City of Saratoga Springs

Sewer Capital Facilities Plan

Project No. 305-11-01

Prepared by:

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

May 2014

Saratoga Springs
Sewer Capital Facilities Plan

Prepared for:

CITY OF SARATOGA SPRINGS

Prepared by:

Bowen, Collins & Associates
154 East 14000 South
Draper, UT 84020

Bowen Collins
& Associates, Inc.
CONSULTING ENGINEERS

LICENSED PROFESSIONAL ENGINEER
29 MAY 2014
343787
KEITH J.
LARSON
STATE OF UTAH

May 2014

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS
(continued)

Page No.

APPENDIX

TABLE OF CONTENTS
(continued)

TABLES

TABLE OF CONTENTS
(continued)

FIGURES

EXECUTIVE SUMMARY
IMPACT FEE FACILITIES PLAN

INTRODUCTION

The City of Saratoga Springs retained Bowen Collins & Associates (BC&A) to prepare a wastewater impact fee facilities plan following the requirements of Section 11-36a of Utah code. The primary purpose of this plan is to summarize the cost of projects needed to meet existing and future users' needs for the City's wastewater collection system and to identify those improvements that qualify to be used in the calculation of impact fees.

PROJECTED WASTEWATER SYSTEM GROWTH

To assemble and calibrate a hydraulic model of the City's wastewater collection system, it is necessary to project how wastewater flows will increase in the future. Based on the projected growth and development expected in the City, the projected sewer production for the City is summarized in Table ES-1.

Table ES-1
Population and Design Sewer Flow Projections

Year	ERCs	Design Sewer Flow (mgd)
2012	5,059	1.29
2013	5,430	1.38
2014	5,812	1.48
2015	6,194	1.58
2016	6,576	1.68
2017	7,377	1.88
2018	7,986	2.04
2019	8,671	2.21
2020	9,541	2.43
2021	10,207	2.60
2022	10,877	2.77

EVALUATION CRITERIA AND LEVEL OF SERVICE

In evaluating the performance of the collection system, it is necessary to first define the required level of service for the various components of the system. The level of service used to evaluate system needs is the same for both existing and future customers and is summarized in Table ES-2.

Table ES-2
Evaluation Criteria for System Level of Service

Criteria	Value
Design Sewer Flow Allowance per ERC including I&I (gpd)	255
Design Flow Peaking Factor	2.5
Maximum Allowable Depth to Diameter Ratio for Peak Flow conditions	0.80
Maximum Velocity in Force Mains (ft/sec)	7.0
Maximum Distance Between Force Main Cleanouts (ft)	1,200
Maximum Allowable Peak Flow to Pump Capacity Ratio at Lift Stations	0.85
Maximum Cycles Per Hour at Lift Station (as a result of wet well volume)	6

RECOMMENDED SYSTEM IMPROVEMENTS

The City can be separated into two service areas, a south area (currently served by the Inlet Park Lift Station), and a north area (currently served by the Posey Lift Station). Projects for each service area required in the next 10 years to satisfy level of service standards as defined above are summarized in Tables ES-3 and ES-4. To satisfy the requirements of state law, the tables also provide a breakdown of the capital facility projects and the percentage of the project costs attributed to existing and future users. It will be noted that a few projects have been included in both tables because they benefit both service areas. For these projects, total costs have been divided between the two service areas based on the projected growth within the planning window.

Table ES-3
Impact Fee Facilities Plan, South Service Area - Costs Required for Future Growth

Project No.	Year of Project (FYE)	Project Description	Estimated Total Cost	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years	Cost to Existing	Cost to 10-year Growth	Cost to Growth Beyond 10 Years
SS-S1.1	2014	River Crossing Phase 1, Alignment & Preliminary Design Study*	$49,154	7.9%	9.5%	82.6%	$3,874	$4,691	$40,588
SS-S1.2	2018	River Crossing Trunk Phase 2, Bridge or Siphon*	$565,760	7.9%	9.5%	82.6%	$44,590	$53,999	$467,171
SS-S1.3	2018	River Crossing Trunk Phase 3, Outfall*	$1,801,486	7.9%	9.5%	82.6%	$141,984	$171,942	$1,487,561
SS-S2.1	2014	Inlet Park Trunk Phase 1, Near Lift Station	$1,399,000	0.0%	16.2%	83.8%	$0	$227,132	$1,171,868
SS-S2.2	2015	Inlet Park Trunk Phase 2, Golf Course Main	$1,654,000	12.6%	12.9%	74.5%	$208,218	$213,386	$1,232,397
SS-L1	2015	Lift Station 1 Pump Upgrade	$300,000	0.0%	11.9%	88.1%	$0	$35,644	$264,356
SS-S4.1	2022	700 South Trunk –First Half	$4,650,600	0.0%	2.0%	98.0%	$0	$92,528	$4,558,072
Totals			**$10,420,000**				**$398,665**	**$799,321**	**$9,222,014**

*Where indicated, projects benefit both south and north service areas. Project costs divided based on projected growth in each area during the planning window.

Table ES-4
Impact Fee Facilities Plan, North Service Area - Costs Required for Future Growth

Project No.	Year of Project (FYE)	Project Description	Estimated Total Cost	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years	Cost to Existing	Cost to 10-year Growth	Cost to Growth Beyond 10 Years
SS-S1.1	2014	River Crossing Phase 1, Alignment & Preliminary Design Study*	$50,846	7.9%	9.5%	82.6%	$4,007	$4,853	$41,986
SS-S1.2	2018	River Crossing Trunk Phase 2, Bridge or Siphon*	$585,240	7.9%	9.5%	82.6%	$46,126	$55,858	$483,257
SS-S1.3	2018	River Crossing Trunk Phase 3, Outfall*	$1,863,514	7.9%	9.5%	82.6%	$146,872	$177,862	$1,538,780
SS-N1	2018	North Trunk	$9,546,000	9.6%	7.2%	83.3%	$912,945	$683,841	$7,949,215
SS-N2	2020	200 West Trunk	$2,351,000	0.0%	3.1%	96.9%	$0	$72,824	$2,278,176
Totals			**$14,396,600**				**$1,109,950**	**$995,237**	**$12,291,413**

*Where indicated, projects benefit both south and north service areas. Project costs divided based on projected growth in each area during the planning window.

EXISTING CAPACITY AVAILABLE TO SERVE NEW GROWTH

In addition to using capacity in the new projects contained in the impact fee facility plan, future growth will also utilize a portion of excess capacity in existing facilities. To calculate the percentage of existing capacity to be used by future growth, BC&A examined the model results in each facility paid for by the City. The calculated percentage of existing capacity used by growth during the 10 year planning window in facilities paid for by the City is as shown in Tables ES-5 and ES-6 below. Table ES-5 includes facilities paid for directly by the City. In addition to these facilities, the City has also recently paid for the remaining capacity in some facilities constructed by developers that have historically been subject to a pioneering agreement. Table ES-6 includes the future capacity to be used in association with these recent reimbursement agreements.

Table ES-5
Existing Facility Capacity Used by Growth

Project ID	Project Description	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years
SAR.016	Inlet Park Sewer Force Main	27.4%	26.8%	45.9%
SAR.017	Inlet Park Lift Station	58.1%	41.9%	0.0%
SAR.019	Sewer Line between 6800 North (400 South) and Entrance to SSD	25.7%	25.1%	49.2%
SAR.104	Smiths Sewer Outfall*	9.3%	40.1%	50.6%
SAR.126	Inlet Park Lift Station Upgrade	58.1%	41.9%	0.0%
SAR.151A	Extend Posey Force Mains to TSSD	68.5%	31.5%	0.0%
SAR.151B	Posey Lift Station Upgrade	68.5%	31.5%	0.0%
SAR.207	Harbor Bay Park Lift Station Upgrade	11.9%	5.3%	82.8%
SAR.266	TSSD Meter Station	8.8%	8.7%	82.6%

*For components with multiple facilities, a weighted average was developed of available capacity used by future growth.

Table ES-6
Reimbursement Agreement Capacity Used by Growth

Project ID	Project Description	Percent to 10-year Growth	Percent to Growth Beyond 10 Years
RA.1	Inlet Park SSD Reimbursement Agreement*	66.7%	33.3%
RA.2	Inlet Park Lakeview Reimbursement Agreement*	23.6%	76.4%

*For components with multiple facilities, a weighted average was developed of available capacity used by future growth.

CHAPTER 1
INTRODUCTION AND BACKGROUND

INTRODUCTION

The City of Saratoga Springs has retained Bowen Collins & Associates (BC&A) to prepare a capital facilities plan for the City's wastewater collection system. The primary purpose of this Sewer Capital Facilities Plan is to provide recommended improvements to resolve existing and projected future deficiencies in the City of Saratoga Springs wastewater collection system based on the City's adopted General Plan. As part of this process, this report will also include an Impact Fee Facilities Plan following the requirements of Section 11-36a of Utah code.

SCOPE OF SERVICES

The general scope of this project involved a thorough analysis of the City of Saratoga Spring's sewer system and its ability to meet the present and future wastewater needs of its residents. As part of this project, BC&A completed the following tasks:

Task 1: Updated existing and future sewer service requirements based on Saratoga Springs growth, its General Plan, and projected growth patterns.

Task 2: Used a calibrated hydraulic sewer model to simulate operation of existing facilities under current development conditions.

Task 3: Used the hydraulic sewer model to simulate operation of facilities with recommended improvements under changes to projected future conditions to identify the impacts of future development on sewer facilities.

Task 4: Used the hydraulic sewer model to evaluate alternative improvements that would resolve the system deficiencies identified in Tasks 2 and 3.

Task 5: Prepared a capital facility plan report to document the analytical procedures used in completing the study and summarize the conclusions reached.

Task 6: Developed an impact fee facilities plan for City budgeting and planning purposes.

Task 8: Conducted progress and coordination meetings as required to keep City staff involved and informed of progress and activities.

This document is a working document. Some of the recommended improvements identified in this report are based on the assumption that development and/or potential annexation will occur in a certain manner. If future growth or development patterns change significantly from those assumed and documented in this report, the recommendations may need to be revised.

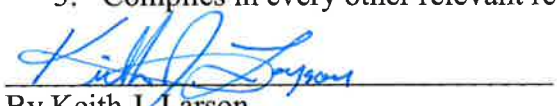
AUTHORIZATION

Saratoga Springs contracted the services of BC&A to prepare this Sanitary Sewer System Capital Facilities Plan in November of 2011. The initial draft facility plan study and associated report were completed December 2012. The final plan was completed in May 2014.

IMPACT FEE FACILITIES PLAN CERTIFICATION

The analysis contained in this report has been prepared based on growth and system information provided by the City of Saratoga Springs. Based on the data and growth assumptions provided and assuming the City follows the improvement plan outlined in this report, BC&A certifies that, to the best of our knowledge and in accordance with Section 11-36a-306, this impact fee facilities plan:

1. Includes only the costs for qualifying public facilities that are:
    a. allowed under the Impact Fees Act; and
    b. actually incurred; or
    c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. Does not include:
    a. costs for operation or maintenance of public facilities;
    b. costs for qualifying public facilities that will raise the level of service for the facilities through impact fees, above the level of service that is supported by existing residents;
    c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. Complies in every other relevant respect with the Impact Fees Act.



By Keith J. Larson

PROJECT STAFF

The project work was performed by the BC&A team members listed below. Team member's roles on the project are also listed. The project was completed in BC&A's Draper, Utah office. Questions may be addressed to Keith Larson, Project Manager at (801) 495-2224.

Jason Luettinger	Principal-In-Charge
Keith Larson	Project Manager
Andrew McKinnon	Project Engineer
Angela Hansen	Word Processing

CHAPTER 2
EXISTING SYSTEM DESCRIPTION

SERVICE AREA

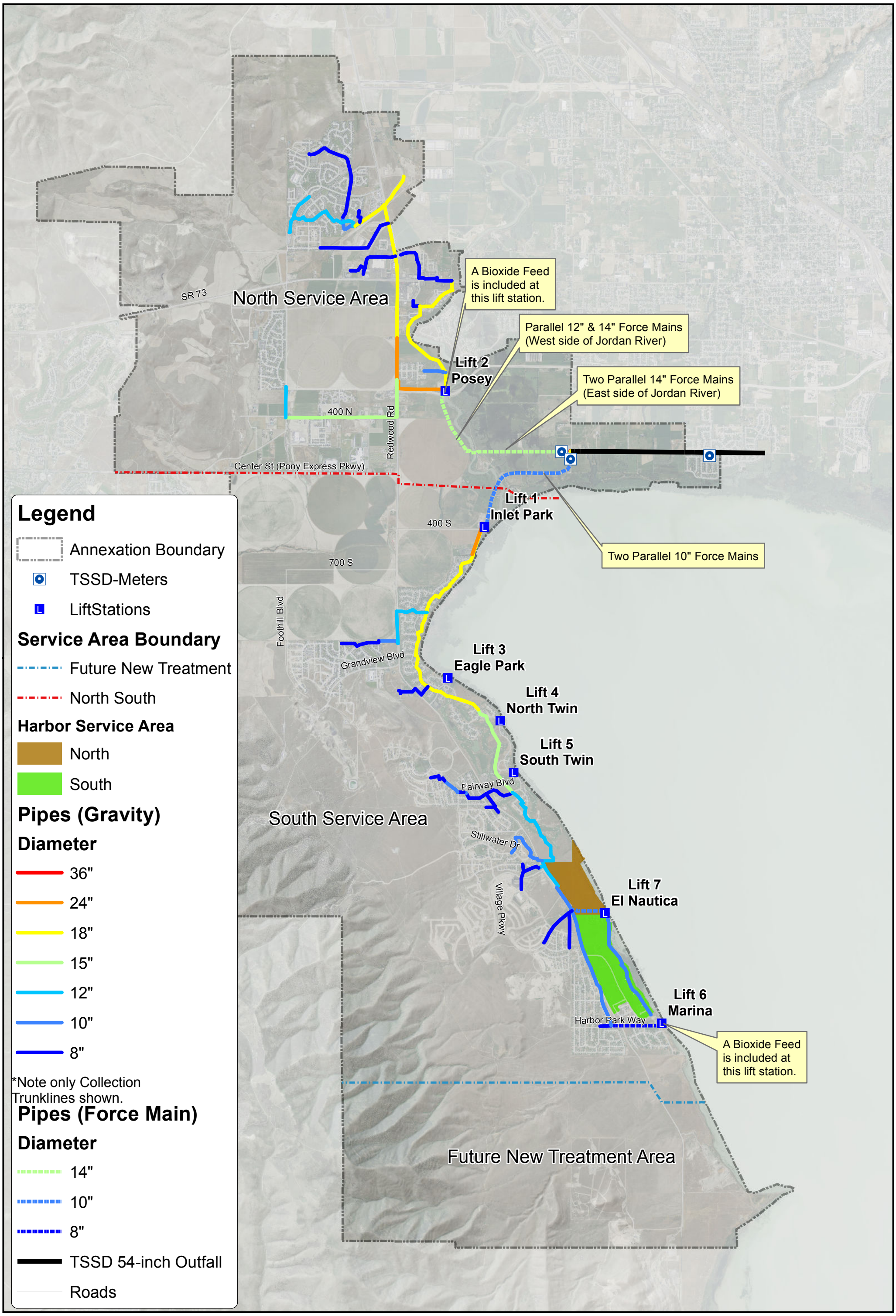
The City of Saratoga Springs, which first incorporated in 1997, is bounded to the west by the Lake Mountains and Eagle Mountain City and to the east and northeast by Utah Lake and Lehi City. Figure 2-1 shows the approximate planning extent of Saratoga Springs along with the City's major collection system components. The topography of the majority of the City slopes west to east toward either Utah Lake or the Jordan River. For the purposes of this report, it has been assumed that the future service area of the City's wastewater collection system will be limited to the annexation boundaries of the City as shown in Figure 2-1.

