**
W40-1	W40	395.6	10	VCP	Cracks and I&I	**$11,077**
W33	W32	305.2	15	VCP	I &I	**$15,260**
W39	W38	405.4	12	VCP	Cracks and I&I	**$12,973**
S9-4	S9-3	297	10	NRCP	Cracks and I&I	**$8,316**
R2-10	R2-7	340.8	8	NRCP	Surface Aggregate, broken pipe	**$8,861**
PS2	R2-10	308.3	8	NRCP	Surface Agg.	**$8,016**
S23-25	S23-23	249.4	10	VCP	Cracks and I&I	**$6,983**
X12-1	X12	17.2	8	RCP	Surface Aggregate	**$447**
s23-14	s23-11	297.6	8	VCP	Cracks and I&I	**$7,738**
V10-33	V10-25	389.2	8	VCP	Cracks and I&I	**$10,119**
X8-21	X8-2	357.6	10	VCP	I&I	**$10,013**
X17	X16	16.4	8	RCP	Surface Aggregate	**$426**
X16	X15	232.5	12	RCP	Surface Aggregate	**$7,440**
X15	X14	341.7	12	RCP	Surface Aggregate	**$10,934**
X14	X13	295.9	15	RCP	Surface Aggregate	**$14,795**
X13	X12	302.3	15	RCP	Surface Aggregate	**$15,115**
X7	X6	345.6	15	RCP	Surface Aggregate	**$17,280**
X6	X5	337.1	15	RCP	Surface Aggregate	**$16,855**
W27-29	W27-28	140.9	12	VCP	Surface Aggregate	**$4,509**
W20-10	W20-9	395.7	8	VCP	Surface Aggregate	**$10,288**
X8-16	X8-1	347.2	8	VCP	Cracks and I&I	**$9,027**
S23-12	S23-11	372.1	8	VCP	Cracks and I&I	**$9,675**
S23-24	S23-23	406.5	8	VCP	Cracks and I&I	**$10,569**
S23-16	S23-15	324.1	8	VCP	Cracks and I&I	**$8,427**
V8	V7	283.6	18	VCP	Cracks and I&I	**$17,867**
V6-8	V6-5	272	8	VCP	Cracks and I&I	**$7,072**
W12	W11	361	21		Surface Aggregate Significant	**$27,075**
W20	W12	1042	28		Surface Aggregate	**$145,880**
W11	W9	565	21		Surface Aggregate	**$42,375**
	Total Length	**18,022**			**Total Cost**	**$773,000**
					With Contingency	**$870,000**

POINT REPAIR PROJECTS FROM SSLC PERSONNEL														
Upstream MH	Downstream MH	Section Length	Size in	Mat.	Comments	2'	4'	6'	8'	10 foot Length	Cost/ Foot	Pump Cost	Cost/ Foot	Project Cost
C/O	W27-45	104.7	8	VCP	Only one access point	1				10	$181	7%	$194	$1,937
W15-3	W15-2	344.3	8	VCP		1	2			30	$181	7%	$194	$5,810
W15-4	W15-3	27	8	VCP	Cracks and I&I		1			10	$181	7%	$194	$1,937
W15-5	W15-4	258.7	8	RCP	One at lat	2				20	$181	7%	$194	$3,873
W19-7	W19-9	365.6	8	RCP	Large Hole		1			10	$181	7%	$194	$1,937
W20-16	W20-12	376.5	10	RCP	Cracks		1			10	$196	7%	$210	$2,097
W20-17	W20-16	357.2	10	RCP	Hole	1				10	$196	7%	$210	$2,097
W27-13	W27-50	282.5	10	VCP	8' by lat	1	1		1	30	$196	7%	$210	$6,292
W27-15	W27-13	282.5	10	VCP	By lat capped		1			10	$196	7%	$210	$2,097
W27-16	W27-15	595.2	8	VCP	I&I /cracks/ by lats	4	1			50	$181	7%	$194	$9,684
W27-2	W27-1	205.7	10	VCP	Cracks		1	1		20	$196	7%	$210	$4,194
W27-21	W27-19	284.2	8	VCP	Cracks and holes		2			20	$181	7%	$194	$3,873
W27-23	W27-21	324.2	8	VCP	Offset repair		1			10	$181	7%	$194	$1,937
W27-3	W27-2	241.1	10	VCP	Both by lat			2		20	$196	7%	$210	$4,194
W27-31	W27-30	191.3	8	VCP	Both by lat		2			20	$181	7%	$194	$3,873
W27-32	W27-30	308	8	VCP	At lat		1			10	$181	7%	$194	$1,937
W27-36	W27-34	301.6	8	VCP	Offset joint / cracks	1	1			20	$181	7%	$194	$3,873
W27-39	W27-8	211.5	8	VCP	Cracks		1			10	$181	7%	$194	$1,937
W27-45	W27-21	620.7	8	PVC	Tie from manhole to pcv pipe			2		20	$181	7%	$194	$3,873
W27-46	W27-34	340.9	8	VCP	By lat		1			10	$181	7%	$194	$1,937
W27-50	W27-3	165.4	10	VCP	By lat		1			10	$196	7%	$210	$2,097
W27-6	W27-4	334.8	8	VCP	Cracks one at lat		4			40	$181	7%	$194	$7,747
W27-8	W27-7	554.1	8	VCP	Cracks		1			10	$181	7%	$194	$1,937
X12-10	X12-9	348.3	8	VCP	Offset joint	1				10	$181	7%	$194	$1,937
X12-14	X12-13	543.5	8	VCP	Cracks and holes	2	2			40	$181	7%	$194	$7,747
X12-4	X12-3	390	10	VCP	Both by lat	1	1			20	$196	7%	$210	$4,194
X12-5	X12-4	320.6	10	VCP	Hole	1				10	$196	7%	$210	$2,097
X12-8	X12-2	292	8	VCP	Offset joint	1				10	$181	7%	$194	$1,937
X12-9	X12-8	338.9	8	VCP	By lat		1			10	$181	7%	$194	$1,937
X24	X23	409.2	10	VCP	Cracks	1	3			40	$196	7%	$210	$8,389
X24-6	X24-2	206	8	VCP	Cracks			1		10	$181	7%	$194	$1,937
X24-8	X24-6	484.4	8	VCP	One at lat tap	2				20	$181	7%	$194	$3,873
X5-3	X5-2	7.1	8	VCP	Hole	1				10	$181	7%	$194	$1,937
X8-12	X8-11	284	8	VCP	Hole	1				10	$181	7%	$194	$1,937
X8-2	X8-1	371.6	10	VCP	I&I	7				70	$196	7%	$210	$14,680
X8-28	X8-27	168.2	8	VCP	I&I / Hole	1	1			20	$181	7%	$194	$3,873
X8-33	X8-30	606.3	8	VCP	By lat one I&I at lat	1	1			20	$181	7%	$194	$3,873
X8-35	X8-34	64.6	8	VCP	At lat hole	1				10	$181	7%	$194	$1,937
X8-5	X8-4	329	8	VCP	By lat		1			10	$181	7%	$194	$1,937
									Total Length	**730**			**Total Cost**	**$145,392**

