

STEAMBOAT LAKE

Water & Sanitation District

Water and Wastewater

System Master Plans

Submitted by:



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Board of Directors
Steamboat Lake Water and Sanitation District
c/o Bob Hulton, President
PO Box 690
Clark, Colorado, 80428

**RE: Letter of Transmittal – Executive Summary
Water and Wastewater System Master Plans**

Ladies and Gentlemen,

Submitted attached is the Water and Wastewater Systems Master Plan report. The report is to provide the District planning guidance for future development and capital improvements.

The District's utility systems are in overall good shape. The most significant needed improvement is the replacement of the sludge holding tank at the wastewater plant and the continual reduction of I/I in the collection system.

As to the water utility – the District has existing water supplies to provide for build-out of the designated service area. However, the District should secure an additional groundwater well to provide for emergency supply should one of the existing wells fail. Additionally, there are several pipeline replacement projects that would improve system hydraulics.

Per our meeting with the Board of Directors, we have included a priority schedule of recommended improvement/replacements with estimated capital budgets. We have placed this schedule as Appendix B of the report.

Should you have any questions or want further information, we will be available to discuss the Report with you.

Very truly yours
Merrick and Company



Ronald E. Dvorak, P.E.



Ronald C. McLaughlin, P.E. & L.S.

Enclosure

TABLE OF CONTENTS

LETTER OF TRANSMITTAL	
INTRODUCTION	1
GENERAL	
STUDY AREA	2
SERVICE AREA AND POPULATION	
WATER SYSTEM	3
GENERAL.....	3
WATER SUPPLY.....	3
DISTRIBUTION SYSTEM	4
STORAGE TANKS.....	5
WATER DEMANDS	6
WASTEWATER SYSTEM	8
GENERAL.....	8
WASTE LOADS	8
LIFT STATION	10
WASTEWATER TREATMENT PLANT	10
COLLECTION SYSTEM	10
MASTER PLANS	12
WATER SYSTEM	12
WASTEWATER SYSTEM.....	14
FIGURE 1	17
APPENDIX A	DISTRICT WATER PRODUCTION
APPENDIX B	PRIORITY IMPROVEMENTS AND ESTIMATED COSTS
DRAWINGS (BOUND IN BACK)	
WATER MASTER PLAN.....	W-1
WASTEWATER MASTER PLAN	S-1

GENERAL

The Steamboat Lake Water & Sanitation District was created in 1969 (the Service Plan was subsequently revised in 1972) and included 15.9 square miles. This Master Plan focuses on the developed service area as has been designated by the Board.

The Goal of the Master Plan is to provide the District with guidance for long range planning of the water and wastewater systems within the designated service area. The system components that were evaluated include:

Water

- Wells/Treatment
- Storage Tanks
- Distribution System/Pipelines

Wastewater

- Treatment Facility
- Sewer Pipelines
- Lift Stations

The report evaluates the existing systems to identify any deficiencies and recommend improvements.

It is understood that the District is evaluating its water rights under a separate study.

SERVICE AREA AND POPULATION

Service Area and Population

The service area of the District is shown on Drawings W-1 and S-1. The service area includes portions of Steamboat Lake Filings No. 1 and No. 2. In planning for the District's replacement wastewater treatment plant in 2006, the Board reviewed the servicable/developable lots in these Filings. The Board found that approximately 305+/- lots (including selected 5 acre combined parcels) can be reasonably serviced utilizing existing pipelines and extensions. The current Board has not changed this maximum.

There are presently 139 single family homes being serviced in the District. Development in the District has not increased since 2008. For calculation purposes for this study, we have used 130 as the number of occupied existing single family units - to account for vacancies.

We would expect to see some increased development in the near future in the District. Since the District has found additional water supply; i.e. the new Guest Well, and with the economy apparently improving, more homes are expected to be built on the existing lots.

GENERAL

Between 1972 and 2007 the District had relied on primarily one ground water well, the Guest Well, to provide water to its customers.

With increased development in the District, drought conditions, and some increased use of water for irrigation, the Guest well could not keep up with user demands. In late 1990-2000 the District drilled four new wells (finding little or no water). The District also drilled several alluvial test wells along Willow Creek to investigate the potential for an infiltration gallery. The alluvium could not provide a usable quantity of water.

Obtaining an adequate physical water supply (quantity and quality) has proven difficult for the District.

WATER SUPPLY

The following is a summary of the District's existing water supplies:

Guest Well Replacement

The District recently completed a re-drill of the Guest Well in 2013. Pump testing this well showed it to produce water of good quality and quantity. This well is designed to provide a sustainable supply of 40 gpm. A new water plant (metering and chlorination) is being constructed in place of the old Guest Well building. The District is under contract to have the well-equipped and the water plant completed in 2014. The new well is a valuable addition to the District's water supply.

Lot 78 Well

The original Lot 78 Well was constructed in 1972 and had provided water for the District at one time. This abandoned well was investigated in 2001, and found to have a cracked casing. It was determined that the well could produce approximately 30 gpm. A new replacement well was drilled in 2007. The new Lot 78 Well has high iron and is treated using chlorine oxidation and filtration. It is capable of producing 30 gpm. The well water was found to have iron bacteria. The iron bacteria causes bio mass fouling of the pump and increased iron concentrations in the raw water. A new 30 gpm iron removal/filtration plant was constructed in 2007 to treat this source. The treatment processes include chlorine addition for oxidation of iron and preventative disinfection, coagulant chemical addition, settling and

multi-media filtration. In 2013 the bio mass fouling had clogged the well pump; the well was cleaned, and a new pump installed.