For the purpose of impact fees, the City's overall service area has been divided into three major impact fee areas (with two additional subareas). These impact fee areas are shown in Figure 2-1, and they include the following:

- North Service Area – Through the middle of the City is a major sewer trunk line owned by Eagle Mountain. The size and depth of this trunk line effectively blocks Saratoga Springs sewer drainage facilities from moving from one side of the City to the other. As a result, the City essentially operates two separate systems until their combination point at the TSSD outfall at the east end of the City. The north portion of this area will be identified in this report as the North Service Area.
- South Service Area – Most of the area south of the Eagle Mountain trunk line has been identified as the South Service Area. Within this area are two subareas that must be considered for impact fee purposes. This includes the North and South Benefited Areas of the Harbor Bay Lift Station. These areas are functionally part of the South Service area but include additional reimbursement agreements that affect development that falls within the areas. A detailed figure identifying these subareas and their associated facilities has been included in the appendix of this report.
- Future Treatment Service Area – As part of previous master plans, it was decided that the City collection system would only extend to the south as far as the service area of the Marina Lift station. All areas to the south of this boundary will be served by a future treatment plant. As a result, development in this service area will be exempt from impact fees, but will need to develop plans for conveyance and treatment on its own.

EXISTING FACILITIES

Saratoga Springs was incorporated in December of 1997. As a relatively new City, much of its existing infrastructure was built by developers as part of individual developments. This infrastructure was then turned over to the City as the developments were incorporated into the City. Because of how the system was constructed, much of the sewer collection infrastructure currently owned by the City still has obligations to be paid to the developer who built the infrastructure as new development connects to the facilities. These obligations, referred to as



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

EXISTING COLLECTION SEWER TRUNKS & LIFT STATIONS

NORTH:

SCALE: 0 2,000 4,000 Feet

FIGURE NO. 2-1

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 2-1 - Existing Facilities.mxd amckinnon 1/15/2014

pioneering agreements, will need to be considered in detail as part of the impact fee analysis prepared for the sewer collection system.

LIFT STATIONS

The City's entire sewer production is treated at the Timpanogos Wastewater Treatment Plant (WWTP), which is owned by the Timpanogos Special Services District (TSSD). This plant is located near the northeast corner of Utah Lake at a slightly higher elevation than the shoreline of the lake that runs the length of much of the City. As a result, much of the City's service area must be pumped to gravity pipelines that flow to the treatment plant.

The Posey Lift Station collects flow from the north end of the City while the Inlet Park Lift Station collects flow from the south end. Both of these lift stations pump through force mains to discharge into a TSSD 54-inch main at approximately 7350 North 9550 West (Lehi City address system). There are five other smaller lift stations that discharge into the City's Inlet Park sewer trunk main. This trunk begins at Harbor Park Way and Redwood Road and flows north to the Inlet Park Lift Station. Table 2-1 summarizes some of the characteristics of each lift station. Lift station capacity is based on the reliable capacity of each station. Reliable capacity is defined as the capacity with one pump out of service (e.g. for a pump station with three pumps, reliable capacity is the capacity of two pumps running with one standby).

Table 2-1
Existing Public Lift Stations

Lift Station	Address[a]	Impeller Size	Wet Well Volume[c] (gallons)	Pump Count & Motor Size (HP)	Design Flow (gpm)	Design Head (ft)
1 – Inlet Park	400 S. Saratoga Rd	14"	4,600	3 – 40	1,600[b]	68
2 – Posey	Pioneer Crossing, Jordan River	15"	5,200	3[d] – 50	2,000[b]	83
3 – Eagle Park	1448 S. Cottonwood Lane	4"	2,500	2[d] – 7 ½	110	N/A
4 – North Twin	1800 S. Centennial Blvd	4"	2,500	2 – 7 ½	110	N/A
5 – South Twin	2170 S. Centennial Blvd	4"	2,500	2 – 7 ½	110	N/A
6 – Marina	275 E. Cascade Court	4"	2,500	2[d] – 25	350	140
7 – El Nautica	100 W. 3000 S. (Harbor Bay)	6"	3,500	3 – 20	550[b]	140

[a] Addresses are approximate
[b] Estimated capacity with two pumps running
[c] Values shown represent approx. effective wet well volume based on as-built drawings and wet well level settings
[d] Lift stations indicated include provisions to add an additional pump on the existing manifold

All of the City's lift stations are connected to the City's SCADA system. The SCADA system currently provides real time data collection at each station for items such as pump status and wet well level. The SCADA does not yet include the capability for remote operation, but the City plans to add this in the future. The planned collection areas for each of the smaller lift stations (Lift Stations 3 through 7) have been delineated and are included in this report in the appendix.

COLLECTION SYSTEM

Table 2-2 lists the recorded length of pipe in the City's collection system as documented in the City's geographic database as of December 2011.

Table 2-2
Saratoga Springs Collection System Pipe Lengths

Gravity Mains		
Diameter (in)	**Length (ft)**	**Length (mi)**
4	982	0.19
6	3,482	0.66
8	119,424	22.62
10	5,592	1.06
12	9,480	1.80
14	8,243	1.56
15	3,174	0.60
18	11,652	2.21
24	1,542	0.29
36	59	0.01
54	9,247	1.75
Total	**172,877**	**32.74**
Pressure Force Mains		
4	982	0.19
6	3,482	0.66
8	2,499	0.47
10	12,685	2.40
14	8,243	1.56
Total	**27,891**	**5.28**
Total All Pipes	**200,768**	**38.02**

It should be noted that because of the rapid growth in the City, there are some portions of the existing collection system that have not yet been inventoried as part of the City's geographic database. The City is currently in the process of collecting data to complete the inventory of its sewer manholes and sewer mains as part of its asset management program. As it moves forward, the City is also requiring developers to submit manhole and sewer main data in a compatible geographic database and format to aid in the collection of asset management data. It should be emphasized that those areas with missing manhole and pipeline data consist strictly of smaller diameter collection piping for individual project level improvements. As a result, none of the data remaining to be collected is necessary for the completion of this study. All the data required to evaluate larger diameter system level improvements is included in the City's geographic database.

METERING STATIONS

At the downstream end of the collection system, the City's sewer flow is metered before being discharged into TSSD's 54-inch trunk line. Table 2-3 summarizes the characteristics of the three existing metering stations serving the City. All of these metering stations are owned and operated by TSSD.

Table 2-3
TSSD Sewer Metering Stations for Saratoga Springs

Meter Station	Address	Size	Count	Type
Inlet Park	145 North Saratoga Road	10"	2	Electromagnetic
Posey	145 North Saratoga Road	14"	2	Electromagnetic
Loch Lomond	575 W 145 North	10"	1	Radar

TREATMENT

All of the City's wastewater is treated at the Timpanogos Wastewater Treatment Plant (WTP). TSSD is responsible for all capacity and treatment requirements from the discharge point of the Posey and Inlet Park lift stations and the TSSD's WTP. However, Saratoga Springs does operate and maintain Bioxide feed systems at the Posey and Marina lift stations.

Bioxide Feed Systems

To mitigate the corrosion and odor concerns, the City implemented bioxide treatment in coordination with TSSD in 2008. This consisted of working with Siemens Water Technologies to design and implement a Bioxide storage and feed system to minimize the production of hydrogen sulfide in the wastewater at the Posey and Marina lift stations. Each Bioxide tank is equipped with two pumps, one that provides a continuous feed and another that is on a timer providing increased dosing during peak flows. Table 2-4 provides the current dosing rates and the data provided by TSSD on measured hydrogen sulfide levels.

Table 2-4
Saratoga Springs Bioxide Feed Systems

	Bioxide Tank Volume	Siemens Recommended Bioxide Dosing	Measured Bioxide Dosing 6-5-2012	Low TSSD measured H_2S gas	High TSSD measured H_2S gas	Target H_2S levels
Posey Lift Station	4,500 gal	48 gal/day	45 - 49 gal/day	11 ppm	76 ppm	4 ppm
Marina Lift Station	6,000 gal	96 gal/day	91 - 97 gal/day	4 ppm	20 ppm	4 ppm

Three additional strategies are being implemented to address TSSD's concerns and to provide better data to the City so that the hydrogen sulfide issue can be better managed in the future:

1. An odor logger was purchased so that hydrogen sulfide levels at various locations in the system can be monitored and Bioxide levels adjusted accordingly to maintain reduced levels of gas.
2. A fresh water source will be provided at Posey so that one of the force mains can be filled with water and shut down, eliminating the need to switch lines and preventing clogging in the inactive line. There is an 18-inch culinary line about 50 feet north of the property and easements will be needed to extend a lateral to the lift station property. Currently the force mains are switched approximately every 3 months.
3. The type of Bioxide has been switched from ammoniated Bioxide (Bioxide-AQ) to chlorinated Bioxide (Bioxide-71). Siemens has informed the City that the chlorinated Bioxide will not only help reduce grease build up in the system, but will also provide a more immediate reduction in sulfide gas and will be effective at lower dosing.

CHAPTER 3
PROJECTED WASTEWATER SYSTEM GROWTH

In order to do any kind of future planning, it is necessary to project wastewater flows increases in the future. The purpose of this chapter is to project future wastewater flows associated with City growth.

EQUIVALENT RESIDENTIAL CONNECTIONS

Existing development in Saratoga Springs was quantified using an Equivalent Residential Connection (ERC). ERC's are a way to provide a common unit of measurement with which to combine residential and non-residential development to provide a development total for the City.

Residential development is generally assigned a value of one ERC for every dwelling unit. For non-residential development, the City assigns an ERC value based on a fixture count that is performed at the issuance of the Building Permit. The fixture count is based on the International Plumbing Code (IPC). Each fixture type is assigned a load value in water supply fixture units (wsfu). For example, a kitchen sink has a load factor of 1.4 wsfu based on how much water is used at a kitchen sink. A typical residential toilet has a load factor of 2.2 wsfu because a toilet uses more water than a kitchen sink. Once all the fixtures are identified, all the fixture units are added together for a total fixture unit count. The City also uses the IPC as the plumbing standard used for plan reviews and building inspections. The IPC fixture count method is used to size the water meter and sewer lateral.

For the evaluation of future growth, it has been assumed that the City will continue to use the IPC fixture unit count method to calculate ERCs. Based on historic City practice, a ¾-inch water meter is the minimum size allowed for a residential connection and all connections are considered to be at least one ERC. The maximum fixture count allowed for a ¾-inch residential water meter is 40. For fixture counts greater than 40, a larger meter will be required and a larger value of ERCs will be calculated. For example, a building with a fixture unit count of 87 would have an impact fee unit of 2.2 (87/40 = 2.2).

EXISTING DEVELOPMENT

At the beginning of 2012, the City's database had 5,059 ERC's. Of this, 4,865 of the total ERC's were associated with residential development, and 194 ERC's were associated with non-residential development. For the same period, the US Census Bureau estimated the population of the City to be 21,137 for an average household size of 4.34 people.

GROWTH PROJECTIONS

Growth projections for Saratoga Springs were made by evaluating the history of building permit issuance over the last decade as summarized in Table 3-1.

Table 3-1
Building Permit History

Year	Annual Residential Permits	Annual Growth
2000	169	63.10%
2001	483	110.50%
2002	369	40.10%
2003	437	33.90%
2004	383	22.20%
2005	656	31.10%
2006	658	23.80%
2007	489	14.30%
2008	193	4.90%
2009	186	4.50%
2010	232	5.40%
2011	464	10.30%

Saratoga experienced rapid growth at the beginning of 2000 followed by a cooling period from 2007 to 2010 with growth rebounding rapidly in the last few years. The City has conservatively projected growth for the near future with stronger growth occurring in about 6 years due to the projected development of the LDS Church property. Total growth projections for the City are summarized in Table 3-2.

Table 3-2
Growth Projections

Year	Total Projected ERCs	Annual Projected Growth Rate
2012	5,059	--
2013	5,430	7.33%
2014	5,812	7.03%
2015	6,194	6.57%
2016	6,576	6.17%
2017	7,377	12.18%
2018	7,986	8.26%
2019	8,671	8.58%
2020	9,541	10.03%
2021	10,207	6.98%
2022	10,877	6.56%

ESTIMATING EXISTING SEWER FLOWS

Utah Administrative Code R317-3-2 indicates that, "New sewer systems shall be designed on the basis of an annual average daily rate of flow of 100 gallons per capita per day (0.38 cubic meter per capita per day) unless there are data to indicate otherwise." A review of available flow monitoring data for the system would indicate a lower design flow rate is merited.

Although the City is still relatively young, it has a record of discharge flow rates at its main sewer outfall that has been collected by Timpanogos Special Service District (TSSD) since the City's inception. During the first several years of the City's existence, metered flow results vary significantly from month to month and year to year. This is believed to be the result of meter inaccuracies at the connection points to TSSD. In 2008, however, new meters were installed and consistent results have been observed since that time. For the purposes of establishing historic sanitary sewer flow rates, BC&A examined available TSSD records of average monthly flow from 2009 to 2011. The results of this analysis are summarized in Table 3-3.

Table 3-3
Historic Saratoga Springs Sewer Flows

	Metered Flow to TSSD (mgd)			Flow/ERC (gpd)		
	2009	**2010**	**2011**	**2009**	**2010**	**2011**
Jan	0.714	0.821	0.922	172.8	190.6	205.4
Feb	0.758	0.768	0.733	182.5	178.0	162.5
Mar	0.658	0.714	0.773	157.7	165.2	170.6
Apr	0.885	0.776	0.842	211.0	179.1	184.9
May	0.804	0.906	0.736	190.8	208.7	160.9
Jun	0.763	0.968	1.102	180.2	222.7	239.7
Jul	1.087	1.110	1.147	255.4	254.8	248.3
Aug	0.982	0.957	1.092	230.2	218.6	234.6
Sep	0.803	0.933	0.856	187.9	212.0	182.4
Oct	0.891	0.843	0.863	208.1	190.6	182.5
Nov	0.714	0.735	0.960	166.4	165.4	201.5
Dec	0.742	0.806	0.923	172.6	180.5	192.2

As can be seen in the table, flow varies slightly from month to month with peak flows observed in the summer months and lower flows observed in the winter. To meet treatment and conveyance requirements, the system must be designed to meet peak flows in the system. Based on these results, the observed historic peak month flow in Saratoga Springs is 255 gpd/ERC.

Based on this analysis, it is recommended that the projected unit flow rate for planning be based on the historic flow rate of 255 gpd/ERC. Table 3-4 summarizes the projected wastewater flow in Saratoga Springs based on projected growth as identified above and historic flow rates. Included in the table are annual projections for the next 10 years.

Table 3-4
ERC and Design Sewer Flow Projections

Year	ERCs	Design Sewer Flow (mgd)
2012	5,059	1.29
2013	5,430	1.38
2014	5,812	1.48
2015	6,194	1.58
2016	6,576	1.68
2017	7,377	1.88
2018	7,986	2.04
2019	8,671	2.21
2020	9,541	2.43
2021	10,207	2.60
2022	10,877	2.77

CHAPTER 4
HYDRAULIC MODELING

The Saratoga Springs sanitary sewer system was evaluated as part of this study using a hydraulic modeling computer program. A hydraulic computer model is a mathematical representation of the pipes, manholes, pumps, and wastewater flows found in the sewer collection system. Hydraulic computer models are useful because they allow the user to simulate operation of large, complex sewer systems and consider how future changes in flow will affect those systems.

AUTODESK STORM AND SANITARY ANALYSIS

The computer modeling software used in this study was Autodesk's Storm and Sanitary Analysis (ASSA). ASSA was chosen as the computer modeling software because of ability to simulate the full profile of sewer flows under gravity, pressure, and surcharging conditions and its availability as an extension of Autodesk's Civil 3D (a software system commonly owned by many municipalities).

GEOMETRIC MODEL DEVELOPMENT

There are two major types of data required to create a hydraulic model of a sewer system: geometric data and flow data. Geometric data consists of all information in the model needed to represent the physical characteristics of the system.

Modeled Pipelines

For the purposes of this study, it was only necessary to include the City's primary conveyance trunk lines as part of the hydraulic model. These system level improvements include those pipelines that serve more than a single development project and are consequently eligible for inclusion in impact fee calculations. In the future, the City could consider adding smaller, project level collection mains to the hydraulic model for inventory purposes. However, the more refined the analysis becomes, the more time, effort, and expense are needed to assemble and calibrate the model. Hence, it is important to consider the required accuracy and available budget when selecting sewer lines to model.