South Salt Lake City
Sanitary Sewer Master Plan
Initial Project Costs
2/24/2014

Recommended Projects

Project ID	Length ft	Dia. in	# MH	Cost $/LF	Pipe Cost	MH Cost	Boring Length ft	Boring Cost $25/"/lf	Carrier Material Installation	Add. Length ft	Pipe Cost	**Cost (det)**	**Cost + 7 % Pumping**	**Total Cost +36% Contingency**
6a	292	15	3	$200	$58,300	$11,734						$70,034	$74,936	$102,000
7a	252	8	2	$161		$7,823	110	$33,000	$1,331	142	$26,008	$68,161	$72,933	$100,000
8a	193	8	2	$161		$7,823	110	$33,000	$1,331	83	$15,241	$57,395	$61,413	$84,000
9a	995	8	4	$161	$160,131	$15,645						$175,776	$188,080	$256,000
													Subtotal	**$542,000**
6b	1121	24	6	$250	$280,150	$23,468						$303,618	$324,871	$442,000
7b	1608	15	5	$200	$321,580	$19,557						$341,137	$365,016	$497,000
8b	862	12	3	$186	$160,239	$11,734						$171,973	$184,011	$251,000
9b	1531	10	5	$177	$271,040	$19,557						$290,597	$310,939	$423,000
9b	575	10	3	$177	$101,775	$11,734						$113,509	$121,455	$166,000
													Subtotal	**$1,779,000**

South Salt Lake City Sewer Budget

Row Labels	Sum of 2012	Sum of 2013	Sum of 2014
Capital Projects	**-**	**-**	**269,000**
Capital Projects	-	-	75,000
CVWRF Contribution	-	-	110,000
Land Acquisition	-	-	-
Machinery & Equiment	-	-	84,000
Office Expense	-	-	-
O&M	**812,831**	**786,135**	**974,500**
CVWRF Treatment	493,729	479,949	550,000
Employee Benefits	77,885	82,013	75,000
Employee Expense	2,134	1,930	2,500
Equiment	10,072	4,314	19,000
Fuel	5,018	6,323	6,000
Insurance	-	-	-
Line Repairs	5,235	2,415	77,000
Misc Expense	601	704	1,000
Office Expense	16,952	17,319	18,000
Professional Services	1,395	1,197	50,000
Salaries/Wages	171,317	162,766	143,000
Supplies	13,027	9,844	14,000
Training	1,495	3,527	3,000
Utilities	13,973	13,834	16,000
Revenues	**1,232,636**	**1,246,279**	**1,475,000**
Cash Transfer	-	-	141,000
Connection Fees	1,740	8,730	8,000
CVWRF Rental Income	17,645	21,594	14,000
Industrial Fees	110,197	105,416	107,000
Interest	3,361	4,140	5,000
Misc Revenue	-	-	-
Transfers	-	-	-
User Fees	1,099,693	1,106,400	1,200,000
Other Revenues	**-**	**-**	**-**
Industrial Waste Monitoring	**140,211**	**144,774**	**136,000**
CVWRF Pretreatment	140,211	144,774	136,000
Non-Departmental	**354,738**	**598,397**	**-**
Bond Expense	-	-	-
Debt Service	-	-	-
Depreciation CVWRF	237,138	479,567	-
Depreciation SSLC	102,603	103,830	-
Insurance	14,000	15,000	-
Misc Expense	997	-	-
Debt Service	**11,263**	**10,609**	**95,500**
Debt Service	11,263	10,609	95,500
Transfers	**-**	**-**	**-**
Extraordinary	**-**	**-**	**-**
Grand Total	**2,551,678**	**2,786,195**	**2,950,000**

RESOLUTION NO. R2014-15

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SOUTH SALT LAKE ADOPTING THE WATER CONSERVATION PLAN PREPARED IN JUNE 2014.

WHEREAS, the City provides culinary water to residents and businesses located within the municipality, and

WHEREAS, water is a scarce and valuable resource; and

WHEREAS, the city must, pursuant to Utah State law, prepare and submit a conservation plan to the Utah Division of Water Resources; and

WHEREAS, the *City of South Salt Lake Water Conservation Plan* has been prepared by the engineering firm Hansen, Allen, & Luce, Inc.; and

WHEREAS, the master plan has been reviewed and discussed during City Council meeting,

NOW THEREFORE, BE IT RESOLVED by South Salt Lake Council that South Salt Lake adopts the *City of South Salt Lake Water Conservation Plan* as this jurisdiction's plan.

(signatures appear on next page)

APPROVED AND ADOPTED by the City of South Salt Lake City Council, South Salt Lake, Utah, on this 13th day of August, 2014.