Doubec, Lot 61 and Lot 124 Wells

These three wells were drilled in October 2002. The Lot 61 and Lot 124 Wells did not show appreciable quantity during the driller’s pump tests. These wells were not connected to the District’s water system and well caps were installed.

The Doubec well was tested by the driller and was found to produce 12 gpm. A metering and chlorination building was constructed and the well was connected to the water system. Production of this well has fallen and a recent pump test in 2005 recommended the well be pumped at 5 gpm maximum. The well was also found to be high in iron.

The District operates this well only in the event of an emergency.

A summary of the District’s wells are shown below.

Name	Capacity	Treatment	Comments
Doubec	5 gpm	Iron, Chlorination	Standby only
Lot 78	25 gpm	Iron, Chlorination	---
New Guest	40 gpm	Chlorination	---
Lot 61	---	---	Not on water system
Lot 124	---	---	Not on water system

DISTRIBUTION SYSTEM

Total available water supply (connected to the system) for Steamboat Lake is 65 gpm or 94,000 gallons/day. The District water distribution system includes pipelines, valves, and fire hydrants. There are approximately 6,900 l.f. of 6-inch main and 14,700 l.f. of 8-inch main. The water pipelines are shown on Drawing 1W. The older pipelines are cast iron, and the newer pipelines are ductile iron; some PVC (polyvinyl chloride pipe) has also been installed.

Valving on the original water distribution system was sparse. During water main breaks, the storage tank has been drained because of the limited number of isolation valves. The District has installed additional valves on main extensions and on new main replacements.

The original fire hydrants in the District were Pacific States brand. These hydrants are no longer manufactured and replacement parts are

unavailable. The District has replaced many of these fire hydrants with new Mueller hydrants.

The District has experienced water main breaks, mostly on the older cast iron pipelines. Causes of these breaks appear to be mostly from the lack of bedding material around the pipe. When repairs are made, the Contractor usually reports 3 to 4-inch diameter rock(s) around the pipeline. These large rocks cause point loadings on the pipe, and, over time, the pipe experiences a beam break. Since many of the pipelines are installed to follow the curvature of the road; deflected joints may result in a local over stressing. This over-deflection has apparently caused main breaks.

A recent history of approximate water main break locations are as follows:

- Jupiter – Break on main near saddle, no pipe bedding, 2013.
- Saturn –3-4 main breaks since 2000. Breaks at joints and improper bedding. Several lengths of pipeline replaced.
- Neptune – Just west of Highway 129; one break, no bedding, 2004, 2 breaks 2012-2013, 3 to 4-inch rock on pipe.
- Longfellow @ Willow Gulch 1 – main break.
- Lower Beaver Canyon/Green Bird 1– main break.

STORAGE TANKS

The District's existing water storage tanks are located on Willow Gulch Road above Lot 216. There are three fiberglass tanks: 2 – 50,000 gallon and 1 – 25,000 gallon. These tanks were recently cleaned in 2012. A small crack was reported on the interior roof of the 25,000 gallon tank. Total available storage for the District is 125,000 gallons.

Treated water storage provides the following functions in the water system:

1. Equalizing fluctuating demands (peaks), permitting lower supply rates and smaller treatment plants or pump stations.
2. Controls system pressures - minimizing pressure fluctuation.
3. Provide overall system reliability (emergencies).
4. Reserves for fire fighting.

WATER DEMANDS

In metropolitan areas with large water systems and grassed lots, a water demand above 500 gpd per unit is typically used. This demand includes household consumption and outside irrigation.

Over the past 4 years the Steamboat Lake District has recorded its water use from their wells (Appendix A). Monthly average water use is summarized on Table 1. During the summer months, average unit water use for a District customer has ranged from 160 gallons/day to 240 gallons/day. This unit water use includes any water system losses - including water mains and service lines. This is a low value, and reflects the following:

- The District water mains and service lines are very tight (not much water loss).
- There is limited outside irrigation. (The District has aggressively pursued limiting outside irrigation for the past 5 years.)
- There may be more vacant houses in the District than assumed.

For this report we have used a design demand of 250 gpd/single family unit. This results in an approximate 30% safety factor above what was found in the last 4 years water usage in the District.

Table 1
Average Monthly Water Usage – Gallons/Day

	2010	2011	2012	2013
January	17,160	13,870	19,400	17,990
February	17,100	11,380	14,160	14,730
March	14,390	9,870	12,860	14,940
April	14,040	9,740	12,960	15,950
May	12,110	14,550	19,560	15,070
June	14,800	20,360	32,930	28,460
July	22,470	21,680	32,330	27,500
August	25,090	23,750	28,380	22,560
September	23,180	19,660	19,920	19,380
October	14,510	17,910	20,430	15,110
November	17,820	15,090	17,690	11,850
December	14,630	14,220	16,020	19,800

Based on a design demand of 250 gpd/unit, the design water supply for the District at buildout requires sources capable of providing approximately 78,000 gallons/day.

GENERAL

The District's wastewater system consists of the wastewater treatment plant, trunk sewer pipelines, collection sewers with manholes, and one lift station.

In 2007 the District constructed a new wastewater treatment facility. The capacity of the treatment plant was based on the District's estimate of new development within the District – 300 single family units.

The purpose of this report is to provide to the District with recommendations for improvements to the wastewater system and guide future expansion of the system to service designated areas in the District.

WASTE LOADS

Wastewater plant loadings have been summarized for the past several years (Table 2). A review of the influent loadings are in accordance with 2006 plant design criteria.

Monthly influent data appear somewhat erratic which may be caused by variable occupancies in the District and variable infiltration.

Peak flows at the wastewater plant occur in April. High flows at the plant are expected during spring runoff when infiltration and inflow (I/I) is high. The following are estimated plant influent loadings.