The major sewer mains included in the hydraulic model were shown in Figure 2-1 (see Chapter 2). The final selection of sewer lines included in this model was reviewed and approved by Saratoga Springs personnel.

Information on the physical characteristics of the pipes included in the model were collected and assembled by Saratoga Springs personnel. A basic framework for the model was developed using Saratoga Springs geographic information system (GIS) records. The City's GIS database included information on the diameter, length, and location of each pipe to be included in the model. Manhole rim elevations were collected by City survey crew. Inverts were based on measure downs collected by wastewater collection personnel.

Modeled Lift Stations

The four largest lift stations in the Saratoga Springs collection system were simulated as part of the hydraulic model. This includes the Posey, Inlet Park, El Nautica, and Marina lift stations. The three remaining existing lift stations serve relatively small service areas that are nearly built-out. Instead of modeling these three individual pump stations, their discharge flows were simply assigned as an inflow at their corresponding discharge manholes. Details for existing lift station characteristics were summarized in Chapter 2.

In addition to these existing lift stations, it is expected that at least one more future lift station will be required to service developable areas not currently serviced by any existing lift station.

FLOW MODEL DEVELOPMENT

The second type of data required by the hydraulic model is sewer flow into the pipes being modeled. Required information includes magnitude of flow, point of entry into the system, and a description of how flow varies with time (to establish peak demand and consider the effects of flow travel time in the system).

Sewer flows for existing and future conditions were calculated based on projections of ERCs as estimated in the City's general plan and land use projections. Existing flows were distributed to the nearest manholes in the hydraulic model. Future flows were distributed into the collection system based on the nearest available collection lines or future collection lines that will be installed. The location of future pipes are indicated as part of the system improvements discussed in Chapter 6.

A distribution of flow over time was accomplished using a composite diurnal curve as shown in Figure 4-1. Table 4-1 summarizes the ratio of flow to average day flow over 24 hours. Because of limited historical data for the City, this diurnal pattern was assembled by BC&A based on flow monitoring conducted in similar municipalities in Utah County. It estimates the average effect of all development including residential, commercial, and industrial demands. The curve includes a maximum peaking factor of 2.5 to match the required peaking factor for interceptor and outfall sewers in State of Utah requirements.

Figure 4-1
Diurnal Patterns Applied to Hydraulic Model

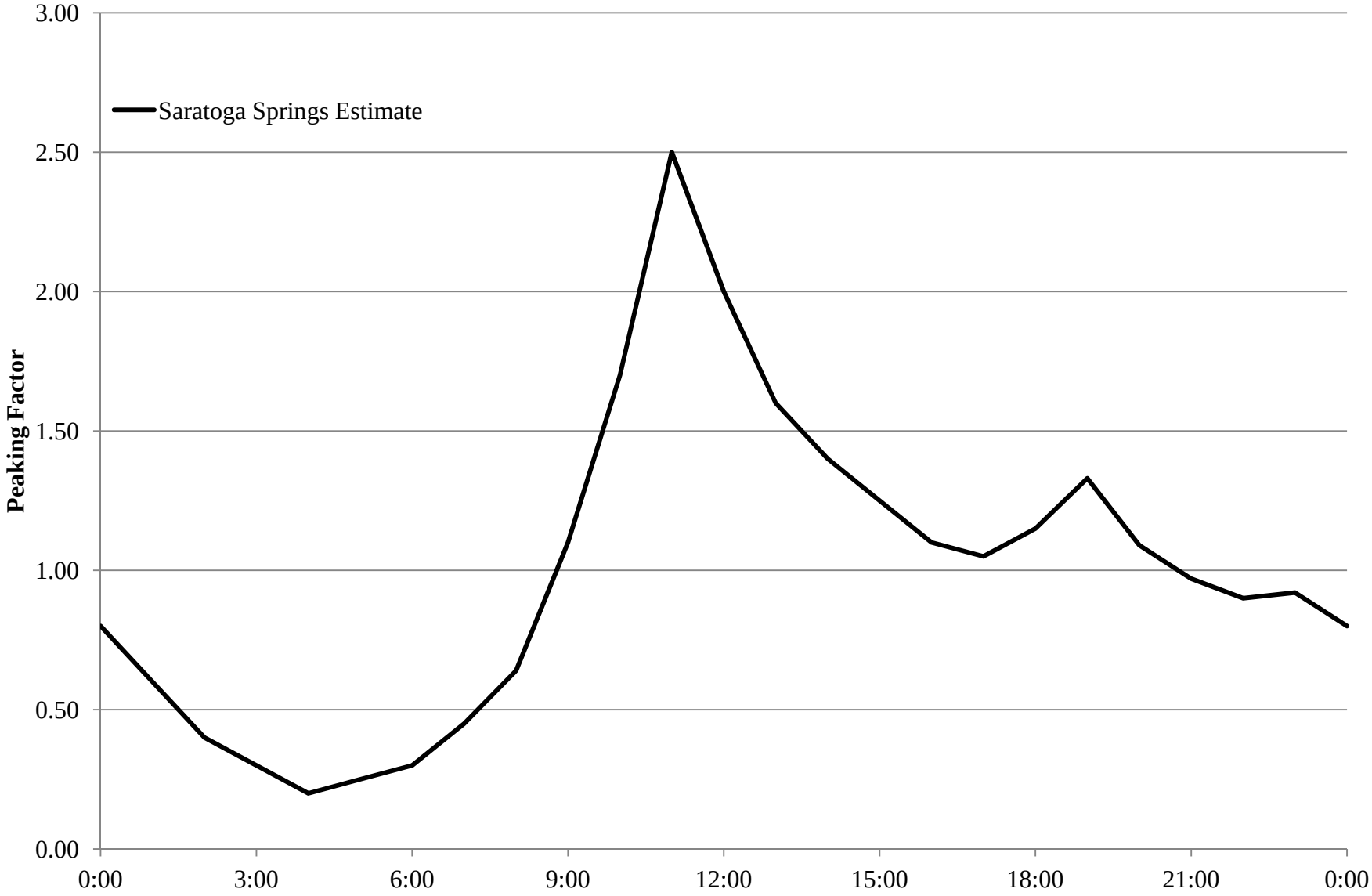


Table 4-1
Hydraulic Model Diurnal Pattern

Hour	Ratio of Average Day Flow
0	0.80
1	0.60
2	0.40
3	0.30
4	0.20
5	0.25
6	0.30
7	0.45
8	0.64
9	1.10
10	1.70
11	2.50
12	2.00
13	1.60
14	1.40
15	1.25
16	1.10
17	1.05
18	1.15
19	1.33
20	1.09
21	0.97
22	0.90
23	0.92
24	0.80

CHAPTER 5
SYSTEM EVALUATION

With the development and calibration of a hydraulic sewer model, it is possible to simulate sewer system operating conditions for both present and future conditions. The purpose of this chapter is to evaluate hydraulic performance of the collection system and identify potential hydraulic deficiencies.

EVALUATION CRITERIA AND LEVEL OF SERVICE

In evaluating the performance of the collection system, it is necessary to first define the required level of service for the various components of the system. This level of service is the same for both existing and future customers:

Sewer Main Level of Service

Saratoga Springs Engineering Standards and Specifications (adopted May 2004) require that all sewer mains be designed such that the peak daily flow depth in the pipe is less than or equal to 80 percent of the pipe's diameter. This design standard will be used as the level of service for system evaluation. Note that the hydraulic capacity of a pipe at 80 percent full (depth to diameter) is nearly equal to the capacity of the pipe at 100 percent full (a phenomenon related to increased friction as the depth in the pipe increases beyond 80 percent).

Force Main Level of Service

Saratoga Springs Engineering Standards and Specifications require that lift station force mains should be designed such that peak velocity through the force main does not exceed 7 ft/sec. By eliminating excessive pipeline velocities, this standard optimizes pump efficiency, limits potential for hydraulic surge issues, and maximizes the life of the force main. It is also required that all force mains have a minimum diameter of 6 inches and that the maximum distance between clean outs along the pipeline be no greater than 1,200 feet. This is to facilitate cleaning of the force mains using the City's jet truck equipment (max reach of approximately 600 feet).

Lift Station Level of Service

Based on industry standards and good design practice, it is recommended that peak daily flow to a lift station not exceed 85 percent of the lift station's hydraulic pumping capacity. Allowing for a modest amount of capacity above projected flows accounts for unknowns associated with flow projections and mechanical wear at each lift station. The minimum design level of service for lift stations has correspondingly been established at 15 percent higher than estimated peak flows at build-out.

The minimum wet well volume for lift stations should be large enough to prevent excessive cycling of lift station pumps. Based on manufacture recommendations for pump operation, the maximum number of cycles per hour should be six or less. Exceeding this value will

significantly shorten the lifespan of the lift station pumps. The number of cycles that will occur at a lift station can be calculated using one of the following two equations:

Equation 1: $V_{min} \geq \frac{60 \times Q_D(Q_P - Q_D)}{N \times Q_P}$ When $Q_D < 0.5 * Q_p$

Equation 2: $V_{min} \geq \frac{15 \times Q_P}{N}$ When $Q_D \geq 0.5 * Q_p$

Where:

N – Maximum number of cycles per hour
Q_D – Peak design flow into the wet well
Q_P – Pump capacity out of wet well

Table 5-1 lists a summary of the evaluation criteria used in this capital facilities plan.

Table 5-1
Evaluation Criteria for System Level of Service

Criteria	Value
Design Sewer Flow Allowance per ERC including I&I (gpd)	255
Design Flow Peaking Factor	2.5
Maximum Allowable Depth to Diameter Ratio for Peak Flow conditions	0.80
Maximum Velocity in Force Mains (ft/sec)	7.0
Maximum Distance Between Force Main Cleanouts (ft)	1,200
Maximum Allowable Peak Flow to Pump Capacity Ratio at Lift Stations	0.85
Maximum Cycles Per Hour at Lift Station (as a result of wet well volume)	6

EXISTING COLLECTION SYSTEM ANALYSIS

Figures 5-1 and 5-2 show the performance of the sewer system under existing flow conditions. Pipes in the figures are color coded to show the ratio of peak flow depth in the pipe to the pipe's diameter. As can be seen in the figure, the existing collection system performs very well under current conditions. Based on the design flows defined above and the level of service adopted by the City, there no pipes that exceed the level of service adopted by the City.

All lift stations appear to have adequate capacity to convey peak flow under existing conditions. There are, however, some opportunities to optimize performance at a few of the lift stations through some projects as discussed in Chapter 6.

FUTURE COLLECTION SYSTEM ANALYSIS

For allocating future resources in this analysis, Saratoga Springs identified the location and magnitude of likely growth in the City for each of the next 20 years and at full buildout. From these projections, BC&A developed short term (growth expected to occur in the next 6 to 10 years), intermediate term (growth expected to occur in the next 20 to 25 years), and long-term

SR 73

400 N

Pkwy)

Redwood Rd

400 S

700 S

Lift 2
Posey

Lift 1
Inlet Park

Legend

LiftStations

Pipes (Gravity)

depth / Diameter

- > 0.8
- 0.71 - 0.8
- 0.61 - 0.7
- 0.51 - 0.6
- 0.41 - 0.5
- 0 - 0.4

Pipes (Force Main)

Qpeak / Qcapacity

- >0.80
- 0.71 - 0.80
- 0.61 - 0.70
- 0.51 - 0.60
- 0.41 - 0.50
- 0.00 - 0.40
- TSSD 54-inch Outfall
- Roads

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

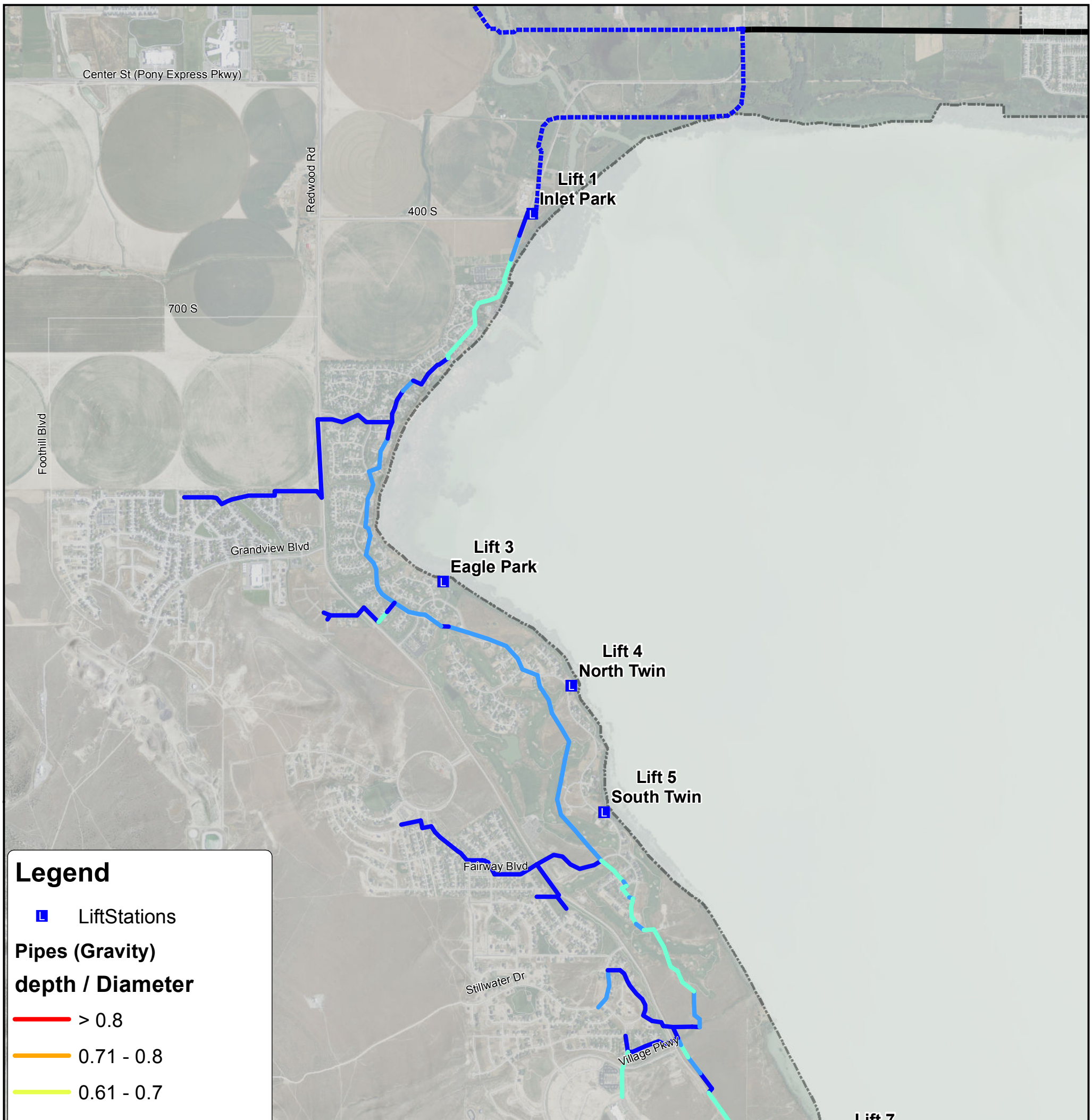
EXISTING COLLECTION SYSTEM CAPACITY NORTH

NORTH:

SCALE: 0 1,000 2,000 Feet

FIGURE NO. 5-1

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 5-1 - Existing Deficiencies.mxd amckinnon 1/15/2014



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

EXISTING COLLECTION SYSTEM CAPACITY SOUTH

NORTH:

SCALE: 0 1,000 2,000 Feet

FIGURE NO. 5-2

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 5-1 - Existing Deficiencies.mxd amckinnon 1/15/2014

(growth through buildout) collection system models. These models were used to calculate the effect of projected growth on the performance of the Saratoga Springs collection system.