BY THE CITY COUNCIL:

Irvin H. Jones, Jr.
Council Chair

City Council Vote as Recorded:

Beverly	Aye
Gold	Aye
Jones	Absent
Rapp	Absent
Rutter	Absent
Snow	Aye
Turner	Aye

ATTEST:

Craig D. Burton
City Recorder

CITY OF SOUTH SALT LAKE
CORPORATE
Seal
SALT LAKE COUNTY, UTAH

SOUTH SALT LAKE

WATER CONSERVATION PLAN

(HAL Project No.: 126.24.200)

June 2014

HANSEN ALLEN & LUCE inc
ENGINEERS

CITY OF SOUTH SALT LAKE

WATER CONSERVATION PLAN

(HAL Project No.: 126.24.200)

PROFESSIONAL ENGINEER
6/13/2014
No. 354085-2202
J LANCE
NIELSEN
STATE OF UTAH

J. Lance Nielsen, P.E.
Project Engineer

HANSEN ALLEN & LUCE inc
ENGINEERS

June 2014

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CHAPTER 1 – INTRODUCTION

Recognizing the need for proactive planning to meet the water needs of its citizens, the City of South Salt Lake (City) has prepared this 2014 update of its Water Conservation Plan (Plan). The original Plan was completed in 2000 and was updated in 2009. The Plan describes the drinking water system, reviews historical water use, assesses water conservation measures available to the City, sets goals to conserve water, and identifies existing and proposed water conservation measures to be implemented.

This Plan is submitted to the Division of Water Resources under the requirements of Utah Code 73-10-32.

CHAPTER 2 – WATER SYSTEM DESCRIPTION

The City of South Salt Lake is located in the heart of Salt Lake County. It had an estimated population of 24,366 in 2012, a moderate increase over its 2010 population of 23,617 and its 2000 population of 22,038. Attractive to both businesses and residents, the City is nearing its build-out capacity and will experience significant growth only with higher-density redevelopment.

SERVICE AREA

Three entities provide drinking water to South Salt Lake (Figure 2-1). In part of South Salt Lake, the City operates its own system, whose service area extends from 3300 South to 2100 South and from 700 East to the Jordan River. Salt Lake City serves a portion in the northwest corner of South Salt Lake. The area south of 3300 South is served directly by Jordan Valley Water Conservancy District.

The City's system serves an estimated 13,300 residents based on an analysis of 2010 census block data within the service area. The 2000 service population was 14,500, indicating a decline of approximately 8% by 2010. The total number of system connections has not increased since 2010, suggesting a stable service population. This report assumes a constant service population of 13,300 since 2010.

While the City is close to build-out, four transit-oriented development (TOD) overlays have been planned within the service area. According to the City's 2013 Drinking Water System Master Plan, the high-density redevelopment is expected to double the service population by 2050.

TYPES OF USE

The City's water system serves residential, commercial, and industrial customers for both indoor and outdoor water uses. Most of the residential development (single and multi-family) is concentrated on the east side of the City. The western half is largely industrial. Commercial zones are located along the major corridors of 3300 South and State Street. The City's drinking water system must meet the demands for these several types of use.

Because there is no secondary irrigation system in the City, irrigation necessary to support existing landscaping is supplied by the drinking water system. Typical landscaping at businesses, churches, and private homes consists of water-intensive features such as turf grass and other non–drought tolerant plants. The City also operates one large park and several smaller parks with large grass areas.