Flow Loadings (Gallons/Day) – April

Year	Domestic	I/I	Total
2012	34,700	27,300	62,000
2013	34,700	24,300	59,000

In the Steamboat Lake collection system, I/I exceeds acceptable I/I flows. The I/I rate did show a slight drop between 2010 and 2012 - which may be the result of the I/I reduction projects undertaken by the District.

Table 2
Wastewater Plant Influent Loads
2012 – 2013

Month	Average Flow (MGD)	BOD ₅ (mg/l)	BOD ₅ lbs/day
2012			
January	.018	299	45
February	.013	274	30
March	.035	118	34
April	.062	79	41
May	.029	151	36
June	.016	206	28
July	.022	288	53
August			
September	.029	223	54
October			
November	.040	211	70
December	.029		
2013			
January	.017	302	43
February	.014	286	33
March	.028	195	46
April	.059	102	50
May			
June	.044	247	91
July			
August	.013	199	22
September			
October	.034	127	36
November			
December			

LIFT STATION

The Lot 78 lift station was rebuilt in 2005. The old 3-phase pumps were replaced with single phase pumps, and a standby pump was added. There has been some problems with the check valve seals; however, reportedly this issue has been resolved.

In 2008 the District contracted to install additional pipe insulation over the force main. There have been no reported freezing problems since installation of the insulation.

WASTEWATER TREATMENT PLANT

The wastewater plant is now only 7 years old - which is relatively new. The plant is operational with no known capital upgrade needs (other than the sludge digester). The plant has been meeting discharge standards (the DMRs show no violations).

The plant operates under Colorado Permit No. CO-0035556. Its design and permitted capacity is 110,000 gal/day and 180 lbs. BOD₅ per day. The plant uses the extended aeration process. Operation using one clarifier was approved by CDPHE because of small size and availability of the standby pond for settling.

The operator reports that the digester (sludge holding) basin is in poor condition and it's aeration system does not function properly. This basin is the old wastewater plant steel tankage; to reduce capital investment it was converted into an aerobic sludge digester. The original design planned on this basin being replaced as a subsequent project.

COLLECTION SYSTEM

Pipelines and Manholes

The District's sewer pipelines consist of 8-inch diameter collectors and a 15-inch diameter trunk sewer. The existing lines are shown on Drawing S-1.

A majority of the pipelines were installed in the early 1970's. The pipe material used was a "truss" pipe; a thin walled pipe with a filler material between the pipe walls. This pipe material is no longer in general use for conventional sewer lines.

The collector pipelines are located in the subdivision roadways. Service taps from residential houses connect to these collectors. The 15-inch

trunk sewer is located in County Road 129 and extends from the subdivision to the sewage treatment plant.

Many of the District collector pipelines (west of CR 129) have been videotaped. The 15-inch trunk sewer has also been videotaped.

The video of the collection sewers shows numerous cracked pipes, leaking joints, and poor service tap connections. These pipe failures are sources of infiltration. Some service lines were also observed to contribute infiltration into the collection system. It is probable that the pipe joints were over deflected on those sewer pipelines installed on a curve. These over deflected joints may also contribute to infiltration.

A leaking section of 15-inch sewer line was replaced. The 15-inch trunk sewer is thought to be in good condition.

The District has contracted for numerous I/I repair work, including televising, selected line replacements, and manhole sealing. The last video was completed in 2009. This inspection revealed numerous I/I sources.

Videos of the District sewers west of CR 129 have been completed. The District has not videotaped the sewers east of CR 129.

WATER SYSTEM

Distribution System

The Water Master Plan is illustrated on Drawing W-1. System sizing for this size community is typically governed by peak flow rates – which occur during fire fighting. The present understood design fire flow is 500 gpm. However, it is recommended that this design flow be increased to 1,000 gpm. Modern fire fighting equipment can utilize this amount when fighting development based fires. Also recent recognition of the potential hazard of wild fires justifies increasing fire flow availability, where practical. This Master Plan recommends the use of a design fire flow of 1,000 gpm for a 2 hour duration.

The Master Plan for the distribution system envisions replacing, when needed, all existing pipelines at the sizes shown on the Drawing. A short section of 6-inch pipeline on Longfellow Way should be upsized to 8-inch diameter. Pipelines should be replaced when existing pipe has reached the end of its useful life. Pipelines for future development are shown on the drawing, with the recommended pipe diameters. These pipelines should be installed when development occurs in these areas.

Additionally, the Master Plan recommends the following distribution system improvements. These improvements are shown on Drawing W-1; items having a high priority (say next 5 years) are marked with an asterisk and include:

1. Replace the Neptune Place waterline; lower segment near Highway 129. This pipeline segment has had numerous breaks. It appears to have reached its useful life. This main should be replaced with 8-inch pipe.
2. Replace the existing 6-inch water tank connecting pipeline with 10-inch diameter pipe. This pipeline feeds the entire District and is undersized to meet fire flows in the District.

The Saturn Court waterline has had numerous breaks; however, most of this waterline has been replaced with new pipe lengths. It is reported that this segment does not need replacement.

Pressures in the distribution system are governed by the storage tank water level. The base system pressure would exceed 180 psi in the lower elevations along Venus Place. When development occurs on Venus Place and the waterline is extended, a pressure reducing valve

(PRV) vault will be required. This valve will maintain acceptable pressures downstream of the valve vault.

Also shown on the Water Master Plan drawing is a pressure boundary line where all customers should be required to install individual PRV's on their services.

There is an area in the District where pressures are low (less than 35 psi). This area is delineated on Drawing W-1. Customers in this area will require special plumbing (larger pipe), or may include individual booster pumps.