Short Term Development Analysis

Figure 5-3 and 5-4 show the performance of the sewer system in the short term. These results represent the immediate needs of the system. As can be seen in the figures, most of the collection system in the City continues to perform well, even with the growth expected to occur in the short term. However, projected growth does result in a few pipelines in which design flows exceed level of service design standards. These pipes are primarily located along the Inlet Park sewer trunkline and include:

- Saratoga Drive, 800 S to 650 S – 18-inch sewer main
- Shirwood Drive – 12-inch sewer main

Projects to bring these pipelines up to the required level of service have been identified and described in Chapter 6.

Growth Beyond Short Term

With the additional future growth projected in Saratoga Springs, it is expected that a number of improvements will be required to meet buildout conditions in the City. Additional trunks will need to be constructed to new areas and some existing trunks will need to be replaced with larger diameter pipes. Because of the extent of the improvements required to meet growth beyond short-term conditions, discussion of these improvements has been divided into a separate section. Chapter 6 discusses conceptual improvements that will be needed to continue to serve growth in Saratoga Springs.

Lift Station Analysis

Table 5-2 indicates flow to the City's lift stations for the various levels of development. Flows in excess of the lift station's existing hydraulic capacity have been highlighted.

SR 73

400 N

Center St (Pony Express Pkwy)

Redwood Rd

400 S

700 S

Foothill Blvd

Grandview Blvd

Lift 2
Posey

Lift 1
Inlet Park

Lift 3
Eagle Park

Lift 4
North Twin

Legend

- LiftStations

Pipes (Gravity)

depth / Diameter

- 0.81 - 1.00
- 0.71 - 0.80
- 0.61 - 0.70
- 0.51 - 0.60
- 0.41 - 0.50
- 0.00 - 0.40

Pipes (Force Main)

Qpeak/QCapacity

- >0.80
- 0.71 - 0.80
- 0.61 - 0.70
- 0.51 - 0.60
- 0.41 - 0.50
- 0.00 - 0.40
- TSSD 54-inch Outfall
- Planned Development
- Roads

Short-Term Projected Growth

Increase in ERUs

- 1.0 - 10.0
- 10.1 - 25.0
- 25.1 - 50.0
- 50.1 - 100.0
- 100.1 - 250

Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

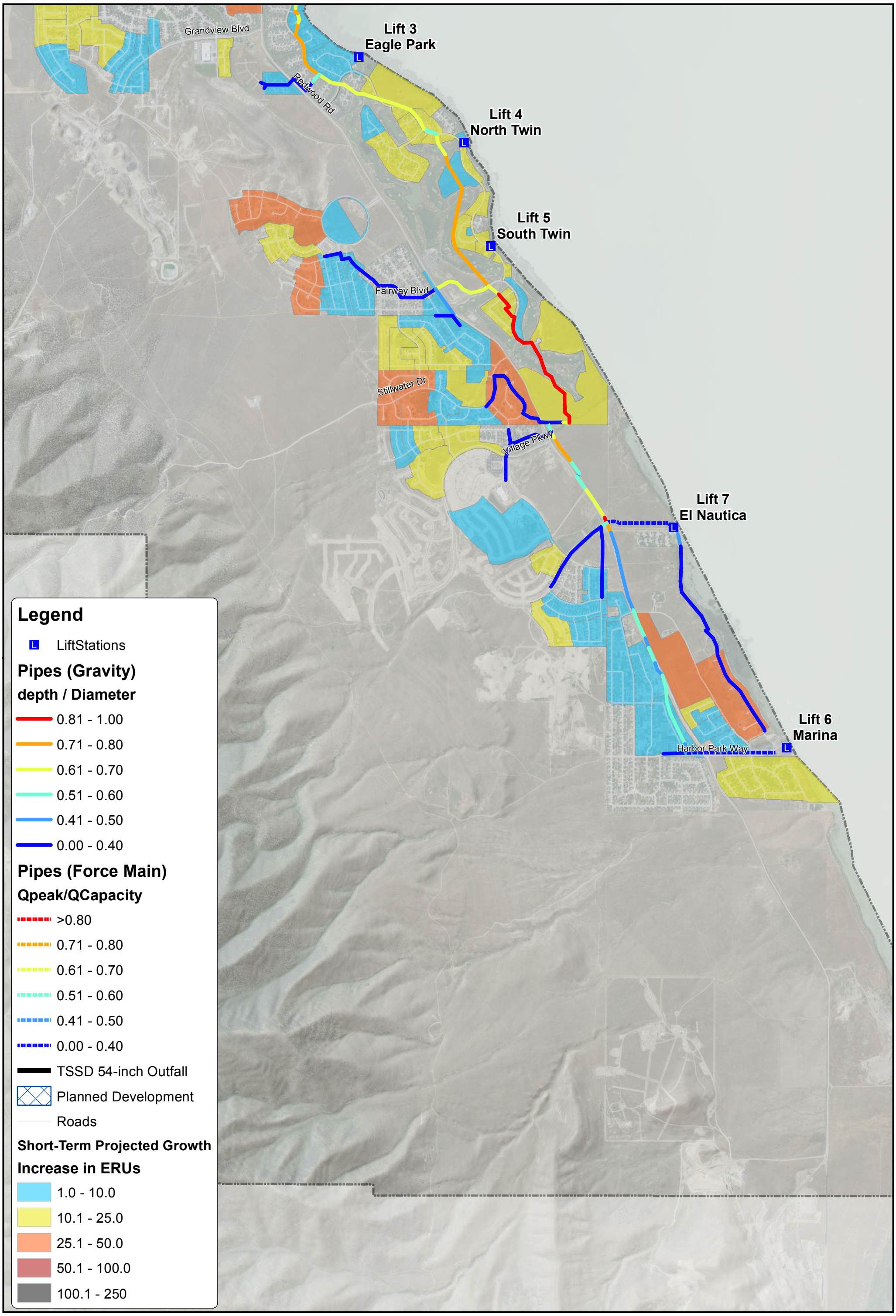
SHORT TERM COLLECTION SYSTEM CAPACITY NORTH

NORTH:

SCALE: 0 1,000 2,000 Feet

FIGURE NO. 5-3

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 5-3 - Short Term Deficiencies.mxd amckinnon 1/15/2014



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

SHORT TERM COLLECTION SYSTEM CAPACITY SOUTH

NORTH:

SCALE: 0 1,000 2,000 Feet

FIGURE NO. 5-4

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 5-3 - Short Term Deficiencies.mxd amckinnon 1/15/2014

Table 5-2
Lift Station Evaluation at Various Development Conditions

Lift Station	Address[a]	Existing Hydraulic Capacity (gpm)	Design Peak Flow - Existing (gpm)	Design Peak Flow - Short Term (gpm)	Buildout Peak Flow (gpm)
1 – Inlet Park	400 S. Saratoga Rd	1,600	920	***1,800*** [d]	***3,600***
2 – Posey[b]	Pioneer Crossing, Jordan River	2,000[c]	1,028	***1,400*** [d]	***1,400***
3 – Eagle Park	1448 S. Cottonwood Lane	110[c]	26	30	30
4 – North Twin	1800 S. Centennial Blvd	110	16	32	45
5 – South Twin	2170 S. Centennial Blvd	110	12	16	16
6 – Marina	275 E. Cascade Court	350[c]	100	116	318
7 – El Nautica	100 W. 3000 S. (Harbor Bay)	550	2	31	370

[a] addresses are approximate
[b] the collection area to this lift station will ultimately be decreased by the construction of new gravity mains.
[c] Lift stations indicated include provisions to add an additional pump on the existing manifold
[d] Short-term peak flow based on the maximum flow experienced prior to the construction of new gravity outfall pipelines (see Project SS-S1, Chapter 6)

CHAPTER 6
BUILDOUT SYSTEM IMPROVEMENTS

The hydraulic model was used to evaluate various alternatives for servicing growth under projected buildout conditions. For the purposes of this report, buildout is defined as full development of all property in the service area at current planning densities as defined in the City's land use element of the General Plan. The following chapter describes the preferred conveyance option for meeting buildout flows.

SYSTEM IMPROVEMENT APPROACH

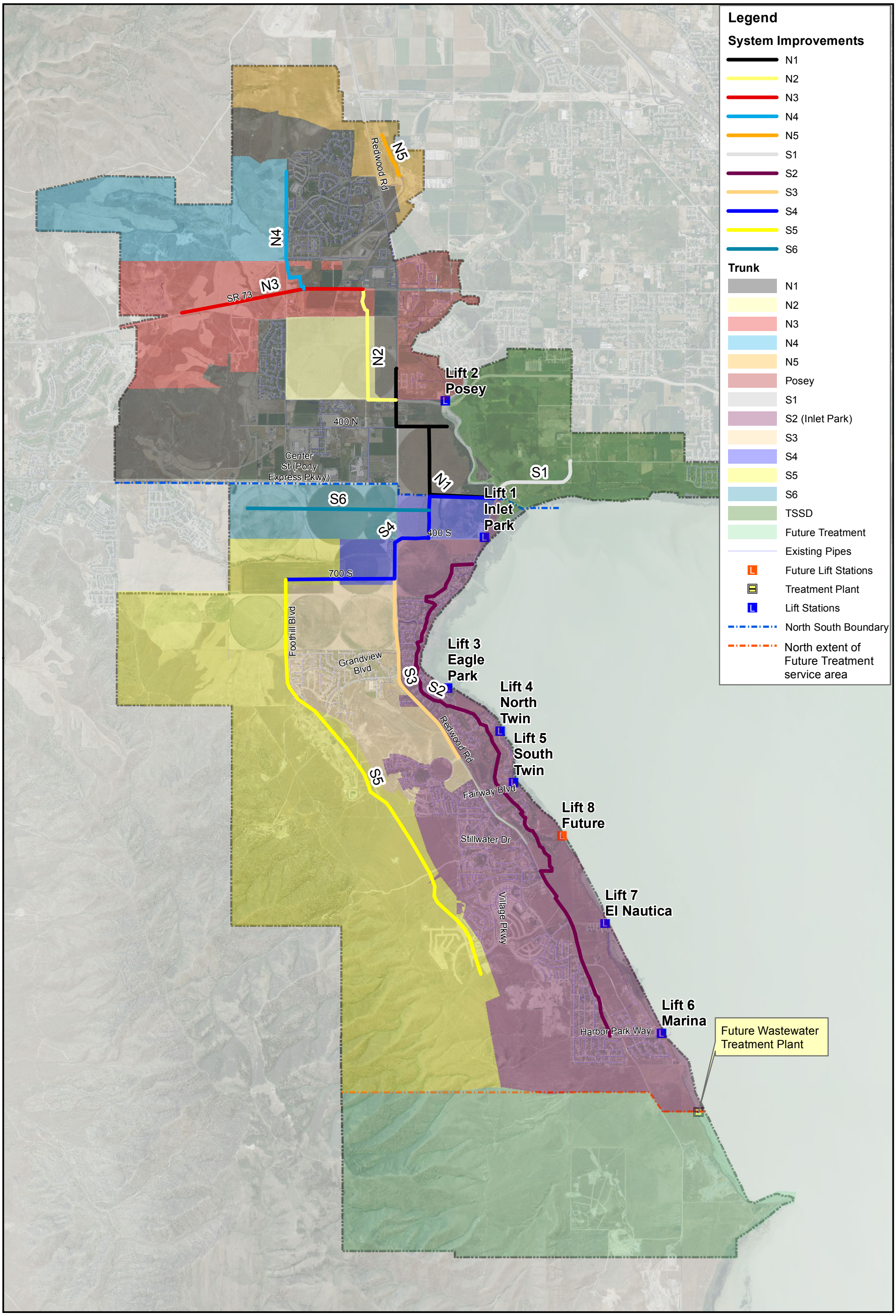
There are a number of different approaches that could be used to service future growth in Saratoga Springs. Prior to developing a recommended approach, BC&A and Saratoga Springs personnel examined previous master plan alternatives and several new alternatives identified during the course of this facilities plan. In developing a preferred conveyance alternative, several issues were considered:

- **Cost –** A primary goal in developing a preferred conveyance alternative was to minimize overall cost. The sizing and alignment of future pipelines were optimized to convey projected flows in the most efficient manner possible. Projects have also been phased to defer projects that are more expensive where possible to try to achieve the lowest present worth cost of improvements.
- **Maintenance and Reliability –** Facilitating maintenance and providing maximum reliability was another important goal in developing a preferred alternative. Based on experience, one of the best ways to accomplish this goal is to minimize reliance on future lift stations. Both lift stations and force mains are the source of frequent maintenance. Lift stations are also vulnerable to power interruption and mechanical failure. They also require ongoing electrical pumping costs that add to the overall cost of operating the system. The improvements recommended here include the construction of several new gravity mains that will allow as much of the City to be conveyed to TSSD by gravity as possible. This will significantly reduce the size of the collection areas currently served by the Inlet Park and Posey Lift Stations.
- **Disruption to Existing Residents –** Where possible, construction of new sewer mains through existing neighborhoods and paved roadways was avoided. By minimizing work in developed rights-of-way, disruption to traffic and residents can be minimized.

After considering these various issues, a preferred alternative for meeting future growth was identified as recommended below.

RECOMMENDED CONVEYANCE IMPROVEMENTS

Figure 6-1 shows the approximate location of improvements recommended to meet future growth in Saratoga Springs through buildout. It should be noted that proposed sizes for pipes have been estimated based on projected flow, estimated pipe slopes developed using 5-meter



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

BUILD-OUT SYSTEM IMPROVEMENTS

NORTH:

SCALE: 0 1,750 3,500 Feet

FIGURE NO. 6-1

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 6-1 - Proposed Facilities.mxd amckinnon 1/15/2014

digital elevation data, and the State of Utah's minimum slope criteria for sanitary sewer mains. Once detailed design of sewer mains commences, the pipeline sizes should be reviewed with design pipe capacity based on the projected buildout flows in upstream sub-basins as discussed in Chapter 4. Also shown in Figure 6-1 is the approximate collection area associated with each major trunk line improvement. It should also be noted that collection basins and pipeline alignments shown are approximate based on current understanding of projected development patterns and future road alignments. As the time for completion of each project approaches, the City should review each collection area and pipeline alignment in detail to optimize the location and functionality of each improvement.

As discussed in Chapter 2, the City can be separated into three service areas, a south area (currently served by the Inlet Park Lift Station), a north area (currently served by the Posey Lift Station), and an area to be served by future treatment facilities at the far south end of the City. Because it will be its own system, no projects are identified for the future treatment service area. Projects for each of the other two service areas are described below.

South Service Area

SS-S1. River Crossing Trunk – A key component to the proposed improvement approach is the construction of a new gravity outfall across the Jordan River. This will allow flow to be conveyed across the Jordan River by gravity to the Timpanogos Special Service District connection. Once this line is completed, it will facilitate two major categories of improvements. First, it will allow new gravity lines to be constructed to service new development on higher elevation properties in the City (see Projects SS-S3 and SS-N1). Second, it will allow the length of the Inlet Park and Posey force mains to be significantly reduced and the existing force main siphons under the river to be eliminated.

Because this improvement is located at the very bottom of the system, it will need to have a very large capacity to meet project flows through buildout. To limit the required funding initially, it is recommended that this project be completed in phases. Initially, a single pipeline will be constructed (36-inch crossing of the Jordan River connected to a 36-inch outfall to the TSSD connection). When required for capacity, a second parallel pipeline will be added. Since this is such a critical component to the City's future system, it is also recommended that the City complete a more detailed preliminary design study to coordinate phasing and invert elevations with upstream pipelines.

It should be noted that this project will serve both the south and the north service areas. It has been included with the south improvements for convenience, but its costs will be divided between the service areas based on the percent of capacity used by each.

SS-S2. Inlet Park Sewer Trunk Upgrade – The existing Inlet Park Sewer Trunk that starts along Redwood Road at the south end of the City and continues north following the shoreline of Utah Lake will need to be upgraded to accommodate build-out

wastewater flows. There are no existing deficiencies along the sewer trunk, but there are two areas with projected deficiencies because of short-term growth (10-year growth). As growth continues into the future, additional sections of the pipeline will fall below level of service requirements. The Inlet Park lift station will eventually need to be upgraded and all of the trunk line will need to be upsized to accommodate future growth.