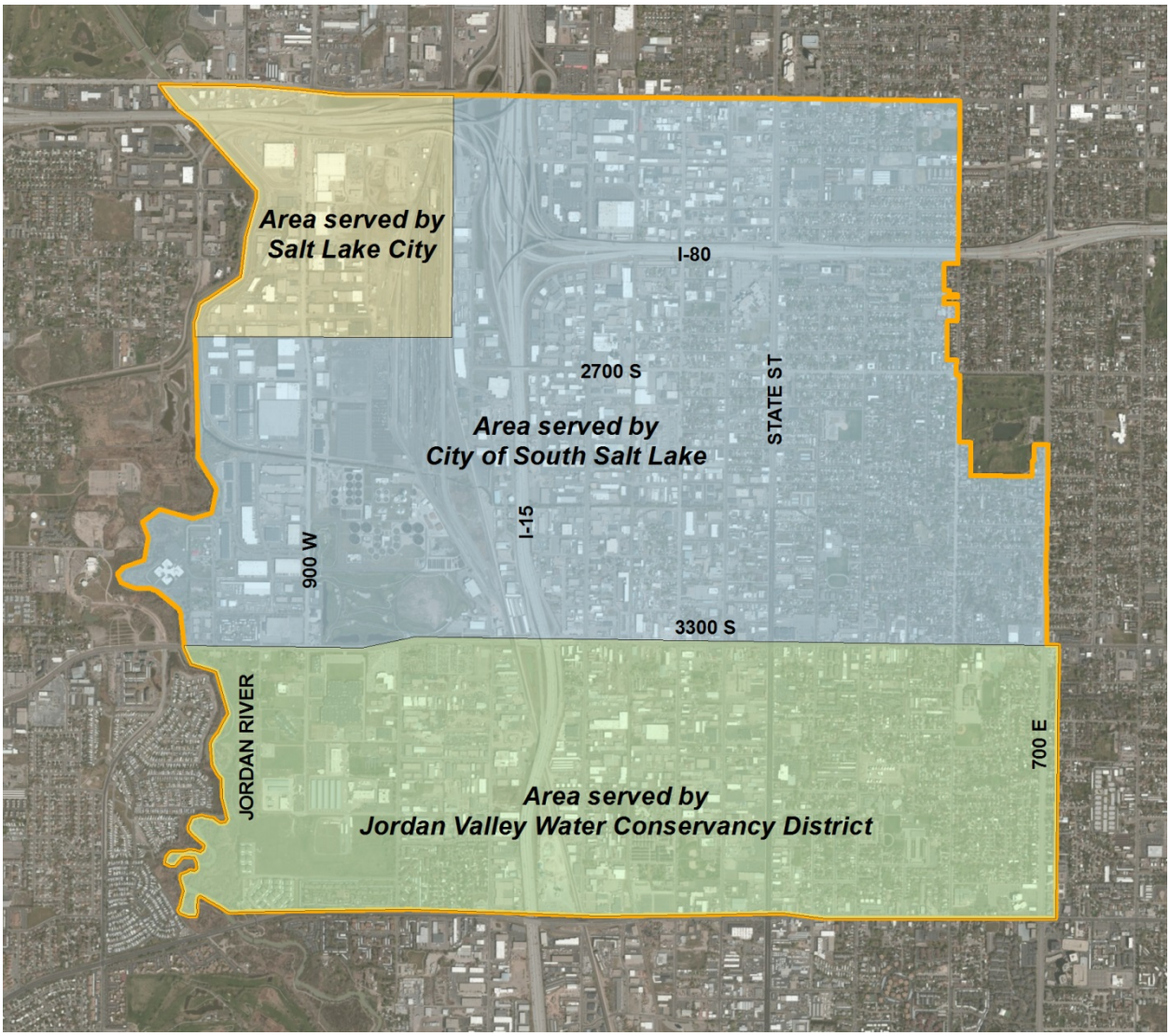

Figure 2-1: Drinking Water Service Areas

INVENTORY OF WATER SOURCES

The City currently receives drinking water from three active wells, four connections to Jordan Valley Water Conservancy District (JVWCD), and two emergency connections to Salt Lake City's (SLC) drinking water system. The City also has three additional wells that are currently not in use. Table 2-1 summarizes the City's drinking water sources.

Table 2-1
Water Sources

Source	Water Rights	Water Right / Contracted Flow	Source Capacity
300 East Well (300 E 2500 S)	57-1056, 2660	2.050 cfs	800 gpm
700 East Well (700 E 3200 S	57-8374, 8789	1.560 cfs	1,400 gpm
Davis Well (465 W 2975 S)	57-641, 727, 806, 1168, 3104, 6010, 7216, 7515, 8288, 8717	6.560 cfs	3,000 gpm
400 East Well (400 E 3050 S)	57-4246 through 4251, and 4253 through 4265	1.570 cfs	Not in use
Bolinder Well (600 W 2250 S)	57-8683, 8687	2.81 cfs	
265 West Well (265 W 2975 S)	57-818, 1056, 1057, 1058, 2660, 3113, 3157, 6010, 7515, 8037, 8288, 8374, 8684	10.665 cfs	
JVWCD (300 E 3300 S)	Contract with Jordan Valley Water Conservancy District	minimum 1,020 ac-ft/year	600 gpm
JVWCD (3300 S State St)			800 gpm
JVWCD (300 W 3300 S)			700 gpm
JVWCD (900 W 3300 S)			1,500 gpm
SLC (2775 S 900 W)	Contract with Salt Lake City Department of Public Utilities	Emergency only; no minimum or maximum	Approx. 800 gpm
SLC (2430 S 300 E)			Approx. 800 gpm

WATER BUDGETS

Water budgets for 2008, 2011, and 2013 are presented in Table 2-2.

Table 2-2
Water Budgets

Year	Produced (ac-ft)	Metered (ac-ft)	% Difference
2008[1]	2,948	2,594	12.0%
2011[2]	2,476	2,181	11.9%
2013[2]	2,908	2,464	15.2%

1. Data from 2009 Water Conservation Plan.
2. Produced and metered data provided by City.

The information in Table 2-2 indicates that a portion of the water supplied by the City's drinking water sources is consistently unaccounted for. Possible explanations include leaks, meter inaccuracies, pipeline flushing, construction activities, fire hydrant testing, and use at unmetered connections. In 2001 the City determined that leaks and backflows to JVWCD connections due to low pressures in the JVWCD system were causing losses up to 40%. The City responded by installing check valves and replacing numerous leaking pipelines, reducing the loss to around 15% in recent years.

HISTORICAL WATER USE

The City's historical water use in gallons per capita per day (gpcd) is shown in Figure 2-2. Since total water use depends on the number of customers, per capita values are a better measure of individual water use over time.

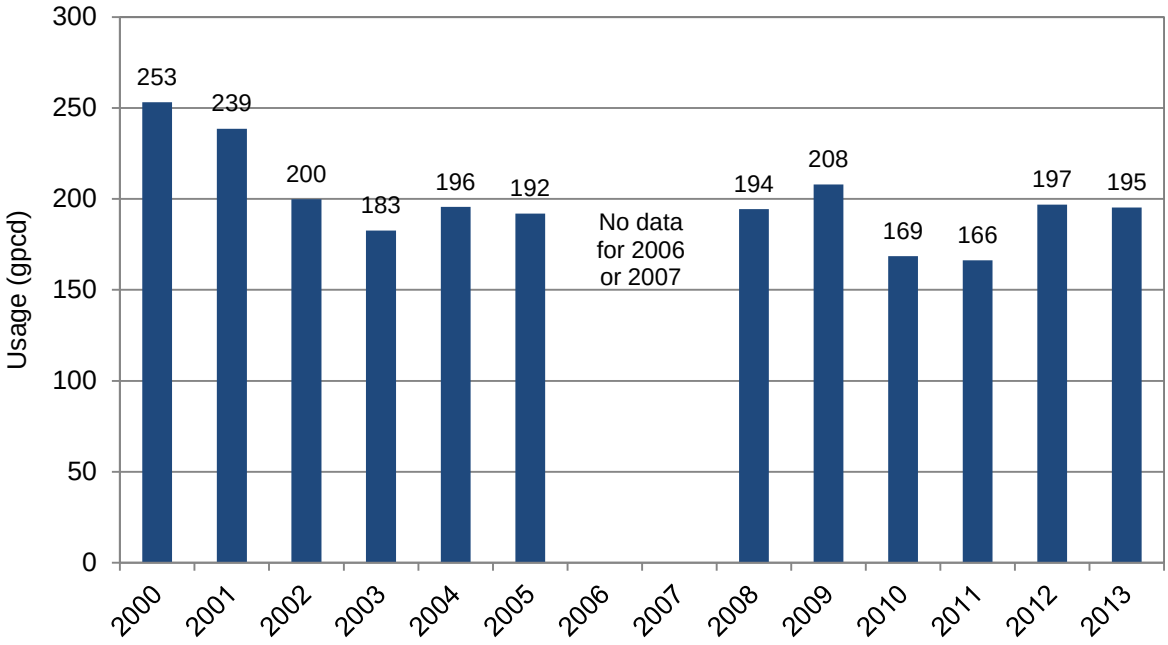

Figure 2-2: Per Capita South Salt Lake Water Use, 2000–2013

As noted above, improvements to the system were completed in 2001 to reduce serious water losses. The improvements contributed to a 21% reduction in water demand from 2000 to 2002. The City's water use has been relatively consistent since then, averaging about 190 gpcd. Use was lower in 2010 and 2011, likely attributable to more precipitation during these years compared to the drier years of 2012 and 2013. The consistent reduction since 2002 is encouraging as the City continues to implement its Water Conservation Plan.