Water Supply and Wells

The existing wells are thought to be able to provide a reliable supply of approximately 94,000 gpd. Since the projected buildout demand is 78,000 gpd, it is believed that the existing wells, properly maintained, will be adequate. However, an adequate water supply is critical to the health of the the Steamboat Lake District; and the location/timing of additional supply would be a wise investment as a standby supply.

The new Guest Well should be brought on line this spring. Water production and well water depth should be monitored. This data will be useful in confirming the projected long term capacity of the aquifer.

The District should pursue bringing in a new ground water supply well (location undetermined) to supplement the existing supplies. A new well (approximate 25 gpm capacity) will provide reliability should the Lot 78 or Guest Well experience problems.

Lot 78 Well

The Lot 78 Well has a high iron bacteria concentration. In 2013, the iron bacteria biofilm clogged the pump, and the District was required to clean and flush the well.

It is recommended the District experiment with chlorinating the well "downhole" next to the well pump. This treatment should reduce the iron bacterial fouling the pump. The District should also budget to have the well cleaned and flushed, probably on a 5-year interval. The capacity of this well is a valuable District asset; except for iron, the quality is excellent.

The Doubec Well should be pumped regularly until an additional well is developed. Operating the well pump will keep the well equipment operational.

Storage

As mentioned previously, storage tanks should provide for fire flow. In this low density area with large lots, a design fire flow demand of 1,000 gpm is desirable. The storage tanks should provide for two hours of fire flow. The existing tanks meet present requirements. The storage tanks should also provide for about 3 days water use, in the event a well is out of service (maintenance, power outage, etc.).

Sizing of storage involves judgment, primarily as to emergency volume allowance. Steamboat Lake is relatively distant, which could delay emergency repair, particularly in winter. Recommended ultimate storage capacity is:

Daily Peaking	25,000 gallons
Fire Protection	120,000 gallons
Weekly Peaking	50,000 gallons
Emergency – 3 days w/1 well out	110,000 gallons

Total storage recommendations typically do not assume simultaneous fire and supply outage. The approximate recommended total volume at buildout is 200,000 gallons.

WASTEWATER SYSTEM

The Wastewater Master Plan is shown on Drawing S-1 at the back of this report. The existing sewers are shown in brown color. New sewer lines to provide service to areas not presently sewered are shown in green.

Two new lift stations with force mains and gravity collectors are needed to service lots on Buck Horn Place, Jim Beam, Gold Queen Place and Golden Tide. Note that the alternative of using individual grinder pumps (rather than a District lift station) should be evaluated when development occurs on Buck Horn Place. The lift stations would be similar to the Jupiter/Lot 78 lift station that the District operates at present.

New gravity lines would provide service to lots on Venus, Willow Gulch and Linda Kay. Sewer service on Linda Kay and Venus Place would require an easement along several individual lots. The wastewater flows from Linda Kay would be collected at the Jupiter lift station. The existing lift station has available capacity.

All existing lines have adequate capacity; no replacements are necessary because of size. The sewer replacement program, then, will be governed by the success of the I/I correction program – or the need to replace because of excessive repair requirements.

Recommended Improvements to Existing Facilities

Wastewater Treatment Plant

The existing aerobic sludge digester/holding basin (refer to Figure 1) should be replaced. The existing aerators do not operate properly. Replacement of the existing sludge digester/holding basin will require CDPHE review. The District should budget for the replacement digester. It is planned that the new sludge digester would be located parallel to the new aeration basin as shown on Figure 1. The new basin could then serve as a standby aeration basin.

Inflow/Infiltration

Infiltration and inflow continues to be a problem in the District. Both the 8-inch collection pipelines and customer service lines have been shown to contribute to I/I.

The Districts I/I reduction program should at a minimum include the following:

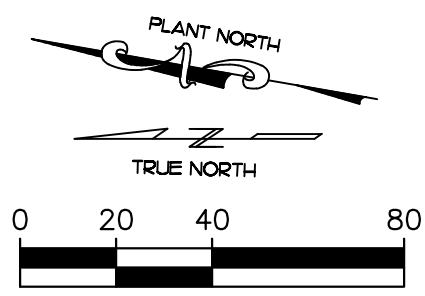
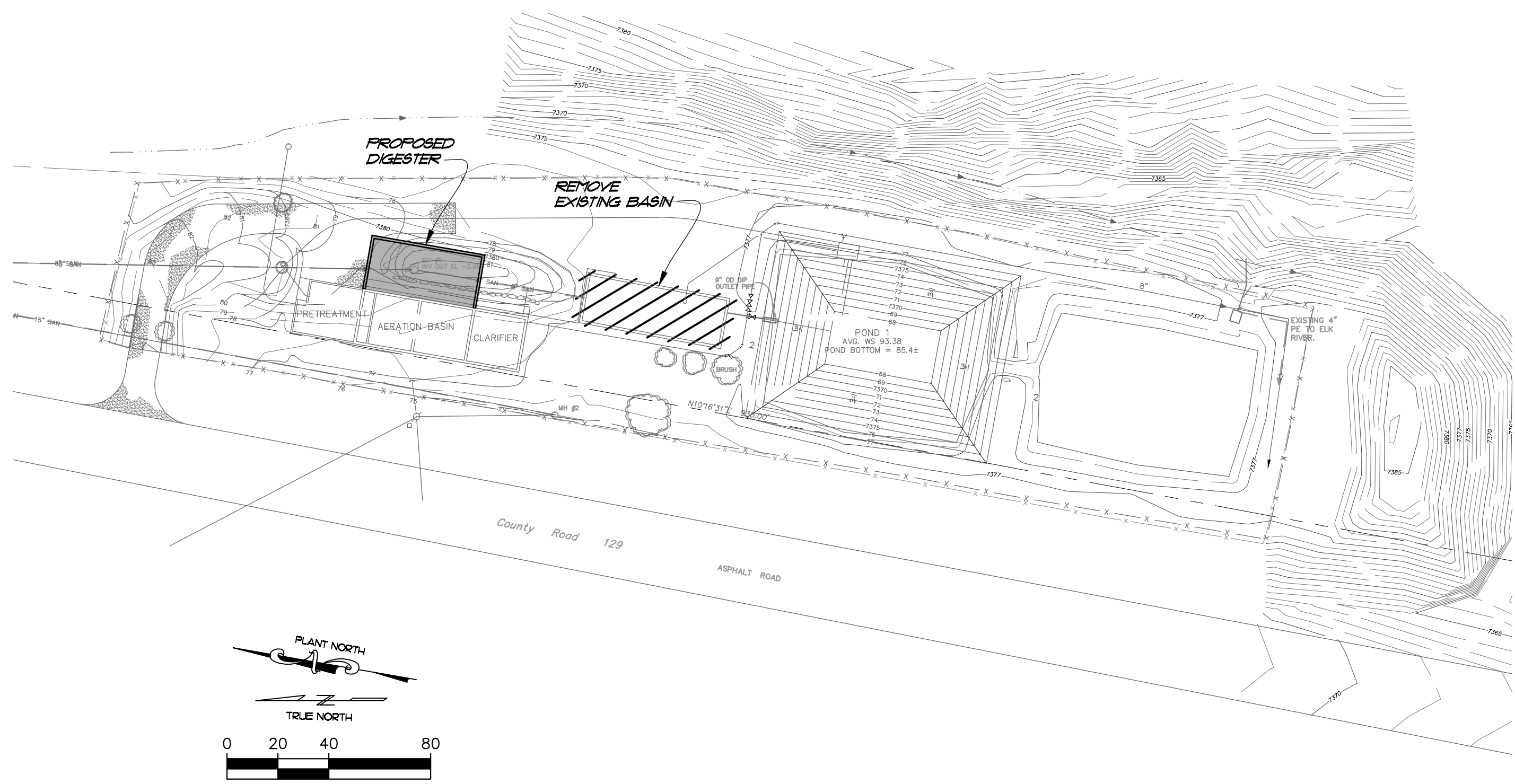
- Schedule sewerline video inspection during high I/I months (April/May),
- Replace 8 inch truss pipe with new PVC pipeline where problems are found,
- 15-inch trunk sewer improvements (when required): insert 12 or 10-inch pipeline.

Recommendations to reduce I/I are as follows:

1. Contract for spot repairs and sewer replacements. Use 2009 video as the basis for identifying repairs and replacements needs.
2. Prepare inventory of customers with I/I in service lines. Notify customers that service lines must be corrected. Provide appropriate time frame for corrections to be made.

3. Contract for videotaping sewer lines east of CR 129 (West Wind, Golden Tide, and Miners Dream Place). Prepare contracts for spot repairs and pipe replacements if found necessary.

Estimated costs for improvements to the water and wastewater system and a priority schedule are included as Appendix B.



Number	Revision Description	By	Date

STEAMBOAT LAKE
WATER AND SANITATION DISTRICT

WASTEWATER TREATMENT PLANT

MASTER PLAN

MERRICK & COMPANY
McLaughlin Water Engineers
A DIVISION OF MERRICK & COMPANY

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Denver, CO 80211
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DESIGN: PROJECT NUMBER
DETAIL: 65418304
CHECK: DATE: FEBRUARY, 2014