SS-S3. Redwood Road Trunk – A new trunk line is recommended along Redwood Road from 700 South to Ring Road. The purpose of this trunk line will be collect wastewater flows from west of Redwood Road and convey it by gravity to the new gravity trunk on 700 South (see Project S4). This trunk line does not extend any further south than Ring Road because this is the high point on Redwood Road. This precludes further collection by gravity along Redwood Road from properties to the south.

SS-S4. 700 South Trunk – A new trunk is recommended to be constructed from west to east at approximately 700 South. The purpose of this trunk line will be to connect all upstream gravity pipelines to the River Crossing Trunk (Project SS-S1). Once this pipeline and the River Crossing Trunk are completed, a large portion of the south service area will be able to bypass the Inlet Park Lift Station. Currently 100 percent of the south service area flows through the lift station. Once the recommended improvements are completed, the collection area for the Inlet Park Lift Station will be reduced to the area shown in Figure 6-1.

It should be noted that, as currently projected, development near this project (especially on property owned by PRI) may require the completion of this project prior to the completion of the River Crossing Trunk. If this is the case, this pipeline can temporarily be connected to the Inlet Park Lift Station until the River Crossing Trunk is completed. During the final design of this pipeline, great care should be taken to make sure the invert elevations of this pipeline are consistent with its ultimate goal of connecting to the River Crossing Trunk.

SS-S5. Foothill Trunk – A new trunk is recommended along the future Foothill Blvd to collect areas along the western edge of the City. Construction of this pipeline will allow all upstream areas to be conveyed by gravity to the new 700 South Trunk (Project SS-S4). As noted above, this will allow all the area served by this pipeline to bypass the Inlet Park Lift Station and flow by gravity to TSSD.

SS-S6. 200 South Trunk – A new trunk is recommended along the future 200 South roadway. Construction of this pipeline will allow all upstream areas to be conveyed by gravity to the new 700 South Trunk (Project SS-S4).

North Service Area

SS-N1. North Trunk – Similar to the south service area, one primary goal of the recommended improvements is to connect as much of the service area as possible

to pipelines that can drain by gravity. The key project to accomplish this in the north service area is SS-N1. This improvement would include a new gravity trunk line from the intersection of Redwood Road and Pioneer Crossing to the River Crossing Trunk. Once this pipeline and the River Crossing Trunk are completed, a large portion of the north service area will be able to bypass the Posey Lift Station. Currently 100 percent of the north service area flows through the lift station. Once the recommended improvements are completed, the collection area for the Posey Lift Station will be reduced to the area shown in Figure 6-1.

It should be noted that capturing the existing flow at the intersection of Redwood Road and Pioneer Crossing will require a relatively deep pipeline. During the detailed preliminary design study for the River Crossing Trunk (Project SS-S1), it is recommended that additional consideration be given to the alignment of Project SS-N1 to minimize pipeline depth and cost.

SS-N2. 200 West Trunk – A new trunk line will need to be constructed along 200 West to collect wastewater from future development. Creating capacity in a new trunk line along this corridor is more cost effective than upsizing the existing pipeline in Redwood Road.

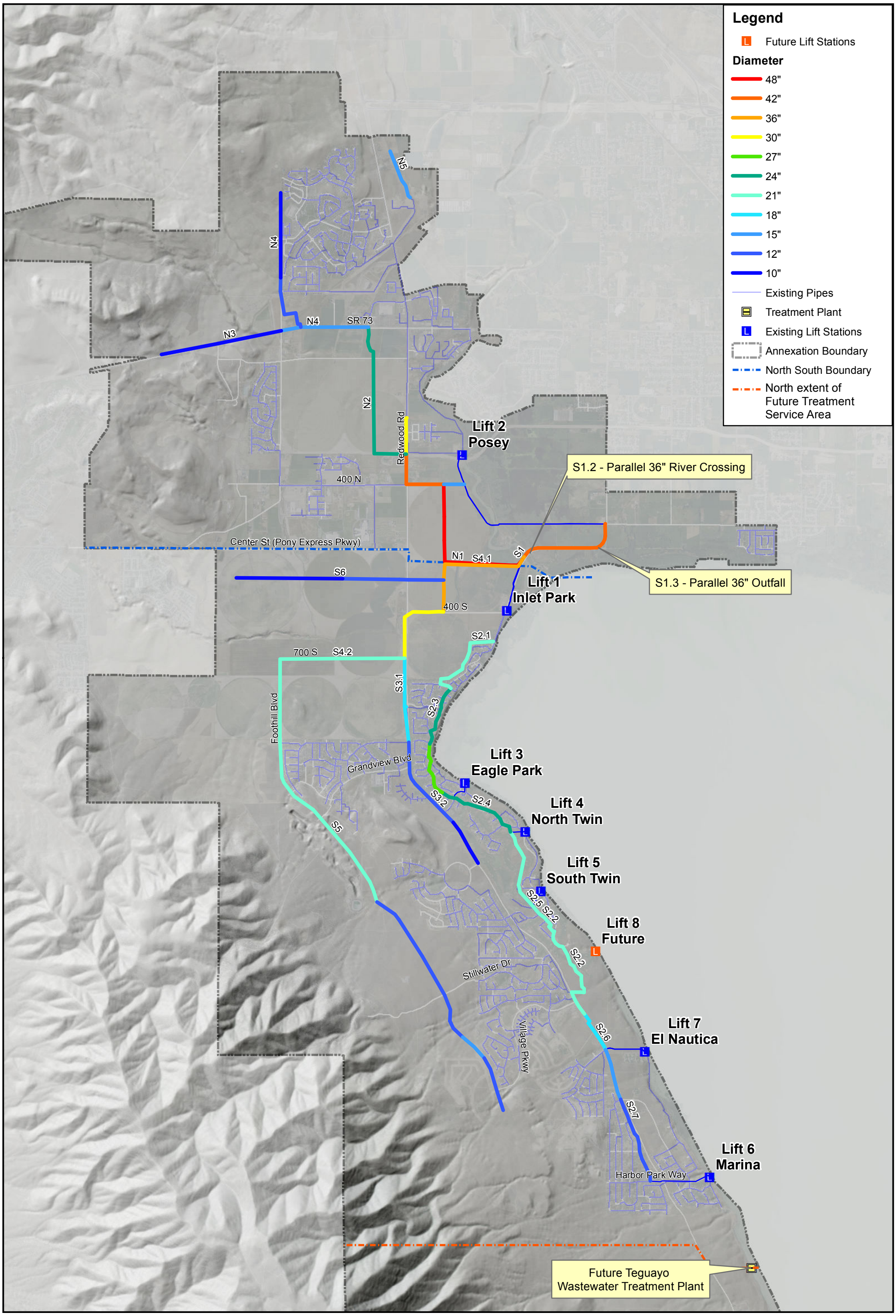
SS-N3. SR-73 Trunk – A new trunk line will need to be constructed along SR-73 to collect wastewater from future development in the area.

SS-N4. 800 West Trunk – A new trunk line is recommended along 800 West to collect wastewater from future development. The purpose of this trunk would be to collect areas that will develop west of the Mountain View Corridor. A new pipeline is recommended along this corridor to avoid surcharging existing pipelines in existing neighborhood sewer mains at buildout.

SS-N5. Canal Trunk – A sewer trunk line should be extended adjacent to the canal near Stagecoach Drive. This trunk line is intended to collect wastewater flow from areas at the north end of the City.

Figure 6-2 shows the diameter of the proposed improvements. Table 6-1 summarizes the cost of the proposed improvements in 2012 dollars. The estimated year of construction is also shown in the table. Note that development will be the primary motivation for most of the projects, and the timing of projects beyond the short-term planning window may be expedited or deferred depending on the rate of development.

It should be noted that costs contained in this chapter are total project costs and do not include any division between existing and future users. As described above, some of the recommended improvements identified in this plan will benefit existing users. A division of project costs between existing and future users based on proportionate share of capacity is contained in Chapter 7.



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

BUILD-OUT
SYSTEM IMPROVEMENT
DIAMETERS

NORTH:

SCALE: 0 1,750 3,500 Feet

FIGURE NO.
6-2

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 6-2 - Proposed Facilities.mxd amckinnon 1/15/2014

It should also be remembered that the collection system improvements identified in these two figures do not include any improvements for potential development at the south end of the City. The topography of Saratoga Springs is different from most other cities because of its location relative to Utah Lake. Conveying flow from the south end of the City to the outfall at the north end of Utah Lake is difficult because there is very little elevation difference between these locations. To cost effectively serve its residents and avoid an excessive number of lift stations, the City has established a policy to extend service on its existing system no further than the southern boundary of the Marina Lift Station. This boundary is shown in Figures 6-1 and 6-2. All properties south of this boundary should be served by a new wastewater treatment plant. As a result, any development that occurs in this area will not be subject to the sewer collection impact fees of the City but will be responsible for development of the new plant and corresponding collection system. A possible location for a future wastewater treatment plant is shown at the south end of the City in Figure 6-2. The final location of this plant along with layout of the corresponding collection system pipelines will need to be completed once development plans in this area become more established.

Table 6-1
Collection System Improvements

Project No.	Projects: Year of Project (Fiscal Year Ending)	Project Description	Estimated Total Cost (2012 Dollars)
Short Term Projects			
SS-S1.1	2014	River Crossing Trunk Phase 1, Alignment & Preliminary Design Study	$100,000
SS-S1.2	2018	River Crossing Trunk Phase 2, Suspended Sewer or Siphon	$1,151,000
SS-S1.3	2018	River Crossing Trunk Phase 3, Outfall	$3,665,000
SS-S2.1	2014	Inlet Park Trunk Phase 1, Near Lift Station	$1,399,000
SS-S2.2	2015	Inlet Park Trunk Phase 2, Golf Course Main	$1,654,000
SS-N1	2018	North Trunk	$9,546,000
SS-N2	2020	200 West Trunk	$2,351,000
SS-S4.1	2022	700 South Trunk Phase 1, First Half	$4,650,600
Short Term Total			**$24,516,600**
Intermediate Term Projects			
SS-S2.3	2023	Inlet Park Trunk Phase 3	$2,716,000
SS-S3.1	2024	Redwood Road Trunk Phase 1, First Half	$1,061,000
SS-S2.4	2025	Inlet Park Trunk Phase 4	$1,967,000
SS-S6	2026	200 South Trunk	$1,919,000
SS-S2.5	2027	Inlet Park Trunk Phase 5	$1,705,000
SS-N5	2028	Canal Trunk	$554,000
SS-2.6	2028	Inlet Park Trunk Phase 6	$1,537,000
SS-S4.2	2029	700 South Trunk Phase 2, Second Half	$1,731,000
SS-2.7	2030	Inlet Park Trunk Phase 7	$2,133,000
SS-S3.2	2031	Redwood Road Trunk Phase 2, Second Half	$1,357,000
Intermediate Total			**$16,680,000**
Long Term Projects			
SS-N3	2032+	Cedar Fort Road Trunk	$2,045,000
SS-N4	2032+	800 West Trunk	$1,388,000
SS-S5	2032+	Foothill Blvd Trunk	$6,279,000
SS-S1.4	2032+	River Crossing Trunk Phase 4, Parallel Outfall	$2,223,000
Long Term Total			**$11,935,00**
Totals			**$53,131,600**

LIFT STATION IMPROVEMENTS

Table 6-2 lists the future recommended wet well volume and hydraulic capacity of lift stations in Saratoga Springs at buildout.

Table 6-2
Required Capacity at Lift Stations

Lift Station	Address[1]	Existing Wet Well Volume (gallons)	Future Required Wet Well Volume (gallons)	Existing Hydraulic Capacity (gpm)	Future Required Hydraulic Capacity (gpm)
1 – Inlet Park	400 S. Saratoga Rd	4,600	***10,650***	1,600	***4,300***
2 – Posey	Pioneer Crossing, Jordan River	5,200	5,000	2,000[2]	*2,000*
3 – Eagle Park	1448 S. Cottonwood Lane	2,500	190	110[2]	75
4 – North Twin	1800 S. Centennial Blvd	2,500	280	110	100
5 – South Twin	2170 S. Centennial Blvd	2,500	210	110	100
6 – Marina	275 E. Cascade Court	2,500	930	350[2]	***370***
7 – El Nautica	100 W. 3000 S. (Harbor Bay)	3,500	1,100	550	*440*
8 – Future		--	160	--	75

[1] Addresses are approximate
[2] Lift stations indicated include provisions to add an additional pump on the existing manifold

It will be noted that improvements are recommended for the Inlet Park Lift Station. This may seem inconsistent with previously recommended projects to remove major portions of the City from this lift station collection area. However, this lift station upgrade is needed for the following reasons:

- **Inlet Park –** Even though Project SS-S4 will allow a significant portion of the City to bypass the Inlet Park Lift Station, there are still large areas of undeveloped land that exist within the remaining collection area of the lift station. To accommodate this future development, significant upgrades to both the wet well volume and capacity of the lift station will be required.

Table 6-3 lists the costs associated with lift station improvements recommended to meet future collection system needs at buildout.

Table 6-3
Lift Station Project Costs

Project No.	Project Description	Estimated Year of Construction	Estimated Cost (2012 Dollars)
SS-L1	Lift Station 1 Pump Upgrade (Inlet Park)	2018	$300,000
SS-L2	New Lift Station 8 Design/Construction	2023	$150,000
SS-L3	Lift Station 1 Wet Well Upgrade (Inlet Park)	2032+	$300,000
SS-L4	Lift Station 6 Pump Upgrade (Marina)	2032+	$150,000
	Total		**$1,350,000**

Saratoga Springs personnel also provided a list of lift station and collection system upgrades that are recommended to improve system operation. Table 6-4 lists the costs associated with these maintenance related projects.

Table 6-4
Maintenance Costs

Project No.	Project Description	Estimated Cost (2012 Dollars)
SS-M1	Lift Station 1 & 2 Grinders	$150,000
SS-M2	Lift Station 4 & 5 Bypass	$200,000
SS-M3	Lift Station 1 & 2 Electrical Work	$50,000
SS-M4	Lift Station Replacement Motors	$85,000
SS-M5	Lift Station 6 Replacement Generator	$30,000
SS-M6	New TV Truck	$175,000
SS-M7.1	Lift Station 1 Force Main Cleanouts	$79,000
SS-M7.2	Lift Station 2 Force Main Cleanouts	$40,000
SS-M8	Drive System Lift Station 1 and 2	$52,654
	Total	**$861,654**

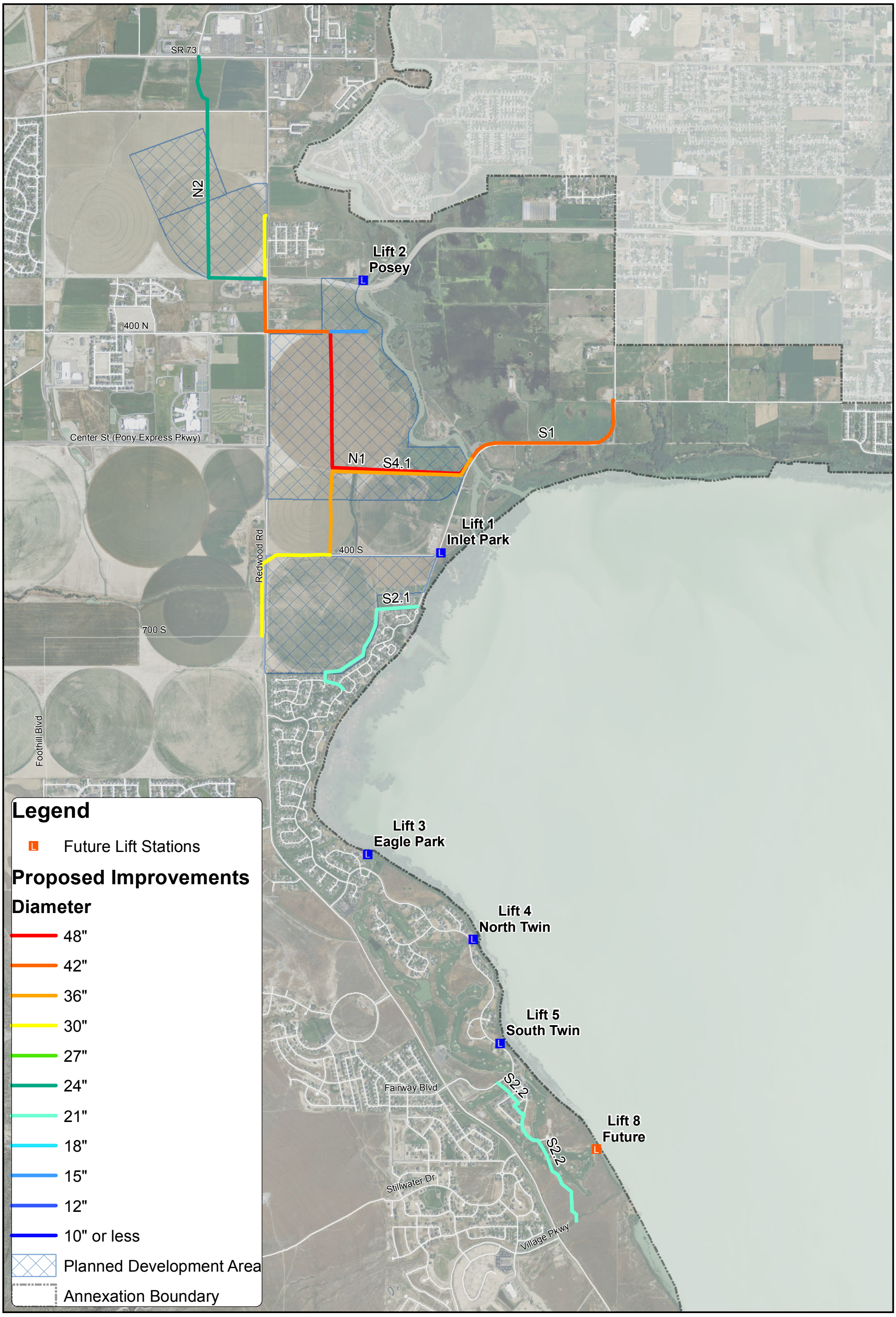
CHAPTER 7
IMPACT FEE FACILITIES PLAN

In the previous chapters, required improvements have been identified. Based on this information, it is now possible to identify those improvements that qualify to be used in the calculation of impact fees as outlined in Section 11-36a of the Utah Code.