It is important to note that the City's previous conservation plans overestimated the service population, leading to lower values of per capita water use. The results of this report should not be compared to earlier ones due to a fundamental difference in assumptions.

Water use for the period 2000–2005 averaged 3,350 ac-ft/yr. Total water use for the period 2008–2013 averaged 2,830 ac-ft/yr. The reduction may be attributed to both population decrease and water conservation.

Figure 2-3 illustrates the seasonal pattern of water use in the service area. The City delivers nearly three times as much water in July as it does in February. Conservation is most effective during summer months, where irrigation and other outdoor uses add to the overall water demand.

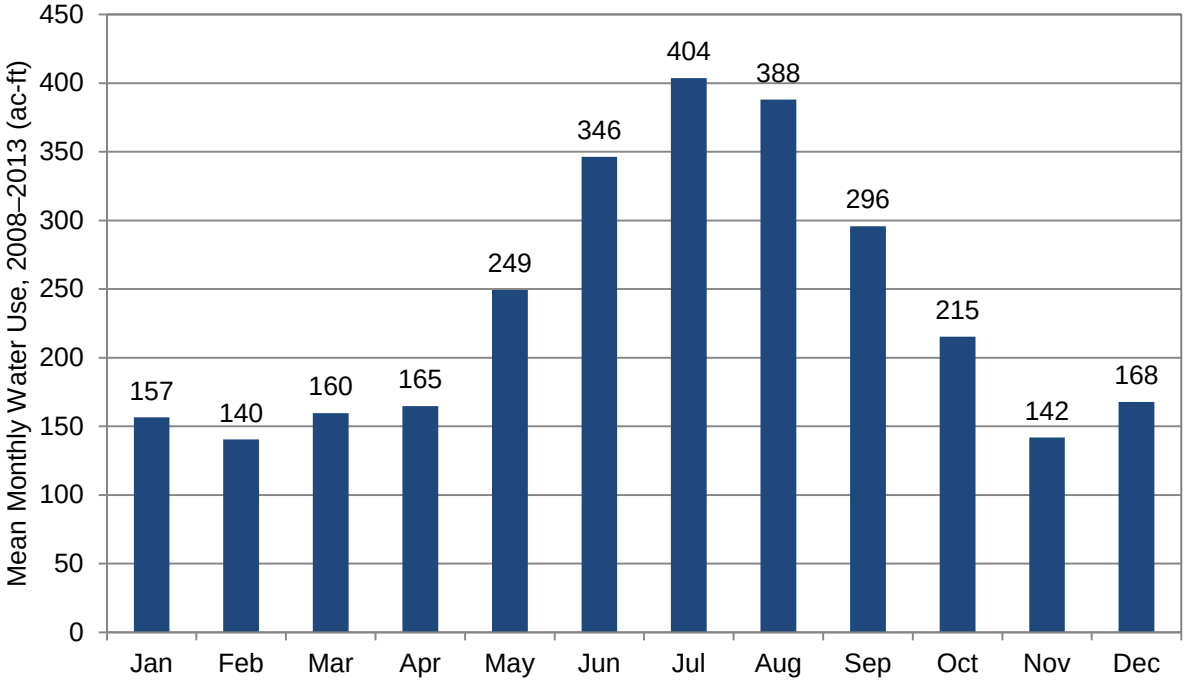

Figure 2-3: Monthly South Salt Lake Water Use, 2008–2013

FUTURE WATER USE

As described in the City's 2013 Drinking Water System Master Plan, redevelopment may double the service population by 2050. Future increases in water demand are expected to be the result of redevelopment and population growth; per capita water use is expected to be similar to recent years as presented in Figure 2-2.

CHAPTER 3 – WATER CONSERVATION GOALS

PROBLEMS

The City of South Salt Lake is concerned with the potential waste of water from inefficient indoor and outdoor water use and from system-wide losses. The following specific concerns have been identified by the City:

- Many pipes in the drinking water distribution system are old or undersized and may be leaking. A pipe replacement program addresses these issues periodically.
- Comparison of the water supplied to the distribution system and the monthly meter readings has revealed water that is unaccounted for.
- Potential for further indoor and outdoor conservation still exists.

GOALS

The City of South Salt Lake has set goals to address the identified problems and to promote conservation. The City currently supports the statewide goal set in 2000 by the Utah Division of Water Resources to reduce water use 25% by 2050. In 2013 Gov. Gary Herbert renewed the challenge: “In the year 2000 we set a target to use 25% less water by the year 2050, and we’ve already reduced our consumption by 18%. So let’s go one step further. Let’s cut the time in half, and achieve that goal by the year 2025.” South Salt Lake has already made considerable progress toward this goal, reducing per capita water use by 21% since 2000. The City will continue working to further conserve its water resources and meet or exceed the original statewide goal.

The following water conservation goals have been identified by the City:

- The City will continue to implement the water conservation measures currently in effect as defined in Chapter 4.
- The City’s water rate structure has been amended to better promote conservation. The City will consider additional rate modifications to encourage wise water use.
- The City will determine potential causes for unaccounted drinking water and attempt to reduce this water loss.
- The City will continue its pipe replacement program, replacing leaking pipelines as budget will allow.

CHAPTER 4 – WATER CONSERVATION MEASURES

EXISTING CONSERVATION MEASURES

The City of South Salt Lake is already implementing, and will continue to implement, the following water conservation measures.