FIGURE
1

**WATER PRODUCTION
SUMMARY BY MONTH**

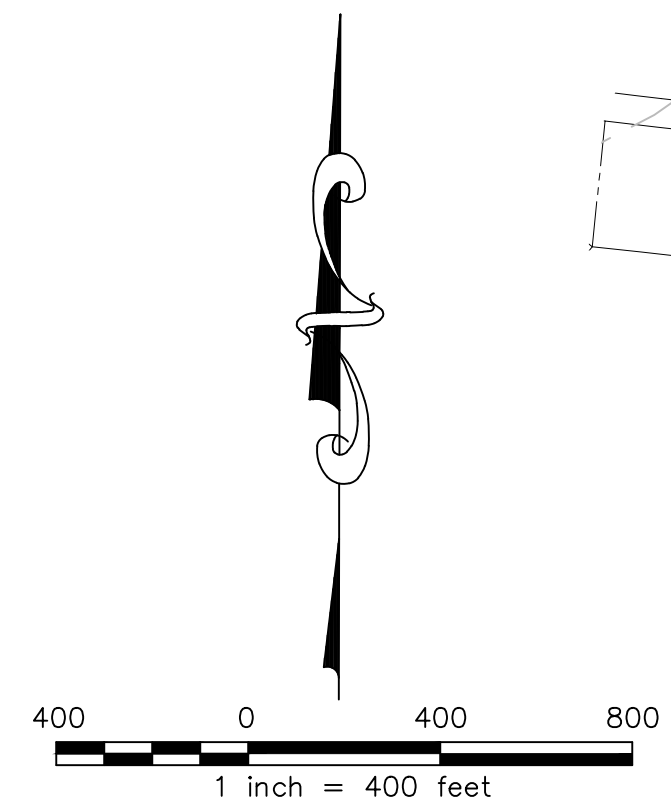
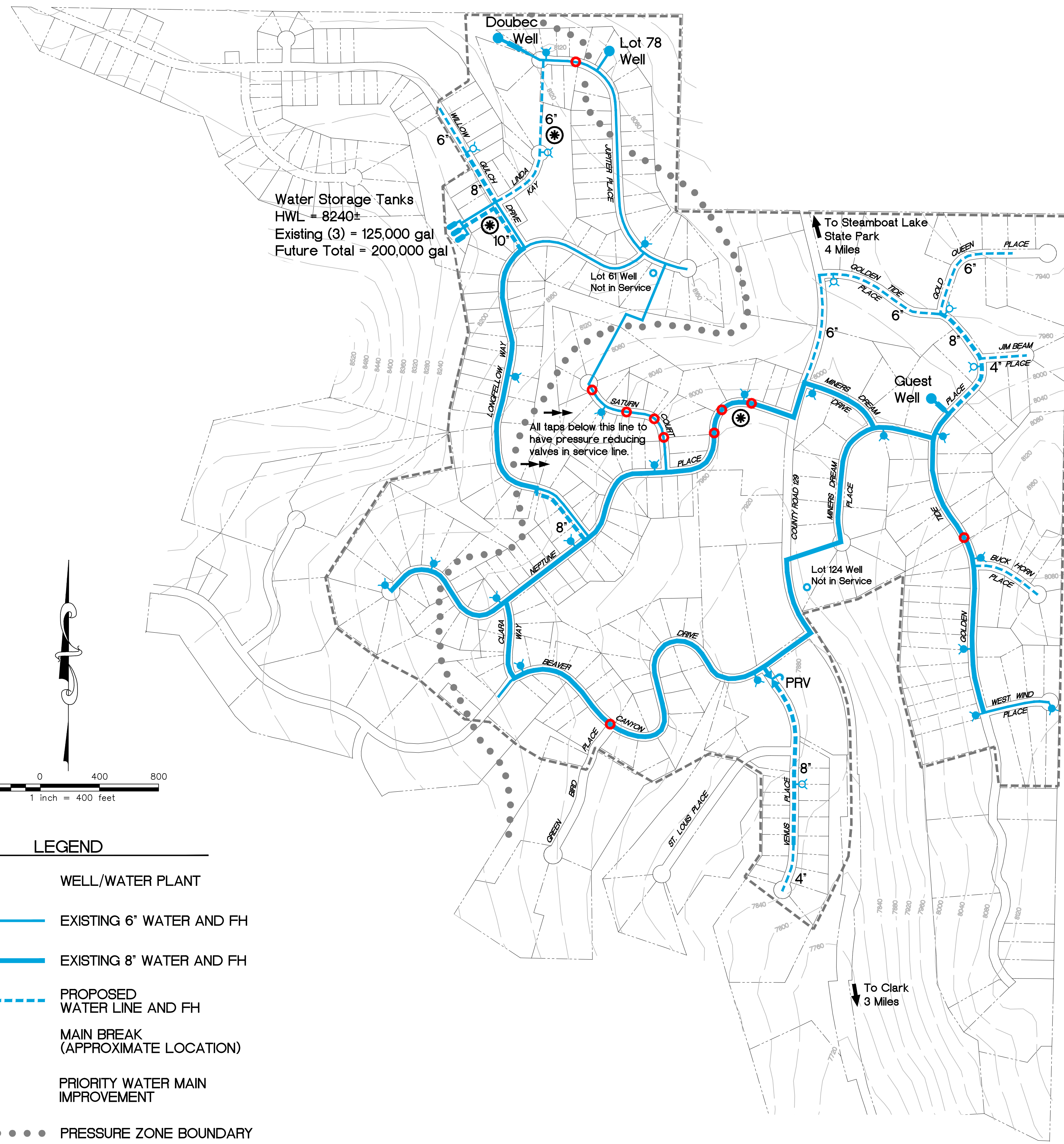
	TOTAL GALLONS PER MONTH 2010				TOTAL GALLONS PER MONTH 2011				TOTAL GALLONS PER MONTH 2012				TOTAL GALLONS PER MONTH 2013				2013 Change from 2012	
	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Total 3 Wells	
January	342,000	189,920		531,920	323,000	107,060		430,060	327,600	273,920		601,520	281,100	230,370	46,350	557,820	-43,700	
February	445,900	31,930		477,830	249,400	69,250		318,650	264,500	146,200		410,700	183,300	229,180	0	412,480	1,780	
March	446,100			446,100	203,600	102,360		305,960	236,900	161,590		398,490	181,600	281,570	0	463,170	64,680	
April	421,100			421,100	218,000	74,350		292,350	203,500	185,330		388,830	258,300	220,130	0	478,430	89,600	
May	43,400	331,880		375,280	133,800	317,280		451,080	325,800	280,420		606,220	264,700	202,430	0	467,130	-139,090	
June	75,600	368,240		443,840	239,400	371,560		610,960	664,300	323,670		987,970	337,200	454,440	62,130	853,770	-134,200	
July	310,000	386,580		696,580	435,100	236,930		672,030	630,200	364,210	7,690	1,002,100	309,100	389,500	153,960	852,560	-149,540	
August	534,600	243,170		777,770	534,000	202,260		736,260	514,000	319,890	45,830	879,720	372,000	306,740	20,730	699,470	-180,250	
September	540,900	154,450		695,350	436,800	152,900		589,700	222,000	295,870	79,870	597,740	0	0	0	0	0	
October	426,000	23,920		449,920	350,900	204,360		555,260	0	437,890	195,400	633,290	0	0	0	0	0	
November	460,000	74,760		534,760	274,800	177,860		452,660	254,200	236,060	1,347	491,607						
December	213,900	239,500		453,400	309,400	131,410		440,810	271,000	225,750	0	496,750						
Subtotal	4,259,500	2,044,350		6,303,850	3,708,200	2,147,580		5,855,780	3,914,000	3,250,800		7,164,800	2,187,300	2,314,360		4,784,830	-490,720	
	AVERAGE GALLONS PER DAY 2010				AVERAGE GALLONS PER DAY 2011				AVERAGE GALLONS PER DAY 2012				AVERAGE GALLONS PER DAY 2013					
	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Lot 78 Well	Guest Well	Doubec Well	Total 3 Wells	Total 3 Wells	
January	11,032	6,126	0	17,159	10,419	3,454	0	13,873	10,568	8,836	0	19,404	9,068	7,431	1,495	17,994	-1,410	