10-YEAR IMPROVEMENT PLAN

Chapter 6 identified all capital facility projects needed to provide service to various parts of the City at projected buildout. Most of these projects will need to be constructed in phases as development occurs. Figure 7-1 shows the components of projects in Chapter 6 that will need to be constructed within the next ten years to address existing needs and meet the needs of growth during the next ten years. This information is also summarized in Tables 7-1 and 7-2. Table 7-1 includes all projects identified for the south service area of the City. Table 7-2 includes all projects identified for the north service area of the City. A more detailed breakdown of costs for the larger projects in the tables is contained in the appendix of this report. In accordance with the requirements of state law, those projects recommended in the capital facilities plan that fall outside of the 10-year planning window have not been included in the impact fee facilities plan shown as Tables 7-1 and 7-2.

It will be noted that a few projects have been included in both tables because they benefit both service areas. For these projects, total costs have been divided between the two service areas based on the projected growth within the planning window. Of the total 5,818 additional ERCs projected in the next ten years, 2,860 ERCs have been identified within the south service area (49.15 percent) and 2,958 ERCs within the north service area (50.85 percent).



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

SARATOGA SPRINGS
SEWER CAPITAL FACILITIES PLAN

10-YEAR SYSTEM IMPROVEMENT DIAMETERS

NORTH:

SCALE: 0 1,000 2,000 Feet

FIGURE NO. 7-1

P:\Saratoga Springs\2011 Capital and Impact Fee Facilities Plans\4.0 GIS\4.1 Projects\SewerMaps\Figure 7-1 - 10-Year Plan.mxd amckinnon 1/15/2014

Table 7-1
Impact Fee Facilities Plan, South Service Area - Costs Required for Future Growth

Project No.	Year of Project (FYE)	Project Description	Estimated Total Cost	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years	Cost to Existing	Cost to 10-year Growth	Cost to Growth Beyond 10 Years
SS-S1.1	2014	River Crossing Phase 1, Alignment & Preliminary Design Study*	$49,154	7.9%	9.5%	82.6%	$3,874	$4,691	$40,588
SS-S1.2	2018	River Crossing Trunk Phase 2, Bridge or Siphon*	$565,760	7.9%	9.5%	82.6%	$44,590	$53,999	$467,171
SS-S1.3	2018	River Crossing Trunk Phase 3, Outfall*	$1,801,486	7.9%	9.5%	82.6%	$141,984	$171,942	$1,487,561
SS-S2.1	2014	Inlet Park Trunk Phase 1, Near Lift Station	$1,399,000	0.0%	16.2%	83.8%	$0	$227,132	$1,171,868
SS-S2.2	2015	Inlet Park Trunk Phase 2, Golf Course Main	$1,654,000	12.6%	12.9%	74.5%	$208,218	$213,386	$1,232,397
SS-L1	2015	Lift Station 1 Pump Upgrade	$300,000	0.0%	11.9%	88.1%	$0	$35,644	$264,356
SS-S4.1	2022	700 South Trunk –First Half	$4,650,600	0.0%	2.0%	98.0%	$0	$92,528	$4,558,072
Totals			**$10,420,000**				**$398,665**	**$799,321**	**$9,222,014**

*Where indicated, projects benefit both south and north service areas. Project costs divided based on projected growth in each area during the planning window.

Table 7-2
Impact Fee Facilities Plan, North Service Area - Costs Required for Future Growth

Project No.	Year of Project (FYE)	Project Description	Estimated Total Cost	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years	Cost to Existing	Cost to 10-year Growth	Cost to Growth Beyond 10 Years
SS-S1.1	2014	River Crossing Phase 1, Alignment & Preliminary Design Study*	$50,846	7.9%	9.5%	82.6%	$4,007	$4,853	$41,986
SS-S1.2	2018	River Crossing Trunk Phase 2, Bridge or Siphon*	$585,240	7.9%	9.5%	82.6%	$46,126	$55,858	$483,257
SS-S1.3	2018	River Crossing Trunk Phase 3, Outfall*	$1,863,514	7.9%	9.5%	82.6%	$146,872	$177,862	$1,538,780
SS-N1	2018	North Trunk	$9,546,000	9.6%	7.2%	83.3%	$912,945	$683,841	$7,949,215
SS-N2	2020	200 West Trunk	$2,351,000	0.0%	3.1%	96.9%	$0	$72,824	$2,278,176
Totals			**$14,396,600**				**$1,109,950**	**$995,237**	**$12,291,413**

*Where indicated, projects benefit both south and north service areas. Project costs divided based on projected growth in each area during the planning window.

PROJECT COST ATTRIBUTABLE TO FUTURE GROWTH

To satisfy the requirements of state law, Tables 7-1 and 7-2 provides a breakdown of the capital facility projects and the percentage of the project costs attributed to existing and future users. As defined in Section 11-36-304, the impact fee facilities plan should only include "the proportionate share of the costs of public facilities [that] are reasonably related to the new development activity." While most projects from the capital facilities plan outlined in previous chapters are required solely to meet future growth, some projects also provide a benefit to existing users.

For some projects, the division of costs between existing and future users is easy because 100 percent of the project costs can be attributed to one category or the other (e.g. infrastructure needed solely to serve new development can be 100 percent attributed to new growth). However, while there are no existing deficiencies in the system, there are some projects that will benefit existing users (e.g., no existing deficiency exists, but a new facility is being added that will be used to convey flow from both existing and future sources). A good example of this is the new river crossing and outfall to TSSD (Project SS-S1). In this case, existing flow is conveyed in force mains from the Posey and Inlet Park lift stations. These force mains have more than adequate capacity to convey existing flows. As a result, no existing deficiencies exist at this location. However, with the construction of a new pipeline for future growth, it makes little sense for the City to maintain three parallel pipelines through the area. As a result, this plan identifies installation of a new pipeline with adequate capacity for both existing and future flows and abandonment of the existing force mains through this area. In this type of situation, costs have been divided between the two categories based on the ratio of flow needed for each type of user. For example, if existing peak flow through a proposed facility will be 0.4 cfs but the ultimate capacity of the pipeline needs to be 1.0 cfs to meet new growth, 60 percent of the costs of the project have been assigned to future growth with 40 percent assigned to existing users.

It should be noted that Tables 7-1 and 7-2 do not include bond costs related to paying for impact fee eligible improvements. These costs should be added as part of the impact fee analysis.

It should also be noted that both Table 7-1 and 7-2 include the several phases of Project SS-S1. As explained in Chapter 6, this project will serve both services areas. As a result, the costs for the project have correspondingly been split between the two service areas based on proportionate flow in the pipeline.

PROJECT COST ATTRIBUTABLE TO 10-YEAR GROWTH

Included in Tables 7-1 and 7-2 is a breakdown of capacity associated with growth both at full build-out and through the next 10-years. Normally, it would be adequate to consider only the percentage of future growth through build-out. In the case of sewer improvements for Saratoga Springs, however, the impact fee facility plan includes several improvements located near the bottom of the collection system. As a result, these projects are required to accommodate large flows representing growth from the entire City. To evaluate most accurately the cost of providing service for growth during the next ten years, added consideration was given to evaluating the growth of flow projected for the next 10-years in each project.

As summarized in Tables 7-1 and 7-2, the total cost of future projects in the impact fee facility plan that are attributable to future growth is over $23 million. Of these costs, $1.8 million are attributable to growth in the next ten years.

EXISTING CAPACITY AVAILABLE TO SERVE NEW GROWTH

In addition to using capacity in new projects contained in the impact fee facility plan, future growth will also utilize a portion of excess capacity in existing facilities. To calculate the percentage of existing capacity to be used by future growth, BC&A examined the model results in each facility paid for by the City. Figures indicating the locations of facilities paid for by the City are located in the Appendix.

The method used to calculate excess capacity used by future flows is as follows:

- **Calculate Flows –** The peak flow in each facility was calculated in the model for both existing and future flows. The maximum capacity of each facility was also calculated.
- **Identify Available Capacity –** Where a facility has capacity in excess of projected flows at buildout, the available capacity in the facility was defined as the difference between existing flows and buildout flows. Where the facility has capacity less than projected flows at buildout, the available capacity in the facility was defined as the difference between existing flows and the facility's maximum capacity.
- **Calculate Percent of Excess Capacity Used in Remaining Facilities –** Where the future flow was less than the capacity of the facility, the percent of excess capacity being used in each facility was calculated by dividing the growth in flow in the facility (future flow less existing flow) by the total capacity (existing flow plus available capacity). Where future flow was more than the capacity of the facility, the percent of excess capacity being used in each facility was calculated by dividing the available remaining capacity in the facility by the total capacity.
- **Calculate Excess Capacity for the System as a Whole –** Each pipeline segment in the system has a different quantity of excess capacity to be used by future growth. To develop an estimate of excess capacity for projects containing multiple pipeline segments, the capacities of each of these pipelines and their contribution to the system as a whole must be considered. To do this, each pipeline must first be weighted based on its contribution to system. For this purpose, each pipeline has been weighted based on the product of its capacity and length (e.g., 100 gpm of capacity in a 4,000 ft pipeline contributes more to the system than 100 gpm of capacity in a 300 ft pipeline). The excess capacity in the system as a whole can then be calculated as the sum of the weighted capacity used by future growth divided by the sum of total weighted capacity in the system.

Based on the method described above, the calculated percentage of existing capacity used by growth during the 10 year planning window in facilities paid for by the City is as shown in Tables 7-3 and 7-4 below. Table 7-3 includes facilities paid for directly by the City. In addition to these facilities, the City has also recently paid for the remaining capacity in some facilities constructed by developers that have historically been subject to a pioneering agreement. Table 7-4 includes the

future capacity to be used in association with these recent reimbursement agreements. It will be noted that Table 7-4 does not include any capacity associated with existing use. This is because the City's payment in the reimbursement agreements was for remaining capacity only. All existing capacity in these facilities has already been paid for through past pioneering agreement. As a result, Table 7-4 calculates the percentage of available future capacity only.

Table 7-3
Existing Facility Capacity Used by Growth

Project ID	Project Description	Percent to Existing	Percent to 10-year Growth	Percent to Growth Beyond 10 Years
SAR.016	Inlet Park Sewer Force Main	27.4%	26.8%	45.9%
SAR.017	Inlet Park Lift Station	58.1%	41.9%	0.0%
SAR.019	Sewer Line between 6800 North (400 South) and Entrance to SSD)	25.7%	25.1%	49.2%
SAR.104	Smiths Sewer Outfall*	9.3%	40.1%	50.6%
SAR.126	Inlet Park Lift Station Upgrade	58.1%	41.9%	0.0%
SAR.151A	Extend Posey Force Mains to TSSD	68.5%	31.5%	0.0%
SAR.151B	Posey Lift Station Upgrade	68.5%	31.5%	0.0%
SAR.207	Harbor Bay Park Lift Station Upgrade	11.9%	5.3%	82.8%
SAR.266	TSSD Meter Station	8.8%	8.7%	82.6%

***** For components with multiple facilities, a weighted average was developed of available capacity used by future growth.

Table 7-4
Reimbursement Agreement Capacity Used by Growth

Project ID	Project Description	Percent to 10-year Growth	Percent to Growth Beyond 10 Years
RA.1	Inlet Park SSD Reimbursement Agreement*	66.7%	33.3%
RA.2	Inlet Park Lakeview Reimbursement Agreement*	23.6%	76.4%

*For components with multiple facilities, a weighted average was developed of available capacity used by future growth.

APPENDIX

COST ESTIMATES

BOWEN COLLINS & Associates, Inc.
Consulting Engineers

TECHNICAL MEMORANDUM

DATE: December 21, 2012

TO: Saratoga Springs

FROM: Keith Larson and Andrew McKinnon
Bowen, Collins & Associates
756 East 12200 South
Draper, Utah 84020

COPIES: File

PROJECT: Sewer Capital Facilities Plan

SUBJECT: Cost estimates

Two levels of cost estimates have been prepared for this project. For projects within the IFFP planning window, detailed cost estimates are attached to this memorandum. These estimates have been based on BC&A's database of recent bids for pipe projects along the Wasatch Front. The database includes extensive data on unit costs for smaller pipes and appurtenances along with some data for larger pipelines. A national cost estimating database for sewer pipes was also consulted to provide data for larger diameter pipes, and to confirm pipe costs for smaller pipes. The unit costs are based on August 2012 dollars with an ENR cost index of 9351.

For cost estimates of projects outside the IFFP planning window, project details are less certain. As a result, BC&A has grouped pipeline and appurtenances together for estimating purposes. This simplifies the valuation procedure for long-term projects without significantly compromising accuracy. Instead of uncertain estimates of the number of individual manholes along an existing pipeline or their approximate location on a future pipeline, using a combined valuation wraps the cost of manholes and other appurtenances at average spacing into the total pipe cost. Based on this research, the proposed valuation for long-term cost estimates is as summarized in Table 1.

Table 1
Proposed Pipeline Valuation

Pipe Diameter (in)	New Pipe ($/LF)	Replace Pipe ($/LF)	CIPP ($/LF)	Pavement Restoration ($/LF)
8	$173	$201	$49	$63
12	$179	$209	$55	$66
15	$190	$222	$61	$69
18	$216	$251	$76	$74
24	$246	$283	$99	$77
27	$308	$349	$148	$85
30	$345	$387	$185	$90
36	$394	$439	$222	$93
42	$542	$591	$308	$101
48	$600	$650	$345	$104
54	$690	$743	$394	$109
60	$730	$784	$431	$112
66	$800	$857	$481	$117
72	$887	$949	$567	$125
78	$955	$1,022	$653	$133

The table includes values for pipes under various conditions:

- **New Pipe –** This column represents the cost of installing a sewer pipe, complete in a new area. It includes excavation, pipe, stub outs for laterals, manholes, backfill, and traffic control. Because it is new pipe, there does not need to be bypass pumping, or reconnections to existing sewer lines.

- **Replace Pipe –** This column entails replacing an existing sewer pipe as part of a planned construction package. It includes everything in the new pipe column, but also includes bypass pumping and reconnections to existing sewer lines.