- Promotion of individual water conservation measures to City residents through the City's website, the annual Water Quality Report, bill stuffers, the City's *On the Move* monthly newsletter, a booth during the City's annual "Night Out Against Crime" community event, and the annual Huck Finn Day.
- Promoted conservation measures include the following:
    - Ways to save water indoors:
        - Check all faucets, pipes, and toilets for leaks.
        - Install water-saving showerheads and low-flush toilets.
        - Take shorter showers.
        - Never use your toilet as an ashtray or wastebasket.
        - Turn off the water while brushing your teeth or shaving.
        - Defrost frozen food in the refrigerator.
        - Rinse vegetables in a full sink or pan of water.
        - Fully load your dishwasher.
        - Rinse dishes in a full sink or pan of water.
        - Wash full loads of clothes.
    - Ways to save water outdoors:
        - Don't over-water landscaping.
        - Water your lawn or garden early in the morning or late in evening.
        - Adjust sprinklers so that they don't water the sidewalk or street.
        - Don't water on cool, rainy, or windy days.
        - Equip all hoses with shutoff nozzles.
        - Use drip irrigation systems.
        - Plant drought-tolerant or low–water use plants and grasses.
        - Use shrubs and ground cover to reduce the amount of grass.
        - Place mulch around plants to reduce evaporation and discourage weeds.
        - Set your mower blades one notch higher, since longer grass means less evaporation.
        - Use a pool cover to cut down on water evaporation.
        - Use a bucket instead of a hose to wash your car.
        - Use a broom rather than a hose to clean sidewalks, driveways, loading docks, and parking lots.
- The City directs citizens to the Slow the Flow website (www.slowtheflow.org) for additional conservation ideas.
- The City directs citizens to Center for Water-Efficient Landscaping at Utah State University (http://cwel.usu.edu/) for information on efficient landscape irrigation.
- A Landscape Handbook is available on the City's website. The handbook addresses irrigation techniques and lists recommended water-efficient plants.
- The City has adopted the International Plumbing Code (IPC) which requires installation of water-saving fixtures in new construction (Municipal Code: 15.08.050). Maximum flow rates as defined by IPC 604.4 are as follows:
    - Shower head: 2.5 gpm at 80 psi
    - Sink faucet: 2.2 gpm at 60 psi
    - Toilet: 1.6 gal per flush

- The City adopted a new water rate structure effective Jan. 1, 2014. Previous rates did not promote water conservation since customers were charged similarly regardless of their use. The new rates encourage reduced water use, especially by the largest users. The 2014 monthly rates are as follows:
    - 0.75-in. service: $11.00 min.; 5,000 gal allowance
    - 1.0-in. service: $19.00 min.; 5,000 gal allowance
    - 1.5-in. service: $32.00 min.; 5,000 gal allowance
    - 2.0-in. service: $47.00 min.; 5,000 gal allowance
    - 3.0-in. service: $89.00 min.; 5,000 gal allowance
    - 4.0-in. service: $136.00 min.; 5,000 gal allowance
    - 6.0-in. service: $267.00 min.; 5,000 gal allowance
    - Metered hydrant use: $3.00 per 1,000 gal
    - Excess water: $2.25 per 1,000 gal between 5,000 and 30,000 gal and $2.75 per 1,000 gal over 30,000 gal
- The City has instituted a program to replace old galvanized steel water services with new copper water services. To date, the City has replaced about 75% of these services and will continue to replace services as leaks are detected and as budget allows. Replacing galvanized pipes in City parks has reduced water use by an estimated 15%.
- Existing City code provides for emergency limitation of water use when necessary.
    - 13.52.050 Mayor's proclamation of water use limitation.
      In time of scarcity of water or whenever it shall be deemed necessary by the City Council, the Mayor shall, by proclamation, limit the use of water to such extent as may be necessary for the public good. Providing, however, that such restrictions and limitations are not discriminatory and are made on a reasonable basis. It is unlawful for any person by himself, family, servants or agents to violate any such proclamation, and in addition to any other penalties which may be imposed, the water shall be turned off and not turned on again until the payment set by resolution of the City Council for each violation has been made.
- Existing City code prohibits the wasting of water.
    - 13.56.070 Waste prohibited.
      It is unlawful for any water user to waste water, or to allow tanks, air conditioning units or similar equipment to leak or overflow, or to wastefully run water from hydrants, faucets or stops, or through basins, water closets, urinals, sinks or other apparatus, or to use the water for purposes other than those for which he has paid or to use water in violation of the rules and regulations for controlling the water supply and the provisions of this chapter.

PROPOSED ADDITIONAL CONSERVATION MEASURES

The City of South Salt Lake proposes to implement the following additional Water Conservation measures:

- The City will consider purchasing leak detection equipment and performing a leak detection survey. This survey would be followed by the implementation of the ongoing pipeline replacement program for leaking pipelines.
- The City is currently developing a commercial landscape ordinance to encourage water conservation. Sections relevant to water conservation include the following:
    - 17.07.050.C Drought Tolerant Species.
      Climatic conditions in Salt Lake County are generally arid, and the selection of plant species suited to dry conditions is allowed and appropriate. The State of Utah has compiled a list of "WaterWise" plants which can be accessed at http://www.waterwiseplants.utah.gov. Drought tolerant plants shall be from transplants and not seeded on site.

- 17.07.050.G.8 Water Conservation.
  Landscape design pursuant to the requirements of this chapter should be done with water conservation in mind because of population growth, limited available water and the climatic limitations of Salt Lake County. While irrigation systems are required for certain landscaping and may be desirable for other applications, all irrigation systems shall be designed for efficient use of water.

- The City will consider reevaluating its water rate structure to further promote water conservation.
- The City will continue its program to replace old galvanized steel water services with copper water services.
- The City will continue to monitor overall system water loss and institute measures to address unaccounted water.

CHAPTER 5 – IMPLEMENTATION PLAN

This Water Conservation Plan renews the existing water conservation measures for at least the next five years. Existing and proposed water conservation measures will be implemented according to Table 5-1.