February	15,925	1,140	0	17,065	8,907	2,473	0	11,380	9,121	5,041	0	14,162	6,546	8,185	0	14,731	569	
March	14,390	0	0	14,390	6,568	3,302	0	9,870	7,642	5,213	0	12,855	5,858	9,083	0	14,941	2,086	
April	14,037	0	0	14,037	7,267	2,478	0	9,745	6,783	6,178	0	12,961	8,610	7,338	0	15,948	2,987	
May	1,400	10,706	0	12,106	4,316	10,235	0	14,551	10,510	9,046	0	19,555	8,539	6,530	0	15,069	-4,487	
June	2,520	12,275	0	14,795	7,980	12,385	0	20,365	22,143	10,789	0	32,932	11,240	15,148	2,071	28,459	-4,473	
July	10,000	12,470	0	22,470	14,035	7,643	0	21,678	20,329	11,749	248	32,326	9,971	12,565	4,966	27,502	-4,824	
August	17,245	7,844	0	25,089	17,226	6,525	0	23,750	16,581	10,319	1,478	28,378	12,000	9,895	669	22,564	-5,815	
September	18,030	5,148	0	23,178	14,560	5,097	0	19,657	7,400	9,862	2,662	19,925				0	0	
October	13,742	772	0	14,514	11,319	6,592	0	17,912	0	14,125	6,303	20,429				0	0	
November	15,333	2,492	0	17,825	9,160	5,929	0	15,089	8,473	7,869	1,347	17,689				0	0	
December	6,900	7,726	0	14,626	9,981	4,239	0	14,220	8,742	7,282	0	16,024				0	0	
Overall average/month	11,713	5,558		17,271	10,145	5,863		16,007	10,691	8,859	1,003	20,553						
Average peak monthly flow	723,233				673,083				956,597				801,933				-154,663	
% change from previous year					0.931				1.421				0.838					
Dec 2006 Design Assumptions:					2012 analysis													
.30 AF/yr per Single Family Unit					Consumption June-July-Aug				2,869,790	3 months								
.25 AF/yr = about 223 gpd. Use 270 gpd/single family unit					Average consumption per day				31,193	92 days								
									130 current families; actual no of homes = 139									
698,158	monthly average summer months 2010 and 2011								use 130 to account for vacancies									
956,597	monthly average summer months 2012								240 gallons per day per Single Family Unit									
1.37	Percent increase																	
801,933	monthly average summer months 2013				2013 analysis													
0.84	Percent decrease				Consumption June-July-Aug				2,405,800	3 months								
					Average consumption per day				26,150	92 days								
									130 current families									
									201 gallons per day per Single Family Unit									
	APPENDIX A																	