- **Cast in Place Pipe (CIPP)** – The City's most common form of pipeline rehabilitation is CIPP. Thus, it was deemed useful to include costs for this type of work. The costs for this category are based on estimates provided by two major companies that perform CIPP, along with bid results from various recently completed projects.

- **Pavement Restoration –** To be able to distinguish between pipes under pavement versus those outside pavement, asphalt restoration has not been included as part of the cost categories above. A separate number for pavement restoration is included in the table based on recent construction bids along the Wasatch Front.

Preliminary Cost Estimate

Project SS-S1.2: River Crossing Trunk - Phase 2 *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$23,000	$23,000
3	Utility Relocation/Reconstruction	1	LS	$2,000	$2,000
4	36-inch Pipeline - Installed	332	LF	$349	$115,709
5	Manholes	2	EA	$10,000	$20,000
6	Lateral Reconnections	0	EA	$1,000	$0
7	Bypass Pumping	0	LS	$0	$0
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$9,000	$9,000
9	Asphalt and Base	71	SY	$47.25	$3,353
10	Bridge Crossing of Jordan River	1	LS	$780,000	$780,000
11	Misc. Unlisted Items	5%			$47,653
12					
13	**Construction Subtotal**				**$1,000,715**
14					
15	Engineering - Design	6%			$60,043
16	Engineering - Construction Management	6%			$60,043
17	Legal and Admin. (ROW, Financing, etc.)	3%			$30,021
18					
19	**Total Cost**				**$1,150,822**

Preliminary Cost Estimate

Project SS-S1.3: River Crossing Trunk - Phase 3 *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$391,000	$391,000
3	Utility Relocation/Reconstruction	1	LS	$194,000	$194,000
4	42-inch Pipeline - Installed	4,360	LF	$442	$1,925,526
5	Manholes	14	EA	$14,000	$196,000
6	Lateral Reconnections	0	EA	$1,000	$0
7	Bypass Pumping	1	LS	$24,000	$24,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$150,000	$150,000
9	Asphalt and Base	5029	SY	$47.25	$237,617
10	Misc. Unlisted Items	5%			$155,907
11					
12	**Construction Subtotal**				**$3,274,050**
13					
14	Engineering - Design	6%			$196,443
15	Engineering - Construction Management	6%			$196,443
16	Legal and Admin. (ROW, Financing, etc.)	3%			$98,222
17					
18	**Total Cost**				**$3,765,158**

Preliminary Cost Estimate

Project SS-S2.1: Inlet Park Trunk - Phase 1, Near Lift Station *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$154,000	$154,000
3	Utility Relocation/Reconstruction	1	LS	$16,000	$16,000
4	21-inch Pipeline - Installed	3850	LF	$170	$656,310
5	Additional Costs Associated with Depth*	1	LS	$131,262	$131,262
6	Manholes	13	EA	$7,500	$97,500
7	Lateral Reconnections	0	EA	$1,000	$0
8	Bypass Pumping	1	LS	$12,000	$12,000
9	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$59,000	$59,000
10	Asphalt and Base	693	SY	$47.25	$32,725
11	Misc. Unlisted Items	5%			$57,940
12					
13	**Construction Subtotal**				**$1,216,736**
14					
15	Engineering - Design	6%			$73,004
16	Engineering - Construction Management	6%			$73,004
17	Legal and Admin. (ROW, Financing, etc.)	3%			$36,502
18					
19	**Total Cost**				**$1,399,247**

* For depths exceeding 15 feet, add 20% to pipe install costs

Preliminary Cost Estimate

BOWEN COLLINS & Associates, Inc.
Consulting Engineers

Project SS-S2.2: Inlet Park Trunk - Phase 2, Golf Course Main *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$154,000	$154,000
3	Utility Relocation/Reconstruction	1	LS	$40,000	$40,000
4	21-inch Pipeline - Installed	4,263	LF	$170	$726,794
5	Manholes	14	EA	$7,500	$105,000
6	Lateral Reconnections	11	EA	$1,000	$11,000
7	Bypass Pumping	1	LS	$124,000	$124,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$118,000	$118,000
9	Asphalt and Base	1917	SY	$47.25	$90,599
10	Misc. Unlisted Items	5%			$68,470
11					
12	**Construction Subtotal**				**$1,437,862**
13					
14	Engineering - Design	6%			$86,272
15	Engineering - Construction Management	6%			$86,272
16	Legal and Admin. (ROW, Financing, etc.)	3%			$43,136
17					
18	**Total Cost**				**$1,653,542**

Preliminary Cost Estimate

BOWEN COLLINS & Associates, Inc. Consulting Engineers

Project SS-N1: North Trunk *Date:* 1/15/2014

Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$1,014,000	$1,014,000
3	Utility Relocation/Reconstruction	1	LS	$68,000	$68,000
4	48-inch Pipeline - Installed	6,576	LF	$513	$3,374,753
5	42-inch Pipeline - Installed	2,812	LF	$442	$1,241,702
6	30-inch Pipeline - Installed	1,526	LF	$245	$374,472
7	Force Main Modification (12" & 14" - Installed	1,737	LF	$117	$202,638
8	Additional Costs Associated with Depth*	1	LS	$499,093	$499,093
9	Manholes	35	EA	$16,000	$560,000
10	Lateral Reconnections	11	EA	$1,000	$11,000
11	Bypass Pumping	1	LS	$48,000	$48,000
12	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$390,000	$390,000
13	Asphalt and Base	2577	SY	$47.25	$121,782
14	Misc. Unlisted Items	5%			$395,272
15					
16	**Construction Subtotal**				**$8,300,711**
17					
18	Engineering - Design	6%			$498,043
19	Engineering - Construction Management	6%			$498,043
20	Legal and Admin. (ROW, Financing, etc.)	3%			$249,021
21					
22	**Total Cost**				**$9,545,818**

* For north half of project, depths exceed 15 feet. Add 20% to pipe install costs this section

Preliminary Cost Estimate

BOWEN COLLINS & Associates, Inc.
Consulting Engineers

Project SS-N2: 200 West *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$269,000	$269,000
3	Utility Relocation/Reconstruction	1	LS	$28,000	$28,000
4	24-inch Pipeline - Installed	6722	LF	$192	$1,290,153
5	Manholes	22	EA	$7,500	$165,000
6	Lateral Reconnections	7	EA	$1,000	$7,000
7	Bypass Pumping	1	LS	$21,000	$21,000
8	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$104,000	$104,000
9	Asphalt and Base	1330	SY	$47.25	$62,851
10	Misc. Unlisted Items	5%			$97,350
11					
12	**Construction Subtotal**				**$2,044,354**
13					
14	Engineering - Design	6%			$122,661
15	Engineering - Construction Management	6%			$122,661
16	Legal and Admin. (ROW, Financing, etc.)	3%			$61,331
17					
18	**Total Cost**				**$2,351,008**

Preliminary Cost Estimate

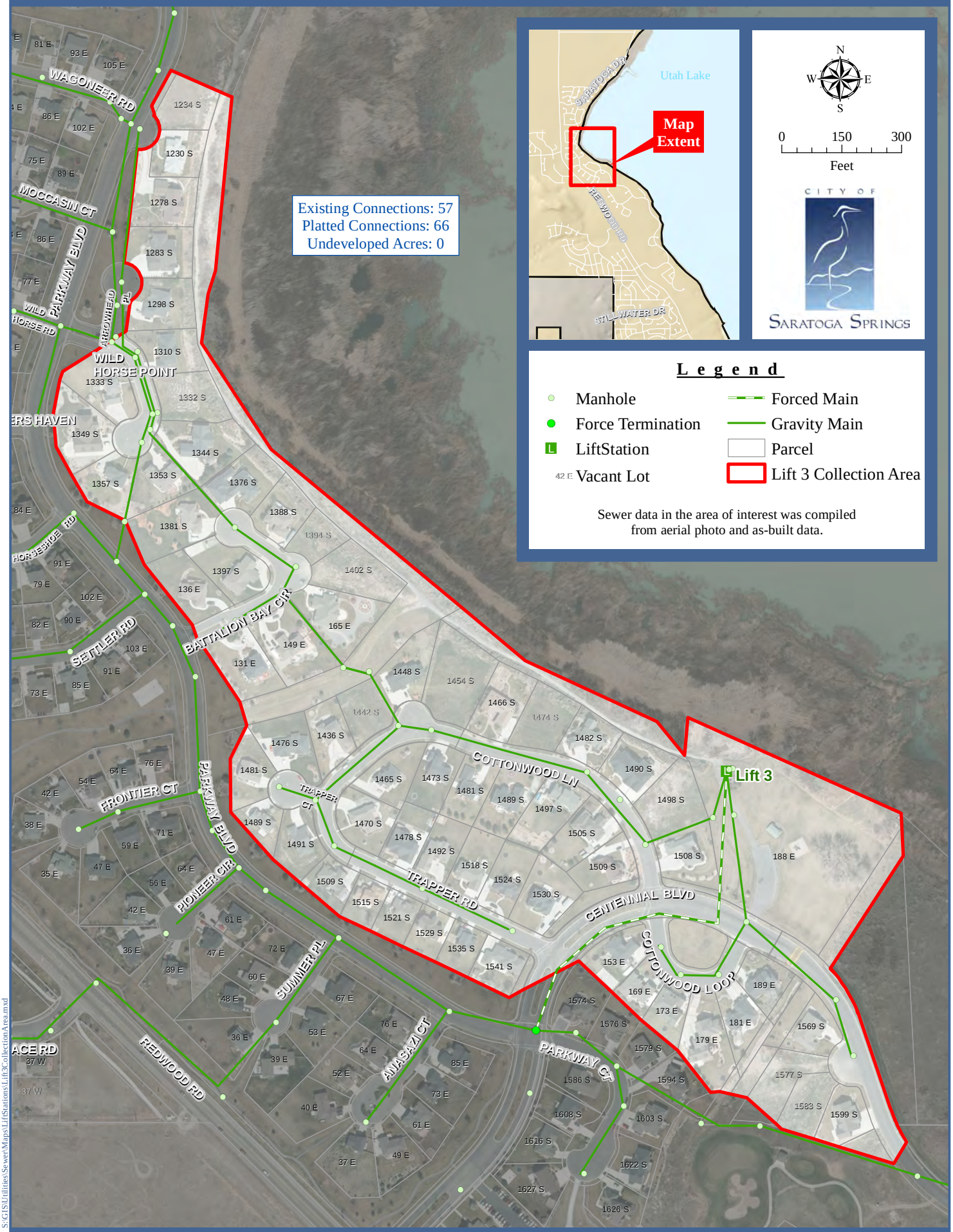
BOWEN COLLINS & Associates, Inc.
Consulting Engineers

Project SS-S4.1: 700 South - First Half *Date:* 1/15/2014
Owner: Saratoga Springs

No.	Item	Quantity	Units	Unit Cost	Cost
1					
2	Mobilization, Demobilization, Permits	1	LS	$552,000	$552,000
3	Utility Relocation/Reconstruction	1	LS	$28,000	$28,000
4	36-inch Pipeline - Installed	5,360	LF	$349	$1,868,012
5	30-inch Pipeline - Installed	3,405	LF	$245	$835,480
6	Manholes	28	EA	$10,000	$280,000
7	Lateral Reconnections	0	EA	$1,000	$0
8	Bypass Pumping	1	LS	$33,000	$33,000
9	Misc. Surface Restoration (Concrete, landscaping, etc.)	1	LS	$212,000	$212,000
10	Asphalt and Base	908	SY	$47.25	$42,898
11	Misc. Unlisted Items	5%			$192,570
12					
13	**Construction Subtotal**				**$4,043,960**
14					
15	Engineering - Design	6%			$242,638
16	Engineering - Construction Management	6%			$242,638
17	Legal and Admin. (ROW, Financing, etc.)	3%			$121,319
18					
19	**Total Cost**				**$4,650,554**