Table 5-1
Water Conservation Implementation Plan

Conservation Measure	Implementation Plan
Promote water conservation measures to City residents	Advertise conservation measures through: • The City's website (www.southsaltlakecity.org). • The annual Water Quality Report. • Bill stuffers. • The City's monthly newsletter, *On the Move* (http://www.southsaltlakecity.com/city-government/city-newsletter). • The annual "Night Out Against Crime" community event. • The annual Huck Finn Day.
Require new development to install water saving plumbing fixtures	Check building plans for water saving fixtures during building permit reviews and enforce compliance through building inspections for new construction.
Replacement of old leaking water services	Replace with copper water services as leaks are detected. Approximately 75% of the old galvanized steel services have been replaced to date.
Prohibit the wasting of water	City Code: 13.56.070 Waste Prohibited • Implemented when water waste is discovered
Emergency limitation of water use	City Code: 13.52.050 Mayor's Proclamation of water use limitation • Implemented in times of scarcity of water or whenever deemed necessary by the City Council
Perform leak detection survey followed by a pipeline replacement program	Public Works department will: • Evaluate necessity of a leak detection survey • Budget funding for survey as deemed necessary • Develop plan for replacement of leaking pipelines when discovered
Adopt a commercial landscaping ordinance that promotes conservation	Building department is developing the ordinance to be adopted by the City Council. Building department will enforce installation of efficient landscape irrigation design.
Assess the need to further modify water rates to promote conservation	Public Works will evaluate the effectiveness of recent water rate modifications in promoting water conservation. Public Works will evaluate the need for additional modifications to the rate structure.

CHAPTER 6 – ADOPTION OF PLAN

Pursuant to Section 73-10-32(2)(a) of the Utah Code (Appendix B), the City's governing body shall devote part of at least one regular meeting every five years to discussion and formal adoption of the Water Conservation Plan. Minutes of such meetings shall be included as an appendix to the Plan. The City shall also provide media access to the Plan and allow public comment on it. These actions serve to increase awareness of the Plan and encourage public involvement in its implementation, leading to a more effective water conservation effort.

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APPENDIX A

Drinking Water System Data

City of South Salt Lake
Drinking Water System Data

Provided by City, 5/5/2014
Calculated 5/5/2014 RBS

2008	January	February	March	April	May	June	July	August	September	October	November	December	Total
Water Produced or Purchased (gal)	59,999,167	52,756,664	55,710,869	57,565,998	86,698,021	105,503,327	140,189,736	135,629,419	90,897,312	59,772,151	47,870,324	68,023,724	960,616,711
Water Delivered (gal)	48,062,000	39,574,000	42,754,000	51,508,000	79,556,000	112,297,000	132,055,000	115,353,000	87,036,000	50,831,000	44,963,000	41,267,000	845,256,000
Difference (gal)	**11,937,167**	**4,694,664**	**16,136,869**	**14,811,998**	**35,190,021**	**25,947,327**	**27,892,736**	**3,574,419**	**-24,455,688**	**-27,263,849**	**-2,960,676**	**23,060,724**	**115,360,711**
Percent Difference	**19.9%**	**8.9%**	**29.0%**	**25.7%**	**40.6%**	**24.6%**	**19.9%**	**2.6%**	**-26.9%**	**-45.6%**	**-6.2%**	**33.9%**	**12.0%**
Water Produced or Purchased (ac-ft)	**184.1**	**161.9**	**171.0**	**176.7**	**266.1**	**323.8**	**430.2**	**416.2**	**279.0**	**183.4**	**146.9**	**208.8**	**2948.0**
Water Delivered (ac-ft)	**147.5**	**121.4**	**131.2**	**158.1**	**244.1**	**344.6**	**405.3**	**354.0**	**267.1**	**156.0**	**138.0**	**126.6**	**2594.0**
Difference (ac-ft)	**36.6**	**14.4**	**49.5**	**45.5**	**108.0**	**79.6**	**85.6**	**11.0**	**-75.1**	**-83.7**	**-9.1**	**70.8**	**354.0**
Percent Difference	**19.9%**	**8.9%**	**29.0%**	**25.7%**	**40.6%**	**24.6%**	**19.9%**	**2.6%**	**-26.9%**	**-45.6%**	**-6.2%**	**33.9%**	**12.0%**

2011	January	February	March	April	May	June	July	August	September	October	November	December	Total
Water Produced or Purchased (gal)	27,450,000	27,086,000	48,464,000	52,370,000	57,530,000	84,236,000	121,981,000	122,668,000	102,344,000	63,253,000	47,330,000	52,141,000	806,853,000
Water Delivered (gal)	39,148,000	34,096,000	38,776,000	38,546,000	52,652,000	91,170,000	105,095,000	114,063,000	81,549,000	44,821,000	43,032,000	27,811,000	710,759,000
Difference (gal)	**-11,698,000**	**-7,010,000**	**9,688,000**	**13,824,000**	**4,878,000**	**-6,934,000**	**16,886,000**	**8,605,000**	**20,795,000**	**18,432,000**	**4,298,000**	**24,330,000**	**96,094,000**
Percent Difference	**-42.6%**	**-25.9%**	**20.0%**	**26.4%**	**8.5%**	**-8.2%**	**13.8%**	**7.0%**	**20.3%**	**29.1%**	**9.1%**	**46.7%**	**11.9%**
Water Produced or Purchased (ac-ft)	**84.2**	**83.1**	**148.7**	**160.7**	**176.6**	**258.5**	**374.3**	**376.5**	**314.1**	**194.1**	**145.3**	**160.0**	**2476.1**
Water Delivered (ac-ft)	**120.1**	**104.6**	**119.0**	**118.3**	**161.6**	**279.8**	**322.5**	**350.0**	**250.3**	**137.6**	**132.1**	**85.3**	**2181.2**
Difference (ac-ft)	**-35.9**	**-21.5**	**29.7**	**42.4**	**15.0**	**-21.3**	**51.8**	**26.4**	**63.8**	**56.6**	**13.2**	**74.7**	**294.9**
Percent Water Loss	**-42.6%**	**-25.9%**	**20.0%**	**26.4%**	**8.5%**	**-8.2%**	**13.8%**	**7.0%**	**20.3%**	**29.1%**	**9.1%**	**46.7%**	**11.9%**