Appendix B

Steamboat Lake Water and Sanitation District

Priority Improvements and Estimated Costs

Priority	Description	Estimated Costs
<u>Wastewater</u>		
1 st Ongoing	I/I Reduction	per District Budget
2 nd	Replace Sludge Storage Tank	\$340,000
<u>Water</u>		
1 st	Upsize waterline to 10 inch from tank	\$117,000
2 nd	Replace 500 feet weak pipe segment in Neptune	\$ 80,000
	Secure new ground water supply	per District Budget



LEGEND

- WELL/WATER PLANT
- EXISTING 6" WATER AND FH
- EXISTING 8" WATER AND FH
- - - PROPOSED WATER LINE AND FH
- MAIN BREAK (APPROXIMATE LOCATION)
- ⊛ PRIORITY WATER MAIN IMPROVEMENT
- PRESSURE ZONE BOUNDARY
- - - - - APPROXIMATE DISTRICT SERVICE AREA

Number	Revision Description	By	Date

STEAMBOAT LAKE
 WATER AND SANITATION DISTRICT

WATER AND SEWER SYSTEMS

WATER FACILITIES
 MASTER PLAN



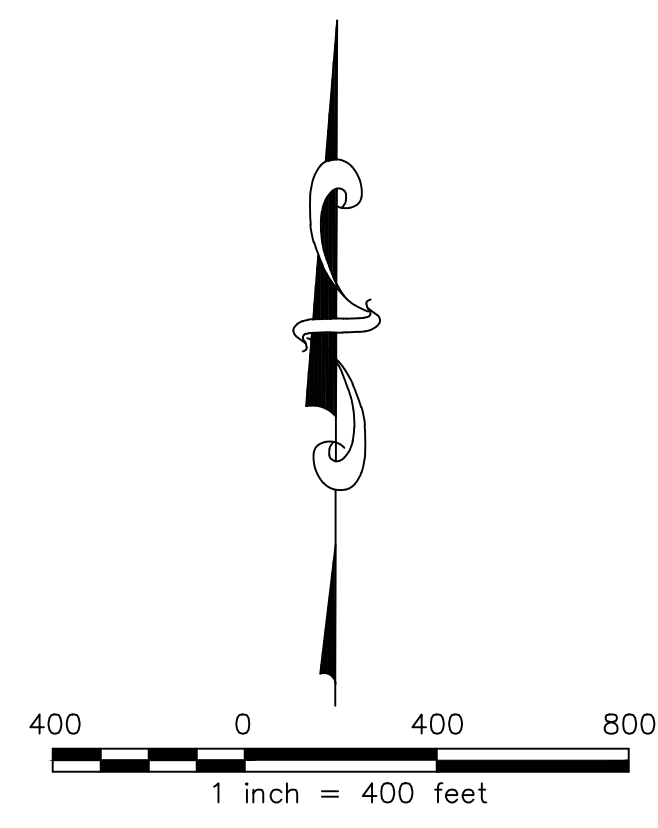
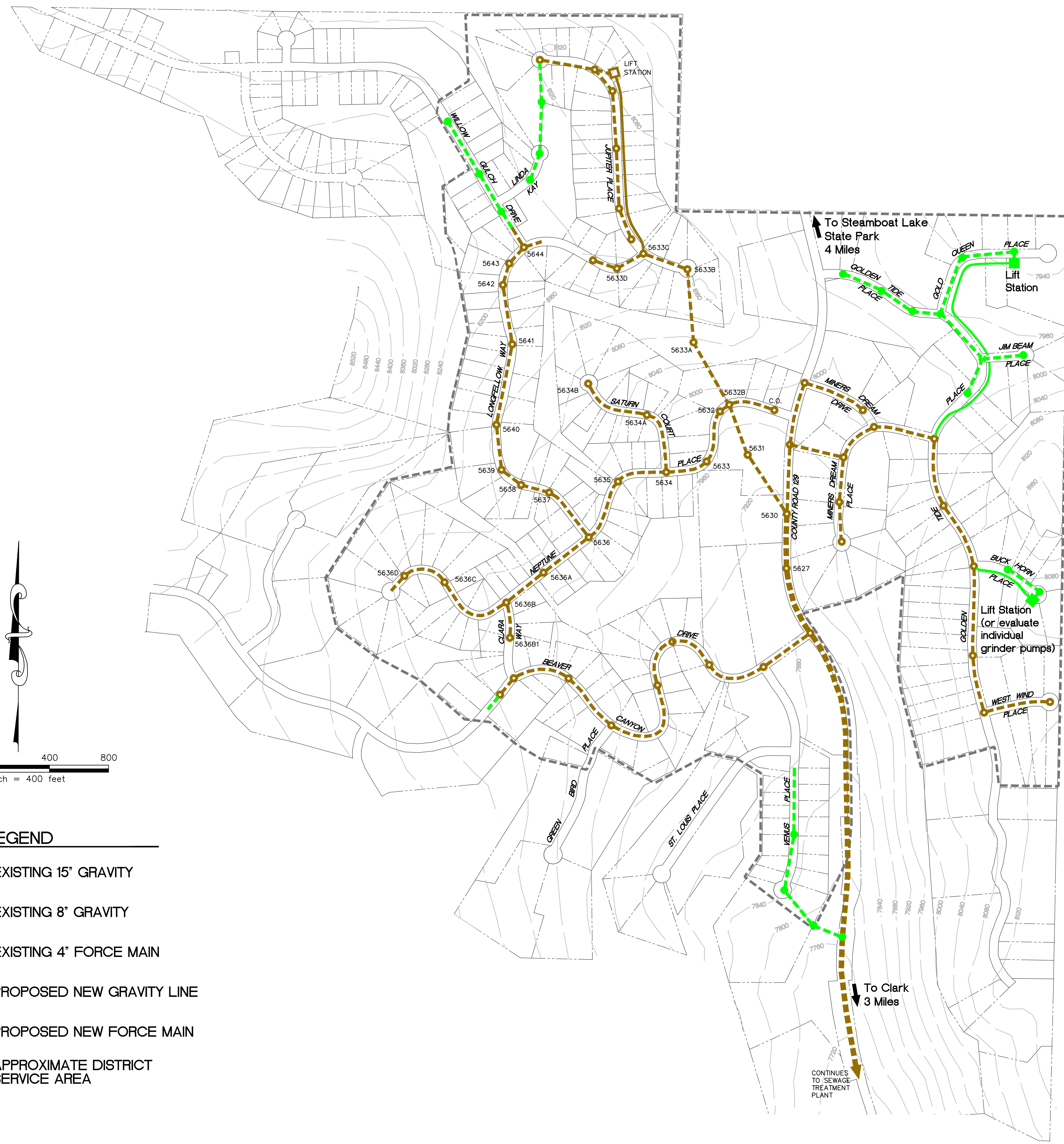
2420 Alcott St.
 Denver, CO 80211
 T303.964.3333
 F303.964.3355

DESIGN: RED, RCM
 DETAIL: AVJ
 CHECK: RCM
 DATE: JANUARY, 2014

PROJECT NUMBER
 65418304

Drawing Number:
W-1

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LEGEND

- - - - - EXISTING 15" GRAVITY
- - - - - EXISTING 8" GRAVITY
- EXISTING 4" FORCE MAIN
- - - - - PROPOSED NEW GRAVITY LINE
- PROPOSED NEW FORCE MAIN
- - - - - APPROXIMATE DISTRICT SERVICE AREA

Number	Revision Description	By	Date

STEAMBOAT LAKE
WATER AND SANITATION DISTRICT

WATER AND SEWER SYSTEM

SEWER FACILITIES
MASTER PLAN

MERRICK & COMPANY
McLaughlin Water Engineers
A DIVISION OF MERRICK & COMPANY

2420 Alcott St.
Denver, CO 80211
T303.964.3333
F303.964.3355

DESIGN: RED, RCM
DETAIL: AVJ
CHECK: RCM
DATE: JANUARY, 2014

PROJECT NUMBER
65418304

Drawing Number:
S-1

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