LIFT STATION COLLECTION AREAS

Sewer Lift 3 Collection Area



S:\GIS\Utilities\SewerMaps\LiftStations\Lift3CollectionArea.mxd

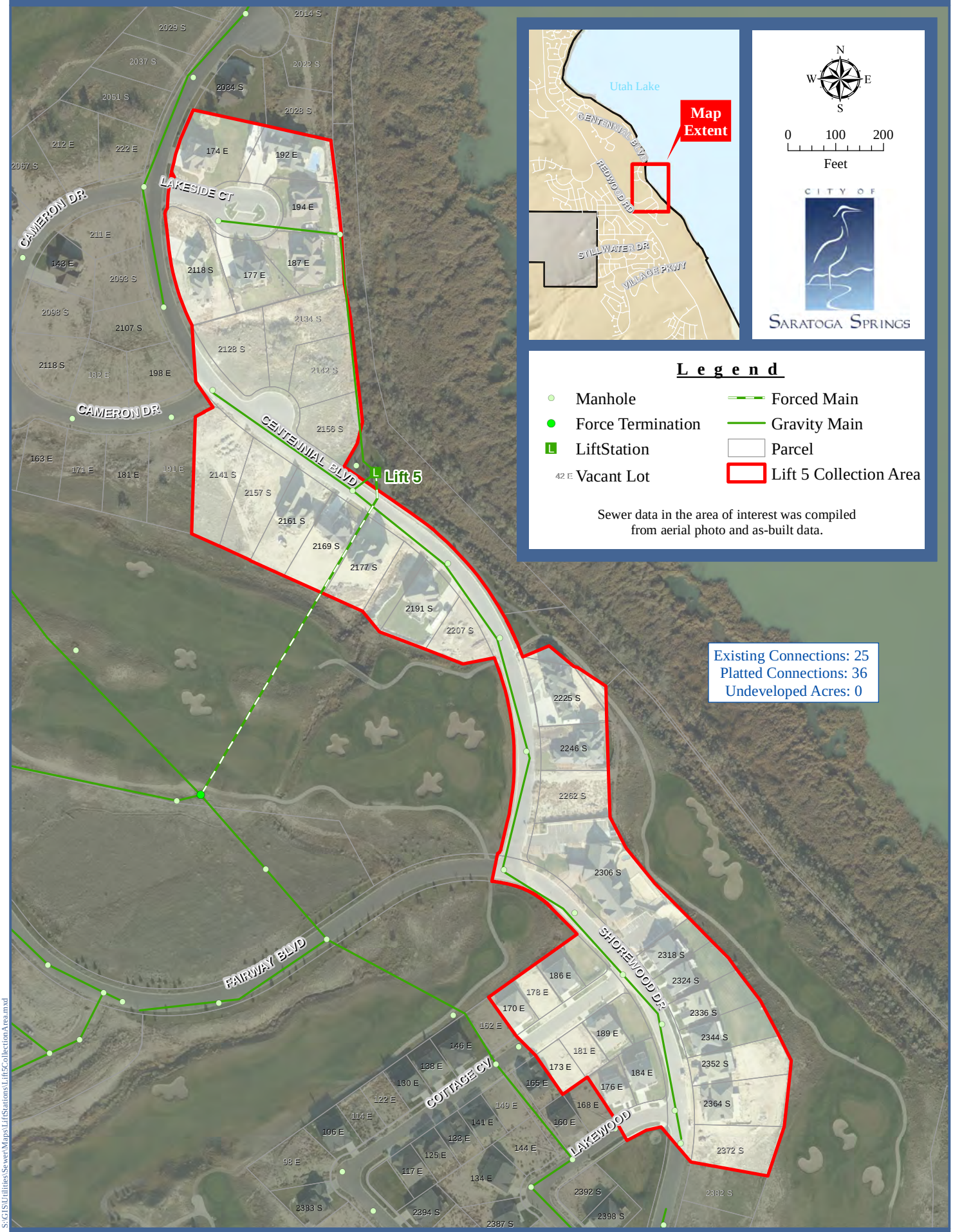
26 December 2012

Sewer Lift 4 Collection Area

S:\GIS\Utilities\SewerMaps\LiftStations\Lift4CollectionArea.mxd

26 December 2012

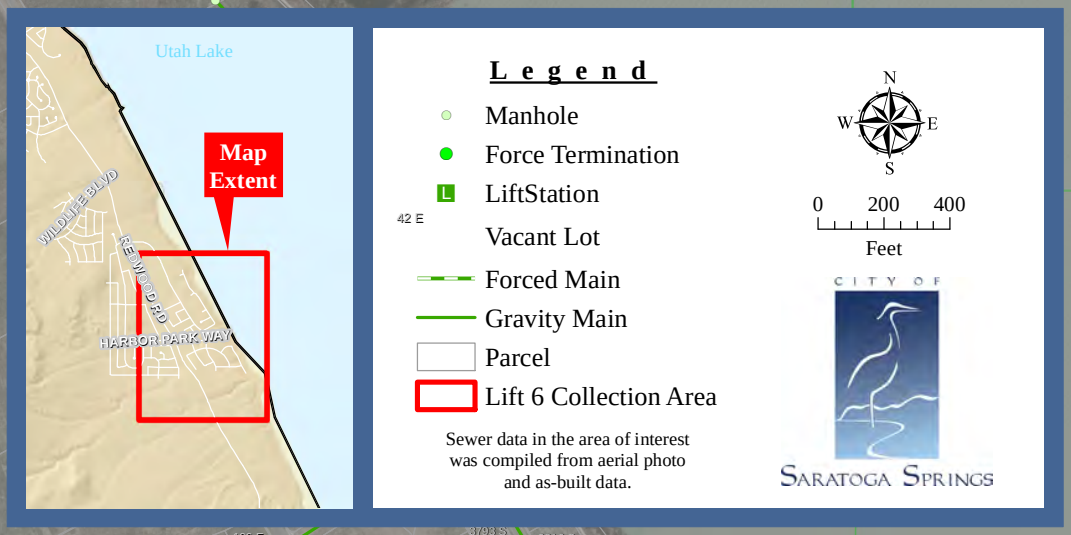
Sewer Lift 5 Collection Area



S:\GIS\Utilities\SewerMaps\LiftStations\Lift5CollectionArea.mxd

26 December 2012

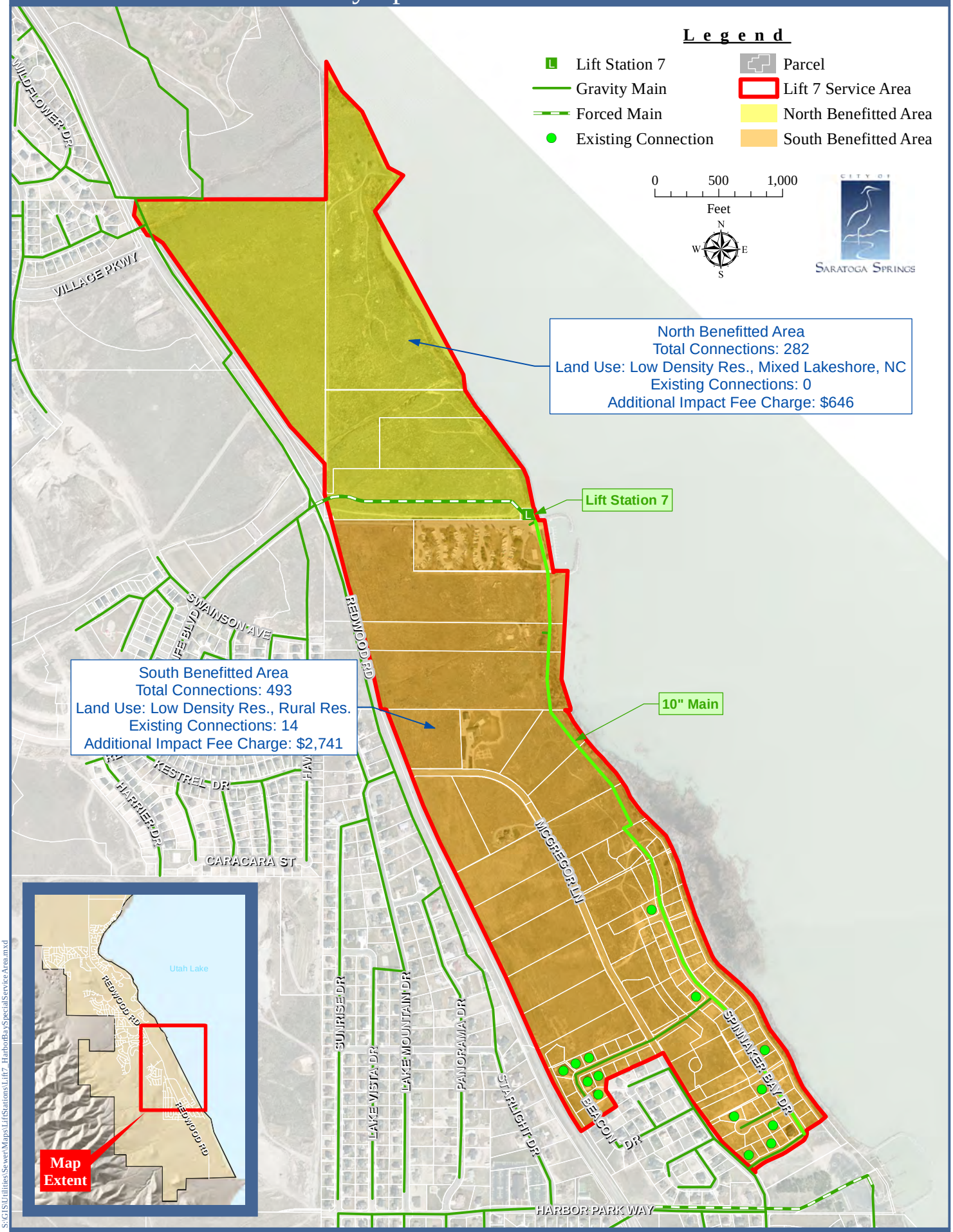
Sewer Lift 6 Collection Area



S:\GIS\Utilities\SewerMaps\LiftStations\Lift6CollectionArea.mxd

27 December 2012

Sewer: Lift 7 - Harbor Bay Special Service Area

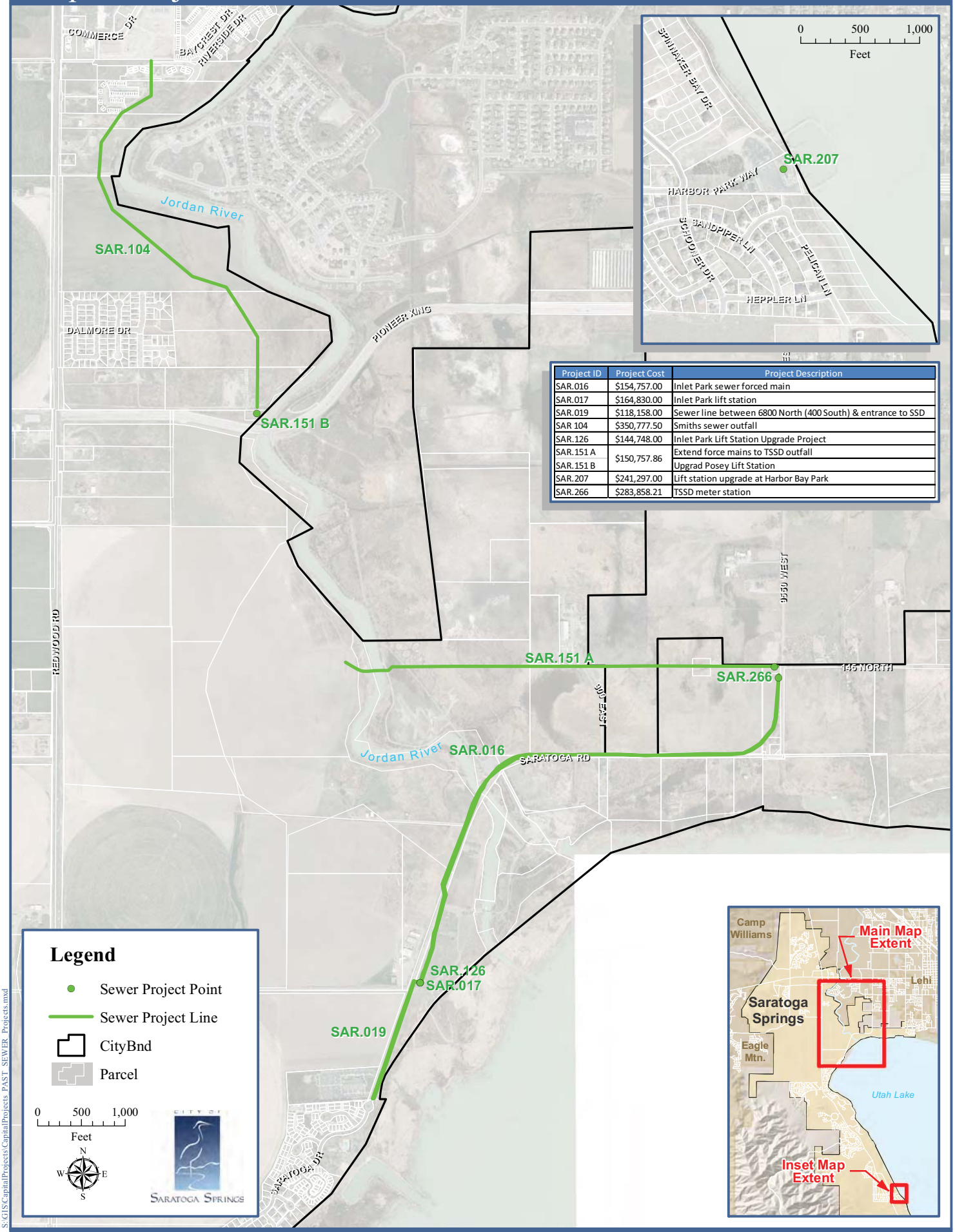


S:\GIS\Utilities\Sewer\Maps\LiftStations\Lift7_HarborBaySpecialServiceArea.mxd

8 January 2014

EXISTING CITY FACILITIES

Capital Projects: Sewer



Project ID	Project Cost	Project Description
SAR.016	$154,757.00	Inlet Park sewer forced main
SAR.017	$164,830.00	Inlet Park lift station
SAR.019	$118,158.00	Sewer line between 6800 North (400 South) & entrance to SSD
SAR 104	$350,777.50	Smiths sewer outfall
SAR.126	$144,748.00	Inlet Park Lift Station Upgrade Project
SAR.151 A	$150,757.86	Extend force mains to TSSD outfall
SAR.151 B		Upgrad Posey Lift Station
SAR.207	$241,297.00	Lift station upgrade at Harbor Bay Park
SAR.266	$283,858.21	TSSD meter station

Legend

- Sewer Project Point
- Sewer Project Line
- CityBnd
- Parcel

0 500 1,000
Feet

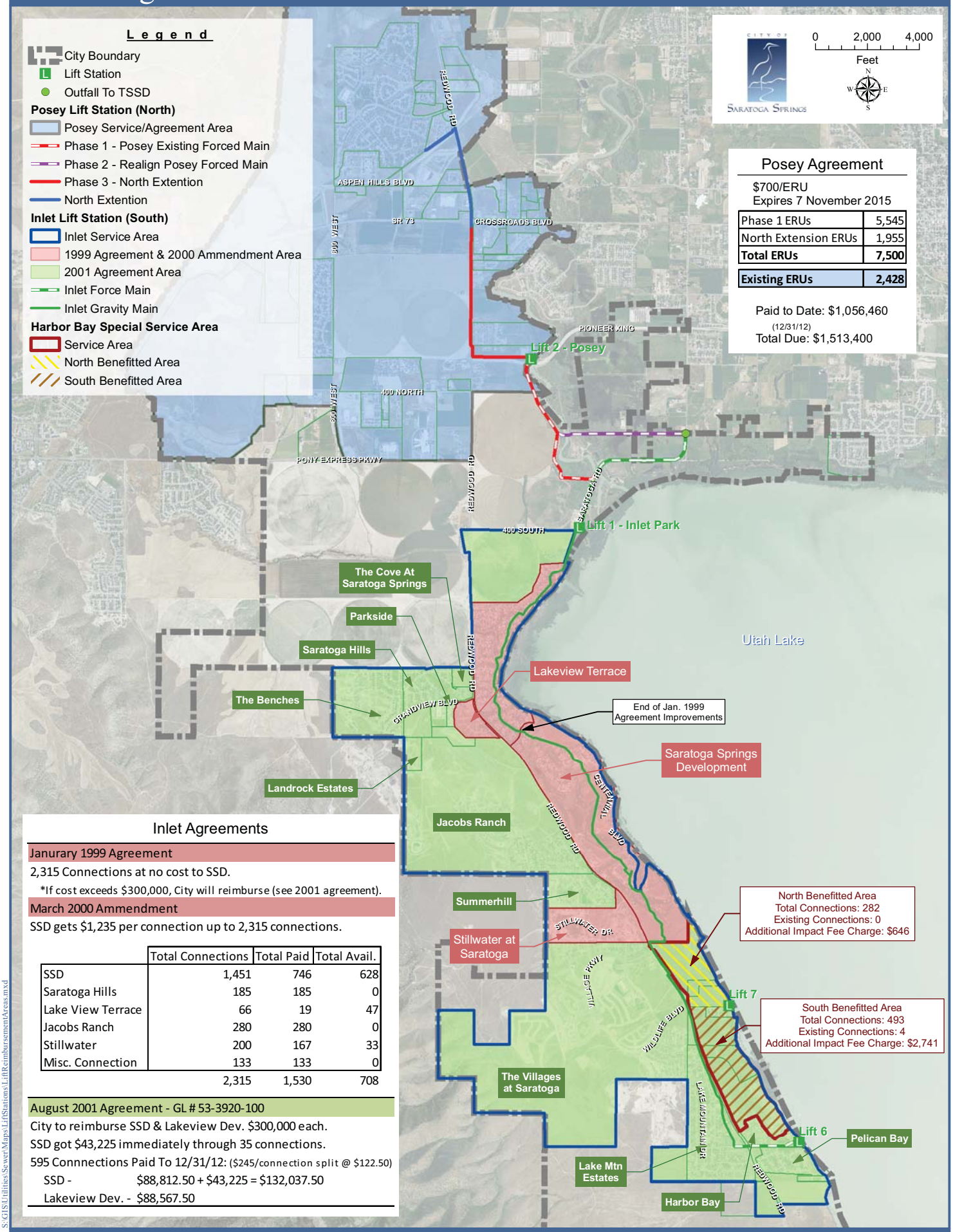
N
W E
S

SARATOGA SPRINGS

S:\GIS\CapitalProjects\CapitalProjects_PAST_SEWER_Projects.mxd

8 January 2014

Sewer Agreements Reimbursement Areas



Inlet Agreements

Janurary 1999 Agreement

2,315 Connections at no cost to SSD.

*If cost exceeds $300,000, City will reimburse (see 2001 agreement).

March 2000 Ammendment

SSD gets $1,235 per connection up to 2,315 connections.

	Total Connections	Total Paid	Total Avail.
SSD	1,451	746	628
Saratoga Hills	185	185	0
Lake View Terrace	66	19	47
Jacobs Ranch	280	280	0
Stillwater	200	167	33
Misc. Connection	133	133	0
	2,315	1,530	708

August 2001 Agreement - GL # 53-3920-100

City to reimburse SSD & Lakeview Dev. $300,000 each.

SSD got $43,225 immediately through 35 connections.

595 Connnections Paid To 12/31/12: ($245/connection split @ $122.50)

SSD - $88,812.50 + $43,225 = $132,037.50

Lakeview Dev. - $88,567.50

S:\GIS\Utilities\Sewer Maps\LiftStations\LiftReimbursementAreas.mxd

Salt Lake Area Office:
154 East 14000 South
Draper, Utah 84020
Phone: (801) 495-2224
Fax: (801) 495-2225

Boise Area Office:
776 East Riverside Drive
Suite 250
Eagle, Idaho 83616
Phone: (208) 939-9561
Fax: (208) 939-9571

Southern Utah Area Office:
20 North Main
Suite107
St. George, Utah 84770
Phone: (435) 656-3299
Fax: (435) 656-2190

Bowen Collins
& Associates, Inc.
CONSULTING ENGINEERS