2013	January	February	March	April	May	June	July	August	September	October	November	December	Total
Water Produced or Purchased (gal)	58,092,000	51,419,000	55,786,000	59,999,000	94,932,000	115,268,000	128,348,000	126,697,000	90,902,000	69,716,000	39,060,000	57,235,000	947,454,000
Water Delivered (gal)	40,448,000	34,288,000	34,780,000	44,359,000	88,666,000	111,924,000	147,499,000	112,692,000	66,366,000	47,392,000	35,338,000	39,233,000	802,985,000
Difference (gal)	**17,644,000**	**17,131,000**	**21,006,000**	**15,640,000**	**6,266,000**	**3,344,000**	**-19,151,000**	**14,005,000**	**24,536,000**	**22,324,000**	**3,722,000**	**18,002,000**	**144,469,000**
Percent Difference	**30.4%**	**33.3%**	**37.7%**	**26.1%**	**6.6%**	**2.9%**	**-14.9%**	**11.1%**	**27.0%**	**32.0%**	**9.5%**	**31.5%**	**15.2%**
Water Produced or Purchased (ac-ft)	**178.3**	**157.8**	**171.2**	**184.1**	**291.3**	**353.7**	**393.9**	**388.8**	**279.0**	**214.0**	**119.9**	**175.6**	**2907.6**
Water Delivered (ac-ft)	**124.1**	**105.2**	**106.7**	**136.1**	**272.1**	**343.5**	**452.7**	**345.8**	**203.7**	**145.4**	**108.4**	**120.4**	**2464.3**
Difference (ac-ft)	**54.1**	**52.6**	**64.5**	**48.0**	**19.2**	**10.3**	**-58.8**	**43.0**	**75.3**	**68.5**	**11.4**	**55.2**	**443.4**
Percent Difference	**30.4%**	**33.3%**	**37.7%**	**26.1%**	**6.6%**	**2.9%**	**-14.9%**	**11.1%**	**27.0%**	**32.0%**	**9.5%**	**31.5%**	**15.2%**

APPENDIX B

Utah Code 73-10-32

73-10-32. Definitions -- Water conservation plan required.

(1) As used in this section:

(a) "Board" means the Board of Water Resources created under Section 73-10-1.5.

(b) "Division" means the Division of Water Resources created under Section 73-10-18.

(c) "Retail" means the level of distribution of culinary water that supplies culinary water directly to the end user.

(d) "Retail water provider" means an entity which:

(i) supplies culinary water to end users; and

(ii) has more than 500 service connections.

(e) "Water conservancy district" means an entity formed under Title 17B, Chapter 2a, Part 10, Water Conservancy District Act.

(f) "Water conservation plan" means a written document that contains existing and proposed water conservation measures describing what will be done by retail water providers, water conservancy districts, and the end user of culinary water to help conserve water and limit or reduce its use in the state in terms of per capita consumption so that adequate supplies of water are available for future needs.

(2) (a) Each water conservation plan shall contain:

(i) a clearly stated overall water use reduction goal and an implementation plan for each of the water conservation measures it chooses to use, including a timeline for action and an evaluation process to measure progress;

(ii) a requirement that each water conservancy district and retail water provider devote part of at least one regular meeting every five years of its governing body to a discussion and formal adoption of the water conservation plan, and allow public comment on it;

(iii) a requirement that a notification procedure be implemented that includes the delivery of the water conservation plan to the media and to the governing body of each municipality and county served by the water conservancy district or retail water provider; and

(iv) a copy of the minutes of the meeting and the notification procedure required in Subsections (2)(a)(ii) and (iii) which shall be added as an appendix to the plan.

(b) A water conservation plan may include information regarding:

(i) the installation and use of water efficient fixtures and appliances, including toilets, shower fixtures, and faucets;

(ii) residential and commercial landscapes and irrigation that require less water to maintain;

(iii) more water efficient industrial and commercial processes involving the use of water;

(iv) water reuse systems, both potable and not potable;

(v) distribution system leak repair;

(vi) dissemination of public information regarding more efficient use of water, including public education programs, customer water use audits, and water saving demonstrations;

(vii) water rate structures designed to encourage more efficient use of water;

(viii) statutes, ordinances, codes, or regulations designed to encourage more

efficient use of water by means such as water efficient fixtures and landscapes;

(ix) incentives to implement water efficient techniques, including rebates to water users to encourage the implementation of more water efficient measures; and

(x) other measures designed to conserve water.

(c) The Division of Water Resources may be contacted for information and technical resources regarding measures listed in Subsections (2)(b)(i) through (2)(b)(x).

(3) (a) Before April 1, 1999, each water conservancy district and each retail water provider shall:

(i) (A) prepare and adopt a water conservation plan if one has not already been adopted; or

(B) if the district or provider has already adopted a water conservation plan, review the existing water conservation plan to determine if it should be amended and, if so, amend the water conservation plan; and

(ii) file a copy of the water conservation plan or amended water conservation plan with the division.

(b) Before adopting or amending a water conservation plan, each water conservancy district or retail water provider shall hold a public hearing with reasonable, advance public notice.

(4) (a) The board shall:

(i) provide guidelines and technical resources to retail water providers and water conservancy districts to prepare and implement water conservation plans;

(ii) investigate alternative measures designed to conserve water; and

(iii) report regarding its compliance with the act and impressions of the overall quality of the plans submitted to the Natural Resources, Agriculture, and Environment Interim Committee of the Legislature at its meeting in November 2004.

(b) The board shall publish an annual report in a paper of state-wide distribution specifying the retail water providers and water conservancy districts that do not have a current water conservation plan on file with the board at the end of the calendar year.

(5) A water conservancy district or retail water provider may only receive state funds for water development if they comply with the requirements of this act.

(6) Each water conservancy district and retail water provider specified under Subsection (3)(a) shall:

(a) update its water conservation plan no less frequently than every five years; and

(b) follow the procedures required under Subsection (3) when updating the water conservation plan.

(7) It is the intent of the Legislature that the water conservation plans, amendments to existing water conservation plans, and the studies and report by the board be handled within the existing budgets of the respective entities or agencies.

Amended by Chapter 329, 2007 General Session